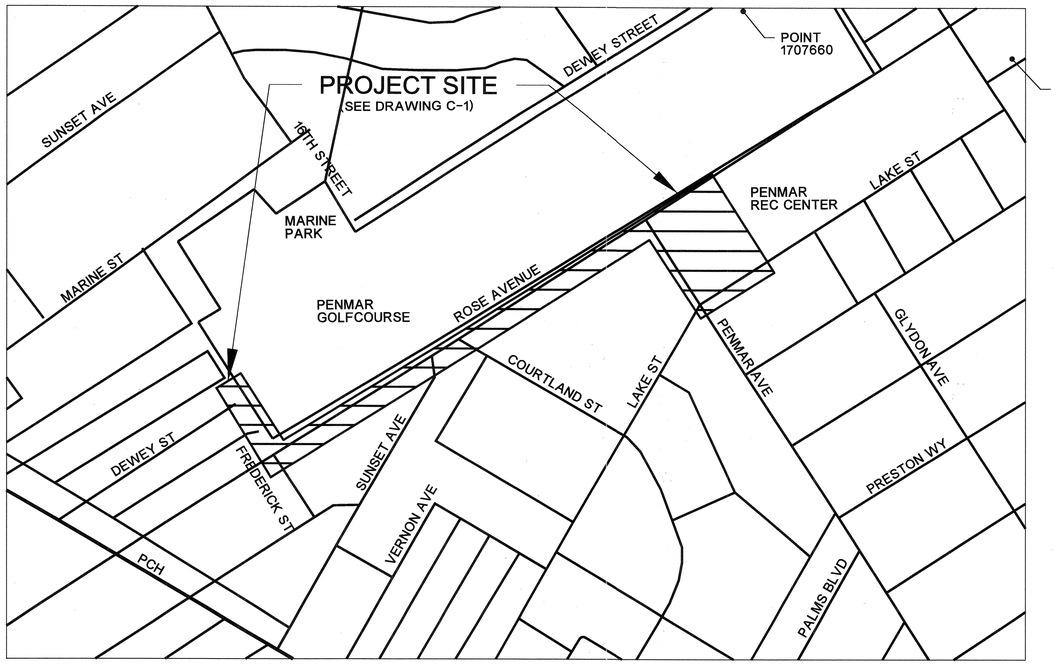
BUREAU OF ENGINEERING
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

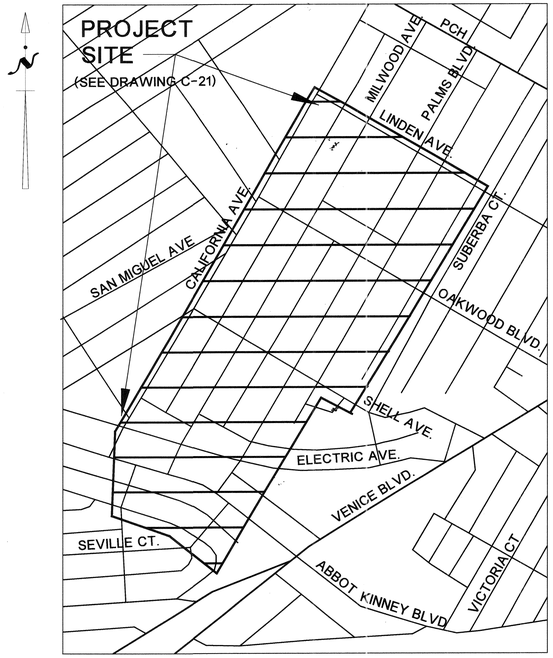
PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
VOLUME I



THOMAS GUIDE 671-J3,H4

LOCATION MAP – PUMP STATION, RESERVOIR, PIPELINE

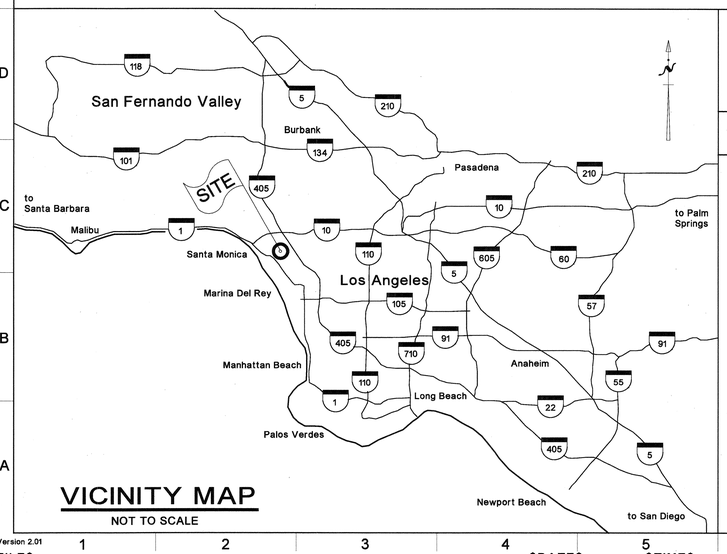
SCALE: NTS



THOMAS GUIDE 671-J5

LOCATION MAP – SEWER UPGRADE

SCALE: NTS



VICINITY MAP

NOT TO SCALE

PROPOSITION "O" BOND PROGRAM

KENDRICK K. OKUDA, P.E.
PROGRAM MANAGER

PROJECT MANAGEMENT	PROJECT DESIGN	CONSTRUCTION MANAGEMENT	SUPPORT SERVICES
CANDELARIO A. FLORES, P.E. PROJECT MANAGER JOANNA TESORO PROJECT ENGINEER ROBERT FINN, P.E. PROJECT MANAGER, BROWN and CALDWELL	CIVIL: CIVIL ENGINEERING DIVISION LARRY MAGURA, P.E. ENGINEERING MANAGER BLACK & VEATCH STRUCTURAL: STRUCTURAL ENGINEERING DIVISION JERRY SIMON, S.E. MANAGING ENGINEER MECHANICAL: MECHANICAL ENGINEERING DIVISION EROS YONG, P.E. SENIOR ENGINEER ELECTRICAL: ELECTRICAL ENGINEERING DIVISION FRANK SHADAN, P.E. MANAGING ENGINEER	CONSTRUCTION MANAGEMENT: CONSTRUCTION MANAGEMENT GROUP JAMES A. TREADAWAY, S.E. DIVISION ENGINEER	SURVEY: SURVEY DIVISION COAST SURVEYING ENVIRONMENTAL: ENVIRONMENTAL GROUP JIM DOTY ACTING GROUP MANAGER MARIA MARTIN ENVIRONMENTAL SUPERVISOR I

BLACK & VEATCH Corporation
Los Angeles, California

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

ROBERT FINN RCE: C25565 DATE

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CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS • BUREAU OF ENGINEERING

LA DPW ENGINEERING Serving The Past, Designing The Future

NO.	REVISIONS:	DATE:	BY:

SERIAL NO.

WORK ACCEPTED

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER GARY LEE MOORE No. C-49446 Exp. 9-30-10 CIVIL STATE OF CALIFORNIA

GARY LEE MOORE, P.E.
CITY ENGINEER

ACCEPTED BY:

DEPUTY CITY ENGINEER/PROGRAM MANAGER — DATE 2-12-10

CITY ENGINEER — DATE

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: COVER SHEET - VOLUME I

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I

ADDRESS: 1216 E. ROSE AVENUE
LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F

DRAWING NO.
R-1

SHEET 1 OF ~~108~~ 48 SHEETS

INDEX OF DISCIPLINE

DISCIPLINE CODE	DISCIPLINE DESCRIPTION
R	REFERENCE
DC	DEMOLITION CIVIL
C	CIVIL
L	LANDSCAPE AND IRRIGATION
S	STRUCTURAL
M	MECHANICAL
E	ELECTRICAL
PI	PROCESS AND INSTRUMENTATION

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REVISION DATES (DESIGN STAGE ONLY)
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Corporation
Los Angeles, California

BUREAU OF ENGINEERING
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NO. REVISIONS: DATE: BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C23565 CIVIL STATE OF CALIFORNIA

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E. CITY ENGINEER DATE: 12.09.02
DESIGN GROUP LIC. NO. 28095 EXP. DATE: 6/30/03
ENGINEER: DOUGLAS B. McCARTNEY
DESIGNED BY: DENNIS SIMONSON
DRAWN BY: DENNIS SIMONSON
CHECKED BY: DOUGLAS B. ROBISON
APPROVED BY: ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: INDEX OF SHEETS - VOLUME I

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. R-2

SHEET 2 OF 48 SHEETS

STANDARD PLANS REQUIRED FOR THIS PROJECT

(ALL STANDARDS SHALL CONFORM TO THE LATEST EDITION OR REVISION)

LA CITY STANDARD PLANS

SEWER MANHOLES - GENERAL	S-140-0
PRECAST CONCRETE SEWER MANHOLE	S-142-0
SANITARY DISPOSAL MANHOLE FRAME AND COVER	S-151-1
PIPE LAYING IN TRENCHES	S-251-1
SUPPORTS FOR STORM DRAIN AND SEWER PIPES ACROSS TRENCHES	S-253-0
BLANKET PROTECTION FOR PIPES	S-255-1
PRESSURE MANHOLE FRAME AND COVER	S-284-2
MANHOLE FRAME AND COVER 36-INCH	S-286-1
MANHOLE "EZ"	S-381-0
TYPES OF CURB AND GUTTER	S-410-2
ALLEY INTERSECTION	S-420-1
JOINTS IN CONCRETE PAVEMENT	S-430-1
MANHOLES, MAINTENANCE HOLE COVERS AND FRAMES, DETECTABLE WARNING SURFACE, TREE WELL COVERS, PAVERS AND SIMILAR INSTALLATIONS	S-601-3
SYMBOLS FOR CONSTRUCTION NOTES	S-627-0
SHRUB, LAWN AND OSCILLATING SPRINKLER HEADS	S-654-0
ELECTRICAL IRRIGATION CONTROLLER	S-658-0
ADVANCE CONSTRUCTION NOTICE SIGNS	S-791-1
BUILDING CREDIT SIGNS	S-792-0
STANDARD SADDLE CONNECTION	27983

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION (SPPWC)

CURB AND SIDEWALK JOINTS	112-1
SUPPORTS FOR CONDUITS ACROSS TENCHES	224-1
BLANKET PROTECTION FOR PIPES	225-1
CURB OPENING CATCH BASIN	300-2
GRATING CATCH BASIN - ALLEY (LONGITUDINAL)	304-2
CURB OPENING CATCH BASIN AT DRIVEWAY	306-2
FRAME AND GRATING FOR CATCH BASINS	311-2
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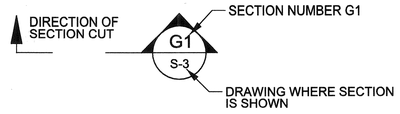
MANHOLE SHAFT 36" WITHOUT REDUCER	326-1
STORM DRAIN JUNCTION STRUCTURE	332-1
CONCRETE COLLAR FOR RCP 12" THROUGH 72"	380-3
36" MANHOLE FRAME AND COVER	633-3

LA DEPARTMENT OF WATER AND POWER

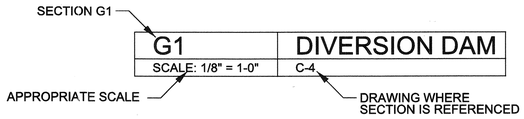
TEMPORARY CONDUIT ENCASEMENT SUPPORT	1-222
SUPPORT REQUIREMENTS FOR MAINS LARGER THAN 16"	B-1453-1A
SUPPORT REQUIREMENTS FOR MAINS 16" AND SMALLER	A3615-A

PLAN, SECTION AND DETAIL DESIGNATIONS

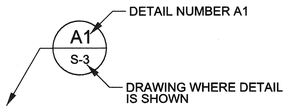
1. SECTION CUTS ARE IDENTIFIED AS FOLLOWS:



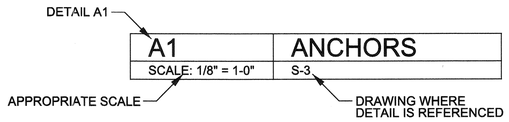
2. SECTIONS ARE LABELED AS FOLLOWS:



3. DETAILS ARE IDENTIFIED AS FOLLOWS:



4. DETAILS ARE LABELED AS FOLLOWS:



PIPE SERVICE ABBREVIATIONS

ABBREV	DESCRIPTION
AIR	AIR
CHEMD	CHEMICAL DRAIN
CHEMV	CHEMICAL VENT
CS	CHEMICAL SOLUTION
D	DRAIN
EC	ELECTRICAL CONDUIT
ECOMM	COMMUNICATION
ECT	ELECTRICAL CABLE TRAY
EDUCT	ELECTRICAL DUCT
EXHA	EXHAUST AIR
FOC	FIBER OPTIC CABLE
FM	FORCE MAIN
FSW	FIRE SUPPLY WATER
G	GAS
HPA	HIGH PRESSURE AIR
IA	INSTRUMENT AIR
LPA	LOW PRESSURE AIR
NG	NATURAL GAS
PD	PROCESS DRAIN
POTW	POTABLE WATER
SD	STORM DRAIN
SS	SANITARY SEWER
SW	SEAL WATER
V	VENT

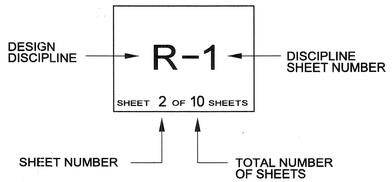
CONSTRUCTION SYMBOLS

SYMBOL	DESCRIPTION
(2)	CONSTRUCT
[59]	EXISTING
[60]	REMOVE
(55) [59]	REMODEL EXISTING
[59] (55)	REMOVE AND CONSTRUCT
(55)	WORK BY OTHERS

REFERENCE PLANS

AS BUILT	UTILITY MAP	DISTRICT MAP	SEWER MAP
E-1543	NONE	NONE	S-533
D-190			
D-195			
D-4807			
D-15476			
D-16206			
P-3174			

SHEET NUMBERING LEGEND



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REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 12-31-03 STATE OF CALIFORNIA

BLACK & VEATCH Corporation Los Angeles, California

BROWN AND CALDWELL LOS ANGELES, CALIFORNIA

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E. CITY ENGINEER DATE: 12.09.02

ENGINEER:	DOUGLAS B. McCARTNEY	LIC. NO. 28095
DESIGN GROUP		
DESIGNED BY:	DENNIS SIMONSON	
DRAWN BY:	DENNIS SIMONSON	
CHECKED BY:	DOUGLAS B. ROBISON	
APPROVED BY:	ROBERT FINN	

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STANDARD PLANS, DESIGNATIONS, AND PIPE SERVICE ABBREVIATIONS

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. R-3

SHEET 3 OF ~~108~~ 48 SHEETS

GENERAL

- EXISTING EQUIPMENT OR MATERIALS TO BE REMOVED
- NEW FACILITIES (SOLID)
- EXISTING (SCREENED)
- EXISTING HIDDEN (SCREENED)
- MATCH LINE
- CENTERLINE
- HIDDEN LINE
- WATER SURFACE
- SCREENED LINES SHOWN WITHIN THE MECHANICAL BOUNDARY LIMITS ARE FOR REFERENCE ONLY. REFER TO THE MECHANICAL DRAWINGS FOR PROCESS PIPING SHOWN AS SCREENED INSIDE THE BOUNDARY.
- CATHODIC PROTECTION CONDUIT (IMPRESSED CURRENT)
- CATHODIC PROTECTION CONDUIT (PASSIVE)
- LIMITS OF WORK

@	AT
&	AND
∠	ANGLE
℄	CENTER LINE
△	DEFLECTION
#	NUMBER OR POUND
ℙ	PLATE OR PROPERTY LINE
±	PLUS OR MINUS
%	PERCENT
Ø	ROUND OR DIAMETER
M	SUM

CIVIL

- FIN GRADE
- FINISHED GRADE
- NATURAL GROUND OR GRADE
- GRANULAR MATERIAL SUCH AS CRUSHED ROCK OR GRAVEL
- AC PAVEMENT IN SECTION
- FENCE
- RAILROAD
- 110 — EXISTING GRADE CONTOURS (SCREENED)
- 110 — FINISH GRADE CONTOURS
- X 120.0 — EXISTING SPOT ELEVATION (SCREENED)
- XX.XX FG — EXISTING FINISHED GRADE ELEVATION
- XX.XX FG — NEW FINISHED GRADE ELEVATION
- XX.XX INV — NEW INVERT ELEVATION
- XX.XX TC — NEW TOP OF CURB ELEVATION OR TOP OF CONCRETE ELEVATION
- XX.XX TOW — NEW TOP OF WALL ELEVATION
- XX.XX TG — NEW TOP OF GRATE ELEVATION
- XX.XX RIM — NEW RIM ELEVATION
- XX.XX FL — NEW FLOW LINE ELEVATION
- XXX — COORDINATE POINT NUMBER
- NEW ASPHALT
- WARPED DG
- DG
- NEW CONCRETE
- SWALE OR DEPRESSION
- EDGE OF WATER; FLOWLINE WITH DIRECTIONAL ARROW
- 3:1 — SLOPE (3 HOR. TO 1 VERT.)
- CUT OR FILL SLOPE; ARROWS POINT DOWN SLOPE
- TREES, SHRUBS OR HEDGE
- B9 — SOIL BORING AND DESIGNATION
- HYDRANT
- BURIED VALVE
- CURB OR CURB AND GUTTER
- MH — MANHOLE
- ACCESS HATCH
- CATCH BASIN OR INLET
- STREET LIGHT
- UTILITY POLE
- PH — POT HOLE DESIGNATION
- SD — EXISTING SD MANHOLE
- UTILITY ACCESS

MATERIALS

- CONCRETE
- REINFORCEMENT IN SECTION
- PRECAST CONCRETE
- MORTAR, GROUT OR PLASTER
- CONC MASONRY WALL SECTION, BRICK OR CAST IRON
- GRATING SPAN
- CHECKER PLATE
- STEEL OR STAINLESS STEEL
- ALUMINUM
- WOOD
- RIGID INSULATION
- BATT INSULATION
- NEOPRENE, RUBBER OR PLASTIC
- OPENING OR DEPRESSION IN SLAB OR WALL
- OPENING WITH GRATING COVER
- OPENING WITH CHECKER PLATE COVER
- JOINT FILLER

MECHANICAL

SINGLE LINE	DOUBLE LINE		
		BALL VALVE	
		BALL CHECK VALVE	
		BUTTERFLY VALVE	
		CHECK VALVE	
		DIAPHRAGM VALVE	
		GLOBE VALVE	
		GATE VALVE	
		KNIFE GATE VALVE	
		NA — NEEDLE VALVE	
		PLUG VALVE	
		PRESSURE REDUCING VALVE	
		PRESSURE SUSTAINING VALVE	
		NA — PRESSURE RELIEF VALVE	
		NA — SOLENOID VALVE	
		STRAINER	
		NA — UNION	

- UTILITY STATION SEE DWG 0M5014
- UTILITY HYDRANT SEE DWG 0M5014
- BURIED VALVE
- FLOOR DRAIN
- CO — CLEANOUT (GRAVITY)
- PC — CLEANOUT (PRESSURE)
- FPC (FLEXIBLE PIPE COUPLING)
- ELASTOMER SPOOL MOLDED
- PC-T (GROOVED END COUPLING)
- PC-T (F), (GROOVED FLANGED COUPLING)

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation
Los Angeles, California

REGISTERED PROFESSIONAL ENGINEER — ROBERT MARTIN FINN — NO. C25565 — 12-31-11 — STATE OF CALIFORNIA

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NO.	REVISIONS:	DATE:	BY:

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INDEX NO.

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP		DATE:	
ENGINEER:	DOUGLAS B. McCARTNEY	LIC. NO.	28095
DESIGNED BY:	DENNIS SIMONSON		
DRAWN BY:	DENNIS SIMONSON		
CHECKED BY:	DOUGLAS B. ROBISON		
APPROVED BY:	ROBERT FINN		

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: LEGENDS

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. R-4

SHEET 4 OF ~~48~~ 108 SHEETS

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REVISION DATES (DESIGN STAGE ONLY)
12.09.02

Sheet Version 2.0

$FILE$ $DATE$ $TIME$

1. DESCRIPTION OF WORK: THE PROPOSED PROJECT CONSISTS OF THE CONSTRUCTION OF A STORMWATER DIVERSION STRUCTURE, PRIMARY AND SECONDARY PUMP STATION SYSTEMS, A PRETREATMENT SYSTEM TO SCREEN TRASH, SEDIMENT, OIL AND GREASE, AN UNDERGROUND DETENTION RESERVOIR, AND THREE FORCE MAINS FOR FLOW CONVEYANCE. AS SEWER CAPACITY ALLOWS, A PORTION OF THE DIVERTED FLOW, INCLUDING DRY WEATHER FLOW WOULD BE DIVERTED DIRECTLY TO THE SANITARY SEWER VIA A FORCE MAIN FROM THE PROPOSED PUMP STATION TO THE SANITARY SEWER AND ULTIMATELY TO THE HYPERION TREATMENT PLANT. ANOTHER PORTION OF THE WET WEATHER FLOW WOULD BE DIVERTED VIA A SECOND FORCE MAIN TO AN APPROXIMATELY 2.75-MILLION GALLON RESERVOIR BENEATH THE PENMAR RECREATION CENTER FIELD 5. STORMWATER STORED IN THE RESERVOIR WOULD BE HELD FOR APPROXIMATELY SEVENTY-TWO (72) HOURS AFTER A STORM EVENT PASSES AND THEN DISCHARGED AT A CONTROLLED RATE TO THE SANITARY SEWER THROUGH A COMBINED GRAVITY AND PUMP SYSTEM THAT WOULD BE CONSTRUCTED ADJACENT TO THE RESERVOIR. THE PROJECT ALSO INCLUDES MINOR SANITARY SEWER UPGRADES ON OAKWOOD AVENUE BETWEEN MILLWOOD AVENUE AND RIALTO COURT, ON RIALTO COURT SOUTH OF NOWITA PLACE, CRESCENT PLACE BETWEEN RIALTO COURT AND PALMS BOULEVARD, AND ON ABBOT KINNEY BOULEVARD AT THE INTERSECTION WITH PALMS BOULEVARD. IMPLEMENTATION OF THIS PROJECT WOULD HELP THE CITY MEET SANTA MONICA BAY BEACHES DRY & WET WEATHER BACTERIA TOTAL MAXIMUM DAILY LOADS (TMDLS) ADOPTED BY THE WATER QUALITY CONTROL BOARD TO PROTECT THE DESIGNATED BENEFICIAL USES OF THE RECEIVING WATERS. THE PROJECT IS FUNDED BY PROPOSITION 0, A $500 MILLION CLEAN WATER BOND MEASURE APPROVED BY VOTERS NOVEMBER 5,2004. IN A SEPARATE CONTRACT, PHASE II OF THE PROJECT WOULD PROVIDE FURTHER TREATMENT FOR BENEFICIAL USE FOR LANDSCAPE IRRIGATION AT PENMAR GOLF COURSE, PENMAR RECREATION CENTER AND/OR MARINE PARK. DIVERTED FLOWS WOULD BE CONVEYED TO A PUMP STATION CONSTRUCTED WITHIN FREDERICK STREET RIGHT-OF-WAY NORTHWEST OF THE INTERSECTION WITH ROSE AVENUE.

2. LEGAL DESCRIPTION OF RESERVOIR SITE: LOT 4 EROLINDA C DE YORBA, RANCHO LA BALLONA TRACT.

3. SPECIFICATIONS: UNLESS OTHERWISE INDICATED IN THE PLANS AND SPECIFICATIONS, ALL WORK SHALL CONFORM TO THE LATEST EDITION AND SUPPLEMENTS OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (SSPWC) PARTS 2 THROUGH 6 ADOPTED BY THE BOARD OF PUBLIC WORKS OF THE CITY OF LOS ANGELES AS MODIFIED BY THE CORRESPONDING ISSUE OF THE BROWN BOOK.

4. THIS IMPROVEMENT CONSISTS OF WORK CALLED FOR ONLY ON THIS PLAN. THE PLAN REFERS TO THE CONTRACT DRAWINGS, SPECIFICATIONS, AND SCHEDULE OF WORK INCLUDED HEREIN.

5. THE ENGINEER DOES NOT WARRANT THE ACCURACY OF SCALED DIMENSIONS. ALL DIMENSIONS SHALL BE AS DESIGNATED ON THE PLANS.

6. SURVEY STATIONING OR ELEVATIONS SHOWN ON THE PLANS ARE EITHER EXISTING FACILITY STATIONS OR ELEVATIONS CALCULATED FROM EXISTING RECORDS. WHERE CONNECTIONS ARE TO BE MADE TO EXISTING FACILITIES, THE CONTRACTOR SHALL VERIFY THE EXISTING ELEVATIONS PRIOR TO DOING ANY WORK THAT MAY BE AFFECTED BY SUCH CONNECTIONS.

7. THE CONTRACTOR IS REQUIRED TO CONTACT UNDERGROUND SERVICE ALERT FOR UPDATED UTILITY MARKINGS. NO CHANGE ORDER WILL BE ISSUED FOR REPAIRS TO UNMARKED OR MISMARKED UTILITIES. THE CONTRACTOR IS DIRECTED TO PURSUE RESPECTIVE UTILITIES FOR ANY REQUIRED COMPENSATION.

8. TIME AND INFORMATION TYPE 2 CONSTRUCTION NOTICE SIGNS (ONE AT THE RESERVOIR SITE AND ONE AT THE PUMP STATION SITE) PER STANDARD PLANS S-791-1 ARE REQUIRED ON THIS PROJECT. THREE (ONE AT EACH OF THE SEWER UPGRADE SITES) TYPE 1 CREDIT SIGNS PER S-791-1 ARE ALSO REQUIRED. THE CITY INSPECTOR WILL DETERMINE APPROPRIATE LOCATIONS. THE TELEPHONE NUMBER FOR THE "INFORMATION" SIGN AND INFORMATION FOR THE "CREDIT" AND "TIME" SIGNS WILL BE FURNISHED AT THE TIME OF CONSTRUCTION.

9. TEMPORARY BYPASS OF LIVE SEWERS IS REQUIRED DURING CONSTRUCTION. SUBMITTALS DETAILING THE METHOD OF BYPASS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO INITIATION OF WORK. SEE SECTION 02999 FOR ADDITIONAL DETAILS. ALL COSTS TO THE CONTRACTOR ASSOCIATED WITH SEWER BYPASS REQUIREMENTS SHALL BE INCLUDED IN THE PRICES BID FOR OTHER RELATED BID ITEMS. THE CONTRACTOR SHALL COMPLY WITH THE PROVISIONS OF THE POLLUTION CONTROL – SEWAGE SPILL PREVENTION AND RESPONSE REQUIREMENTS AND THE BOARD OF PUBLIC WORKS' POLICY OF "ZERO SPILLS" REQUIREMENTS AS SET FORTH IN SECTION 01563 OF THE GENERAL REQUIREMENTS.

10. SEWAGE FLOW CONDITIONS DURING CONSTRUCTION: IN CASE OF SEWAGE SPILL, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND CONTACT THE WASTEWATER COLLECTION SYSTEMS DIVISION (WCSD) AT (213) 485-7675. THE CONTRACTOR SHALL TAKE ALL ACTIONS NECESSARY TO RESOLVE SPILLAGE AND BE SOLELY RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH CLEANUP, REPAIR, AND TIME.

11. REPLACEMENT SEWERS SHALL BE CONNECTED TO EXISTING MAINTENANCE HOLES WITH FLEXIBLE JOINTS AS SHOWN ON STANDARD PLANS S-140 AND S-142. APPLICABLE TO SEWER REPLACEMENT WORK ONLY.

12. UPON COMPLETION OF WORK, EACH LOCATION SHALL BE OPENED TO TRAFFIC WITHIN 2 CALENDAR DAYS AND PERMANENT RESURFACING (BASE PAVEMENT) SHALL BE PLACED WITHIN 14 CALENDAR DAYS.

13. HOLIDAY MORATORIUM CONSTRUCTION RESTRICTION: ABBOT KINNEY BLVD. LANE CLOSURES OR WORK WILL NOT BE ALLOWED BETWEEN NOVEMBER 15 THROUGH JANUARY 2.

14. THE CONTRACTOR SHALL DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO APPLICABLE LOCAL, STATE, AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS. LOCATIONS REQUIRING SHEETING AND SHORING SHALL BE DETERMINED BY THE CONTRACTOR. SHORING REQUIREMENTS FOR THIS PROJECT SHALL BE AS DETERMINED BY THE CALIFORNIA CODE OF REGULATIONS, TITLE 8, CONSTRUCTION SAFETY ORDERS. SHORING PLANS SHALL BE SUBMITTED TO THE PROJECT ENGINEER FOR REVIEW AND APPROVAL PRIOR TO INITIATION OF WORK.

15. CASE 2 BEDDING PER STANDARD PLAN S-251-1 SHALL BE PLACED IN ALL TRENCHES UNLESS OTHERWISE INDICATED ON THE PLANS.

16. TRENCH BACKFILL AND COMPACTION: THE CONSOLIDATION OF BACKFILL IN TRENCHES SHALL BE IN ACCORDANCE WITH THE FOLLOWING:

   A. BACK FILL IN TRENCHES SHALL BE IN ACCORDANCE WITH SUBSECTION 306-1.3 OF THE STANDARD SPECIFICATIONS AS MODIFIED BY STANDARD PLAN S-251, AND AS MODIFIED HEREIN.

   B. COMPACTION BY FLOODING SHALL NOT BE ALLOWED. THE CONSOLIDATION OF BACKFILL IN TRENCHES SHALL BE DONE EITHER BY MECHANICAL COMPACTION FOR JETTING IN ACCORDANCE WITH SECTIONS 306-1.3.2 AND 306-1.3.3 OF THE SSPWC. DETERMINATION OF THE COMPACTION METHOD SHALL BE MADE BY THE PROJECT ENGINEER BASED ON THE CONTRACTOR'S OPTIONS. COMPACTION BY JETTING SHALL NOT BE USED IN MECHANICALLY COMPACTED FILLS, UNCONSOLIDATED FILLS, STEEP SLOES, SLIDE AREAS, OR AREAS OF PRESSURE FROM STRUCTURES.

   C. NATIVE TRENCH SOIL UNSUITABLE FOR BACKFILL MAY BE MADE ACCEPTABLE UNDER THE FOLLOWING CONDITIONS:

      1. IT MAY BE MIXED WITH A MORE SUITABLE SOIL, IN PROPORTIONS DETERMINED BY THE GEOTECHNICAL ENGINEER.

      2. IT MAY BE COMPACTED BY JETTING TO WITHIN 3 FEET OF PAVEMENT SURFACE PROVIDED THE REMAINDER OF BACKFILL IS CRUSHED AGGREGATE BASE. IN EASEMENTS NOT UNDER PAVEMENT, THE TOP 12" OF BACKFILL SHALL BE NATIVE SOIL.

   D. UNSUITABLE BACKFILL SOIL SHALL BE REMOVED AND REPLACED WITH IMPORTED SOIL IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS, SUBSECTION 306-1.3.5 SAND OR COHESIONLESS MATERIAL SHALL NOT BE USED AS BACKFILL EXCEPT WHERE NATIVE SOIL IN THE TRENCH IS SAND.

17. RELATIVE COMPACTION OF THE TOP 12 INCHES OF ALL SUBGRADE MATERIALS BENEATH ALL IMPROVEMENTS SHALL BE A MINIMUM OF 95% COMPACTION.

18. EXISTING PAVEMENT THICKNESS, WHERE UNKNOWN, SHALL BE ASSUMED TO BE 4" AC ON 6 INCHES OF CONCRETE FOR LOCAL STREETS AND 8 INCHES OF CONCRETE FOR SECONDARY COLLECTOR, AND MAJOR STREETS. PAYMENT ADJUSTMENT FOR PAVEMENT THICKNESS WILL BE PER STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (SSPWC) SECTION 300-1.4, AS MODIFIED BY THE BROWN BOOK.

19. PERMANENT RESURFACING:

   A. UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS, PERMANENT RESURFACING SHALL BE IN ACCORDANCE WITH SECTION 306-1.5.2 OF THE LATEST BROWN BOOK, EXCEPT THAT THE PAVEMENT THICKNESS SHALL BE IN ACCORDANCE WITH THE FOLLOWING TABLE:

CURB-TO-CURB STREET WIDTH	PAVEMENT THICKNESS
LESS THAN 44 FEET	6-INCH AC ON 4-INCH CMB
44 TO 66 FEET	6-INCH AC ON 6-INCH CMB
66 TO 84 FEET	8-INCH AC ON 8-INCH CMB

   B. WHERE SLURRY BACKFILL IS PERMITTED BY THE ENGINEER, THE BACKFILL SHALL BE PLACED TO PAVING LEVEL WITH NO BASE MATERIAL REQUIRED.

   C. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD CHECK THE JOB SITE COMPLETELY AND TO IDENTIFY ALL CONCRETE CROSS GUTTER, CURB AND GUTTER, SIDEWALKS, DRIVEWAYS, BUSPADS, APRONS, AND MISCELLANEOUS CONCRETE STRUCTURES AFFECTED. WHERE REMOVAL AND RECONSTRUCTION OF SUCH CONCRETE STRUCTURES IS NECESSARY, COST FOR SUCH REMOVAL AND RECONSTRUCTION SHALL BE INCLUDED IN THE COST FOR PIPE REMOVAL AND REPLACEMENT.

20. THE CONTRACTOR SHALL COLLECT, HANDLE, REMOVE, AND DISPOSE OF ALL DEBRIS PROPERLY AND SAFELY. DEBRIS TO BE REMOVED FROM THE FACILITIES INCLUDES, BUT IS NOT LIMITED TO, SEDIMENT, MORTAR, CONCRETE PIECES, BRICKS, AND WIRE MESH. DEBRIS SHALL BE TREATED TO PREVENT ODORS PRIOR TO REMOVAL AND DISPOSAL.

21. ALL COSTS ASSOCIATED WITH DEBRIS HANDLING, REMOVAL, AND DISPOSAL SHALL BE INCLUDED AS PART OF THE REHABILITATION OR CLEANING WORK LISTED ON THE SCHEDULE OF WORK AND PRICES.

22. SUBSTRUCTURE LOCATIONS SHOWN ON THE PLANS ARE APPROXIMATE. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES AND PROVIDE ADEQUATE SUPPORT TO ALL UTILITIES IN COMPLIANCE WITH RESPECTIVE UTILITY OWNER REQUIREMENTS. THE CONTRACTOR SHALL NOTIFY AND REQUEST DIRECTION FROM THE ENGINEER WHEN UTILITIES WHICH ARE NOT SHOWN ON THE PLANS ARE LOCATED.

23. ALL EXISTING SEWERS AND STORM DRAINS THAT CROSS THE PROPOSED WORK SHALL BE SUPPORTED IN ACCORDANCE WITH STANDARD PLAN S-253-0. THE COST OF SUPPORTING THE SEWERS AND STORM DRAINS SHALL BE INCLUDED IN THE BID PRICES FOR ASSOCIATED WORK. THE CONTRACTOR SHALL SUBMIT CALCULATIONS AND DRAWINGS OF SUPPORT FOR LARGE UTILITIES AND STRUCTURES FOR APPROVAL BY THE ENGINEER.

24. THE CONTRACTOR SHALL SUPPORT POWER CONDUITS AT TRENCH CROSSINGS IN ACCORDANCE WITH STANDARD DRAWING SPPWC 224-1. THE CONTRACTOR SHALL SUPPORT WATER CONDUITS AT TRENCH CROSSINGS IN ACCORDANCE WITH STANDARD DRAWING SPPWC 224-1.

25. THE CONTRACTOR IS HEREBY NOTIFIED THAT THE EXISTING ALIGNMENT AND INTERIOR CONDITION SHOWN IN THIS SET OF DRAWINGS ARE TAKEN FROM AVAILABLE RECORDS AND INTERPRETED BY THE ENGINEER'S BEST JUDGMENT. ACTUAL ELEVATION, DEGREE OF CORROSION, OR EXTENT OF DEBRIS CAN BE DIFFERENT THAN AS SHOWN HEREIN. THE CONTRACTOR SHALL NOT BE ALLOWED TO CLAIM ANY OF THESE DIFFERENCES AS CHANGE OF SITE CONDITION NOR SHALL BE COMPENSATED FOR ADDITIONAL WORK.

26. THE CONTRACTOR IS REQUIRED TO SAWCUT EXISTING PAVEMENT IN OPEN-TRENCH OPERATION WHERE EXISTING PAVEMENT HAS TO BE REMOVED. STOMPING IS NOT ALLOWED.

27. THE CONTRACTOR SHALL OBTAIN REQUIRED PERMITS FROM THE CALIFORNIA DIVISION OF INDUSTRIAL SAFETY FOR CONSTRUCTION OF TRENCHES AND EXCAVATION OVER FIVE FEET DEEP. THE CONTRACTOR SHALL SUBMIT PROOF OF PERMIT TO THE INSPECTOR.

28. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE RULES AND REGULATIONS. SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

29. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTROLLING GROUNDWATER ENCOUNTERED AND SECURING APPROPRIATE DISCHARGE PERMITS. CONTRACTOR SHALL SUBMIT DEWATERING PLAN TO ENGINEER FOR APPROVAL. DEWATERING SHALL BE IN ACCORDANCE WITH BOE SPECIAL ORDER 001-0204 AND GR SECTION 02200.

30. THE CONTRACTOR SHALL NOT SHUT OFF ANY WATER SERVICE AT THE CURB AT ANY TIME PER CITY OF LOS ANGELES RULES GOVERNING WATER AND ELECTRIC SERVICE, RULE 10-2, SECTION A.3. SHOULD THE CONTRACTOR REQUIRE THE WATER SERVICE TO BE SHUT OFF TO THE PRIVATE PROPERTY, ARRANGEMENTS SHALL BE MADE SOLELY BY THE CONTRACTOR WITH THE PROPERTY OWNER AND THE CONTRACTOR SHALL PROVIDE THE PROPERTY OWNER WITH AT LEAST 48 HOURS PRIOR NOTICE.

31. NOTIFICATION

   A. THE CONTRACTOR SHALL NOTIFY THE OPERATION CONTROL DIVISION OF THE METROPOLITAN TRANSIT AUTHORITY (MTA) AT THE SPECIAL EVENTS OFFICE (213) 922-4632 TEN (10) WORKING DAYS IN ADVANCE OF ANY WORK THAT WILL AFFECT MTA BUS STOPS.

   B. BEFORE COMMENCING ANY EXCAVATION, THE CONTRACTOR SHALL OBTAIN AN UNDERGROUND SERVICE ALERT (USA) INQUIRY I.D. NUMBER BY CALLING 1-800-422-4133. TWO (2) WORKING DAYS SHALL BE ALLOWED AFTER THE I.D. NUMBER IS OBTAINED AND BEFORE THE EXCAVATION WORK IS STARTED SO THAT UTILITY OWNERS CAN BE NOTIFIED. THE I.D. NUMBER TOGETHER WITH THE DATE ACQUIRED SHALL BE REPORTED TO THE BUREAU OF CONTRACT ADMINISTRATION AT (213) 485-5080 WHEN CALLING FOR INSPECTION. I.D. NUMBERS WILL NOT BE GIVEN MORE THAN TEN (10) DAYS PRIOR TO STARTING EXCAVATION WORK.

32. CONTRACTOR IS TO PROVIDE ALL CONSTRUCTION SURVEYING. THIS PROJECT WAS SURVEYED FOR DESIGN USING THE NAVD OF 1988. TO ADJUST RECORD ELEVATIONS BASED ON THE NGVD OF 1929 CITY DATUM NUMERICALLY ADD TO THE RECORD ELEVATION AN ADJUSTMENT FACTOR OF 2.33 FEET. THE CONTRACTOR SHALL REESTABLISH ANY MONUMENT OR BENCH MARK THAT IS DISTURBED OR DESTROYED BY HIS OPERATIONS. A CORNER RECORD OR A RECORD OF SURVEY SHALL BE FILED AS REQUIRED BY THE LAND SURVEYORS ACT.

33. INTERFERING STRUCTURES SHALL BE REMOVED PER DEMOLITION PLANS.

34. AN ADJUSTMENT TO THE CONTRACT BID AMOUNT WILL BE MADE IF THE CONTRACTOR IS REQUIRED TO RELOCATE EXISTING PIPELINES OR INSTALL PROPOSED PIPELINES IN DIFFERENT LOCATIONS THAN THOSE SHOWN ON THE DRAWINGS, AND IF SUCH WORK CAN BE DEMONSTRATED TO PRODUCE ADDITIONAL FABRICATION OR INSTALLATION COSTS.

35. THE CONTRACTOR SHALL PROTECT EXISTING UTILITIES WHETHER SHOWN OR NOT SHOWN ON THE DRAWINGS. ALL EXISTING STRUCTURES, PIPING, AND PIPING LATERALS SHALL BE PROTECTED. AT UNDERGROUND CROSSINGS OF EXISTING UTILITIES, THE CONTRACTOR SHALL PROVIDE STRUCTURAL SUPPORT TO PROTECT EXISTING FACILITIES. PIPELINES THAT ARE DAMAGED OR BROKEN AT A CROSSING SHALL BE REPLACED.

36. THE CONTRACTOR SHALL REPAIR OR REPLACE IN KIND ALL EXISTING PAVEMENT, SIDEWALKS, DRIVEWAYS, CURBS, BERMS, PAVED AND DIRT ROADS, DRAINAGE DITCHES, CULVERTS, DRAIN PIPES, AND OTHER EXISTING FACILITIES, BOTH ABOVE AND BELOW GROUND, THAT ARE DAMAGED DURING PERFORMANCE OF THE WORK.

37. THE CONTRACTOR SHALL MAINTAIN A SUPPLY OF MATERIALS ON HAND TO MAKE REPAIRS TO PIPELINES THAT ARE DAMAGED BY HIS OPERATIONS.

38. CURBS AND GUTTERS DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED IN ACCORDANCE WITH THE SPECIFIED STANDARD DETAILS.

39. CONTRACTOR SHALL FULLY COMPLY WITH THE ENVIRONMENTAL, ARCHEOLOGICAL AND CULTURAL MITIGATION MEASURES AND REQUIREMENTS DEFINED IN SECTION 01562.

40. THE CONTRACTOR SHALL PROTECT ALL EXISTING TREES BY FENCING OFF ALL AREAS UNDER TREE CANOPIES. NO PARKING OF EQUIPMENT OR VEHICLES SHALL BE ALLOWED UNDER TREES.

41. THE CONTRACTOR SHALL REPLACE ANY TREES AND SHRUBS THAT HE REMOVES IN THE COURSE OF CONSTRUCTION OF THE WORK. IF THE CONTRACTOR PROPOSES TO TRIM TREES OR SHRUBS THAT FACILITATE HIS CONSTRUCTION ASSESS, SUCH PROPOSALS SHALL BE SUBMITTED TO THE CITY FOR REVIEW TWO WEEKS IN ADVANCE OF THE WORK. TRIMMING WORK SHALL BE DESIGNED AND SUPERVISED BY A LICENSED ARBORIST. TRIMMING OF TREES TO BE COORDINATED WITH RECREATION AND PARKS DEPARTMENT AT 213-485-4826 IN ADDITION TO OTHER REQUIREMENTS. DRIP LINES OF TREES SHALL BE ENCLOSED BY 8' HIGH CHAIN LINK FENCING. ANY SPRINKLER HEADS AND VALVES REMOVED SHALL BE SALVAGED AND PROVIDED TO THE ENGINEER.

42. THE CONTRACTOR SHALL MAINTAIN ACCESS TO UTILITY EASEMENTS.

43. EXISTING OR FINISHED GRADES SHOWN ON THE PIPELINE PLAN AND PROFILE DRAWINGS ARE OVER THE CENTERLINE OF THE PIPE, STATIONS, COORDINATES, AND RADII REFER TO THE CENTERLINE OF THE PIPE. STATIONS SHOWN ARE VERTICAL PROJECTIONS ON THE HORIZONTAL CENTERLINE OF THE PIPE. RIGHTS-OF-WAY AND EASEMENTS SHOWN ON THE DRAWINGS ARE PERMANENT UNLESS OTHERWISE NOTED.

44. THE CONTRACTOR SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF THE PROJECT, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND SHALL NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE CITY AND THE ENGINEER HARMLESS FORM ANY AN ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT. EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE CITY OR THE ENGINEER.

45. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY CONSTRUCTION PERMITS AND PAY ALL ASSOCIATED FEES.

46. ALL CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE CODES AND REGULATIONS. THE CONTRACTOR IS RESPONSIBLE FOR DUST CONTROL, EROSION CONTROL, DRAINAGE, STORMWATER POLLUTION PREVENTION, ETC. FOR THE DURATION OF THE PROJECT.

47. THE CONTRACTOR SHALL MAINTAIN A CLEAN WORK SITE FOR THE DURATION OF THE CONTRACT.

48. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT LEAST TWO WORKING DAYS IN ADVANCE OF ANY SHUTDOWN INVOLVING UTILITIES OPERATED BY THE CITY.

49. THE CONTRACTOR SHALL BE GIVEN WRITTEN NOTICE TO THE ENGINEER AT LEAST ONE WORKING DAY IN ADVANCE FOR INSPECTION AND TESTING REQUIREMENTS.

50. THE CONTRACTOR SHALL PROVIDE ALL WATER REQUIRED FOR CONSTRUCTION PURPOSES. THE CONTRACTOR SHALL CONFORM TO THE CITY'S REQUIREMENTS FOR THE USE OF POTABLE WATER FROM ANY SOURCES AND SHALL BE RESPONSIBLE FOR ALL FEES REGARDING SUCH USAGE.

51. OBTAIN APPROVAL FORM THE CITY PRIOR TO DEMOLITION OF EXISTING PIPELINES, ELECTRICAL, AND STRUCTURES. COMPLY WITH ALL CONSTRUCTION SEQUENCING AND SCHEDULING REQUIREMENTS PROVIDED IN THE CONTRACT SPECIFICATIONS.

52. THE CONTRACTOR SHALL REMOVE FROM THE JOB SITE ALL DEMOLISHED MATERIAL AND PIPE UNLESS NOTED OTHERWISE.

53. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE WORK OF ALL TRADES AND OF THE UTILITY COMPANIES' RELOCATION AND/OR INSTALLATION WORK.

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation
Los Angeles, California

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

Sheet Version 2.0

$FILE$ $DATE$ $TIME$

BUREAU OF ENGINEERING • DEPARTMENT OF PUBLIC WORKS • CITY OF LOS ANGELES

LA DPW ENGINEERING Serving The Peoples Designing The Future

DATE: BY: NO. REVISIONS:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25566 EXP. 6-30-04 STATE OF CALIFORNIA

CITY ENGINEER DATE:

LIC. NO. 28095

GARY LEE MOORE, P.E.

DESIGN GROUP

ENGINEER: DOUGLAS B. McCARTNEY

DESIGNED BY: DENNIS SIMONSON

DRAWN BY: DENNIS SIMONSON

CHECKED BY: DOUGLAS B. ROBISON

APPROVED BY: ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ

HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: GENERAL NOTES 1

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. R-5

SHEET 5 OF 48 SHEETS

54. BENCHMARKS:

THE FOLLOWING LA CITY BENCH MARKS:

POINT	NORTHING	EASTING	ELEV
1707590	1825636.44	6423854.45	29.31
1707600	1826218.28	6423584.03	43.67
1707660	1825851.93	6422647.04	34.40

THE FOLLOWING NGS/CSRC CGPS STATION:

POINT	NORTHING	EASTING	ELEV
DSHH	1831273.12	6456057.89	111.79
NOPK	1815188.92	6456162.79	228.21
UCLP	1847829.44	6427838.47	483.81
WRHS	1807427.14	6431998.34	145.86

COORDINATES ARE CALIFORNIA STATE PLANE, ZONE V NORTH AMERICAN DATUM OF 1983 (NAD83) (2007.00 EPOCH) AS DERIVED FROM THE FOUR NGS/CSRC STATIONS LISTED ABOVE.

ELEVATIONS ARE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AS DERIVED FROM THE FOUR LA CITY BENCH MARKS LISTED ABOVE.

ALL UNITS ARE U.S. SURVEY FEET.

55. THE CONTRACTOR IS TO INSTALL THE FINISHED SURFACE OF THE PROPOSED FACILITIES LOCATED IN SIDEWALKS AND OTHER DISABLED ACCESSIBLE AREAS SO THAT CHANGES IN LEVEL DO NOT EXCEED 0.25-INCHES IN ELEVATION IN ACCORDANCE WITH THE AMERICANS WITH DISABILITIES ACT (ADA) ACCESSIBILITY GUIDELINES FOR ACCESSIBLE TRAVELED WAYS.

56. FOR PURPOSES OF PROCESSING PERMITS THE ADDRESS OF THE RESERVOIR SITE IS 1216 EAST ROSE AVENUE, LOS ANGELES, CA 90291, AND THE ADDRESS OF THE PUMP STATION SITE IS 901 EAST ROSE AVENUE, LOS ANGELES, CA 90291.

57. ALL FILL OR BACKFILL SHALL BE COMPACTED BY MECHANICAL MEANS TO A MINIMUM 90% RELATIVE COMPACTION AS DETERMINED BY ASTM METHOD D-1557 AND AS INDICATED ON THE DRAWINGS.

58. THE SOILS ENGINEER IS TO APPROVE THE KEY OR BOTTOM OF ALL EXCAVATIONS AND LEAVE A CERTIFICATE OF APPROVAL ON THE SITE FOR THE GRADING INSPECTOR. THE GRADING INSPECTOR IS TO BE NOTIFIED BEFORE ANY GRADING BEGINS AND, FOR BOTTOM OR KEY INSPECTION, BEFORE FILL IS PLACED. FILL MAY NOT BE PLACED WITHOUT THE APPROVAL OF THE GRADING INSPECTOR.

59. NOT USED.

60. DATA ON EXISTING UTILITIES SHOWN ON PLANS ARE PROVIDED BY OWNER AND MUST BE VERIFIED BY CONTRACTOR BEFORE STARTING WORK. CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY OF ANY DISCREPANCIES. MINIMUM NUMBER OF POTHOLE LOCATIONS ARE SHOWN ON DRAWINGS. CONTRACTOR MUST POTHOLE ALL UTILITIES THAT ARE WITHIN 3 FEET OF THE WORK. POTHOLING SHALL BE PERFORMED IN ACCORDANCE WITH GR 01732.

THE CONTRACTOR SHALL POTHOLE AND VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD BEFORE STARTING WORK, AND SHALL NOTIFY THE ENGINEER IMMEDIATELY OF ANY DISCREPANCIES. CONTRACTOR TO SUBMIT POTHOLE PLAN FOR APPROVAL PRIOR TO BEGINNING OF WORK. CONTRACTOR SHALL POTHOLE LOCATIONS NOTED ON PLANS TO VERIFY ANY POTENTIAL CONFLICTS PRIOR TO BEGINNING ANY DEMOLITION OR CONSTRUCTION WORK. CONTRACTOR SHALL POTHOLE ANY ADDITIONAL FACILITY LOCATIONS WITHIN 3 FEET OF THE WORK TO VERIFY ELEVATIONS, AND CLEARANCES NECESSARY TO COMPLETE THE WORK.

61. CONTRACTOR IS RESPONSIBLE FOR DESIGN AND APPROVAL OF TRAFFIC CONTROL BY CITY OF LOS ANGELES DEPARTMENT OF TRANSPORTATION FOR AREAS THAT ARE NOT INCLUDED IN THESE PLANS.

62. CONTRACTOR IS REQUIRED TO MAINTAIN TWO LANES OF TRAFFIC ON ROSE AVENUE. CONSTRUCTION OF FREDERICK AND ROSE WILL NEED TO BE PHASED IN ACCORDANCE WITH THE PROVIDED TRAFFIC CONTROL PLANS.

63. DUCTILE IRON PIPE SHALL HAVE RUBBER GASKET PUSH-ON JOINTS PER AWWA C111 UNLESS SHOWN OTHERWISE ON THE DRAWINGS OR IN THE SPECIFICATIONS. JOINTS SHALL BE RESTRAINED AT LOCATIONS SHOWN ON THE DRAWINGS.

64. CHECK VALVES SHALL BE SWING CHECK WITH OUTSIDE LEVER AND SPRING OF WEIGHT AS SPECIFIED IN SECTION 15700-2.5.E.3 UNLESS SHOWN OTHERWISE ON THE DRAWINGS OR IN THE SPECIFICATIONS.

65. IF, DURING THE COURSE OF CONSTRUCTION, AN OIL OR GAS WELL IS UNCOVERED, STOP WORK AND IMMEDIATELY NOTIFY THE CALIFORNIA DEPARTMENT OF CONSERVATION, DIVISION OF OIL AND GAS AT (714) 816-6847.

SEWER REHABILITATION NOTES (SHEETS C-23 THROUGH C-26):

66. THE CONTRACTOR SHALL POST AT MINIMUM SIX (6) TIME/INFORMATION COMBINATION SIGNS PER STANDARD PLAN S-291-1 ON PALMS BLVD., ABBOT KINNEY BLVD., OAKWOOD AVE., AND ANY OTHER AREAS WHERE PARKING WILL BE IMPACTED 5 DAYS IN ADVANCE. THE NUMBER OF SIGNS, TYPE, AND LOCATION SHALL BE APPROVED BY THE INSPECTOR. "NO PARKING" AND "TOW AWAY" SIGNS SHALL BE POSTED 24 HOURS IN ADVANCE OF AFFECTED AREAS. RESIDENTIAL ACCESS TO DRIVEWAYS SHALL BE MAINTAINED AT ALL TIMES OR COORDINATED PER NOTE 3.

67. THE CONTRACTOR SHALL DISTRIBUTE ONE HUNDRED (100) 8-1/2" X 11" PUBLIC NOTICE FLYERS (GRAPHICS AND TEXT WILL BE PROVIDED BY THE ENGINEER) TO LOCAL AND AFFECTED NEIGHBORS NO LESS THAN 10 DAYS IN ADVANCE OF THE SEWER UPGRADES PORTION OF THE PROJECT, DESCRIBING THE SEWER UPGRADES PROJECT LOCATION, SCHEDULED CONSTRUCTION DATES, AND ANTICIPATED DURATION.

68. BEFORE AND DURING CONSTRUCTION AT THE SOUTHWEST END OF RIALTO COURT BY CRESCENT PLACE, THE CONTRACTOR SHALL COORDINATE WITH AFFECTED PROPERTY OWNERS TO MAINTAIN ACCESS TO THEIR DRIVEWAYS, AND SHALL PLATE OVER TRENCH DURING NON-WORKING HOURS.

69. AT THE INTERSECTION OF RIALTO COURT AND CRESCENT PLACE, IF NECESSARY TO FACILITATE CONSTRUCTION, THE CONTRACTOR SHALL REMOVE WITHOUT DAMAGING THE ORIGINAL BRICK STEPPING STONES AND METAL GATE, AND RESTORE TO THE APPROXIMATE ORIGINAL LOCATION AT THE COMPLETION OF CONSTRUCTION, TO THE SATISFACTION OF THE INSPECTOR.

70. AT THE INTERSECTION OF RIALTO COURT AND CRESCENT PLACE: IF DEMOLITION OF THE GATE, FENCE, OR OTHER PROPERTY IS NECESSARY FOR CONSTRUCTION, THE CONTRACTOR SHALL SEEK APPROVAL FOR THE DEMOLITION AND REMOVAL OF HISTORICAL ELEMENTS IDENTIFIED BY CITY'S ENVIRONMENTAL MANAGEMENT GROUP (EMG) FROM EMG AND THE ENGINEER.

71. THE SANITARY SEWER PIPE INSTALLATION SHALL COMPLY WITH THE CITY OF LOS ANGELES, DEPARTMENT OF PUBLIC WORKS "GREEN BOOK" AND "BROWN BOOK," SECTION 306 AND SECTION 500-1.4.1, UNLESS SUPERSEDED BY THE PROJECT PLANS AND SPECIFICATIONS.

72. CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH LADOT TO CONFIRM TRAFFIC CONTROL REQUIREMENTS PRIOR TO START OF WORK, INCLUDING ANY ADDITIONAL SUBMITTALS THAT ARE REQUIRED BY LADOT.

73. TRAFFIC LANE REQUIREMENTS:

A. ABBOT KINNEY BOULEVARD
ALL TRAFFIC LANES (INCLUDING THROUGH, TURNING, AND PARKING LANES) SHALL BE UNOBSTRUCTED FROM 3:30 PM TO 9 AM OF THE NEXT DAY. MAINTAIN ONE LANE OF TRAFFIC IN EACH DIRECTION AT ALL OTHER TIMES.

B. PALMS BOULEVARD
MAINTAIN ONE LANE OF TRAFFIC WITH FLAGPERSON CONTROL IF NECESSITATED BY CONSTRUCTION FROM 9 AM TO 3:30 PM.

C. OTHER STREETS
MAINTAIN LOCAL EMERGENCY ACCESS AT ALL TIMES.

D. THE WORK SHALL BE PERFORMED IN ACCORDANCE WITH LADOT'S APPROVED WORKSITE TRAFFIC CONTROL PLANS (WTCP). THE WTCP SHALL BE IN COMPLIANCE WITH THE TEMPORARY TRAFFIC CONTROL PROVISIONS OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES [MUTCD] (2003 OR LATEST) AND THE CALIFORNIA MUTCD (2006 OR LATEST). THE WTCP SHALL SHOW TYPICAL LANE CLOSURES AND PROPOSED TEMPORARY TRAFFIC CONTROL DEVICES. THE WTCP SHALL BE SUBMITTED IN FINAL DRAFT FORM TEN (10) DAYS PRIOR TO THE START OF CONSTRUCTION.

E. THE CONTRACTOR SHALL NOTIFY LADOT'S WESTERN DISTRICT OFFICE, LATDOT AT (310) 575-8138 FIVE (5) DAYS IN ADVANCE PRIOR TO STARTING CONSTRUCTION. PROVIDE THE WORKING HOURS AND DURATION OF CONSTRUCTION.

74. TRAFFIC CONTROL DEVICES MAINTENANCE:
(APPLIES ONLY TO SEWER REHABILITATION WORK)

A. THE CONTRACTOR SHALL MAKE ARRANGEMENTS FOR THE RESTORATION OF ALL OBLITERATED STRIPING AND PAVEMENT MARKINGS AND FOR THE REINSTALLATION OF ALL MISSING, DAMAGED AND NECESSARY TRAFFIC CONTROL DEVICES (I.E., SIGNS, CURB MARKINGS, SPEED HUMPS, STAMPED CROSSWALKS, PARKING METERS, ETC.). THE CONTRACTOR WILL BE REQUIRED TO PHYSICALLY INSTALL THESE TRAFFIC CONTROL DEVICES TO THE FULL SATISFACTION OF LADOT, BUT THE CITY MAY CHOOSE TO INSTALL NONE, SOME, OR ALL OF SAID TRAFFIC CONTROL DEVICES. THE ENTIRE COST THEREOF SHALL BE BORNE BY THE CONTRACTOR (UNLESS PAYMENT BY THE CITY IS PRE-APPROVED BY LADOT). ALL STRIPING AND PAVEMENT MARKINGS SHALL BE INSTALLED UTILIZING THERMOPLASTIC MATERIALS PER LADOT SPECIFICATIONS. THE CONTRACTOR SHALL CONTACT THE WESTERN DISTRICT OFFICE, LADOT AT (310) 575-8138 PRIOR TO COMMENCING ANY WORK THAT REQUIRES TRAFFIC CONTROL DEVICES' MAINTENANCE.

B. THE CONTRACTOR MAY NOTIFY LADOT'S SPECIAL TRAFFIC CONTROL DIVISION AT (213) 485-2298 FIVE (5) WORKING DAYS TO THE START OF CONSTRUCTION FOR THE POSTING OF TEMPORARY "TOW-AWAY NO STOPPING" SIGNS ADJACENT TO THE WORK AREA AS NEEDED.

C. FOR TRAFFIC RELATED QUESTIONS DURING CONSTRUCTION, CONTACT THE WESTERN DISTRICT OFFICE, LADOT AT (310) 575-8138.

OBTAINING PERMITS ISSUED BY COUNTY OF LOS ANGELES, DEPARTMENT OF PUBLIC WORKS:

75. CONTRACTOR IS REQUIRED TO SUBMIT INSURANCE AND CONTACT INFORMATION TO WESTCHESTER PERMIT OFFICE (NO. 3) AT LEAST 24 HOURS PRIOR TO COMMENCING WORK AT:

5530 W. 83RD STREET
LOS ANGELES, CALIFORNIA 90045
PHONE: 310-649-6300
FAX: 310-215-3952

76. CONTRACTOR MUST OBTAIN WRITTEN PERMISSION FOR THE COUNTY OF LOS ANGELES FOR ANY DEVIATION IN WORK FROM THE PERMIT DRAWINGS.

77. A COPY OF THE PERMITS MUST BE KEPT ON-SITE DURING ALL PERIODS OF OPERATION.

78. CONTRACTOR IS RESPONSIBLE TO FULFILL ALL CONDITIONS LISTED ON COUNTY OF LOS ANGELES ISSUED PERMITS PCFL 200900287 AND PCFL 200900707.

OBTAINING PERMITS ISSUED BY CITY OF LOS ANGELES, DEPARTMENT OF BUILDING AND SAFETY:

79. CONTRACTOR IS REQUIRED TO FULFILL CONDITIONS REQUIRED BY THE CITY OF LOS ANGELES, DEPARTMENT OF BUILDING AND SAFETY TO OBTAIN STRUCTURAL, GRADING, MECHANICAL (PLUMBING), ELECTRICAL PERMITS, AND ANY ADDITIONAL PERMITS REQUIRED.

80. CONTRACTOR WILL NEED TO PROVIDE PROOF OF INSURANCE, CERTIFICATE OF WORKERS COMPENSATION INSURANCE, COPY OF CONTRACTOR'S STATE LICENSE, AND COPY OF CITY OF LOS ANGELES BUSINESS TAX REGISTRATION CERTIFICATE.

81. ALL PLAN CHECK APPROVALS AND PERMITS ISSUED BY THE CITY OF LOS ANGELES, DEPARTMENT OF BUILDING AND SAFETY APPLY ONLY TO STRUCTURAL, GRADING, PLUMBING AND ELECTRICAL WORK ON THE EXCAVATION, GRADING, UNDERGROUND STORAGE TANK, UNDERGROUND PIPING AND ELECTRICAL WORK PERFORMED INSIDE THE PROPERTY LINE AT 1216 E. ROSE AVE., ON THE 9.9222 ACRE PROPERTY IN ZONE R1 DEFINED BY APN#2422-100-900, TRACT - RANCHO LA BALLONA LOT - PT LOT 4. ALL WORK OCCURRING OUTSIDE THE PROPERTY LINE IS NOT COVERED BY PLAN CHECK APPROVALS PROVIDED BY CITY OF LOS ANGELES, DEPARTMENT OF BUILDING AND SAFETY.

82. CITY OF LOS ANGELES, DEPARTMENT OF BUILDING AND SAFETY DOES NOT REVIEW OR APPROVE ANY SPECIFICATIONS REFERENCED ON CONTRACT DRAWINGS.

83. THE FOLLOWING NOTES APPLY TO THE STRUCTURAL AND/OR GRADING PERMITS:

A. CONTRACTOR MUST SUBMIT FINAL EXCAVATION DETAILS OF AREA AND CROSS SECTION OF EXCAVATION INCLUDING CALCULATED AMOUNTS OF CUT, FILL, AND EXPORT IN CUBIC YARDS FOR APPROVAL BY CITY OF LOS ANGELES, DEPARTMENT OF BUILDING AND SAFETY.

B. CONTRACTOR MUST SUBMIT ENGINEERING DESIGN OF SHORING SYSTEM FOR APPROVAL BY CITY OF LOS ANGELES, DEPARTMENT OF BUILDING AND SAFETY.

C. CONTRACTOR MUST SUBMIT THE LOCATION OF UNDERGROUND TANK WALL JOINTS FOR APPROVAL BY CITY OF LOS ANGELES, DEPARTMENT OF BUILDING AND SAFETY.

D. CONTRACTOR MUST COMPLY WITH HAUL ROUTE. ANY CHANGES TO HAUL ROUTE ARE THE RESPONSIBILITY OF THE CONTRACTOR AND MUST BE APPROVED BY CITY OF LOS ANGELES, DEPARTMENT OF BUILDING AND SAFETY.

E. CONTRACTOR MUST OBTAIN GRADING BOND.

F. CONTRACTOR MUST PAY FEES REQUIRED BY THE CITY OF LOS ANGELES, DEPARTMENT OF BUILDING AND SAFETY FOR ISSUANCE OF STRUCTURAL AND GRADING PERMIT.

G. CONTRACTOR MUST FULFILL ANY OTHER CONDITIONS THAT ARE REQUIRED FOR PERMIT APPROVAL BY THE CITY OF LOS ANGELES, DEPARTMENT OF BUILDING AND SAFETY.

84. CONTRACTOR SHALL COMPLY WITH RECOMMENDATIONS FROM GEOTECH REPORTS PREPARED BY NINYO & MOORE, WHICH ARE PART OF THE SPECIFICATIONS OF THIS PROJECT. GEOTECHNICAL EVALUATION REPORT, DATED JUNE 13, 2008, SUPPLEMENTAL GEOTECH RECOMMENDATIONS, DATED AUGUST 11, 2009, AND GROUNDWATER QUALITY TESTING, DATED AUGUST 27, 2009.

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

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GARY LEE MOORE, P.E.
CITY ENGINEER
DATE:
LIC. NO. 20095

VERTICAL CONTROL:	NGVD29, 1985 ADJ
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5
ENGINEER:	DESIGN GROUP DOUGLAS B. McCARTNEY
DESIGNED BY:	DENNIS SIMONSON
DRAWN BY:	DENNIS SIMONSON
CHECKED BY:	DOUGLAS B. ROBISON
APPROVED BY:	ROBERT FINN

SHEET TITLE: GENERAL NOTES 2

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 CIVIL STATE OF CALIFORNIA

DATE: BY: NO. REVISIONS:

STRUCTURE NO.

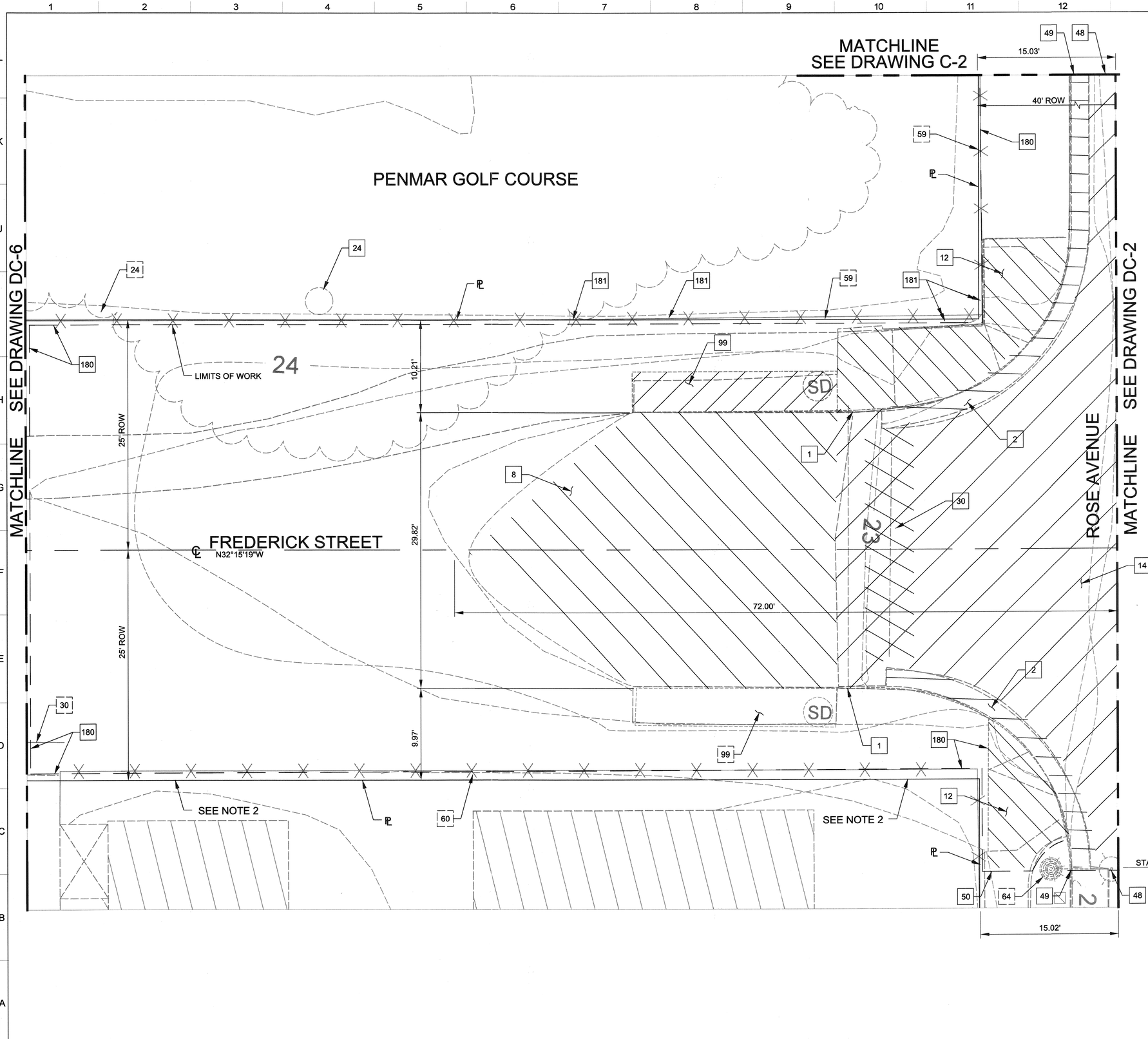
INDEX NO.

WORK ORDER NO. EW40019F

DRAWING NO. R-6

SHEET 6 OF ~~408~~ 48 SHEETS

$FILES$ $DATES$ $TIMES$



CONSTRUCTION SYMBOLS:

1	DEMOLISH EXISTING CONCRETE CURB
2	DEMOLISH EXISTING CONCRETE CURB AND GUTTER
8	DEMOLISH EXISTING 2" AC PAVEMENT (SHOWN ON RECORD DRAWINGS, NOT VISIBLE FROM THE SURFACE)
12	DEMOLISH EXISTING CONCRETE SIDEWALK
14	DEMOLISH 8" ASPHALT PAVEMENT
24	EXISTING TREE; APPROXIMATE LOCATION OF TREE TRUNK SHOWN; TRIM AS NEEDED
30	DEMOLISH EXISTING GUARD RAIL
48	SAWCUT EXISTING ASPHALT PAVEMENT; PROTECT EDGE IN PLACE
49	SAWCUT EXISTING CONCRETE CURB AND GUTTER
50	SAWCUT EXISTING CONCRETE SIDEWALK
99	DEMOLISH EXISTING STORM DRAIN CATCH BASIN
180	CLEAR AND GRUB WORK AREA
181	EXISTING MULTIPLE SHRUBS, TRIM TO FENCE
[24]	EXISTING TREE; PROTECT IN PLACE
[30]	EXISTING GUARD RAIL; PROTECT IN PLACE
[59]	EXISTING GOLF COURSE FENCE; PROTECT IN PLACE
[60]	EXISTING RESIDENTIAL FENCE; PROTECT IN PLACE
[64]	EXISTING LIGHT STANDARD; PROTECT IN PLACE
[99]	EXISTING STORM DRAIN CATCH BASIN; PROTECT IN PLACE

NOTES:

1. SEE NOTE 41 ON DRAWING R5 FOR REQUIREMENTS ON PROTECTION OF EXISTING TREES.
2. MAINTAIN 3' WIDE PATHWAY FOR ACCESS ALONG FREDERICK STREET.

SCALE 1"=5'

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GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
ENGINEER: DOUGLAS B. McCARTNEY
DESIGNED BY: DENNIS SIMONSON
DRAWN BY: DENNIS SIMONSON
CHECKED BY: DOUGLAS B. ROBISON
APPROVED BY: ROBERT FINN
LIC. NO. 28085
DATE:

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PAVING AND GRADING DEMOLITION PLAN 1
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25585 CIVIL STATE OF CALIFORNIA

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.
INDEX NO.

WORK ORDER NO.
EW40019F
DRAWING NO.
DC-1
SHEET 7 OF ~~48~~ 108 SHEETS

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REVISION DATES (DESIGN STAGE ONLY)
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$FILE$ $DATE$ $TIME$

MATCHLINE
SEE DRAWING C-2

MATCHLINE
SEE DRAWING DC-1

ROSE AVENUE

LINCOLN BLVD.-INDIANA AVE. STORM DRAIN
LACFCD PROJECT NO. 46, LINE "A" (D-15476)

FREDERICK STREET
N32°15'19"W

N57°45'25"E

40' ROW

25' ROW

STA. 64+90.00
STA. 64+80.00
STA. 64+70.00
STA. 64+60.00
STA. 64+50.00
STA. 64+40.00
STA. 64+30.00
STA. 64+20.00
STA. 64+10.00
STA. 64+07.59

119
120
121
122
144
145

3.0'
22.96'
14.05'
27.97'

14
48

SD

24

25

℄

CONSTRUCTION SYMBOLS:

14 DEMOLISH 8" ASPHALT PAVEMENT; PROTECT EDGE IN PLACE

48 SAWCUT EXISTING ASPHALT PAVEMENT; PROTECT EDGE IN PLACE

NOTES:

1. STATIONS ARE PER THE LINCOLN BLVD.-INDIANA AVE. STORM DRAIN, LACFCD PROJECT NO. 46, LINE "A" (D-15476).
2. SEE NOTE 41 ON DRAWING R5 FOR REQUIREMENTS ON PROTECTION OF EXISTING TREES.

COORDINATE POINTS							
NUMBER	NORTHING	EASTING	ELEV	NUMBER	NORTHING	EASTING	ELEV
119	1823734.76	6420665.52	N/A	122	1823671.70	6420629.71	N/A
120	1823731.58	6420660.54	N/A	144	1823700.58	6420611.44	N/A
121	1823702.76	6420678.78	N/A	145	1823688.65	6420592.53	N/A

SCALE 1"=5'

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GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
ENGINEER: DOUGLAS B. McCARTNEY LIC. NO. 26585
DESIGNED BY: DENNIS SIMONSON
DRAWN BY: DENNIS SIMONSON
CHECKED BY: DOUGLAS B. ROBISON
APPROVED BY: ROBERT FINN

DATE: BY:
NO. REVISIONS:

STRUCTURE NO.
INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT M. FINN No. C25565 STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH: 1991.5

SHEET TITLE: PAVING AND GRADING DEMOLITION PLAN 2
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA. 90291

WORK ORDER NO. EW40019F
DRAWING NO. DC-2
SHEET 8 OF ~~108~~ 48 SHEETS

REVISION DATES (DESIGN STAGE ONLY)
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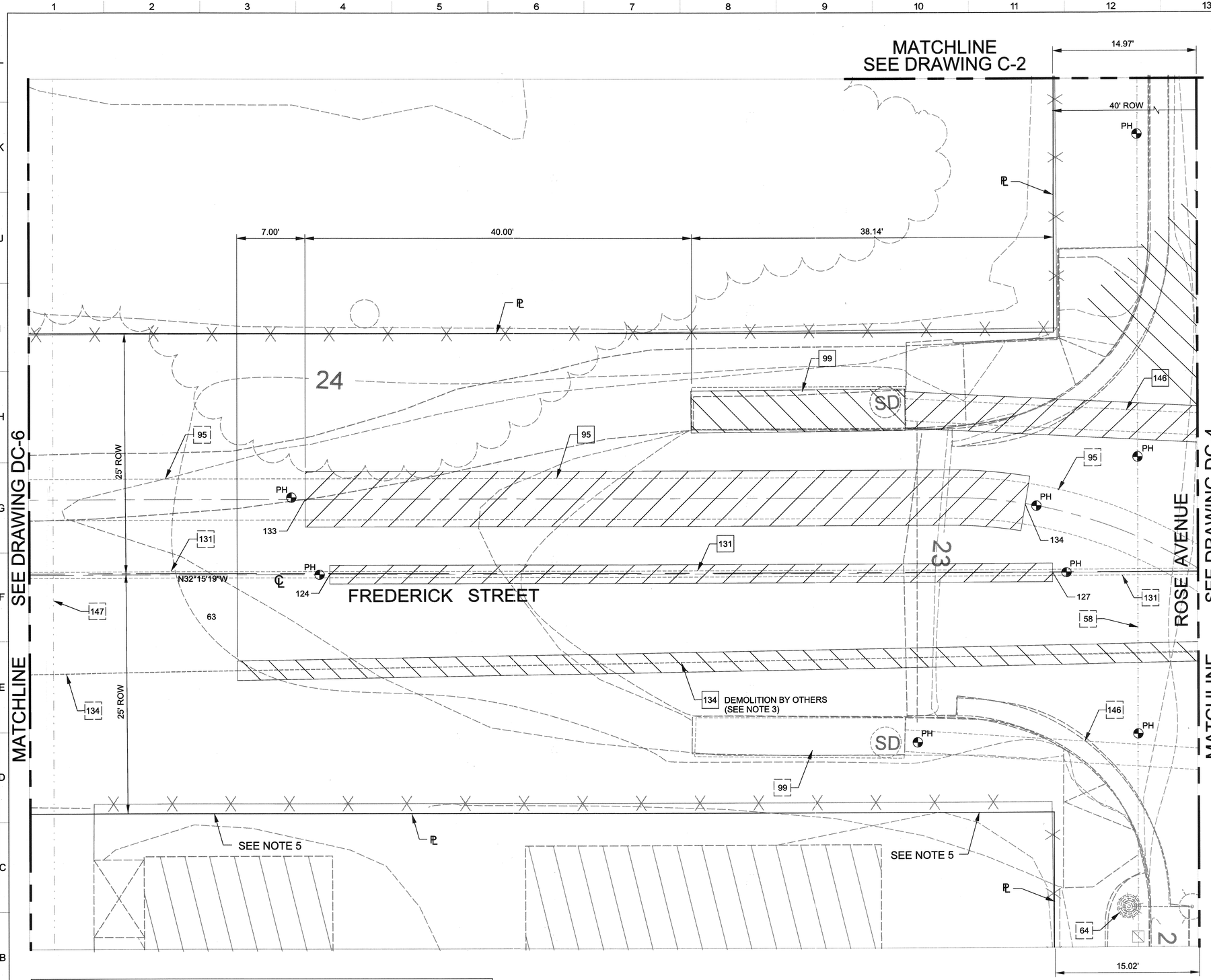

CONSTRUCTION SYMBOLS:

95	DEMOLISH EXISTING 51" RCP STORM DRAIN
99	DEMOLISH EXISTING STORM DRAIN CHATCH BASIN PER DWG. DC-1
131	DEMOLISH EXISTING 8" SEWER PIPE
134	DEMOLISH EXISTING 6" STEEL WATER PIPE (BY OTHERS) (SEE NOTE 2)
146	DEMOLISH EXISTING 27" STORM DRAIN
58	EXISTING POWER CONDUIT; IN ROSE AVENUE, NO RECORD; PROTECT IN PLACE
64	EXISTING LIGHT STANDARD; PROTECT IN PLACE
95	EXISTING 51" RCP STORM DRAIN; PROTECT IN PLACE
99	EXISTING STORM DRAIN CATCH BASIN; PROTECT IN PLACE
131	EXISTING 8" SEWER PIPE; PROTECT IN PLACE
134	EXISTING 6" STEEL WATER PIPE; PROTECT IN PLACE
146	EXISTING 27" RCP STORM DRAIN; PROTECT IN PLACE
147	EXISTING 8" GAS PIPE; PROTECT IN PLACE

NOTES:

1. DEMOLISH PIPE AT NEXT PIPE JOINT.
2. SAWCUT PIPE AT LOCATION SHOWN.
3. LADWP WILL DEMOLISH AND REALIGN WATER LINE PRIOR TO BEGINNING OF WORK.
4. SEE NOTE 41 ON DRAWING R5 FOR REQUIREMENTS ON PROTECTION OF EXISTING TREES.
5. MAINTAIN 3' WIDE PATHWAY FOR ACCESS ALONG FREDERICK STREET.

COORDINATE POINTS							
NUMBER	NORTHING	EASTING	NOTE	NUMBER	NORTHING	EASTING	NOTE
124	1823785.93	6420572.15	2	133	1823792.29	6420577.48	2
127	1823722.38	6420612.35	2	134	1823728.64	6420616.98	2
128	1823788.70	6420558.49	1				

5 0 5 10
SCALE 1"=5'

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NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROGER MARTIN FINN No. C25585 12-31-11 STATE OF CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER DATE:

DESIGN GROUP	
ENGINEER:	DOUGLAS B. McCARTNEY
LIC. NO.	28085
DESIGNED BY:	DENNIS SIMONSON
DRAWN BY:	DENNIS SIMONSON
CHECKED BY:	DOUGLAS B. ROBISON
APPROVED BY:	ROBERT FINN

VERTICAL CONTROL:	NGVD29, 1985 ADJ
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5
SHEET TITLE:	UNDERGROUND PIPING DEMOLITION PLAN 1
PROJECT:	PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS:	1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F
DRAWING NO.
DC-3
SHEET 9 OF ~~108~~ 48 SHEETS

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

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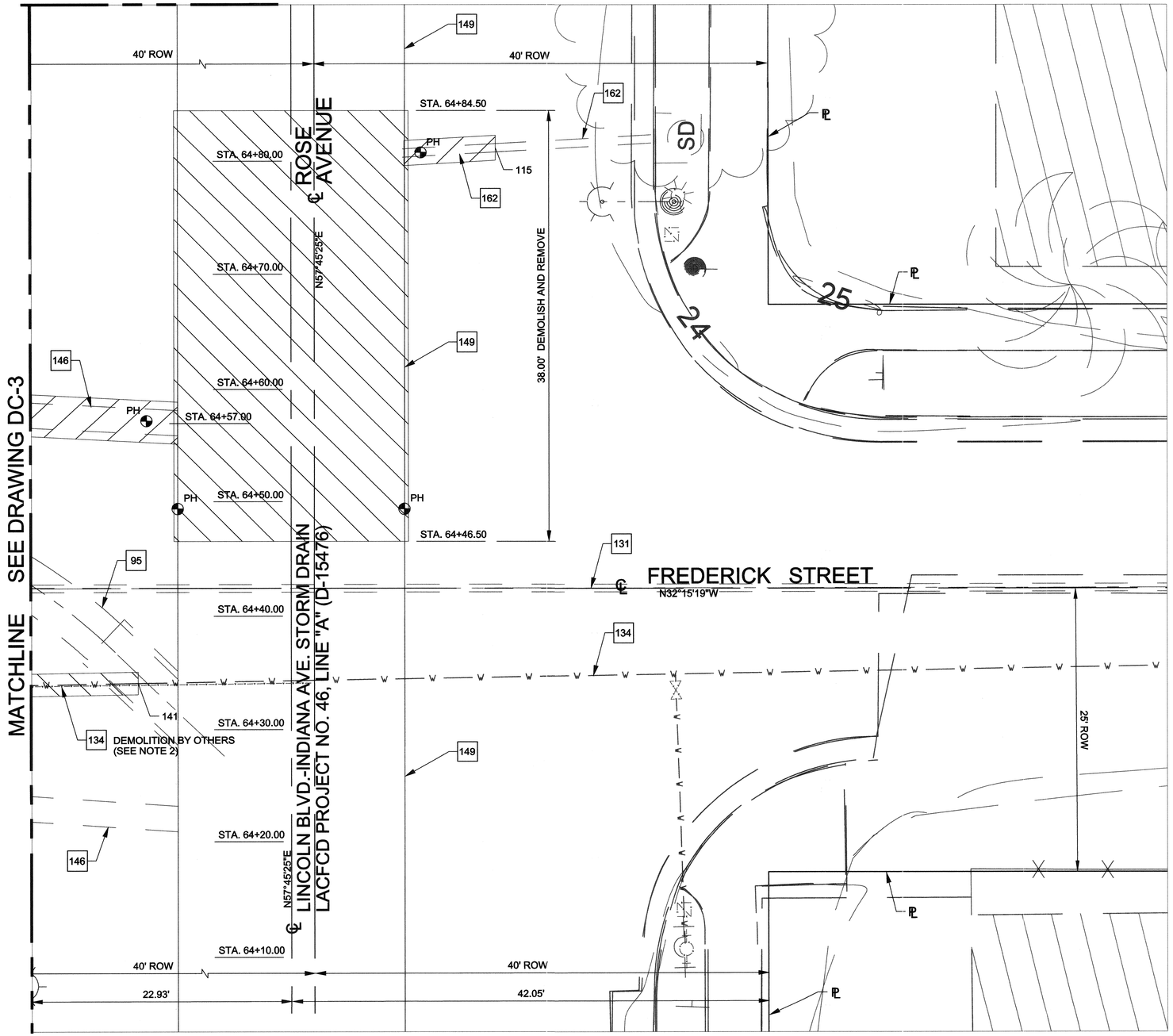
$FILE$ $DATE$ $TIME$



COORDINATE POINTS			
NUMBER	NORTHING	EASTING	NOTE
115	1823695.67	6420675.13	1
141	1823697.18	6420618.50	1

NOTES:

1. DEMOLISH PIPE AT NEXT PIPE JOINT.
2. LADWP WILL DEMOLISH AND REALIGN WATER LINE PRIOR TO BEGINNING OF WORK.
3. STATIONS SHOWN ARE PER LINCOLN BLVD-INDIANA AVE, STORM DRAIN LACFCD PROJECT NO. 46, LINE "A" (D-15476).

CONSTRUCTION SYMBOLS:

134	DEMOLISH EXISTING 6" STEEL WATER PIPE (BY OTHERS) (SEE NOTE 2)
146	DEMOLISH EXISTING 27" STORM DRAIN
149	DEMOLISH ALL OF EXISTING STORM DRAIN BETWEEN STATIONING POINTS AS SHOWN; LINCOLN BLVD-INDIANA AVE. STORM DRAIN, 1955; (D-15476). DOUBLE RCB 9'W X 12' H, LACFCD PROJECT NO. 46, LINE "A".
162	DEMOLISH EXISTING 18" RCP STORM DRAIN.
95	EXISTING 51" RCP STORM DRAIN; PROTECT IN PLACE
131	EXISTING 8" SEWER PIPE; PROTECT IN PLACE
134	EXISTING 6" STEEL WATER PIPE; PROTECT IN PLACE
146	EXISTING 27" RCP STORM DRAIN; PROTECT IN PLACE
149	EXISTING STORM DRAIN; LINCOLN BLVD-INDIANA AVE. STORM DRAIN, 1955; (D-15476). DOUBLE RCB 9'W X 12' H, LACFCD PROJECT NO. 46, LINE "A"; PROTECT IN PLACE
162	EXISTING 18" RCP STORM DRAIN; PROTECT IN PLACE

CONCRETE REMOVAL NOTES:

WHERE REINFORCEMENT IS REQUIRED TO EXTEND THROUGH THE NEW JOINT, CONCRETE SHALL BE REMOVED IN THE FOLLOWING SEQUENCE:

1. A SAWCUT SHALL BE MADE ONE AND ONE-HALF INCHES DEEP AT THE REMOVAL LIMITS. CARE SHALL BE EXERCISED IN SAWING AT THE REMOVAL LIMITS SO AS NOT TO CUT THE REINFORCING STEEL IN THE REMAINING SLAB. THE EXISTING REINFORCING STEEL SHALL BE RETAINED AND EXTENDED INTO THE NEW CONSTRUCTION AS INDICATED ON THE PLANS.
2. USING HANDHELD EQUIPMENT, THE CONCRETE SHALL BE CAREFULLY REMOVED FOR THE FULL DEPTH OF THE WALL OR SLAB AND FOR A MINIMUM DISTANCE FROM THE SAWCUT EQUAL TO THE LONGEST EXTENSION OF THE EXISTING BARS TO BE EXTENDED INTO THE NEW CONSTRUCTION. THIS EXTENSION SHALL BE 30 BAR DIAMETERS, UNLESS OTHERWISE SHOWN. SEE G12/S-12 FOR EXISTING REBAR TO REMAIN IN TACT.
3. EXISTING REINFORCEMENT SHALL BE CUT TO THE REQUIRED BAR EXTENSION.
4. THE REMAINING CONCRETE MAY BE REMOVED BY ANY SUITABLE METHOD UPON APPROVAL OF THE ENGINEER, WHO SHALL BE THE SOLE JUDGE OF THE USE OF ANY CONCRETE REMOVAL EQUIPMENT. EXPLOSIVES, WRECKING BALL, OR OTHER SIMILAR DEVICES, WHICH ARE LIKELY TO DAMAGE THE CONCRETE TO BE LEFT IN PLACE, SHALL NOT BE USED.
5. CONTRACTOR SHALL PROVIDE TEMPORARY SHORING AT EXISTING ROOF SLAB DURING WALL DEMOLITION AND RECONSTRUCTION.
6. DO NOT DAMAGE 2'-6" OF EXISTING HORIZONTAL WALL REBAR AT EACH END OF DEMOLITION EXTENTS TO HELP TIE THE EXISTING CONCRETE TO NEW CONCRETE.

5 0 5 10
SCALE 1"=5'

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GARY LEE MOORE, P.E.
CITY ENGINEER
DATE:
LIC. NO. 28085

DESIGN GROUP	
ENGINEER:	DOUGLAS B. McCARTNEY
DESIGNED BY:	DENNIS SIMONSON
DRAWN BY:	DENNIS SIMONSON
CHECKED BY:	DOUGLAS B. ROBISON
APPROVED BY:	ROBERT FINN

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C35581 12-31-11 STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: UNDERGROUND PIPING DEMOLITION PLAN 2

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. DC-4

SHEET 10 OF ~~108~~ 48 SHEETS

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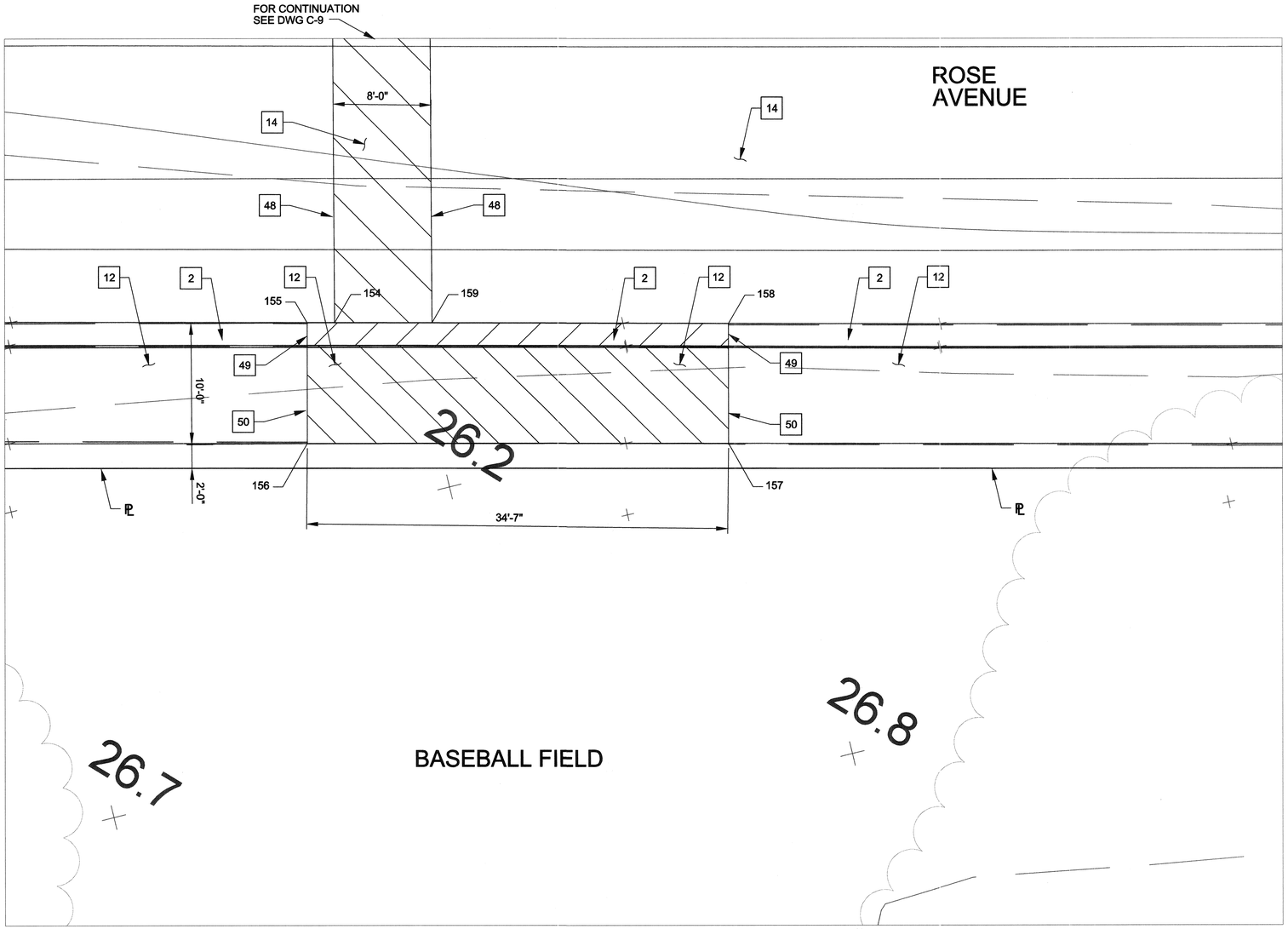

CONSTRUCTION SYMBOLS:

2	DEMOLISH EXISTING CONCRETE CURB AND GUTTER
12	DEMOLISH EXISTING CONCRETE SIDEWALK
14	DEMOLISH 8" ASPHALT PAVEMENT
48	SAWCUT EXISTING ASPHALT PAVEMENT; PROTECT EDGE IN PLACE
49	SAWCUT EXISTING CONCRETE CURB AND GUTTER
50	SAWCUT EXISTING CONCRETE SIDEWALK
2	EXISTING CURB AND GUTTER; PROTECT IN PLACE
12	EXISTING CONCRETE SIDEWALK; PROTECT IN PLACE
14	EXISTING ASPHALT PAVEMENT; PROTECT IN PLACE

COORDINATE POINTS			
NUMBER	NORTHING	EASTING	ELEV
154	1824860.94	6422545.37	TC 26.25
155	1824859.74	6422543.47	TC 26.25
156	1824851.25	6422548.83	TC 26.25
157	1824869.71	6422578.08	TC 26.25
158	1824878.14	6422572.76	TC 26.25
159	1824865.20	6422552.15	TC 26.25

SCALE 1"=5'

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STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 12-31-11 STATE OF CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP

ENGINEER:	DOUGLAS B. McCARTNEY	LIC. NO. 28085
DESIGNED BY:	DENNIS SIMONSON	
DRAWN BY:	DENNIS SIMONSON	
CHECKED BY:	DOUGLAS B. ROBISON	
APPROVED BY:	ROBERT FINN	

SHEET TITLE:	RESERVOIR PUMPING STATION AND MAG METER VAULT DEMOLITION PLAN
PROJECT:	PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
ADDRESS:	1216 E. ROSE AVENUE LOS ANGELES, CA 90291
VERTICAL CONTROL:	NGVD29, 1985 ADJ
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5

WORK ORDER NO. EW40019F

DRAWING NO. DC-5

SHEET 11 OF ~~108~~ 48 SHEETS

REVISION DATES (DESIGN STAGE ONLY)
02.09.02

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PENMAR GOLF COURSE

℄ 181 59 181

180 LIMITS OF WORK 180

25' ROW

24

LAYDOWN AREA

131 131

℄ FREDERICK STREET N32°15'19"W

100.0'

MATCHLINE SEE DRAWING DC-1 AND DC-3

30

180 180

180

SEE NOTE 2 ℄ 60 SEE NOTE 2

CONSTRUCTION SYMBOLS:

180	CLEAR AND GRUB WORK AREA
181	EXISTING MULTIPLE SHRUBS, TRIM TO FENCE
30	EXISTING GUARD RAIL; PROTECT IN PLACE
59	EXISTING GOLF COURSE FENCE; PROTECT IN PLACE
60	EXISTING RESIDENTIAL FENCE; PROTECT IN PLACE
131	EXISTING 8" SEWER PIPE; PROTECT IN PLACE

NOTES:

1. SEE NOTE 41 ON DRAWING R5 FOR REQUIREMENTS ON PROTECTION OF EXISTING TREES.
2. MAINTAIN 3' WIDE PATHWAY FOR ACCESS ALONG FREDERICK STREET.

5 0 5 10
SCALE 1"=5'

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

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NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 CIVIL STATE OF CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER DATE:

DESIGN GROUP	
ENGINEER:	DOUGLAS B. McCARTNEY LIC. NO. 28085
DESIGNED BY:	DENNIS SIMONSON
DRAWN BY:	DENNIS SIMONSON
CHECKED BY:	DOUGLAS B. ROBISON
APPROVED BY:	ROBERT FINN

VERTICAL CONTROL:	NGVD29, 1985 ADJ.
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5
SHEET TITLE:	LAY DOWN AREA DEMOLITION PLAN
PROJECT:	PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS:	1216 E. ROSE AVENUE LOS ANGELES, CA. 90291

WORK ORDER NO. EW40019F

DRAWING NO. DC-6

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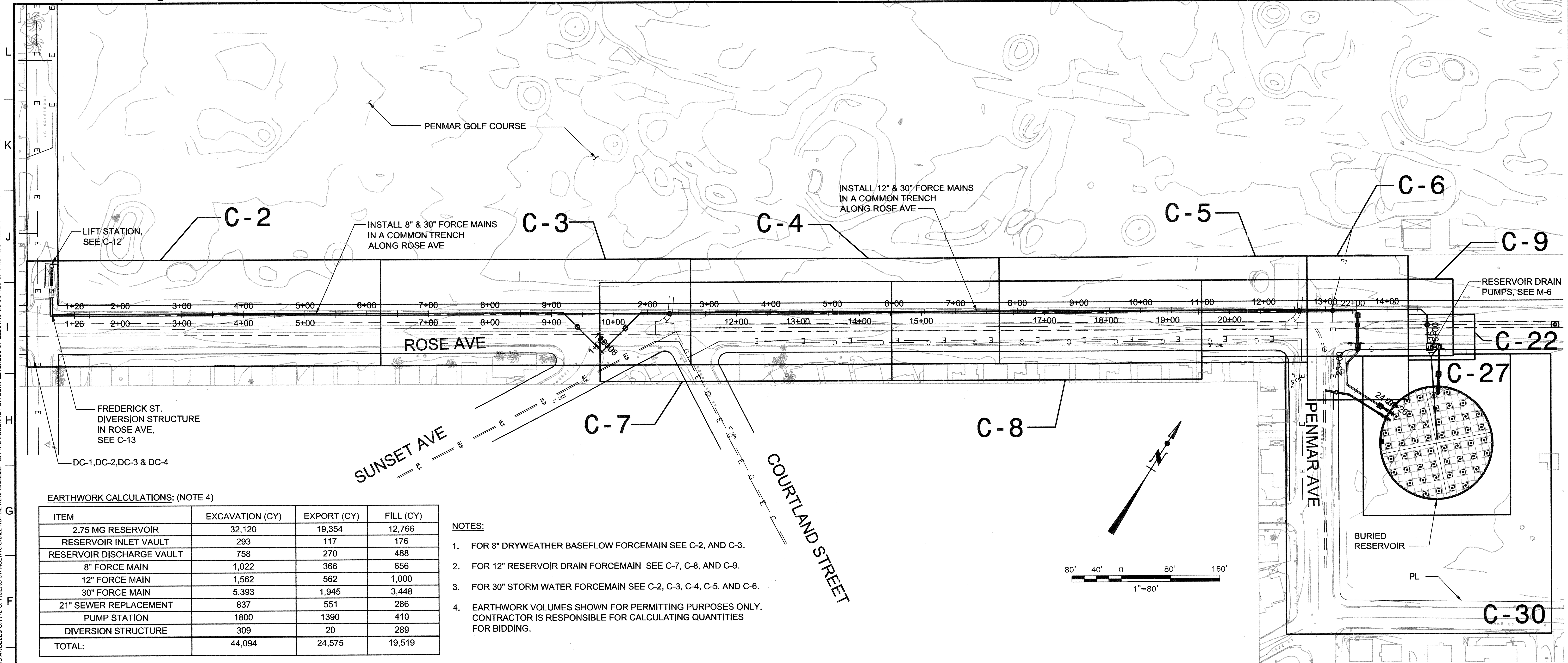


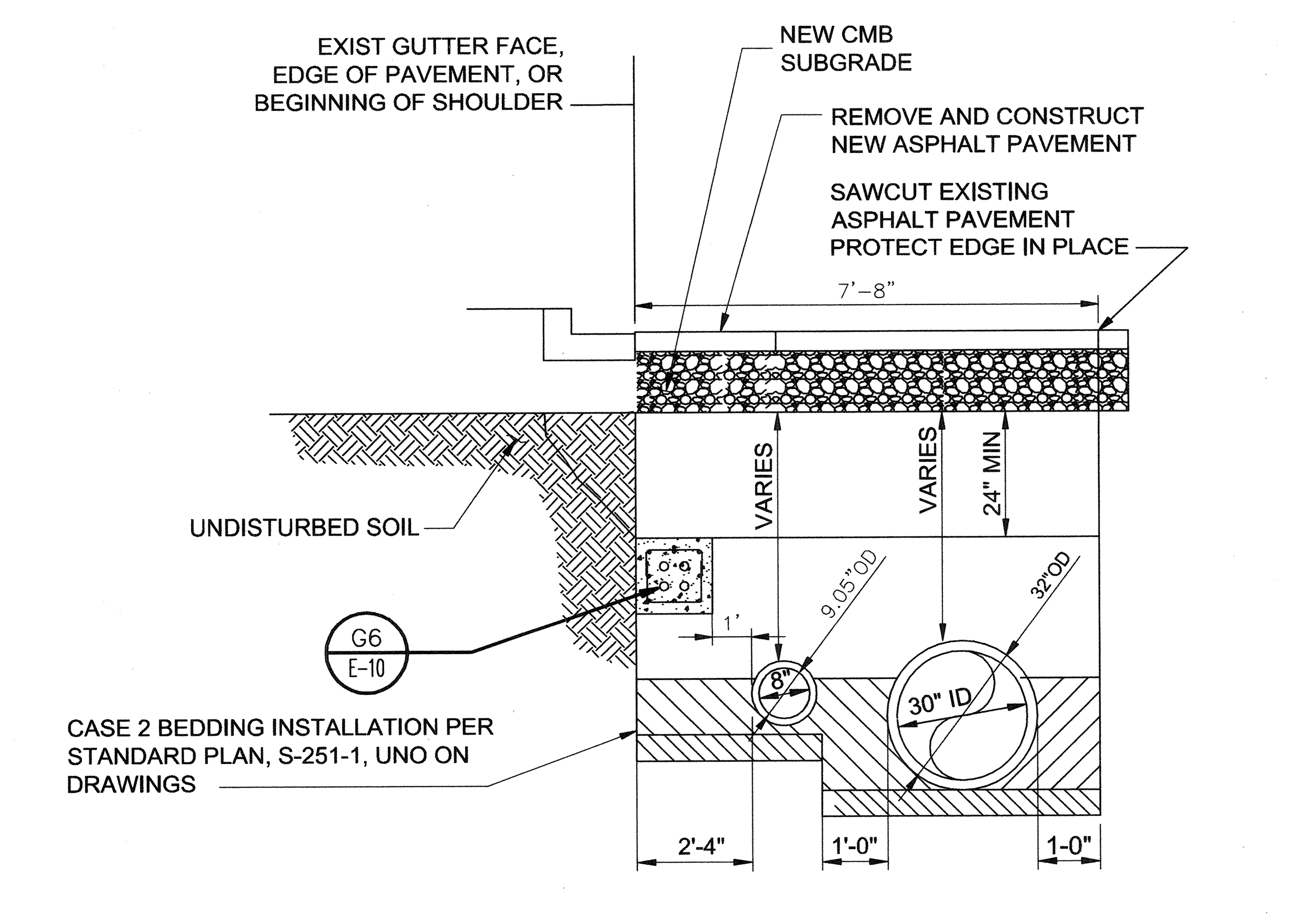
EARTHWORK CALCULATIONS: (NOTE 4)

ITEM	EXCAVATION (CY)	EXPORT (CY)	FILL (CY)
2.75 MG RESERVOIR	32,120	19,354	12,766
RESERVOIR INLET VAULT	293	117	176
RESERVOIR DISCHARGE VAULT	758	270	488
8" FORCE MAIN	1,022	366	656
12" FORCE MAIN	1,562	562	1,000
30" FORCE MAIN	5,393	1,945	3,448
21" SEWER REPLACEMENT	837	551	286
PUMP STATION	1800	1390	410
DIVERSION STRUCTURE	309	20	289
TOTAL:	44,094	24,575	19,519

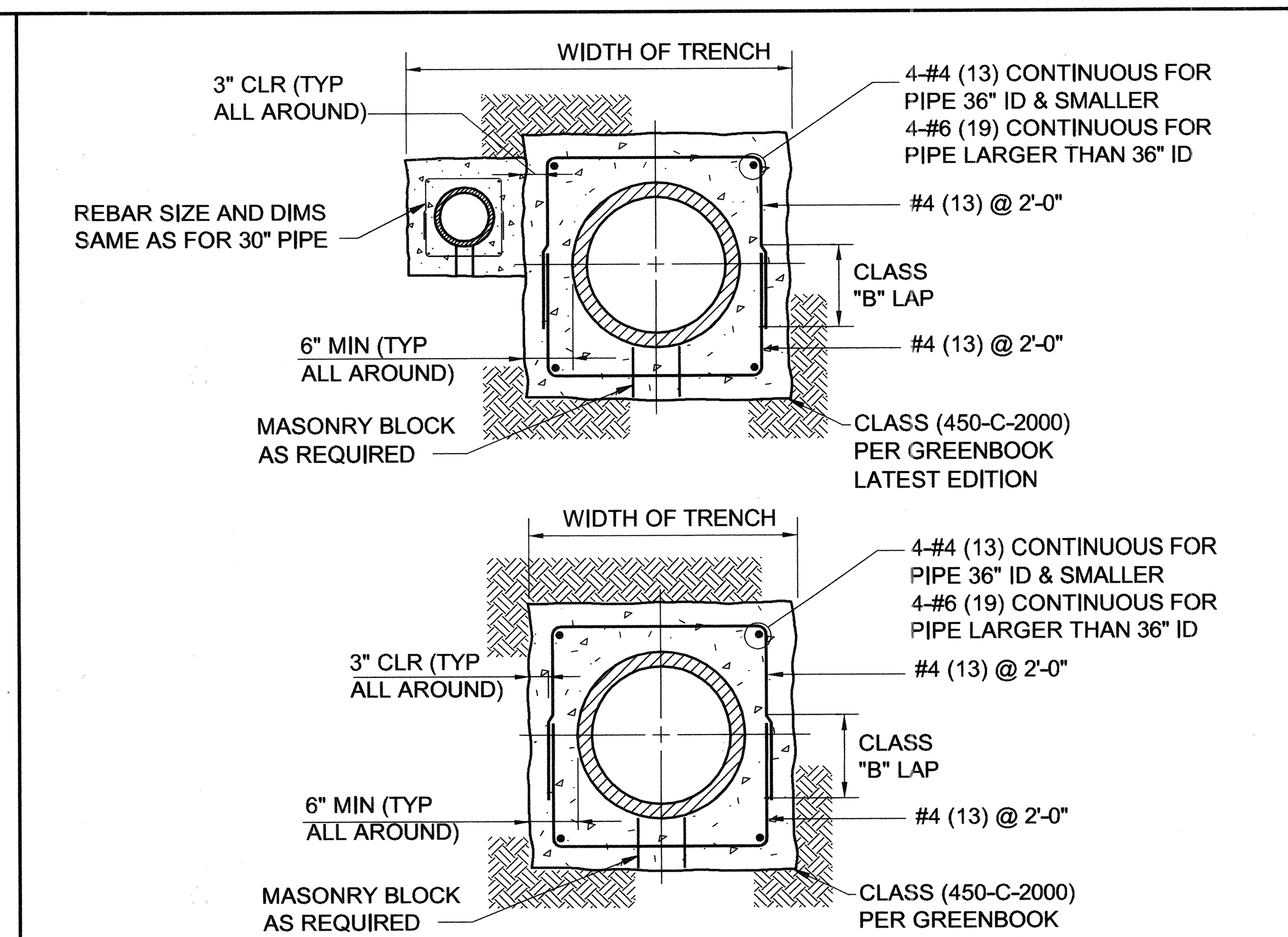
NOTES:

1. FOR 8" DRYWEATHER BASEFLOW FORCEMAIN SEE C-2, AND C-3.
2. FOR 12" RESERVOIR DRAIN FORCEMAIN SEE C-7, C-8, AND C-9.
3. FOR 30" STORM WATER FORCEMAIN SEE C-2, C-3, C-4, C-5, AND C-6.
4. EARTHWORK VOLUMES SHOWN FOR PERMITTING PURPOSES ONLY. CONTRACTOR IS RESPONSIBLE FOR CALCULATING QUANTITIES FOR BIDDING.

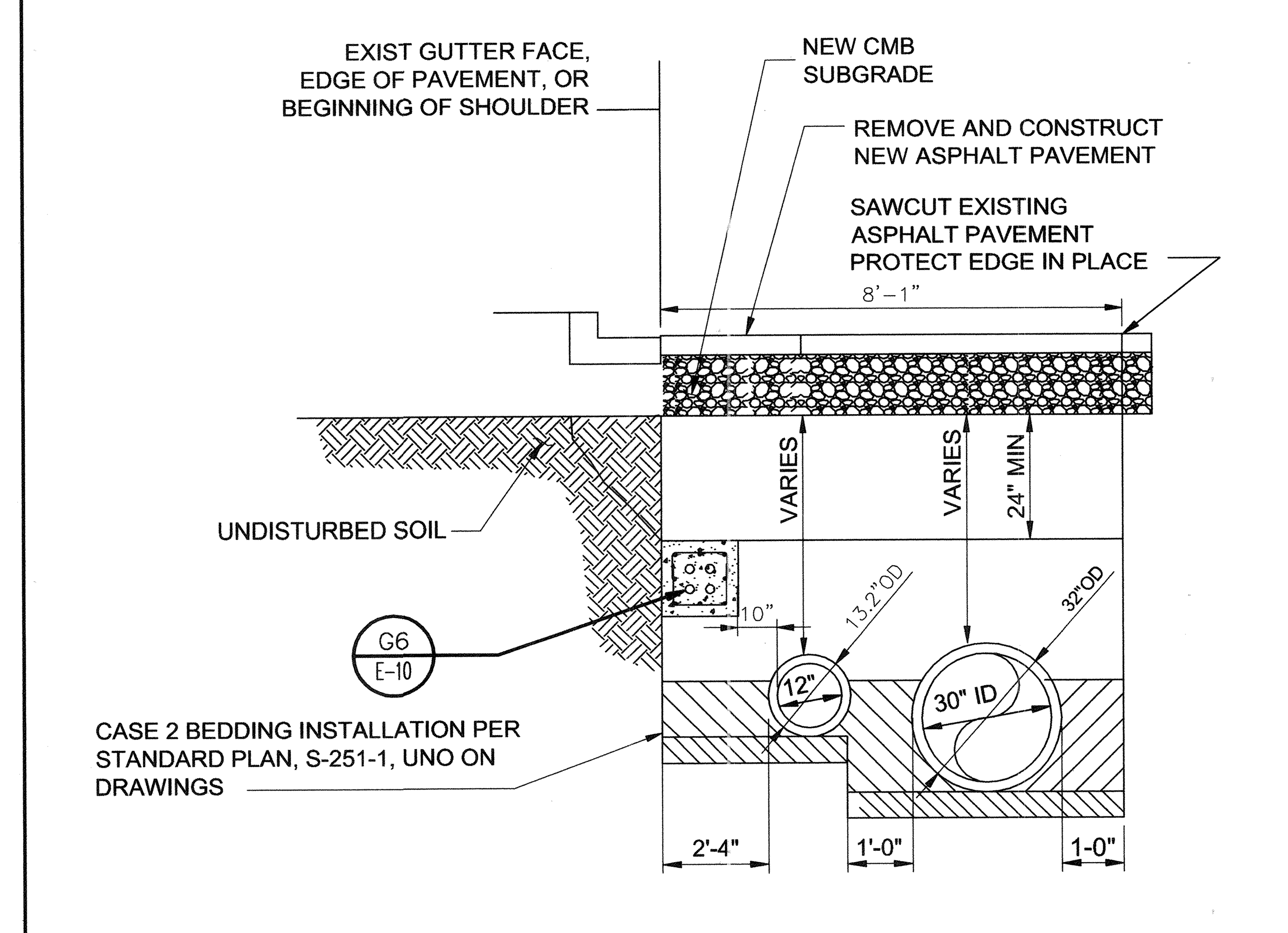
E1 SHEET INDEX
1"=20' C-1



A1 SECTION
NO SCALE C-3



A6 TYPICAL CONCRETE ENCASEMENT DETAIL
NO SCALE C-3



A11 SECTION
NO SCALE C-6, C-9

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REVISION DATES (DESIGN STAGE ONLY)

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Los Angeles, California

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LA DPW ENGINEERING

NO.	REVISIONS	DATE	BY

STRUCTURE NO.

INDEX NO.

GARY LEE MOORE, P.E. CITY ENGINEER DATE:

DESIGN GROUP

ENGINEER: LAWRENCE M. MAGURA LIC. NO. C43286
DESIGNED BY: MOSTAFA HASHAD
DRAWN BY: ALEJANDRO GUTIERREZ
CHECKED BY: LAWRENCE M. MAGURA
APPROVED BY: ROBERT FINN

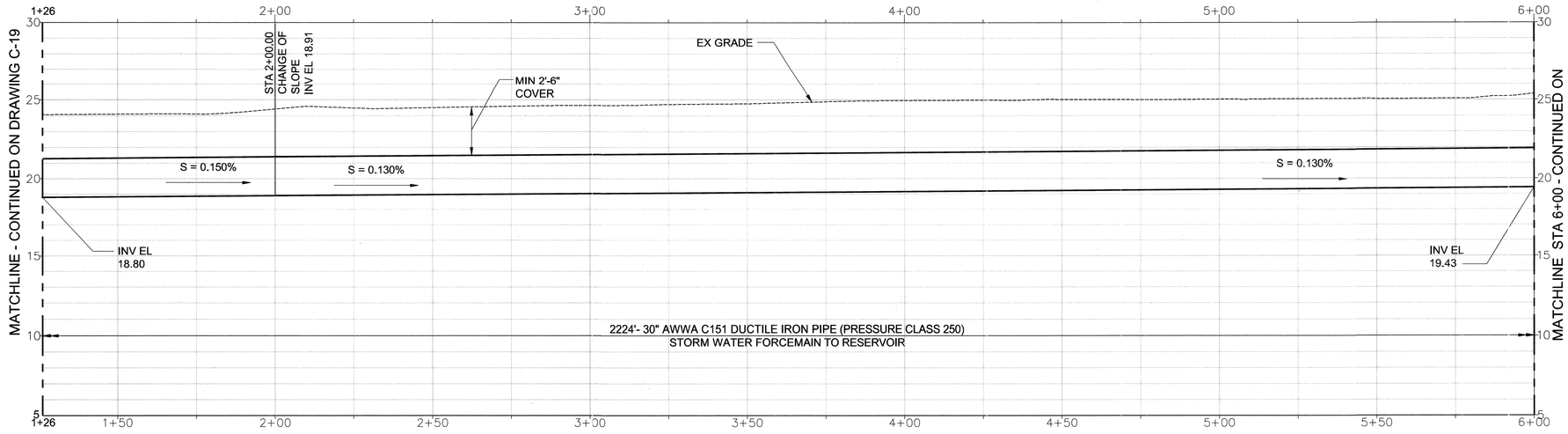
VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: OVERALL SITE PLAN
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F
DRAWING NO. C-1

SHEET 13 OF 108 48 SHEETS

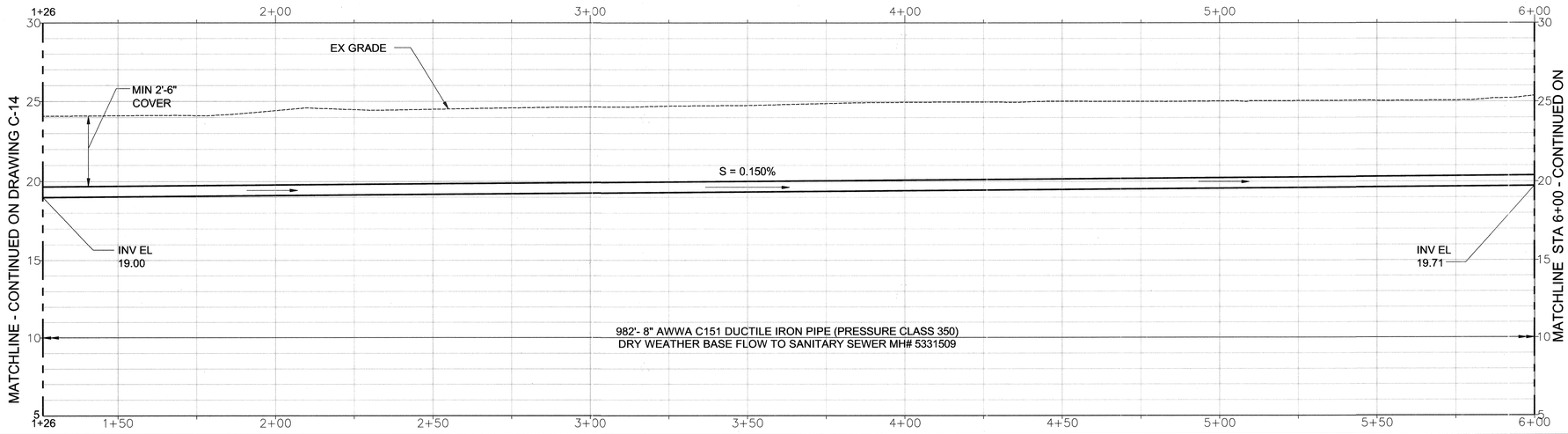
Sheet Version 3.0



FROM STA 1+00 TO 23+39			
	Q MAX	(CFS)	23.39
	VELOCITY	(FPS)	4.8
	HEADLOSS	%	0.2
	PRESSURE CLASS	(PSI)	250
	MATERIAL		DIP
	STANDARD	AWWA	C151
	PIPE SIZE	(INCH)	30
	OD	(INCH)	32
	THICKNESS	(INCH)	0.42

H1 PROFILE STA 1+26 TO 6+00 OF 30" LINE

H:1"=20'-0" V:1"=4' | C-2



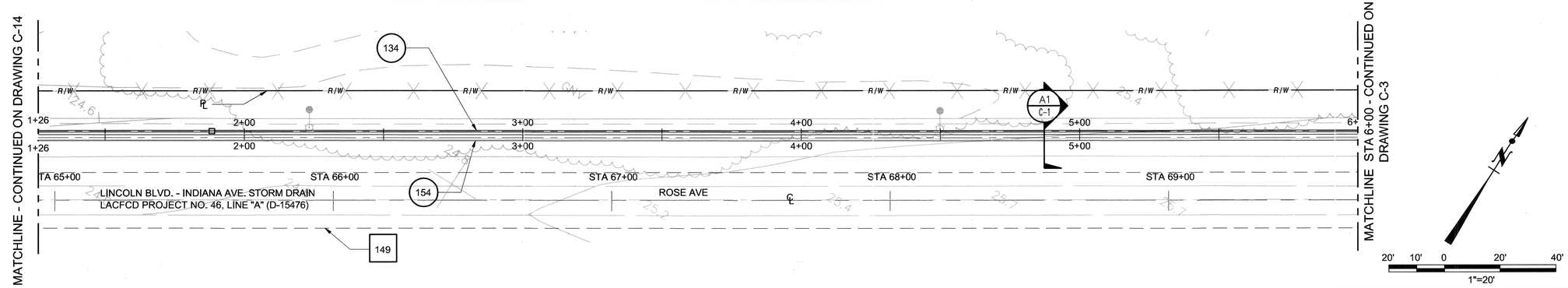
FROM STA 1+00 TO 10+07			
	Q MAX	(CFS)	20
	VELOCITY	(FPS)	4.1
	HEADLOSS	%	0.15
	PRESSURE CLASS	(PSI)	350
	MATERIAL		DIP
	STANDARD	AWWA	C151
	PIPE SIZE	(INCH)	8
	OD	(INCH)	9.05
	THICKNESS	(INCH)	0.25

D1 PROFILE STA 1+26 TO 6+00 OF 8" LINE

H:1"=20'-0" V:1"=4' | C-2

LEGEND

- (134) CONSTRUCT 8", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350
- (154) CONSTRUCT 30", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
- [149] EXISTING DOUBLE 9'x12' RC BOX, STATIONS ARE PER LINCOLN BLVD. - INDIANA AVE. STORM DRAIN, LACFCD PROJECT NO. 46, LINE "A" (D-15476)



A1 PLAN STA 1+26 TO 6+00 OF 8" AND 30" LINES

1"=20'-0" | C-2

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DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

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GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP

ENGINEER:	LAWRENCE M. MAGURA
DESIGNED BY:	MOSTAFA HASHAD
DRAWN BY:	ALEJANDRO GUTIERREZ
CHECKED BY:	LAWRENCE M. MAGURA
APPROVED BY:	ROBERT FINN

LIC. NO. C43285

DATE:

SHEET TITLE: PLAN AND PROFILE 1

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

WORK ORDER NO. EW40019F

DRAWING NO. C-2

SHEET 14 OF ~~100~~ 48 SHEETS

NO. | REVISIONS: | DATE: | BY:

STRUCTURE NO.

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REVISION DATES (DESIGN STAGE ONLY)

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

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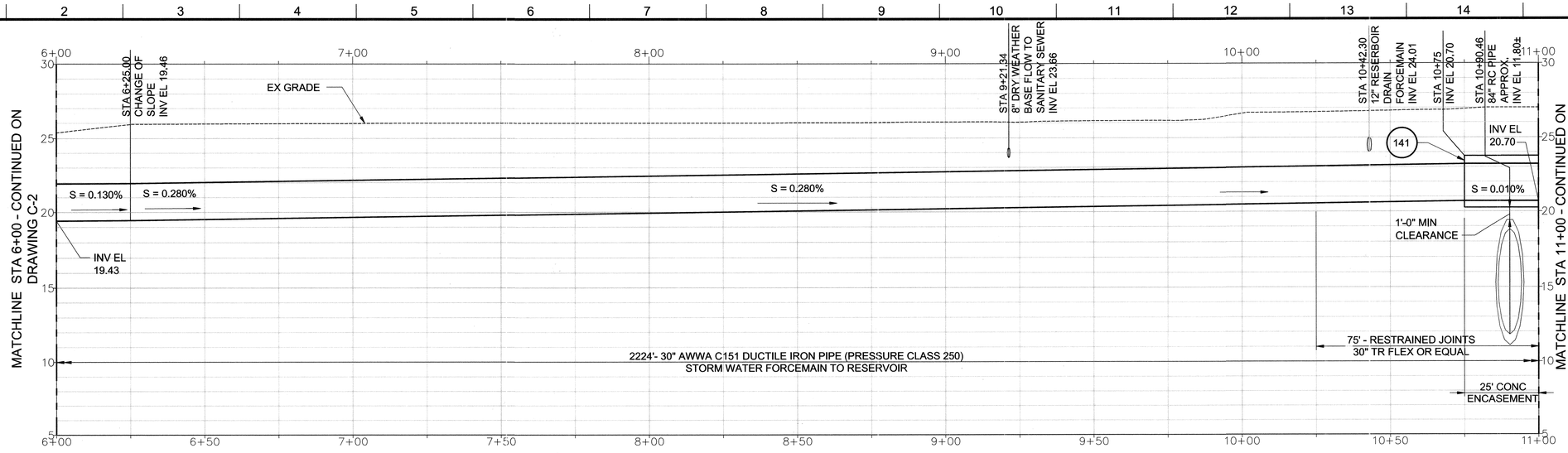
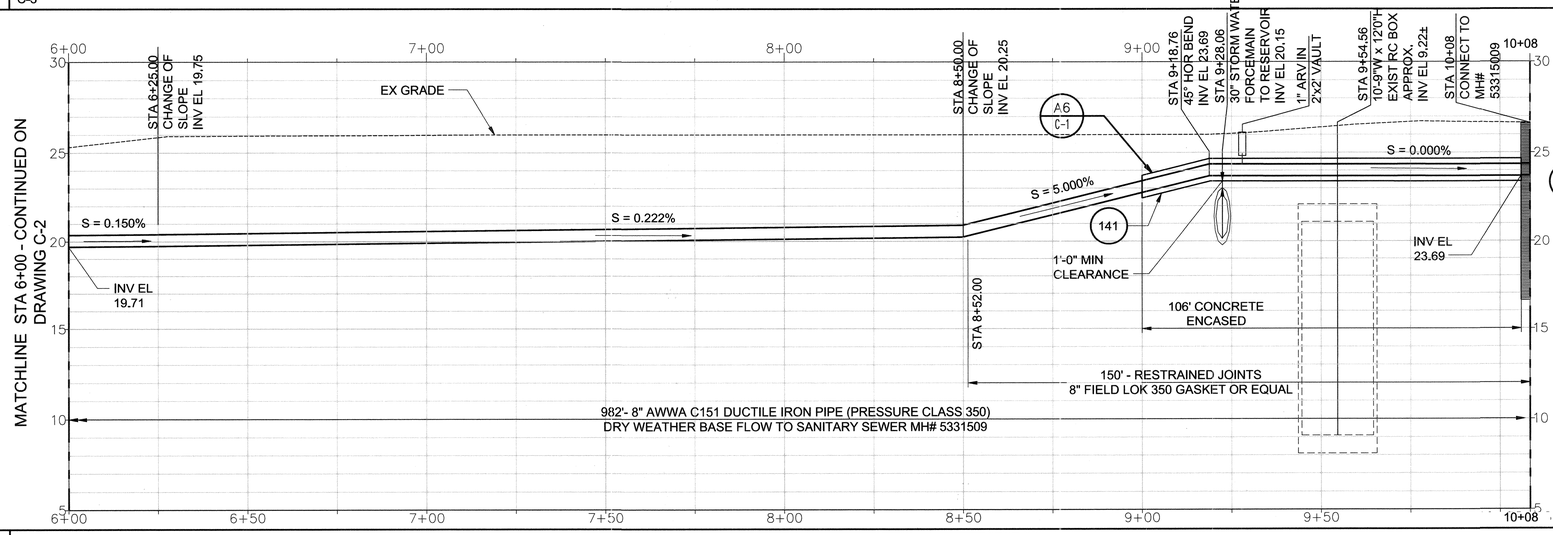
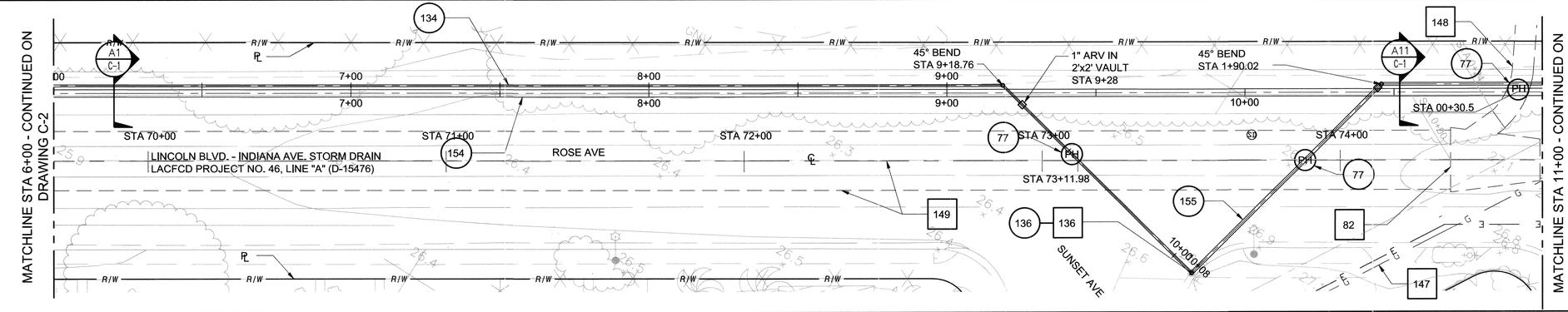


H1	PROFILE STA 6+00 TO 11+00 OF 30" LINE
H:1"=20'-0" V:1"=4'	C-3



D1	PROFILE STA 6+00 TO 10+08 OF 8" LINE
H:1"=20'-0" V:1"=4'	C-3



A1	PLAN STA 6+00 TO 11+00 OF 30" LINE, STA 6+00 TO 10+08 OF 8" LINE
1"=20'-0"	C-3

LEGEND

77	POT HOLE AND VERIFY EXISTING UTILITIES
82	EXISTING JUNCTION STRUCTURE; PROTECT IN PLACE
134	CONSTRUCT 8", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350
136	REMOVE EXISTING AND CONSTRUCT NEW MANHOLE PER S-140-0 AND S-142-0. TYPE II PROTECTIVE LINING. CONNECT ALL INCOMMING AND OUTGOING LATERALS ACCORDINGLY.
141	CONSTRUCT CONCRETE ENCASEMENT PER DETAIL A6, SHEET C-1
147	EXISTING 6" GAS LINE, PROTECT IN PLACE
148	EXISTING 84" RCP STORMDRAIN, STATIONS ARE PER LINCOLN BLVD. - INDIANA AVE. STORM DRAIN, LACFCD PROJECT NO. 46, LINE "A" (D-15476)
149	EXISTING DOUBLE 9'x12' RC BOX, STATIONS ARE PER LINCOLN BLVD. - INDIANA AVE. STORM DRAIN, LACFCD PROJECT NO. 46, LINE "A" (D-15476)
154	CONSTRUCT 30", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
155	CONSTRUCT 12", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350

20' 10' 0 20' 40'
1"=20'

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CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

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STRUCTURE NO.

INDEX NO.

RENEWAL 6/30/2023
REGISTERED PROFESSIONAL ENGINEER
LAWRENCE M. MAGURA
No. 43285
CIVIL
STATE OF CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER DATE:
DESIGN GROUP
ENGINEER: LAWRENCE M. MAGURA LIC. NO. C43285
DESIGNED BY: MOSTAFA HASHAD
DRAWN BY: ALEJANDRO GUTIERREZ
CHECKED BY: LAWRENCE M. MAGURA
APPROVED BY: ROBERT FINN

SHEET TITLE: PLAN AND PROFILE 2
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

WORK ORDER NO.
EW40019F
DRAWING NO.
C-3
SHEET 15 OF 48 SHEETS

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES (DESIGN STAGE ONLY)

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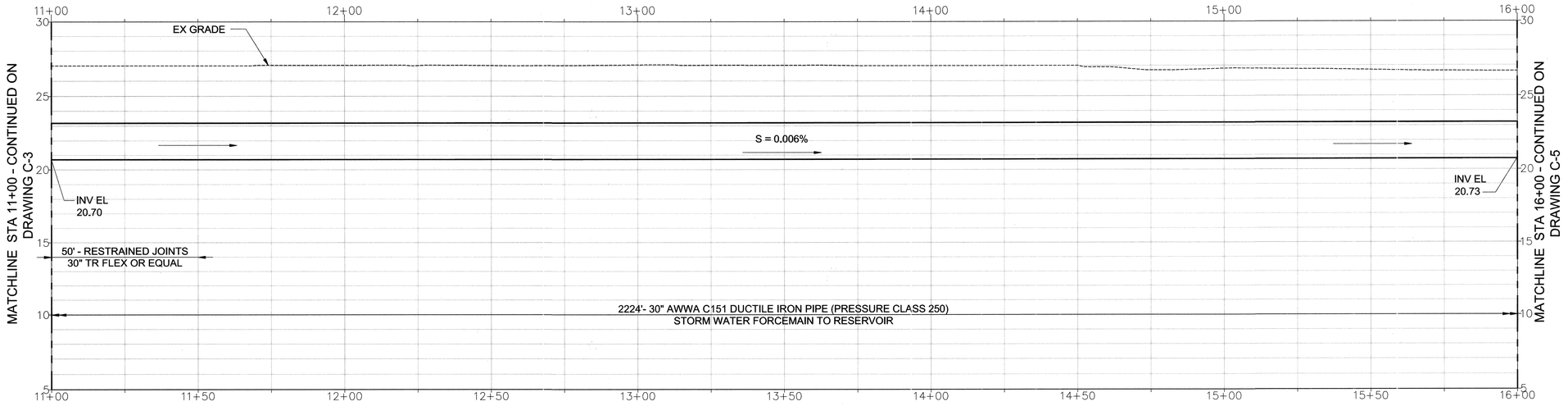
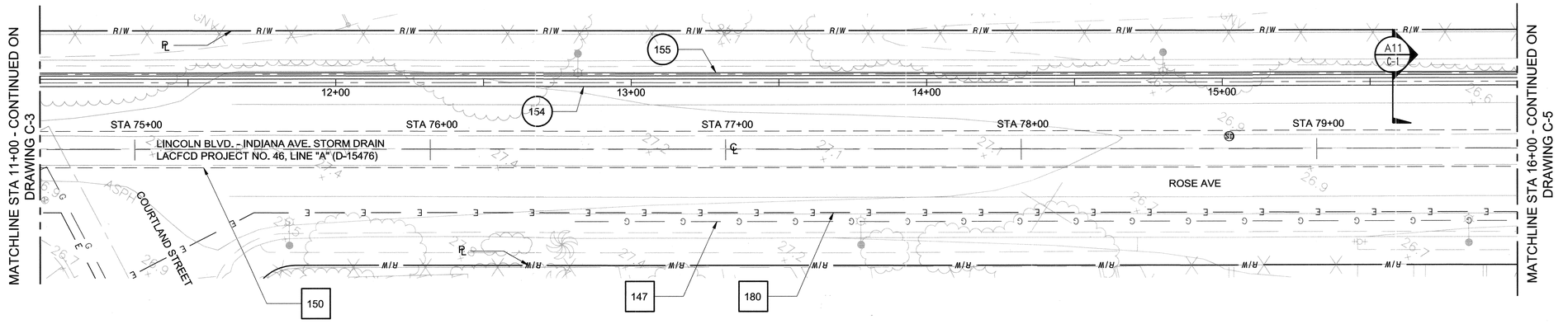


F1 PROFILE STA 11+00 TO 16+00 OF 30" LINE

H:1"=20'-0" V:1"=4' | C-4



LEGEND

147	EXISTING 6" GAS LINE, PROTECT IN PLACE
150	EXISTING 10'-9"x 12'-0" RC BOX, STATIONS ARE PER LINCOLN BLVD. - INDIANA AVE. STORM DRAIN, LACFCD PROJECT NO. 46, LINE "A" (D-15476)
154	CONSTRUCT 30", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
155	CONSTRUCT 12", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350
180	EXISTING ELECTRIC LINE, PROTECT IN PLACE

A1 PLAN STA 11+00 TO 16+00 OF 30" LINE

1"=20'-0" | C-4

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LOS ANGELES, CALIFORNIA

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STRUCTURE NO.
INDEX NO.
PROFESSIONAL ENGINEER — LAWRENCE M. MAGURA — No. C43285 — STATE OF CALIFORNIA — CIVIL — Exp. 3/31/19
12/06/2018

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
CITY ENGINEER
DATE:
GARY LEE MOORE, P.E.
DESIGN GROUP
LIC. NO. C43285
ENGINEER: LAWRENCE M. MAGURA
DESIGNED BY: MOSTAFA HASHAD
DRAWN BY: ALEJANDRO GUTIERREZ
CHECKED BY: LAWRENCE M. MAGURA
APPROVED BY: ROBERT FINN
VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5
SHEET TITLE: PLAN AND PROFILE 3
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291
WORK ORDER NO. EW40019F
DRAWING NO. C-4
SHEET 16 OF ~~108~~ 48 SHEETS

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES (DESIGN STAGE ONLY)

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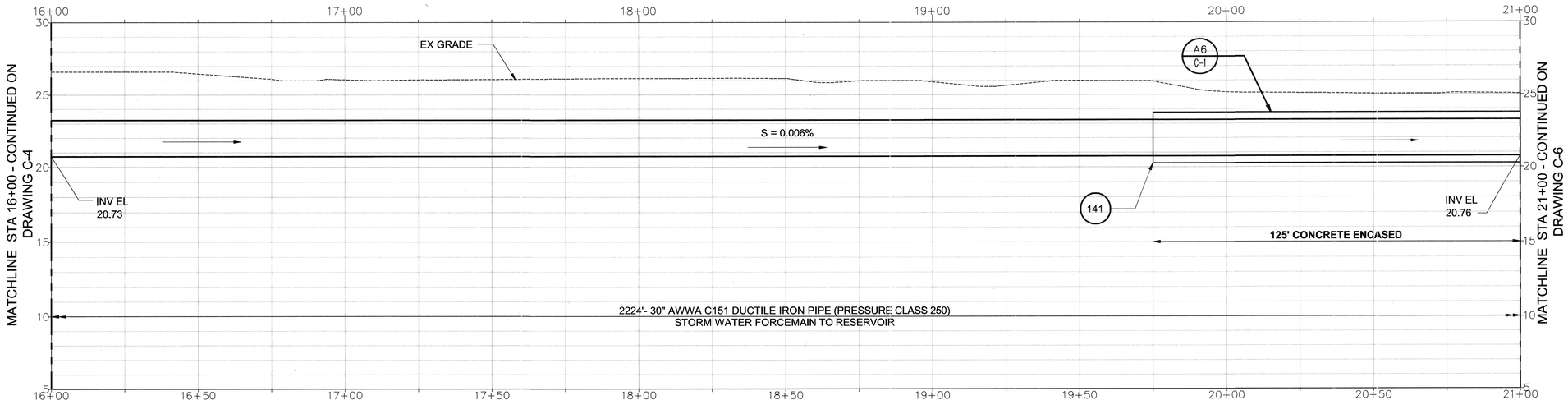
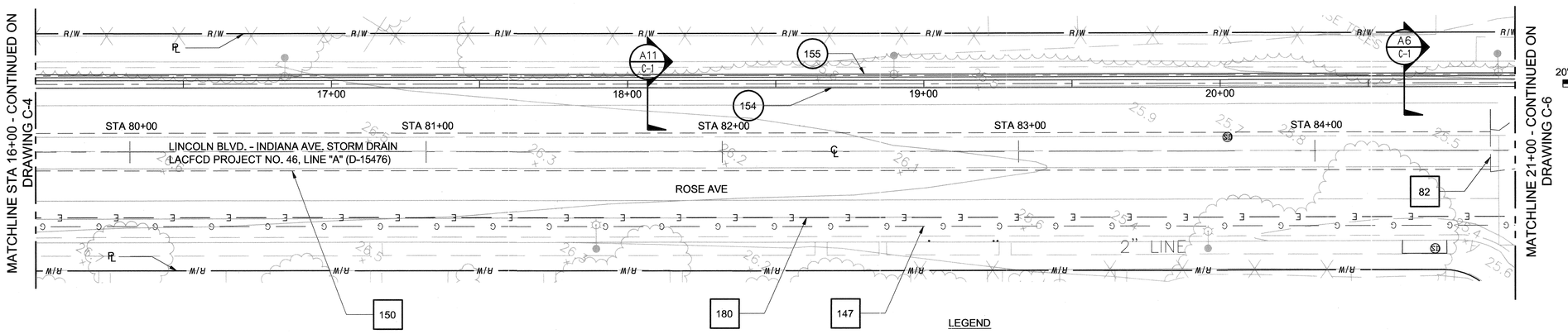


F1 PROFILE STA 16+00 TO 21+00 OF 30" LINE

H:1"=20'-0" V:1"=4' | C-5



LEGEND

82	EXISTING JUNCTION STRUCTURE; PROTECT IN PLACE
147	EXISTING 6" GAS LINE, PROTECT IN PLACE
150	EXISTING 10'-9"x 12'-0" RC BOX, STATIONS ARE PER LINCOLN BLVD. - INDIANA AVE. STORM DRAIN, LACFCD PROJECT NO. 46, LINE "A" (D-15476)
141	CONSTRUCT CONCRETE ENCASEMENT PER SHEET C-1
154	CONSTRUCT 30", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
155	CONSTRUCT 12", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350
180	EXISTING ELECTRIC LINE, PROTECT IN PLACE

A1 PLAN STA 16+00 TO 21+00 OF 30" LINE

1"=20'-0" | C-5

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NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

CITY ENGINEER
GARY LEE MOORE, P.E.
DESIGN GROUP
ENGINEER: LAWRENCE M. MAGURA LIC. NO. C43285
DESIGNED BY: MOSTAFA HASHAD
DRAWN BY: ALEJANDRO GUTIERREZ
CHECKED BY: LAWRENCE M. MAGURA
APPROVED BY: ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PLAN AND PROFILE 4

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

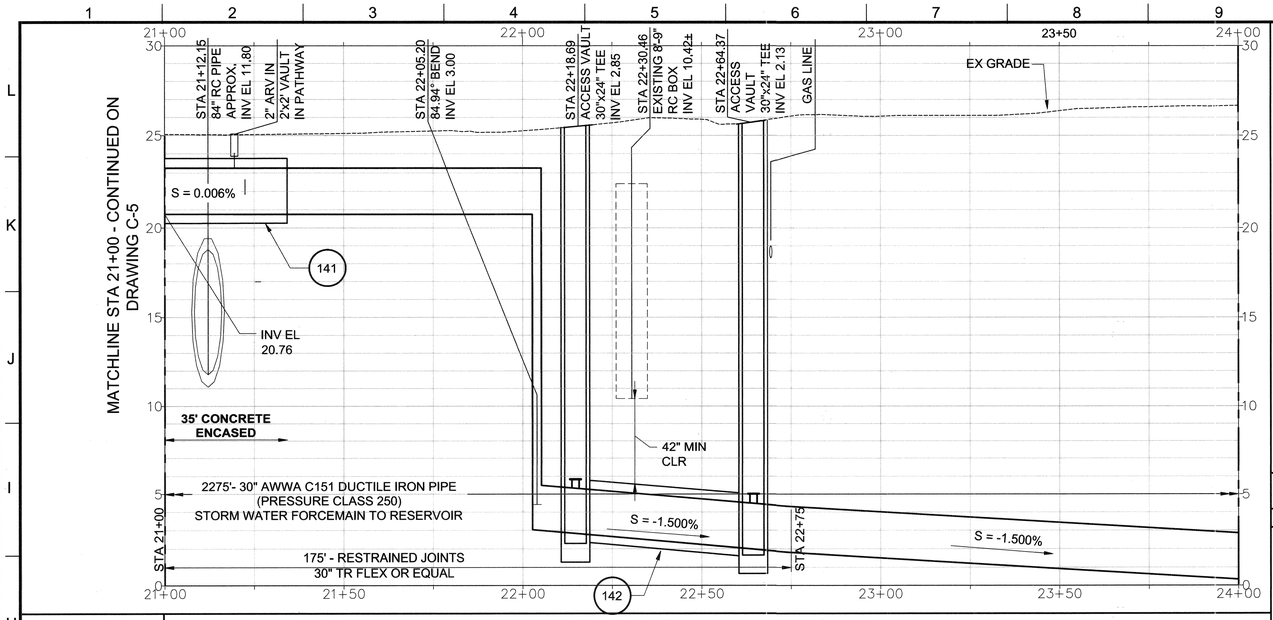
WORK ORDER NO. EW40019F

DRAWING NO. C-5

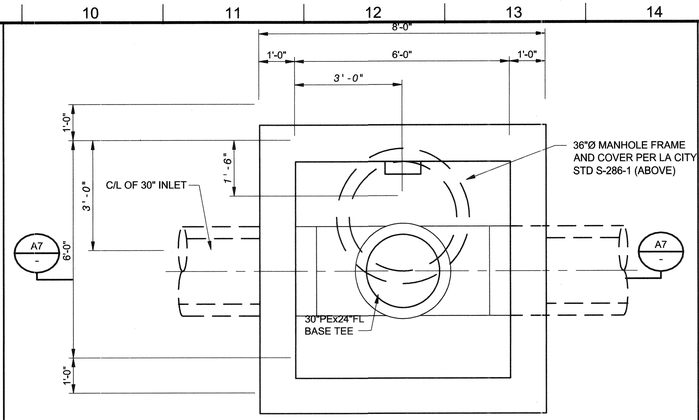
SHEET 17 OF ~~100~~ 48 SHEETS

REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 3.0



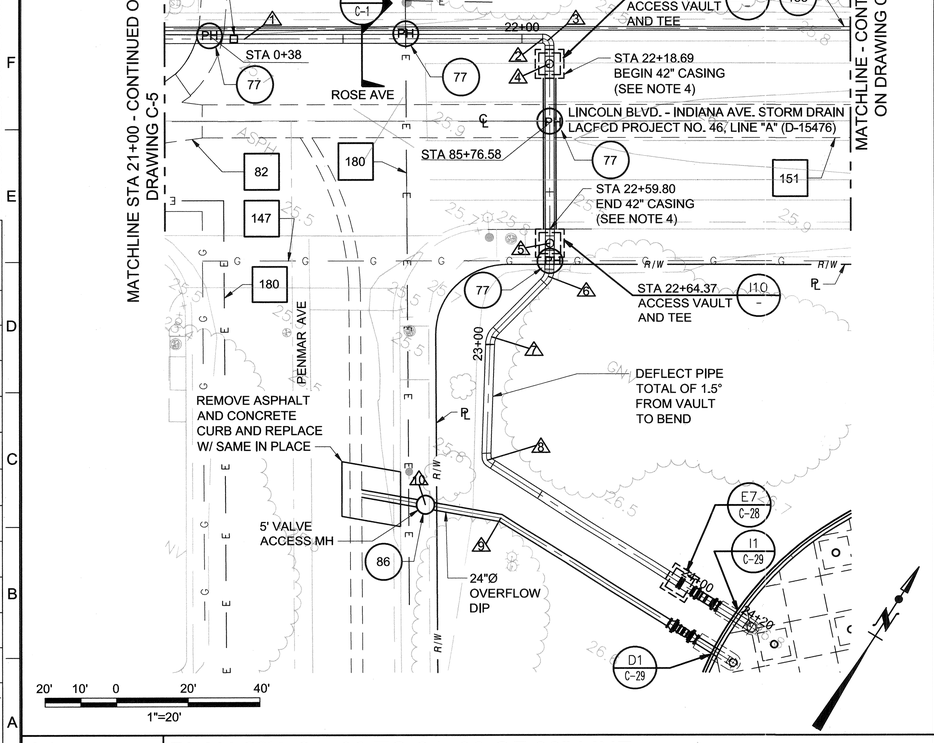
H1	PROFILE STA 21+00 TO 24+00 OF 30" LINE
H:1"=20'-0" V:1"=4'	C-6



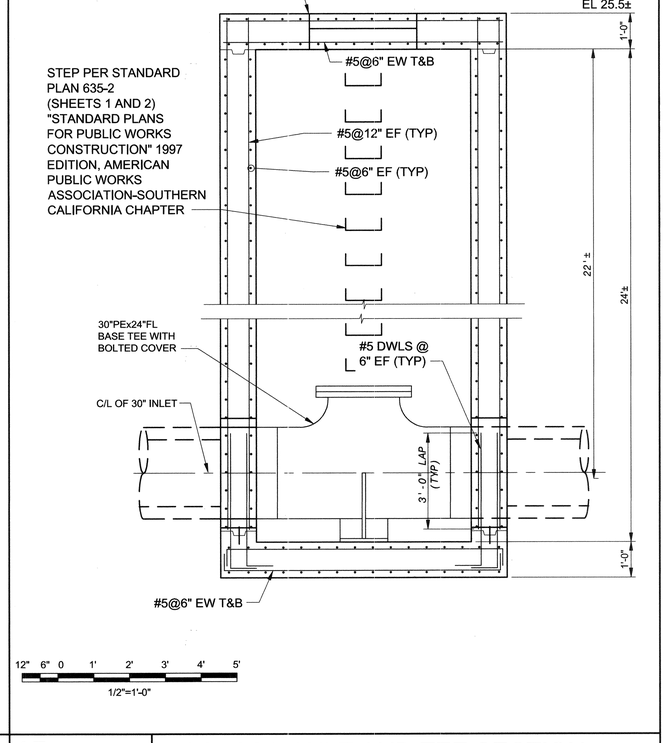
I10	ACCESS VAULT AND TEE PLAN
1/2"=1'-0"	-

LEGEND

77	POT HOLE AND VERIFY EXISTING UTILITIES
82	EXISTING JUNCTION STRUCTURE; PROTECT IN PLACE
141	CONSTRUCT CONCRETE ENCASEMENT PER DETAIL A6 SHEET C-1
142	42" STEEL CASING PIPE, 0.25 INCH THICK PLATE, SEE NOTE 5 ABOVE
147	EXISTING 6" GAS LINE, PROTECT IN PLACE
151	EXISTING 8'-9"x 12" RC BOX, STATIONS ARE PER LINCOLN BLVD. - INDIANA AVE. STORM DRAIN, LACFCD PROJECT NO. 46, LINE "A" (D-15476)
152	EXISTING 39" RCP, REFER TO LACFCD PROJECT NO. 46 (D17984)
154	CONSTRUCT 30", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
155	CONSTRUCT 12", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350
180	EXISTING ELECTRIC LINE, PROTECT IN PLACE
86	CONSTRUCT VALVE ACCESS MANHOLE PER S-381-0



A1	PLAN STA 21+00 TO 24+00 OF 30" LINE
1"=20'-0"	C-6



A7	ACCESS VAULT AND TEE SECTION
1/2"=1'-0"	-

NOTES:

1. PROTECT ALL TREES IN PLACE. PROVIDE FENCING FOR TREE CANOPY. SEE SHEET L-1 FOR TREE PROTECTION REQUIREMENTS.
2. THE CONTRACTOR SHALL VERIFY THE EXISTING 39-INCH RCP LINE ALONG PENMAR AVE AND VERIFY INVERT ELEVATION PRIOR TO CONSTRUCTION OF THE OVERFLOW LINE. THE CONTRACTOR SHALL PROVIDE METHOD STATEMENTS OUTLINING HIS APPROACH TO CONNECT THE OVERFLOW LINE TO THE EXISTING LINE ONCE THE INVERT ELEVATION IS VERIFIED.
3. ELEVATIONS AND LOCATION OF EXISTING 8'-9" STORM DRAIN IS APPROX AND IS SUBJECTED TO SITE VERIFICATION PRIOR TO CONSTRUCTION.
4. NO SHEETING OR BRACING WILL BE USED BEYOND THE LIMIT OF THE TUNNEL CASING.
5. INSTALL STEEL CASING PIPE USING PROCEDURES DESCRIBED IN SECTION 02441 (SMALL DIAMETER TUNNELING) AND SECTION 02623 (MICRO TUNNELING).
6. SEE SECTION 02150 (SHORING FOR RECOMMENDATIONS REGARDING THE SHORING OF MICRO TUNNELING SHAFTS.
7. THE OAK TREES NEAREST THE SOUTHEAST CORNER OF ROSE AND PENMAR MUST BE TRIMMED PRIOR TO STARTING THE 30" FORCE MAIN WORK IN THE AREA. AN ARBORIST APPROVED BY THE CITY SHALL SUPERVISE THE CONTRACTOR'S WORK. A RECREATION AND PARKS DEPARTMENT ARBORIST SHALL BE NOTIFIED 48 HOURS PRIOR TO START OF TREE TRIMMING. CONTACT LAURA BAUERNFEIN AT (213) 485-3674.
8. THE CASING UNDER THE STORM DRAIN IN ROSE SHALL BE INSTALLED BY MICROTUNNELING WITH A CLOSED FACE MACHINE. THE CONTRACTOR SHALL SUBMIT ANY ADDITIONAL TRAFFIC CONTROL NECESSARY FOR THIS WORK TO THE CITY OF LOS ANGELES, DEPARTMENT OF TRANSPORTATION FOR APPROVAL BEFORE STARTING THE WORK.

TABLE OF FITTINGS

	DESCRIPTION	N	E
1	11 1/4° DIP VERTICAL BEND	1824800.09	6422353.93
2	11 1/4° DIP VERTICAL BEND	1824844.25	6422423.95
3	90° DIP HORIZONTAL BEND	1824846.02	6422426.76
4	ACCESS VAULT MID-LINE 30"PEx24"FL BASE TEE	1824840.10	6422430.50
5	ACCESS VAULT MID-LINE 30"PEx24"FL BASE TEE	1824799.27	6422456.25
6	45° DIP HORIZONTAL BEND	1824790.65	6422461.50
7	45° DIP HORIZONTAL BEND	1824766.10	6422456.34
8	45° DIP HORIZONTAL BEND	1824731.77	6422478.74
9	22.5° DIP HORIZONTAL BEND	1824725.28	6422485.65
10	NEW VALVE ACCESS MANHOLE	1824717.10	6422465.90

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LOS ANGELES, CALIFORNIA

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

LA DPW ENGINEERING Building a Better Los Angeles

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER LAWRENCE M. MAGURA No. C43285 CIVIL STATE OF CALIFORNIA
02/06/2020

CITY ENGINEER
GARY LEE MOORE, P.E.
DATE:
LIC. NO. C43285

DESIGN GROUP	
ENGINEER:	LAWRENCE M. MAGURA
DESIGNED BY:	MOSTAFA HASHAD
DRAWN BY:	ALEJANDRO GUTIERREZ
CHECKED BY:	LAWRENCE M. MAGURA
APPROVED BY:	ROBERT FINN

VERTICAL CONTROL: NGVD29- 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PLAN AND PROFILE 5

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. C-6

SHEET 18 OF ~~100~~ 48 SHEETS

REVISION DATES: (DESIGN STAGE ONLY)

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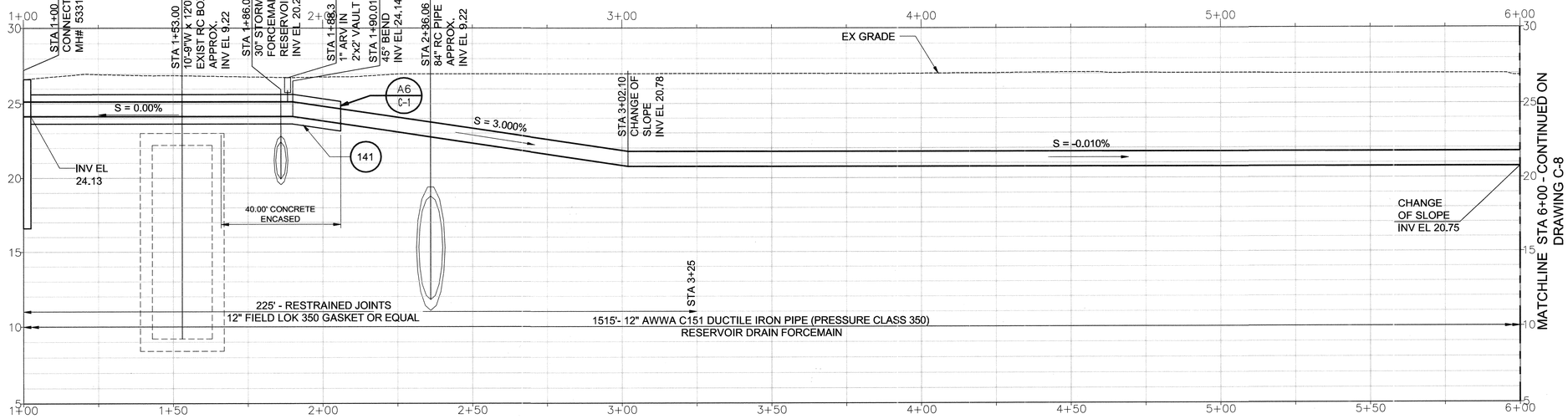
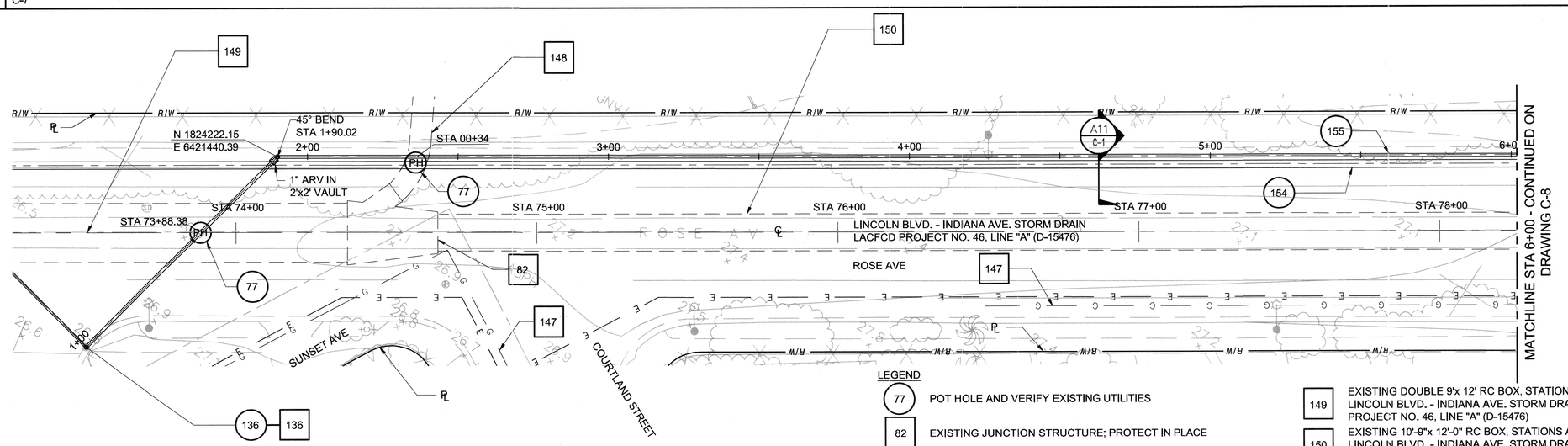


FROM STA 1+00 TO 15+06		
Q MAX	(CFS)	3.50
VELOCITY	(FPS)	4.5
HEADLOSS	%	0.5
PRESSURE CLASS	(PSI)	350
MATERIAL		DIP
STANDARD	AWWA	C151
PIPE SIZE	(INCH)	12
OD	(INCH)	13.20
THICKNESS	(INCH)	0.28

F1	PROFILE STA 1+00 TO 6+00 OF 12" LINE
H:1"=20'-0" V:1"=4'	C-7



LEGEND

77	POT HOLE AND VERIFY EXISTING UTILITIES
82	EXISTING JUNCTION STRUCTURE; PROTECT IN PLACE
136 136	REMOVE EXISTING AND CONSTRUCT NEW MANHOLE PER S-140-0 AND S-142-0, TYPE II PROTECTIVE LINING. CONNECT ALL INCOMING AND OUTGOING LATERALS ACCORDINGLY.
141	CONSTRUCT CONCRETE BLANKET PER DETAIL A6, SHEET C-1
147	EXISTING 6" GAS LINE, PROTECT IN PLACE
148	EXISTING 84" RCP STORMDRAIN, STATIONS ARE PER LINCOLN BLVD. - INDIANA AVE. STORM DRAIN, LACFCD PROJECT NO. 46, LINE "A" (D-15476)
149	EXISTING DOUBLE 9'x 12' RC BOX, STATIONS ARE PER LINCOLN BLVD. - INDIANA AVE. STORM DRAIN, LACFCD PROJECT NO. 46, LINE "A" (D-15476)
150	EXISTING 10'-9"x 12'-0" RC BOX, STATIONS ARE PER LINCOLN BLVD. - INDIANA AVE. STORM DRAIN, LACFCD PROJECT NO. 46, LINE "A" (D-15476)
180	EXISTING ELECTRIC LINE, PROTECT IN PLACE
154	CONSTRUCT 30", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
155	CONSTRUCT 12", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350

20' 10' 0 20' 40'
1"=20'

A1	PLAN STA 1+00 TO 6+00 OF 12" LINE
1"=20'-0"	C-7

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CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

GARY LEE MOORE, P.E. CITY ENGINEER
DATE:
LIC. NO. C43285

DESIGN GROUP	
ENGINEER:	LAWRENCE M. MAGURA
DESIGNED BY:	MOSTAFA HASHAD
DRAWN BY:	ALEJANDRO GUTIERREZ
CHECKED BY:	LAWRENCE M. MAGURA
APPROVED BY:	ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PLAN AND PROFILE 6

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

DATE: BY: / NO. REVISIONS:

STRUCTURE NO.

INDEX NO.

LA DPW ENGINEERING Science & Technology Dedicated to the Future

PROFESSIONAL ENGINEER LAWRENCE M. MAGURA EXP. 3/31/11 STATE OF CALIFORNIA
02/08/2010

WORK ORDER NO. EW40019F

DRAWING NO. C-7

SHEET 19 OF ~~198~~ 48 SHEETS

REVISION DATES (DESIGN STAGE ONLY)

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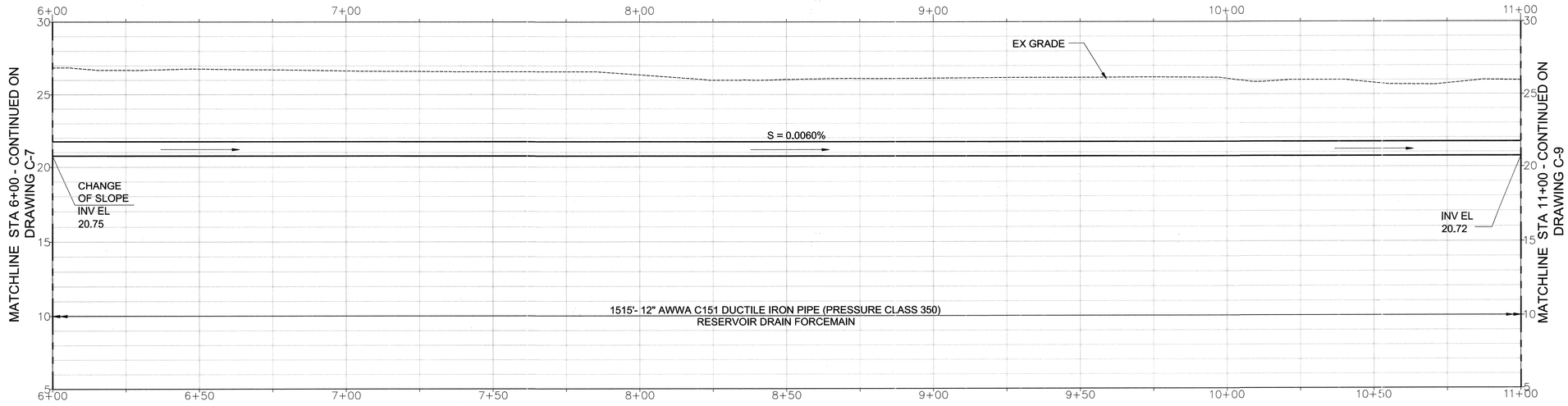
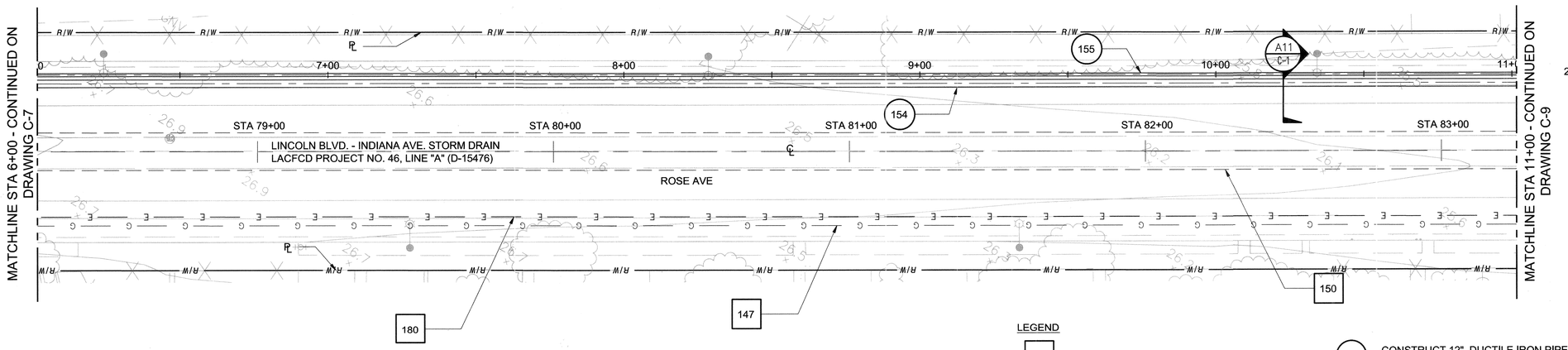
F1 PROFILE STA 6+00 TO 11+00 OF 12" LINE

H:1"=20'-0" V:1"=4' | C-8



A1 PLAN STA 6+00 TO 11+00 OF 12" LINE

1"=20'-0" | C-8



LEGEND

147	EXISTING 6" GAS LINE, PROTECT IN PLACE
150	EXISTING 10'-9"x 12'-0" RC BOX, STATIONS ARE PER LINCOLN BLVD. - INDIANA AVE. STORM DRAIN, LACFCD PROJECT NO. 46, LINE "A" (D-15476)
154	CONSTRUCT 30", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
180	EXISTING ELECTRIC LINE, PROTECT IN PLACE
155	CONSTRUCT 12", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350

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NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER LAWRENCE M. MAGURA No. C43285 CIVIL STATE OF CALIFORNIA
PROFESSIONAL ENGINEER
03/05/10

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

CITY ENGINEER: GARY LEE MOORE, P.E. DATE:

DESIGN GROUP

ENGINEER:	LAWRENCE M. MAGURA
LIC. NO.	C43285
DESIGNED BY:	MOSTAFA HASHAD
DRAWN BY:	ALEJANDRO GUTIERREZ
CHECKED BY:	LAWRENCE M. MAGURA
APPROVED BY:	ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PLAN AND PROFILE 7

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA. 90291

WORK ORDER NO. EW40019F

DRAWING NO. C-8

SHEET 20 OF 108 SHEETS

REVISION DATES (DESIGN STAGE ONLY)

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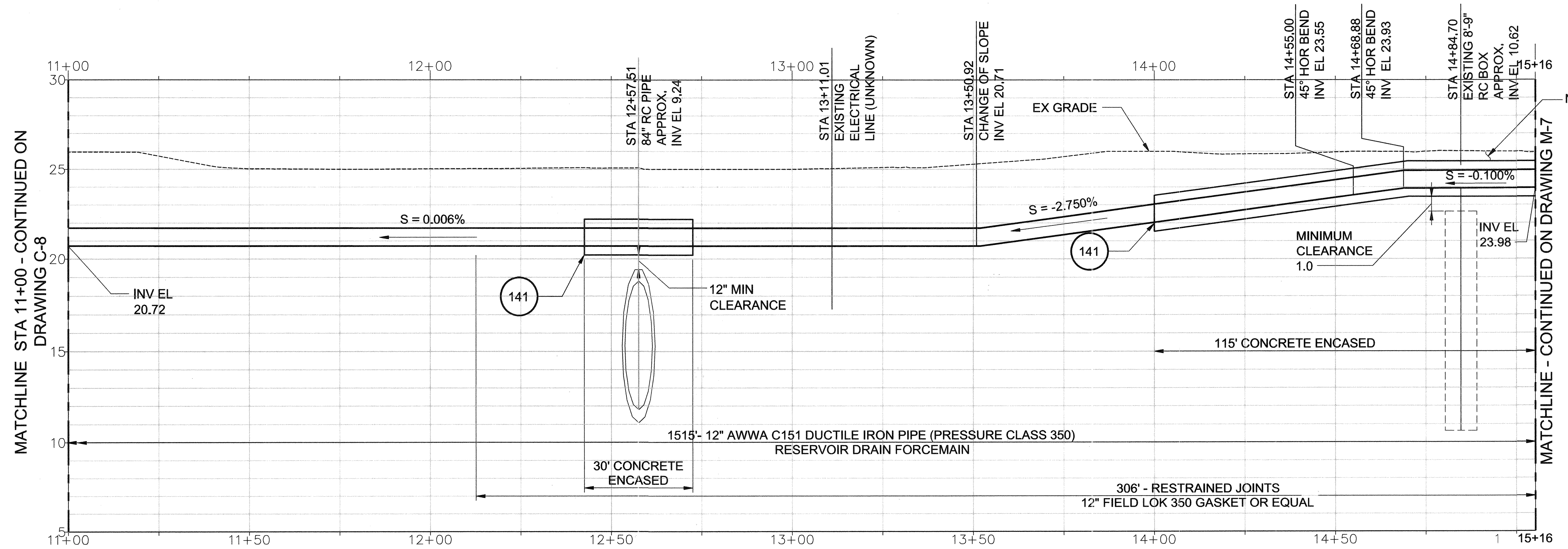
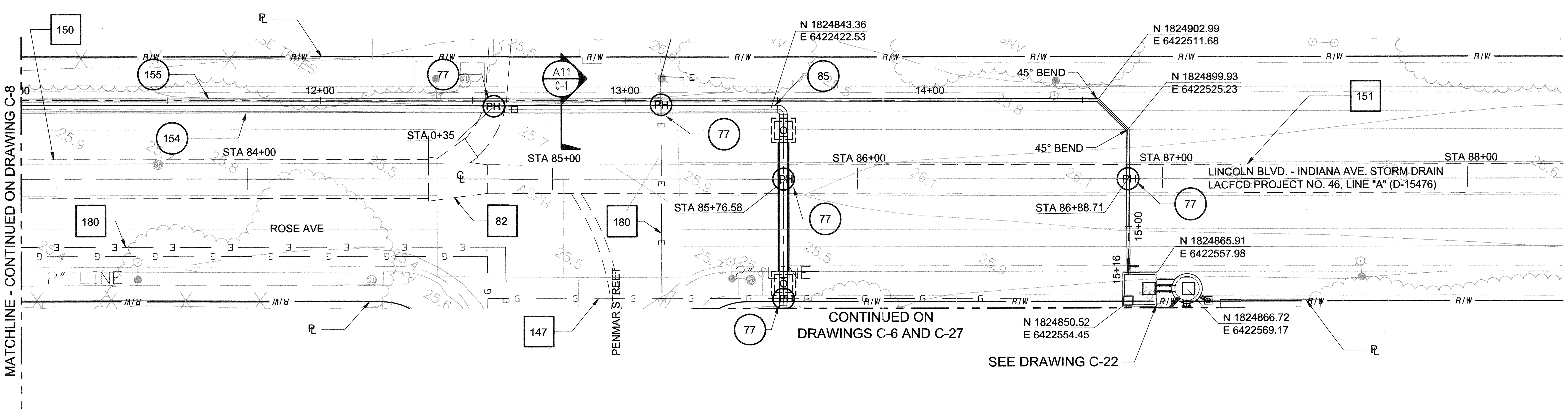


NOTE:

1. FILL SPACE BETWEEN CROWN OF PIPE AND PAVEMENT SUBGRADE ELEVATION FROM STA 14+64.88 TO 15+16 WITH CDF AND REPAVE TO ORIGINAL GRADE WITH AC PAVEMENT.

F1 PROFILE STA 11+00 TO 15+15 OF 12" LINE
H:1"=20'-0" V:1"=4' C-9



NOTE:

1. PROTECT ALL TREES IN PLACE. PROVIDE FENCING FOR TREE CANOPY. SEE SHEET L-1 FOR TREE PROTECTION REQUIRMENTS.

LEGEND

77	POT HOLE AND VERIFY EXISTING UTILITIES
82	EXISTING JUNCTION STRUCTURE; PROTECT IN PLACE
85	CONSTRUCT STORM DRAIN MANHOLE PER S-284-2
141	CONSTRUCT CONCRETE ENCASEMENT PER A6 SHEET C-1
147	EXISTING 6" GAS LINE, PROTECT IN PLACE
151	EXISTING 8'-9"x 12" RC BOX, STATIONS ARE PER LINCOLN BLVD. - INDIANA AVE. STORM DRAIN, LACFCD PROJECT NO. 46, LINE "A" (D-15476)
154	CONSTRUCT 30", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
155	CONSTRUCT 12", DUCTILE IRON PIPE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350
180	EXISTING ELECTRIC LINE, PROTECT IN PLACE

A1 PLAN STA 11+00 TO 15+15 OF 12" LINE
1"=20'-0" C-9

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GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP

ENGINEER: LAWRENCE M. MAGURA LIC. NO. C43285
DESIGNED BY: MOSTAFA HASHAD
DRAWN BY: ALEJANDRO GUTIERREZ
CHECKED BY: LAWRENCE M. MAGURA
APPROVED BY: ROBERT FINN

VERTICAL CONTROL: NGVD29, 1995 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PLAN AND PROFILE 8
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

NO. REVISIONS: DATE: BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER LAWRENCE M. MAGURA No. 43285 CIVIL STATE OF CALIFORNIA
02/06/2010

WORK ORDER NO. EW40019F
DRAWING NO. C-9
SHEET 21 OF 108 48 SHEETS

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6. MAINTAIN 3' WIDE PATHWAY FOR ACCESS ALONG FREDERICK STREET.

7. TO BE MAINTAINED BY THE CITY OF LOS ANGELES.

PENMAR GOLF COURSE

SEE NOTE 2

MATCHLINE SEE DRAWING C-2

STA. 1+26.00

17.19'

40' ROW

FORCE MAIN METER VAULT; SEE DWGS M-5 AND S-13

RE-ESTABLISH EXISTING CURB GRADE

WARP CONCRETE SIDEWALK TO MEET TOP OF VAULT, SIDE SLOPE 0.5% MIN., 1.5% MAX

1'-3"

TC 24.35
FL 23.85
(SEE NOTE 1)

ELECTRICAL EQUIPMENT SEE DWG E-6

STORM DRAIN PUMPING STATION SEE DWGS M-1 AND S-8. SEE NOTE 7.

TAPERED CURB FACE

0" CURB FACE

1'-10"

FS 24.50

FS 24.40

FS 24.10

24

1% MIN

TC 24.60

SLOPE VARIES

TC 24.32

1.5%

6%

10'

5' NOTE 3

1' TYP.

TC 24.90

STORM DRAIN CATCH BASIN SEE DWG C-20

25' ROW

MEET EXISTING GRADE

24.36 HP

SMH NO. 1
RIM 24.46
HP

SMH NO. 2
RIM 24.20

SMH NO. 3
RIM 24.20

SMH NO. 4
RIM 24.40

5' (TYP)

TC 24.42

TC 24.93

WARP DG PAVING TO MEET FL OF EXISTING STORM DRAIN INLET

SEE NOTE 6

TAPERED CURB FACE

RE-ESTABLISH EXISTING CURB GRADE

TC 24.65
FL 24.15
(SEE NOTE 1)

17.07'

FREDERICK STREET

N32°15'19"W

ROSE AVENUE

MATCHLINE SEE DRAWING C-11

SCALE 1"=5'

COORDINATE POINTS											
NUMBER	NORTHING	EASTING	ELEV	NUMBER	NORTHING	EASTING	ELEV	NUMBER	NORTHING	EASTING	ELEV
101	1823823.73	6420573.19	24.20 LP	107	1823703.42	6420583.56	NOTE 4	113	1823796.90	6420578.51	TC 24.02
102	1823820.66	6420577.71	TC 24.90	108	1823747.60	6420653.88	TC 24.40	114	1823787.68	6420584.33	TC 24.02
103	1823786.09	6420596.94	TC 24.90	109	1823790.62	6420596.62	TC 24.90	117	1823739.71	6420658.60	TC 24.40
104	1823735.19	6420633.91	TC 24.60	110	1823742.69	6420624.33	TC 24.90	118	1823721.40	6420609.92	N/A
105	1823802.68	6420539.74	24.20 LP	111	1823745.02	6420650.88	TC 24.40				
106	1823711.96	6420596.97	TC 24.93	112	1823739.96	6420642.84	TC 24.40				

NOTES:

1. INSTALL CURB AND GUTTER AND ALLEY INTERSECTION ON CONTINUOUS GRADE BETWEEN EXISTING CURB AND GUTTER CUTS.
2. PROTECT EXISTING GOLF COURSE IMPROVEMENTS, SHRUBS, AND TREES IN PLACE
3. 1.5% MAXIMUM CROSS SLOPE AND ZERO CURB FACE TO PROVIDE ADA ACCESS ALONG SIDEWALK.
4. MATCH EXISTING ELEVATION.
5. SEE NOTE 41 ON DRAWING R5 FOR REQUIREMENTS ON PROTECTION OF EXISTING TREES.

CONSTRUCTION SYMBOLS:

- (2) TYPE C INTEGRAL CONCRETE CURB AND GUTTER PER S-410-2. a=24", b=6"
- (11) CONCRETE ALLEY INTERSECTION PER S-420-1, TYPE A. w=44', r=8', t=8" MODIFIED PER PLAN
- (12) 4" THICK CONCRETE SIDEWALK PER SPPWC 112-1; 1.5% MAX SLOPE
- (14) ASPHALT PAVEMENT, 8" AC OVER 12" CMB BASE
- (51) MEET EDGE OF EXISTING ASPHALT PAVEMENT PER I1/C-21
- (52) MEET EDGE OF EXISTING CONCRETE CURB AND GUTTER
- (53) MEET EDGE OF EXISTING CONCRETE SIDEWALK
- (54) REMOVABLE BOLLARDS, 9 REQUIRED; SEE E1/C-21
- (55) 6" THICK OF DG PER SSPWC SECTION 200-2.7 COMPACTED TO 95% RELATIVE MINIMUM. WARP TO MEET EXISTING GRADE TO MAINTAIN MINIMUM 1% SLOPE TOWARDS THE DG OR CONCRETE. SEE I9/C-21. DG INSTALLED WITH SOIL STABILIZER PER DRAWING L-2.
- (56) 6" THICK OF DG PER SSPWC SECTION 200-2.7 COMPACTED TO 95% RELATIVE MINIMUM. SEE I9/C-21. DG INSTALLED WITH SOIL STABILIZER PER DRAWING L-2.
- (57) DG SURFACE TO MEET TOP OF PUMP STATION
- (62) CONCRETE PAD FOR ELECTRICAL EQUIPMENT. SEE I5/C-21. TC= 24.90
- (100) 12" PVC VENT PIPE
- [30] EXISTING GUARD RAIL; PROTECT IN PLACE
- [59] EXISTING GOLF COURSE FENCE; PROTECT IN PLACE
- [60] EXISTING RESIDENTIAL FENCE; PROTECT IN PLACE
- [61] EXISTING RESIDENTIAL STRUCTURE; PROTECT IN PLACE
- [64] EXISTING LIGHT STANDARD; PROTECT IN PLACE
- [99] EXISTING STORM DRAIN CATCH BASIN; PROTECT IN PLACE

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REVISION DATES (DESIGN STAGE ONLY)
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12.09.02

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GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP

ENGINEER: DOUGLAS B. McCARTNEY LIC. NO. 28085 DATE:

DESIGNED BY: DENNIS SIMONSON

DRAWN BY: DENNIS SIMONSON

CHECKED BY: DOUGLAS B. ROBISON

APPROVED BY: ROBERT FINN

REVISIONS: NO. DATE: BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25566 12-31-11 CIVIL STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PAVING AND GRADING PLAN 1

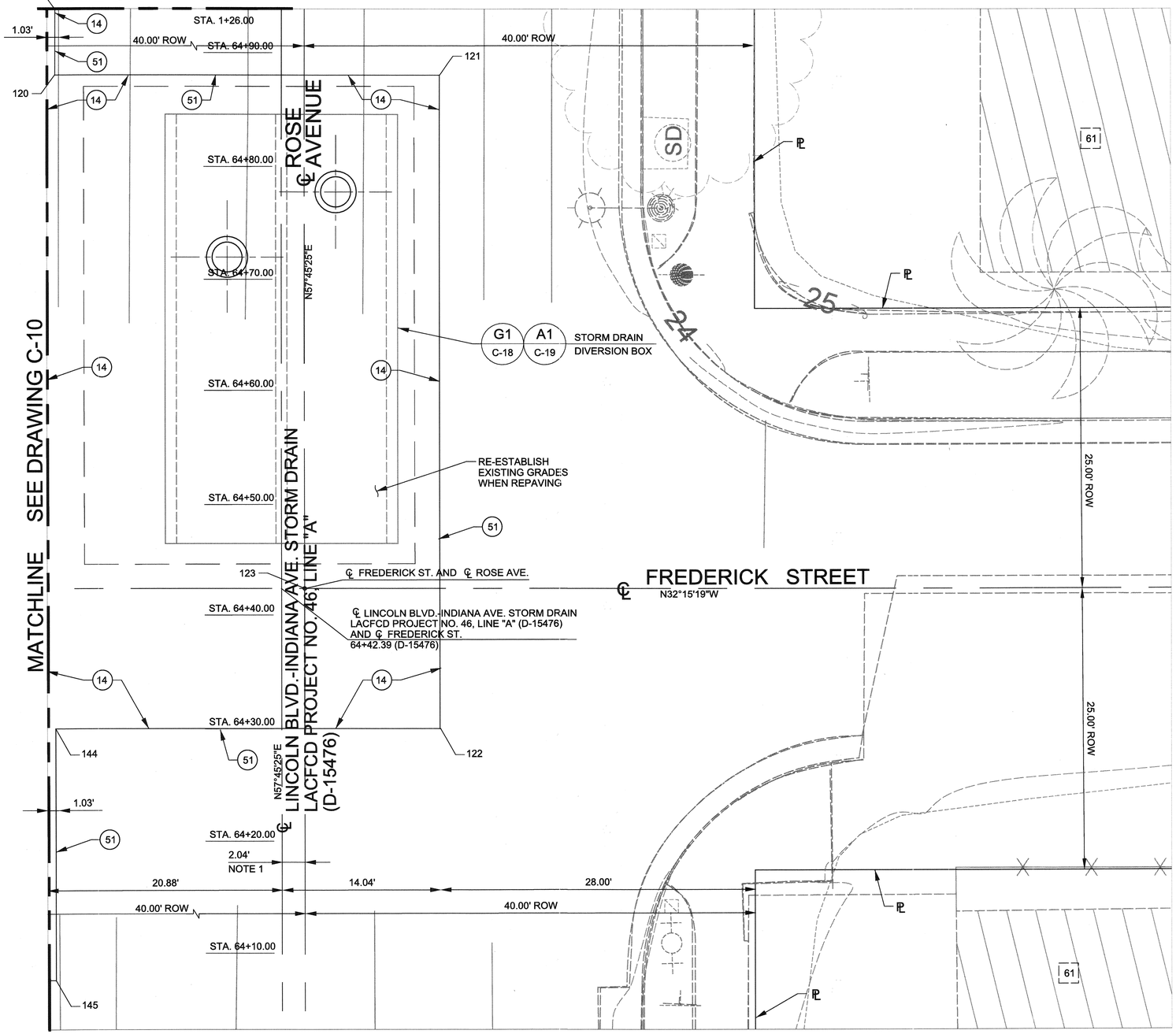
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. C-10

SHEET 22 OF ~~108~~ 46 SHEETS



CONSTRUCTION SYMBOLS:

- (14) ASPHALT PAVEMENT 8" AC OVER 12" CMB BASE
- (51) MEET EDGE OF EXISTING ASPHALT PAVEMENT PER I1/C-21
- [61] EXISTING RESIDENTUAL STRUCTURE; PROTECT IN PLACE

COORDINATE POINTS							
NUMBER	NORTHING	EASTING	ELEV	NUMBER	NORTHING	EASTING	ELEV
119	1823734.76	6420665.52	NOTE 2	123	1823688.47	6420633.80	N/A
120	1823731.58	6420660.54	NOTE 2	144	1823700.58	6420611.44	NOTE 2
121	1823702.76	6420678.78	NOTE 2	145	1823688.65	6420592.53	NOTE 2
122	1823671.70	6420629.71	NOTE 2				

NOTES:

1. DISTANCE BETWEEN CENTERLINE OF ROSE AVENUE AND CENTERLINE OF LINCOLN BLVD.-INDIANA AVE. STORM DRAIN; LACFD PROJECT NO. 46, LINE "A" (D-15476).
2. FINISHED SURFACE TO MEET EXISTING ASPHALT PAVEMENT.
3. STATIONS ARE PER LINCOLN BLVD.-INDIANA AVE. STORM DRAIN LACFD PROJECT NO. 46, LINE "A" (D-15476).

SCALE 1"=5'

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BUREAU OF ENGINEERING

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GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
ENGINEER: DOUGLAS B. McCARTNEY LIC. NO. 28085
DESIGNED BY: DENNIS SIMONSON
DRAWN BY: DENNIS SIMONSON
CHECKED BY: DOUGLAS B. ROBISON
APPROVED BY: ROBERT FINN

DATE: BY:
NO. REVISIONS:

STRUCTURE NO.
INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 DATE 12-31-11 CIVIL STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PAVING AND GRADING PLAN 2

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F
DRAWING NO. C-11
SHEET 23 OF ~~48~~ 46 SHEETS

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REVISION DATES (DESIGN STAGE ONLY)
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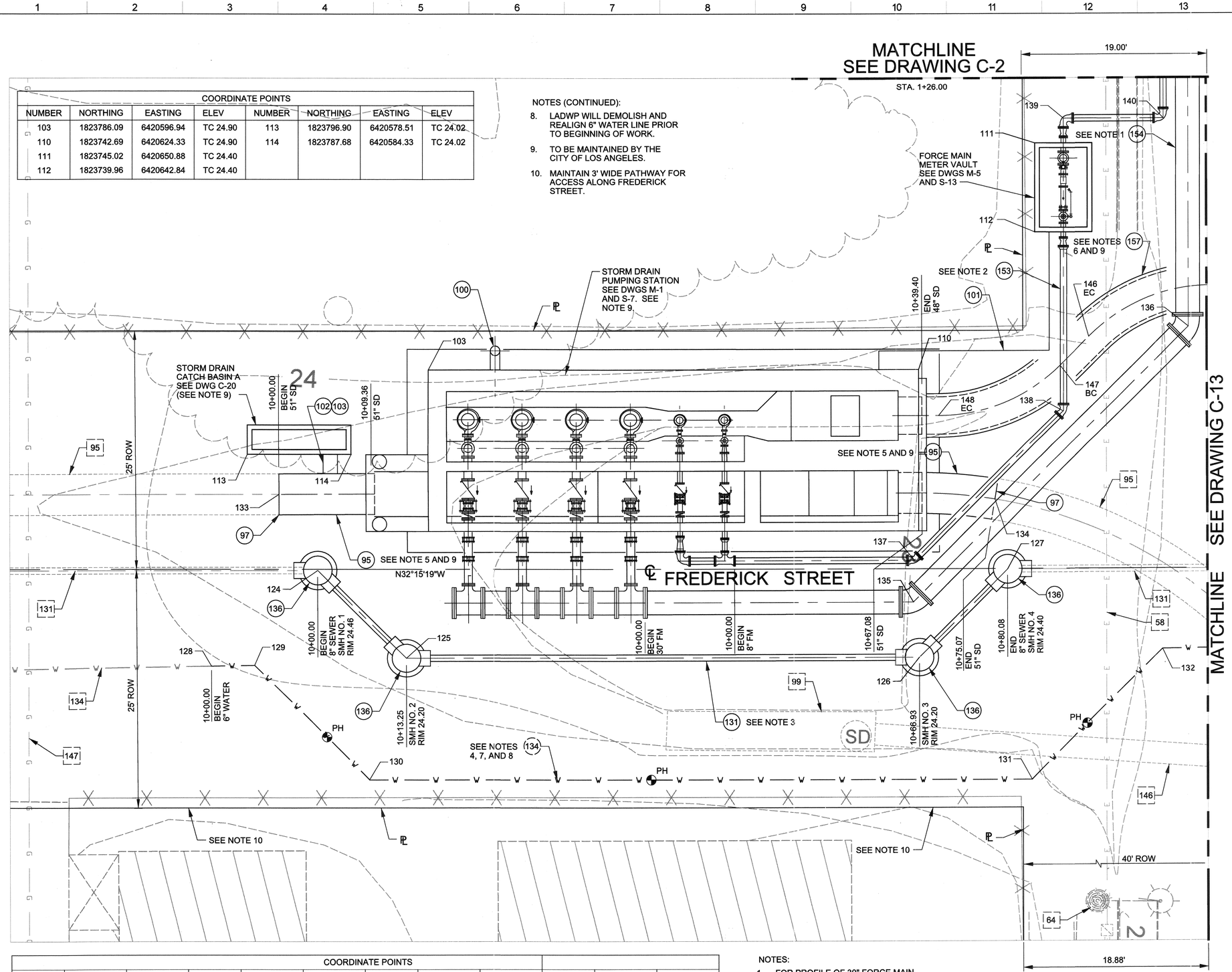

COORDINATE POINTS							
NUMBER	NORTHING	EASTING	ELEV	NUMBER	NORTHING	EASTING	ELEV
103	1823786.09	6420596.94	TC 24.90	113	1823796.90	6420578.51	TC 24.02
110	1823742.69	6420624.33	TC 24.90	114	1823787.68	6420584.33	TC 24.02
111	1823745.02	6420650.88	TC 24.40				
112	1823739.96	6420642.84	TC 24.40				

NOTES (CONTINUED):

8. LADWP WILL DEMOLISH AND REALIGN 6" WATER LINE PRIOR TO BEGINNING OF WORK.
9. TO BE MAINTAINED BY THE CITY OF LOS ANGELES.
10. MAINTAIN 3' WIDE PATHWAY FOR ACCESS ALONG FREDERICK STREET.

COORDINATE POINTS										
NUMBER	NORTHING	EASTING	NUMBER	NORTHING	EASTING	NUMBER	NORTHING	EASTING	NUMBER	NORTHING	EASTING
124	1823784.66	6420572.96	130	1823768.34	6420557.23	136	1823721.17	6420643.14	147	1823730.37	6420632.57
125	1823771.89	6420570.08	131	1823709.69	6420594.22	137	1823732.41	6420607.11	148	1823738.32	6420621.32
126	1823726.52	6420598.78	132	1823705.45	6420613.08	138	1823727.52	6420628.71	149	1823747.93	6420636.54
127	1823723.65	6420611.55	133	1823792.29	6420577.48	139	1823743.86	6420654.67			
128	1823788.70	6420558.49	134	1823728.64	6420616.98	140	1823734.92	6420660.21			
129	1823784.93	6420560.96	135	1823730.17	6420603.39	146	1823729.44	6420636.71			

NOTES:

1. FOR PROFILE OF 30" FORCE MAIN SEE F1/C-17.
2. FOR PROFILE OF 8" FORCE MAIN SEE F1/C-14.
3. FOR PROFILE OF 8" SEWER LINE SEE A1/C-14.
4. FOR PROFILEOF 6" WATER LINE SEE A1/C-15.
5. FOR PROFILE OF 51" STORM DRAIN SEE F1/C-15.
6. FOR PROFILE OF 48" STORM DRAIN SEE A1/C-16.
7. MINIMUM SEPARATION BETWEEN SEWER LINE AND WATER LINE SHALL BE 10 FEET.

CONSTRUCTION SYMBOLS:

- (95) 51" RCP STORM DRAIN, D1500, CASE 2 BEDDING
- (97) CONNECT TO EXISTING 51" RCP STORM DRAIN WITH CONCRETE COLLAR PER SPPWC 380-3. MODIFIED TO NOT CONFLICT WITH 8" AND 30" FM PIPES
- (100) 12" PVC VENT PIPE
- (101) 3" DI DRAIN PIPE
- (102) 18" RCP STORM DRAIN, D1500, CASE 2 BEDDING. TO BE MAINTAINED BY THE CITY OF LOS ANGELES.
- (103) JUNCTION STRUCTURE PER SPPWC 332-1; CASE 1. TO BE MAINTAINED BY THE CITY OF LOS ANGELES.
- (131) 8" VCP SEWER PIPE, CASE 2 BEDDING
- (136) SEWER MAINTENANCE HOLE PER S-140-0; Dm=4.00', H PER DRAWINGS. WITH 36" FRAME AND COVER PER S-286-1
- (153) 8" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350
- (154) 30" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
- (157) 48" RCP STORM DRAIN, D2100, CASE 2 BEDDING
- [58] EXISTING POWER CONDUIT IN ROSE AVENUE, NO RECORD; PROTECT IN PLACE
- [63] EXISTING POWER CONDUIT IN FREDERICK, NO RECORD; PROTECT IN PLACE
- [64] EXISTING LIGHT STANDARD; PROTECT IN PLACE
- [95] EXISTING 51" RCP STORM DRAIN IN FREDERICK STREET, 1960, D-16206; PROTECT IN PLACE
- [99] EXISTING STORM DRAIN CATCH BASIN; PROTECT IN PLACE
- [131] EXISTING 8" VCP SEWER PIPE; LINCOLN AND SUNSET ALLEY SEWER REPLACEMENT, 2005, E-1543; PROTECT IN PLACE
- [134] EXISTING 6" STEEL WATER PIPE IN FREDERICK STREET; NO RECORD; PROTECT IN PLACE
- [146] EXISTING 27" RCP STORM DRAIN IN FREDERICK STREET; PROTECT IN PLACE
- [147] EXISTING 6" GAS PIPE IN FREDERICK STREET; PROTECT IN PLACE
- (134) 6" STEEL WATER PIPE (BY OTHERS) (SEE NOTES 7 AND 8)

SCALE 1"=5'

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation
Los Angeles, California

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING
GARY LEE MOORE, P.E. CITY ENGINEER

ENGINEER:	DESIGN GROUP
DESIGNED BY:	DOUGLAS B. McCARTNEY LIC. NO. 28085
DRAWN BY:	DENNIS SIMONSON
CHECKED BY:	DENNIS SIMONSON
APPROVED BY:	DOUGLAS B. ROBISON
	ROBERT FINN

DATE:
DATE: BY:
NO. REVISIONS:
STRUCTURE NO.
INDEX NO.

REGISTERED PROFESSIONAL ENGINEER MARTIN FINN No. C25585 12-31-11 STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: UNDERGROUND PIPING PLAN 1

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F
DRAWING NO. C-12
SHEET 24 OF ~~108~~ 48 SHEETS

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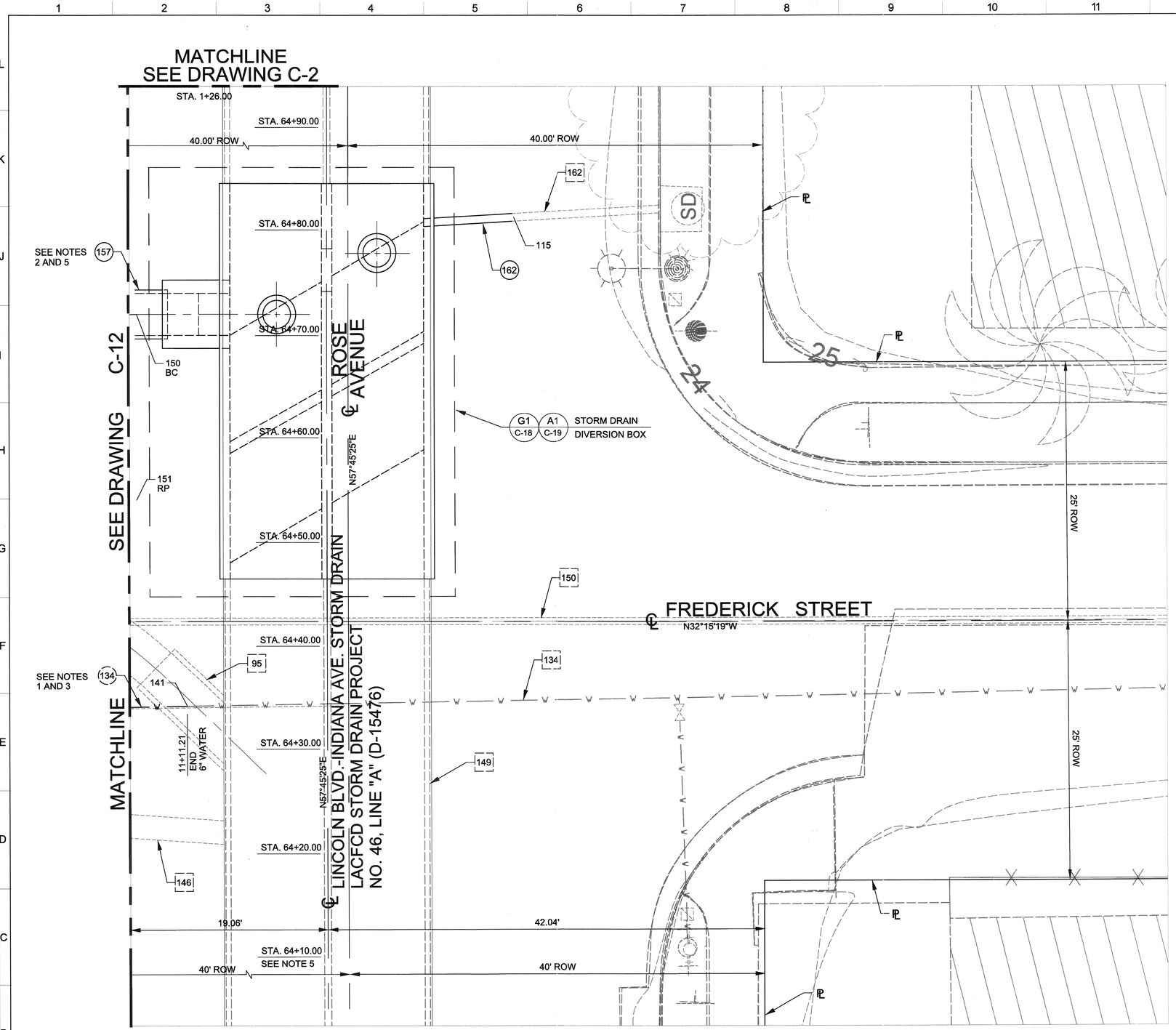

CONSTRUCTION SYMBOLS:

- (157) 48" RCP STORM DRAIN, D2100, CASE 2 BEDDING
- (162) 18" RCP STORM DRAIN, D1500, CASE 2 BEDDING. TIE INTO EXISTING RCP STORM DRAIN.
- [95] EXISTING 51" RCP STORM DRAIN IN FREDERICK STREET, 1960, D-16206; PROTECT IN PLACE
- [134] EXISTING 6" STEEL WATER PIPE IN FREDERICK STREET, NO RECORD; PROTECT IN PLACE
- [146] EXISTING 27" RCP STORM DRAIN IN FREDERICK STREET; PROTECT IN PLACE
- [149] EXISTING STORM DRAIN; LINCOLN BLVD-INDIANA AVE. STORM DRAIN, 1955, (D-15476). DOUBLE RCB 9'W X 12'H, LACFCD PROJECT NO. 46, LINE "A"; PROTECT IN PLACE
- [150] EXISTING 8" SEWER PIPE; LINCOLN AND SUNSET SEWER REPLACEMENT, 2005, E-1543; PROTECT IN PLACE
- [162] EXISTING 18" RCP STORM DRAIN IN ROSE AVENUE; NO RECORD; PROTECT IN PLACE
- (134) 6" STEEL WATER PIPE (BY OTHERS) (SEE NOTE 3)

COORDINATE POINTS		
NUMBER	NORTHING	EASTING
115	1823695.67	6420675.13
141	1823697.18	6420618.50
150	1823721.49	6420647.96
151	1823711.88	6420632.74

NOTES:

1. FOR PROFILE OF 6" WATER LINE SEE A1/C-15.
2. FOR PROFILE OF 48" STORM DRAIN SEE A1/C-18.
3. LADWP WILL DEMOLISH AND REALIGN 6" WATER LINE PRIOR TO BEGINNING OF WORK.
4. STATIONS SHOWN PER LINCOLN BLVD.-INDIANA AVE. STORM DRAIN LACFCD STORM DRAIN PROJECT NO. 46, LINE "A" (D-15476).
5. TO BE MAINTAINED BY THE CITY OF LOS ANGELES.

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

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$FILE$ $DATE$ $TIME$

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CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

LA DPW ENGINEERING Serving The Peoples Community For Future

GARY LEE MOORE, P.E. CITY ENGINEER
DATE:
LIC. NO. 28085
DESIGN GROUP
ENGINEER: DOUGLAS B. McCARTNEY
DESIGNED BY: DENNIS SIMONSON
DRAWN BY: DENNIS SIMONSON
CHECKED BY: DOUGLAS B. ROBISON
APPROVED BY: ROBERT FINN

NO. REVISIONS: DATE: BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 EXP. 6-30-14 STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: UNDERGROUND PIPING PLAN 2

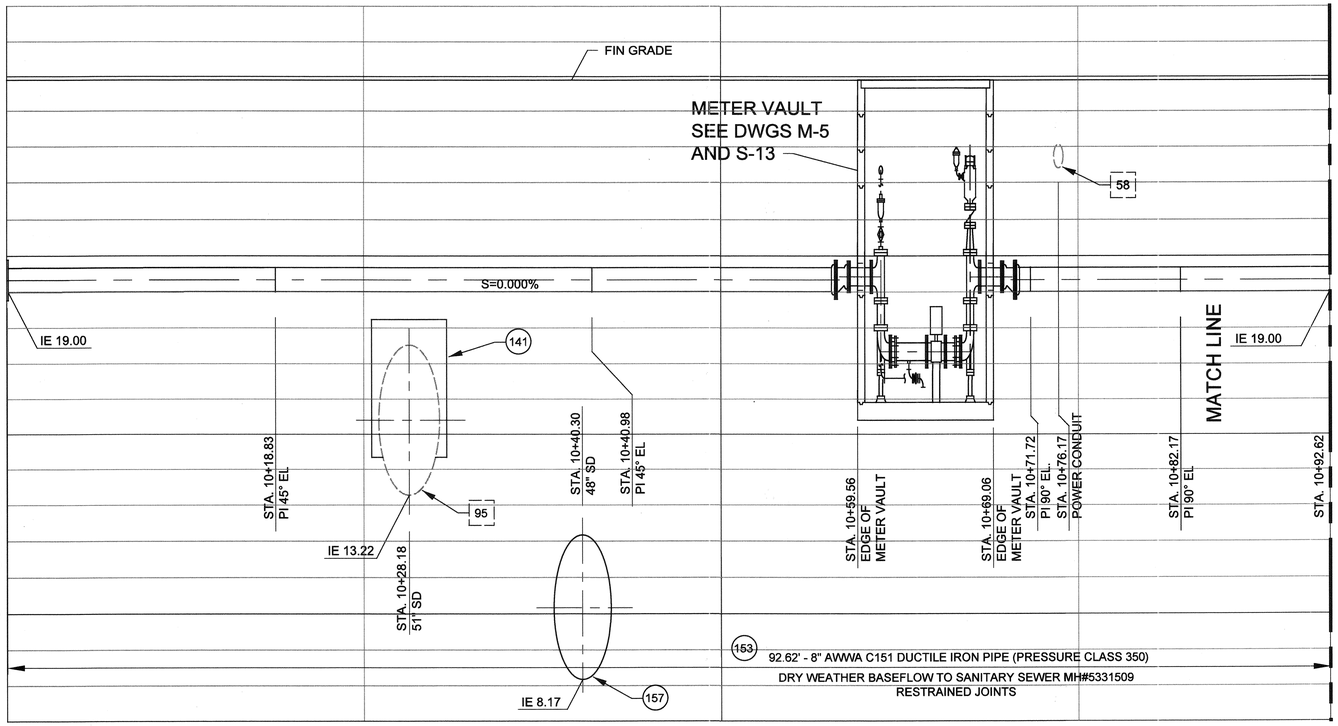
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

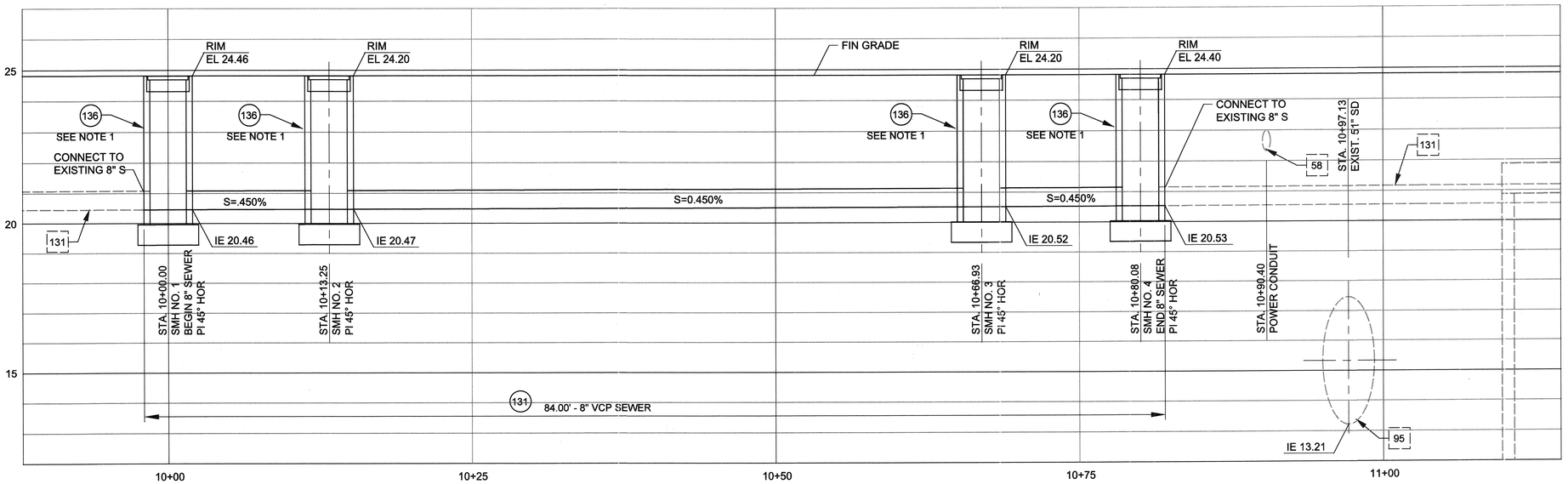
DRAWING NO. C-13

SHEET 25 OF ~~108~~ 48 SHEETS



F1 PROFILE OF 8" FORCE MAIN

HOR SCALE: 1"=5' VERT SCALE: 1"=2' C-12



A1 PROFILE OF 8" SEWER

HOR SCALE: 1"=5' VERT SCALE: 1"=2' C-12

CONSTRUCTION SYMBOLS:

(131) 8" VCP SEWER PIPE, CASE 2 BEDDING

(136) SEWER MAINENTANCE HOLE PER S-140-0, Dm=4.00',H PER DRAWING, WITH 36" FRAME AND COVER PER S-286-1

(141) CONCRETE BLANKET PER SPPWC-225-1, 10 LINEAR FT.

(153) 8" FORCE MAIN AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350

(157) 48" RCP STORM DRAIN, D2100, CASE 2 BEDDING

[58] EXISTING POWER CONDUIIT; IN ROSE AVENUE; NO RECORD; PROTECT IN PLACE

[95] EXISTING 51" RCP STORM DRAIN; IN FREDERICK STREET, 1960, D-16206; PROTECT IN PLACE

[131] EXISTING 8" VCP SEWER PIPE; LINCOLN AND SUNSET ALLEY SEWER REPLACEMENT, 2005, E-1543; PROTECT IN PLACE

NOTES:

1. PIPE CONNECTION TO MAINTENANCE HOLE PER S-140-0.

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STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25585 12-31-11 STATE OF CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER DATE:

DESIGN GROUP	LIC. NO. 28585
ENGINEER: DOUGLAS B. McCARTNEY	
DESIGNED BY: DENNIS SIMONSON	
DRAWN BY: DENNIS SIMONSON	
CHECKED BY: DOUGLAS B. ROBISON	
APPROVED BY: ROBERT FINN	

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PIPING PROFILES 1

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. C-14

SHEET 26 OF ~~108~~ 48 SHEETS

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

Sheet Version 2.0

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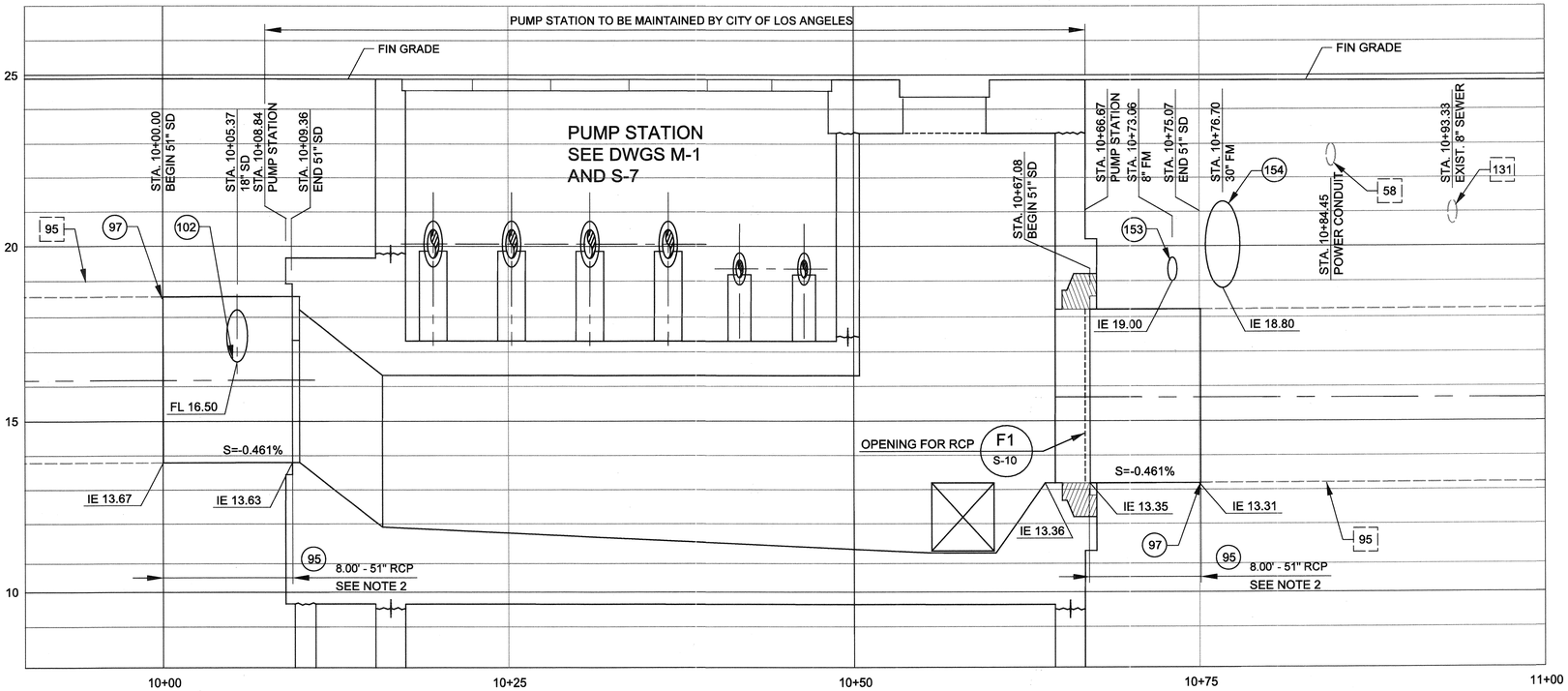
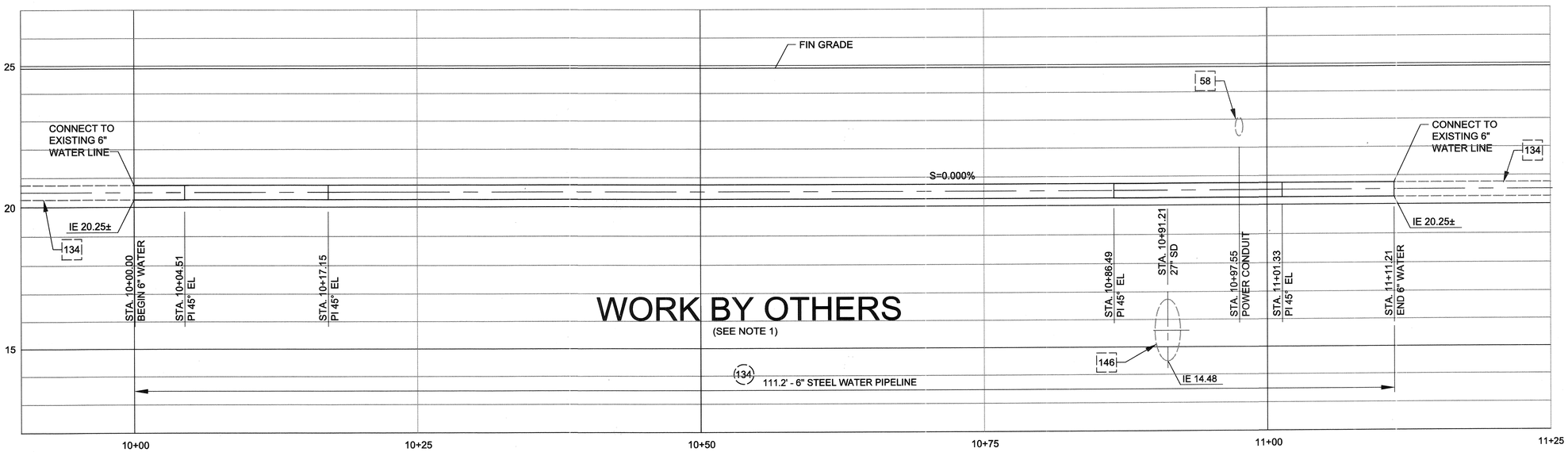


F1 PROFILE OF 51" STORM DRAIN

HOR SCALE: 1"=5' VERT SCALE: 1"=2' C-12



A1 PROFILE OF 6" WATER LINE

HOR SCALE: 1"=5' VERT SCALE: 1"=2' C-12

CONSTRUCTION SYMBOLS:

- (95) 51" RCP STORM DRAIN, D1500, CASE 2 BEDDING
- (97) CONNECT TO EXISTING 51" RCP STORM DRAIN WITH CONCRETE COLLAR PER SPPWC 380-3
- (102) 18" RCP STORM DRAIN, D1500, CASE 2 BEDDING
- (153) 8" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350
- (154) 30" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
- [58] EXISTING POWER CONDUIT; IN ROSE AVENUE; NO RECORD; PROTECT IN PLACE
- [95] EXISTING 51" RCP STORM DRAIN; IN FREDERICK STREET, 1960, D-16206; PROTECT IN PLACE
- [131] EXISTING 8" VCP SEWER PIPE; LINCOLN AND SUNSET ALLEY; SEWER REPLACEMENT; 2005, E-1543; PROTECT IN PLACE
- [134] EXISTING 6" STEEL WATER PIPE IN FREDERICK STREET; NO RECORD; PROTECT IN PLACE
- [146] EXISTING 27" RCP STORM DRAIN; IN FREDERICK STREET; PROTECT IN PLACE
- (134) 6" STEEL WATER PIPE (BY OTHERS) (SEE NOTE 1)

NOTES:

1. LADWP WILL DEMOLISH AND REALIGN 6" WATER LINE PRIOR TO BEGINNING OF WORK.
2. TO BE MAINTAINED BY THE CITY OF LOS ANGELES.

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STRUCTURE NO.

INDEX NO.

GARY LEE MOORE, P.E. CITY ENGINEER DATE:

DESIGN GROUP	
ENGINEER:	DOUGLAS B. McCARTNEY
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DRAWN BY:	DENNIS SIMONSON
CHECKED BY:	DOUGLAS B. ROBISON
APPROVED BY:	ROBERT FINN
LIC. NO.	26585
ATTNEY	
N	
N	
ISON	

SHEET TITLE: PIPING PROFILES 2

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. C-15

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12.09.02

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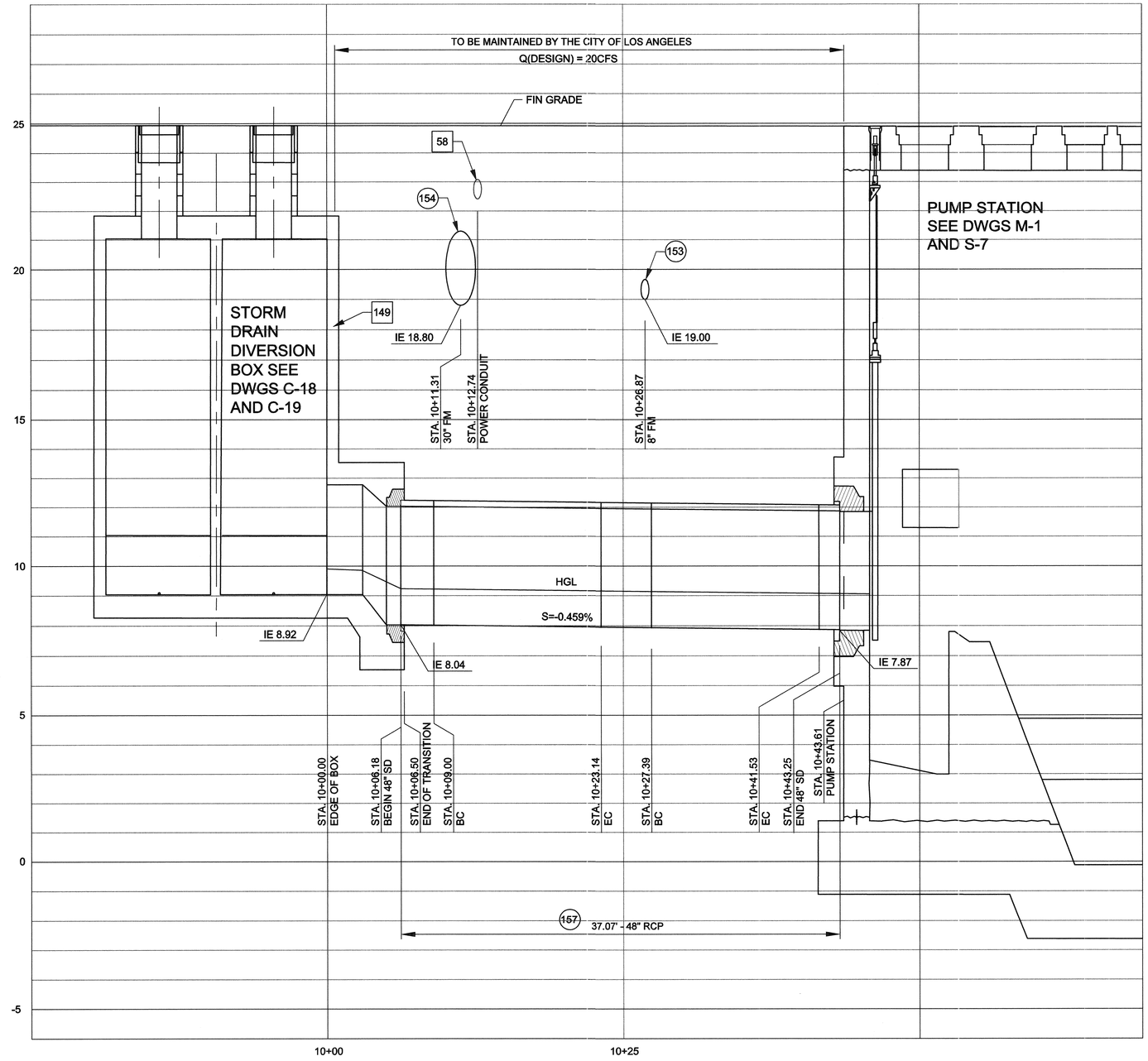

CONSTRUCTION SYMBOLS:

(153) 8" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350

(154) 30" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250

(157) 48" RCP STORM DRAIN, D2100, CASE 2 BEDDING

[58] EXISTING POWER CONDUIT; IN ROSE AVENUE; NO RECORD; PROTECT IN PLACE

[149] EXISTING STORM DRAIN; LINCOLN BLVD-INDIANA AVE. STORM DRAIN, 1955, (D-16476). DOUBLE RCB 9'W X 12'H. LACFCD PROJECT NO. 46, LINE "A"; PROTECT IN PLACE

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A1 — PROFILE OF 48" STORM DRAIN

HOR SCALE: 1"=5' VERT SCALE: 1"=2'

C-12

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STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 Exp. 12-31-11 STATE OF CALIFORNIA

CITY ENGINEER

DATE:

LIC. NO. 29085

GARY LEE MOORE, P.E. CITY ENGINEER

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DESIGNED BY:	DENNIS SIMONSON
DRAWN BY:	DENNIS SIMONSON
CHECKED BY:	DOUGLAS B. ROBISON
APPROVED BY:	ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PIPING PROFILES 3

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. C-16 48

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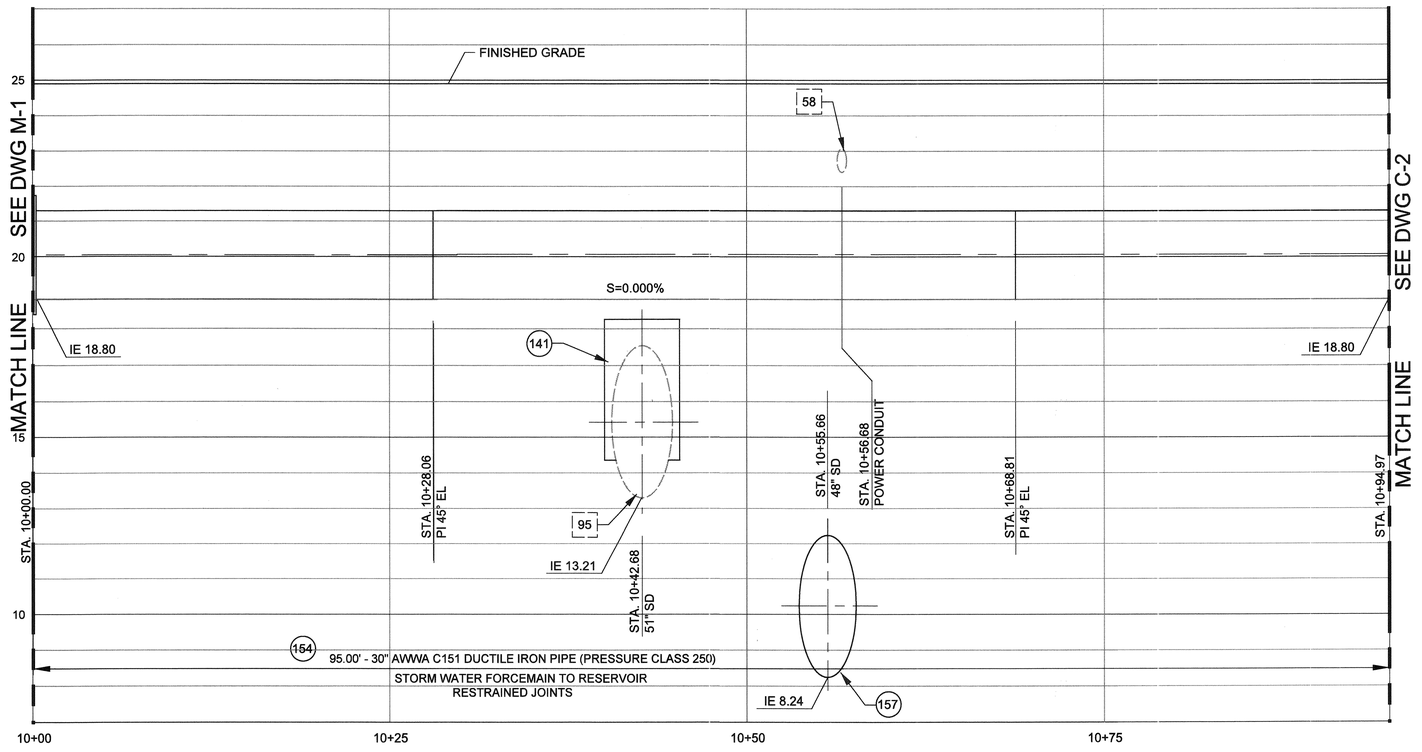

CONSTRUCTION SYMBOLS:

(104) 3" SCH 40 PVC LOW FLOW DRAIN

(141) CONCRETE BLANKET PER SSPWC-225-1; 15 LINEAR FT.

(151) STORM DRAIN DIVERSION DAM; SEE A8/C-19

(154) 30" FORCE MAIN AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250

(157) 48" RCP STORM DRAIN, D2100, CASE 2 BEDDING

(158) STRUCTURAL CONCRETE: 560-C-3200

(159) #4@18"EW ADHESIVE DOWELS; SEE G4/S-4 FOR EMBEDMENT AND ADDITIONAL DETAILS

[58] EXISTING POWER CONDUIT; IN ROSE AVENUE, NO RECORD; PROTECT IN PLACE

[95] EXISTING 51" RCP STORM DRAIN; IN FREDERICK STREET, 1960, D-16206; PROTECT IN PLACE

[149] EXISTING STORM DRAIN; LINCOLN BLVD.-INDIANA AVE. STORM DRAIN, 1955; LACFCD PROJECT NO. 46, LINE "A" (D-15476); DOUBLE RCB 9'W X 12'H. PROTECT IN PLACE

NOTES:

1. CHIP EXISTING CONCRETE TO FORM 1-1/2" X 1'-6" X CONTINUOUS KEYWAY TYPICAL AT EACH SIDE.
2. ROUGHEN EXISTING SURFACE TO 1/4" AMPLITUDE. SURFACE SATURATED DRY CONDITION BEFORE PLACEMENT OF NEW CONCRETE.

F1 — **PROFILE OF 30" FORCE MAIN**

HOR SCALE: 1"=5' VERT SCALE: 1"=2' — C-12

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STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER * MARTIN FINN * NO. C25565 * EXP. 12-31-11 * STATE OF CALIFORNIA

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E.
CITY ENGINEER
DATE:
LIC. NO. 28085

	DESIGN GROUP
ENGINEER:	DOUGLAS B. McCARTNEY
DESIGNED BY:	DENNIS SIMONSON
DRAWN BY:	DENNIS SIMONSON
CHECKED BY:	DOUGLAS B. ROBISON
APPROVED BY:	ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PIPING PROFILES 4 AND DIVERSION BOX SECTIONS 3
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F
DRAWING NO. C-17
SHEET 29 OF 108 SHEETS
46

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12.09.02

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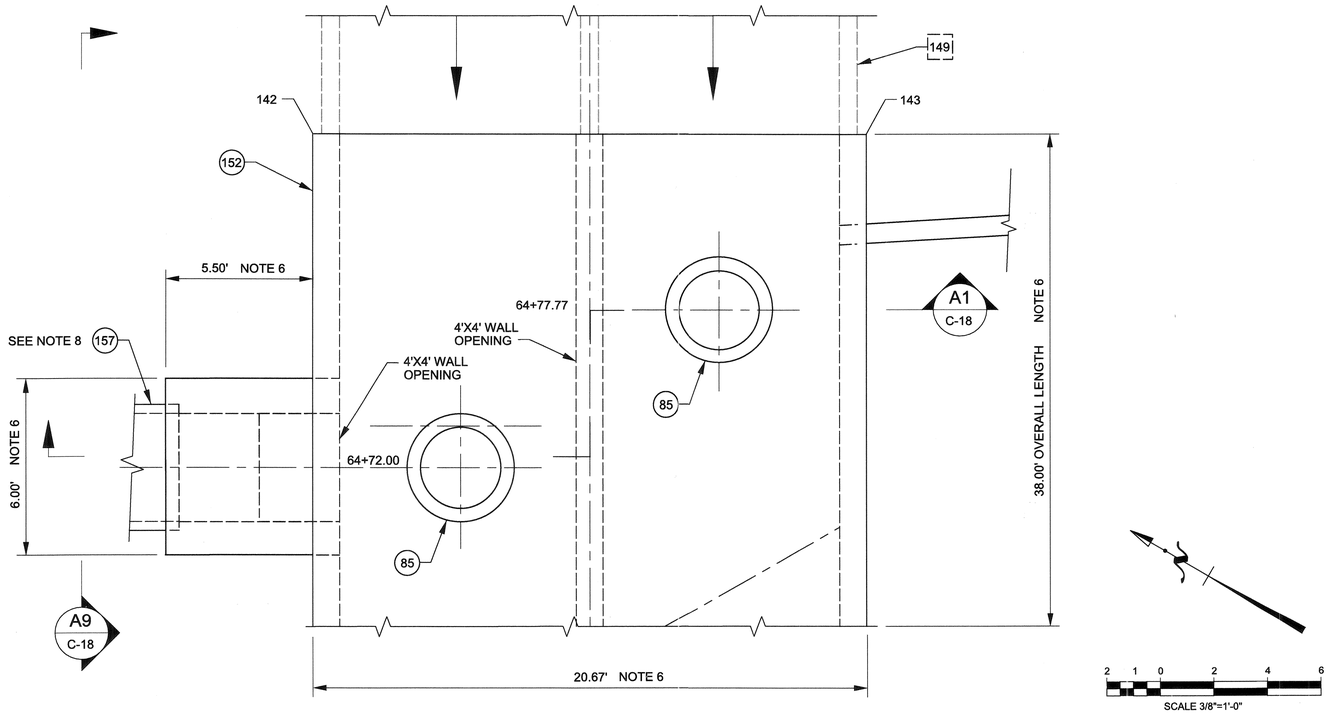


SCALE 3/8"=1'-0"

G1	TOP PLAN OF DIVERSION BOX
SCALE: 3/8" = 1'-0"	C-11, C-13

NOTES:

1. ADJUST MAINTENANCE HOLE RIM ELEVATION TO MEET NEW PAVEMENT ELEVATION.
2. ELEVATION SHOWN IS PER RECORD DRAWINGS; FLOW LINE OF NEW 48" STORM DRAIN TRANSITION STRUCTURE IS TO MEET FLOW LINE OF WALL OPENING. RECORD ELEVATION PER DRAWINGS D15476 IS 6.66' ON THE MSL DATUM OF 1929; DESIGN ELEVATION IS 8.99 ON THE NAVD88.
3. STATIONING SHOWN IS PER LINCOLN BLVD.-INDIANA AVE. STORM DRAIN, LACFD STORM DRAIN PROJECT NO. 46, LINE "A" (D-15476).
4. STORM DRAIN MAINTENANCE HOLE TO BE SIMILAR TO SPPWC 323-1 WITH SHAFT PER SPPWC 326-1 AND 36" FRAME AND COVER PER SPPWC 633-3. OMIT LADDER RUNGS.
5. ATTACH RISER RINGS TO TOP OF CONCRETE SLEEVE WITH #4 DOWELS @ 8", 6" EMBEDMENT.
6. FOR COMPLETE DIMENSIONING SEE STRUCTURAL DRAWING S-12.
7. CONTRACTOR SHALL PROVIDE TEMPORARY SHORING AT EXISTING ROOF SLAB DURING WALL RECONSTRUCTION.
8. TO BE MAINTAINED BY THE CITY OF LOS ANGELES.

CONSTRUCTION SYMBOLS:

(14) ASPHALT PAVEMENT 8" AC OVER 12" AB

(85) SHALLOW STORM DRAIN MANTAINENCE HOLE SIMILAR TO SPPWC 323-1; SEE NOTE 4. TO BE MAINTAINED BY THE CITY OF LOS ANGELES.

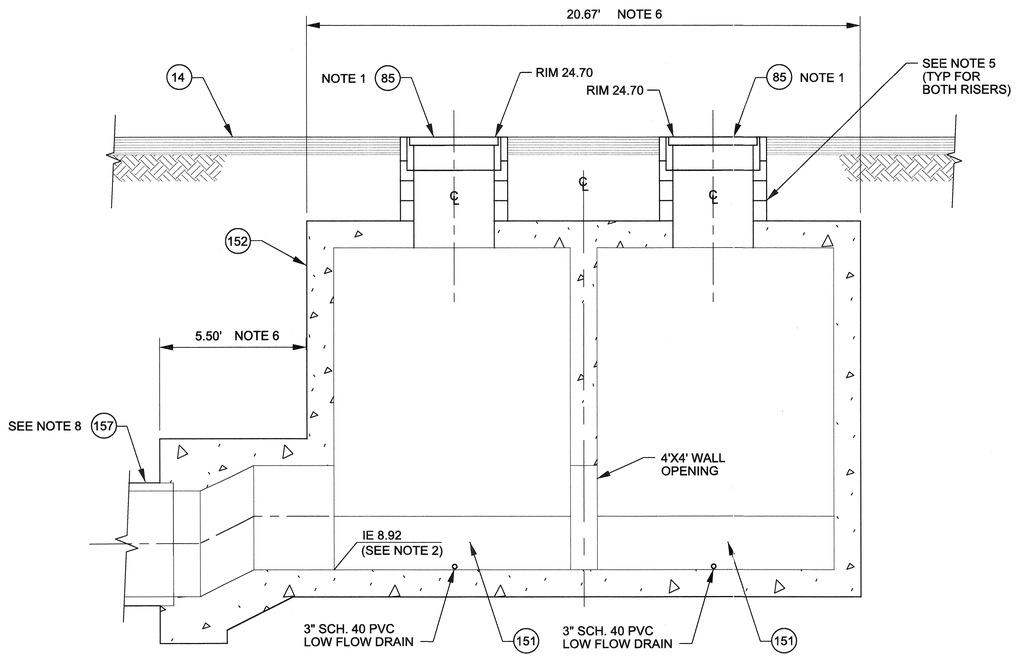
(151) STORM DRAIN DIVERSION DAM SEE A8/C-19

(152) STORM DRAIN DIVERSION BOX SEE F1/S12 AND F8/S12

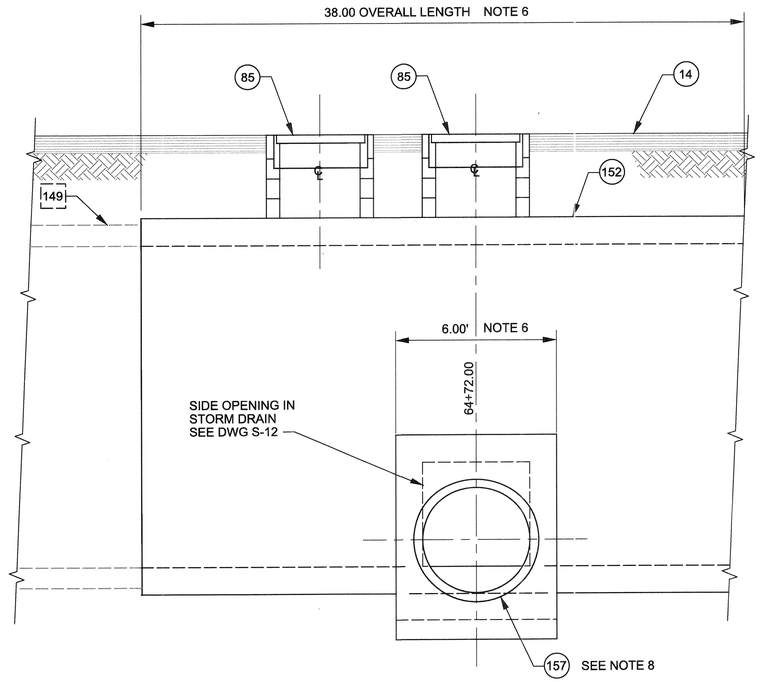
(157) 48" RCP STORM DRAIN, D2100, CASE 2 BEDDING

[149] EXISTING STORM DRAIN; LINCOLN BLVD.-INDIANA AVE. STORM DRAIN, 1955; LACFCD PROJECT STORM DRAIN NO. 46, LINE "A" (D-15476); DOUBLE RCB 9'W X 12'H. PROTECT IN PLACE

COORDINATE POINTS			
NUMBER	NORTHING	EASTING	ELEV
142	1823721.39	6420662.80	N/A
143	1823703.92	6420673.84	N/A



A1	MAINTENANCE HOLE LOCATIONS
SCALE: 3/8" = 1'-0"	C-18, C-19



A9	STORM DRAIN TRANSITION
SCALE: 3/8" = 1'-0"	C-18

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GARY LEE MOORE, P.E.
CITY ENGINEER
DATE:
LIC. NO. 28085

DESIGN GROUP
ENGINEER: DOUGLAS B. McCARTNEY
DESIGNED BY: DENNIS SIMONSON
DRAWN BY: DENNIS SIMONSON
CHECKED BY: DOUGLAS B. ROBISON
APPROVED BY: ROBERT FINN

REVISIONS: NO. DATE: BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 12-31-11 CIVIL STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: DIVERSION BOX PLAN AND SECTIONS 1
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F
DRAWING NO. C-18
SHEET 30 OF ~~108~~ 46 SHEETS

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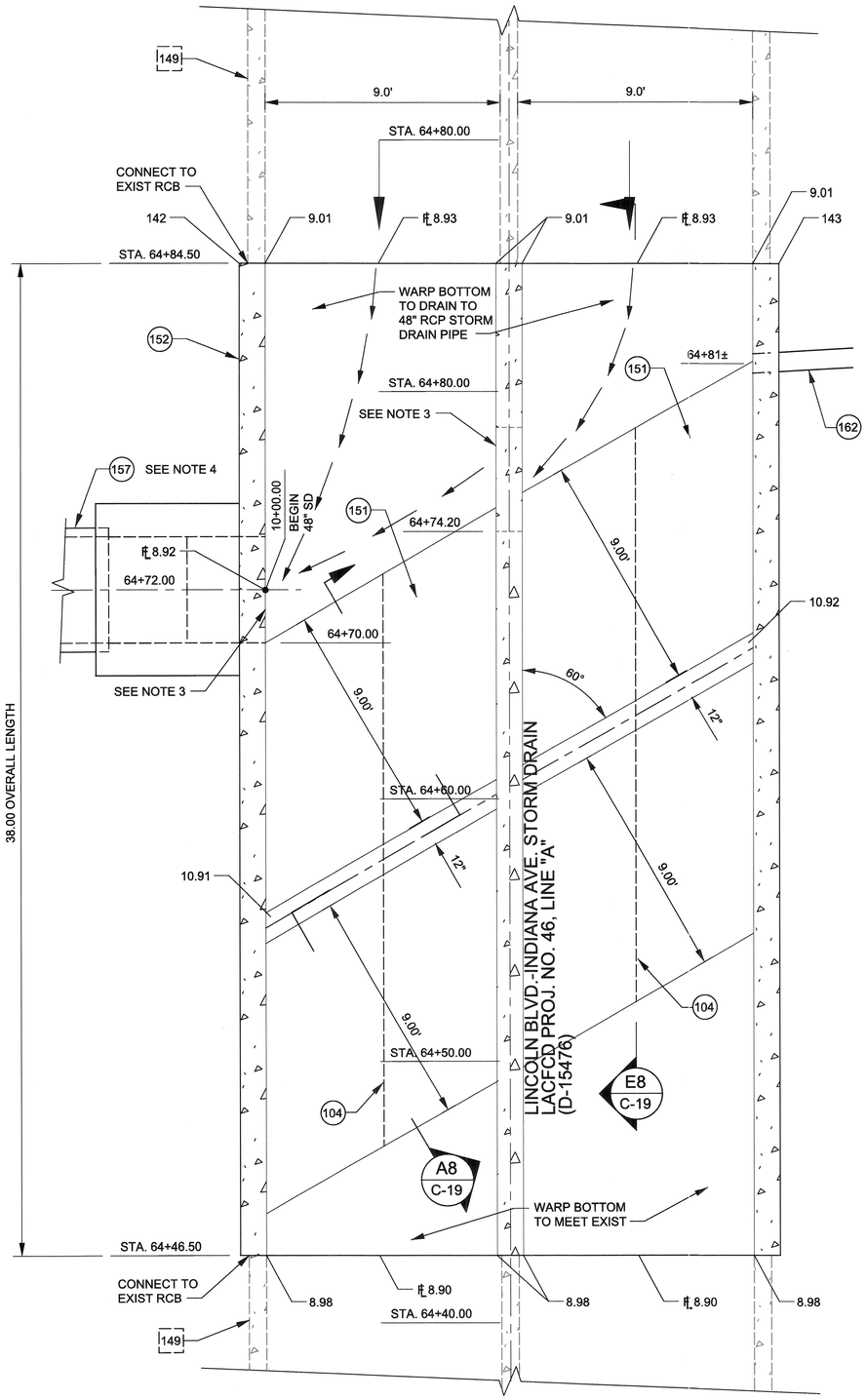


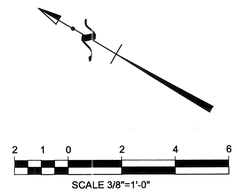
COORDINATE POINTS			
NUMBER	NORTHING	EASTING	ELEV
142	1823721.39	6420662.80	N/A
143	1823703.92	6420673.84	N/A

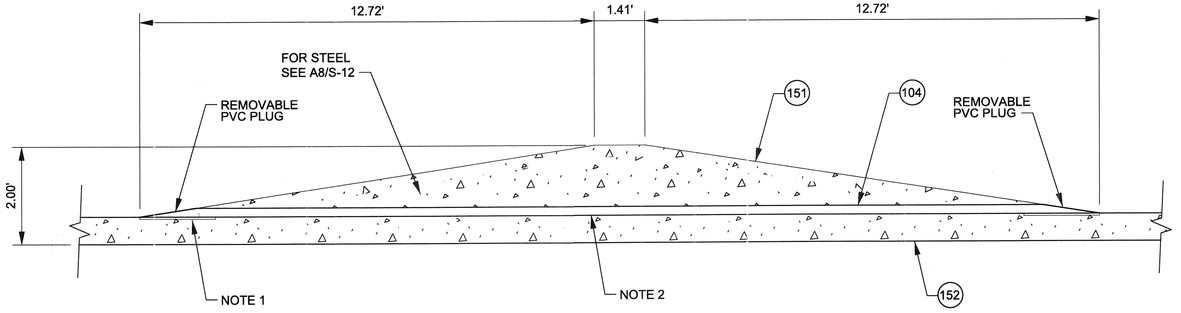
NOTES:

1. 1-1/2" X 1'-6" X CONTINUOUS KEYWAY TYPICAL AT EACH SIDE.
2. CONSTRUCTION JOINT.
3. 4'x4' WALL OPENING. SEE DWGS S-12 AND C-18.
4. TO BE MAINTAINED BY THE CITY OF LOS ANGELES.

CONSTRUCTION SYMBOLS:

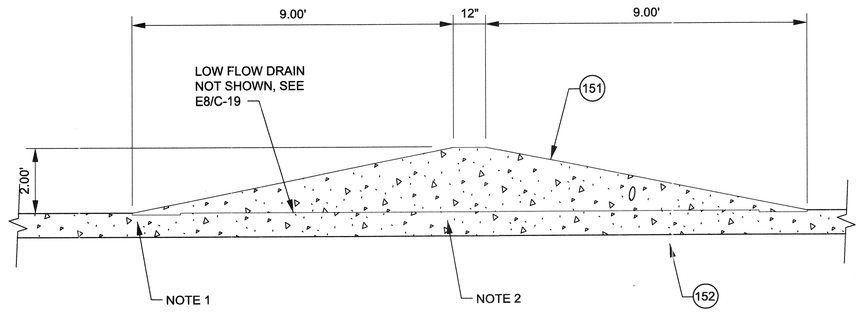
- (104) 3" SCH 40 PVC LOW FLOW DRAIN
- (151) STORM DRAIN DIVERSION DAM; SEE A8/S-12
- (152) STORM DRAIN DIVERSION BOX SEE F1/S-12
- (157) 48" RCP STORM DRAIN, D2100, CASE 2 BEDDING
- (162) 18" RCP STORM DRAIN, D1500, CASE 2 BEDDING
- [149] EXISTING STORM DRAIN; LINCOLN BLVD.-INDIANA AVE. STORM DRAIN, 1955, (D-15476) DOUBLE RCB 9'W X 12'H; LACFCD PROJECT NO. 46, LINE "A"; PROTECT IN PLACE





E8 DIVERSION DAM - LONGITUDINAL SECTION

SCALE: 1/2" = 1'-0" | C-19



A1 BOTTOM PLAN OF DIVERSION BOX

SCALE: 3/8"=1'-0" | C-13

A8 DIVERSION DAM

SCALE: 1/2"=1'-0" | C-19

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GARY LEE MOORE, P.E. CITY ENGINEER

		DATE:	BY:
DESIGN GROUP			
ENGINEER:	DOUGLAS B. McCARTNEY LIC. NO. 28585		
DESIGNED BY:	DENNIS SIMONSON		
DRAWN BY:	DENNIS SIMONSON		
CHECKED BY:	DOUGLAS B. ROBISON		
APPROVED BY:	ROBERT FINN		

REVISIONS: NO.

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 12-31-11 STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: DIVERSION BOX PLAN AND SECTIONS 2

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA. 90291

WORK ORDER NO. EW40019F

DRAWING NO. C-19

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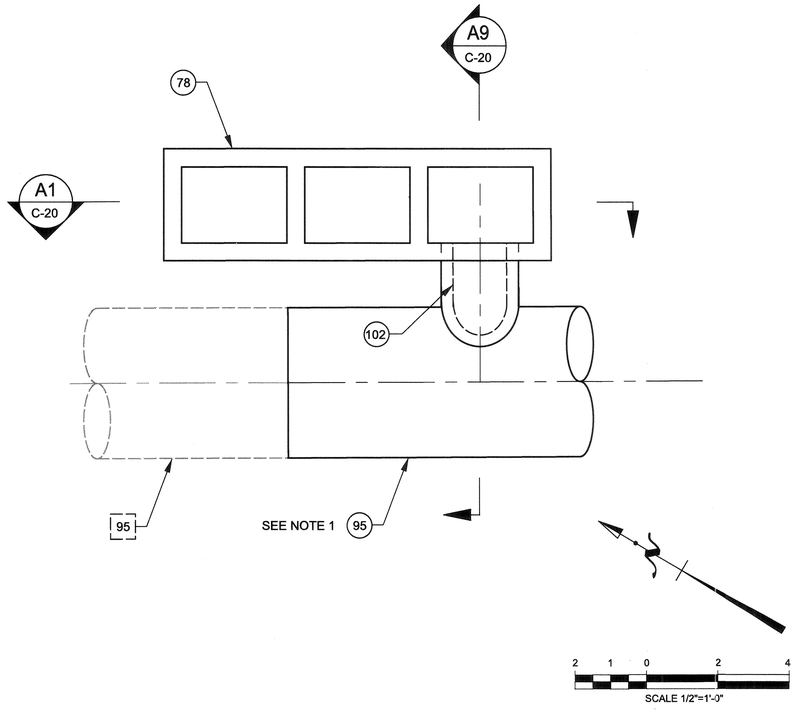
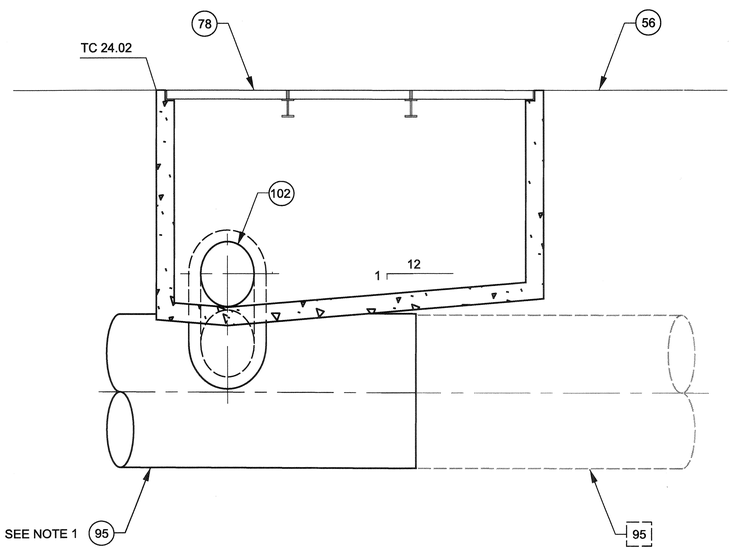
REVISION DATES (DESIGN STAGE ONLY): 12.09.02



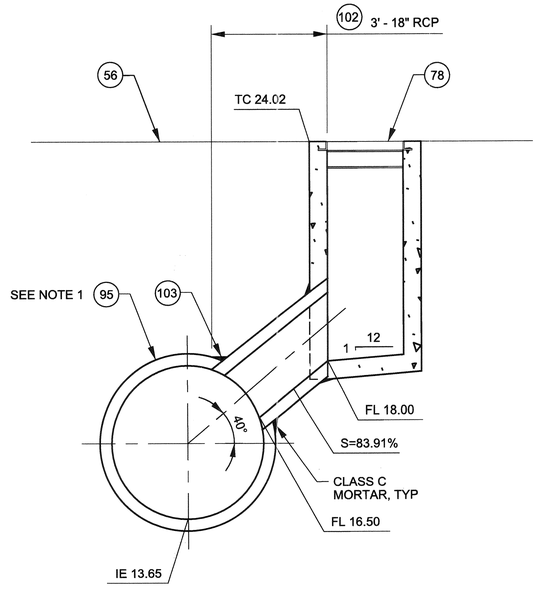
G1 TOP PLAN OF CATCH BASIN A

SCALE: 1/2" = 1'-0" | C-10



A1 CATCH BASIN A SECTION

SCALE: 1/2" = 1'-0" | C-20



A9 CATCH BASIN A CROSS SECTION

SCALE: 1/2" = 1'-0" | C-20

CONSTRUCTION SYMBOLS:

(56) 6" THICK OF DG PER SSPWC SECTION 200-2.7 COMPACTED TO 90% RELATIVE MINIUMUM. SEE I9/C-20.

(78) STORM DRAIN CATCH BASIN PER SPPWC 304-2. GRATE AND FRAME PER SPPWC311-2. TO BE MAINTAINED BY THE CITY OF LOS ANGELES.

(95) 51" RCP STORM DRAIN, D1500, CASE 2 BEDDING

(102) 18" RCP STORM DRAIN, D1500, CASE 2 BEDDING. TO BE MAINTAINED BY THE CITY OF LOS ANGELES

(103) JUNCTION STRUCTURE PER SPPWC 332.-1; CASE 1. TO BE MAINTAINED BY THE CITY OF LOS ANGELES.

[95] EXISTING 51" RCP STORM DRAIN; IN FREDERICK STREET; 1069; D-15206; PROTECT IN PLACE

NOTES:

1. TO BE MAINTAINED BY THE CITY OF LOS ANGELES.

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Los Angeles, California

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

LA DPW ENGINEERING Serving THE Present: Shaping THE Future

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 CIVIL STATE OF CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER DATE:

DESIGN GROUP	
ENGINEER:	DOUGLAS B. McCARTNEY
DESIGNED BY:	DENNIS SIMONSON
DRAWN BY:	DENNIS SIMONSON
CHECKED BY:	DOUGLAS B. ROBISON
APPROVED BY:	ROBERT FINN

LIC. NO. 28085

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: CATCH BASIN A PLAN AND SECTIONS

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. C-20

SHEET 32 OF ~~106~~ 48 SHEETS

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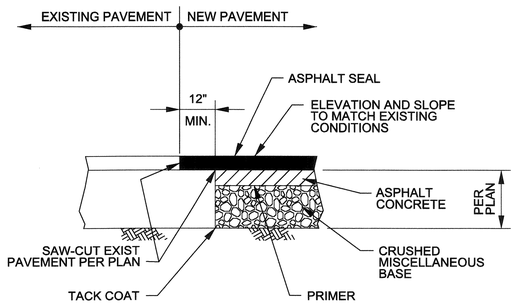
REVISION DATES (DESIGN STAGE ONLY)
12.09.02

Sheet Version 2.0

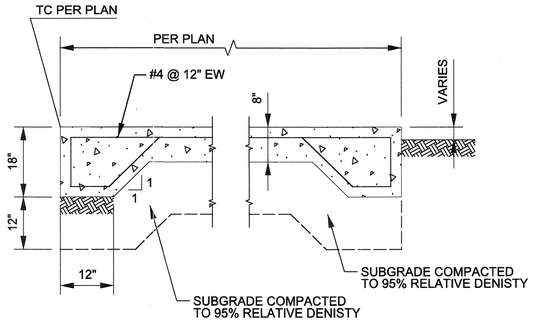
$FILE$ $DATE$ $TIME$



NOTE:
APPLICABLE AT ALL LOCATIONS WHERE
NEW PAVING MEETS EXISTING PAVING.

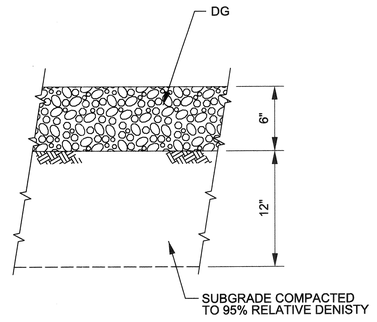
I1 PAVEMENT TRANSITION

SCALE: NONE | C-10, C-11



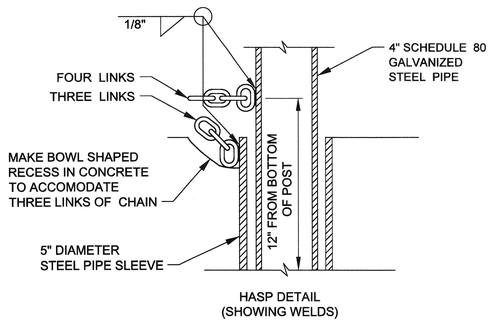
I5 CONCRETE PAD FOR MCC

SCALE: NONE | C-10

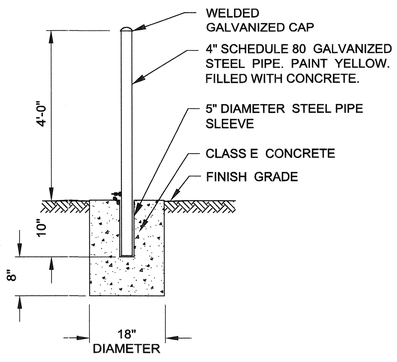


I9 CRUSHED MISC. BASE

SCALE: NONE | C-10



HASP DETAIL
(SHOWING WELDS)



E1 REMOVABLE BOLLARDS

SCALE: NONE | C-10

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

Sheet Version 2.0

$FILE$ $DATE$ $TIME$

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NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN No. C25585 12-31-03 CIVIL STATE OF CALIFORNIA

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E. CITY ENGINEER

		DESIGN GROUP	DATE:
ENGINEER:	DOUGLAS B. McCARTNEY	LIC. NO. 28085	
DESIGNED BY:	DENNIS SIMONSON		
DRAWN BY:	DENNIS SIMONSON		
CHECKED BY:	DOUGLAS B. ROBISON		
APPROVED BY:	ROBERT FINN		

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: CIVIL DETAILS

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

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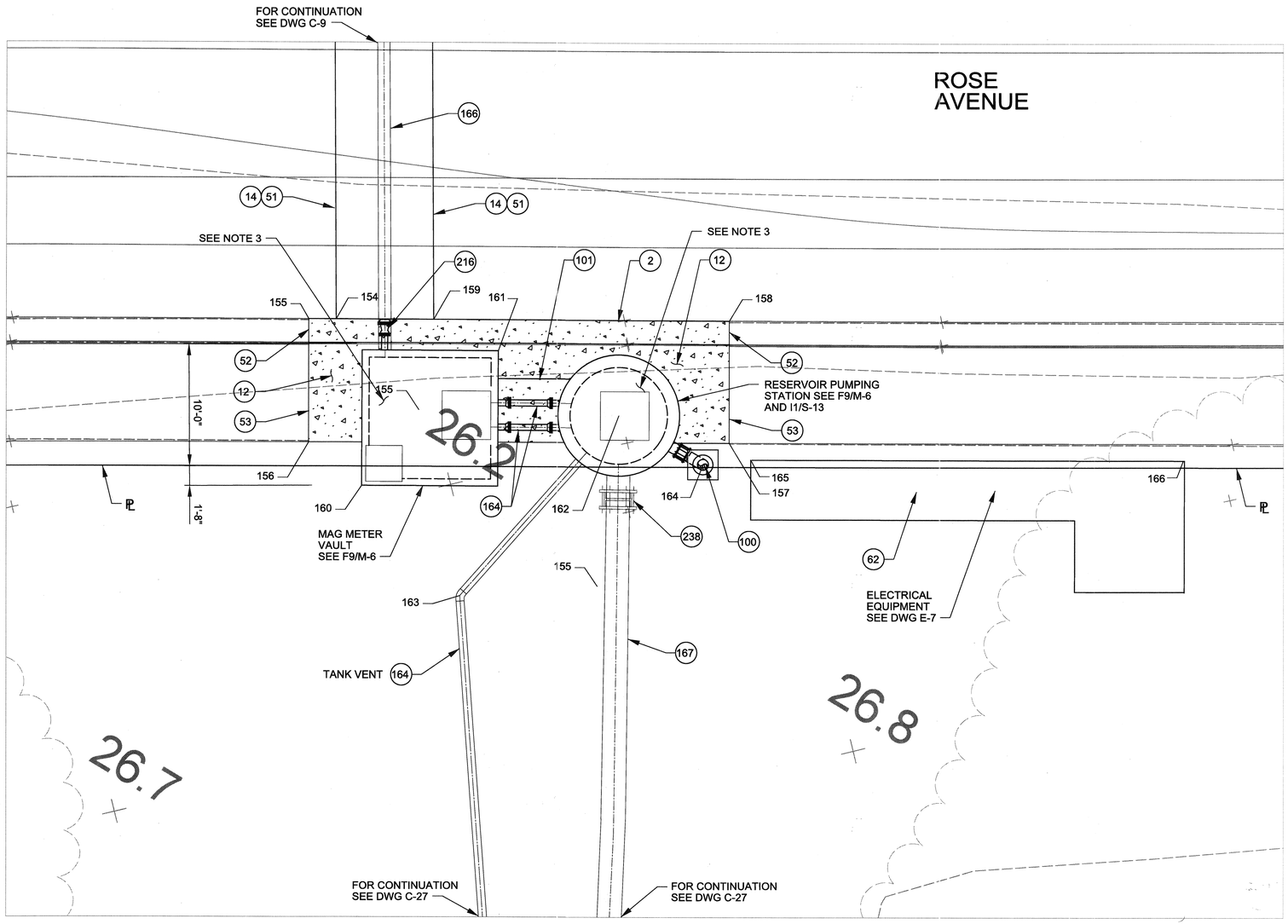
BLACK & VEATCH Corporation Los Angeles, California

WORK ORDER NO. EW40019F

DRAWING NO. C-21

SHEET 33 OF ~~106~~ 48 SHEETS



CONSTRUCTION SYMBOLS:

- (2) TYPE C INTEGRAL CONCRETE CURB AND GUTTER PER S-410-2. a=24", b=6"
- (12) 4" THICK CONCRETE SIDEWALK PER SPPWC 112-1.
- (14) ASPHALT PAVEMENT, 8" AC OVER 12" CMB BASE
- (51) MEET EDGE OF EXISTING ASPHALT PAVEMENT PER I1/C-21
- (52) MEET EDGE OF EXISTING CONCRETE CURB AND GUTTER
- (53) MEET EDGE OF EXISTING CONCRETE SIDEWALK
- (62) CONCRETE PAD FOR ELECTRICAL EQUIPMENT. SEE I5/C-21. TC=30.00
- (100) 12" VENT SCHEDULE 40 PVC
- (101) 3" DRAIN LINE AWWA C151 DUCTION IRON PIPE, PRESSURE CLASS 250
- (164) 6" DRAIN LINE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
- (166) 12" DRAIN LINE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
- (167) 24" DRAIN LINE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
- (216) 6" X 12" ECCENTRIC INCREASER (FLAT TOP)
- (238) 24" SEISMIC FLEX JOINT

COORDINATE POINTS							
NUMBER	NORTHING	EASTING	ELEV	NUMBER	NORTHING	EASTING	ELEV
154	1824860.94	6422545.37	TC 26.25	160	1824850.52	6422554.45	TC 26.25
155	1824859.74	6422543.47	TC 26.25	161	1824865.91	6422557.98	TC 26.25
156	1824851.25	6422548.83	TC 26.25	162	1824866.73	6422569.17	TC 26.25
157	1824869.71	6422578.08	TC 26.25	163	1824847.04	6422566.17	NA
158	1824878.14	6422572.76	TC 26.25	164	1824867.01	6422577.17	NA
159	1824865.20	6422552.15	TC 26.25	165	1824869.44	6422580.28	TC 27.00
				166	1824888.35	6422610.33	TC 27.00

NOTES:

1. INSTALL CURB AND GUTTER ON CONTINUOUS GRADE BETWEEN EXISTING CURB AND GUTTER CUTS.
2. MATCH EXISTING ELEVATION.
3. ADJUST TOP ELEVATION AND SLOPE TO MEET EXISTING SIDEWALK AND CURB FLUSH.

5 0 5 10
SCALE 1"=5'

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NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

PROFESSIONAL ENGINEER * REGISTERED * STATE OF CALIFORNIA
ROBERT MARTIN FINN
No. C25565
Exp. 12-31-11

CITY ENGINEER
DATE:

GARY LEE MOORE, P.E.
LIC. NO. 28085

DESIGN GROUP
ENGINEER: DOUGLAS B. McCARTNEY
DESIGNED BY: DENNIS SIMONSON
DRAWN BY: DENNIS SIMONSON
CHECKED BY: DOUGLAS B. ROBISON
APPROVED BY: ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: RESERVOIR PUMPING STATION AND MAG METER VAULT PLAN
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F
DRAWING NO.
C-22
SHEET 34 OF 108 SHEETS

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES (DESIGN STAGE ONLY)
02.09.02

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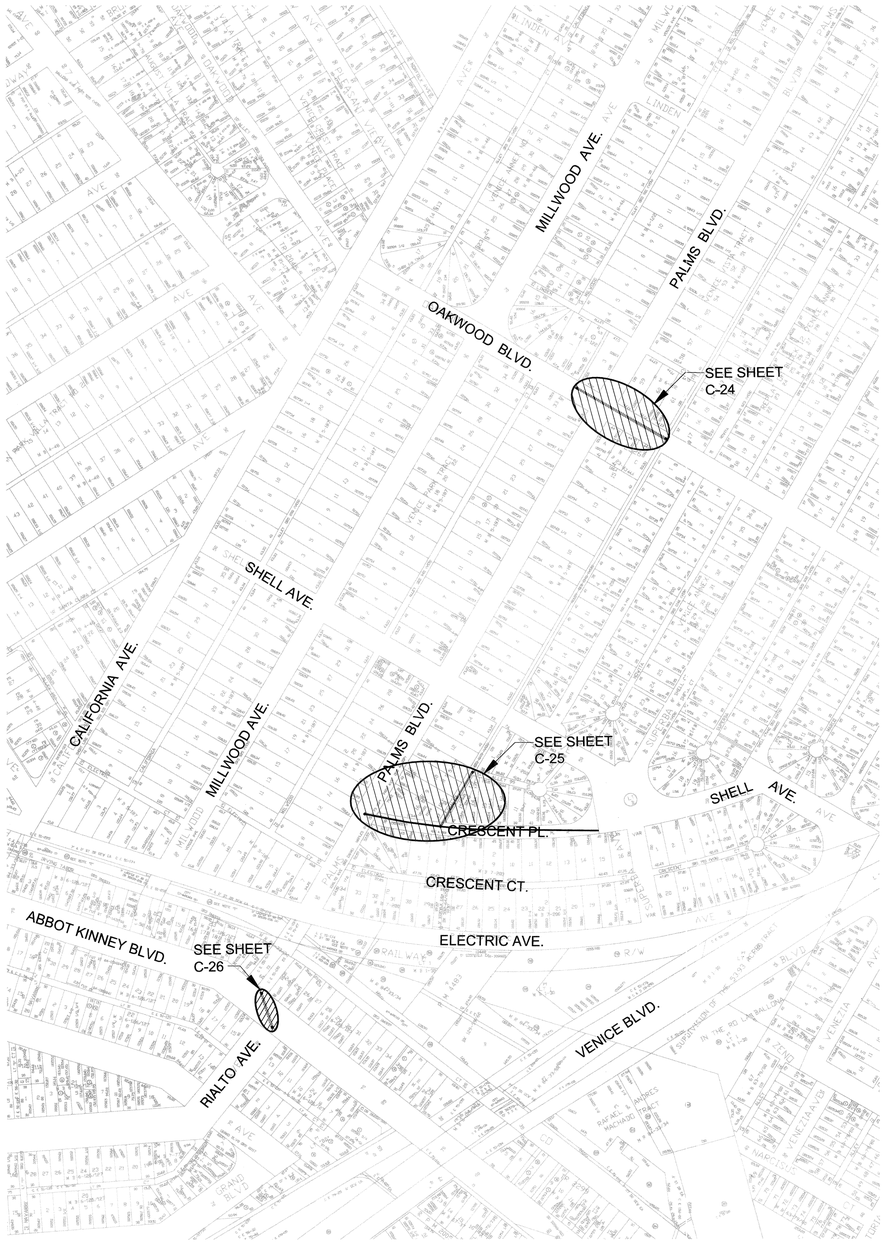

OVERALL SANITARY SEWER REPLACEMENT LOCATION MAP

1"=20'

DEMOLITION NOTES:

1. OBTAIN APPROVAL FROM THE CITY PRIOR TO DEMOLITION OF EXISTING PIPELINES, ELECTRICAL, AND STRUCTURES. COMPLY WITH ALL CONSTRUCTION SEQUENCING AND SCHEDULING REQUIREMENTS PROVIDED IN THE CONTRACT SPECIFICATIONS.
2. POTHOLE AND FIELD VERIFY LOCATION OF ALL EXISTING PIPELINES AND OTHER UTILITIES PRIOR TO DEMOLITION WORK AT NO ADDITIONAL COST TO THE CITY.
3. REMOVE FROM JOB SITE ALL DEMOLISHED MATERIAL AND PIPE UNLESS NOTED OTHERWISE.
4. REPLACE IN-KIND ALL ADJACENT UTILITIES, STRUCTURES AND LANDSCAPING DISTURBED BY DEMOLITION WORK.

CIVIL GENERAL NOTES:

1. LOCATIONS OF EXISTING UNDERGROUND UTILITIES SHOWN ON THE DRAWINGS HAVE BEEN DETERMINED FROM AERIAL PHOTOGRAPHS, RECORD DRAWINGS, FIELD SURVEYS AND/OR SURVEYED POTHOLED UTILITIES. EXCEPT FOR SURVEYED POTHOLED UTILITIES MARKED AS SUCH ON THE DRAWINGS, ACTUAL LOCATIONS AND ELEVATIONS OF EXISTING UTILITIES MAY VARY FROM THE LOCATIONS AND ELEVATIONS SHOWN ON THE DRAWINGS. SUCH VARIANCES THAT DO NOT PREVENT THE PROPOSED PIPELINES FROM BEING INSTALLED IN THE SHOWN ALIGNMENTS SHALL BE INCLUDED IN THE CONTRACT BID PRICES FOR THE PROPOSED PIPELINES.
2. THE CONTRACTOR SHALL PROTECT EXISTING UTILITIES AND OTHER MISCELLANEOUS STRUCTURES WHETHER SHOWN OR NOT SHOWN ON THE DRAWINGS. ALL EXISTING STRUCTURES, PIPING, AND PIPING LATERALS SHALL BE PROTECTED. AT UNDERGROUND CROSSINGS OF EXISTING UTILITIES, THE CONTRACTOR SHALL PROVIDE STRUCTURAL SUPPORT TO PROTECT EXISTING FACILITIES. PIPELINES THAT ARE DAMAGED OR BROKEN AT A CROSSING SHALL BE REPLACED.
3. THE CONTRACTOR SHALL REPAIR OR REPLACE IN KIND ALL EXISTING PAVEMENT, SIDEWALKS, DRIVEWAYS, CURBS, BERMS, PAVED AND DIRT ROADS, DRAINAGE DITCHES, CULVERTS, DRAIN PIPES, AND OTHER EXISTING FACILITIES, BOTH ABOVE AND BELOW GROUND, THAT ARE DAMAGED DURING PERFORMANCE OF THE WORK.
4. TRAFFIC CONTROL. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARING TRAFFIC CONTROL PLANS FOR ALL SANITARY SEWER WORK ZONES AND OBTAINING APPROVAL FROM CITY OF LA DEPARTMENT OF TRANSPORTATION.
5. FLOW DIVERSION. CONTRACTOR SHALL INSTALL, OPERATE, AND MAINTAIN TEMPORARY BYPASS PUMPING FACILITIES AND SURFACE CONVEYANCE PIPING AROUND EACH OF THE WORK AREAS DESCRIBED ON THESE PLANS. GENERALLY FLOW SHALL BE DIVERTED FROM THE FIRST MAINTENANCE HOLE UPSTREAM OF THE MAINTENANCE HOLE SHOWN ON THE PLANS WHERE THE REPLACEMENT PIPE WILL BE CONNECTED TO, AND RETURNED TO THE SANITARY SEWER SYSTEM AT THE FIRST MAINTENANCE HOLE DOWNSTREAM OF THE MAINTENANCE HOLE WHERE THE REPLACEMENT PIPE TERMINATES. FLOW DIVERSION SHALL NOT BE ACCOMPLISHED AT ANY MAINTENANCE HOLE THAT IS INVOLVED WITH PIPELINE REPLACEMENT. SEWER BYPASS PLANS SHALL BE APPROVED PRIOR TO IMPLEMENTATION.
6. EXISTING UTILITIES. EXISTING UTILITIES IN THE WORK ZONE ARE NOT SHOWN ON THE PROJECT PLANS. CONTRACTOR SHALL BE RESPONSIBLE FOR HAVING ALL EXISTING UTILITIES LOCATED AND MARKED WITH THE APPROPRIATE COLOR PAINT IN ALL WORK ZONES AND CONDUCTING THE PIPE REPLACEMENT WORK IN A MANNER THAT DOES NOT DAMAGE ANY EXISTING UTILITIES. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING ANY DAMAGE TO EXISTING UTILITIES CAUSED BY HIS ACTIONS TO THE SATISFACTION OF THE APPROPRIATE UTILITY COMPANY.
7. ASSUME PIPE IS FLOWING FULL.
8. VERIFY HOUSE CONNECTIONS / LATERALS WITH CCTV PRIOR TO COMMENCING WORK.
9. CONTRACTOR CANNOT PROCEED WITH WORK UNTIL COASTAL DEVELOPMENT PERMIT IS OBTAINED BY CITY OF LOS ANGELES.

TRAFFIC LANE REQUIREMENTS

ABBOT KINNEY BOULEVARD

ALL TRAFFIC LANES (INCLUDING THROUGH, TURNING AND PARKING LANES) SHALL BE UNOBSTRUCTED FROM 3:30PM TO 9:00AM OF THE NEXT DAY. ONE LANE MAY BE CLOSED AT ALL OTHER TIMES.

PALMS BOULEVARD

MAINTAIN ONE LANE OF TRAFFIC IN EACH DIRECTION AT ALL TIMES. MAINTAIN ONE LANE OF TRAFFIC WITH FLAGPERSON CONTROL IF NECESSITATED BY CONSTRUCTION FROM 9AM TO 3PM.

OTHER STREETS

MAINTAIN LOCAL AND EMERGENCY ACCESS AT ALL TIMES.

THE WORK SHALL BE PERFORMED IN ACCORDANCE WITH LADOT'S APPROVED WORKSITE TRAFFIC CONTROL PLAN (WTCP). THE WTCP SHALL BE IN COMPLIANCE WITH THE TEMPORARY TRAFFIC CONTROL PROVISIONS OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES {MUTCD} (2003 OR LATEST) AND THE CALIFORNIA MUTCD (2006 OR LATEST). THE WTCP SHALL SHOW TYPICAL LANE CLOSURES AND PROPOSED TEMPORARY TRAFFIC CONTROL DEVICES. THE WTCP SHALL BE SUBMITTED IN FINAL DRAFT FORM TEN (10) DAY PRIOR TO THE START OF CONSTRUCTION. CONTACT THE WESTERN DISTRICT OFFICE, LADOT AT (310) 575-8138 TO ARRANGE FOR PLAN REVIEWS. ANY DEVIATION FROM THE APPROVED WTCP SHALL BE SUBMITTED IN WRITING AND RECEIVE APPROVAL FROM LADOT PRIOR TO IMPLEMENTATION.

THE CONTRACTOR SHALL NOTIFY LADOT'S WESTER DISTRICT OFFICE, LADOT AT (310) 575-8138 FIVE (5) DAYS IN ADVANCE PRIOR TO STARTING CONSTRUCTION. PROVIDE THE WORKING HOURS AND DURATION OF CONSTRUCTION.

TRAFFIC CONTROL DEVICES

THE CONTRACTOR SHALL MAKE ARRANGEMENTS FOR THE RESTORATION OF ALL OBLITERATED STRIPING AND PAVEMENT MARKINGS AND FOR THE REINSTALLATION OF ALL MISSING, DAMAGED AND NECESSARY TRAFFIC CONTROL DEVICES (I.E., SIGNS, CURB MARKINGS, SPEED HUMPS, STAMPED CROSSWALKS, PARKING METERS, ETC.). THE CONTRACTOR WILL BE REQUIRED TO PHYSICALLY INSTALL THESE TRAFFIC CONTROL DEVICES TO THE FULL SATISFACTION OF LADOT, BUT THE CITY MAY CHOOSE TO INSTALL NONE, SOME OR ALL OTHER OR ALL OF THE SAID TRAFFIC CONTROL DEVICES. THE ENTIRE COST THEREOF SHALL BE BORNE BY THE CONTRACTOR (UNLESS PAYMENT BY THE CITY IS PRE-APPROVED BY LADOT). ALL STRIPING AND PAVEMENT MARKINGS SHALL BE INSTALLED UTILIZING THERMOPLASTIC MATERIALS PER LADOT SPECIFICATIONS. THE CONTRACTOR SHALL CONTACT THE WESTERN DISTRICT OFFICE, LADOT AT (310) 575-8138 PRIOR TO COMMENCING ANY WORK THAT REQUIRES TRAFFIC CONTROL DEVICES MAINTENANCE.

THE CONTRACTOR MAY NOTIFY LADOT'S SPECIAL TRAFFIC CONTROL DIVISION AT (213) 485-2298 FIVE (5) WORK DAYS PRIOR TO THE START OF CONSTRUCTION FOR THE POSTING OF TEMPORARY "TOWAWAY NO STOPPING" SIGNS ADJACENT TO THE WORK AREA AS NEEDED.

FOR TRAFFIC RELATED QUESTIONS DURING CONSTRUCTION, CONTACT THE WESTERN DISTRICT OFFICE, LADOT AT (310) 575-8138

N

20' 10' 0 20' 40'

1"=20'

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Los Angeles, California

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

LA DPW ENGINEERING Serving the Present... Building the Future

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

LAWRENCE M. MAGURA No. 43285 PROFESSIONAL ENGINEER CIVIL STATE OF CALIFORNIA
01/06/2010

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP		DATE:	
ENGINEER:	LAWRENCE M. MAGURA	LIC. NO.	C43285
DESIGNED BY:	MOSTAFA HASHAD		
DRAWN BY:	ALEJANDRO GUTIERREZ		
CHECKED BY:	LAWRENCE M. MAGURA		
APPROVED BY:	ROBERT FINN		

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: OVERALL SANITARY SEWER REPLACEMENT PLAN

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA. 90291

WORK ORDER NO. EW40019F

DRAWING NO. C-23

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REVISION DATES (DESIGN STAGE ONLY)

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PALMS BLVD.

MILWOOD CT.

50.10'

EX. 16" VCP

MH.F #561-03-050 STA 2+50
REMOVE AND CONSTRUCT NEW PER
S-140-0 W/TYPE II LINING
RECONNECT ALL INCOMING AND
OUTGOING LATERALS AND
CONNECTIONS
MH DEPTH ~7.7FT

REMOVE 250 LF - EXISTING 16" VCP
& REPLACE WITH 24" HDPE OR
APPROVED EQUAL ON SAME
GRADE. SIX EXISTING HOUSE
CONNECTIONS TO BE VERIFIED AND
RECONNECTED
(PLAN & PROFILE: P-3174)

HC 1+04
HC 0+96
HC 0+90
HC 0+53
HC 0+48
HC 0+30

RIALTO COURT

EX. 8" VCP

MH.F #561-03-052 STA 0+00
REMOVE AND CONSTRUCT NEW PER
S-140-0 W/TYPE II LINING
RECONNECT ALL INCOMING AND
OUTGOING LATERALS AND
CONNECTIONS
MH DEPTH ~8.2FT

EX. 8" VCP

NOWITA PL.

EX. 16" VCP

OAKWOOD AVE.

N

20' 10' 0 20' 40'
1"=20'

OAKWOOD AVE. SEWER UPGRADE
1"=20'

REVISION DATES
(DESIGN STAGE ONLY)

Sheet Version 3.0

BUREAU OF ENGINEERING

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

LA DPW ENGINEERING Sustainable Streets Division Delivering the Future

REGISTERED PROFESSIONAL ENGINEER LAWRENCE M. MAGURA No. 43285 CIVIL STATE OF CALIFORNIA

02/26/2010

DEPARTMENT OF PUBLIC WORKS

CITY OF LOS ANGELES

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP	
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DRAWN BY:	ALEJANDRO GUTIERREZ
CHECKED BY:	LAWRENCE M. MAGURA
APPROVED BY:	ROBERT FINN
DATE:	
LIC. NO.	C43285

BLACK & VEATCH
Black & Veatch Corporation
Los Angeles, California

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: OAKWOOD AVE. SEWER UPGRADE PLAN

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F

DRAWING NO.
C-24

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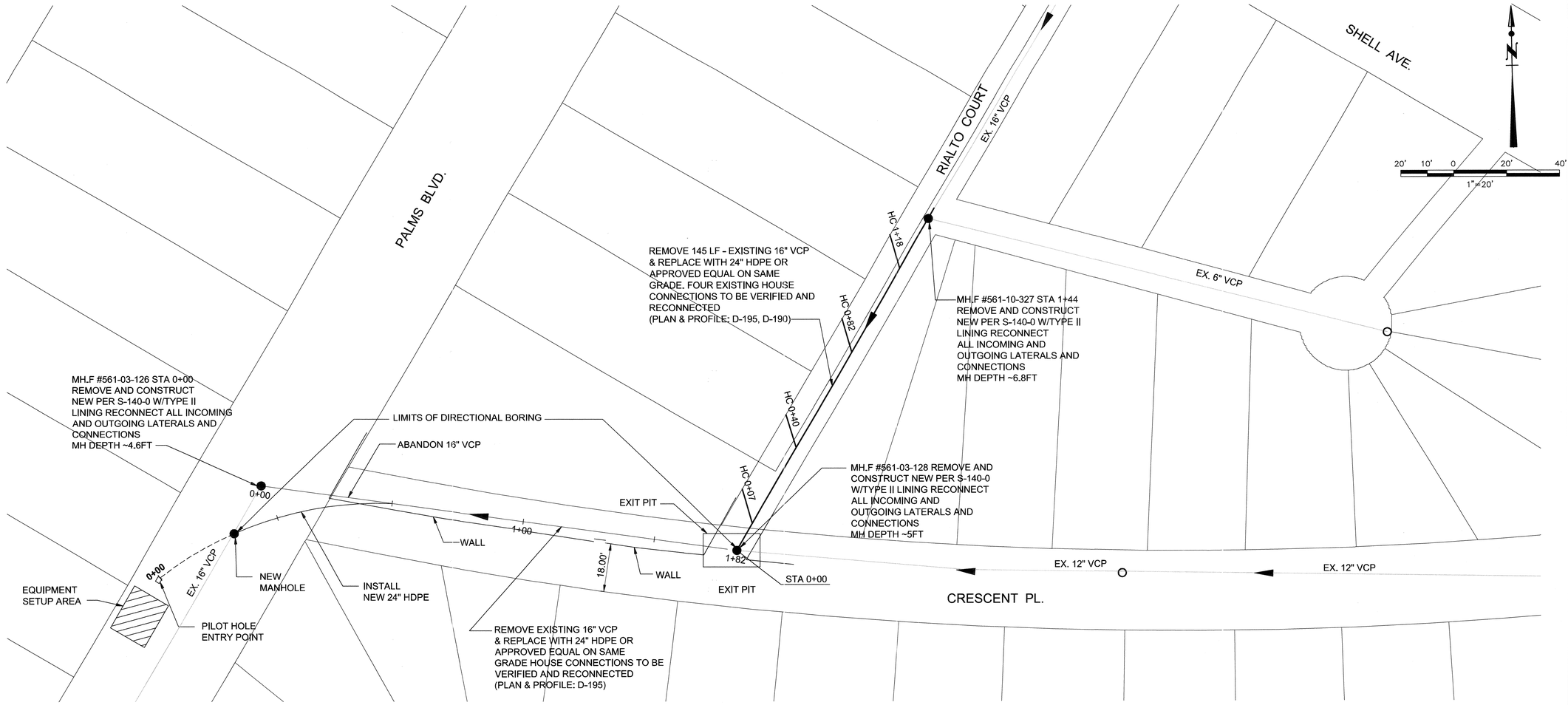
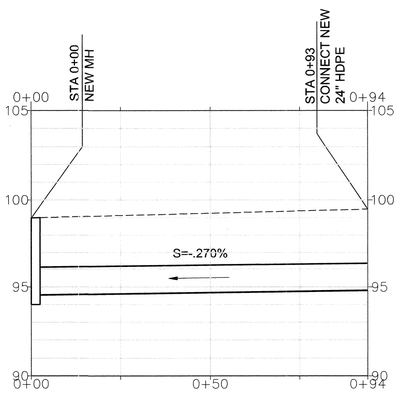


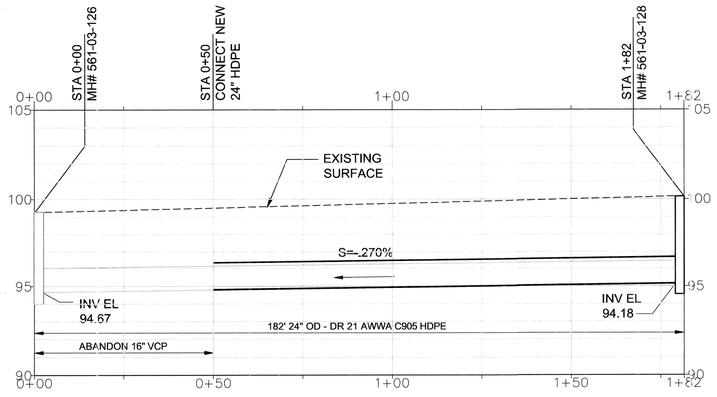
E1 RIALTO COURT AND CRESCENT PLACE SEWER UPGRADE PLAN

H 1"=20'-0" V:1"=4' C-25

SEQUENCE OF OPERATIONS:

1) - ESTABLISH BYPASS SYSTEM.
2) - ESTABLISH TRAFFIC CONTROLS.
3) - SETUP HDD EQUIPMENT.
4) - DRILL PILOT HOLE TO INTERCEPT 16"VCP ON PALMS BLVD AND CRECSENT PLACE.
5) - EXCAVATE EXIT PIT 94' WIDE X 10' LONG AND DEPTH AS REQUIRED.
6) - ATTACH REAMER TO DRILL PIPE WITH FUSED HDPE ATTACHED BEHIND REAMER AND REAM BACK.
7) - CONSTRUCT NEW MANHOLE.
8) - CONSTRUCT A 12" THICK BRICK BULKHEAD AT THE END OF ABANDONEND 18" VCP AT STA 0+00
9) - ABANDON EXISTING PIPE FROM MANHOLE AT STA 0+00 TO INTERSECTION OF NEW PIPE ON CRESCENT PLACE BY FILLING THE PIPE WITH FLOWABLE FILL.
10)- INSTALL MH AT ST 1+82 AND MAKE CONNECTIONS.
11)- RESTORE SURFACE CONDITIONS TO ORIGINAL CONDITION.





A1 CRESCENT PLACE SEWER UPGRADE PROFILE

H 1"=20'-0" V:1"=4' C-25

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LOS ANGELES, CALIFORNIA

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Los Angeles, California

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

LA DPW ENGINEERING Standards for Practice Distinction for Future

GARY LEE MOORE, P.E. CITY ENGINEER
DATE:
LIC. NO. C43285

DESIGN GROUP	
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DRAWN BY:	ALEJANDRO GUTIERREZ
CHECKED BY:	LAWRENCE M. MAGURA
APPROVED BY:	ROBERT FINN

DATE: BY: REVISIONS: NO.

STRUCTURE NO.

INDEX NO.

LAWRENCE M. MAGURA — No. C43285 — Exp. 3/31/10 — STATE OF CALIFORNIA — REGISTERED PROFESSIONAL ENGINEER
02/06/2020

SHEET TITLE: RIALTO COURT AND CRESCENT PL. SEWER UPGRADE PLAN

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

WORK ORDER NO. EW40019F

DRAWING NO. C-25

SHEET 37 OF ~~108~~ 48 SHEETS

REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 3.0

PALMS BLVD.

ELECTRIC AVE.

ABBOT KINNEY BLVD.

RIALTO AVE.

MH.F #561-03-346 STA 0+76
REMOVE AND CONSTRUCT NEW
PER S-140-0 W/TYPE II LINING
RECONNECT ALL INCOMING AND
OUTGOING LATERALS AND
CONNECTIONS
MH DEPTH ~7FT

MH.F #561-03-155 STA 0+00
REMOVE AND CONSTRUCT NEW
PER S-140-0 W/TYPE II LINING
RECONNECT ALL INCOMING AND
OUTGOING LATERALS AND
CONNECTIONS
MH DEPTH ~8FT

REMOVE 76 LF - EXISTING 18" VCP
& REPLACE WITH 24" HDPE OR
APPROVED EQUAL ON SAME
GRADE. SIX EXISTING HOUSE
CONNECTIONS TO BE VERIFIED AND
RECONNECTED
(PLAN & PROFILE: D-191)

EX. 12" VCP
EX. 8" VCP
EX. 8" VCP
EX. 8"VCP
EX. 6" VCP
EX. 6" VCP
EX. 20" VCP
EX. 6" VCP
EX. 20" VCP
70.03'

STA 0+15
STA 0+00

ABBOT KINNEY BLVD. SEWER UPGRADE

1"=20'

20' 10' 0 20' 40'
1"=20'

DESIGN DATES
(DESIGN STAGE ONLY)

Sheet Version 3.0

BUREAU OF ENGINEERING
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

LA DPW ENGINEERING
Serving the Present
Dedicated to the Future

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER
LAWRENCE M. MAGURA
No. XXXXX
CIVIL
STATE OF CALIFORNIA
2/26/2010

GARY LEE MOORE, P.E. CITY ENGINEER
DATE:

DESIGN GROUP	
ENGINEER:	LAWRENCE M. MAGURA
LIC. NO.	CA3285
DESIGNED BY:	MOSTAFA HASHAD
DRAWN BY:	ALEJANDRO GUTIERREZ
CHECKED BY:	LAWRENCE M. MAGURA
APPROVED BY:	ROBERT FINN

BLACK & VEATCH
Black & Veatch Corporation
Los Angeles, California

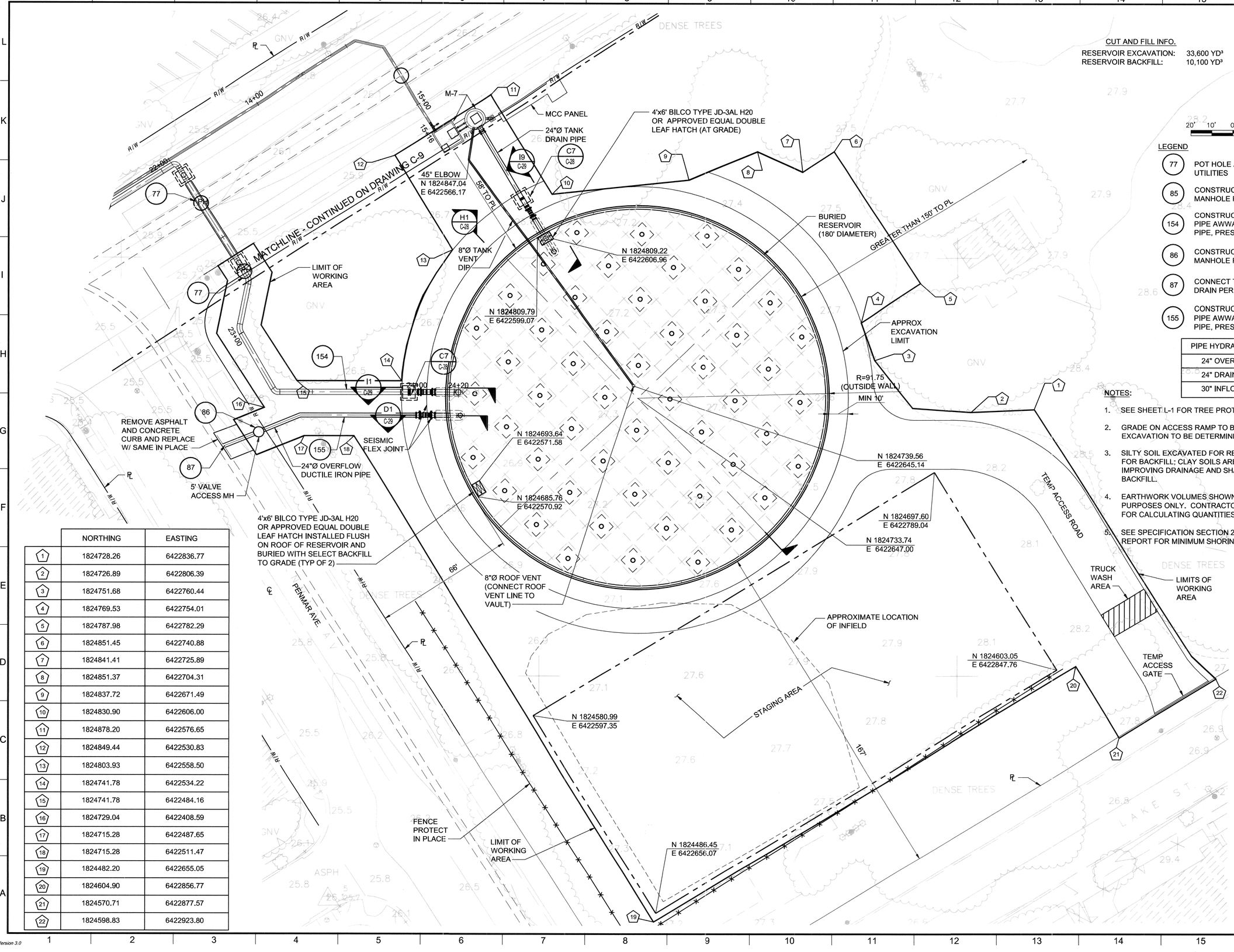
BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

VERTICAL CONTROL:	NGVD29, 1985 ADJ.
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5
SHEET TITLE:	ABBOT KINNEY BLVD. SEWER UPGRADE PLAN
PROJECT:	PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS:	1216 E. ROSE AVENUE LOS ANGELES, CA. 90291

WORK ORDER NO.
EW40019F

DRAWING NO.
C-26

SHEET 38 OF ~~108~~ 48 SHEETS



	NORTHING	EASTING
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2	1824726.89	6422806.39
3	1824751.68	6422760.44
4	1824769.53	6422754.01
5	1824787.98	6422782.29
6	1824851.45	6422740.88
7	1824841.41	6422725.89
8	1824851.37	6422704.31
9	1824837.72	6422671.49
10	1824830.90	6422606.00
11	1824878.20	6422576.65
12	1824849.44	6422530.83
13	1824803.93	6422558.50
14	1824741.78	6422534.22
15	1824741.78	6422484.16
16	1824729.04	6422408.59
17	1824715.28	6422487.65
18	1824715.28	6422511.47
19	1824482.20	6422655.05
20	1824604.90	6422856.77
21	1824570.71	6422877.57
22	1824598.83	6422923.80

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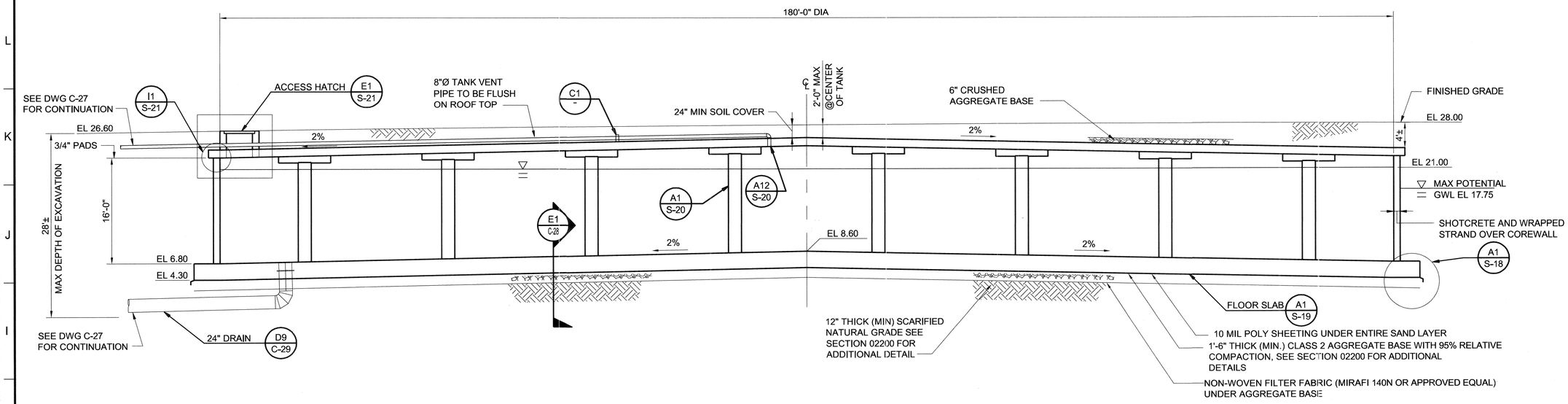
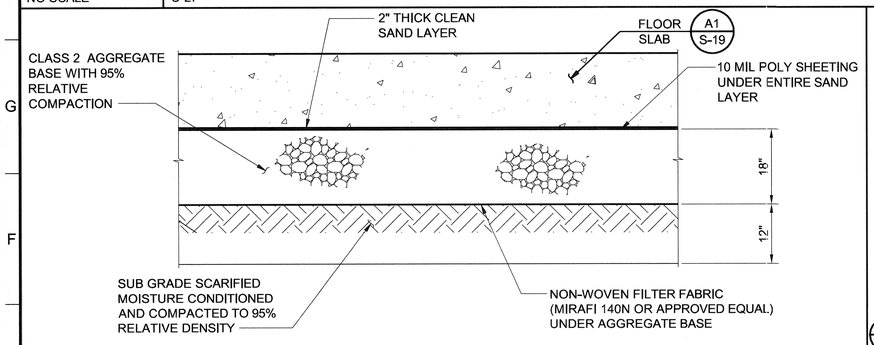
REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 3.0

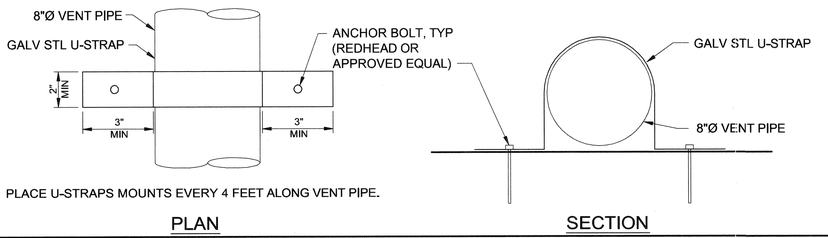
BUREAU OF ENGINEERING
LA DPW ENGINEERING Service the Present • Elevate the Future
DATE: BY:
NO. REVISIONS:
STRUCTURE NO.
INDEX NO.
CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
ENGINEER: LAWRENCE M. MAGURA LIC. NO. CA3285
DESIGNED BY: MOSTAFA HASHAD
DRAWN BY: ALEJANDRO GUTIERREZ
CHECKED BY: LAWRENCE M. MAGURA
APPROVED BY: ROBERT FINN
DATE:
BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA
BLACK & VEATCH
Black & Veatch Corporation
Los Angeles, California
VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5
SHEET TITLE: RESERVOIR PLAN
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291
WORK ORDER NO. EW40019F
DRAWING NO. C-27
SHEET 39 OF ~~108~~ 48 SHEETS



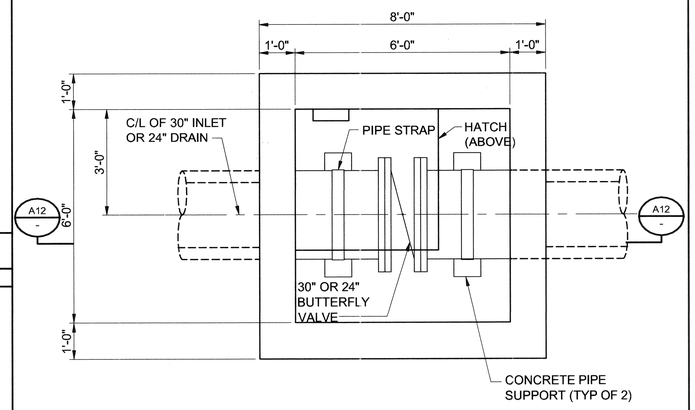
H1	TANK SECTION
NO SCALE	C-27



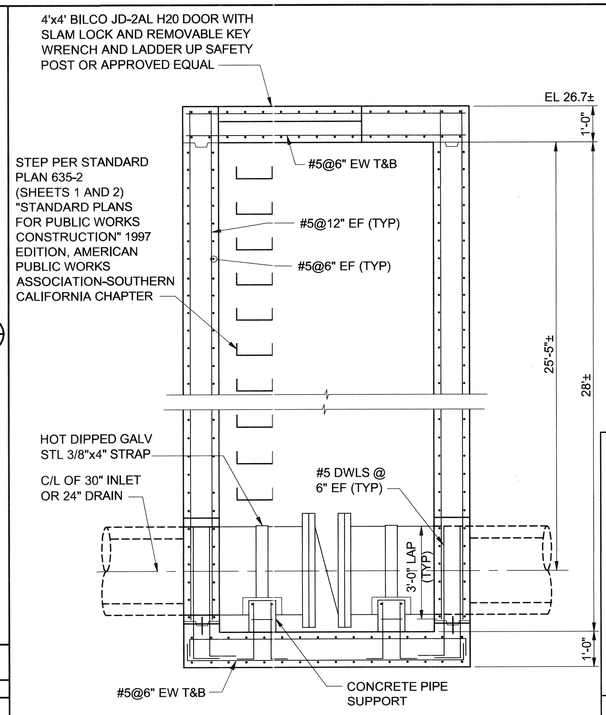
E1	TANK BASE FILL
NO SCALE	C-28



C1	VENT PIPE MOUNT
NO SCALE	-



C7	VALVE ACCESS VAULT PLAN
1/2"=1'-0"	C-27



A12	VALVE ACCESS VAULT SECTION
1/2"=1'-0"	-

NOTES:

1. PLACEMENT AND COMPACTION OF FILL ABOVE RESERVOIR SHALL BE DONE WITH LIGHT WEIGHT EQUIPMENT, EXCESSIVE IMPACT, VIBRATION AND COMPACTION LOADS SHALL NOT BE ALLOWED.
2. NO MECHANICAL COMPACTION SHALL BE ALLOWED ON TOP OF THE TANK ROOF. THE CONTRACTOR SHALL SUBMIT A BACKFILL/COMPACTION PLAN PRIOR TO PLACEMENT OF ANY BACKFILL ON TANK ROOF.
3. WATERPROOFING OF EXTERIOR OF TANK WALL AND ROOF IS NOT REQUIRED.

12" 6" 0 1' 2' 3' 4' 5'
1/2"=1'-0"

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LOS ANGELES, CALIFORNIA

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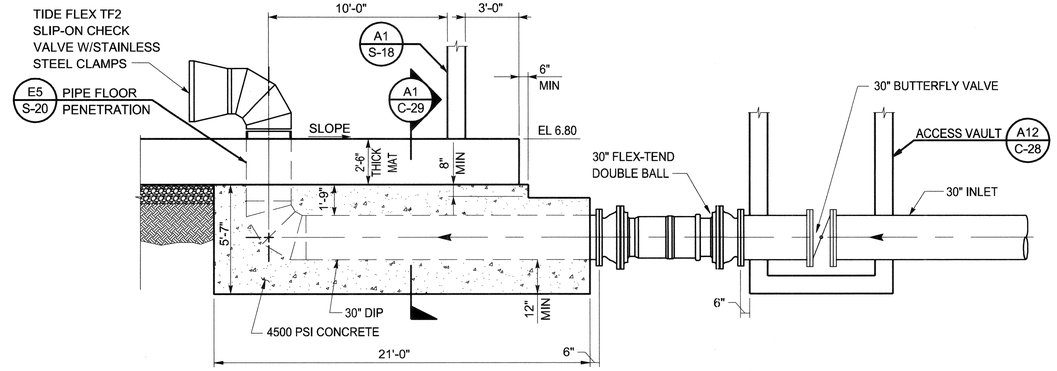
Black & Veatch Corporation
Los Angeles, California

BUREAU OF ENGINEERING
LA DPW ENGINEERING Standard Practice Delivering the Future
DATE: BY:
NO. REVISIONS:
STRUCTURE NO.
INDEX NO.
PROFESSIONAL ENGINEER REGISTERED IN CIVIL ENGINEERING Exp. 6.30.2015 STATE OF CALIFORNIA 02/06/2020

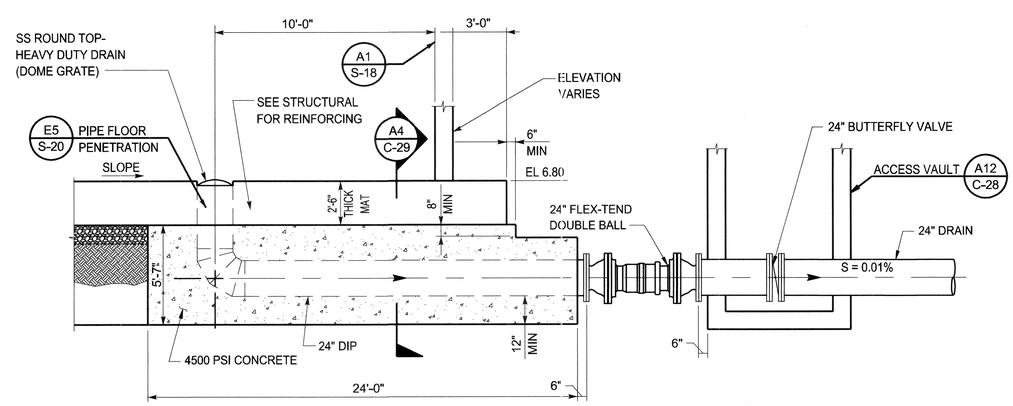
CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
GARY LEE MOORE, P.E. CITY ENGINEER
DATE:
LIC. NO. C43285
DESIGN GROUP
ENGINEER: LAWRENCE M. MAGURA
DESIGNED BY: MOSTAFA HASHAD
DRAWN BY: ALEJANDRO GUTIERREZ
CHECKED BY: LAWRENCE M. MAGURA
APPROVED BY: ROBERT FINN
VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5
SHEET TITLE: TANK SECTION
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291
WORK ORDER NO. EW40019F
DRAWING NO. C-28
SHEET 40 OF ~~106~~ 48 SHEETS

REVISION DATES (DESIGN STAGE ONLY)

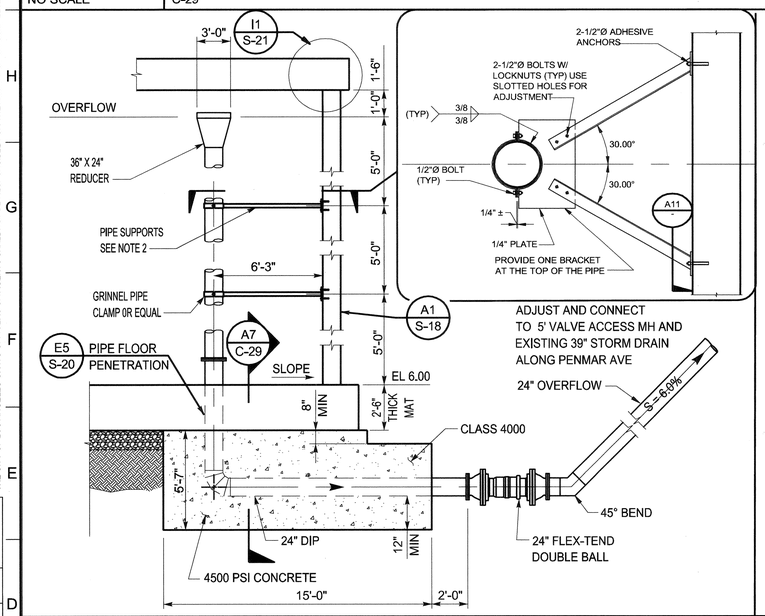


NOTE:
ORIENT CHECK VALVE SO THAT IT DOES NOT IMPINGE FLOW ON EITHER RESERVOIR WALL OR ROOF SUPPORT COLUMN.

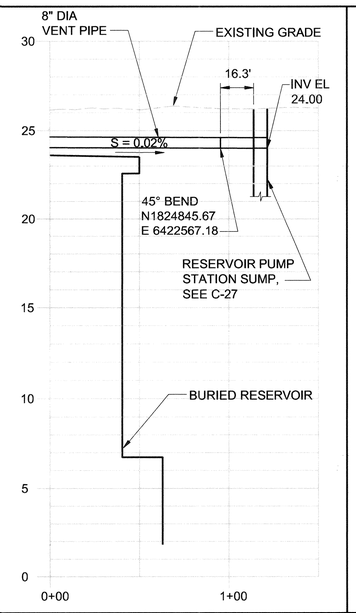
I1	30" TANK INLET SECTION
NO SCALE	C-29



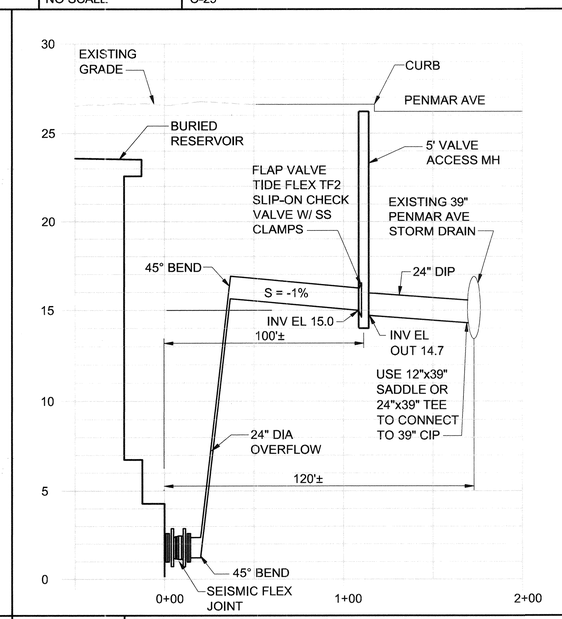
I9	24" DRAIN SECTION
NO SCALE	C-29



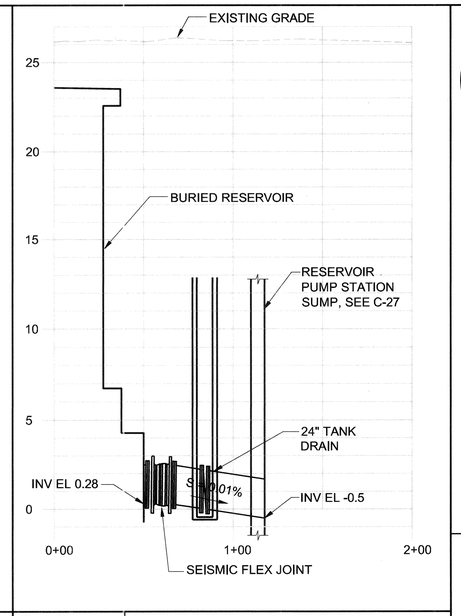
D1	24" OVERFLOW SECTION
NO SCALE	C-29



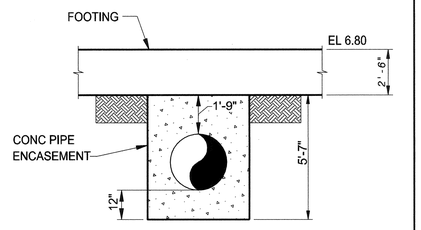
D6	8" DIA TANK VENT
NO SCALE	C-27



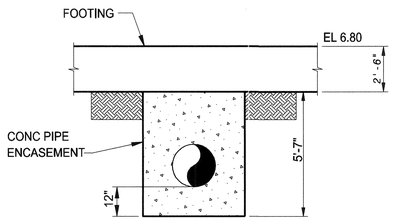
D8	24" DIA OVERFLOW PIPE
NO SCALE	C-27



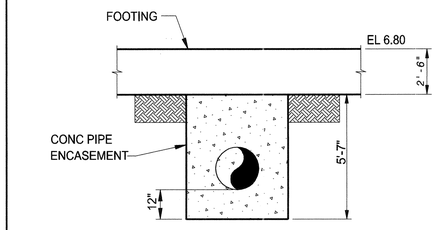
D12	24" DIA TANK DRAIN
NO SCALE	C-27



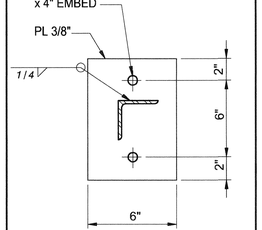
A1	30" CONC ENCASEMENT
NO SCALE	C-29



A4	24" CONC ENCASEMENT
NO SCALE	C-29



A7	24" CONC ENCASEMENT
NO SCALE	C-29



A11	ANCHOR PLATE
	C-29

NOTES:
1. ALL ENCASED DUCTILE IRON PIPES AND SPOOLS TO BE CEMENT LINED AND COATED.
2. THE CONTRACTOR SHALL PROVIDE A COMPLETE PIPE SUPPORT SYSTEM DESIGN AS PER THE REQUIREMENT OF SECTION 15140.
3. INVERT ELEVATIONS FOR 8" TANK VENT, 12" OVERFLOW PIPE AND 24" TANK DRAIN ARE APPROXIMATE AND TO BE VERIFIED BASED ON SITE CONDITIONS.

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH
Black & Veatch Corporation
Los Angeles, California

REGISTERED PROFESSIONAL ENGINEER * ROBERT MARTIN FINN * No. C25565 Exp. 12-31-11 * CIVIL * STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER * LAWRENCE M. MAGURA * No. C43285 Exp. 3/31/10 * CIVIL * STATE OF CALIFORNIA

BUREAU OF ENGINEERING
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

LA DPW ENGINEERING Service For A Growing City Designing The Future

DATE: BY:
NO. REVISIONS:

STRUCTURE NO.
INDEX NO.

CITY ENGINEER
GARY LEE MOORE, P.E.
DATE:

DESIGN GROUP
ENGINEER: LAWRENCE M. MAGURA LIC. NO. C43285
DESIGNED BY: MOSTAFA HASHAD
DRAWN BY: ALEJANDRO GUTIERREZ
CHECKED BY: LAWRENCE M. MAGURA
APPROVED BY: ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: FOREBAY SECTIONS

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F
DRAWING NO.
C-29
SHEET 41 OF ~~108~~ 48 SHEETS

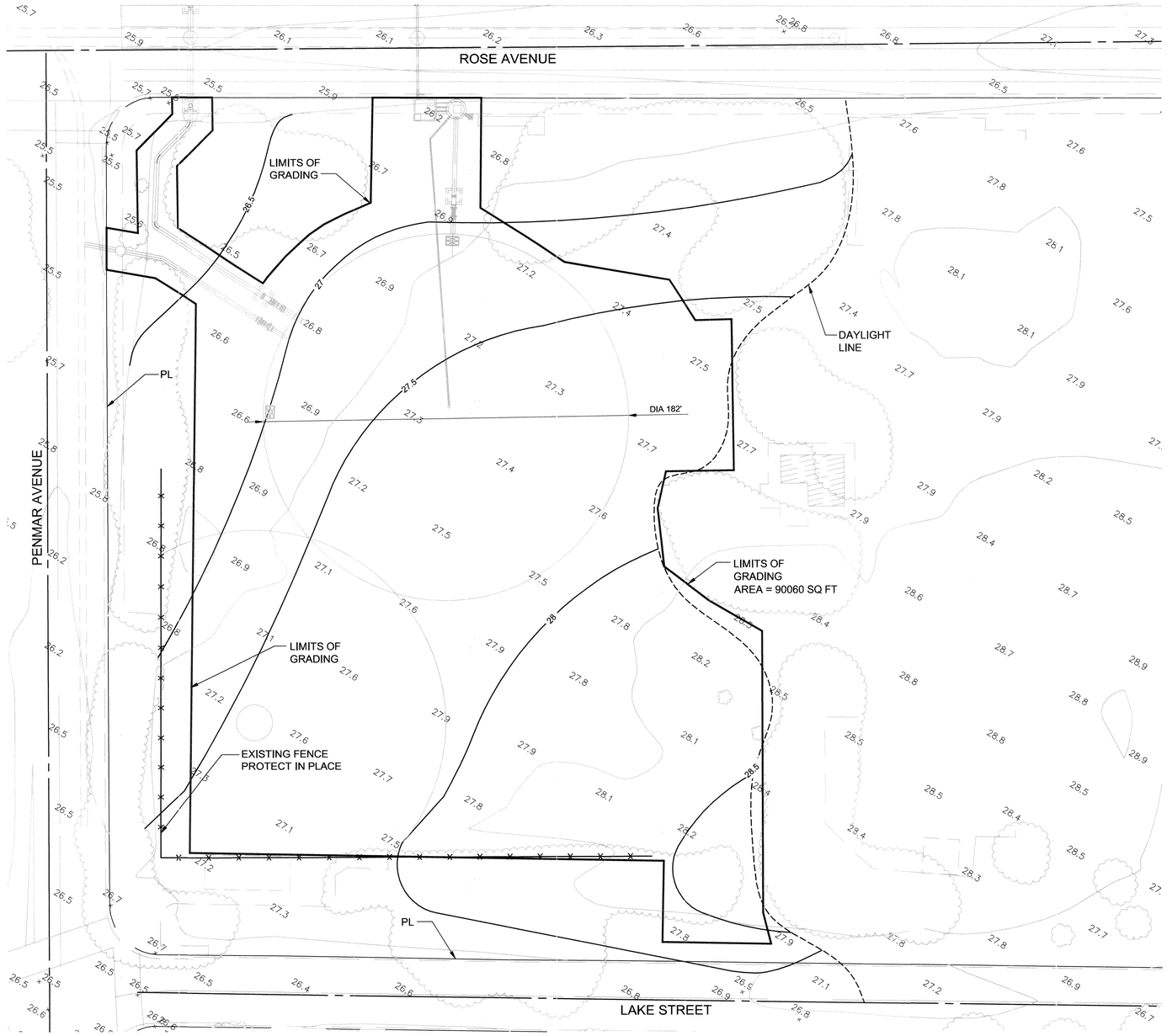
THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 3.0

NOTES:

1. NO FILL TO BE PLACED UNTIL THE CITY GRADING INSPECTOR HAS INSPECTED AND APPROVED THE BOTTOM EXCAVATION.
2. MAN-MADE FILL SHALL BE COMPACTED TO A MINIMUM RELATIVE COMPACTION OF 90% MAX. DRY DENSITY WITHIN 40 FEET BELOW FINISH GRADE AND 93% OF MAX. DRY DENSITY DEEPER THAN 40 FEET BELOW FINISHED GRADE, UNLESS A LOWER RELATIVE COMPACTION (NOT LESS THAN 90% OF MAX. DRY DENSITY) IS JUSTIFIED BY SOILS ENGINEER.
3. TEMPORARARY EROSION CONTROL TO BE INSTALLED BETWEEN OCTOBER 1 AND APRIL 15. OBTAIN GRADING INSPECTOR'S AND DEPARTMENT OF PUBLIC WORKS APPROVAL OF PROPOSED PROCEDURES.
4. SEE L SHEETS FOR FINISH GRADE AND TOP SOIL REQUIREMENTS.
5. SILTY SOIL EXCAVATED FOR RESERVOIR IS SUITABLE FOR BACKFILL; CLAY SOILS ARE NOT SUITABLE FOR IMPROVING DRAINAGE AND SHALL NOT BE USED FOR BACKFILL.



N

30' 20' 10' 0 30' 60'
1"=30'

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES (DESIGN STAGE ONLY)

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LOS ANGELES, CALIFORNIA

BLACK & VEATCH
Black & Veatch Corporation
Los Angeles, California

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

LA DPW ENGINEERING Service for a Great City. Designing the Future.

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER LAWRENCE M. MAGURA No. 34910 CIVIL STATE OF CALIFORNIA
02/06/2020

GARY LEE MOORE, P.E. CITY ENGINEER
DATE:
LIC. NO. C43285

DESIGN GROUP	
ENGINEER:	LAWRENCE M. MAGURA
DESIGNED BY:	MOSTAFA HASHAD
DRAWN BY:	ALEJANDRO GUTIERREZ
CHECKED BY:	LAWRENCE M. MAGURA
APPROVED BY:	ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: SITE GRADING PLAN

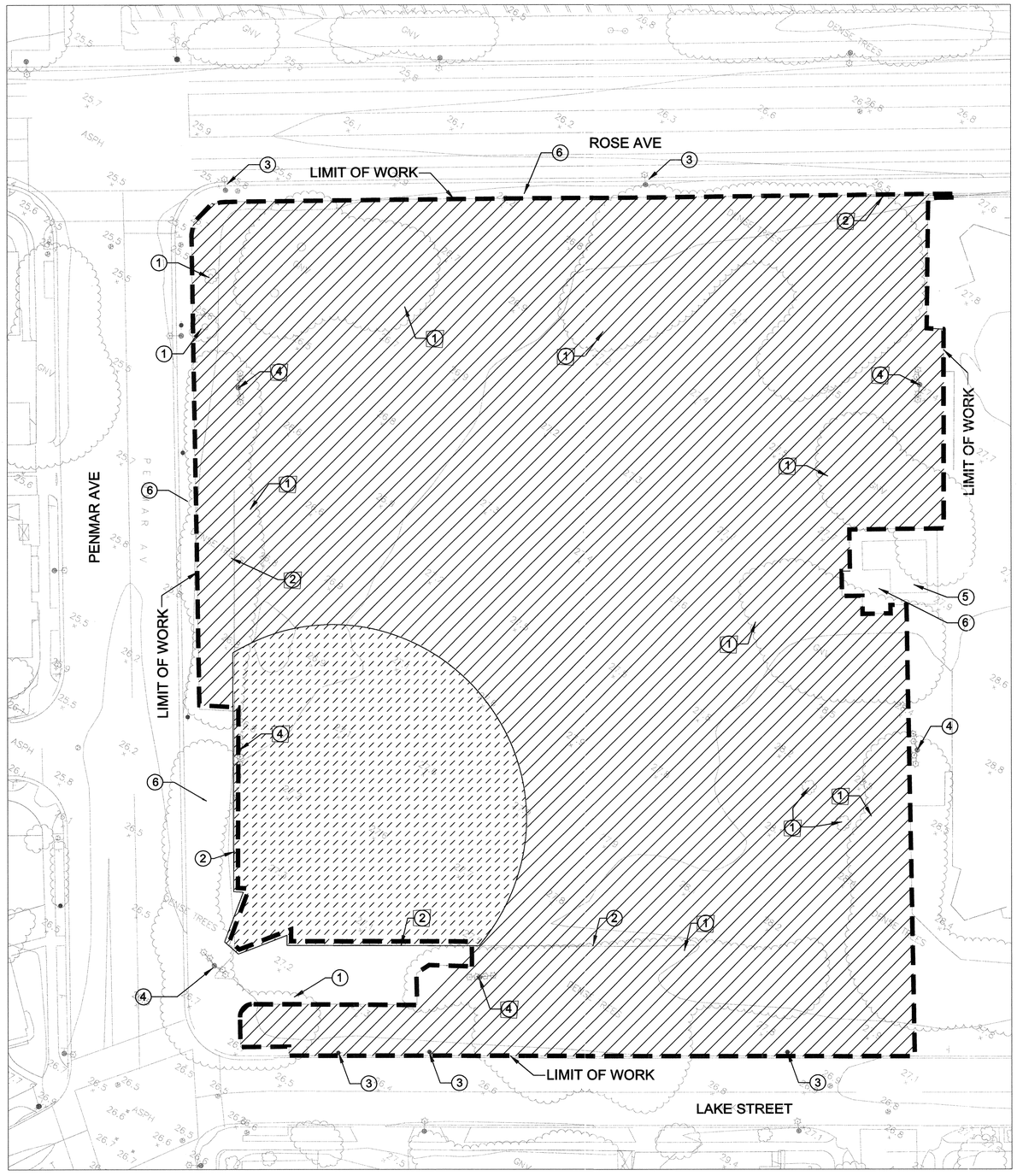
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. C-30

SHEET 42 OF ~~108~~ 48 SHEETS



LANDSCAPE DEMOLITION PLAN
SCALE: 1" = 30'-0"

TREE PROTECTION REQUIREMENTS

THESE TREE SPECIFICATIONS SHALL BE FOLLOWED TO PROTECT ALL TREES WHOSE DRIPLINE IS ENCROACHED UPON EITHER DIRECTLY OR INDIRECTLY BY CONSTRUCTION WITHIN CITY PARKS.

A RECREATION AND PARKS ARBORIST SHALL BE INVITED TO THE JOB START MEETING AND ALSO NOTIFIED 48-HOURS PRIOR TO CONSTRUCTION. CONTACT LAURA BAUERNFEIND AT (213) 485-3674 OR STEVE DUNLAP AT (213) 485-4826.

GENERAL REQUIREMENTS *

1. CONTRACTOR TO PROTECT QUALIFIED TREES WITHIN PROJECT LIMIT.
2. CONTRACTOR'S RESPONSIBLITY TO PROTECT TREES WITHIN DRIPLINE OF SITE BOUNDARIES.
3. TREE PROTECTION DEFINED BY DRIPLINE DETERMINED BY ARBORIST.
4. CONTRACTOR SHALL HAVE A DEPT. OF REC AND PARKS APPROVED ARBORIST PRESENT ANYTIME DURING EXCAVATION WITHIN TWO TIMES THE DRIPLINE RADIUS OF THE TREES.
5. NO EQUIPMENT IS TO BE OPERATED OR PARKED UNDER A TREE, NOR ARE ANY MATERIALS TO BE STORED WITHIN THE DRIPLINE OF A TREE OR LEANED AGAINST A TREE TRUNK. DO NOT PILE OR COMPACT SOIL WITHIN A DRIPLINE.
6. IN AREAS OF CONSTRUCTION, PROTECT SOIL SURFACE FROM TRAFFIC COMPACTION WITH 3" OF MULCH OR OVERLAPPING 3/4" PLYWOOD SHEETS.
7. NO SURFACE IRRIGATION SHALL BE INSTALLED WITHIN TREE'S DRIPLINE OF A TREE.
8. ALL WORK SHALL BE IN ACCORDANCE WITH THE CITY OF LOS ANGELES' OAK TREE ORDINANCE.
9. NO CHEMICAL HERBICIDES ARE TO BE USED WITHIN 100 FT. OF A TREE'S DRIPLINE.
10. DO NOT NAIL GRADE STAKES OR ANYTHING ELSE TO TREES.
11. ENCROACHMENT FROM PAVING OR STRUCTURES WITHIN THE DRIPLINE OF A TREE SHALL BE PERMITTED ONLY WITH WRITTEN AUTHORIZATION FROM THE DEPARTMENT'S ARBORIST. AN ARBORIST SUITABLE TO REC AND PARKS IS REQUIRED TO REVIEW ALL EARTHWORK OR EXCAVATION WITHIN THE DRIPLINE OF THE TREES. HAND DIGGING MAY BE REQUIRED TO PROTECT TREE ROOTS.
12. DO NOT STRIP TOPSOIL AROUND TREES. ANY VEGETATION TO BE REMOVED SHOULD BE REMOVED BY CUTTING AT GROUND LEVEL RATHER THAN PULLING OUT BY EQUIPMENT.
13. USE A PNEUMATIC DRILL TO EXCAVATE UNDER WOODY ROOTS LARGER THAN 2" IN DIAMETER. DO NOT CUT ANY ROOT LARGER THAN 2" DIAMETER. IF ROOTS MUST BE SEVERED, CUTS ARE TO BE MADE BY AN ARBORIST AND SOIL BACKFILLED IMMEDIATELY.

TYPICAL WORK PROCEDURES

ALL WORK AROUND ANY EXISTING OAK TREES SHALL FOLLOW THIS WORK PROCEDURES PROGRAM. THIS PROGRAM HAS BEEN DEVELOPED TO MINIMIZE THE IMPACTS TO EACH TREE AND PROTECT THEM FROM UNSCHEDULED DAMAGE.

14. ALL WORK WITHIN A TREE'S ROOT ZONE SHALL BE OBSERVED BY THE RECREATION AND PARKS ARBORIST.
15. THE EXTENT OF ALL WORK AFFECTING ANY OAKS SHALL BE STAKED BY FIELD SURVEY AND REVIEWED WITH THE RECREATION AND PARKS ARBORIST PRIOR TO CONSTRUCTION.
16. ANY APPROVED PRUNING OF OAKS SHALL BE DONE BY A RECREATION AND PARKS ARBORIST PRIOR TO THE START OF CONSTRUCTION.
17. HAND DIG VERTICAL TRENCH AT THE FINAL CUT LINE TO FINAL GRADE AND CLEANLY CUT ANY ROOTS ENCOUNTERED AND SEAL WITH APPROVED TREE SEAL. (THIS PROCEDURE WILL PROTECT THE ROOT SYSTEM FROM UNNECESSARY DAMAGE BY EXCAVATION EQUIPMENT).
18. A FIVE (5) FOOT HIGH CHAIN LINK FENCE SHALL BE CONSTRUCTED AT THE LIMIT OF APPROVED WORK TO PROTECT THE TREES FROM FURTHER UNAUTHORIZED DAMAGE AND REMAIN IN PLACE UNTIL COMPLETION OF CONSTRUCTION.
19. NO FURTHER WORK WITHIN THE ROOT ZONE SHALL BE DONE BEYOND THAT WHICH WAS APPROVED, WITHOUT OBTAINING WRITTEN APPROVAL FROM THE RECREATION AND PARKS ARBORIST PRIOR TO PROCEEDING.
20. THE AREA WITHIN THE CHAIN LINK FENCE SHALL NOT BE USED FOR MATERIAL, EQUIPMENT STORAGE, OR PARKING DURING CONSTRUCTION.
21. DURING CONSTRUCTION, THE IMPACTED TREES SHOULD BE CLOSELY MONITORED TO FURTHER MITIGATE SHOCK SYMPTOMS IF THEY OCCUR. THE CONTRACTOR SHOULD BE PREPARED TO PROVIDE TEMPORARY WATER TO IRRIGATE AND WASH THE DUST FROM FOLIAGE IF NEEDED. CONTACT A RECREATION AND PARKS ARBORIST IF A DECLINE IN TREE CONDITION IS NOTED.
22. RECREATION AND PARKS ARBORISTS ARE AVAILABLE TO ANSWER ANY GENERAL QUESTIONS REGARDING TREES IN PARKS.

DEMOLITION NOTES

1. PROTECT IN PLACE EXISTING TREES - SEE NOTES
2. PROTECT IN PLACE EXISTING FENCE
3. PROTECT IN PLACE EXISTING STREET LIGHTING
4. PROTECT IN PLACE EXISTING FIELD LIGHTING
5. PROTECT IN PLACE EXISTING RESTROOM BUILDING
6. PROTECT IN PLACE EXISTING PAVING

LEGEND

- LIMIT OF WORK
- EXISTING FENCE
- EXISTING TREES
- EXISTING LAWN TO BE REMOVED TO DEPTH OF 6"
- EXISTING INFIELD TO BE REMOVED TO DEPTH OF 10"

Underground Service Alert
Call : TOLL FREE
1-800
422-4133
TWO WORKING DAYS BEFORE YOU DIG

30' 20' 10' 0 30' 60'
1"=30'

DAMAGES

IF A TREE THAT IS DESIGNATED TO REMAIN IS REMOVED OR CAUSED TO BE IRREVERSIBLY DAMAGED AS DETERMINED BY THE RECREATION AND PARKS ARBORIST, THE CONTRACTOR SHALL INSTALL A REPLACEMENT TREE MATCHING IN SIZE, QUALITY AND VARIETY USING AN INSTALLER DESIGNATED BY THE RECREATION AND PARKS ARBORIST. IF AN ACCEPTABLE REPLACEMENT TREE IS NOT AVAILABLE, PAY DAMAGES TO THE CITY FOR THE VALUE OF THE DAMAGED TREE AS ASSESSED BY THE TREE VALUE FORMULA IN THE ISA GUIDE FOR ESTABLISHING VALUE OF TREES AND OTHER PLANTS.

IMPLEMENTATION

THE QUALIFICATIONS OF OAK TREE CONSULTANTS SHALL ALSO BE REVIEWED PRIOR TO REPORT PREPARATION. IF TREE REMOVALS ARE REQUESTED, THE STREET TREE DIVISION REVIEWS APPLICATIONS AND PASSES THEIR RECOMMENDATIONS TO THE BOARD OF PUBLIC WORKS FOR ACTION. IF PRUNING IS REQUIRED, CONTACT STEVE DUNLAP, TREE SURGEON SUPERVISOR III, AT CENTRAL SERVICE YARD, (213) 485-6547.

*REFER TO TREE PROTECTION DETAILS, SHEET L-3, DETAILS E5 AND E9.

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REVISION DATES (DESIGN STAGE ONLY)
12.09.02

Sheet Version 2.0

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NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

LICENSED LANDSCAPE ARCHITECT — LAURA BAUERNFEIND — No. 4840 — March 31, 2011 — Renewal Date — STATE OF CALIFORNIA

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E. — CITY ENGINEER — DATE:
LIC. NO. 4840

DESIGN GROUP

ENGINEER: MATTHEW DURHAM
DESIGNED BY: YUNSOO KIM
DRAWN BY: JOSH SEGAL
CHECKED BY: YUNSOO KIM/ JAMES CURTIS
APPROVED BY: MATTHEW DURHAM

EDAW | AECOM
515 S. FLOWER ST., 9TH FLOOR
LOS ANGELES, CALIFORNIA 90071

BLACK & VEATCH Corporation
Los Angeles, California

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

VERTICAL CONTROL: NGVD29, 1986 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: LANDSCAPE DEMOLITION PLAN

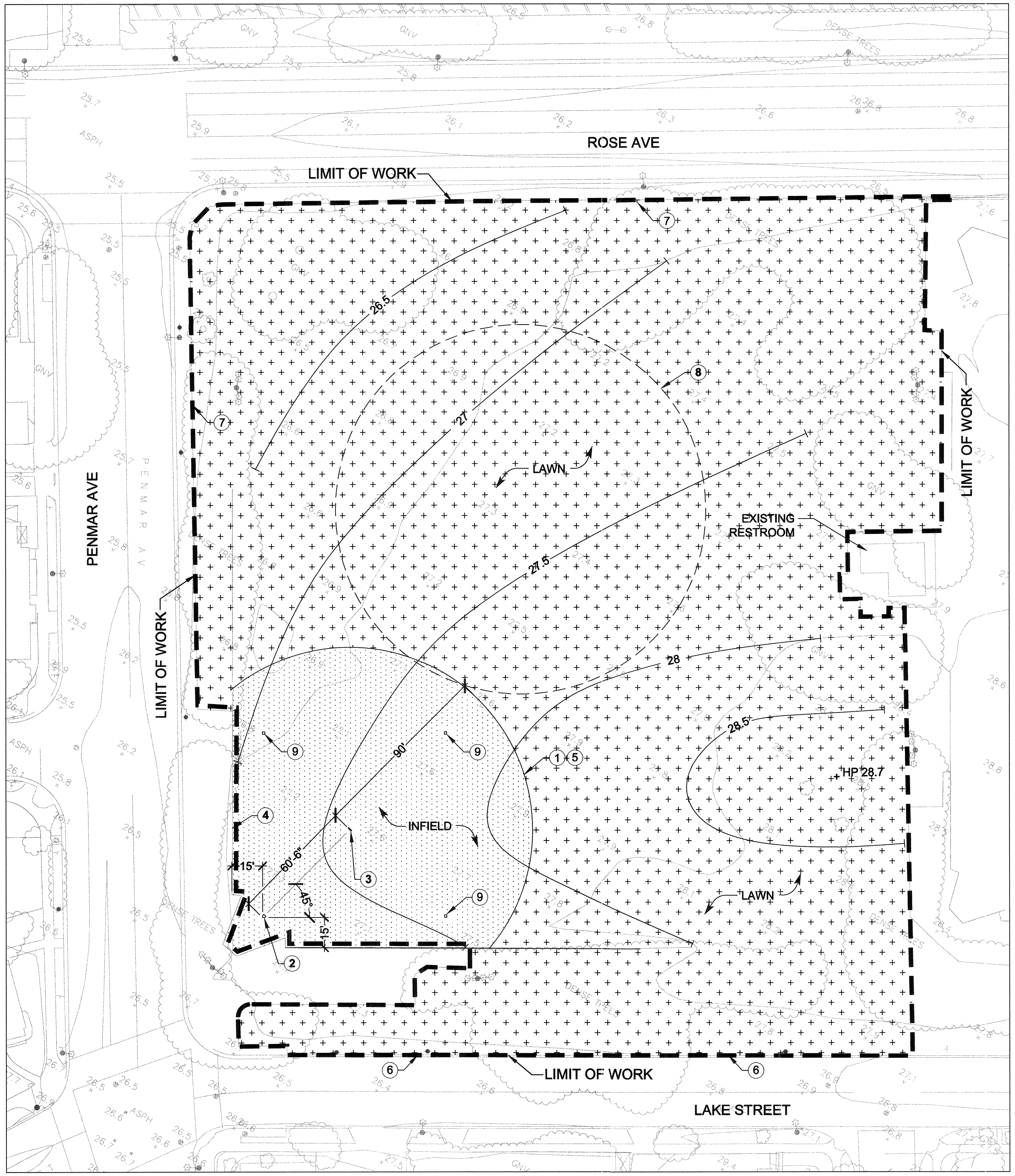
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. L-1

SHEET 43 OF ~~106~~ 48 SHEETS



LANDSCAPE CONSTRUCTION PLAN
SCALE: 1" = 30'-0"

PRODUCT SPECIFICATIONS

BASEBALL INFIELD MIX

THE TOP 6 INCHES OF THE SKINNED INFIELD SHALL BE IMPORTED "BASEBALL MIX," COMPACTED TO 90% RELATIVE COMPACTION. THE MIX SHALL BE A SANDY LOAM SOIL CONSISTING OF 30% CLAY, 40% SAND AND 30% SILT, PROCESSED IN A 3/16" ROTATING SCREEN AND PULVERIZED. NO STONE PARTICLES LARGER THAN 3/16" WILL BE ALLOWED IN THE MIX. MIX AVAILABLE AT B.D. WHITE, (213) 370-5511; A.E. SCHMIDT, (818) 983-0297; OR BRUBAKER-MANN, (714) 256-2520, (200-2.6). SUPPLY DELIVERY TICKET TO THE BCA CITY INSPECTOR.

THE PORTION OF D.G RETAINED ON THE NO. 4 SIEVE SHALL HAVE A MAXIMUM PERCENTAGE OF WEAR OF 50 AT 500 REVOLUTIONS AS DETERMINED BY AASHTO T96-77.

THE PORTION PASSING A NO. 40 SIEVE SHALL HAVE A MAXIMUM LIQUID LIMIT OF 25 AND MAXIMUM PLASTICITY INDEX OF 7 AS DETERMINED BY AASHTO T89-81 AND AASHTO T90-81, RESPECTIVELY.

CRUSHED AGGREGATE SCREENINGS SHALL BE FREE FROM CLAY LUMPS, VEGETATIVE MATTER AND DELETERIOUS MATERIAL.

SOIL STABILIZER

THE STABILIZER SHALL BE A NON-TOXIC, COLORLESS, ODORLESS, ORGANIC POWDER THAT BINDS D.G. SCREENINGS. THE STABILIZER SHALL BE MANUFACTURED BY STABILIZER INC., (800) 336-2468, FAX, (602) 852-0718.

BASEBALL DIAMOND EQUIPMENT

1 (ONE) HOME PLATE, MODEL NO. SRHP-10350, MANUFACTURED BY HOLLYWOOD BASES (800) 959-1844, OR EQUAL.

1 (ONE) PITCHING RUBBER MODEL NO. BBPB-10380, MANUFACTURED BY HOLLYWOOD BASES (800) 959-1844, OR EQUAL.

CONSTRUCTION NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY COORDINATION WITH SUB-CONTRACTORS AS REQUIRED TO ACCOMPLISH ALL CONSTRUCTION OPERATIONS.
2. LIMIT OF WORK AND PROPERTY LINE SHALL BE VERIFIED PRIOR TO COMMENCING WORK.
3. REFER TO CITY STANDARD PLANS AND SPECIFICATIONS WHERE APPLICABLE.
4. CONTRACTOR SHALL NOTIFY PROJECT MANAGER OR CITY'S RESPRESENTATIVE OF ANY DISCREPANCIES. FAILURE TO MAKE SUCH CONFLICTS KNOWN WILL RESULT IN CONTRACTOR'S LIABILITY TO REDO THE WORK WITHOUT ADDITIONAL COST TO THE CITY.
5. FOR TOPSOIL REQUIREMENTS SEE SECTION 02950-2.1.
6. FOR FILL SOIL SEE CIVIL DRAWINGS AND SPECIFICATIONS.
7. THE LAWN SEEDING SHALL BEGIN DURING THE WINDOW OF APRIL 15TH THROUGH SEPTEMBER 15TH, IN ORDER TO ESTABLISH WARM SEASON GRASS. IF THE CONTRACTOR IS NOT READY TO APPLY THE SEED WITHIN THESE DATES, THE ENGINEER (AT THE ENGINEER'S OPTION) WILL GRANT THE CONTRACTOR A NON-COMPENSABLE TIME EXTENSION OF THE LAWN INSTALLATION PORTION OF THE WORK ONLY. THE TIME EXTENSION WILL BE THE NUMBER OF CALENDAR DAYS FROM THE DATE THE CONTRACTOR IS READY TO APPLY SEED UNTIL APRIL 15TH. THERE WILL BE NO CORRESPONDING TIME EXTENSION FOR THE BALANCE OF THE WORK. IF ALL OTHER CONTRACT WORK IS COMPLETED EXCEPT THE LAWN WORK, THE CONTRACTOR MAY DEMOBILIZE PERMANENTLY FROM THE SITE. CONTACT JUAN GUZMAN, FACILITY DIRECTOR, AT (310) 396-8735 FOR COORDINATING FIELD SHUTDOWN. SEE GENERAL REQUIREMENTS SECTION 02950 FOR PLANTING REQUIREMENTS.

MATERIALS LEGEND

SYMBOL	KEY	DESCRIPTION
	LAWN	PENNISETUM CLANDESTINUM / KIKUYU GRASS (SEED - REFER TO SPECIFICATIONS FOR HYDROSEED MIXTURE)
	INFIELD	INFIELD BASEBALL MIX - SEE SPECS ABOVE

LEGEND

SYMBOL	DESCRIPTION	
	LIMIT OF WORK	
	EXISTING FENCE (TO REMAIN)	
	PROPOSED TOPO	
	EXISTING TOPO	
	EXISTING TREES (TO REMAIN)	
1	STANDARD FULL SIZE BASEBALL FIELD (PER LANDSCAPE ARCHITECTURAL DESIGN GUIDELINES, CITY OF L.A.)	
2	HOME PLATE - SEE SPECS ABOVE	
3	PITCHING RUBBER - SEE SPECS ABOVE	
4	SKINNED INFIELD AT PAVING	SEE A9/L-3
5	LAWN AT SKINNED INFIELD	SEE A5/L-3
6	LAWN AT CONCRETE CURB	SEE A1/L-3
7	LAWN AT SIDEWALK	SEE E1/L-3
8	BURIED WATER TANK	SEE CIVIL DRAWINGS
9	BASES - SHOWN FOR CONTEXT ONLY (NOT TO BE PROVIDED)	

30' 20' 10' 0 30' 60'
1"=30'

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REVISION DATED (DESIGN STAGE ONLY) 12.09.02

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LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation
Los Angeles, California

EDAW | AECOM
515 S. FLOWER ST, 9TH FLOOR
LOS ANGELES, CALIFORNIA 90071

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS • BUREAU OF ENGINEERING

GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
ENGINEER: MATTHEW DURHAM LIC. NO. 4840
DESIGNED BY: YUNSOO KIM
DRAWN BY: JOSH SEGAL
CHECKED BY: YUNSOO KIM / JAMES CURTIS
APPROVED BY: MATTHEW DURHAM

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

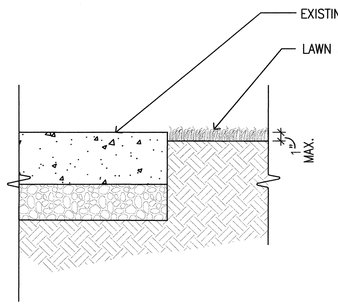
SHEET TITLE: LANDSCAPE CONSTRUCTION PLAN
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

NO. | REVISIONS: | DATE: | BY:

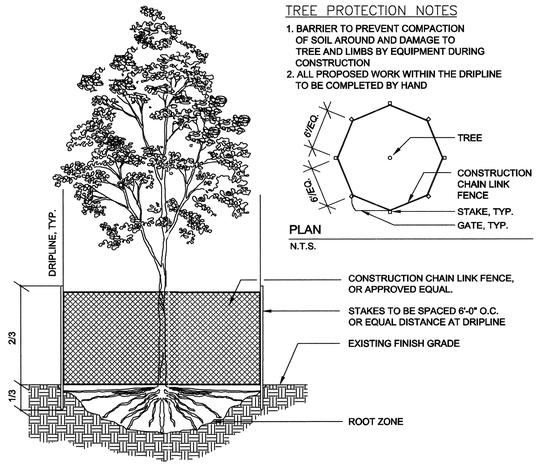
STRUCTURE NO.

INDEX NO.

WORK ORDER NO. EW40019F
DRAWING NO. L-2
SHEET 44 OF 108 48 SHEETS



E1 LAWN AREA AT SIDEWALK
1-1/2" = 1'-0" | L-2 | DT-PAVE-17-CONCPAVER@PLANT



TREE PROTECTION NOTES

1. BARRIER TO PREVENT COMPACTION OF SOIL AROUND AND DAMAGE TO TREE AND LIMBS BY EQUIPMENT DURING CONSTRUCTION
2. ALL PROPOSED WORK WITHIN THE DRIPLINE TO BE COMPLETED BY HAND

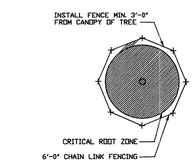
PLAN
N.T.S.

E5 TYPICAL TREE PROTECTION
NTS | L-1 | DT-TREE PROTECTION

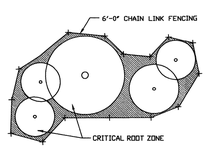
TREE PROTECTION FENCING NOTES

1. TREE PROTECTION SHALL BE A MINIMUM OF 6'-0" HIGH CHAIN LINK FENCE MOUNTED ON VERTICAL PIPES DRIVEN 2'-0" INTO THE GROUND, AT APPROXIMATELY 6'-0" TO 10'-0" (MAX.) ON CENTER, WITH NO GATES.

2. TREE PROTECTIONS SHALL BE ERECTED AT THE CRITICAL ROOT ZONE OR BEYOND PRIOR TO START OF ANY CLEANING, GRADING, OR OTHER CONSTRUCTION ACTIVITY. SIGNS STATING "NO ENTRY, TREE PROTECTION AREA, CALL 213-485-3674 TO REPORT VIOLATIONS" ARE TO BE POSTED IN BOTH ENGLISH AND SPANISH. TREE PROTECTION SHALL NOT BE REMOVED UNTIL COMPLETION OF ALL CONSTRUCTION ACTIVITY.

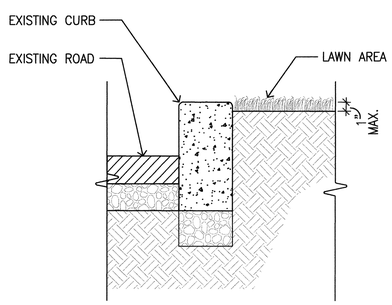


SINGLE OR SPECIMEN TREE

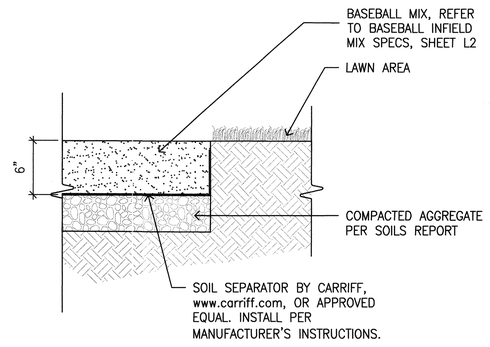


MULTIPLE OR CLUSTERED TREES

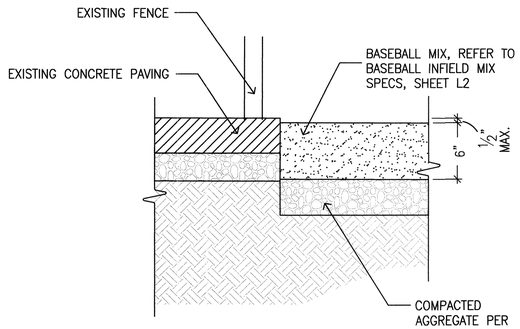
E9 TYPICAL TREE PROTECTION FENCE
NTS | L-1 | DT-PROTECTION FENCE



A1 LAWN AREA AT CURB
1-1/2" = 1'-0" | L-2 | DT-PAVE-17-CURB@PLANT



A5 LAWN AREA AT SKINNED INFIELD
1-1/2" = 1'-0" | L-2 | DT-PAVE-17-SKINNEDINFIELD@PLANT



A9 SKINNED INFIELD AT PAVING
1-1/2" = 1'-0" | L-2 | SKINNED INFIELD@CURB

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INDEX NO.

LICENSED LANDSCAPE ARCHITECT MATTHEW DURHAM NO. 4840 March 31, 2011 RENEWAL DATE 2-31-14 STATE OF CALIFORNIA

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

EDAW | AECOM
515 S. FLOWER ST., 9TH FLOOR
LOS ANGELES, CALIFORNIA 90071

GARY LEE MOORE, P.E. — CITY ENGINEER — DATE:
LIC. NO. 4840

DESIGN GROUP	
ENGINEER:	MATTHEW DURHAM
DESIGNED BY:	YUNSOO KIM
DRAWN BY:	JOSH SEGAL
CHECKED BY:	YUNSOO KIM/ JAMES CURTIS
APPROVED BY:	MATTHEW DURHAM

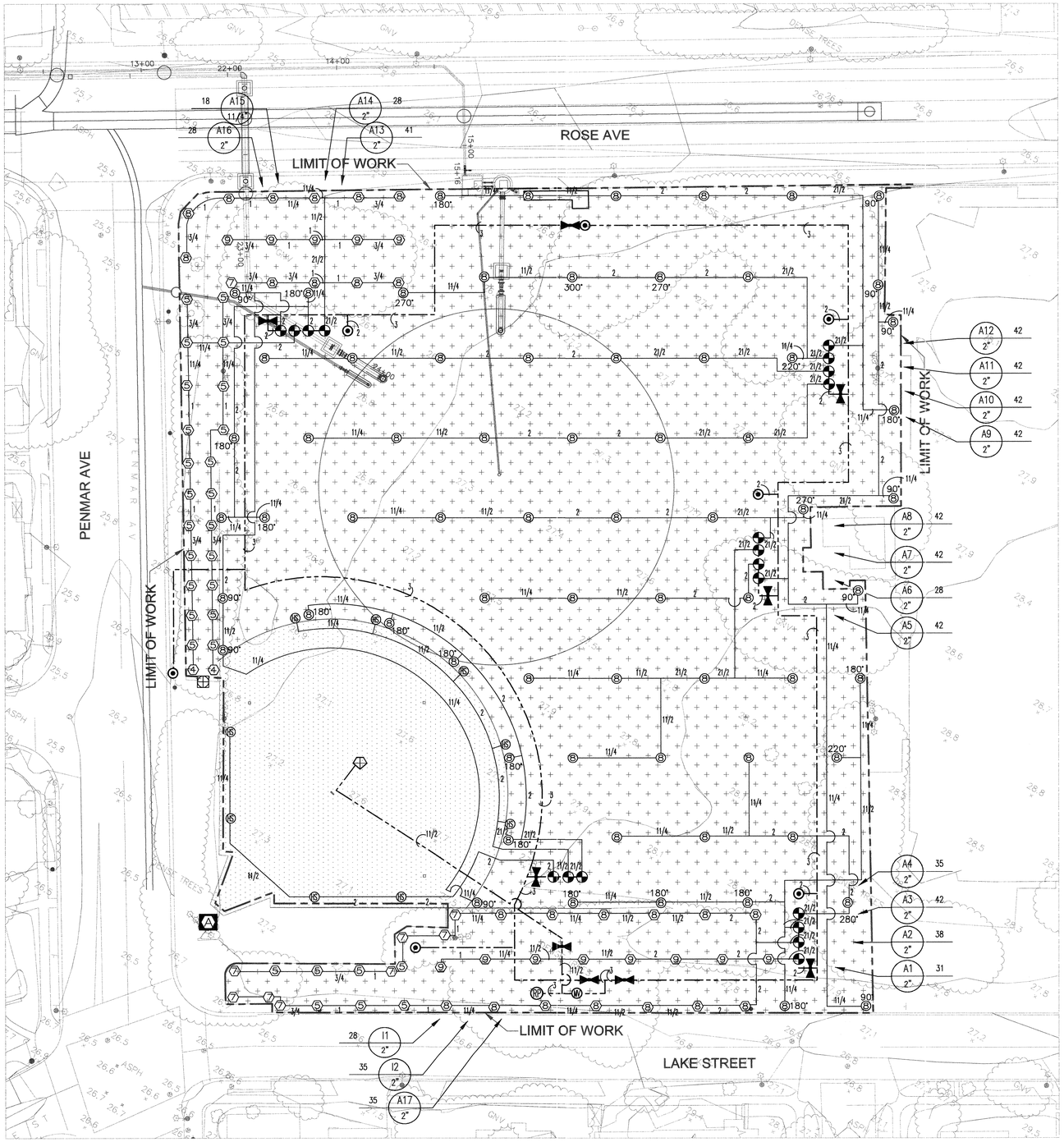
BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation
Los Angeles, California

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.8

SHEET TITLE: LANDSCAPE DETAILS
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F
DRAWING NO. L-3 48
SHEET 45 OF ~~108~~ SHEETS



IRRIGATION PLAN

SCALE: 1" = 30'-0"

NOTE A:
CONTRACTOR SHALL CONNECT NEW PROPOSED 3" IRRIGATION MAINLINE DIRECTLY DOWNSTREAM OF EXISTING 2" BACKFLOW DEVICE. REMOVE ALL EXISTING MAINLINE PIPE DOWNSTREAM OF BACKFLOW DEVICE AND TIE NEW PROPOSED MAINLINE INTO BACKFLOW DEVICE. VERIFY THE ACTUAL LOCATION, SIZE AND WATER PRESSURE IN THE FIELD PRIOR TO STARTING WORK. IF ANY OF THE POC INFORMATION SHOWN ON THESE DRAWING IS FOUND TO BE DIFFERENT THAN THE ACTUAL POC INFORMATION GATHERED IN THE FIELD, IMMEDIATELY NOTIFY LANDSCAPE ARCHITECT OR CITY'S AUTHORIZED REPRESENTATIVE. SHOULD THE CONTRACTOR FAIL TO VERIFY THE POC INFORMATION ANY CHANGES REQUIRED BY LOW PRESSURE OR VOLUME SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

STATIC WATER PRESSURE	63 PSI
DESIGN WATER PRESSURE	63 PSI
MAXIMUM SYSTEM DEMAND	42 GPM
RESIDUAL WATER PRESSURE	0 PSI

NOTE B:
CONTRACTOR SHALL REFER TO IRRIGATION LEGEND FOR CONTROLLER TYPE AND SIZE. FINAL LOCATION OF CONTROLLER AND ELECTRICAL POC SHALL BE CONFIRMED WITH CITY'S AUTHORIZED REPRESENTATIVE PRIOR TO COMMENCING WORK.

NOTE C:
CONTRACTOR SHALL REMOVE EXISTING RAIN BIRD ESP-LX CONTROLLER AND TURN OVER TO THE CITY. CONTRACTOR SHALL REROUTE ALL NEW CONTROL WIRES TO CONTROLLER LOCATION. EXISTING WIRES ARE TO BE REMOVED AND DISCARDED.

NOTE D:
CONTRACTOR SHALL ADJUST ALL HEADS AS REQUIRED TO ACCOMMODATE ANY VERTICAL OBSTRUCTIONS THAT MAY OCCUR, INCLUDING BUT NOT LIMITED TO LIGHT POLES, FIRE HYDRANTS, ETC. VERIFY ALL HEAD LAYOUT WITH CITY'S AUTHORIZED REPRESENTATIVE PRIOR TO COMMENCING WORK.

NOTE E:
CONTRACTOR SHALL VERIFY ALL SITE CONDITIONS, PROPERTY LINES, DIMENSIONS, ETC. PRIOR TO BIDDING AND PRIOR TO COMMENCING WORK. NOTIFY THE CITY'S AUTHORIZED REPRESENTATIVE IMMEDIATELY IF ANY DISCREPANCIES ARE FOUND. CONTRACTOR SHALL THOROUGHLY FAMILIARIZE HIMSELF WITH ALL SITE CONDITIONS PRIOR TO BIDDING AND COMMENCING WORK.

NOTE F:
CONTRACTOR SHALL CONNECT RCV 11' AND 12' CONTROL WIRES TO INDIVIDUAL SWITCHES WITHIN ENCLOSURE. CONNECT SEPARATE COMMON WIRE TO BOTH SWITCHES. VERIFY ACTUAL INSTALLATION LOCATION IN FIELD WITH CITY'S AUTHORIZED REPRESENTATIVE.

NOTE G:
THE RCV MANIFOLD FOR VALVES I1, I2 , AND A17 SHALL BE INSTALLED OUTSIDE PLAYING FIELD A OF MINIMUM 15 FEET SOUTH OF RIGHT FIELD FOUL LINE.

NOTE H:
THE QCV SHALL BE INSTALLED BEHIND PITCHER'S MOUND AT A LOCATION DETERMINED BY THE CITY'S REPRESENTATIVE.

NOTE I:
CONTACT RECREATION AND PARKS PRIOR TO REMOVING EXISTING IRRIGATION SYSTEM. ED FRY 310-836-1040.

NOTE J:
CAP EXISTING UTILITIES ENDS FOR IRRIGATION.

30' 20' 10' 0 30' 60'
1"=30'

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

Sheet Version 2.0

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LOS ANGELES, CALIFORNIA

BLACK & VEATCH
Corporation
Los Angeles, California

EDAW | AECOM
515 S. FLOWER ST. 9TH FLOOR
LOS ANGELES, CALIFORNIA 90071

BRINKERHOFF & ASSOCIATES
IRRIGATION DESIGN & CONSERVATION MANAGEMENT
73280 HWY 111, SUITE 203,
PALM DESERT, CA. 92260
OFFICE: 760-346-5872
FAX: 760-346-5875

LANDSCAPE ARCHITECT
LICENSED
MATTHEW DURHAM
No. 4840
March 31, 2011
REGISTERED
STATE OF CALIFORNIA

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CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

CITY ENGINEER: GARY LEE MOORE, P.E. DATE:

DESIGN GROUP		
ENGINEER:	MATTHEW DURHAM	LIC. NO. 4840
DESIGNED BY:	MARK BRINKERHOFF	
DRAWN BY:	SID MARTINEZ	
CHECKED BY:	JIM BRINKERHOFF	
APPROVED BY:	MATTHEW DURHAM	

VERTICAL CONTROL: NGVD29, 1988 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: IRRIGATION PLAN
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F
DRAWING NO. L-4
SHEET 46 OF ~~108~~ 48 SHEETS

IRRIGATION LEGEND

IRRIGATION SPRINKLERS

SYMBOL/NOZZLE Q	H	F	MFR.	MODEL NO. / DESCRIPTION	G.P.M./NOZZLE Q	H	F	PRECIP RATE/HR.	PSI	RADIUS	DETAIL / SHEET
①	②	③	RAIN BIRD	1806-SAM TURF HEAD W/ HUNTER MP ROTATOR 1000 SERIES 90/180/360 NOZZLES	.19	.37	.75	0.39"	44	10-14 FT	A9, L-6
④	⑤	⑥	RAIN BIRD	1806-SAM TURF HEAD W/ HUNTER MP ROTATOR 2000 SERIES 90/180/360 NOZZLES	.40	.74	1.47	0.39"	44	15-21 FT	A9, L-6
⑦	⑧	⑨	RAIN BIRD	1806-SAM TURF HEAD W/ HUNTER MP ROTATOR 3000 SERIES 90/180/360 NOZZLES	.86	1.82	3.64	0.39"	44	22-30 FT	A9, L-6
	⑧		RAIN BIRD	F4-FC/PC-SS W/ NOZZLE #8 TURF ROTOR HEAD	7.0			Q H F 1.50" 0.75" 0.37"	44	45 FT	E9, L-6
	⑧		RAIN BIRD	F4-PC-SS-HS W/ NOZZLE #8 TURF ROTOR HEAD	7.0			DUST CONTROL	44	45 FT	E9, L-6

IRRIGATION UTILITIES

Ⓜ	SUPERIOR	MODEL 3000, 2" NORMALLY CLOSED MASTER CONTROL VALVE	I9, L-6
Ⓜ	EXISTING	EXISTING 2" BACKFLOW DEVICE, VERIFY EXACT LOCATION IN FIELD, PRIOR TO COMMENCING WORK.	N/A
▶◀	NIBCO	T-113 GATE VALVE, LINE SIZE, WITH BRONZE WHEEL HANDLE UP TO 2" AND BRONZE CROSS HANDLE OVER 2" IN SIZE	I5, E1, L-6
⊙	RAIN BIRD	44-RC, 1" QUICK COUPLER VALVE. CONTRACTOR TO SUPPLY TWO (2) QCV KEYS MODEL # 44K WITH 1" FULL PORT HOSE BIB TO THE CITY PRIOR TO FINAL COMPLETION	A1, L-6
◉	RAIN BIRD	XXX-GB, (11/4", 2") BRASS SERIES REMOTE CONTROL VALVE, SIZE AS SHOWN	I5, I9, L-6
◈	NELSON	7542, 1" QUICK COUPLER VALVE. CONTRACTOR TO SUPPLY ONE (1) QCV KEY MODEL 7641 WITH 1" FULL PORT HOSE BIB TO THE CITY PRIOR TO FINAL COMPLETION	A1, L-6

IRRIGATION CONTROLLER

Ⓐ	WEATHERMATIC	SL-4800 SMARTLINE CONTROLLER WITH TWO SLM12 12-ZONE MODULES, 24 STATION WALL MOUNTED CONTROLLER	N/A
NO SYMBOL	WEATHERMATIC	SMARTLINE SLRC-KIT WIRELESS HANDHELD REMOTE CONTROL KIT. INCLUDES HANDHELD REMOTE AND SLHUB-RF WIRELESS RECEIVER HUB. CONTRACTOR SHALL HOOKUP HUB TO CONTROLLER AND SHALL DELIVER RECEIVER TO THE CITY PRIOR TO FINAL COMPLETION.	N/A
⊠	WEATHERMATIC	SLW WIRELESS ON-SITE WEATHER STATION. LOCATION TO BE DETERMINED BY CITY REPRESENTATIVE	N/A
E	EXISTING	120 VOLT ELECTRICAL POWER, VERIFY ACTUAL LOCATION IN FIELD	N/A
⊞	AS APPROVED	INFIELD BYPASS SWITCH ASSEMBLY, CONNECT RCV '11' AND '12' CONTROL WIRES TO INDIVIDUAL SWITCHES WITHIN ENCLOSURE. CONNECT SEPARATE COMMON WIRE TO BOTH SWITCHES. VERIFY ACTUAL INSTALLATION LOCATION IN FIELD WITH AUTHORIZED CITY REPRESENTATIVE.	I1, L-6

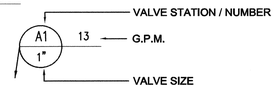
IRRIGATION PIPING

———	AS APPROVED	PVC PIPE 3/4" - 21/2" SCH.40 AS LATERAL LINES 12" BELOW GRADE	A5, L-6
——— – – ———	AS APPROVED	PVC PIPE (11/2", 2") SCH.40 AS MAINLINES 24" BELOW GRADE PVC PIPE 3" CL.315 AS MAINLINES 24" BELOW GRADE	A5,E5, L-6
— — — — —	AS APPROVED	PVC PIPE SCH. 40 AS SLEEVING, TWICE THE DIAMETER OF PIPE OR WIRE BUNDLE CARRIED PLACE BELOW ALL PAVING, HARDSCAPE, ETC., AND AS DIRECTED BY CITY'S AUTHORIZED REPRESENTATIVE.	A5,E5, L-6

IRRIGATION MISCELLANEOUS EQUIPMENT

NO SYMBOL	AS APPROVED	PVC SCH 80 FITTINGS MUST BE USED ON ALL SOLVENT WELD MAINLINE FITTINGS 2"-3". WHEN A FITTING HAS A THREADED FEMALE OR MALE COMPONENT THE FITTING SHALL ALWAYS BE PVC SCH 80. ALL THREADED PLASTIC NIPPLES SHALL BE PVC SCH 80 TYPE	N/A
NO SYMBOL	AS APPROVED	CONCRETE IRRIGATION VALVE BOXES WITH LOCKING METAL LIDS FOR IRRIGATION EQUIPMENT. MANUFACTURER AND MODEL SHALL BE CITY APPROVED ONLY	I5, I9, L6
NO SYMBOL	AS APPROVED	IRRIGATION 'COMMON' WIRE #12UF AWG DIRECT BURIAL (U.L. APPROVED)	N/A
NO SYMBOL	AS APPROVED	IRRIGATION 'CONTROL' WIRE #14UF AWG DIRECT BURIAL (U.L. APPROVED)	N/A
NO SYMBOL	3M	DBY & OR DBR WIRE SPLICE/CONNECTOR	N/A

IRRIGATION VALVE IDENTIFICATION



IRRIGATION NOTES

1. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROCURE AN ORIGINAL SET OF THESE PRINTED IRRIGATION PLANS FOR BIDDING AND CONSTRUCTION. COPIES OF THESE PLANS ARE NOT ALLOWED FOR BIDDING AND CONSTRUCTION AS THEY MAY NOT SHOW IRRIGATION SYMBOLS, LINE WEIGHTS, OR LINE TYPES CLEARLY.
2. ALL LOCAL MUNICIPAL AND STATE LAWS, RULES AND REGULATIONS GOVERNING OR RELATING TO ANY PORTION OF THIS WORK ARE HEREBY INCORPORATED INTO AND MADE A PART OF THESE SPECIFICATIONS AND THEIR PROVISIONS SHALL BE CARRIED OUT BY THE CONTRACTOR.
3. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL EXISTING UTILITIES, STRUCTURES AND SERVICES BEFORE COMMENCING WORK. THE LOCATIONS OF UTILITIES, STRUCTURES AND SERVICES SHOWN IN THESE PLANS ARE APPROXIMATE ONLY. ANY DISCREPANCIES BETWEEN THESE PLANS AND ACTUAL FIELD CONDITIONS SHALL BE REPORTED TO THE OWNER'S REPRESENTATIVE.
4. THE CONTRACTOR SHALL OBTAIN THE PERTINENT ENGINEERING OR ARCHITECTURAL PLANS BEFORE BEGINNING WORK.
5. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS REQUIRED TO PERFORM THE WORK INDICATED HEREIN BEFORE BEGINNING WORK.
6. THIS DESIGN IS DIAGRAMMATIC. ALL EQUIPMENT SHOWN IN PAVED AREAS IS FOR DESIGN CLARITY ONLY AND IS TO BE INSTALLED WITHIN PLANTING AREAS.
7. THE CONTRACTOR SHALL NOT WILLFULLY INSTALL ANY EQUIPMENT AS SHOWN ON THE PLANS WHEN IT IS OBVIOUS IN THE FIELD THAT UNKNOWN CONDITIONS EXIST THAT WERE NOT EVIDENT AT THE TIME THESE PLANS WERE PREPARED. ANY SUCH CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE CITY'S REPRESENTATIVE PRIOR TO ANY WORK OR THE IRRIGATION CONTRACTOR SHALL ASSUME ALL RESPONSIBILITY FOR ANY FIELD CHANGES DEEMED NECESSARY BY THE CITY'S.
8. INSTALL ALL EQUIPMENT AS SHOWN IN THE DETAILS AND SPECIFICATIONS. CONTRACTOR SHALL BE RESPONSIBLE TO COMPLY WITH LOCAL CITY, COUNTY AND STATE REQUIREMENTS FOR BOTH EQUIPMENT AND INSTALLATION.
9. ACTUAL LOCATION FOR THE INSTALLATION OF THE BACKFLOW PREVENTER AND THE AUTOMATIC CONTROLLER IS TO BE DETERMINED IN THE FIELD BY THE CITY'S AUTHORIZED REPRESENTATIVE.
10. CONTRACTOR IS TO PROVIDE TWO ADDITIONAL 'CONTROL WIRES' AND ONE ADDITIONAL 'COMMON' WIRE FROM CONTROLLER ALONG ENTIRETY OF MAIN LINE TO THE LAST RCV ON EACH AND EVERY LEG OF MAIN LINE. LABEL SPARE WIRES AT BOTH ENDS.
11. ALL PIPE UNDER PAVED AREAS TO BE INSTALLED IN SLEEVING TWICE THE DIAMETER OF THE PIPE CARRIED. SEE LEGEND FOR TYPE. ALL WIRE UNDER PAVED AREAS TO BE INSTALLED IN A SCH. 40 SLEEVE THE SIZE REQUIRED TO EASILY PULL WIRE THROUGH. ALL SLEEVES TO BE INSTALLED WITH A MINIMUM DEPTH AS SHOWN ON THE SLEEVING DETAILS. SLEEVES TO EXTEND AT LEAST 12" PAST THE EDGE OF THE PAVING.
12. ALL QUICK COUPLER AND REMOTE CONTROL VALVES TO BE INSTALLED IN SHRUB OR GROUND COVER AREAS WHERE POSSIBLE. ALL QUICK COUPLER AND REMOTE CONTROL VALVES TO BE INSTALLED AS SHOWN ON THE INSTALLATION DETAILS. INSTALL ALL QUICK COUPLER AND REMOTE CONTROL VALVES WITHIN 18" OF HARDSCAPE.
13. ALL HEADS ARE TO BE INSTALLED WITH THE NOZZLE, SCREEN AND ARCS SHOWN ON THE PLANS. ALL HEADS ARE TO BE ADJUSTED TO PREVENT OVERSPRAY ONTO BUILDINGS, WALLS, FENCES AND HARDSCAPE. THIS INCLUDES, BUT NOT LIMITED TO, ADJUSTMENT OF DIFFUSER PIN OR ADJUSTMENT SCREW, REPLACEMENT OF PRESSURE COMPENSATING SCREENS, REPLACEMENT OF NOZZLES WITH MORE APPROPRIATE RADIUS UNITS AND THE REPLACEMENT OF NOZZLES WITH ADJUSTABLE ARC UNITS.
14. THE CONTRACTOR SHALL USE U.L. APPROVED GROUND ROD(S) AND/OR GROUND PLATE(S) WITH CADWELD ONE-SHOT CONNECTION PROCESS FOR CONNECTING THE CONDUCTOR WIRE TO THE ROD(S) AND/OR PLATE(S). THE NUMBER OF RODS OR PLATES SHALL DEPEND ON THE CONDUCTIVITY OF THE IMMEDIATE SOIL SURROUNDING THE ROD(S) AND/OR PLATE(S). MAXIMUM GROUND RESISTANCE SHALL BE PER CONTROLLER MANUFACTURER'S SPECIFICATIONS.

IRRIGATION CONTROLLER RUN TIME CHART

CONTROLLER: A

Month:	JULY	Eto, INCHES	CROP FACTOR	Pr RATE, INCHES	IRRIGATION EFFCIENCY	RUN TIME PER DAY	CYCLES PER DAY	RUN TIME PER CYCLE	SOAK TIME PER CYCLE	TOTAL SOAK TIME	VALVE QUANTITY	TOTAL OPERATION TIME (HOURS)
Days In Month:	31	5.4	(Akc)		(IE)	(MINUTES)		(MINUTES)	(MINUTES)	(MINUTES)		
Water Days Per Week:	4											
TURF GRASS, Warm Season:												
MP Rotator Heads		5.4	0.60	0.39	85%	33	1	33	0	0	4	**2.21**
40'-55' Quarter Rotor Heads		5.4	0.60	1.50	80%	9	2	5	25	50	2	**0.30**
40'-55' Half Rotor Heads		5.4	0.60	0.75	80%	18	2	9	25	50	4	**1.22**
40'-55' Full Rotor Heads		5.4	0.60	0.37	80%	37	1	37	0	0	7	**4.33**
								TOTAL NUMBER OF STATIONS:			17	
								OVERHEAD SPRAY, TOTAL RUN TIME IN HOURS:				**8.06**
								TOTAL PROJECT, RUN TIME IN HOURS:				**8.06**

CITY DROUGHT REGULATIONS MAY REQUIRE ALTERATION TO THE CONTROLLER RUN TIME CHART. CONSULT WITH THE WEST REGION MAINTENANCE SUPERINTENDENT, (310) 202-2803 WHEN INITIALLY PROGRAMMING THE CONTROLLER.

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

Sheet Version 2.0

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Los Angeles, California

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IRRIGATION DESIGN & CONSERVATION MANAGEMENT
72280 HWY 111, SUITE 203, PALM DESERT, CA. 92260
OFFICE: 760-346-8872
FAX: 760-346-8875

LANDSCAPE IRRIGATION DESIGNER

LICENSED LANDSCAPE ARCHITECT — VINCENT DURHAM — No. 4840 — March 31, 2011 — Renewal Date — STATE OF CALIFORNIA

LA DPW ENGINEERING — Serving THE Present; Designing THE Future

BUREAU OF ENGINEERING

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E. — CITY ENGINEER — DATE:

DESIGN GROUP — LIC. NO. 4840

ENGINEER:	MATTHEW DURHAM
DESIGNED BY:	JIM BRINKERHOFF
DRAWN BY:	SID MARTINEZ
CHECKED BY:	JIM BRINKERHOFF
APPROVED BY:	MATTHEW DURHAM

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: IRRIGATION LEGEND

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. L-5

SHEET 47 OF ~~108~~ 58 SHEETS

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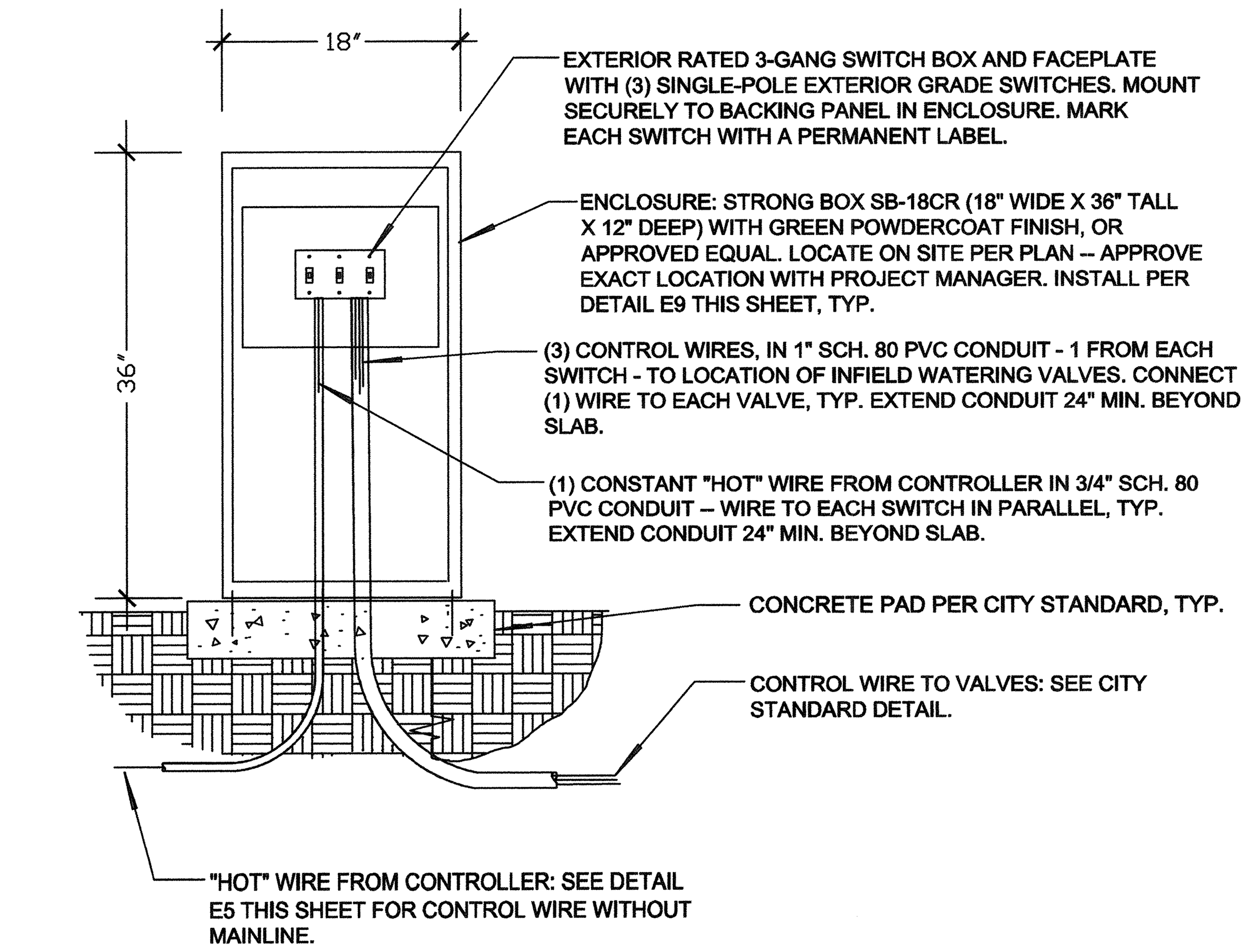
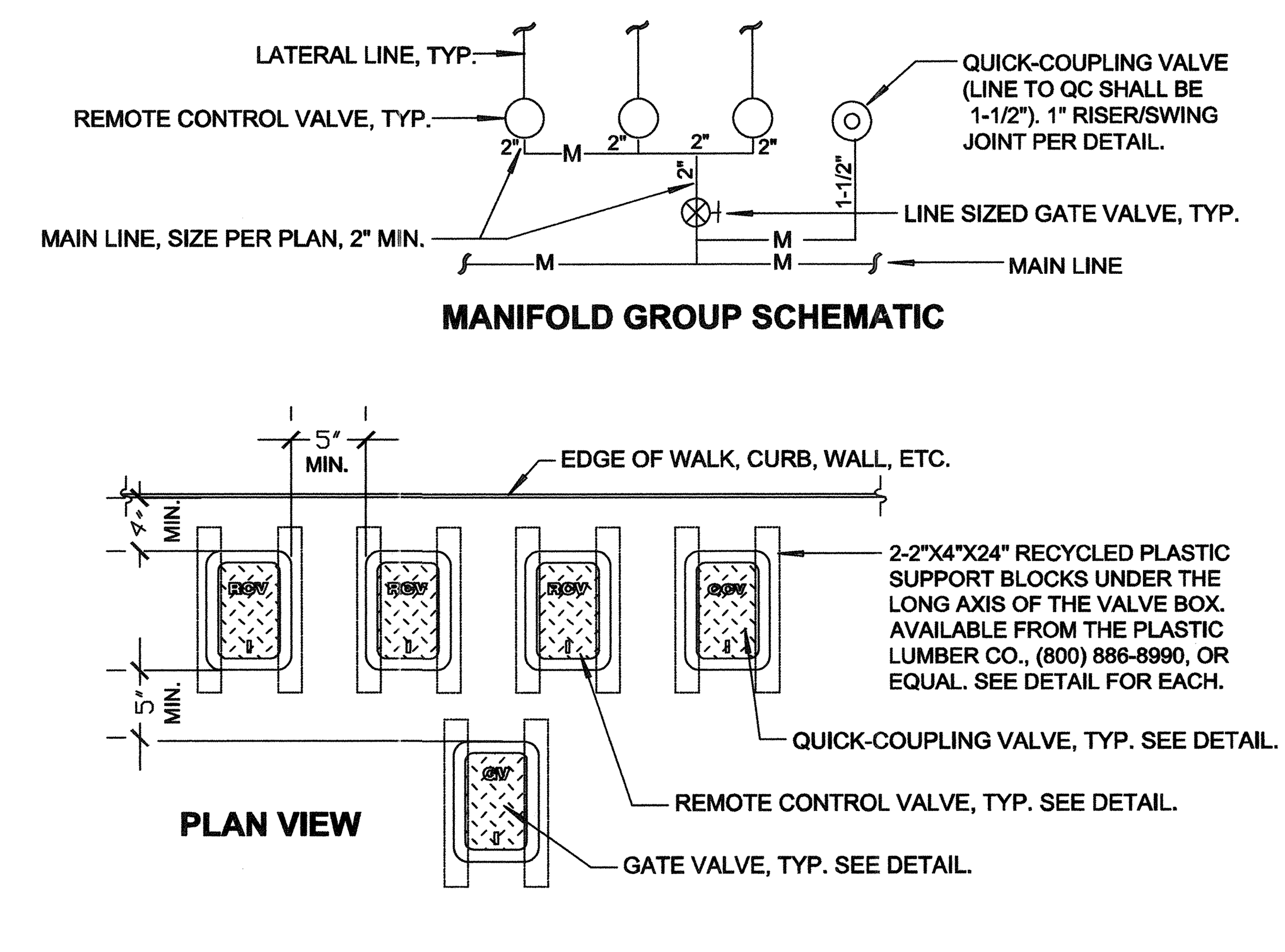


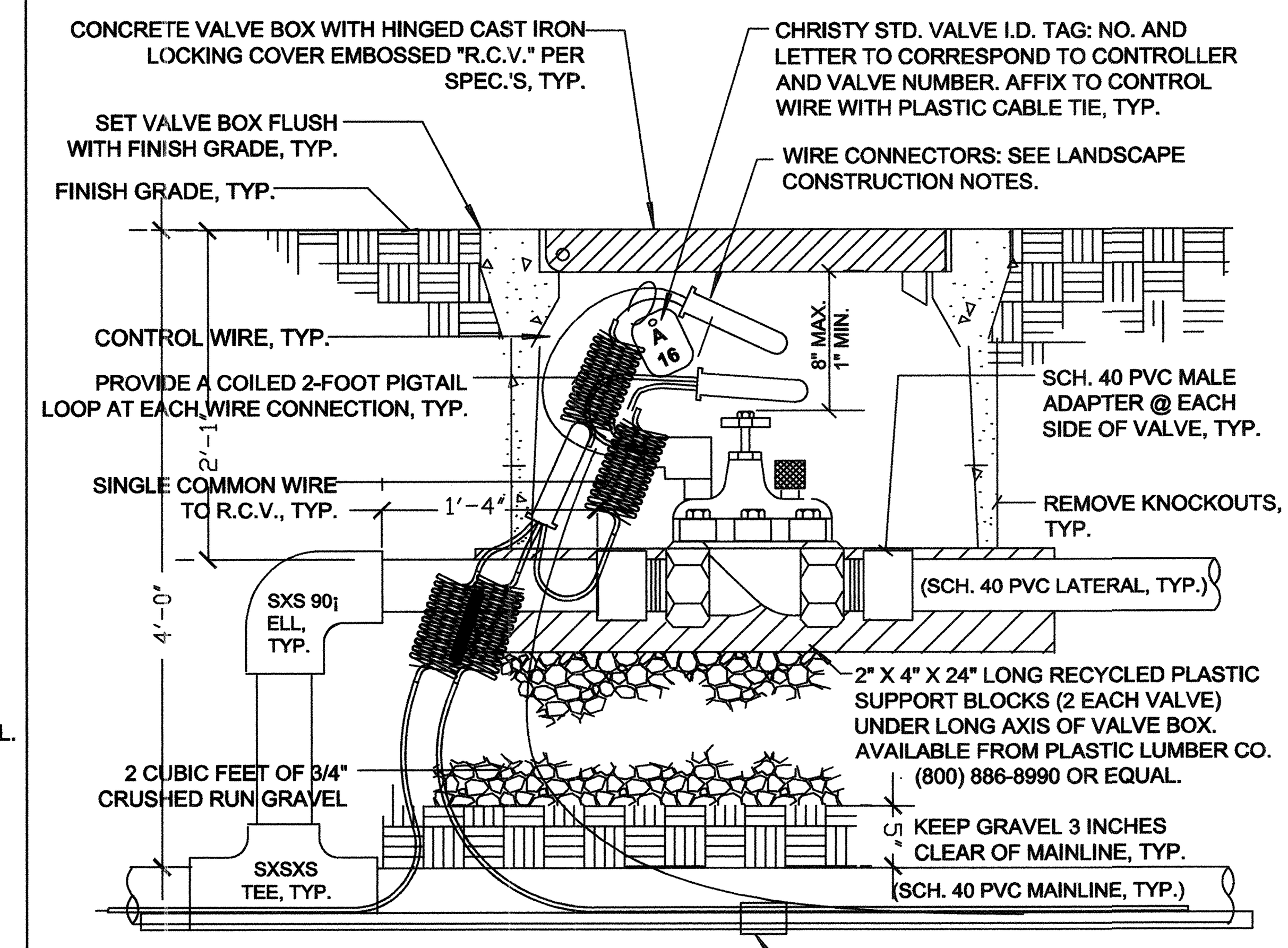
I1 INFIELD BYPASS SWITCH
N.T.S. BOE VERSION Jan/07 - RF — RAP DETAIL L1440



NOTES:
1. ALL VALVES SHALL BE RUN OFF A MANIFOLD GROUP SIMILAR TO THAT SHOWN IN ABOVE SCHEMATIC.
2. ALL BOXES SHALL BE SQUARE TO ONE ANOTHER, AND TO EDGES OF ADJACENT FIXED OBJECTS.
3. ALL VALVE BOXES SHALL BE SET FLUSH TO FINISH GRADE.

RP VERSION 5-13-96 RLF, JPH, RCM

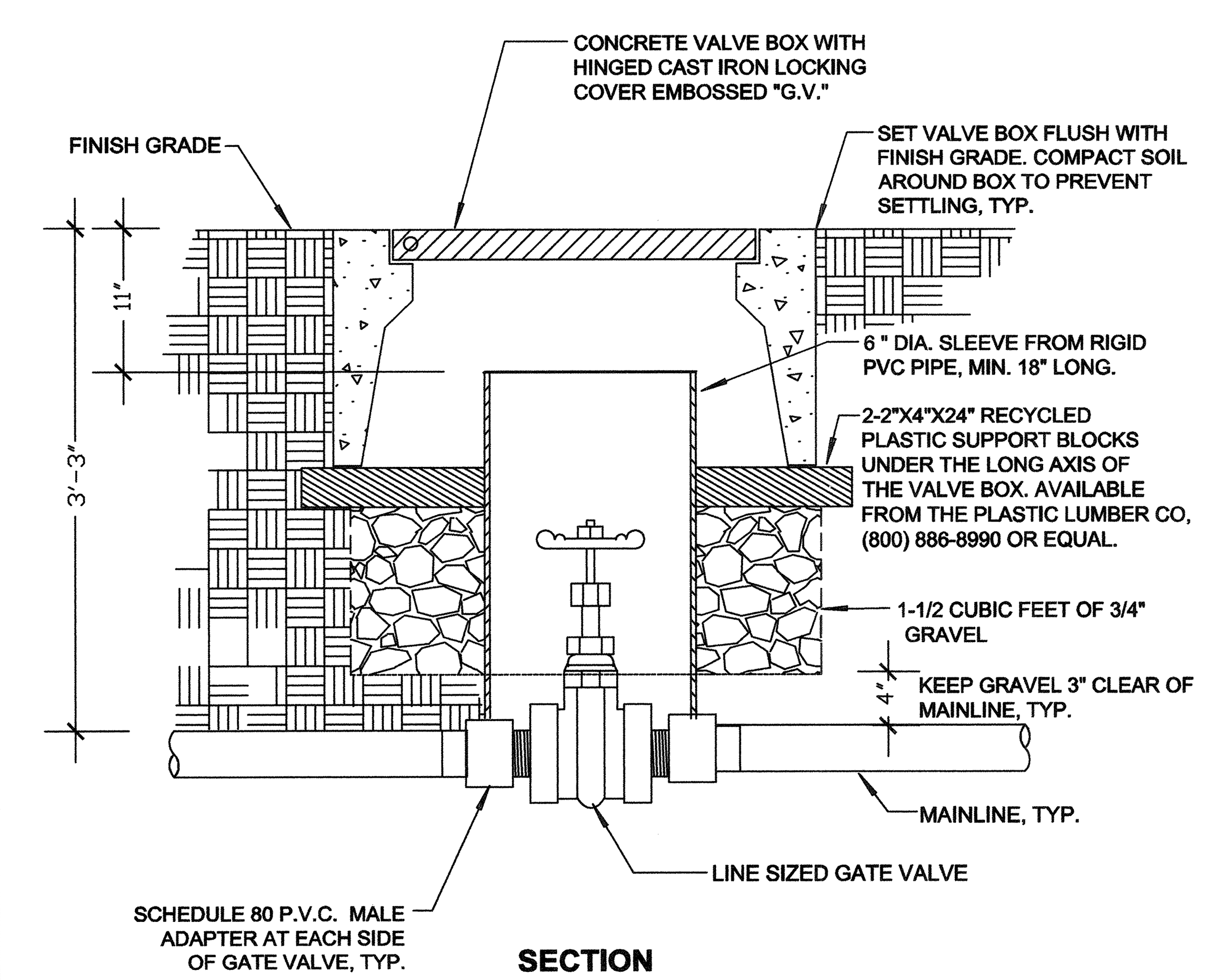
I5 VALVE BOX PLACEMENT
N.T.S. BOE VERSION Jan/07 — RAP DETAIL L1410



NOTES:
1. ALL PIPE AND FITTINGS SHALL BE SCHEDULE 40 PVC.
2. EACH VALVE SHALL HAVE A SEPARATE CONTROL WIRE RUNNING FROM THE CONTROLLER, TYP. SEE LANDSCAPE CONSTRUCTION NOTES FOR CONTROL WIRE COLORS.

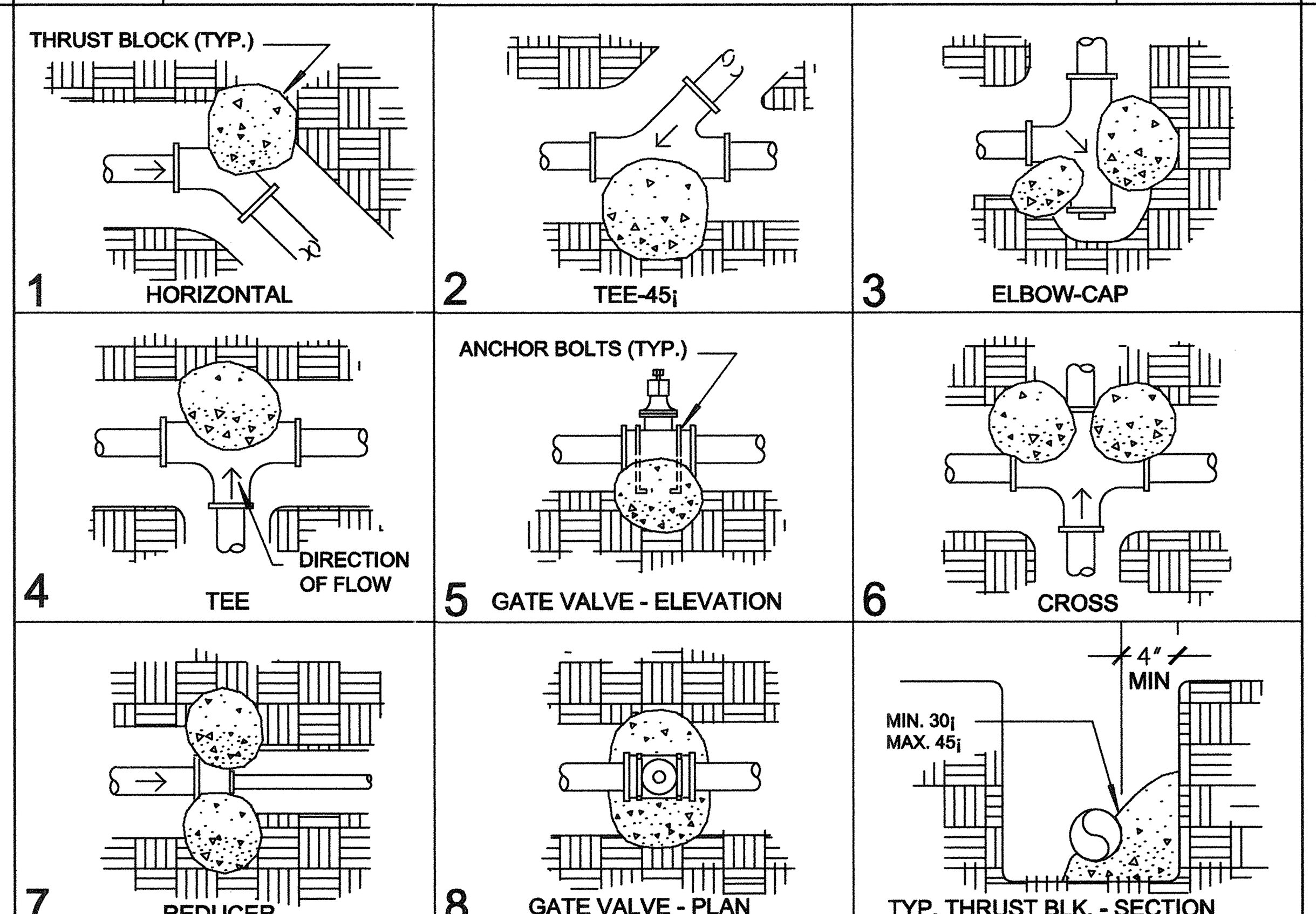
VERSION 09-20-02 JPH, RCM, STS, JPH,SLG

I9 RCV INSTALLATION DETAIL (Concrete Box)
N.T.S. BOE VERSION Aug/08 — RAP DETAIL L1400



RP VERSION 09-20-02 RCM, JPH, SLG

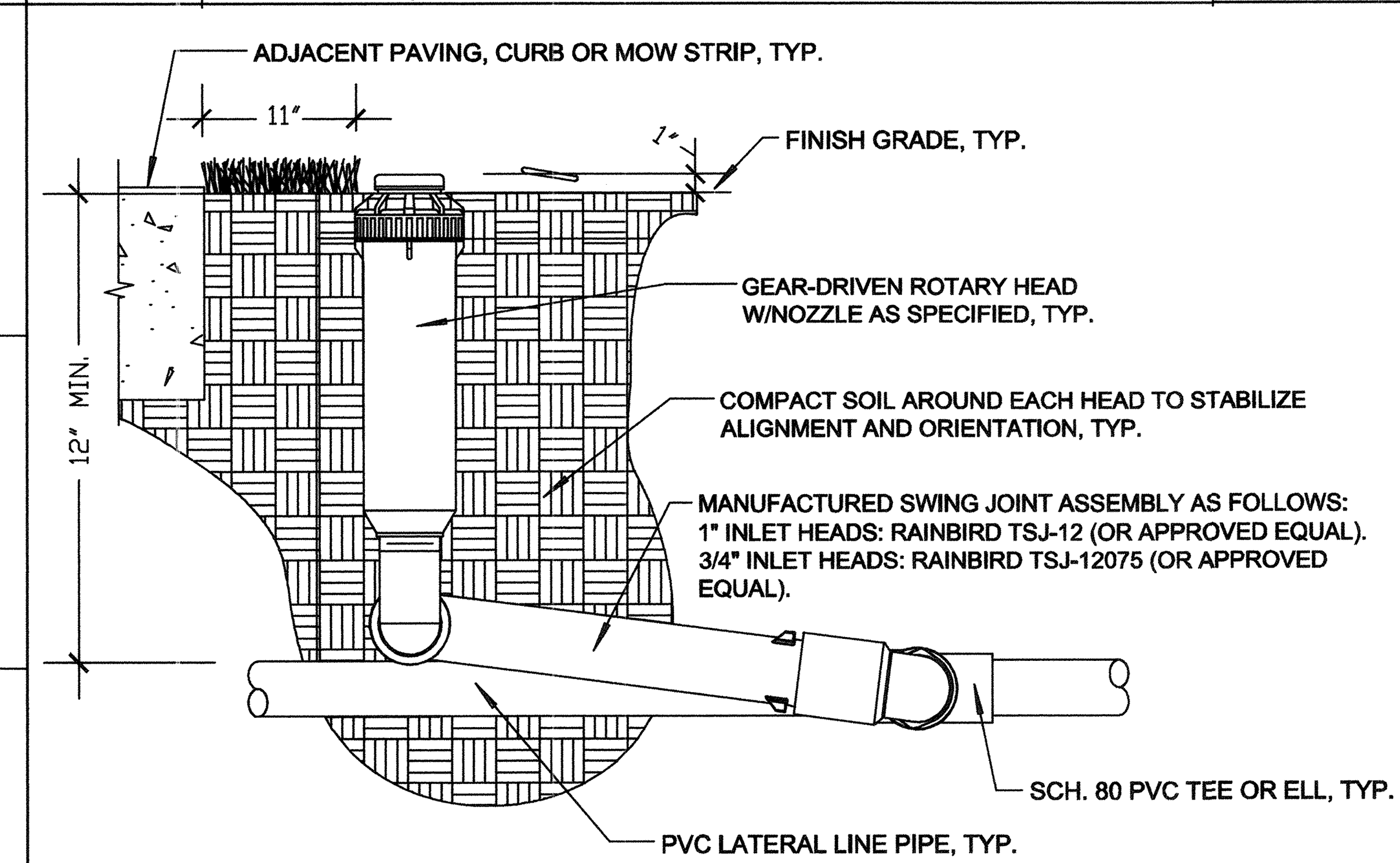
E1 GATE VALVE INSTALLATION, 3/4" TO 3"
N.T.S. BOE VERSION Jul/08 - RF, SD — RP DETAIL L1100



1. PLASTIC PIPE SHALL BE INSTALLED ACCORDING TO THESE DETAILS UNLESS OTHERWISE NOTED OR DETAILED.
2. THE PORTLAND CEMENT CONCRETE USED FOR THRUST BLOCKS SHALL BE MIN. 470-B-2000 CONC.
3. ALL ANCHOR RODS SHALL BE GALVANIZED STEEL MIN. 1/2" INCH IN DIAMETER.
4. SIZE OF THRUST BLK: 4" PIPE = 4 CU. FT. CONC., 6" PIPE = 6 CU. FT., 8" PIPE = 8 CU. FT.
5. WRAP ALL EPOXY COATED FITTINGS WITH SIX MIL PLASTIC BEFORE POURING THRUST BLOCKS.
6. POOR SOIL CONDITIONS : USE THRUST BLOCKS FOR 3" PIPE AT SIZE SHOWN FOR 4" PIPE.
7. ALL THRUST BLOCKS SHALL BEAR AGAINST UNDISTURBED SOIL.

RAP VERSION 3/1/02 RCM, JPH

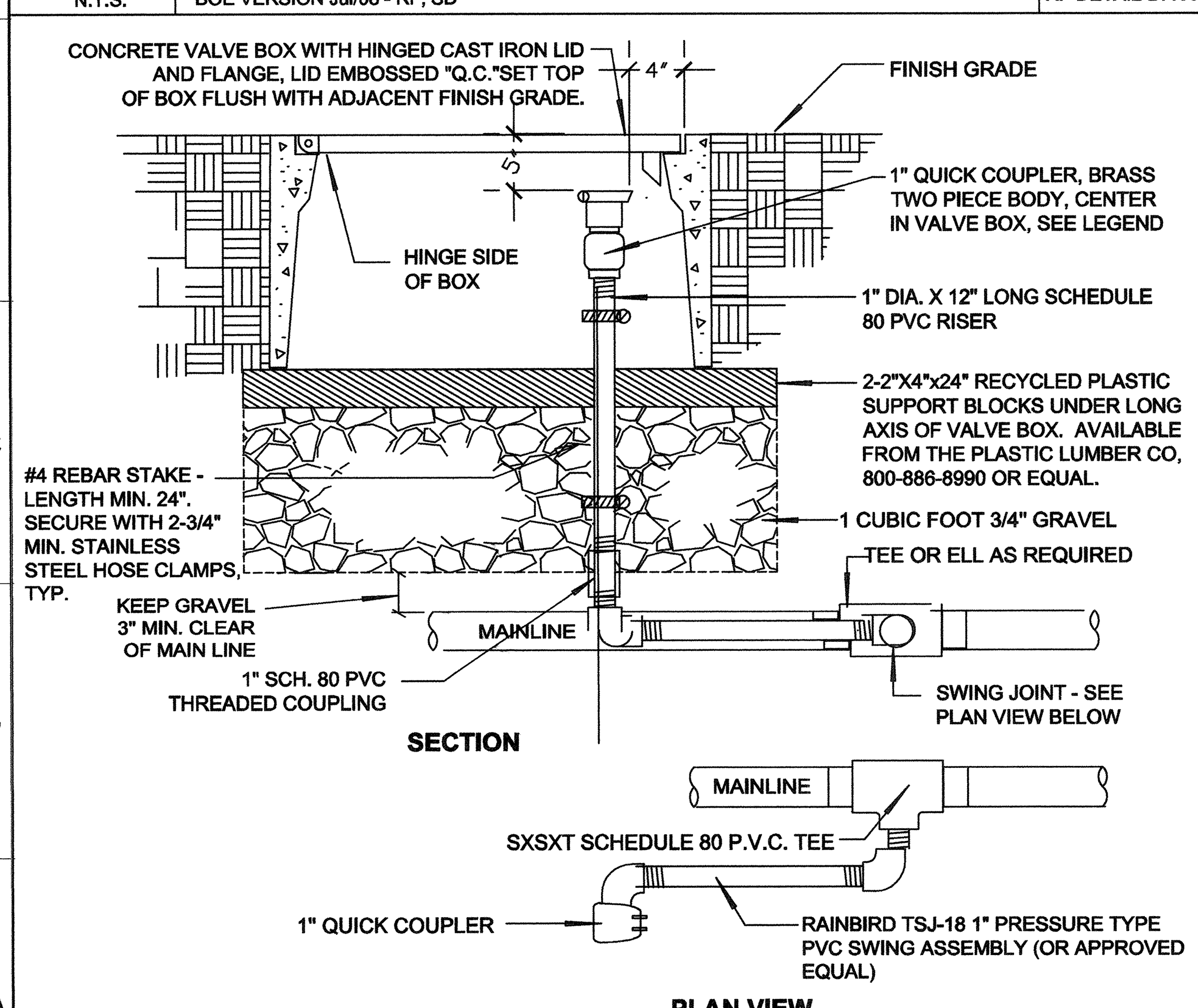
E5 THRUST BLOCK INSTALLATION
N.T.S. BOE VERSION Sep/07 — RP DETAIL L1340



NOTES:
1. PLACE ALL HEADS 1/4" ABOVE FINISH GRADE AT INITIAL INSTALLATION. SET HEADS 3" AWAY FROM WALKS, CURBS, OR MOW STRIPS.
2. INSTALL ALL HEADS PERPENDICULAR TO FINISH GRADE.
3. THOROUGHLY FLUSH ALL LATERAL LINE PIPES TO REMOVE DIRT AND DEBRIS BEFORE INSTALLATION OF NOZZLES.
4. ADJUST ALL HEADS TO PROPER ARC AND RADIUS AS NECESSARY TO ACHIEVE PROPER COVERAGE AND UNIFORMITY. IF PROPER COVERAGE AND UNIFORMITY IS NOT ACHIEVED WITH THE SPECIFIED NOZZLE, CONTRACTOR SHALL CHANGE NOZZLE AS NEEDED IN CONSULTATION WITH LANDSCAPE ARCHITECT UNTIL DESIRED PERFORMANCE IS ACHIEVED.

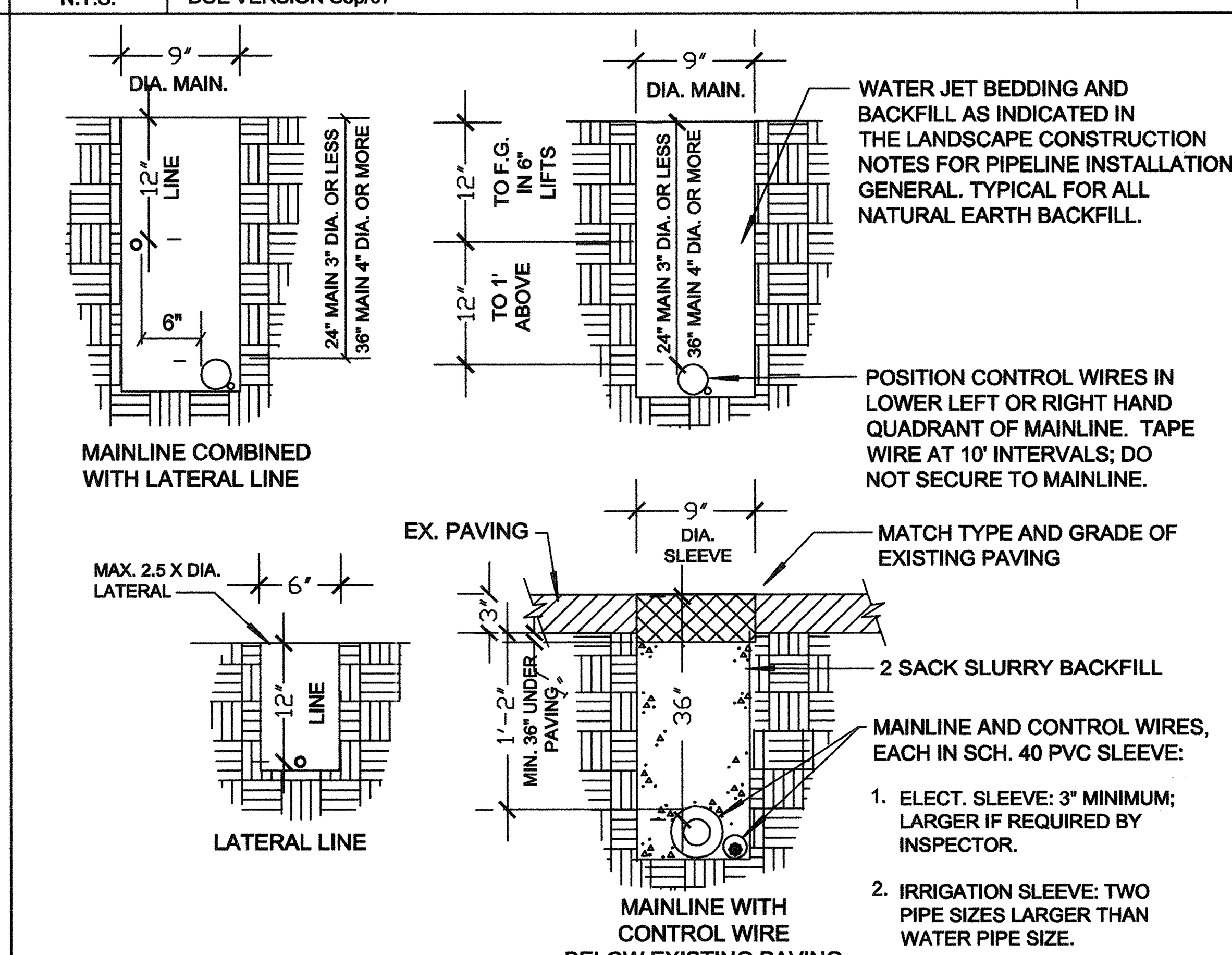
RP VERSION 6-17-99 / RDF, PTN, RCM, JPH

E9 GEAR-DRIVEN ROTOR HEAD INSTALLATION
N.T.S. BOE VERSION Apr/08 - SG, RF — RAP DETAIL L1621



RAP VERSION 5-5-97 / JPH

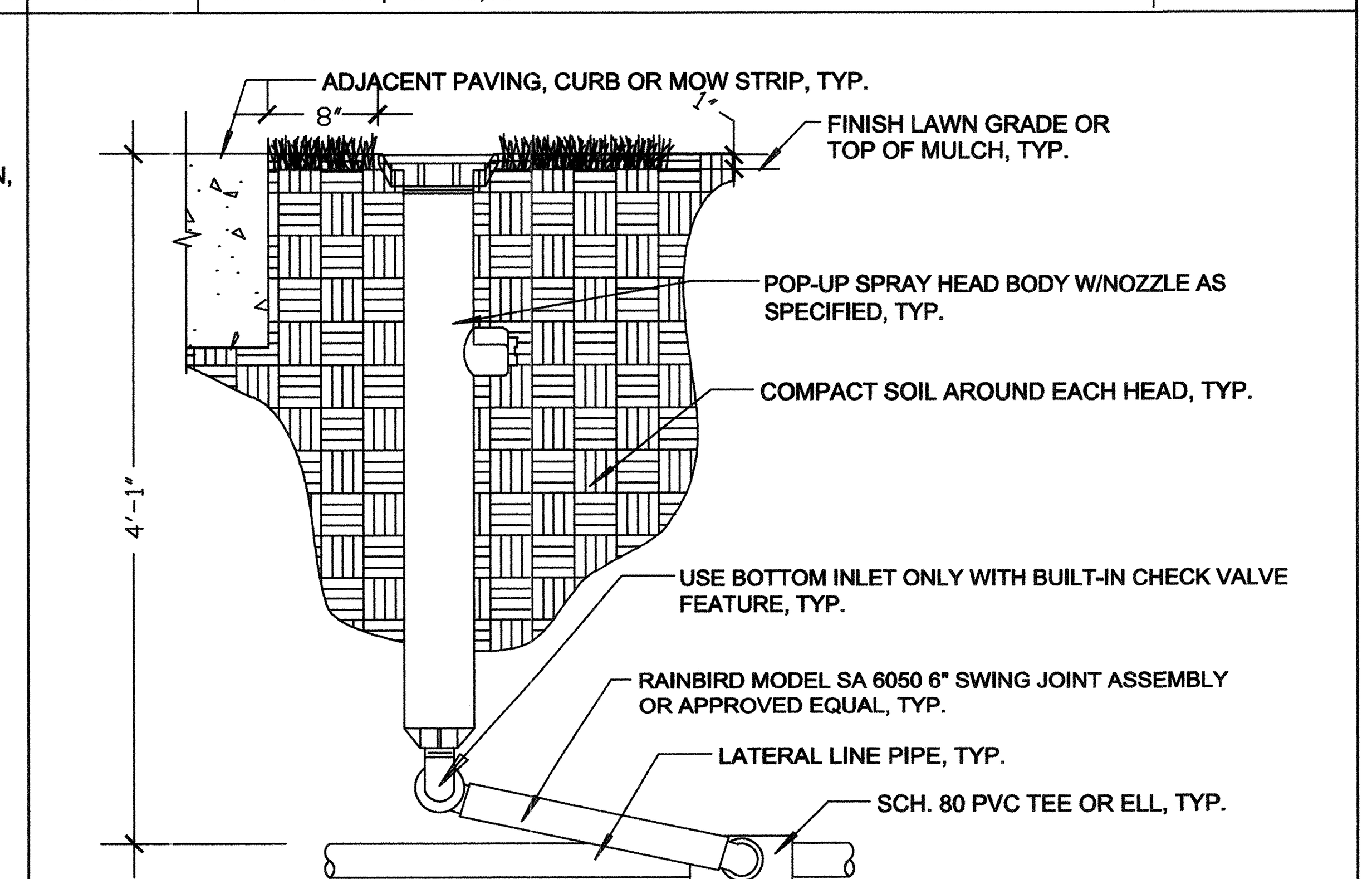
A1 QUICK COUPLER INSTALLATION (2" MAINLINE OR SMALLER)
N.T.S. BOE VERSION Dec/07 RF — RP DETAIL L1200



NOTE:
PIPE AND CONTROL WIRE CROSSING A VEHICULAR ROADWAY SHALL BE SLEEVED AS INDICATED ABOVE. PIPE BEDDING AND BACKFILL SHALL BE WATER JETTED TO ACHIEVE PROPER DENSIFICATION. SEE LANDSCAPE CONSTRUCTION NOTES, PIPELINE INSTALLATION GENERAL, FOR TRENCHING REQUIREMENTS.

RAP VERSION 6-5-98 / RCM, JPH

A5 IRRIGATION TRENCHING DETAIL
N.T.S. BOE VERSION Jul/08 — RP DETAIL L1350



NOTES:
1. PLACE ALL HEADS 1/4" ABOVE FINISH GRADE AT INITIAL INSTALLATION. SET HEADS 3" AWAY FROM WALKS, CURBS, OR MOW STRIPS.
2. INSTALL ALL HEADS PERPENDICULAR TO FINISH GRADE.
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RP VERSION 6-17-99 / RDF, PTN, RCM, JPH

A9 POP-UP SPRAY HEAD INSTALLATION
N.T.S. BOE VERSION Jun/08 - RF, SG — RAP DETAIL L1622

REVISION DATES (DESIGN STAGE ONLY) 12.09.02
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BROWN AND CALDWELL LOS ANGELES, CALIFORNIA

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING

LA DPW ENGINEERING

GARY LEE MOORE, P.E.	CITY ENGINEER
DESIGN GROUP	DATE:
ENGINEER: MATTHEW DURHAM	LIC. NO. 4840
DESIGNED BY: JIM BRINKERHOFF	
DRAWN BY: SID MARTINEZ	
CHECKED BY: JIM BRINKERHOFF	
APPROVED BY: MATTHEW DURHAM	

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: IRRIGATION DETAILS
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.
INDEX NO.

WORK ORDER NO. EW40019F
DRAWING NO. L-6
SHEET 48 OF 408 SHEETS (corrected: 48)

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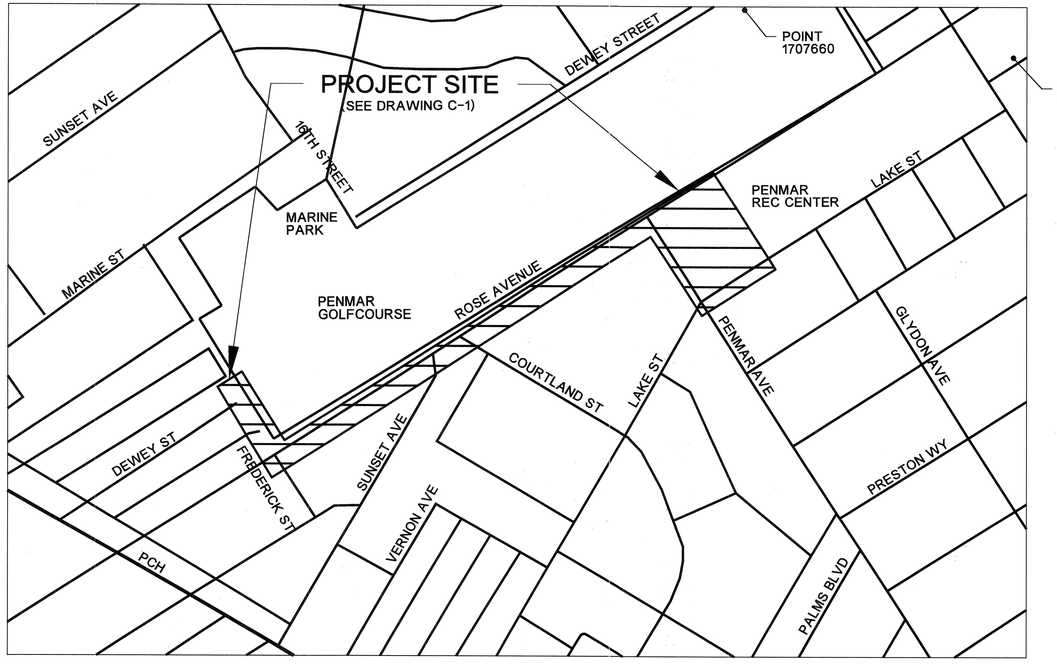
CITY OF LOS ANGELES

PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I

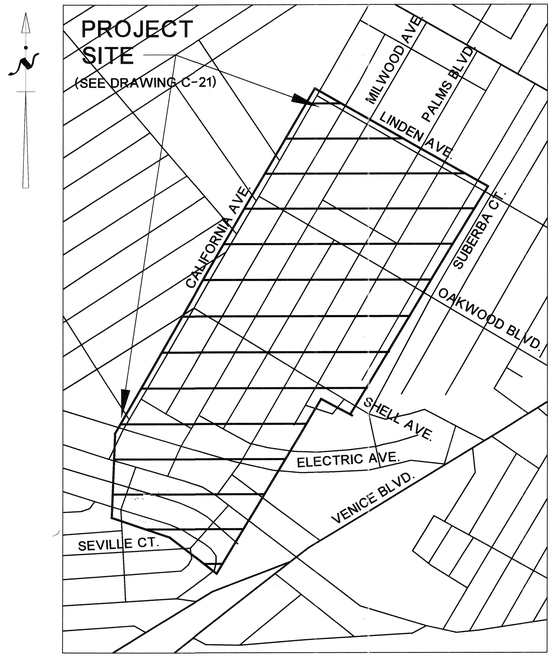
VOLUME II



THOMAS GUIDE 671-J3,H4

LOCATION MAP – PUMP STATION, RESERVOIR, PIPELINE

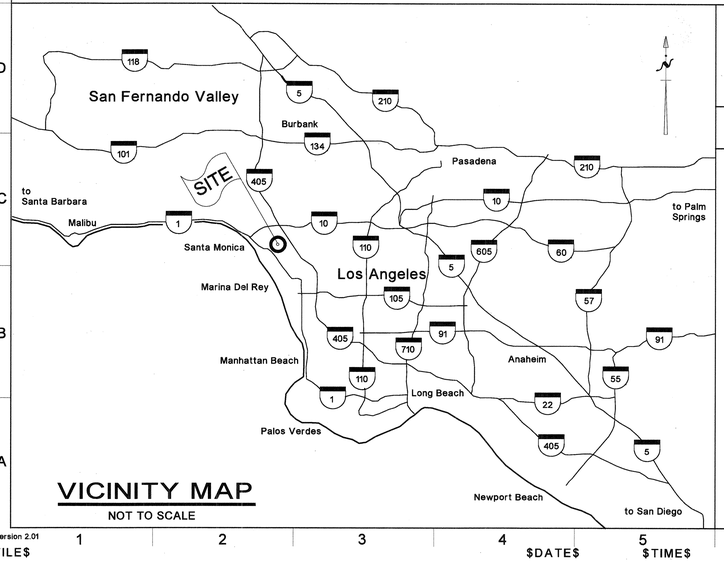
SCALE: NTS



THOMAS GUIDE 671-J5

LOCATION MAP – SEWER UPGRADE

SCALE: NTS



VICINITY MAP

NOT TO SCALE

PROPOSITION "O" BOND PROGRAM

KENDRICK K. OKUDA, P.E.
PROGRAM MANAGER

PROJECT MANAGEMENT	PROJECT DESIGN		CONSTRUCTION MANAGEMENT		SUPPORT SERVICES	
CANDELARIO A. FLORES, P.E. PROJECT MANAGER	CIVIL:	CIVIL ENGINEERING DIVISION LARRY MAGURA, P.E. ENGINEERING MANAGER BLACK & VEATCH	CONSTRUCTION MANAGEMENT:	CONSTRUCTION MANAGEMENT GROUP JAMES A. TREADAWAY, S.E. DIVISION ENGINEER	SURVEY:	SURVEY DIVISION COAST SURVEYING
JOANNA TESORO PROJECT ENGINEER	STRUCTURAL:	STRUCTURAL ENGINEERING DIVISION JERRY SIMON, S.E. MANAGING ENGINEER			ENVIRONMENTAL:	ENVIRONMENTAL GROUP JIM DOTY ACTING GROUP MANAGER MARIA MARTIN ENVIRONMENTAL SUPERVISOR I
ROBERT FINN, P.E. PROJECT MANAGER, BROWN and CALDWELL	MECHANICAL:	MECHANICAL ENGINEERING DIVISION EROS YONG, P.E. SENIOR ENGINEER				
	ELECTRICAL:	ELECTRICAL ENGINEERING DIVISION FRANK SHADAN, P.E. MANAGING ENGINEER				

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NO. REVISIONS: DATE: BY:

WORK ACCEPTED SERIAL NO.

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER GARY LEE MOORE No. C-49446 Exp. 9-30-10 CIVIL STATE OF CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER — ACCEPTED BY: — DATE 2-12-10

DEPUTY CITY ENGINEER/PROGRAM MANAGER — DATE

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: COVER SHEET - VOLUME II

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE, LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. R-7

SHEET 1 OF 60 SHEETS

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REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 2.01 $FILE$ $DATE$ $TIME$

INDEX OF DISCIPLINE

DISCIPLINE CODE	DISCIPLINE DESCRIPTION
R	REFERENCE
DC	DEMOLITION CIVIL
C	CIVIL
L	LANDSCAPE AND IRRIGATION
S	STRUCTURAL
M	MECHANICAL
E	ELECTRICAL
PI	PROCESS AND INSTRUMENTATION

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INDEX OF SHEETS

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REVISION DATES (DESIGN STAGE ONLY)
12.09.02

Sheet Version 2.0

$FILE$ $DATE$ $TIME$

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GARY LEE MOORE, P.E.
CITY ENGINEER

DESIGN GROUP

ENGINEER:	DOUGLAS B. McCARTNEY	DATE: 12.09.02
DESIGNED BY:	DENNIS SIMONSON	LIC. NO. 28095
DRAWN BY:	DENNIS SIMONSON	
CHECKED BY:	DOUGLAS B. ROBISON	
APPROVED BY:	ROBERT FINN	

REVISIONS:

NO.	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER MARTIN FINN No. C25565 Exp. 12-31-11 STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: INDEX OF SHEETS – VOLUME II

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. R-8

SHEET 2 OF 60 SHEETS

GENERAL

G 1 SCOPE
THE GENERAL NOTES AND TYPICAL DETAILS ARE GENERAL AND APPLY TO THE ENTIRE PROJECT EXCEPT WHERE THERE ARE SPECIFIC INDICATIONS TO THE CONTRARY. ALL DETAILS SHOWN ON DRAWINGS S-1 THROUGH S-13 MAY NOT BE REQUIRED TO COMPLETE THE WORK.

G 2 PRECEDENCE
PROJECT SPECIFICATIONS SUPERSEDE THESE GENERAL NOTES, SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS. SPECIFIC NOTES AND DETAILS ON DRAWINGS TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS.

G 3 DIMENSIONS
STRUCTURAL DIMENSIONS CONTROLLED BY OR RELATED TO THE MECHANICAL OR ELECTRICAL EQUIPMENT SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL CONSTRUCTION DIMENSIONS AND NOTIFYING CONSTRUCTION MANAGER OF DISCREPANCIES IN A TIMELY FASHION.

G 4 PROVISIONS FOR EQUIPMENT
MECHANICAL AND ELECTRICAL EQUIPMENT SUPPORTS, ANCHORAGES, OPENINGS, RECESSES AND REVEALS NOT SHOWN ON THE STRUCTURAL DRAWINGS BUT REQUIRED BY OTHER CONTRACT DRAWINGS SHALL BE PROVIDED PRIOR TO CASTING CONCRETE.

G 5 MEANS, METHODS AND CONSTRUCTION LOADS
CONTRACT DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE. CONTRACTOR IS RESPONSIBLE FOR MEANS, METHODS AND SEQUENCE OF CONSTRUCTION, AND SHALL MAKE ADEQUATE PROVISION TO MAINTAIN THE INTEGRITY OF ALL STRUCTURES AT ALL STAGES OF CONSTRUCTION. DETERMINATION OF AND PROVISIONS FOR CONSTRUCTION LOADING SHALL BE PROVIDED BY THE CONTRACTOR.

G 6 SAFETY
CONTRACTOR SHALL TAKE ADEQUATE PRECAUTIONS TO ENSURE THE SAFETY OF WORKERS AND VISITORS TO THE SITE, INCLUDING BUT NOT LIMITED TO SHORING, BRACING AND ACCESS RESTRICTION. COMPLY WITH ALL FEDERAL, STATE AND LOCAL SAFETY CODES AND STANDARDS.

G 7 LIVE LOAD SIGNS
LIVE LOAD SIGNS SHALL BE PROVIDED IN AREAS DESIGNATED BY THE ENGINEER OR REQUIRED BY THE BUILDING OFFICIAL. SIGNS SHALL BE AS REQUIRED IN THE SPECIFICATIONS.

G 8 DRAINAGE SURFACES
SLOPE DRAINAGE SURFACES UNIFORMLY TO DRAIN. SLOPE SHALL BE 1/8" TO 1/4" PER FOOT EXCEPT WHERE NOTED OTHERWISE ON THE PLANS.

G 9 FLOOR DRAINS
SEE ARCHITECTURAL AND MECHANICAL DRAWINGS FOR LOCATIONS AND SIZES.

G 11 OPENINGS
OPENINGS THROUGH NEW AND EXISTING WALLS AND SLABS FOR PIPES, DUCTS, CONDUITS, ETC., ARE NOT ALL SHOWN ON THE STRUCTURAL DRAWINGS. THE CONTRACTOR SHALL PROVIDE THESE OPENINGS IN ACCORDANCE WITH THE OTHER CONTRACT DRAWINGS. REINFORCEMENT AROUND OPENINGS FOR NEW WALLS AND SLABS SHALL BE PER DETAIL G5/S-3.

DESIGN CRITERIA

D 1 GOVERNING BUILDING CODE
2007 CALIFORNIA BUILDING CODE AND THE 2006 INTERNATIONAL BUILDING CODE LOCALLY AMENDED. THE ABOVE SHALL GOVERN EXCEPT WHERE OTHER APPLICABLE CODES OR CONTRACT PROVISIONS ARE MORE RESTRICTIVE.

D 2 GRAVITY LIVE LOADS
1. MCC EQUIPMENT AREA .....250 PSF
2. PROCESS AREA FLOOR LOADING.....LIVE LOAD 150 PSF
3. GRATING, CHECKERED PLATES AND HATCHES.....SAME LOADINGS AS ADJACENT FLOOR AREAS
4. TRUCK TRAFFIC AREAS.....250 PSF OR H-20 LOADING

D 3 WIND, BASIC WIND SPEED.....85 MPH
EXPOSURE C
IMPORTANCE FACTOR I = 1.15

D 4 SEISMIC.....SDS = 1.044 / SD1 = 0.600
SITE CLASSIFICATION D
IMPORTANCE FACTOR I = 1.5 IP = 1.5

FOUNDATION

F 1 DESIGN BASIS
FOUNDATION DESIGN IS BASED ON RECOMMENDATIONS CONTAINED IN A GEOTECHNICAL REPORT DATED JUNE 13, 2008 BY NINYO AND MOORE, PROJECT NO. 207328001. CONTRACTOR SHALL FOLLOW THE PROJECT SPECIFICATIONS AND TAKE INTO CONSIDERATION RECOMMENDATIONS CONTAINED IN THE REPORT. NOTIFY THE CONSTRUCTION MANAGER OF CONFLICTS BETWEEN SPECIFICATIONS AND THE REPORT RECOMMENDATIONS FOR RESOLUTION.

F 2 MINIMUM FOUNDATION PREPARATION
SPECIFICATIONS AND DRAWINGS DESCRIBE A SITE SOIL STABILIZATION PROGRAM AS WELL AS SPECIFIC FOUNDATION PREPARATION AND REQUIREMENTS. FOR SITUATIONS NOT SPECIFICALLY NOTED, SUBMIT REQUEST FOR CLARIFICATION TO CONSTRUCTION MANAGER PRIOR TO PROCEEDING.

F 3 DIFFERING CONDITIONS
FOUNDATION CONDITIONS NOTED DURING CONSTRUCTION WHICH DIFFER FROM THOSE INDICATED IN THE REPORT SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER. CONTRACTOR IS RESPONSIBLE FOR REPLACING WORK CONDUCTED AFTER SUCH NOTIFICATION BUT BEFORE ENGINEER PROVIDES ADDITIONAL DIRECTIONS.

F 4 EXCAVATION, DEWATERING AND SAFETY
CONTRACTOR SHALL PROVIDE FOR ALL DE-WATERING OF EXCAVATIONS, AND DESIGN/PROVIDE ALL CRIBBING, SHORING AND BRACING REQUIRED FOR SAFETY AND TO ALLOW CONSTRUCTION OF THE WORK PRESENTED HEREIN.

ALUMINUM

A 1 APPLICABLE CODES
ALUMINUM CONSTRUCTION SHALL CONFORM TO THE LATEST EDITION OF THE ALUMINUM CONSTRUCTION MANUAL OF THE ALUMINUM ASSOCIATION.

A 2 MATERIAL
UNLESS OTHERWISE INDICATED, STRUCTURAL ALUMINUM SHALL BE ALLOY 6061-T6 AS SPECIFIED IN ASTM B-221.

A 3 ALUMINUM IN CONTACT WITH CONCRETE
WHERE ALUMINUM IS IN CONTACT WITH CONCRETE OR MASONRY SURFACES, CONTACT SURFACE SHALL BE COATED WITH HEAVY ALKALI-RESISTANT BITUMINOUS PAINT.

A 4 FALL PROTECTION DEVICES
PROVIDE RETRACTABLE WEBBED SAFETY NET COMPLYING WITH OSHA AND LOCAL CODES AT ACCESS HATCHES WITH 5 FEET CLEAR TO FLOOR OR LANDING BELOW. HATCH NET 121 BY SAFE APPROACH, INC.; HATCH SAFETY NET BY USF FABRICATION; OR EQUAL.

CONCRETE

C 1 APPLICABLE CODE AND MIX DESIGN
CONCRETE CONSTRUCTION SHALL CONFORM TO THE LATEST EDITION OF THE ACI BUILDING CODE (ACI 318 BUILDINGS AND ACI 350 LIQUID RETAINING).

C 2 REINFORCING STEEL DETAILS
ALL DETAILING, FABRICATION AND ERECTION OF REINFORCING BARS, UNLESS OTHERWISE NOTED SHALL BE IN ACCORDANCE WITH MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES (ACI-315), LATEST EDITION.

C 3 DESIGN STRENGTH
1. GENERAL CONCRETE.....f'c=4,500 PSI ULTIMATE COMPRESSIVE STRESS AT 28 DAYS
2. REINFORCING STEEL.....ASTM A-615, GRADE 60 DEFORMED BARS UNLESS OTHERWISE NOTED

C 4 CONCRETE COVER
CONCRETE COVER FOR REINFORCING BARS SHALL CONFORM TO ACI 350 AND AS FOLLOWS WITH MINIMUM COVER OF ONE BAR DIAMETER.
1. FOOTING AND FOUNDATION MATS CAST ON GROUND.....3"
2. CONCRETE IN CONTACT WITH SEWAGE OR WATER
   PRINCIPAL REINFORCEMENT.....2-1/2"
   STIRRUPS AND TIES.....2"
3. CONCRETE IN CONTACT WITH GROUND OR WEATHER
   a. SLAB AND JOISTS
      BARS GREATER THAN #5.....2"
      BARS #5 OR LESS.....1-1/2"
   b. BEAMS AND COLUMNS
      STIRRUPS AND TIES.....2"
      PRINCIPAL REINFORCEMENT.....2-1/2"
4. CONCRETE NOT TO BE EXPOSED TO GROUND, WEATHER OR LIQUID
   BEAMS AND COLUMNS.....1-1/2"
   SLABS, WALLS AND JOISTS.....1"

C 5 MINIMUM REINFORCING
CONCRETE CONSTRUCTION SHALL BE REINFORCED CONCRETE EXCEPT WHERE PLAIN CONCRETE IS INDICATED ON THE DRAWINGS.

MINIMUM TEMPERATURE AND SHRINKAGE STEEL SHALL BE PROVIDED IN ACCORDANCE WITH ACI-350.

MASS CONCRETE SHALL BE REINFORCED WITH #5 @ 12" EACH WAY MINIMUM IN ALL FACES. HIGHER MINIMUM STEEL IS PROVIDED IN WATER CONTAINING STRUCTURES.

C 6 EXTRA ACCESSORY BARS
IN ADDITION TO NORMAL ACCESSORIES USED TO HOLD REINFORCING STEEL FIRMLY IN POSITION, EXTRA ACCESSORY BARS SHALL BE USED AS FOLLOWS:
1. IN SLABS, #5 RAISER BARS AT 36" ON CENTER MAXIMUM TO SUPPORT TOP REINFORCING STEEL.
2. IN WALLS WITH TWO CURTAINS #3 U OR Z-SHAPE SPACERS AT 6'-0" ON CENTER EACH WAY.

C 7 UNLESS INDICATED OTHERWISE, ALL REINFORCEMENT LAP SPLICES SHALL SATISFY THE LENGTHS IN THE FOLLOWING TABLE. LAP SPLICES FOR WHICH THE FOLLOWING TABLE IS NOT APPLICABLE SHALL BE AS SHOWN ON THE DRAWINGS OR SHALL BE REFERRED TO THE ENGINEER FOR DETERMINATION OF THE REQUIRED LENGTH.

STANDARDS - CITY OF LOS ANGELES

ALL WORK SHALL COMPLY WITH ALL THE APPLICABLE FEDERAL LAWS, STATES STATUES, LOCAL ORDINANCES AND THE REGULATIONS OF THE L.A.C. PUBLIC WORKS (THE LATEST EDITION OF THE GREEN BOOK AND THE GREY BOOK).

LAP SPLICES SHALL NOT BE MADE AT POINTS OF MAXIMUM STRESS AS DETERMINED BY THE ENGINEER. LAP SPLICES FOR CONTINUOUS SLAB OR LONGITUDINAL BEAM BARS SHALL BE LOCATED IN THE MIDDLE 1/3 OF THE SPAN FOR TOP BARS AND CENTERED OVER THE SUPPORT FOR BOTTOM BARS.

WALLS AND SLABS - LAP SPLICE LENGTHS IN INCHES
GRADE 60 REINFORCEMENT

BAR SIZE		#3	#4	#5	#6	#7	#8	#9	#10	#11
2" COVER	REGULAR BARS	16	16	19	23	33	37	46	57	68
	TOP BARS	16	20	24	29	42	48	60	74	89
1" COVER	REGULAR BARS	16	16	22	31	50	62	76	92	108
	TOP BARS	16	20	29	40	64	81	98	119	141

NOTES:
1. CONCRETE IS NORMAL WEIGHT CONCRETE WITH A MINIMUM CONCRETE COMPRESSIVE STRENGTH = 4500 PSI.
2. MINIMUM BAR SPACING IS 6".
3. A TOP BAR IS A HORIZONTAL BAR WHERE MORE THAN 12 INCHES OF FRESH CONCRETE IS CAST DIRECTLY BELOW THE BAR. HORIZONTAL WALL BARS ARE CONSIDERED TOP BARS.
4. FOR EPOXY-COATED REINFORCEMENT MULTIPLY THE TABULATED VALUES BY 1.5 FOR 'REGULAR BARS' AND 1.3 FOR 'TOP BARS'.
5. LAP SPLICE LENGTHS FOR BEAMS SHALL BE AS SHOWN IN THE TABLE ON THE TYPICAL BEAM ELEVATION.

C 8 WELDING REINFORCING BARS
IF APPROVED BY THE ENGINEER, REINFORCING MAY BE WELDED IN ACCORDANCE WITH WITH AWS SPECIFICATION D1.4 ALL REINFORCING TO BE WELDED SHALL CONFORM TO ASTM A706.

C 9 STANDARD HOOKS
BARS ENDING IN RIGHT ANGLE BENDS OR HOOKS SHALL CONFORM TO THE REQUIREMENTS OF PARAGRAPH 7.1, ACI-318. PROVIDE STANDARD HOOK IN BARS WHICH TERMINATE AT WALL OR SLAB INTERSECTIONS THAT PROVIDE LESS THAN THE SPECIFIED DEVELOPMENT LENGTH.

C 10 GROUND SUPPORTED SLABS & FOUNDATIONS
UNLESS OTHERWISE SPECIFIED OR NOTED ON THE DRAWINGS, CONFORM TO THE FOLLOWING:
1. CONCRETE SLABS SUPPORTED BY GROUND SHALL BE 6" THICK REINFORCED WITH #5 @ 12" EACH WAY, CENTERED AT THE MID-DEPTH OF SLAB. PROVIDE 1/2" PREMOLDED JOINT FILLER AT WALLS AND COLUMNS TO PROVIDE SEPARATION BETWEEN THE SLAB AND WALLS AND COLUMNS.
2. CONCRETE SLABS SUPPORTING PROCESS EQUIPMENT, PREFABRICATED BUILDINGS AND OTHER MINOR STRUCTURES SHALL BE 8" THICK WITH #5 @ 12 EACH WAY CENTERED, WITH EDGES THICKENED TO BELOW FROST DEPTH GRADE AS SET BY THE LOCAL BUILDING JURISDICTION. PROVIDE (2) #5 x CONTINUOUS IN TURNED DOWN SECTION, ALL AROUND.

C 11 CHAMFERS
EXCEPT AS OTHERWISE REQUIRED, EXPOSED CONCRETE CORNERS AND EDGES SHALL HAVE 3/4" CHAMFERS. RE-ENTRANT CORNERS SHALL NOT HAVE FILLETS.

C 12 JOINTS IN SIDEWALKS
SIDEWALK CONTROL JOINTS SHALL BE 1/2" RADIUS TOOLED JOINTS AT 4'-0" SPACING OR WIDTH OF SIDEWALK, WHICHEVER IS GREATER. SIDEWALK EXPANSION JOINTS SHALL BE LOCATED AT 16'-0" MAXIMUM SPACING AND ALL LOCATIONS WHERE SIDEWALK ABUTS OTHER CONCRETE WORK SUCH AS BASINS, CURBS, PAVING, OR STRUCTURAL. EXPANSION JOINTS SHALL UTILIZE PREFORMED JOINT FILLER CONFORMING TO SPECIFICATION SECTION 07900.

C 13 ANCHOR BOLTS
ANCHOR BOLTS SHALL BE ASTM A320 TYPE 316 MATERIAL UNLESS OTHERWISE NOTED. EMBEDMENT, EDGE DISTANCES AND ALLOWABLE LOADS SHALL CONFORM TO IBC TABLE 1912.2 OR AS NOTED ON THE DRAWINGS.

C 14 INSERTS
PROVIDE ANCHORAGE INSERTS WHERE SHOWN ON CONCRETE WALLS AND CONCRETE CEILINGS IN GALLERIES, PIPE CHASES, TUNNELS AND AS REQUIRED BY MECHANICAL AND ELECTRICAL INSTALLATIONS. UNISTRUT P-3762 HOT DIP GALVANIZED OR EQUAL.

C 15 COMPATIBLE FINISHES
CURING COMPOUNDS AND OTHER SURFACE TREATMENTS, CONCRETE ADMIXTURES AND SUB-SLAB DRAINAGE SHALL BE REVIEWED BY CONTRACTOR AND CERTIFIED COMPATIBLE WITH FINISHES TO BE APPLIED LATER IN THE CONSTRUCTION SEQUENCE.

BACKFILL INSPECTION REQUIREMENTS

THE SOILS ENGINEER IS TO APPROVE THE KEY OR BOTTOM OF ALL EXCAVATIONS AND LEAVE A CERTIFICATE OF APPROVAL ON THE SITE FOR THE GRADING INSPECTOR. THE GRADING INSPECTOR IS TO BE NOTIFIED BEFORE ANY GRADING BEGINS AND, FOR THE BOTTOM OR KEY INSPECTOR, BEFORE FILL IS PLACED. FILL MAY NOT BE PLACED WITHOUT THE APPROVAL OF THE GRADING INSPECTOR.

STEEL

ST 1 APPLICABLE CODE
STEEL CONSTRUCTION SHALL CONFORM TO SPECIFICATIONS AND STANDARDS PRESENTED IN THE 13TH EDITION OF THE AISC STEEL CONSTRUCTION MANUAL. CAMBERING OF BEAMS AND GIRDERS SHALL BE AS SPECIFIED IN TABLE OF MAXIMUM AND MINIMUM INDUCED CAMBER UNLESS OTHERWISE SPECIFIED.

ST 2 MATERIALS
1. SUBMIT CERTIFIED MILL TEST REPORTS TO ENGINEER FOR REVIEW.
2. STEEL WIDE FLANGE SHAPES SHALL CONFORM TO ASTM A992. OTHER SHAPES AND PLATES SHALL CONFORM TO ASTM A36.
3. STRUCTURAL PIPE SHALL CONFORM TO ASTM A53 TYPES E OR S GRADE B, OR A500 GRADE A. STRUCTURAL TUBING SHALL CONFORM TO ASTM A500 GRADE B.
4. ALL STAINLESS STEEL SHALL BE TYPE 316 MEETING ASTM A276 UNLESS OTHERWISE SPECIFIED.

ST 3 WELDING
1. WELDING SHALL CONFORM TO AWS D1.1-1 AND AISC 341-02.
2. ELECTRODES FOR SHOP AND FIELD WELDS SHALL CONFORM TO AWS A5.1 OR A5.5 , CLASS E70XX.
3. SUBMIT WELD PROCEDURES AND WELDER CERTIFICATIONS TO ENGINEER FOR REVIEW.
4. STAINLESS STEEL WELDING SHALL CONFORM TO AWS D1.6 WITH A5.4 OR A5.9 ELECTRODES.

ST 4 BOLTS
STRUCTURAL BOLTS SHALL CONFORM TO ASTM A325N UNLESS MACHINE BOLTS, A-307, ARE NOTED ON THE DRAWINGS. HIGH STRENGTH BOLTS SHALL BE FULLY TENSIONED UNLESS CONNECTING HSS SHAPES OR OTHERWISE NOTED.

ST 5 ENCASED STEEL
STEEL COMPLETELY ENCASED IN CONCRETE SHALL NOT BE GALVANIZED OR PAINTED AND SHALL HAVE A CLEAN SURFACE FOR BONDING TO CONCRETE UNLESS OTHERWISE NOTED ON THE DRAWINGS.

ST 6 PAINTING
STRUCTURAL STEEL SHALL BE PAINTED IN ACCORDANCE WITH SPECIFICATIONS. SHOP PRIMER SHALL BE COMPATIBLE WITH FINISH COATINGS.

STRUCTURAL OBSERVATION

COORDINATE STRUCTURES TO RECEIVE STRUCTURAL OBSERVATION WITH CONSTRUCTION MANAGER. NOTIFY ENGINEER AT LEAST 48 HOURS BEFORE DESIGNATED WORK IS TO BE COVERED.

ITEM	DESCRIPTION
1. MAIN FLOOR SLABS	- REINFORCING STEEL
4. FINAL	- SUBSTANTIAL COMPLETION

STRUCTURAL DEFERRED SUBMITTALS

CONTRACTOR TO SUBMIT DRAWINGS AND CALCULATIONS BEARING THE SEAL OF A PROFESSIONAL ENGINEER LICENSED IN CALIFORNIA TO CONSTRUCTION MANAGER BEFORE SUBMITTING TO JURISDICTION FOR REVIEW AND PERMITTING.

ITEM
1. CONCRETE MIX DESIGN
2. PRECAST CONCRETE VAULTS
3. FLOOR DOORS

SPECIAL INSPECTION

IN ACCORDANCE WITH IBC CHAPTER 17, THE FOLLOWING TYPES OF WORK REQUIRE SPECIAL INSPECTION. SEE THE SPECIFICATIONS AND DRAWINGS FOR ADDITIONAL REQUIREMENTS FOR INSPECTION AND TESTING.

ITEM PER CHAPTER 17	DESCRIPTION	TYPE
1. CONCRETE	- STRUCTURAL CONCRETE PLACEMENT	CONTINUOUS
2. BOLTS INSTALLED IN CONCRETE	- WEDGE AND ADHESIVE ANCHORS INSTALLATION - ALL ANCHOR BOLTS	PERIODIC
3. REINFORCING STEEL	- REINFORCING STEEL PLACEMENT IN FOUNDATION, SLABS AND WALLS	PERIODIC
5. WELDING	- ALL FIELD WELDING - ALL SHOP WELDING	PER CHAPTER 17, IBC

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BLACK & VEATCH Corporation
Los Angeles, California

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NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER — GARY L. SIMON — No. 68080 — Exp. 6-30-09 — CIVIL — STATE OF CALIFORNIA — VENTURA

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E.
CITY ENGINEER
LIC. NO. 68080
DATE:

DESIGN GROUP	
ENGINEER:	JERRY SIMON
DESIGNED BY:	ERMILO CHAVEZ
DRAWN BY:	ERIC BLACK
CHECKED BY:	JERRY SIMON
APPROVED BY:	ROBERT MARTIN FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PUMP STATION STRUCTURAL GENERAL NOTES

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. S-1

SHEET 3 OF ~~51~~ 60 ~~408~~ SHEETS

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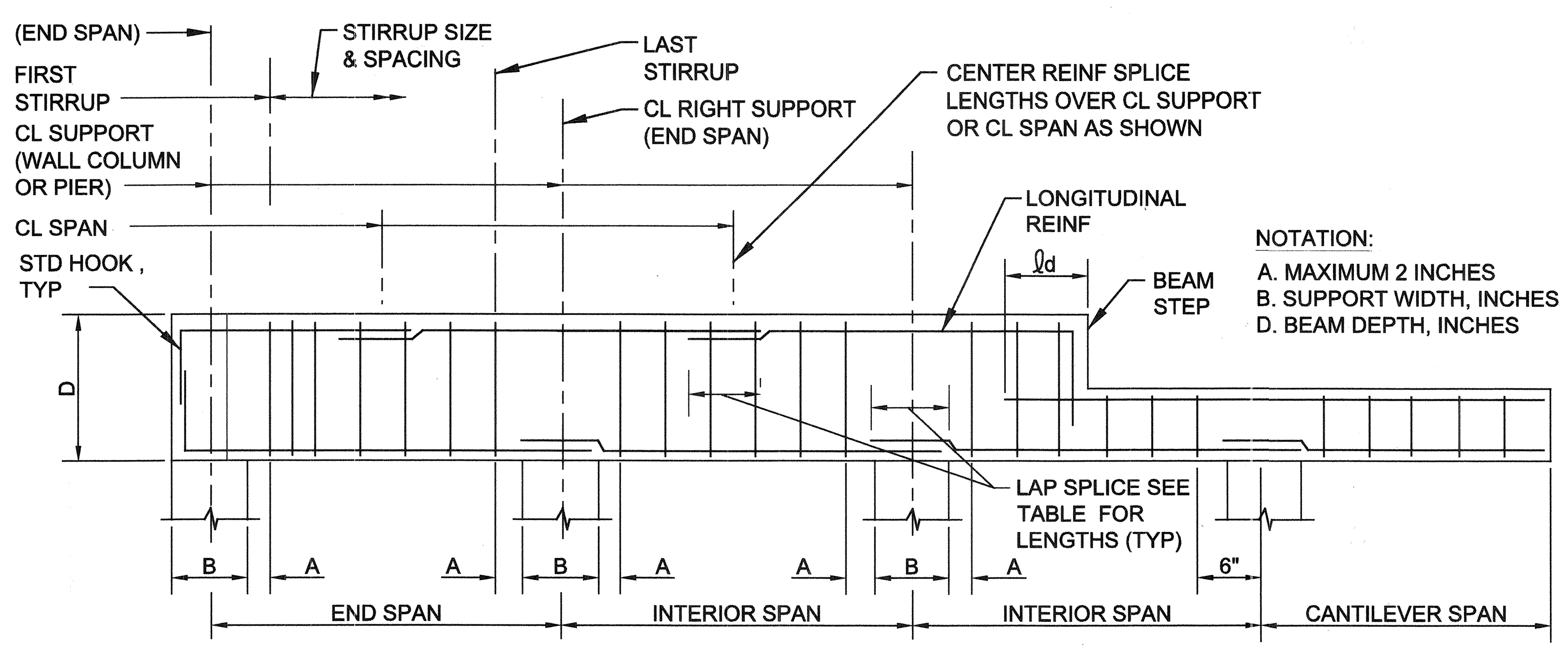
REVISION DATES (DESIGN STAGE ONLY)
12.09.02

Sheet Version 2.0



NOTATION:
A. MAXIMUM 2 INCHES
B. SUPPORT WIDTH, INCHES
D. BEAM DEPTH, INCHES

BEAM ELEVATION NOTES:
1. WHERE SAME NUMBER AND SIZE OF REINF BARS CONTINUE FROM SPAN TO SPAN, SPLICES MAY BE OMITTED. WHERE SPLICES ARE PROVIDED, LOCATE TOP SPLICES AT MIDSPAN AND BOTTOM SPLICES OVER SUPPORTS AS INDICATED.
2. WHERE BEAM ENDS IN WALL, PROVIDE MINIMUM 8" HORIZONTAL BEAM POCKET IN WALL UNLESS OTHERWISE NOTED.

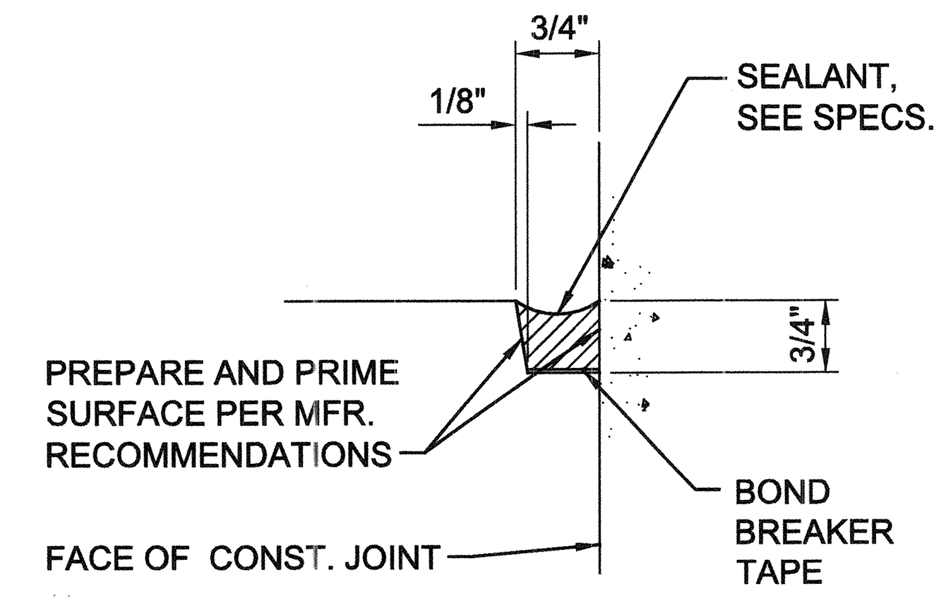
SPLICE NOTES:
1. UNLESS INDICATED OTHERWISE, ALL BEAM REINFORCEMENT LAP SPLICES SHALL SATISFY THE LENGTHS IN THE FOLLOWING TABLE. BEAM LAP SPLICES FOR WHICH THE TABLE IS NOT APPLICABLE SHALL BE AS SHOWN ON THE DRAWINGS OR SHALL BE REFERRED TO THE ENGINEER FOR DETERMINATION OF THE REQUIRED LENGTH.
2. CONCRETE IS NORMAL WEIGHT CONCRETE WITH A MINIMUM CONCRETE COMPRESSIVE STRENGTH = 4500 PSI.
3. MINIMUM BAR SPACING = $3d_b$.
4. MINIMUM CONCRETE COVER = 1.5".
5. A TOP BAR IS A HORIZONTAL BAR WHERE MORE THAN 12 INCHES OF FRESH CONCRETE IS CAST DIRECTLY BELOW.
6. LAP SPLICES SHALL BE AS PROVIDED IN TABLE UNLESS OTHERWISE NOTED.

BEAM LAP SPLICE LENGTHS IN INCHES - GRADE 60 REINF

BAR SIZE	OTHER BAR	TOP BAR
#5	31	40
#6	37	49
#7	54	71
#8	62	81
#9	70	91
#10	79	102
#11	87	113

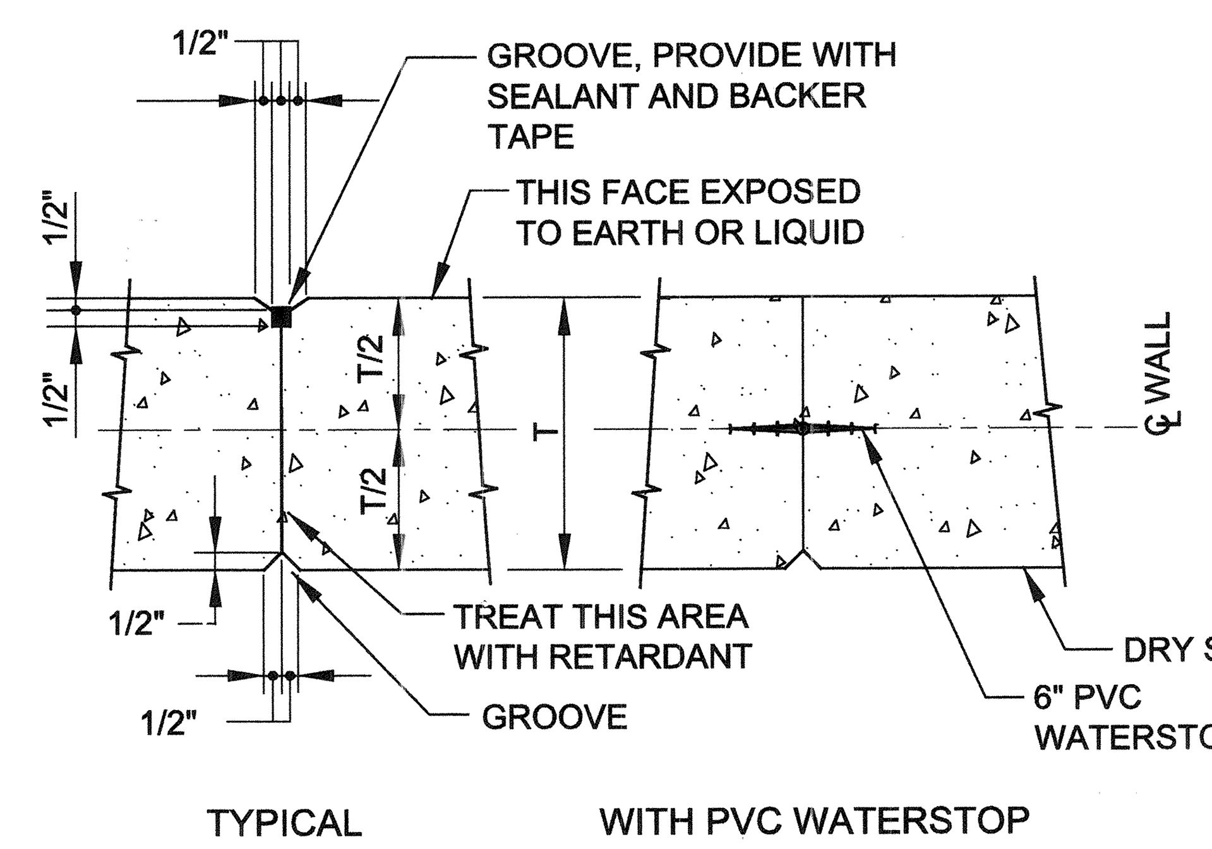
F1 TYPICAL BEAM ELEVATION

SCALE: NONE | S-2



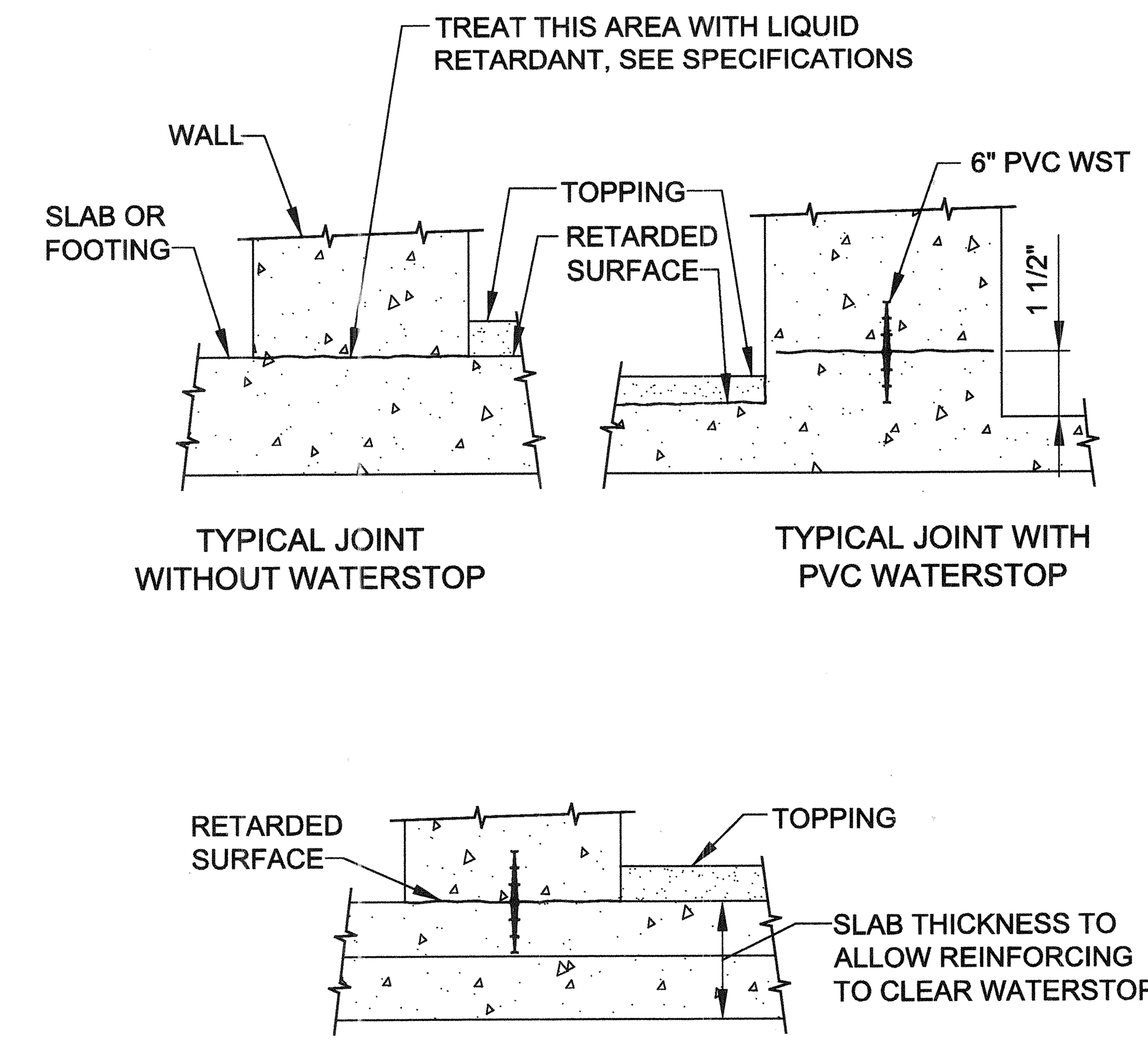
J8 SEALANT GROOVE

SCALE: NONE | VARIES



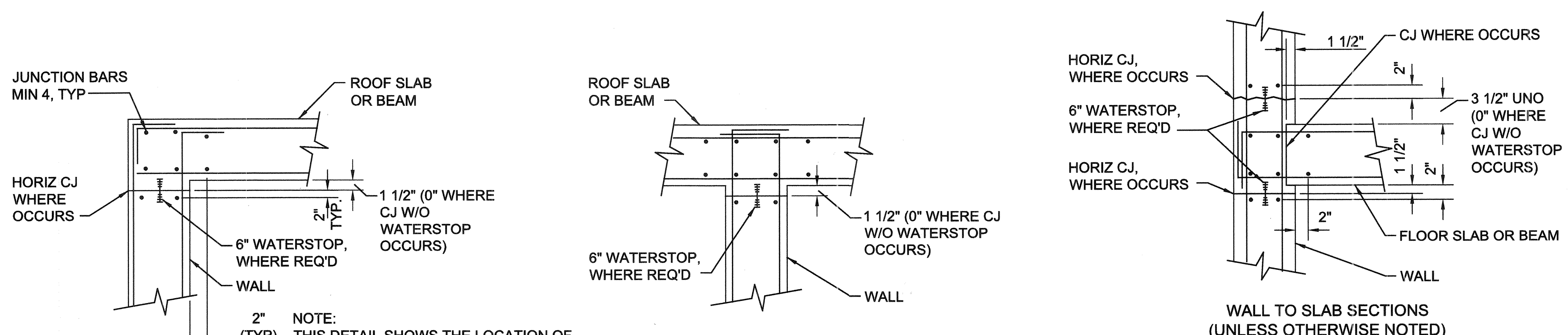
F8 VERTICAL CONSTRUCTION JOINT AT WALLS

SCALE: NONE | VARIES



F12 HORIZ. CONSTRUCTION JOINT AT WALLS AND FOOTINGS

SCALE: NONE | VARIES



NOTE: THIS DETAIL SHOWS THE LOCATION OF 2 CONSTRUCTION JOINTS, ALL MAY NOT OCCUR AT A WALL TO SLAB INTERSECTION AT THE SAME TIME.

CONSTRUCTION JOINT NOTES:
1. REINFORCING SHOWN IS FOR CLARITY ONLY. SEE PLANS AND SECTIONS FOR REINFORCING SIZES, SPACING, LOCATION AND DETAILS.
2. JUNCTION BARS SHALL BE SAME SIZE OF THE LARGER OF WALL OR SLAB REINFORCING EXCEPT WHERE NOTED OTHERWISE ON THE DETAILS.
3. ALL LAP SPLICES SHALL BE CLASS B TENSION LAP.
4. WATERSTOP SHALL BE PLACED AT CENTER OF WALL OR SLAB, UNLESS NOTED OTHERWISE.
5. UNLESS NOTED OTHERWISE, WATERSTOP SHALL BE PLACED AT ALL CONSTRUCTION JOINTS FOR WATER RETENTION STRUCTURES.

A1 CONSTRUCTION JOINT AT WALL/SLAB INTERSECTION

SCALE: NONE | VARIES

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12-09-02
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NO. | REVISIONS: | DATE: | BY:

STRUCTURE NO.

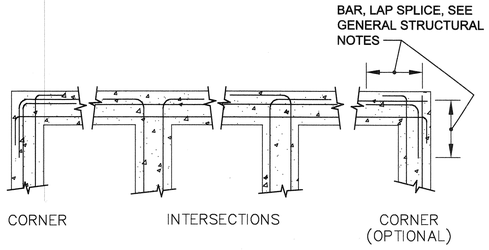
INDEX NO.

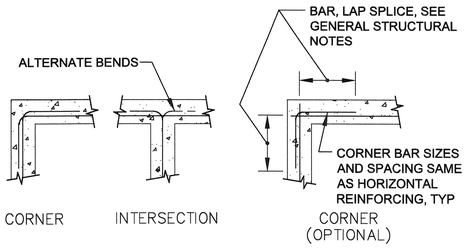
REGISTERED PROFESSIONAL ENGINEER A. SIMON NO. 66080 Exp. 6-30-2011 CIVIL STATE OF CALIFORNIA
5/27/2010

GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
LIC. NO. 66080
DATE:
ENGINEER: JERRY SIMON
DESIGNED BY: ERMILO CHAVEZ
DRAWN BY: ERIC BLACK
CHECKED BY: JERRY SIMON
APPROVED BY: ROBERT MARTIN FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5
SHEET TITLE: PUMP STATION STRUCTURAL TYPICAL DETAILS 1
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F
DRAWING NO.
S-2
SHEET 52 OF 108 SHEETS (4 OF 60)

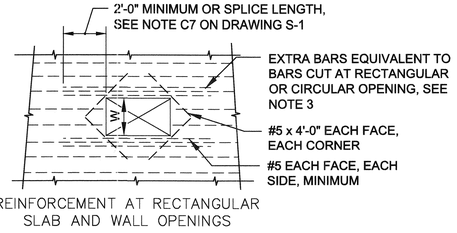




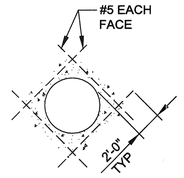
NOTE:
ALL 90 DEGREE BENDS SHALL BE STANDARD HOOKS PER ACI 318 UNLESS OTHERWISE SPECIFIED

G1 REINFORCING STEEL AT BEAM AND WALL INTERSECTIONS

SCALE: NONE VARIES



REINFORCEMENT AT RECTANGULAR SLAB AND WALL OPENINGS

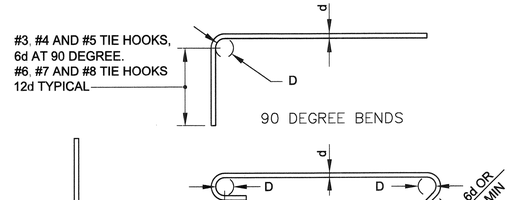


CORNER BAR FOR CIRCULAR OPENING

OPENING STEEL NOTES:
1. W=DIMENSION OF OPENING PERPENDICULAR TO BARS CUT. FOR CIRCULAR OPENINGS W=DIAMETER.
2. THIS DETAIL IS FOR ISOLATED OPENINGS BETWEEN 1'-0" AND 3'-0". FOR LARGER OPENINGS, SEE DRAWINGS.
3. TRANSVERSE REINFORCEMENT NOT SHOWN BUT SHALL BE TREATED IN SAME MANNER AS BARS SHOWN.
4. FOR SLAB AND WALL OPENINGS NOT SPECIFIED ON STRUCTURAL DRAWINGS SEE MECHANICAL AND ARCHITECTURAL DRAWINGS.
5. SUPPLEMENTARY REINFORCEMENT MAY BE OMITTED ONLY WHERE OPENING IS FRAMED BY BEAMS OR WALLS.

G5 REINFORCEMENT AT SLAB AND WALL OPENINGS

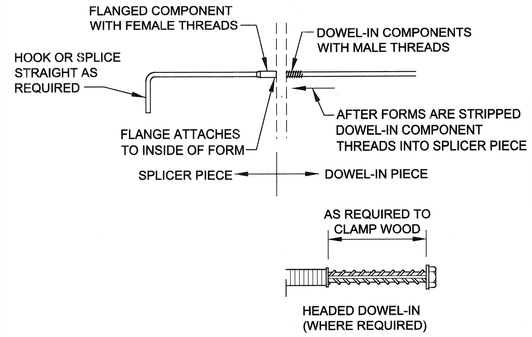
SCALE: NONE VARIES



NOTE:
D = 6d FOR #3 THRU #8
D = 8d FOR #9 THRU #11
D = 10d FOR #14 THRU #18
D = 4d FOR TIES #3, #4 AND #5

G9 TYPICAL REINFORCING BAR BENDS

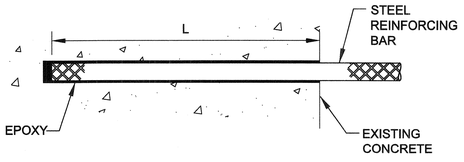
SCALE: NONE VARIES



TWO-PART DOWEL NOTES:
1. MECHANICAL SPLICE SHALL DEVELOP AT LEAST 125 PERCENT fy FOR BARS SPLICED (ACI 12.14.3.4) ACCEPTABLE PRODUCTS:
   a) RICHMOND DOWEL BAR SUBSTITUTION, SAME SIZE SPLICER AND DOWEL-IN PIECES AS REINFORCING SPLICED.
   a) DAYTON SUPERIOR MRC-150 SERIES COUPLERS, REBARS AND PLUGS.
   c) DAYTON SUPERIOR D-50 COUPLER WITH D-5X SERIES REBAR. SIZE SPLICE SYSTEM ONE SIZE LARGER THAN REBAR SPLICED (EXAMPLE: #5 SPLICE, USE #6 COUPLER AND BARS).
   d) DYWIDAG THREADBAR REINFORCING SYSTEM.
   e) WILLIAMS CD2 FLANGE COUPLER
   f) HEADED DOWEL-IN, DAYTON SUPERIOR D-108, OR EQUAL, TO SUIT OTHER MANUFACTURERS (SEE DETAIL ABOVE). HEADED DOWEL-IN DOES NOT REQUIRE 125% fy STRENGTH.
2. GALVANIZE SPLICER PER SPECIFICATIONS AND PROVIDE ANTI-SIEZE COMPOUND IN FEMALE COUPLER WITH GALVANIZED BOLT.
3. AT THE CONTRACTOR'S OPTION THE TWO-PART DOWEL PRODUCTS LISTED MAY BE USED TO REPLACE ORDINARY DOWELS SPECIFIED IN THE DRAWINGS.
4. FOLLOW MANUFACTURER'S DIRECTIONS AND APPLICABLE ICBO REPORTS. SPECIAL INSPECTION IS REQUIRED FOR USE IN OCCUPIED STRUCTURES.
5. TWO-PART COMPONENTS MUST BE OF SPECIFIED LENGTH AFTER ASSEMBLY.

G13 TWO PART DOWEL SYSTEM

SCALE: NONE VARIES

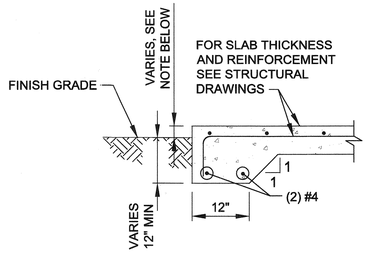


MINIMUM EMBEDMENT LENGTH, L					
SIZE	#3	#4	#5	#6	#7
L	6"	8"	10"	12"	14"
DRILL DIA	1/2"	5/8"	3/4"	7/8"	1"
SIZE	#8	#9	#10	#11	
L	15"	17"	19"	21"	
DRILL DIA	1 1/4"	1 3/8"	1 1/2"	1 3/4"	

ADHESIVE DOWELED STEEL REBAR NOTES:
1. MINIMUM EMBEDMENT LENGTH SHALL BE BY SCHEDULE UNLESS INDICATED OTHERWISE ON DRAWINGS.
2. CONFORM TO ICC REPORT REQUIREMENTS AND MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION.
3. DOWELS SHALL NOT BE CLOSER THAN 3 INCHES FROM CENTERLINE OF DOWEL TO FACE OF CONCRETE.
4. ADHESIVE ANCHOR VALUES BASED ON HILTI HIT-RE-500 ADHESIVES IN 4500 PSI CONCRETE. SUBMIT ICC REPORT FOR ALTERNATE PRODUCTS.

A1 ADHESIVE DOWELED STEEL REBAR

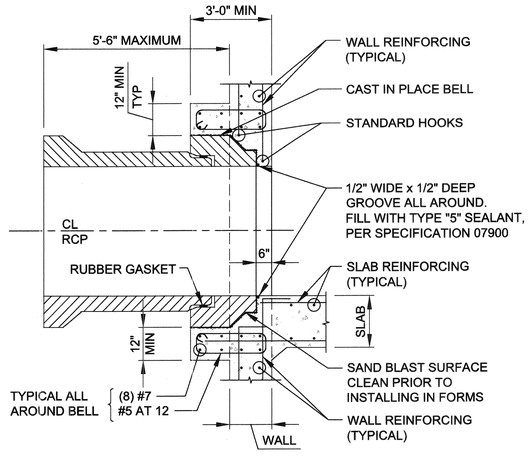
SCALE: NONE VARIES



NOTE:
1. DIMENSION EQUALS SPECIFIED DEPTH OF ADJACENT PAVING, OR EQUALS 2" FOR SOD OR OTHER LANDSCAPE FINISH APPLICATION, AS REQUIRED.
2. FOR MCC PAD SEE DRAWING C-20.

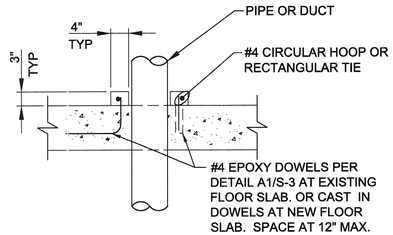
A5 SLAB-ON-GRADE THICKENED EDGE

SCALE: NONE VARIES



A9 CAST-IN-PLACE PIPE BELL

SCALE: NONE S-9, S-10



A13 CURB AT FLOOR PENETRATION

SCALE: NONE VARIES

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GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP — DATE: — LIC. NO. 68080

ENGINEER:	JERRY SIMON
DESIGNED BY:	ERMILO CHAVEZ
DRAWN BY:	ERIC BLACK
CHECKED BY:	JERRY SIMON
APPROVED BY:	ROBERT MARTIN FINN

REVISIONS: NO. — DATE: BY:

STRUCTURE NO.

INDEX NO.

PROFESSIONAL ENGINEER * JERRY A. SIMON * No. 68080 Exp. 6-30-2011 * CIVIL * STATE OF CALIFORNIA
12/7/10

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PUMP STATION STRUCTURAL TYPICAL DETAILS 2

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. S-3

SHEET 53 OF 108 SHEETS

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

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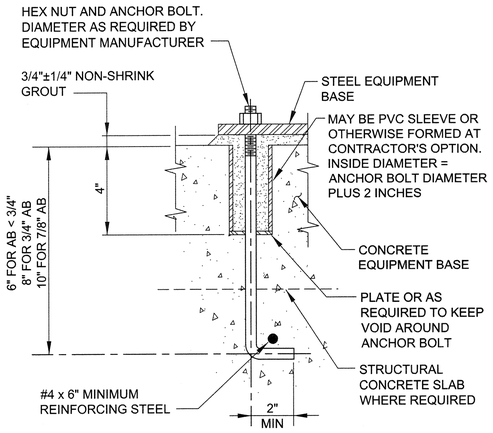
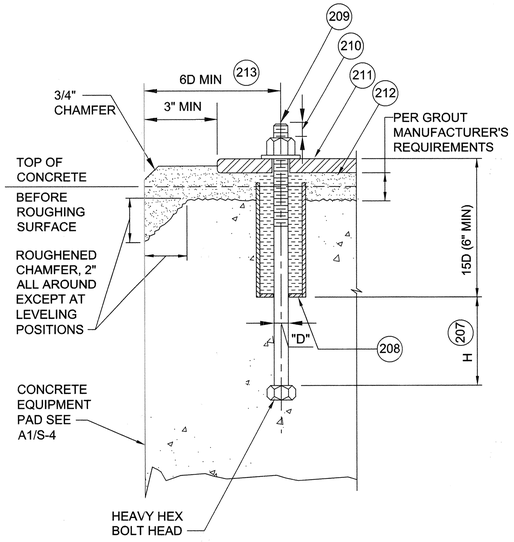


NOTES:
1. ANCHOR BOLTS SHALL BE MINIMUM LENGTH SHOWN OR LONGER AS REQUIRED BY EQUIPMENT MANUFACTURER.
2. MAXIMUM 7/8" AB, 1,000 LB EQUIPMENT OR 200 LB ROTATING MASS WEIGHT THIS DETAIL.

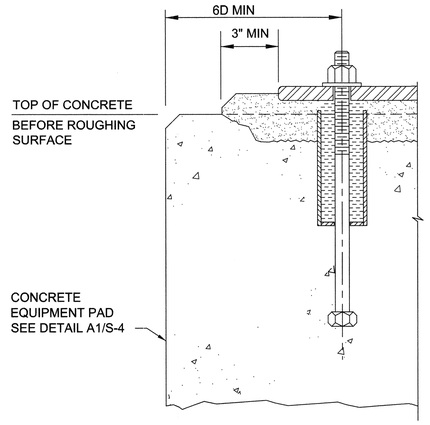
G1 ANCHOR BOLT FOR LIGHT EQUIPMENT

SCALE: NONE | VARIES



G5 GROUT TO EDGE OF EQUIPMENT PAD

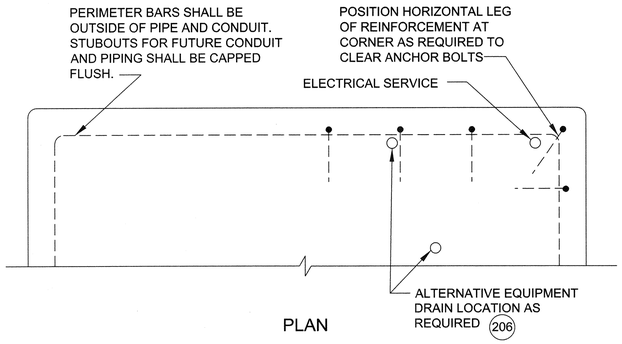
SCALE: NONE | VARIES



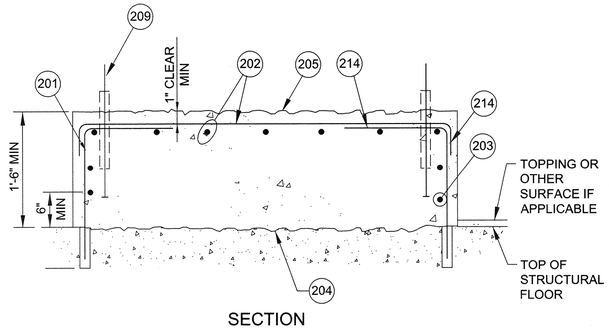
NOTE:
CONFORM TO G5/S-4 UNLESS NOTED OTHERWISE

G9 GROUT SET BACK FROM EQUIPMENT PAD EDGE

SCALE: NONE | VARIES



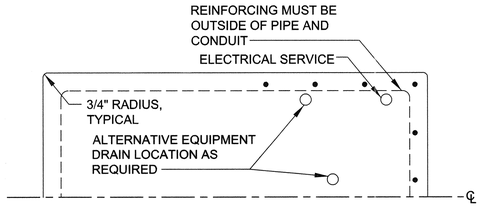
PLAN



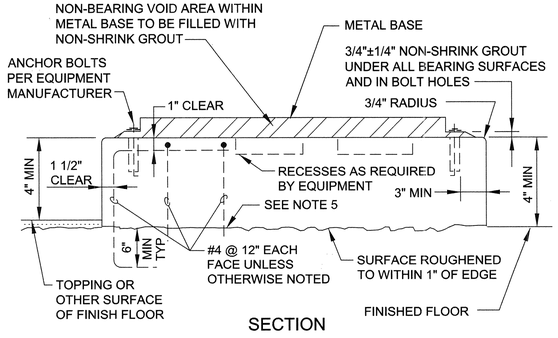
SECTION

A1 EQUIPMENT PAD FOR RIGID EQUIPMENT MOUNTS

SCALE: NONE | VARIES



PLAN



SECTION

EQUIPMENT BASE NOTES:
1. ALL EQUIPMENT INCLUDING TANKS, SHALL HAVE A CONCRETE EQUIPMENT BASE TO SUIT.
2. ANCHOR BOLTS SHALL BE SIZED FOR THE EQUIPMENT LOAD PLUS SEISMIC LOADS.
3. ANCHOR BOLTS SHALL BE SET IN POCKETS, SEE G1/S-4. ANCHOR BOLT SHALL PENETRATE STRUCTURAL SLAB AS REQUIRED TO MEET MINIMUM EMBEDMENT SPECIFIED.
4. ALL PENETRATIONS FOR CONDUIT AND PIPING SHALL BE WITHIN CONCRETE EQUIPMENT PAD. PAD TO BE CONFIGURED ACCORDINGLY.
5. WHERE BASES ARE PLACED ON EXISTING SLABS, DOWEL ALL VERTICAL BASE REINFORCING INTO EXISTING SLAB USING ADHESIVE ANCHOR.

A6 LIGHT EQUIPMENT AND TANK BASE

SCALE: NONE | VARIES

CONSTRUCTION SYMBOL:

(201) #4 AT 12" DOWEL WITH 90 DEGREE STANDARD HOOK. SEE A1/S-3.

(202) #4 AT 12" EACH WAY.

(203) #4 AT 12" CLOSED TIES WITH 135° END HOOKS, (1) MINIMUM.

(204) ROUGHEN SURFACE TO 1/4" AMPLITUDE. REMOVE ALL LAITANCE AND LOOSE MATERIAL. APPLY EPOXY BONDING AGENT 30 MINUTES OR LESS BEFORE PLACING CONCRETE.

(205) AFTER THE CONCRETE IS FULLY CURED, THE TOP OF THE EQUIPMENT PAD SHALL BE ROUGHENED TO 1/4"± AMPLITUDE.

(206) THE CONTRACTOR SHALL COORDINATE LOCATION OF ELECTRICAL CONDUIT AND DRAINAGE PIPING PENETRATIONS WITHIN THE EQUIPMENT PAD. ALL PENETRATIONS SHALL STUB-UP ON THE SAME SIDE OF THE EQUIPMENT AS REQUIRED FOR CONNECTION TO EQUIPMENT. EQUIPMENT DRAINS SHALL BE LOCATED AS REQUIRED FOR DRAINAGE FROM EQUIPMENT. EQUIPMENT PAD SHALL BE CONFIGURED ACCORDINGLY.

(207) EQUIPMENT ANCHOR EMBEDMENT, "H", SHALL BE AT LEAST THE MINIMUM LENGTH REQUIRED TO DEVELOP THE STRENGTH OF THE BOLTS, PER ACI 318-05 APPENDIX "D". IF THE ANCHOR BOLT PENETRATES CONSTRUCTION JOINTS THE EMBEDMENT REQUIRED SHALL BE CALCULATED FROM THE LOWEST CONSTRUCTION JOINT TO THE LENGHT REQUIRED TO FULLY DEVELOP THE STRENGHT OF THE BOLT.

(208) EQUIPMENT ANCHOR SLEEVE WITH INSIDE DIAMETER EQUAL TO EQUIPMENT ANCHOR DIAMETER PLUS 2 INCHES. FILL SLEEVE WITH SILICONE RUBBER OR WAX. PROTECT THREADS ABOVE SLEEVE FROM DAMAGE AND CONCRETE SPLATTER.

(209) HEX NUT, WASHER AND EQUIPMENT ANCHOR SHALL BE TYPE 316 STAINLESS STEEL, DIAMETER, "D", AS REQUIRED BY EQUIPMENT MANUFACTURER.

(210) 2 THREADS MINIMUM, 3/4" MAXIMUM.

(211) FINISHED POSITION OF BASE PLATE, SOLE PLATE OR MOUNTING BLOCK. SEE MECHANICAL DRAWINGS FOR EQUIPMENT MOUNTING REQUIREMENTS.

(212) EPOXY GROUT INSTALLED PER SPECIFICATION SECTIONS 03315 AND 11000 AFTER LEVELING OF BASE PLATE, SOLE PLATE OR MOUNTING BLOCK.

(213) PRIOR TO CONCRETE PLACEMENT, EQUIPMENT ANCHORS SHALL BE ACCURATELY SET ACCORDING TO THE EQUIPMENT MANUFACTURER'S MOUNTING TEMPLATE AND FIRMLY SECURED TO PREVENT SHIFTING DURING CONCRETE PLACEMENT.

(214) HOOK REINFORCING OR PROVIDE CLASS "B" LAP SPLICE.

NOTES:
1. COORDINATE EQUIPMENT PAD, ANCHORS AND MOUNTING REQUIREMENTS WITH SPEC SECTION 11300.

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STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER * KINNON A. SIMON * No. 68080 Exp. 6-30-2011 * STATE OF CALIFORNIA * CIVIL

V2/7/2019

GARY LEE MOORE, P.E.
CITY ENGINEER
DATE:
LIC. NO. 68080

	DESIGN GROUP	CHECKED
ENGINEER:	JERRY SIMON	
DESIGNED BY:	ERMILO CHAVEZ	
DRAWN BY:	ERIC BLACK	
CHECKED BY:	JERRY SIMON	
APPROVED BY:	ROBERT MARTIN FINN	

VERTICAL CONTROL:	NGVD29, 1985 ADJ
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5
SHEET TITLE:	PUMP STATION STRUCTURAL TYPICAL DETAILS 3
PROJECT:	PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
ADDRESS:	1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F

DRAWING NO.
S-4

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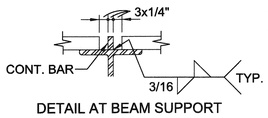
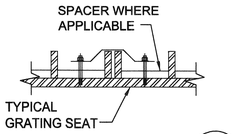
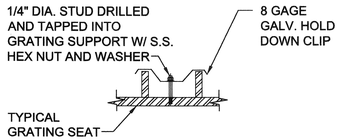
GRATING SCHEDULE (6)	
BEARING BAR SIZE ALUMINUM	CLEAR SPAN
1 x 3/16	2'-6"
1 1/4 x 3/16	3'-6"
1 1/2 x 3/16	4'-0"
1 3/4 x 3/16	5'-0"
2 x 3/16	5'-6"
2 1/4 x 3/16	6'-6"
2 1/2 x 3/16	7'-0"



DETAIL AT BEAM SUPPORT



SECTION A S-5
SCALE: NO SCALE



SECTION B S-5
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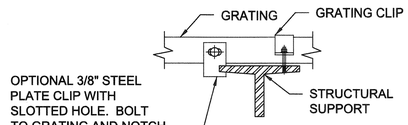

SECTION C S-5
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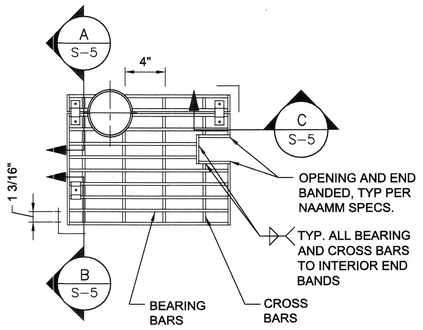
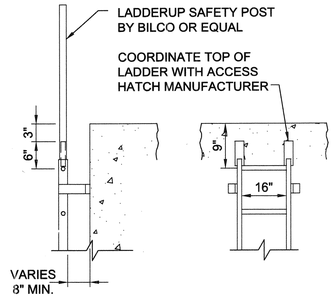
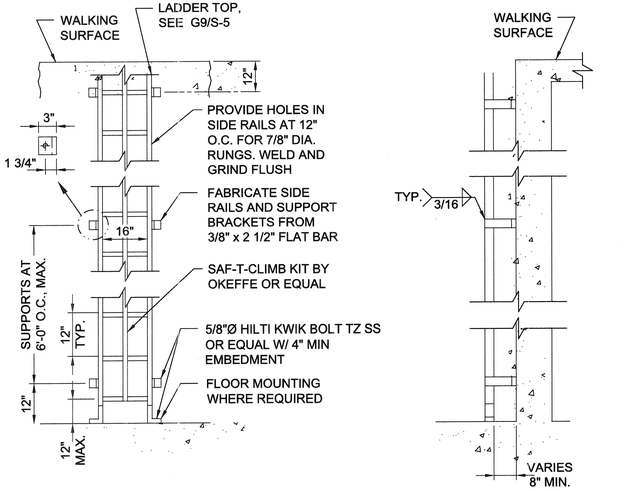


NOTES:
1. GRATING SHALL CONFORM TO THE METAL BAR GRATING MANUAL OF NAAMM, UNLESS OTHERWISE SPECIFIED. GRATING SHALL BE ALUMINUM UNLESS NOTED OTHERWISE.
2. GRATING SHALL BE SWAGED AND FORGED.
3. WHERE BOLTED GRATING IS SPECIFIED. PROVIDE 4 GRATING CLIPS APPROX. 4" FROM THE CORNERS OF EACH PIECE. ADJACENT PIECES MAY BE ANCHORED WITH ONE CLIP AND 2 STUDS, (SEE SECTION A).
4. GRATING SHALL BE REMOVABLE.
5. CLEAR SPAN SHALL BE PLAN DIMENSION. FACE TO FACE OF OPENING.
6. GRATING SCHEDULE IS SUITABLE FOR DESIGN LIVE LOADS OF 250 PSF OR LESS.
7. END BAND TO BE 1/4" LESS THAN GRATING DEPTH.
8. PROVIDE END SUPPORT PER A1/S-5 AT ALL LOCATIONS WHERE GRATING ON MOVE MORE THAN 1/4" IF UNCLIPPED.
9. ALL GRATING SHALL BE NON-SLIP GRATING.

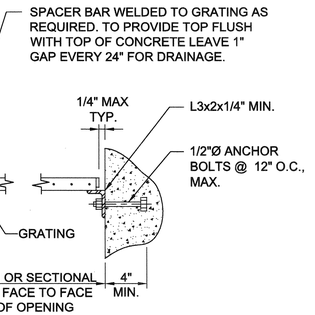
G1	GRATING SCHEDULE AND CONNECTION DETAILS
SCALE: NONE	VARIES



G9	TOP OF LADDER UNDER GRATING OR ACCESS HATCH
SCALE: NONE	VARIES

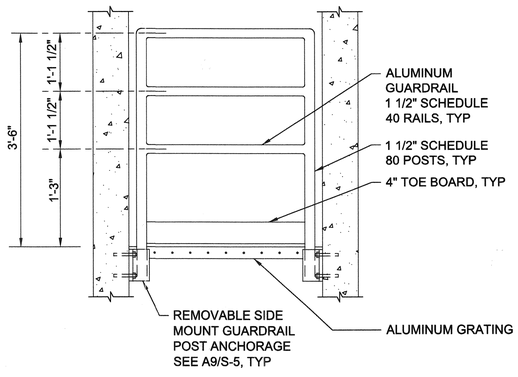


G12	ALUMINUM LADDER
SCALE: NONE	S-8



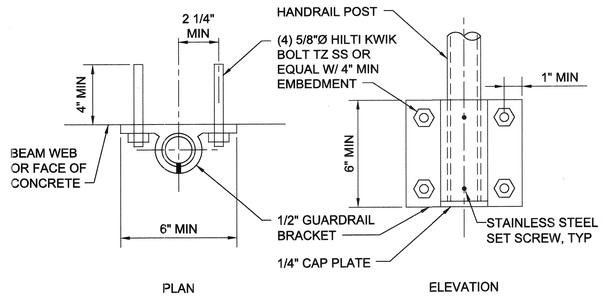
NOTES:
1. ALL MEMBERS SHALL BE 316 SST.

A1	GRATING SUPPORT AT CONCRETE
SCALE: NONE	VARIES



NOTES:
1. ALL GUARDRAIL FASTENERS SHALL BE STAINLESS STEEL.
2. GUARDRAIL SHALL BE INSTALLED SO AS NOT TO INTERFERE WITH ANY PIPING, EQUIPMENT OR OTHER PIPING ASSEMBLY.
3. RAILING POST LOCATION SHALL BE FIELD MEASURED AND RAILING FABRICATED TO FIT. NO FIELD CUTTING OR WELDING WILL BE PERMITTED. RAILING WHICH DOES NOT FIT MOUNTING PREVIOUSLY SET IN CONCRETE WILL BE REJECTED.
4. GUARDRAIL MANUFACTURER'S STANDARD CONNECTION DETAILS MAY BE USED IF STAINLESS STEEL BOLTS ARE USED AND DETAIL IS IBC APPROVED.

A5	GUARDRAIL
SCALE: NONE	S-9



SIDE MOUNT - CONCRETE SLAB

NOTES:
1. MATCH EXISTING GUARDRAIL MATERIAL. IF ALUMINUM, COAT PARTS IN CONTACT WITH DISSIMILAR METALS OR CONCRETE WITH A BITUMINOUS PAINT.
2. ANCHOR BOLT SIZE SHOWN IS MINIMUM, PROVIDE LARGER SIZE IF NECESSARY TO MEET LOAD REQUIREMENTS.

A9	REMOVABLE GUARDRAIL POST ANCHORAGE
SCALE: NONE	S-5

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PROFESSIONAL ENGINEER A. SIMON No. C 68080 CIVIL STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PUMP STATION STRUCTURAL TYPICAL DETAILS 4

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

GARY LEE MOORE, P.E. CITY ENGINEER DATE:

DESIGN GROUP		LIC. NO.
ENGINEER:	JERRY SIMON	
DESIGNED BY:	ERMILO CHAVEZ	
DRAWN BY:	ERIC BLACK	
CHECKED BY:	JERRY SIMON	
APPROVED BY:	ROBERT MARTIN FINN	

WORK ORDER NO. EW40019F

DRAWING NO. S-5

SHEET 55 OF 100 SHEETS

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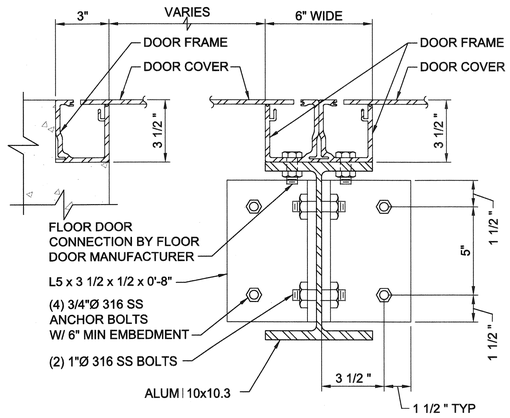
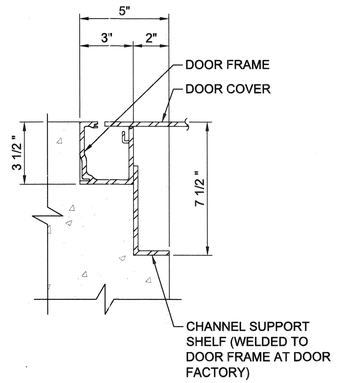


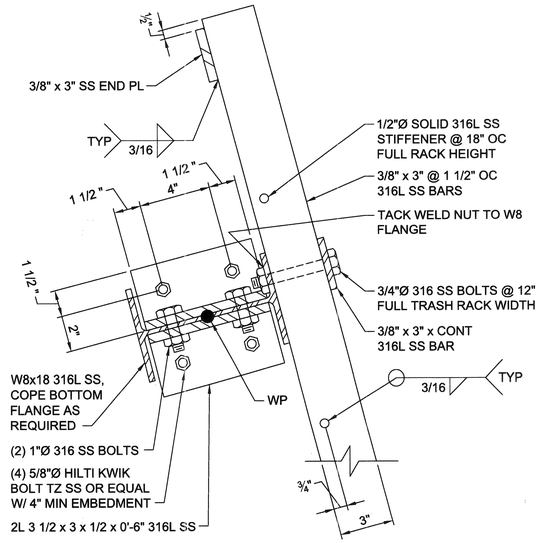
FRAME PARALLEL WITH HINGE SIDE OF DOOR



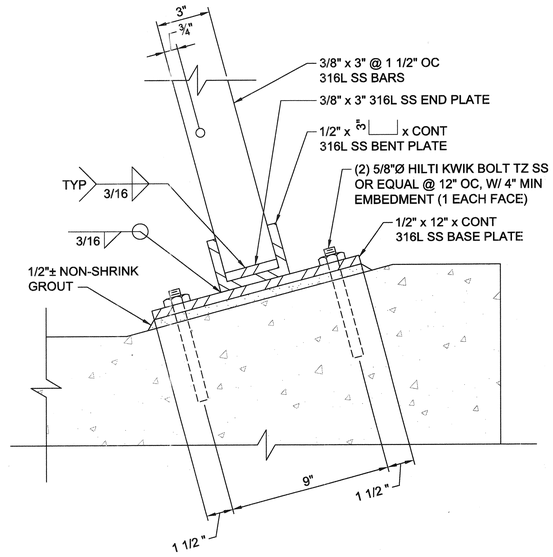
FRAME PERPENDICULAR TO HINGE SIDE OF DOOR

✱ CONFIRM DIMENSION WITH MANUFACTURER OF DOOR PURCHASED

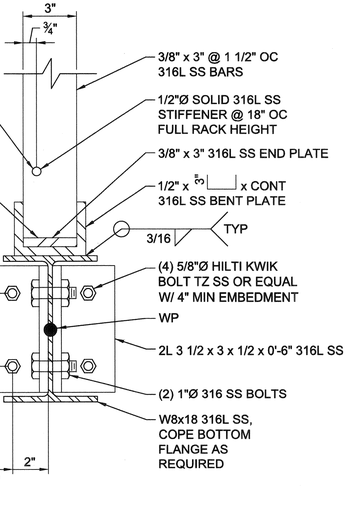
G1	DOOR COVER FRAMING DETAILS
SCALE: NONE	S-9, S-10, S-11, S-13



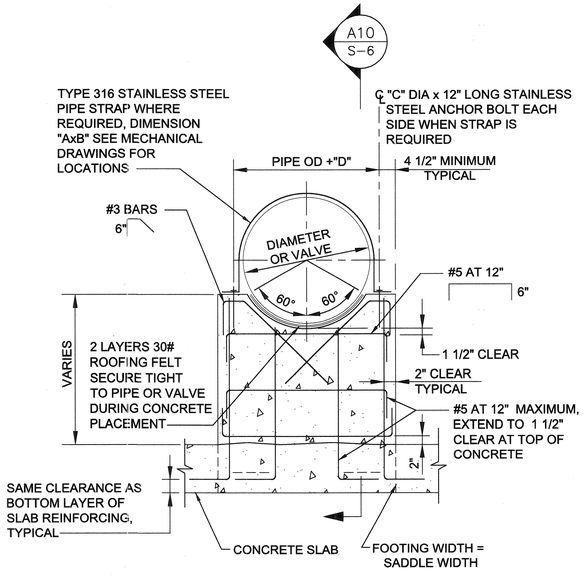
G8	BAR RAKE CONNECTION
SCALE: NONE	S-9



G12	BAR RAKE CONNECTION
SCALE: NONE	S-9

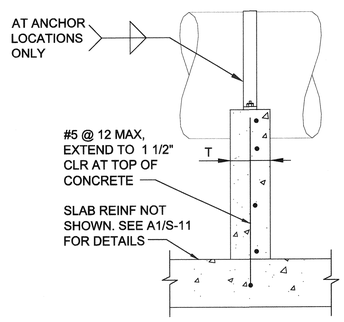


A1	BAR RAKE CONNECTION
SCALE: NONE	S-9



A5	CONCRETE PIPE OR VALVE SADDLE
SCALE: NONE	S-10, M-3, M-7

PIPE SIZE	DIMENSIONS				
	A	B	C	D	T
6" - 12"	1/4"	2"	3/4"	3"	8"
14" - 18"	1/4"	4"	3/4"	3"	8"
20" - 36"	3/8"	5"	3/4"	3"	10"
42" - 54"	3/8"	6"	1"	4"	12"
60" - 72"	3/8"	6"	1 1/8"	4"	16"



CONCRETE PIPE OR VALVE SADDLE NOTE:

FOR THICKNESS GREATER THAN 10 INCHES, USE 2 LAYERS OF REINFORCING, TURN HORIZONTAL BARS 90 DEGREES TO HOOK AROUND VERTICAL BARS. 1 1/2" CLEARANCE ON CONCRETE.

A10	CONCRETE PIPE OR VALVE SADDLE SECTION
SCALE: NONE	S-6

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GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP		DATE:
ENGINEER:	JERRY SIMON	LIC. NO. 68080
DESIGNED BY:	ERMILO CHAVEZ	
DRAWN BY:	ERIC BLACK	
CHECKED BY:	JERRY SIMON	
APPROVED BY:	ROBERT MARTIN FINN	

REVISIONS: NO. | DATE: BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER * JERRY A. SIMON * NO. 68080 * CIVIL * STATE OF CALIFORNIA

VERIFIED

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PUMP STATION STRUCTURAL TYPICAL DETAILS 5

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. S-6

SHEET ~~56~~ 60 OF ~~106~~ SHEETS

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

Sheet Version 2.0

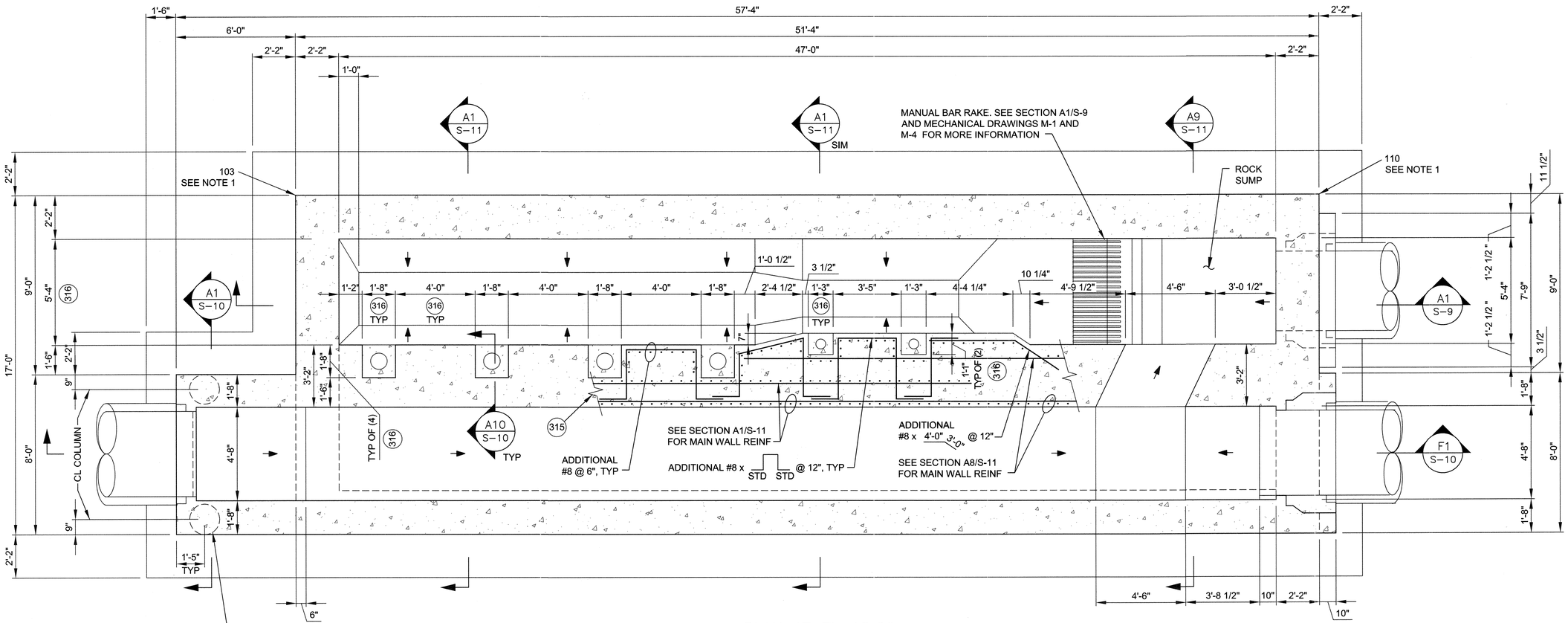
CONSTRUCTION SYMBOLS:

(315) PARTIAL REINFORCEMENT SHOWN FOR CLARITY ONLY. SEE CROSS SECTION FOR MAIN WALL REINFORCEMENT.

(316) COORDINATE DIMENSIONS WITH EQUIPMENT MANUFACTURER'S REQUIREMENTS.

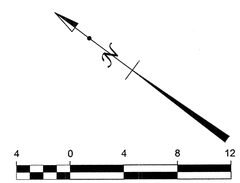
NOTES:

1. FOR STRUCTURE COORDINATES SEE DRAWING C-10.



PLAN AT EL 15.00

SCALE: 3/8"=1'-0"



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STRUCTURE NO.

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GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
LIC. NO. 68080

ENGINEER:	JERRY SIMON
DESIGNED BY:	ERMILO CHAVEZ
DRAWN BY:	ERIC BLACK
CHECKED BY:	JERRY SIMON
APPROVED BY:	ROBERT MARTIN FINN

REGISTERED PROFESSIONAL ENGINEER * JERRY A. SIMON * No. 68080 * Exp. 6-30-2011 * CIVIL * STATE OF CALIFORNIA
1/27/2010

SHEET TITLE:	PUMP STATION STRUCTURAL PLAN AT EL. 15.00
PROJECT:	PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
ADDRESS:	1216 E. ROSE AVENUE LOS ANGELES, CA 90291
VERTICAL CONTROL:	NGVD29, 1985 ADJ.
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5

WORK ORDER NO.
EW40019F

DRAWING NO.
S-7

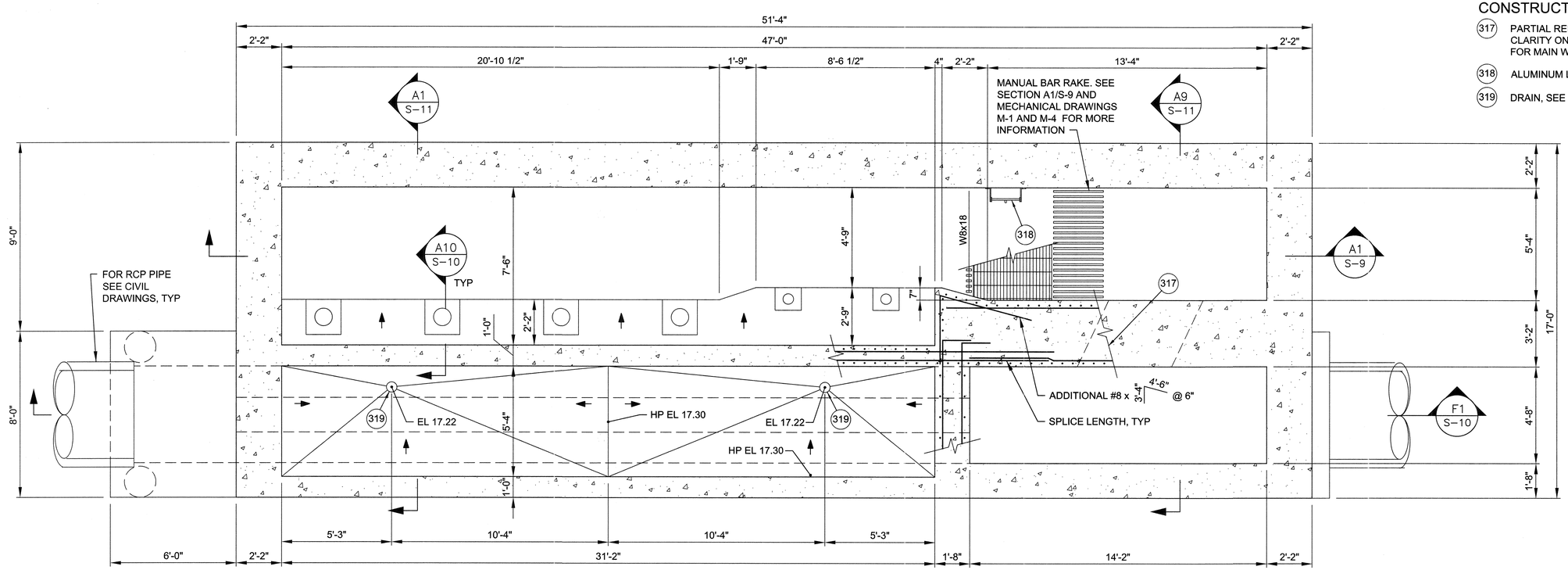
SHEET ~~57~~ 60 OF ~~408~~ SHEETS

CONSTRUCTION SYMBOLS:

(317) PARTIAL REINFORCEMENT SHOWN FOR CLARITY ONLY. SEE CROSS SECTION FOR MAIN WALL REINFORCEMENT.

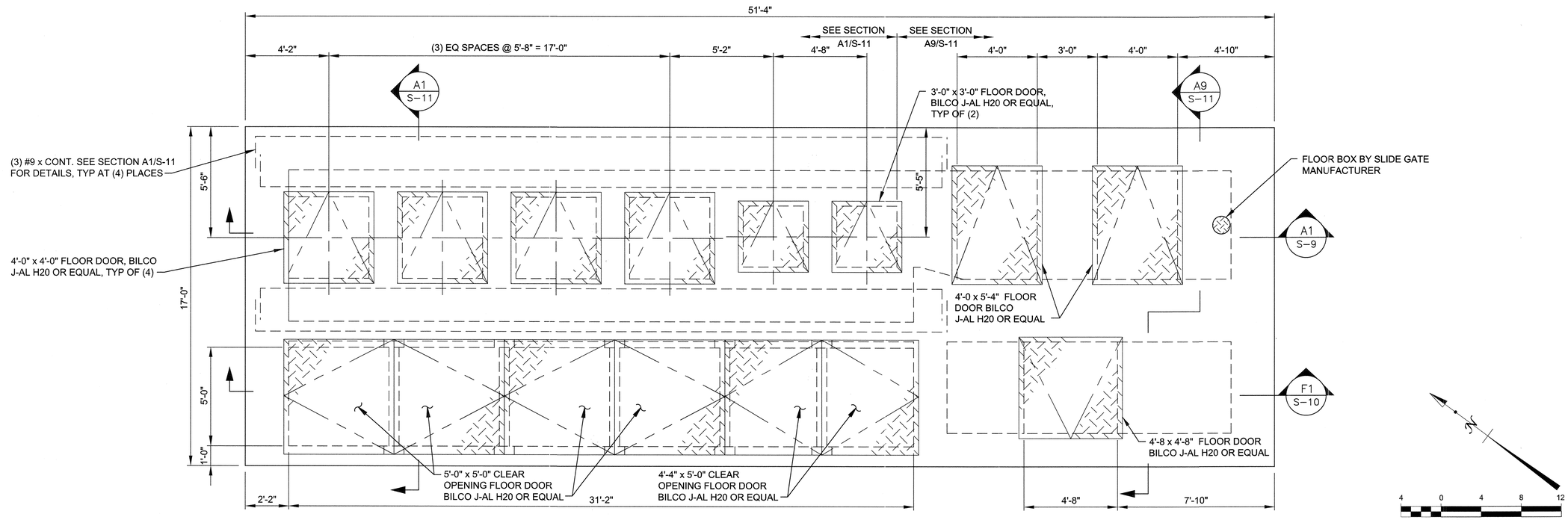
(318) ALUMINUM LADDER, SEE G12/S-5.

(319) DRAIN, SEE DRAWING M-1.



PLAN AT EL 22.00

SCALE: 3/8"=1'-0"



PLAN AT EL 25.00

SCALE: 3/8"=1'-0"

SCALE: 3/8"=1'-0"

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REGISTERED PROFESSIONAL ENGINEER GARY A. SIMON No. 68080 Exp. 6-30-2011 CIVIL STATE OF CALIFORNIA

12/21/2010

GARY LEE MOORE, P.E.
CITY ENGINEER
DATE:
LIC. NO. 68080

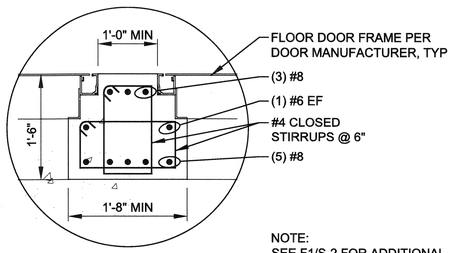
DESIGN GROUP	
ENGINEER:	JERRY SIMON
DESIGNED BY:	ERMILO CHAVEZ
DRAWN BY:	ERIC BLACK
CHECKED BY:	JERRY SIMON
APPROVED BY:	ROBERT MARTIN FINN

VERTICAL CONTROL:	NGVD29, 1985 ADJ
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5
SHEET TITLE:	PUMP STATION STRUCTURAL PLANS AT EL. 22.00 AND EL. 25.00
PROJECT:	PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
ADDRESS:	1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F

DRAWING NO.
S-8

SHEET ~~58~~ 10 OF ~~106~~ 60 SHEETS



DETAIL TYP OF (5)

NOTE:
SEE F1/S-2 FOR ADDITIONAL BEAM DETAILS

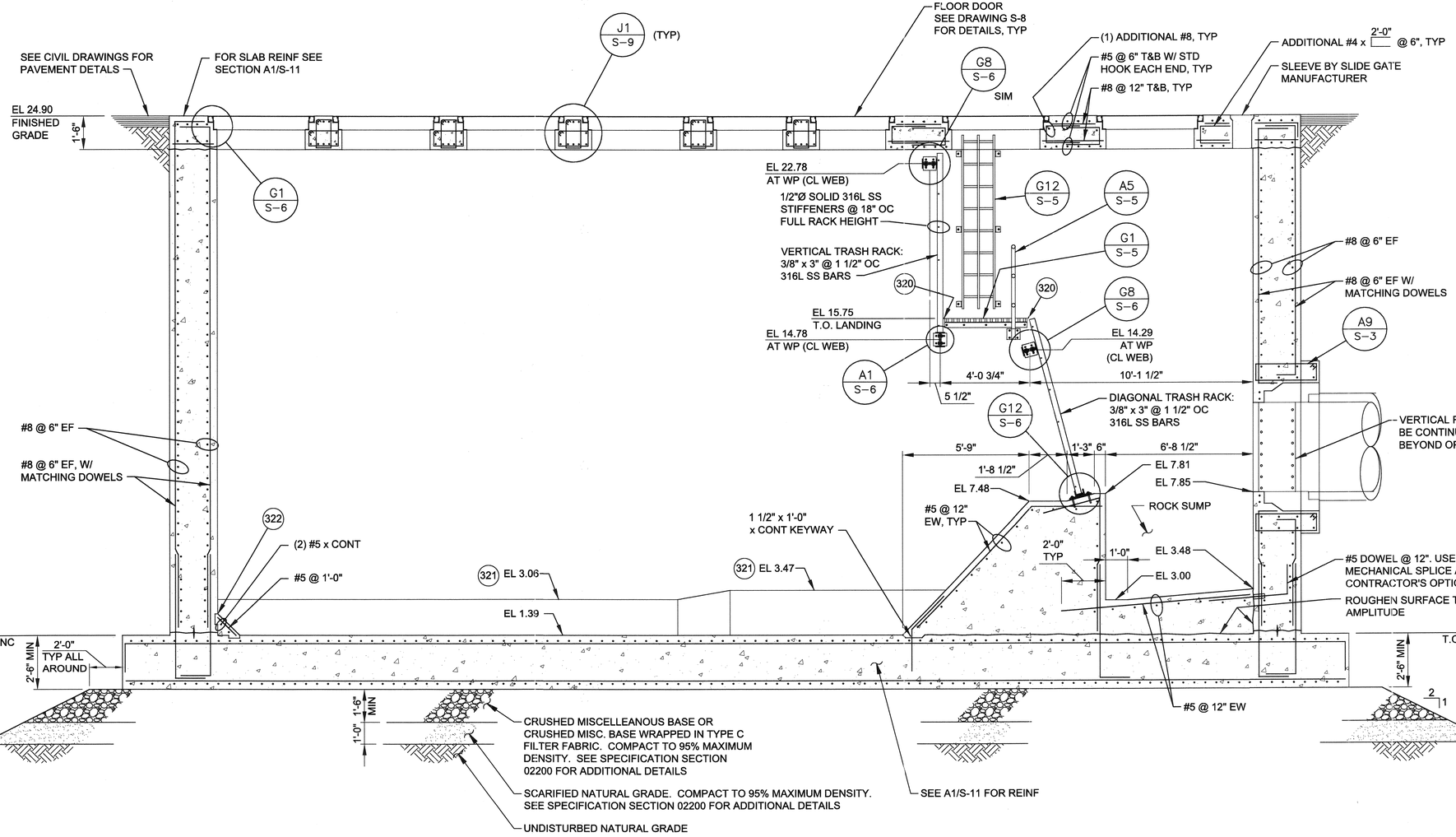
J1	BEAM SECTION
SCALE: 3"=1'-0"	S-9

CONSTRUCTION SYMBOLS:

(320) PROVIDE 1" MAXIMUM GAP BETWEEN ALUMINUM GRATING AND TRASH RACK EDGE.

(321) COORDINATE ELEVATION WITH PUMP MANUFACTURER.

(322) 1 1/2" x 6" x CONTINUOUS KEYWAY.



A1	PUMPING STATION SECTION
SCALE: 3/8"-1'-0"	S-7, S-8

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

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STRUCTURE NO.

INDEX NO.

DESIGN GROUP

		LIC. NO.
ENGINEER:	JERRY SIMON	
DESIGNED BY:	ERMILO CHAVEZ	
DRAWN BY:	ERIC BLACK	
CHECKED BY:	JERRY SIMON	
APPROVED BY:	ROBERT MARTIN FINN	

REGISTERED PROFESSIONAL ENGINEER A. SIMON No. C 50620 Exp. 6-30-2011 CIVIL STATE OF CALIFORNIA

12/09/02

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PUMP STATION STRUCTURAL SECTIONS 1

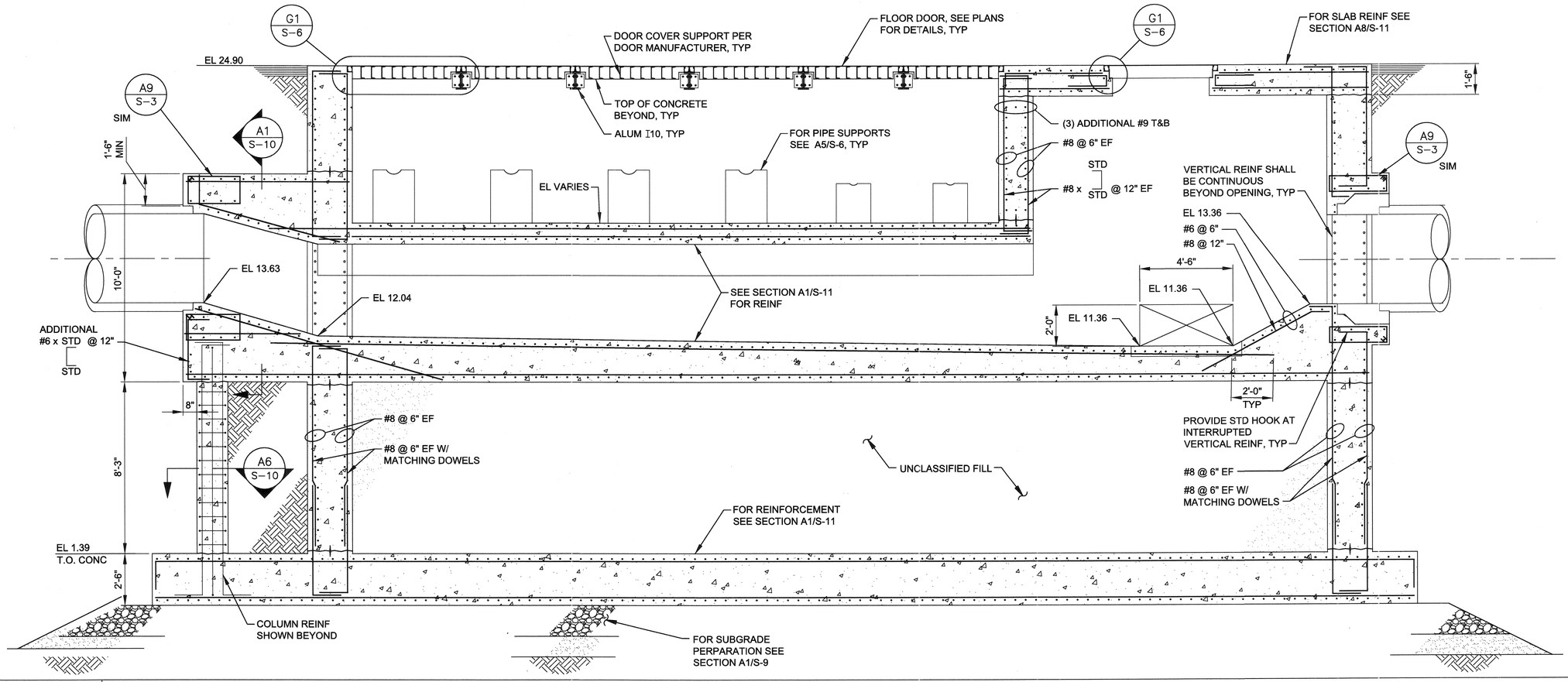
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA. 90291

WORK ORDER NO. EW40019F

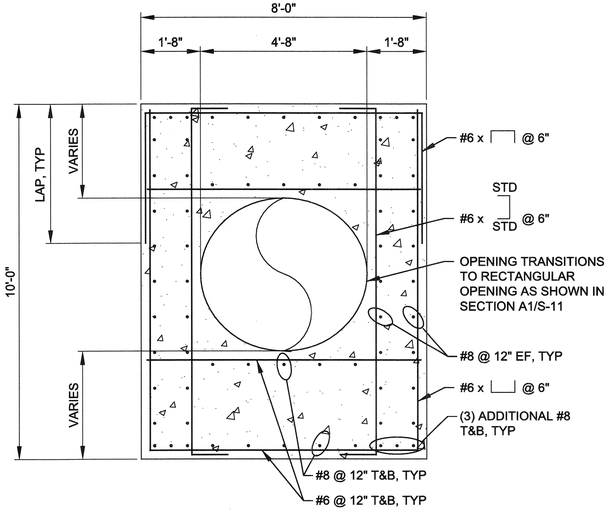
DRAWING NO. S-9

SHEET 59 OF 108 SHEETS



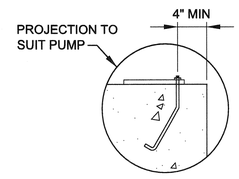
F1 PUMPING STATION SECTION

SCALE: 3/8"=1'-0" | S-7, S-8



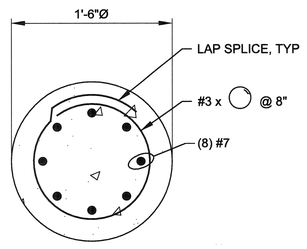
A1 END SECTION

SCALE: 1/2"=1'-0" | S-7, S-10



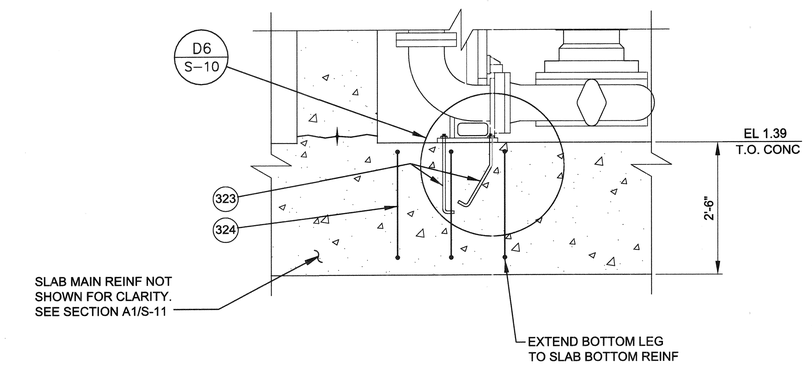
D6 PUMP BASE

SCALE: NONE | S-10



A6 COLUMN SECTION

SCALE: 1 1/2"=1'-0" | S-10



A10 PUMP BASE SECTION

SCALE: 3/4"=1'-0" | S-7, S-8

NOTES:

1. ANCHOR BOLTS SHALL BE TYPE 316 SS. QUANTITY, DIAMETER, AND EMBEDMENT PER PUMP MANUFACTURER'S REQUIREMENTS.
2. PROVIDE EPOXY GROUT UNDER BASE ELBOW AS SPECIFIED IN SECTION 03600.

CONSTRUCTION SYMBOLS:

(323) (3) #5 x ENCLOSE PUMP ANCHOR BOLTS

(324) (6) #5 x STD STD . (3) EACH FACE.

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GARY LEE MOORE, P.E.
CITY ENGINEER
DATE:
LIC. NO. 68080

DESIGN GROUP	
ENGINEER:	JERRY SIMON
DESIGNED BY:	ERMILO CHAVEZ
DRAWN BY:	ERIC BLACK
CHECKED BY:	JERRY SIMON
APPROVED BY:	ROBERT MARTIN FINN

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ★ JERRY A. SIMON ★ No. 68080 ★ CIVIL ★ STATE OF CALIFORNIA
Vz 7/12/10

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PUMP STATION STRUCTURAL SECTIONS 2

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. S-10

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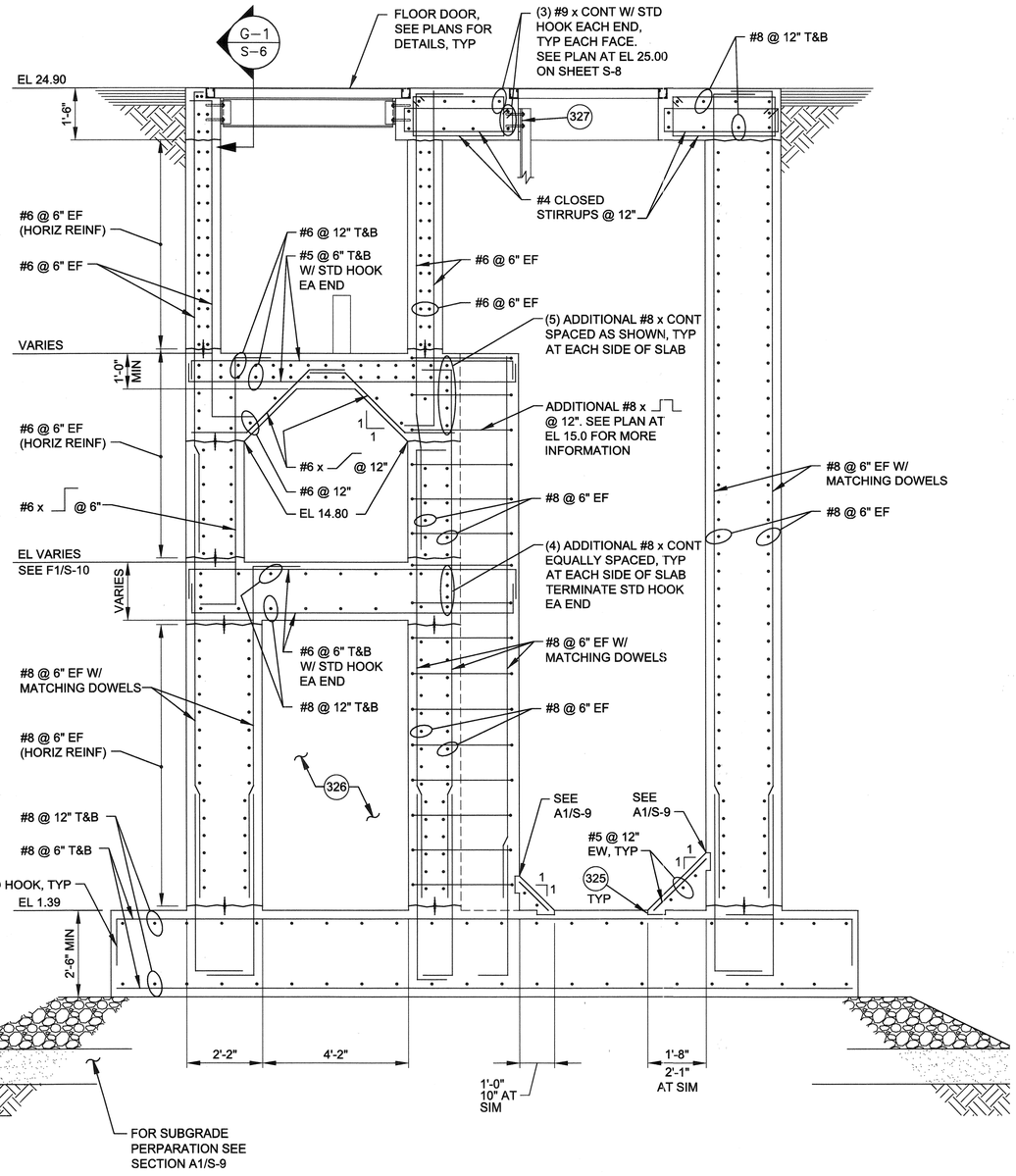
CONSTRUCTION SYMBOLS:

(325) 1 1/2" x 6" x CONTINUOUS KEYWAY.

(326) UNCLASSIFIED FILL.

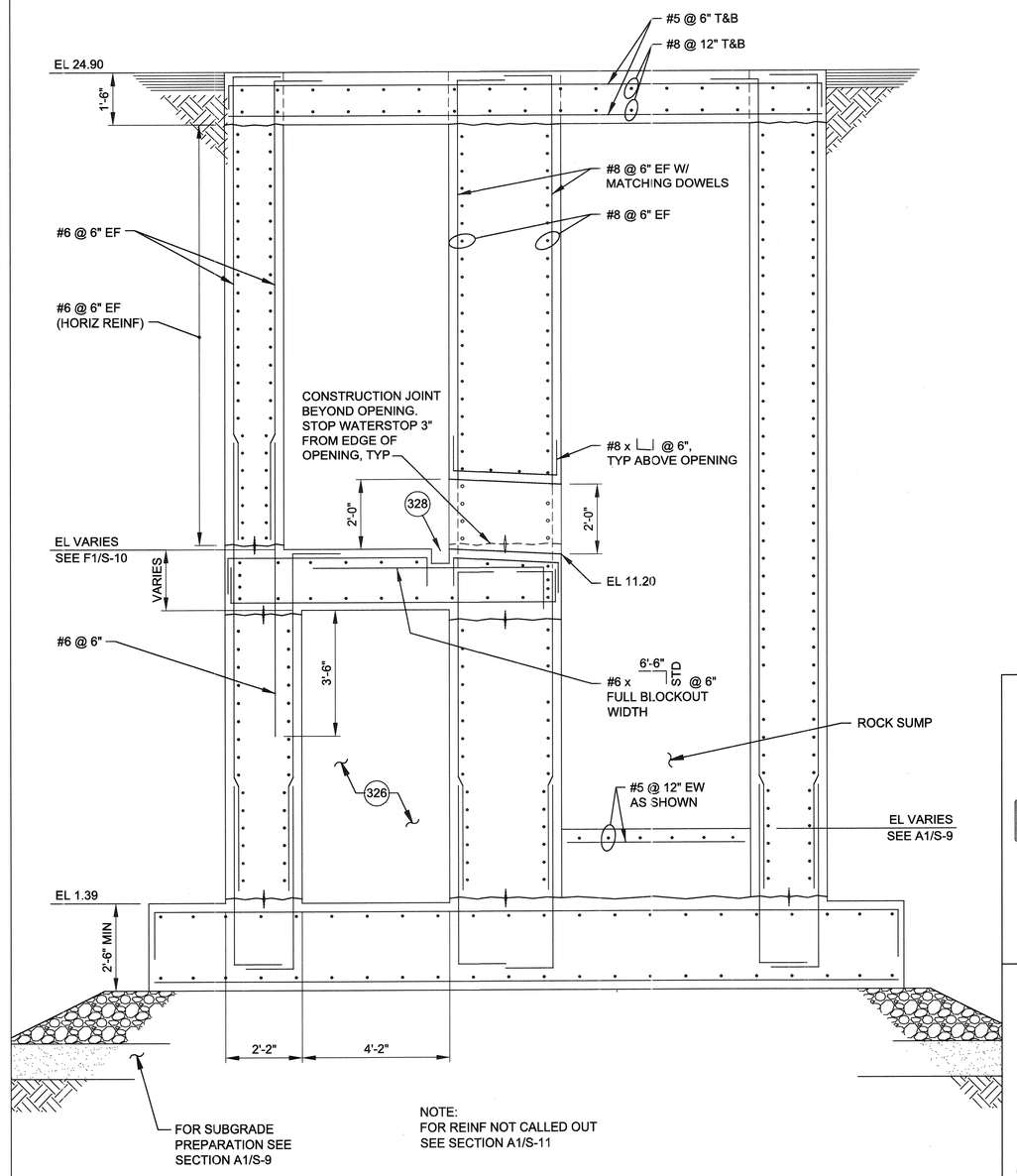
(327) PUMP GUIDE SUPPORT SHALL BE DESIGNED AND PROVIDED BY PUMP MANUFACTURER. BRACKET AND ANCHOR BOLTS SHALL BE 316 SS.

(328) 6" WIDE x 5" DEEP (MAXIMUM) BLOCKOUT FOR SLIDE GATE. COORDINATE BLOCKOUT SIZE WITH SLIDE GATE MANUFACTURER.



A1 PUMPING STATION CROSS SECTION

SCALE: 1/2"=1'-0" | S-7, S-8



NOTE:
FOR REINF NOT CALLED OUT
SEE SECTION A1/S-11

A9 PUMPING STATION CROSS SECTION

SCALE: 1/2"=1'-0" | S-7, S-8

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GARY LEE MOORE, P.E. CITY ENGINEER DATE:

DESIGN GROUP
ENGINEER: JERRY SIMON
DESIGNED BY: ERMILO CHAVEZ
DRAWN BY: ERIC BLACK
CHECKED BY: JERRY SIMON
APPROVED BY: ROBERT MARTIN FINN

LIC. NO. 66080

REGISTERED PROFESSIONAL ENGINEER JERRY A. SIMON NO. 66080 CIVIL STATE OF CALIFORNIA 12/31/2010

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PUMP STATION STRUCTURAL SECTIONS 3
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

STRUCTURE NO.

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NO.	REVISIONS:	DATE:	BY:

WORK ORDER NO. EW40019F

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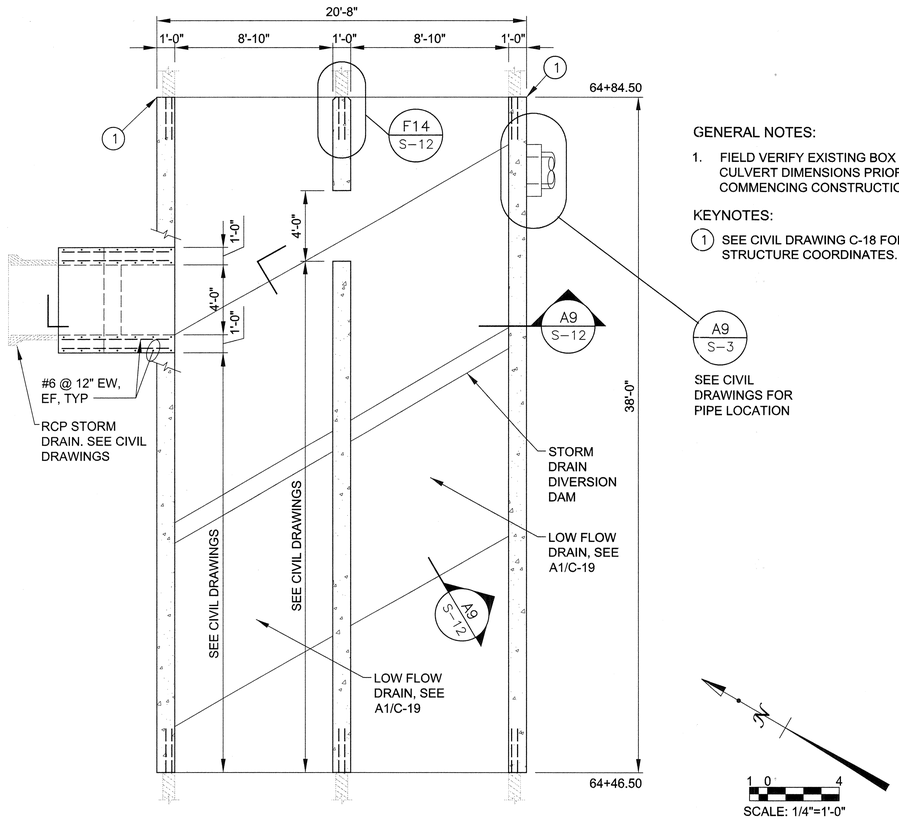


GENERAL NOTES:

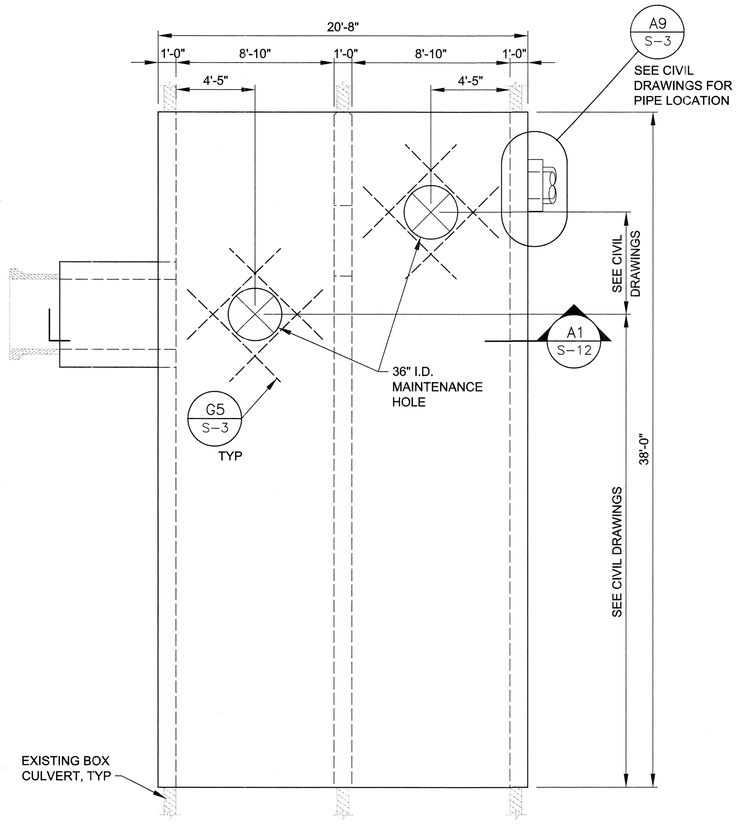
1. FIELD VERIFY EXISTING BOX CULVERT DIMENSIONS PRIOR TO COMMENCING CONSTRUCTION.

KEYNOTES:

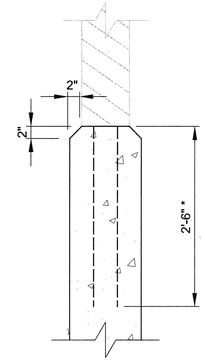
(1) SEE CIVIL DRAWING C-18 FOR STRUCTURE COORDINATES.

SCALE: 1/4"=1'-0"

F1	STORM DRAIN BOX LOWER LEVEL PLAN
SCALE: 1/4"=1'-0"	S-12

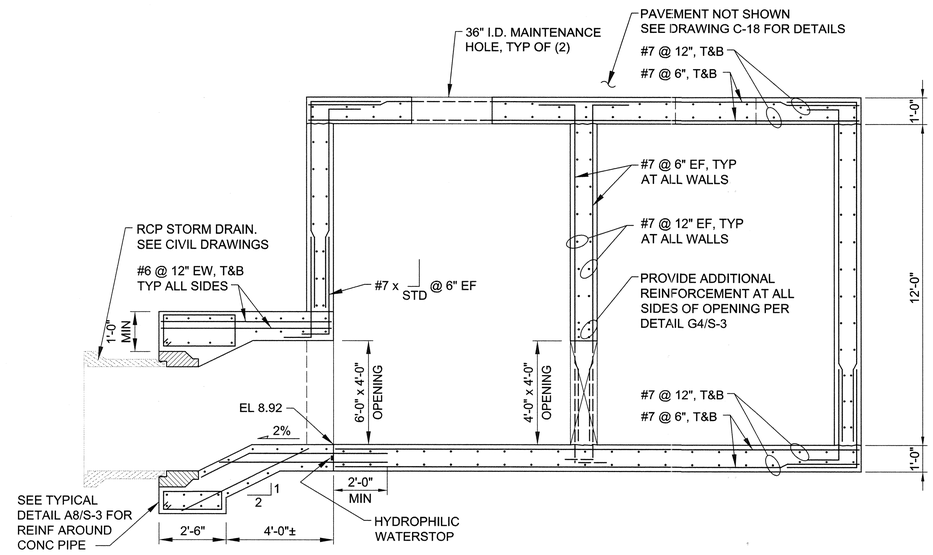


F8	STORM DRAIN BOX UPPER LEVEL PLAN
SCALE: 1/4"=1'-0"	S-12

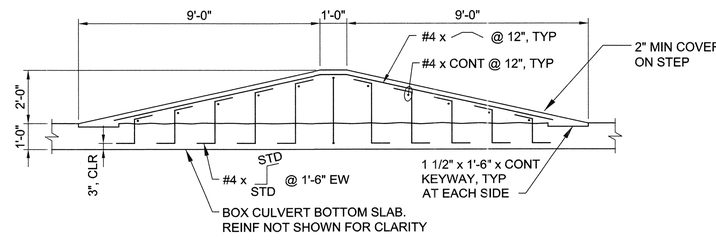


★ 2'-6" OF EXISTING REINF SHALL REMAIN FOR TIE-IN AND SHALL NOT BE DAMAGED. TYPICAL (6) LOCATIONS.

F14	DETAIL
SCALE: 1"=1'-0"	S-12



A1	SECTION - STORM DRAIN BOX
SCALE: 3/8"=1'-0"	S-12



A9	SECTION - STORM DRAIN DIVERSION DAM
SCALE: 3/8"=1'-0"	S-12

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INDEX NO.

GARY LEE MOORE, P.E. CITY ENGINEER
DATE:
LIC. NO. 68080

DESIGN GROUP

ENGINEER:	JERRY SIMON
DESIGNED BY:	ERMILO CHAVEZ
DRAWN BY:	ERIC BLACK
CHECKED BY:	JERRY SIMON
APPROVED BY:	ROBERT MARTIN FINN

REGISTERED PROFESSIONAL ENGINEER A. SIMON No. 68080 STATE OF CALIFORNIA
01/31/12

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PUMP STATION STRUCTURAL SECTIONS 4

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. S-12

SHEET 62 OF 100 SHEETS

14 60

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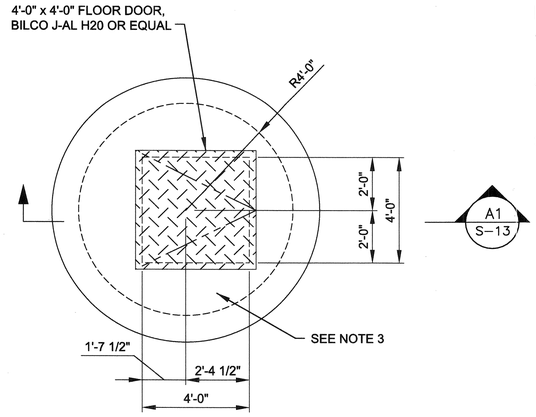
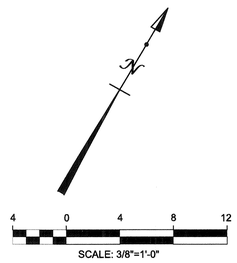
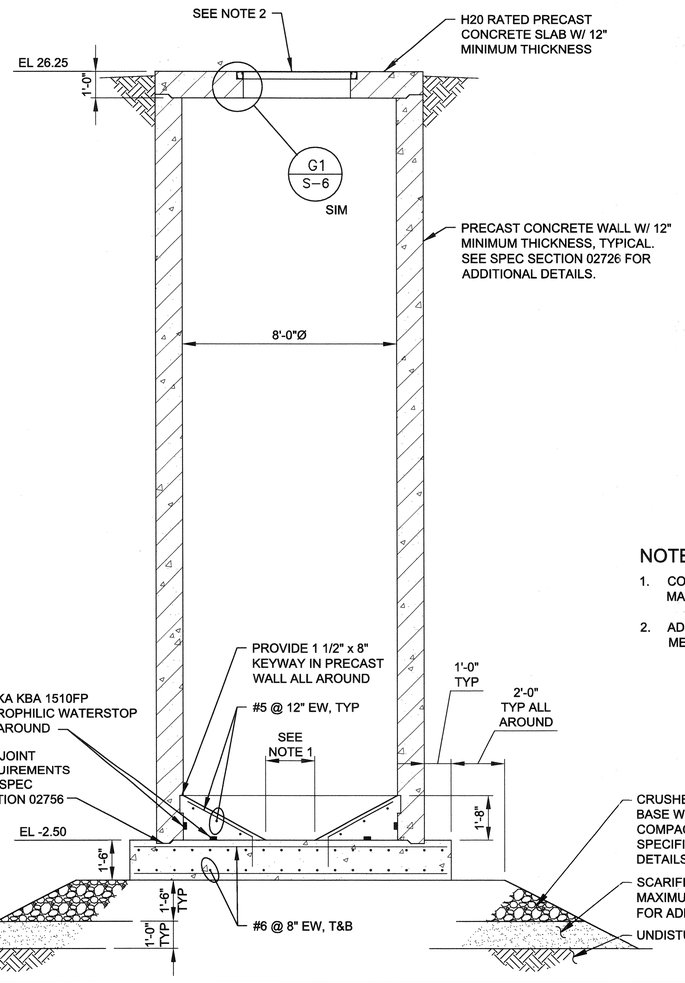


NOTES:

1. FOR RESERVOIR PUMP STATION EXACT LOCATION, SEE CIVIL DRAWING C-9.
2. COORDINATE FLOOR DOOR HINGE SIDE WITH PUMP MANUFACTURER PRIOR TO FABRICATING FLOOR DOOR.
3. ADJUST TOP ELEVATION AND SLOPE TO MEET EXISTING SIDEWALK AND CURB FLUSH.



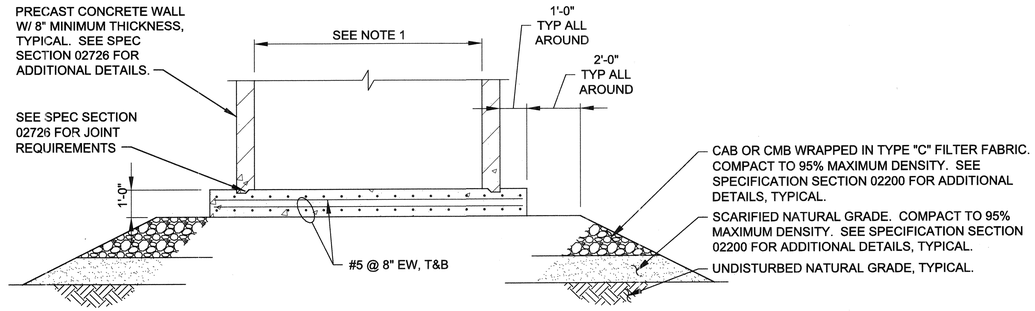
I1	RESERVOIR PUMPING STATION PLAN
SCALE: 3/8"=1'-0"	---



NOTES:

1. COORDINATE SIZE OF FILLET WITH PUMP MANUFACTURER.
2. ADJUST TOP ELEVATION AND SLOPE TO MEET EXISTING SIDEWALK AND CURB FLUSH.

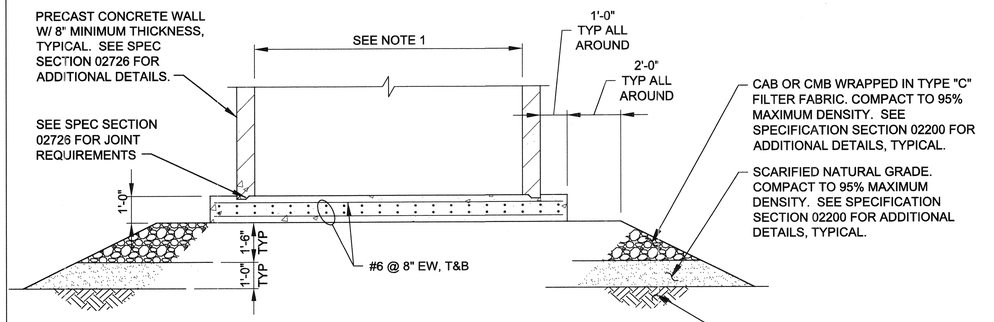
A1	RESERVOIR PUMPING STATION SECTION
SCALE: 3/8"=1'-0"	S-13, M-6



NOTES:

1. SEE DRAWING M-5 FOR VAULT GEOMETRY AND ADDITIONAL DETAILS.

G9	SECTION - METER VAULT BASE AND FOUNDATION
SCALE: 3/8"=1'-0"	S-13, M-5



NOTES:

1. SEE DRAWING M-6 FOR VAULT GEOMETRY AND ADDITIONAL DETAILS.

A9	SECTION - MAG METER VAULT BASE AND FOUNDATION
SCALE: 3/8"=1'-0"	S-13

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STRUCTURE NO.

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REGISTERED PROFESSIONAL ENGINEER GARY A. SIMON LIC. NO. 68080 Exp. 6-30-2011 CIVIL STATE OF CALIFORNIA
Vanzandt

GARY LEE MOORE, P.E. CITY ENGINEER DATE:

DESIGN GROUP	
ENGINEER:	JERRY SIMON
DESIGNED BY:	ERMILO CHAVEZ
DRAWN BY:	ERIC BLACK
CHECKED BY:	JERRY SIMON
APPROVED BY:	ROBERT MARTIN FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: PUMP STATION STRUCTURAL SECTIONS 5

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. S-13

SHEET 63 OF 108 SHEETS

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GENERAL STRUCTURAL NOTES

THESE NOTES SHALL APPLY TO THE RESERVOIR UNLESS SHOWN OTHERWISE ON PLANS

GENERAL

1. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS BEFORE STARTING WORK. SHOULD CONDITIONS EXIST WHICH ARE CONTRARY TO THOSE SHOWN ON PLANS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER BEFORE PROCEEDING WITH WORK.
2. THE CONTRACTOR ACKNOWLEDGES RESPONSIBILITY FOR JOBSITE SAFETY AND ACKNOWLEDGES THAT THE ENGINEER WILL NOT HAVE SUCH RESPONSIBILITY. IF A LAWSUIT IS FILED BY ONE OF THE CONTRACTOR'S OR SUBCONTRACTOR'S EMPLOYEES, OR ANY ONE ELSE, THE CONTRACTOR WILL INDEMNIFY, DEFEND AND HOLD THE OWNER AND CONSULTANTS, THEIR PARENT AND SUBSIDIARY COMPANIES HARMLESS OF ANY AND ALL SUCH CLAIMS.
3. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ASSURE THAT ALL WALLS, COLUMNS, ETC. ARE ADEQUATELY BRACED DURING CONSTRUCTION. BRACING OF CONCRETE WALLS AND COLUMNS SHALL REMAIN IN PLACE UNTIL ROOF SLAB IS COMPLETELY INSTALLED.
4. ALL WORK SHALL CONFORM TO THE PLANS AND SPECIFICATIONS IN ALL RESPECTS AND SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER. WHERE NO CONSTRUCTION DETAILS ARE SHOWN OR NOTED FOR ANY PART OF WORK, DETAILS SHALL BE THE SAME AS FOR OTHER SIMILAR WORK.
5. UNLESS DETAILED, SPECIFIED, OR INDICATED OTHERWISE, CONSTRUCTION SHALL BE AS INDICATED IN THE APPLICABLE TYPICAL DETAILS AND GENERAL NOTES. TYPICAL DETAILS ARE MEANT TO APPLY EVEN THOUGH NOT REFERENCED AT SPECIFIC LOCATIONS ON DRAWINGS.
6. SOIL PROPERTIES, ALLOWABLE DESIGN VALUES, GRADING AND COMPACTION REQUIREMENTS AS PER SOILS REPORT PROJECT No. 207328001 BY NINYO & MOORE, DATED JUNE 13, 2008. THE CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH THIS REPORT'S RECOMMENDATIONS, UNLESS STRICTER REQUIREMENTS ARE REQUIRED BY THE CONTRACT DOCUMENTS. A COPY OF SOILS REPORT SHALL BE KEPT AT THE JOB SITE AT ALL TIMES. A COPY OF THIS REPORT IS AVAILABLE FOR REVIEW IN THE ENGINEERS OFFICE. SOIL BEARING CAPACITY = 5000 PSF. MIN FOOTING EMBED = 24".
7. THE CONTRACTOR SHALL WAIT 7 DAYS AFTER THE OUTER COAT OF SHORCRETE IS APPLIED BEFORE BACKFILLING.
8. THE CONTRACTOR SHALL WAIT UNTIL THE SLAB HAS REACHED THE DESIGN COMPRESSIVE STRENGTH BEFORE REMOVING SLAB FORMS.
9. POWER DRIVEN STEEL ANCHORS SHALL NOT BE USED ON THE OUTSIDE FACE OF THE WALL WHERE PRESTRESSING TENDONS ARE LOCATED.
10. CONTRACTORS RESPONSIBLE FOR THE CONSTRUCTION OF A WIND OR SEISMIC FORC RESISTING SSTEM/COMPONENT LISTED IN TEH "STATEMENT OF SPECIAL INSPECTION" SHALL SUBMIT A WRITTEN STATEMENT OF RESPONSIBILITY TO THE LADBS INSPECTORS AND THE OWNER PRIOR TO THE COMMENCEMENT OF WORK ON SUCH SYSTEM OR COMPONENT PER SEC 1706.1.
11. A COPY OF THE LOS ANGELES RESEARCH REPORT AND/OR CONDITIONS OF LISTING SHALL BE MADE AVAILIABLE AT THE JOB SITE.

CONCRETE NOTES

1. ALL CONCRETE SHALL BE STONE AGGREGATE CLASS D. CALCIUM CHLORIDE SHALL NOT BE USED IN CONCRETE MIXES. CONCRETE STRENGTH SHALL BE AS FOLLOWS:

a)	WALL	5000 PSI AT 28 DAYS 4000 PSI AT TIME OF TENSIONING
b)	COLUMNS	4500 PSI AT 28 DAYS
c)	ROOF SLAB	4500 PSI AT 28 DAYS
d)	FOOTINGS	4500 PSI AT 28 DAYS
e)	FLOOR SLAB	4500 PSI AT 28 DAYS
d)	SHOTCRETE	5000 PSI AT 28 DAYS (1C:3S)
e)	RICH CONCRETE WALL MIX	5000 PSI AT 28 DAYS

2. CEMENT SHALL BE IN ACCORDANCE WITH A.S.T.M. C-150, TYPE V.
3. ALL CONSTRUCTION JOINTS IN TANK WALLS SHALL BE VERTICAL. NO HORIZONTAL JOINTS WILL BE ALLOWED. SEE DETAIL E5 ON S-21 FOR VERTICAL JOINT DETAIL AND REQUIREMENT.
4. CONCRETE COVER FOR REINFORCING BARS (U.N.O) SHALL BE:
   CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH ——— 3"
   WALL EXPOSED TO EARTH, WEATHER OR WATER ——— 2"
   SLABS EXPOSED TO WEATHER, WATER OR IN CONTACT WITH THE GROUND:
   NO. 6 THROUGH NO. 18 BARS ——— 2"
   NO. 5 BAR AND SMALLER ——— 2"
   BEAMS, COLUMNS EXPOSED TO EARTH, WATER, OR WEATHER ——— 2"
   PRIMARY REINFORCEMENT, TIE, STIRRUPS AND SPIRALS ——— 2"
5. DRYPACK SHALL BE 1 PART CEMENT AND 3 PARTS SAND (BY VOLUME).
6. NO PIPES OR DUCTS SHALL BE PLACED IN STRUCTURAL CONCRETE UNLESS SPECIFICALLY DETAILED. SEE CIVIL, PIPELINE AND/OR ELECTRICAL DRAWINGS FOR LOCATION OF SLEEVES THROUGH WALLS AND FLOORS.
7. THE LOCATION OF ALL CONSTRUCTION JOINTS NOT SHOWN SHALL BE APPROVED BY ENGINEER.
8. PROVIDE 3/4 INCH CHAMFER AT ALL EXPOSED EDGES UNLESS NOTED OTHERWISE.
9. "CLEAR" CONCRETE COVER DIMENSIONS SHOWN ON THESE DRAWINGS ARE MINIMUMS INCLUDING PERMITTED CONSTRUCTION TOLERENCE.
10. CALCIUM CHLORIDE OR ADMIXTURE CONTAINING CHLORIDE SHALL NOT BE USED IN SHOTCRETE.

REINFORCING NOTES

1. REINFORCEMENT FOR CONCRETE SHALL BE DEFORMED BARS CONFORMING TO LATEST A.S.T.M. SPEC. A-615. GRADE 60 STEEL SHALL BE USED FOR ALL CONSTRUCTION EXCEPT THAT #3 BARS MAY BE GRADE 40 STEEL.
2. CONTINUOUS BARS SHALL EXTEND FULL LENGTH OF MEMBER CONTAINING THEM AND MAY BE SPLICED ONLY WHERE NOTED ON THE PLANS. HORIZONTAL REINFORCEMENT SHALL BE SPLICED BY LAPPING BARS PER DETAIL A1 ON SHEET S-22.
3. ALL REINFORCEMENT, ANCHOR BOLTS, AND OTHER ANCHORAGES PLACED IN CONCRETE SHALL BE ACCURATELY PLACED AND POSITIVELY SECURED AND SUPPORTED BY CONCRETE BLOCKS, PLASTIC CHAIRS, SPACERS, OR PLASTIC HANGERS PRIOR TO POURING CONCRETE.

SPECIAL INSPECTION

1. SPECIAL INSPECTIONS REQUIRED FOR THIS PROJECT SHALL BE PERFORMED IN ACCORDANCE WITH CBC CHAPTER 17. SPECIAL INSPECTIONS SHALL BE PERFORMED BY A REGISTERED DEPUTY INSPECTOR EMPLOYED BY THE OWNER IN THESE CATEGORIES:

ITEM PER CHAPTER 17	DESCRIPTION	TYPE
1. CONCRETE	- STRUCTURAL CONCRETE PLACEMENT	CONTINUOUS
2. BOLTS INSTALLED IN CONCRETE	- HIGH STRENGTH BOLTS - ALL OTHER CONCRETE BOLTS	PERIODIC
3. REINFORCING STEEL	-REINFORCING STEEL	PERIODIC
4. WELDING	-ALL STRUCTURAL WELDING	PER CHAPTER 17, CBC
5. SOIL	- GRADING - EXCAVATION AND BACKFILLING	PERIODIC
6. PRESTRESSING	- ALL PRESTRESSING	CONTINUOUS

STEEL NOTES

1. STRUCTURAL AND MISCELLANEOUS STEEL SHALL BE A.S.T.M. A-36-88 UNLESS NOTED OTHERWISE AND SHALL BE FABRICATED IN ACCORDANCE WITH THE A.I.S.C. SPECIFICATION FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS. FABRICATOR SHALL BE A BUILDING DEPARTMENT APPROVED SHOP.
2. STEEL TUBES SHALL CONFORM TO A.S.T.M. A-500, GRADE B OR BETTER, UNLESS NOTED OTHERWISE.
3. STEEL PIPES SHALL CONFORM TO A.S.T.M. A-53, GRADE B.
4. STAINLESS STEEL SHALL CONFORM TO A.S.T.M. A-276, TYPE 316 UNLESS NOTED OTHERWISE.
5. BOLTS SHALL CONFORM TO A.S.T.M. A-307-88 OR BETTER, UNLESS NOTED OTHERWISE.
6. STAINLESS STEEL BOLTS SHALL CONFORM TO A.S.T.M. A-193 AND NUTS TO A.S.T.M. A-194.
7. HOLES FOR BOLTS IN STEEL SHALL BE OF SAME DIAMETER AS BOLT + 1/16" MAXIMUM.
8. ALL WELDING SHALL BE SHIELDED ARC TYPE AND SHALL BE PERFORMED BY A CERTIFIED WELDER IN A BUILDING DEPARTMENT APPROVED SHOP. CONTINUOUS INSPECTION IS REQUIRED OF ALL FIELD WELDING IN ACCORDANCE WITH C.B.C. CHAPTER 17.
9. WELDING OF STAINLESS STEEL SHALL CONFORM TO STRUCTURAL WELDING CODE - STAINLESS STEEL, A.N.S.I./A.W.S. D1.6-98.
10. NO STRUCTURAL STEEL MEMBER SHALL BE CUT FOR PIPES, DUCTS, ETC. UNLESS SPECIFICALLY DETAILED AND APPROVED BY STRUCTURAL ENGINEER.
11. STAIR FRAMING OR LADDER DETAILS NOT SHOWN ON THE PLANS SHALL BE DESIGNED BY THE CONTRACTOR, AND SUBJECT TO APPROVAL BY THE ENGINEER. BASED ON SUBMITTALS PROVIDED BY THE CONTRACTOR.

CIRCUMFERENTIAL PRESTRESSING NOTES

1. THE MAXIMUM STRESS TOLERANCE IN ANY STRAND, AT ANY POINT, AT ANY ELEVATION ON THE TANK WALL, AT ANY TIME DURING THE WRAPPING OPERATION SHALL NOT EXCEED PLUS OR MINUS 320 POUNDS FROM THE AVERAGE FORCE SETTING OF 14,950 POUNDS.
2. THE CONTRACTOR SHALL PROVIDE A CONTINUOUSLY ELECTRONICALLY RECORDED FORCE APPLICATION GRAPH FOR THE FULL LENGTH OF ALL THE WRAPPED STRAND AS PERMANENT DOCUMENTED EVIDENCE THAT THE FORCE APPLICATION REQUIREMENTS HAVE BEEN MET. ALL SUCH FORCE READINGS MUST BE BASED ON CONTINUOUS SENSING OF THE STRAND BETWEEN THE TENSIONING DRUM AND THE WALL AS THE STRAND IS BEING LAID ON THE WALL.
3. MANUAL, INDIVIDUAL OR INTERMITTENT FORCE READINGS TAKEN WHEN THE STRAND IS IN FULL BODILY CONTACT WITH THE WALL WILL NOT BE ACCEPTED.
4. INTERNAL TENDONS PLACED CIRCUMFERENTIALLY INSIDE THE CORE WALL WILL NOT BE ACCEPTED.
5. THE STRAND SHALL BE 3/8" DIA BEFORE GALVANIZING WITH A MINIMUM GALVANIZING OF 0.85 OUNCES PER SQUARE FOOT AND A MINIMUM BREAKING STRENGTH OF 21,400 POUNDS AFTER GALVANIZING.
6. PRIOR TO APPLYING THE CIRCUMFERENTIAL PRESTRESSING, APPLY A 3/8" THICK LAYER OF SHOTCRETE OVER THE ENTIRE CORE WALL.
7. IF MULTIPLE LAYERS OF STRAND ARE REQUIRED, PROVIDE 3/8" MINIMUM SHOTCRETE COVERAGE BETWEEN LAYERS.
8. PROVIDE 2" MINIMUM SHOTCRETE COVERAGE OVER THE OUTER LAYER OF STRAND.
9. ALL SHOTCRETE TO BE APPLED WITH AN AUTOMATED PROCESS KEEPING THE NOZZLE AT A CONSTANT DISTANCE AND ANGLE AS IT TRAVELS AT A UNIFORM BI-DIRECTIONAL SPEED.
10. FINAL SHOTCRETE COVER TO HAVE A NATURAL GUN FINISH.
11. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS AND CALCS FOR ANCHORAGE OF CIRCUMFERENTIAL PRESTRESSING.

VERTICAL PRESTRESSING NOTES

1. PRESTRESSING STEEL SHALL BE 1 3/8" DIA THREADBARS MEETING THE TENSILE, PHYSICAL AND DEFORMATION REQUIREMENTS FOR ASTM-722 TYPE II BARS.
2. THREADBARS SHALL BE GALVANIZED AND COATED WITH UNOCAL SOLUBLE OIL 10 RUSTBAN OR EQUAL PRIOR TO INSTALLATION INTO PVC PIPE.
3. THREADBARS WITH QUENCHED OR TEMPERED STEEL WILL NOT BE ALLOWED.
4. THREADBARS SHALL HAVE A MAXIMUM CARBON CONTENT OF 0.55%.
5. DEFORMATIONS IN THREADED BARS SHALL BE UNIFORM AND SUCH THAT ANY LENGTH OF BAR MAY BE CUT AT ANY POINT AND THE INTERNAL THREADS OF THE PROPER NUT CAN BE FREELY THREADED ON THE BAR.
6. MINIMUM ULTIMATE STRENGTH OF THE NUT MUST EQUAL AT LEAST 95% OF THE MINIMUM ULTIMATE STRENGTH OF THE BAR.
7. DURING EACH WALL POUR, FLUSH THE VERTICAL TENDONS WITH CLEAN WATER FROM A HOSE PLACED THROUGH AN OPENING IN THE WOODEN CAP ON THE STEEL TUBING.
8. EACH VERTICAL TENDON SHALL BE STRESSED AS FOLLOWS:

	INITIAL		
	FINAL FORCE	FORCE	ELONGATION
BEFORE WRAPPING:	134.30 K	173.9 K	0.673"

9. PROVIDE CONTINUOUS, SIMULTANEOUS ELECTRONICALLY RECORDED FORCE-ELONGATION GRAPH FOR EACH STRESSING OPERATION FROM START TO FULL RETRACTION. MANUAL RECORDINGS BASED ON VISUAL GAUGE READINGS AND MECHANICAL MEASURING DEVICES WILL NOT BE ACCEPTED.
10. EPOXY PUMP EACH VERTICAL TENDON FROM THE BOTTOM GROUT CONNECTION WITH A TWO-PART WATER INSENSITIVE SOLID EPOXY UNTIL THE ENTIRE NUT AT THE TOP ANCHOR HAS BEEN COVERED. THEN DRYPACK THE REMAINDER OF THE STEEL TUBES WITH A 1-PART CEMENT TO 1-PART SAND MIX IMMEDIATELY AFTER THE CAN HAS BEEN COATED WITH EPOXY. IN LIEU OF DRYPACKING, THE ENTIRE CAN MAY BE FILLED WITH EPOXY GROUT.
11. VERTICAL POST-TENSION OPERATION MAY COMMENCE ONCE TANK WALL HAS REACHED A MINIMUM CONCRETE COMPRESSIVE STRENGTH OF 4,000 psi.

STRUCTURAL OBSERVATION

1. THE DESIGN ENGINEER, OR ANOTHER ENGINEER DESIGNATED BY THE DESIGN ENGINEER SHALL PERFORM STRUCTURAL OBSERVATION AS REQUIRED BY CBC SECTION 1709, AND AS DEFINED BY SECTION 1702.1. STRUCTURAL OBSERVATION SHALL BE PROVIDED DURING THE STAGES OF CONSTRUCTION LISTED BELOW. IT SHALL BE THE SOLE RESONSIBILITY OF THE CONTRACTOR TO PROVIDE AT LEAST 72 HOURS ADVANCE NOTICE TO THE DESIGN ENGINEER WHEN HIS WORK IS READY FOR STRUCTURAL OBSERVATION FOR EACH OF THESE STAGES:
   FIRST FLOOR POUR, FIRST ROOF POUR, FIRST WALL, FIRST COLUMN, PRESTRESSING.

DESIGN CRITERIA

1. ALL DESIGN AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE FOLLOWING:
   a) A.C.I. STANDARD 318-05. "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE."
   b) A.C.I. 350-06. "ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES"
   c) A.C.I.350.3-06 AND ACI 350 3R-06, "SEISMIC DESIGN OF LIQUID-CONTAINING CONCRETE STRUCTURE AND COMMENTARY"
   d) A.C.I. COMMITTEE 372R-03 REPORT. "DESIGN AND CONSTRUCTION OF CIRCULAR WIRE AND STRAND- WRAPPED PRESTRESSED CONCRETE STRUCTURES."
   e) A.C.I. STANDARD 301-99. "SPECIFICATIONS FOR STRUCTURAL CONCRETE BUILDINGS."
   f) A.W.W.A. STANDARDS AND SECTION D110. SEISMIC DESIGN IS BASED ON SECTION D110-04.
   g) 2007 C.B.C.
2. FOUNDATIONS BASED ON RECOMMENDATIONS OF THE GEOTECHNICAL REPORT BY: NINYO & MOORE "GEOTECHNICAL EVALUATION PENMAR WATER QUALITY IMPROVEMENT PROJECT"
   PROJECT NO. 207328001 DATED JUNE 13, 2008

RESERVOIR DESIGN LOADS

1.	ROOF SUPERIMPOSED DEAD LOAD	380 PSF
2.	ROOF LIVE LOAD	250 PSF OR H-20 TRUCK
3.	INTERNAL FLUID DENSITY	62.5 PCF (WATER)
4.	MAPPED SPECTRAL ACCELERATION S_s = 1.566g S_8 = 0.600g	
5.	SOIL SITE CLASS D	
6.	IMPORTANCE FACTOR = 1.0	
7.	3.6 KM FROM B FAULT Fa = 1.0 Fv = 1.5	
8.	PEAK GROUND SEISMIC ACCELERATION (SITE SPECIFIC) BASED ON A SEISMIC EVENT WITH A 2% CHANCE OF EXCEEDANCE IN 50 YEARS HORIZONTAL: 0.45 g	
9.	RESPONSE MODIFICATION FACTORS PER ACI 350.3-06 R_I = 3.25 R_C = 1.0	

STRUCTURAL ABBREVIATIONS

A.B.	ANCHOR BOLT	PCF	POUNDS PER CUBIC FOOT
A.C.	ASPHALTIC CONCRETE	PSF	POUNDS PER SQUARE FOOT
A.C.I.	AMERICAN CONCRETE INSTITUTE	PSI	POUNDS PER SQUARE INCH
A.I.S.C.	AMERICAN INSTITUTE OF STEEL. CONSTRUCTION	P/S	PRESTRESSED
		P.T.	PRESSURE TREATED
ALUM.	ALUMINUM	P.V.C.	POLYVINYL CHLORIDE
A.P.I.	AMERICAN PETROLEUM INSTITUTE		
A.S.T.M.	AMERICAN SOCIETY FOR TESTING AND MATERIALS	REF	REFERENCE
		REINF	REINFORCING
A.W.S.	AMERICAN WELDING SOCIETY	REQ'D	REQUIRED
A.W.W.A.	AMERICAN WATER WORKS ASSOCIATION	RES.	RESERVOIR
		R.O.	ROUGH OPENING
		R/S	ROUGH SAWN
B.N.	BOUNDARY NAILING		
BTM	BOTTOM	SHT	SHEET
BTWN	BETWEEN	SIM	SIMILAR
		SPECS.	SPECIFICATIONS
C.I.	CAST IRON	SQ	SQUARE
C.I.D.H.	CAST-IN-DRILLED-HOLE	SS	STAINLESS STEEL
C.I.P.	CAST IN PLACE	STL	STEEL
CIRC	CIRCULAR	STRUCT	STRUCTURAL
C.J.	CONSTRUCTION JOINT		
CLR	CLEAR	T&B	TOP AND BOTTOM
COL	COLUMN	T.O.C.	TOP OF CONCRETE
CONC	CONCRETE	T.O.F.	TOP OF FOOTING
CONT	CONTINUOUS	T.O.S.	TOP OF STEEL
C.R.S.I.	CONCRETE REINFORCING STEEL INSTITUTE	T.R.	TOP OF ROOF SLAB
		TS	TUBE STEEL
		TYP	TYPICAL
DET	DETAIL		
DIA	DIAMETER	UBC	UNIFORM BUILDING CODE
DWG	DRAWING	U.O.N.	UNLESS OTHERWISE NOTED
(E)	EXISTING	VERT	VERTICAL
EA	EACH		
EF	EACH FACE	w/	WITH
EL	ELEVATION		
ELEV	ELEVATION		
E.N.	EDGE NAILING		
EQ	EQUAL		
EW	EACH WAY		
EXIST	EXISTING		
FIN.	FINISH		
F.F.	FINISH FLOOR		
F.G.	FINISH GRADE		
FDN	FOUNDATION		
F.N.	FIELD NAILING		
FTG	FOOTING		
GA.	GAUGE		
GALV	GALVANIZED		
GEN.	GENERAL		
G.I.	GALVANIZED IRON		
HORIZ	HORIZONTAL		
HT.	HEIGHT		
HWL	HIGH WATER LEVEL		
I.C.B.O.	INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS		
K	KIPS		
KSI	KIPS PER SQUARE INCH		
LONGIT.	LONGITUDINAL		
LWL	LOW WATER LEVEL		
MAS.	MASONRY		
MAX	MAXIMUM		
MFR.	MANUFACTURER		
MID	MIDDLE		
MIN	MINIMUM		
M.H.	MANHOLE		
M.O.	MASONRY OPENING		
MPH	MILES PER HOUR		
N.I.C.	NOT IN CONTRACT		
No	NUMBER		
NTS	NOT TO SCALE		
O.A.E.	OR APPROVED EQUAL		
O.C.	ON CENTER		

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STRUCTURE NO.

INDEX NO.

REGISTERED CIVIL ENGINEER ERIC CHUN NG No. 35833 STATE OF CALIFORNIA

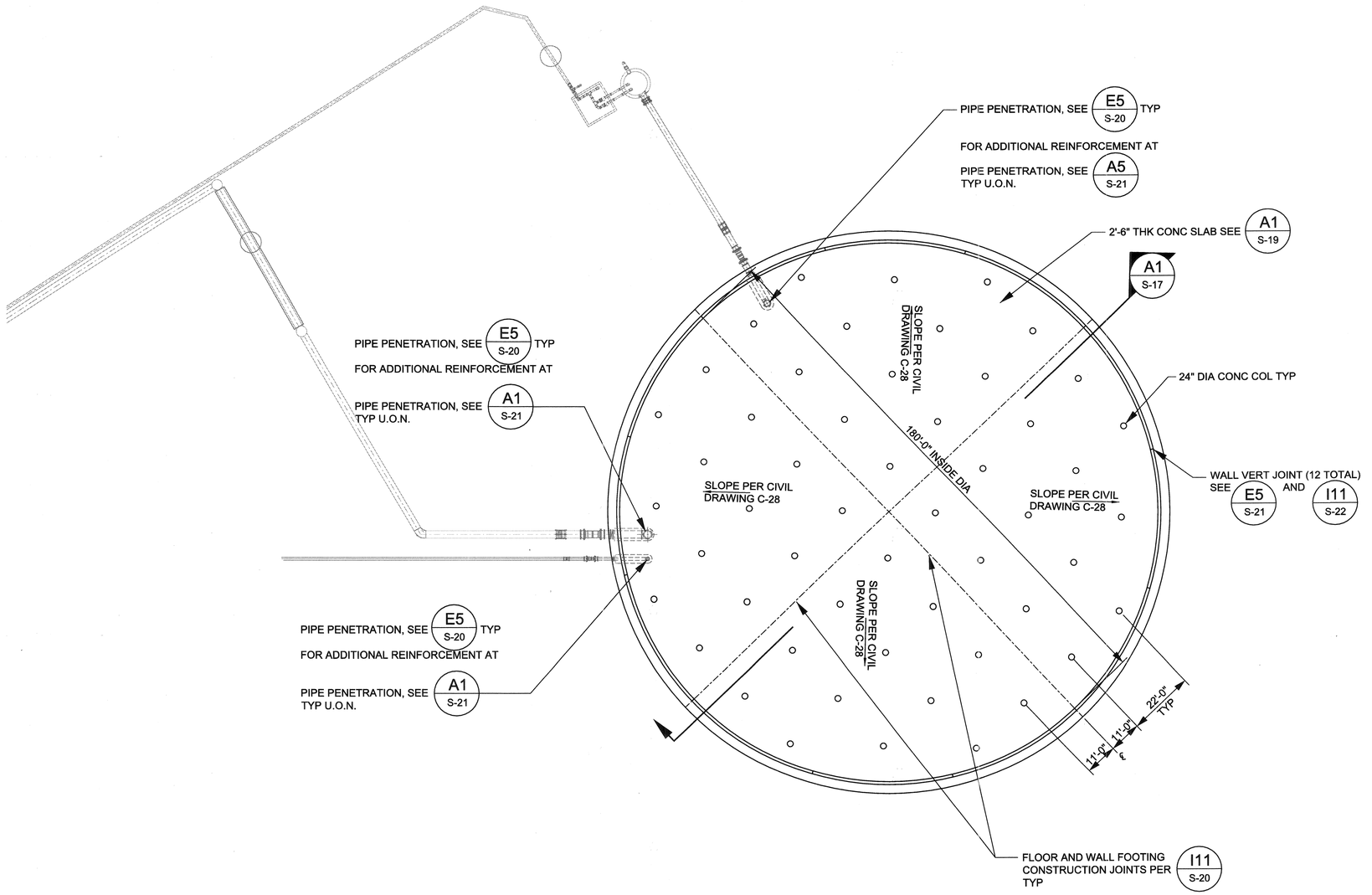
CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E. CITY ENGINEER
DATE:
LIC. NO. CA SE 3583
DESIGN GROUP
ENGINEER: ERIC NG
DESIGNED BY: NGANHA VU
DRAWN BY: SOO MAY LEE
CHECKED BY: ERIC NG
APPROVED BY: SIMON WONG

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: RESERVOIR TYPICAL NOTES
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F
DRAWING NO. S-14
SHEET 64 OF 408 SHEETS
16 60



NOTES:

1. THE SEQUENCE OF POURING THE SLAB SECTIONS SHALL BE SUCH THAT NO SECTION SHALL SHARE A COMMON SIDE WITH ANOTHER SLAB SECTION PLACED IN THE SAME POUR.
2. CONCRETE SHALL NOT BE CAST AGAINST OTHER CONCRETE UNTIL A MINIMUM OF 3-FULL DAYS (72 HOURS) HAS ELAPSED SINCE THE PREVIOUS SECTION WAS PLACED AND FINISHED.
3. REFER TO CIVIL PLANS & GEOTECHNICAL REPORT FOR OVEREXCAVATION AND RECOMPACTION REQUIREMENTS.
4. SEE PIPELINE DRAWINGS FOR PIPE PENETRATION LOCATIONS, DEPRESSED SLAB LOCATION, AND PIPE ENCASEMENT DETAILS.

20' 10' 0' 20 40'
SCALE 1"=20'

A1 RESERVOIR TANK FOUNDATION PLAN

SCALE: 1" = 20'

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

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BUREAU OF PUBLIC WORKS

GARY LEE MOORE, P.E. CITY ENGINEER

ENGINEER: ERIC NG
LIC. NO. CA SE 3583
DESIGN GROUP
DESIGNED BY: NGANHA VU
DRAWN BY: SOO MAY LEE
CHECKED BY: ERIC NG
APPROVED BY: SIMON WONG
DATE:

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: TANK FOUNDATION PLAN
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

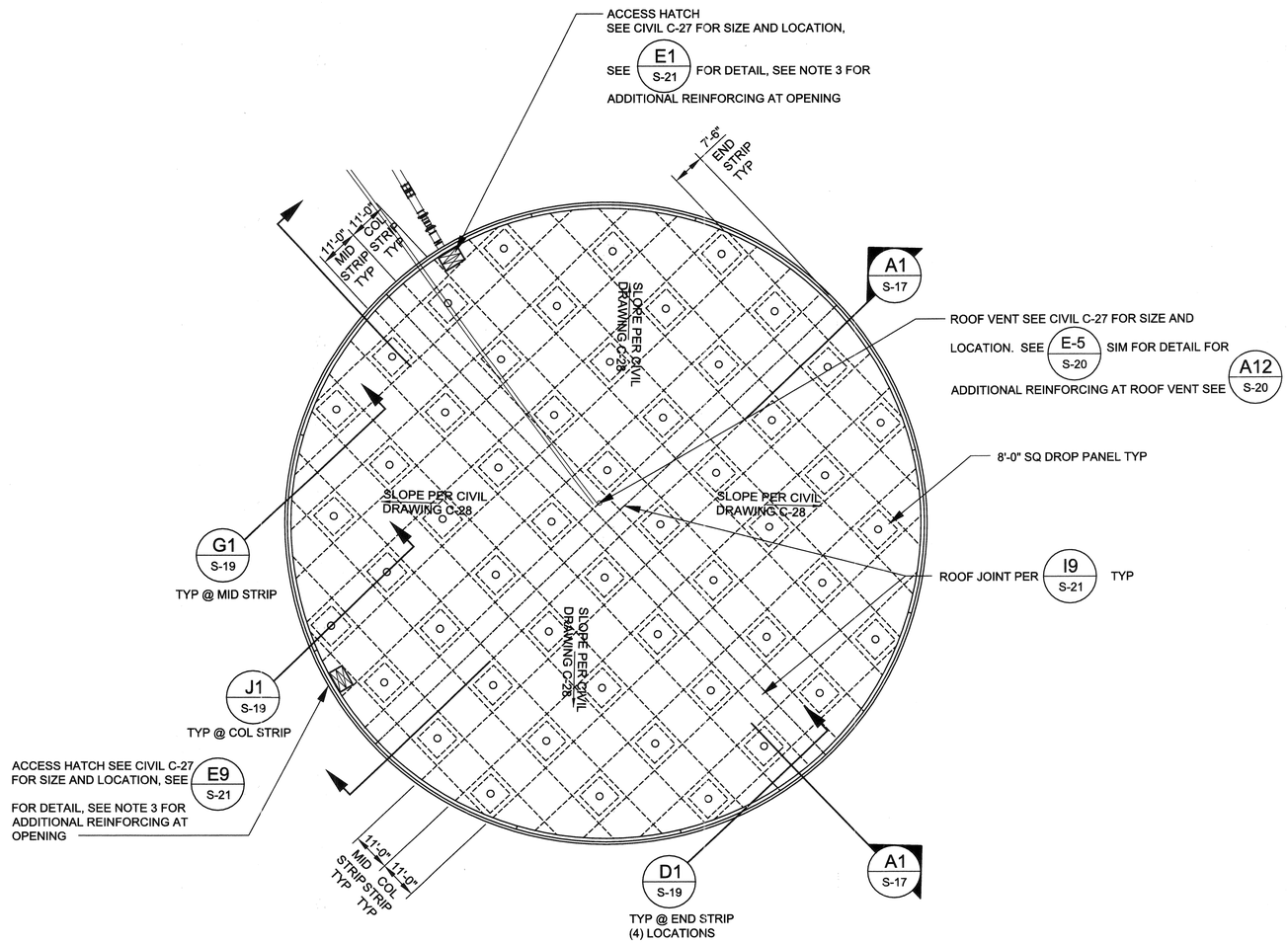
WORK ORDER NO. EW40019F

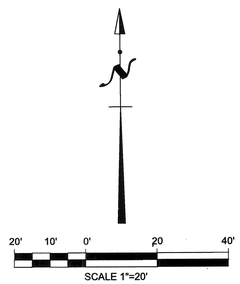
DRAWING NO. S-15

SHEET 17 OF 108 SHEETS
~~65~~ ~~60~~

NOTES:

1. THE SEQUENCE OF POURING THE SLAB SECTIONS SHALL BE SUCH THAT NO SECTION SHALL SHARE A COMMON SIDE WITH ANOTHER SLAB SECTION PLACED IN THE SAME POUR.
2. CONCRETE SHALL NOT BE CAST AGAINST OTHER CONCRETE UNTIL A MINIMUM OF 3-FULL DAYS (72 HOURS) HAS ELAPSED SINCE THE PREVIOUS SECTION WAS PLACED AND FINISHED.
3. FOR ADDITIONAL REINFORCING AT ACCESS HATCHES, SEE A1/S-23, A9/S-23, G1/S-23 AND G9/S-23.





A1 RESERVOIR TANK ROOF PLAN

SCALE: 1" = 20'

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INDEX NO.

PROFESSIONAL ENGINEER ERIC CHUN NG No. S 3583 REGISTERED CIVIL ENGINEER STATE OF CALIFORNIA

CITY ENGINEER
DATE:
LIC. NO. CA SE 3583

GARY LEE MOORE, P.E.

DESIGN GROUP
ENGINEER: ERIC NG
DESIGNED BY: NGANHA VU
DRAWN BY: SOO MAY LEE
CHECKED BY: ERIC NG
APPROVED BY: SIMON WONG

VERTICAL CONTROL: NGVD29, 1988 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: TANK ROOF PLAN

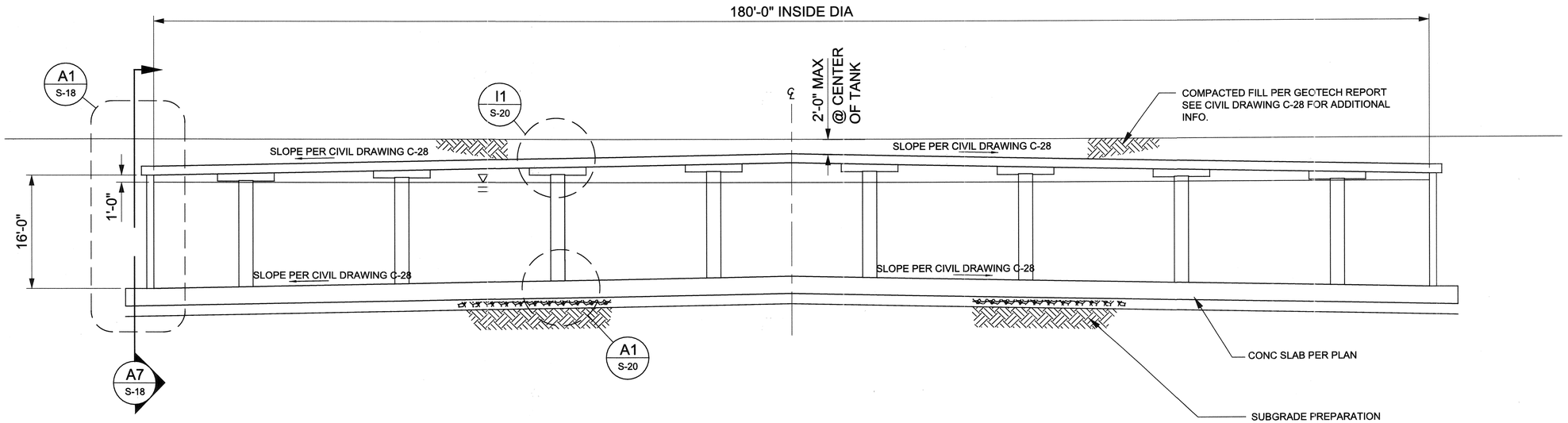
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F

DRAWING NO.
S-16

SHEET 18 OF ~~66~~ 60 ~~108~~ SHEETS



0 2' 4' 8' 16' 24'
SCALE: 1/8" = 1'-0"

A1 RESERVOIR TANK SECTION
SCALE: 1/8" = 1'-0" | S-15, S-16

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

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BUREAU OF ENGINEERING

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

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LA DPW ENGINEERING Serving the People Building THE Future

REGISTERED PROFESSIONAL ENGINEER ERIC CHUN YIU NG No. S 3583 EXP. 6/30/11 CIVIL CALIFORNIA

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E. CITY ENGINEER
DATE:
LIC. NO. CA SE 3583

ENGINEER: ERIC NG	DESIGN GROUP
DESIGNED BY: NGANHA VU	
DRAWN BY: SOO MAY LEE	
CHECKED BY: ERIC NG	
APPROVED BY: SIMON WONG	

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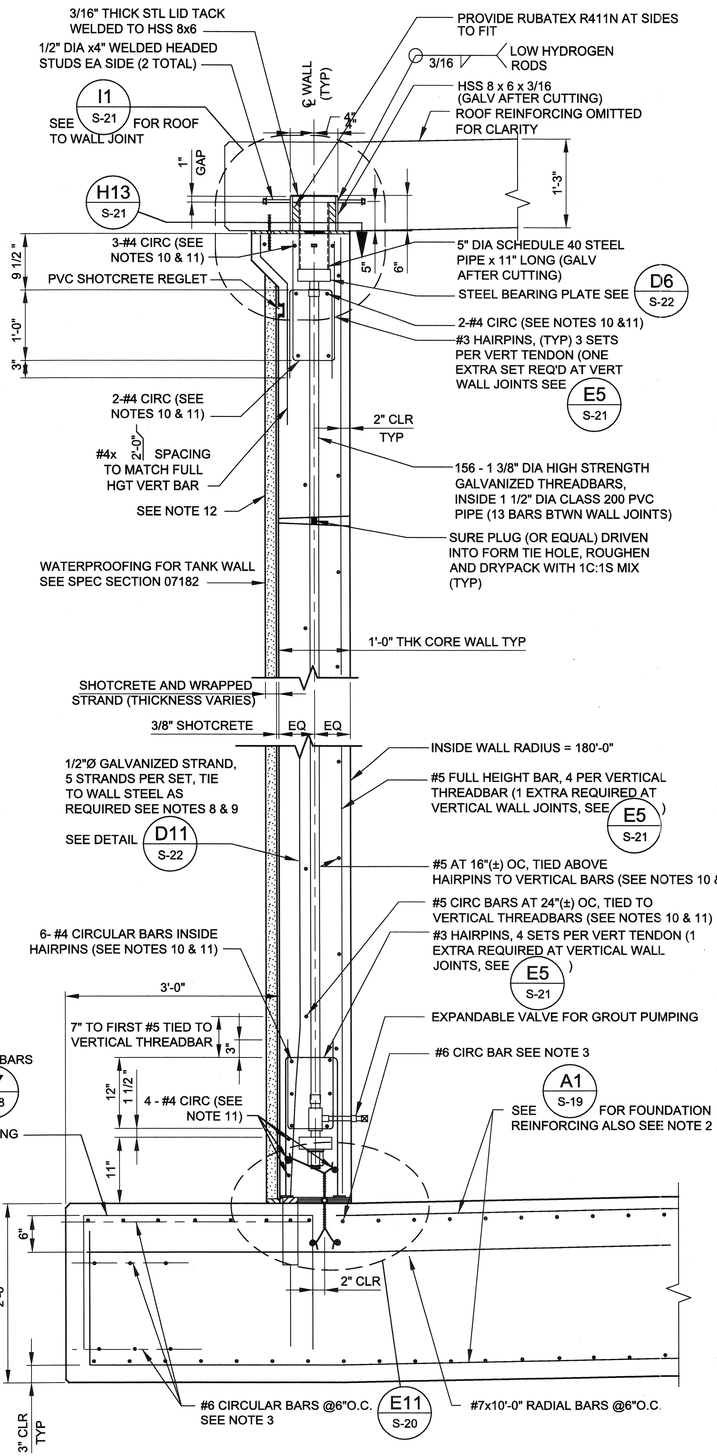
BLACK & VEATCH Corporation
Los Angeles, California

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: TANK SECTION
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

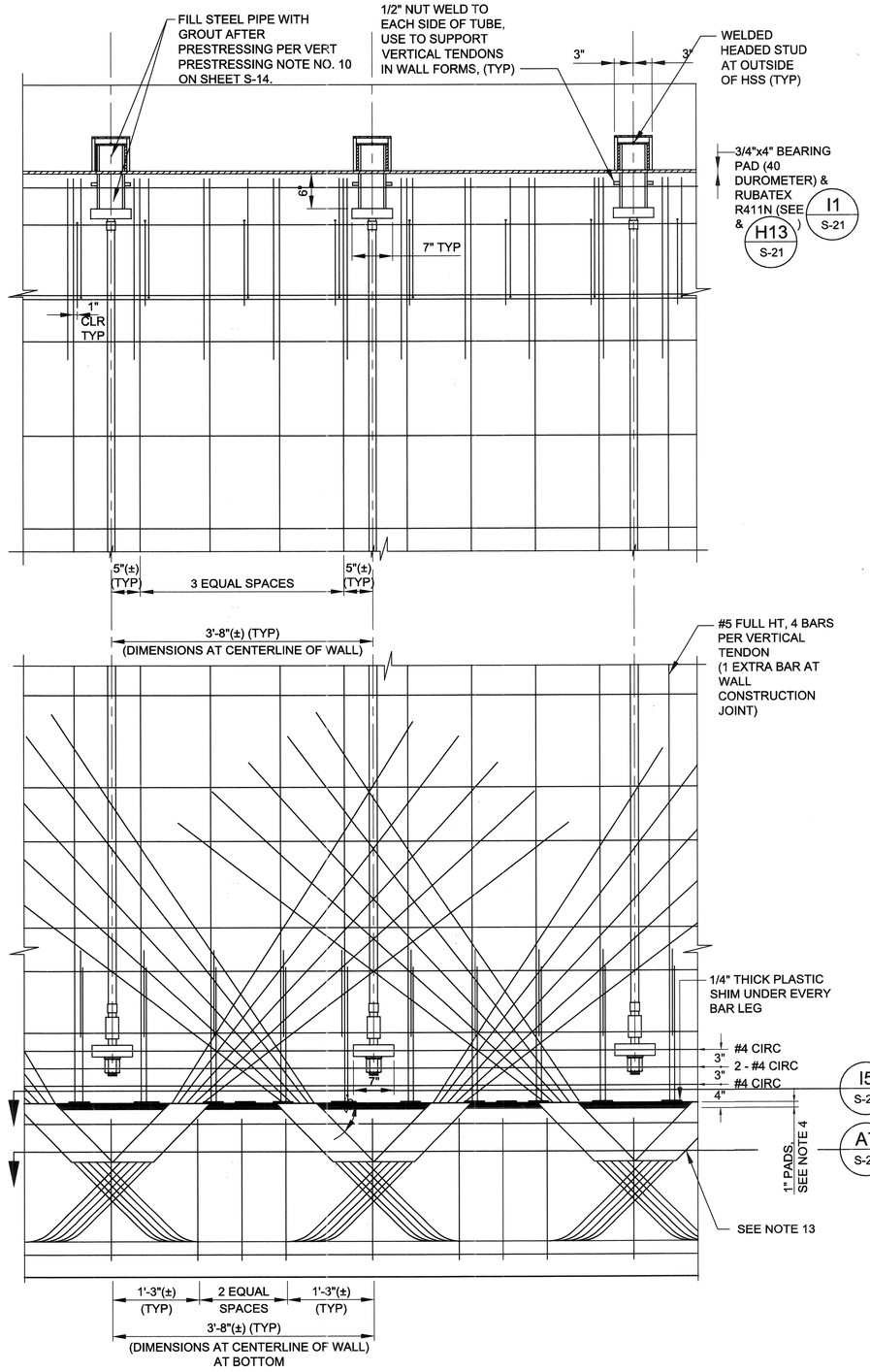
WORK ORDER NO. EW40019F
DRAWING NO. S-17
SHEET ~~67~~ 19 OF ~~400~~ 60 SHEETS



A1 WALL AND WALL MAT FOUNDATION SECTION

SCALE: 1" = 1'-0"

S-17, S-21



A7 WALL AND WALL FOOTING SECTION

SCALE: 1" = 1'-0"

S-21

NOTES:

1. TIE OFF ALL WATERSTOPS AT 12" OC ON BOTH SIDES AND IN BOTH DIRECTIONS.
2. EXTEND MAT REINFORCING TOP BAR TO WATERSTOP. EXTEND MAT REINFORCING BOTTOM BAR TO EDGE OF SLAB.
3. REINFORCE THE WALL FOOTING WITH 14 - #6 CIRC BARS WITH 30" STAGGERED LAPS. STOP CIRC BARS 2" CLEAR OF WALL FOOTING JOINT, PROVIDE #6 x 6'-0" LONG GALVANIZED BARS, CENTERED ON AND PERPENDICULAR TO JOINT, PLACE BARS AT SAME ELEVATION AS CIRC BAR THAT IS TRIMMED.
4. SEE DETAIL I5 ON S-20 AND DETAIL E11 ON S-20 FOR DETAILS OF THE WATERSTOP AND BEARING PADS AT THE BASE OF THE WALL.
5. SEE DETAIL I1 ON S-21 AND DETAIL H13 ON S-21 FOR DETAILS OF THE ROOF SHEAR CONNECTION AND THE BEARING PADS AT THE TOP OF THE WALL.
6. POUR A 1" THICK LAYER OF 1C:1S MIX AT THE BASE OF THE WALL IMMEDIATELY PRIOR TO BEGINNING THE WALL POUR. THE GROUT IS TO HELP SEAL THE BOTTOM OF THE FORMS AND PREVENT ROCK POCKETS AND VOIDS AT THE BASE OF THE WALL. EXTREME CARE MUST BE EXERCISED TO PREVENT PUSHING THE GROUT ALONG THE WALL BASE TOWARDS THE ENDS OF THE FORMS RESULTING IN A CONCENTRATION OF GROUT NOT INTEGRATED WITH THE REGULAR WALL CONCRETE. GROUT PLACED TOO SOON BEFORE THE REGULAR WALL CONCRETE MAY FORM A CRUST OVER THE WATERSTOP REDUCING ITS EFFECTIVENESS. ALTERNATIVES TO USING THE GROUT MAY BE SUBMITTED FOR CONSIDERATION.
7. THE TOP OF THE WALL FOOTING AND FLOOR SHALL RECEIVE A SMOOTH AND HARD STEEL-TROWELLED FINISH.
8. MAINTAIN CLEARANCE BETWEEN THE INDIVIDUAL STRANDS IN THE SEISMIC CABLE SETS (DO NOT BUNDLE).
9. SEISMIC CABLES MAY BE BENT PRIOR TO INSTALLATION.
10. ALL CIRCUMFERENTIAL REINFORCING MUST EXTEND 2'-6"(±) PAST BOTH ENDS OF THE FIRST WALL SECTION AND ONE END OF ALL INTERMEDIATE WALL SECTIONS IN ORDER TO PROVIDE 2'-0" LAPS. CIRCUMFERENTIAL REINFORCING MAY NOT EXTEND PAST EITHER END OF THE LAST WALL SECTION. CIRCUMFERENTIAL REINFORCEMENT WITHIN THE WALL PANELS TO BE PROVIDED WITH 2'-0" STAGGERED LAPS.
11. SEE DETAIL E5 ON S-21 FOR VERTICAL WALL JOINTS.
12. SEE DETAILS I1 ON S-22 AND I5 ON S-22 FOR WALL PRESTRESSING SCHEDULE AND PRESTRESS WRAPPING DETAIL.
13. SEE DETAIL A7 ON S-22 FOR PLAN VIEW OF SEISMIC CABLES IN WALL FOOTING.
14. SEE DETAIL I11 ON S-22 FOR SECTION AT VERTICAL WALL JOINT.

REVISION DATES (DESIGN STAGE ONLY)
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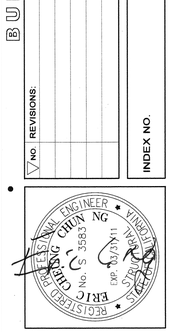
STRUCTURE NO.

INDEX NO.



CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP | DATE:

ENGINEER: ERIC NG | LIC. NO. CA SE 3583

DESIGNED BY: NGANHA VU

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LOS ANGELES, CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STRUCTURAL DETAILS 1

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. S-18

SHEET 20 OF 60 SHEETS
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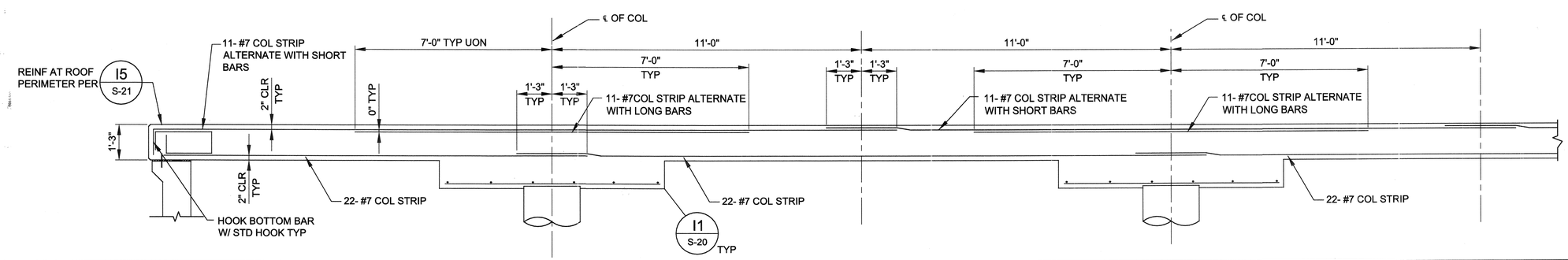
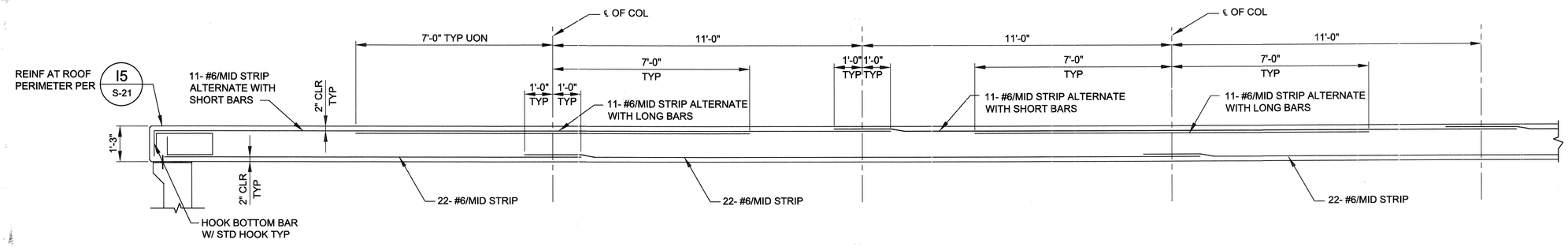


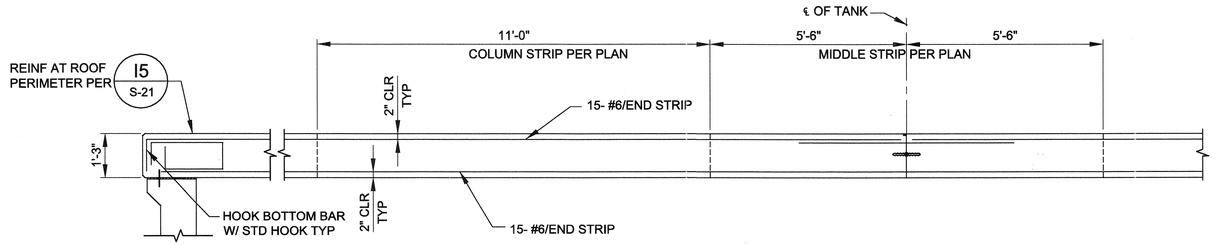
J1 TYP REINFORCING COLUMN STRIP SECTION

SCALE: 1/2" = 1'-0" S-16



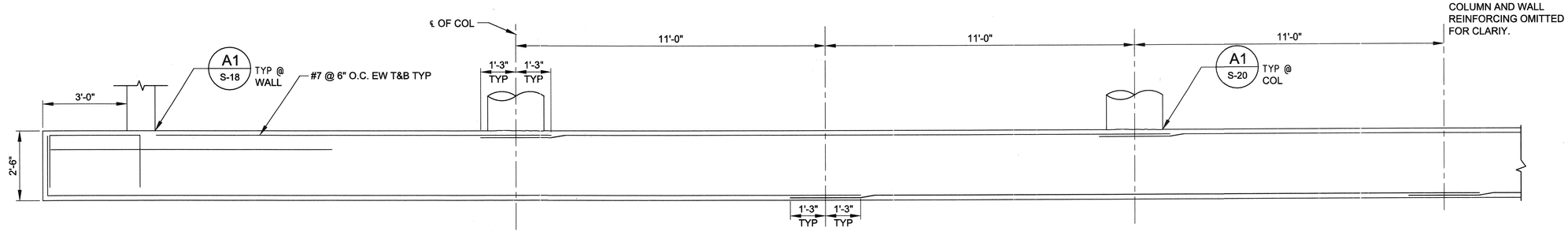
G1 TYP REINFORCING IN MIDDLE STRIP SECTION

SCALE: 1/2" = 1'-0" S-16



D1 TYP REINFORCING IN END STRIP SECTION

SCALE: 1/2" = 1'-0" S-16



A1 TYP REINFORCING IN FOUNDATION

SCALE: 1/2" = 1'-0" S-15, S-18

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12.09.02

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REGISTERED PROFESSIONAL ENGINEER ERIC CHUN NG No. S 3583 CIVIL STATE OF CALIFORNIA

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP

ENGINEER ERIC NG
DESIGNED BY: NGANHA VU
DRAWN BY: SOO MAY LEE
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APPROVED BY: SIMON WONG

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LOS ANGELES, CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STRUCTURAL DETAILS 2

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA. 90291

WORK ORDER NO. EW40019F

DRAWING NO. S-19

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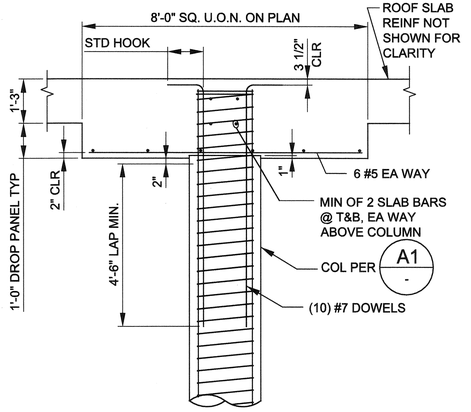
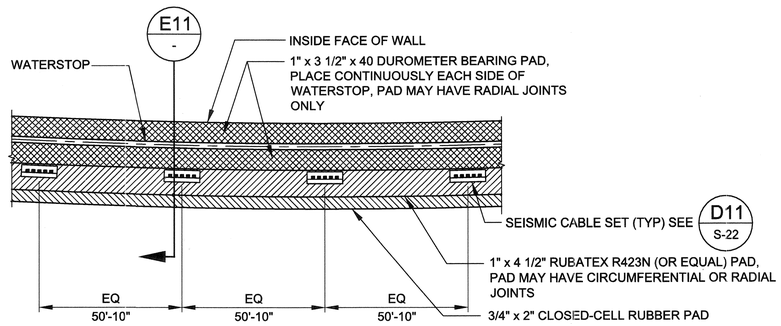


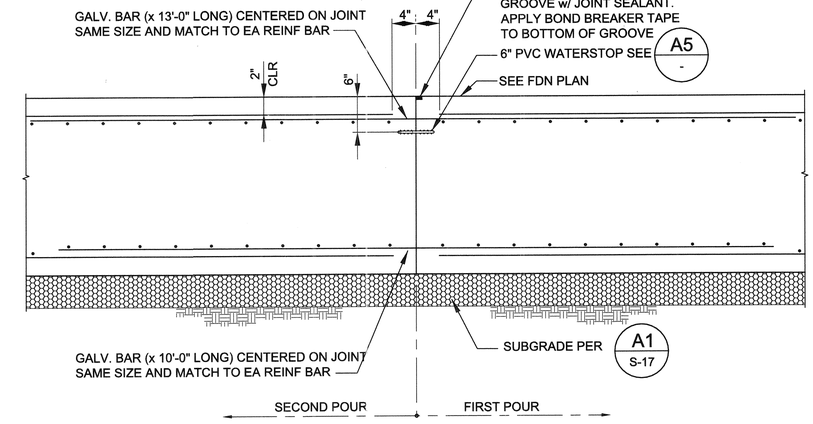
I1 DROP PANEL

SCALE: 1/2" = 1'-0" | S-17, S-19



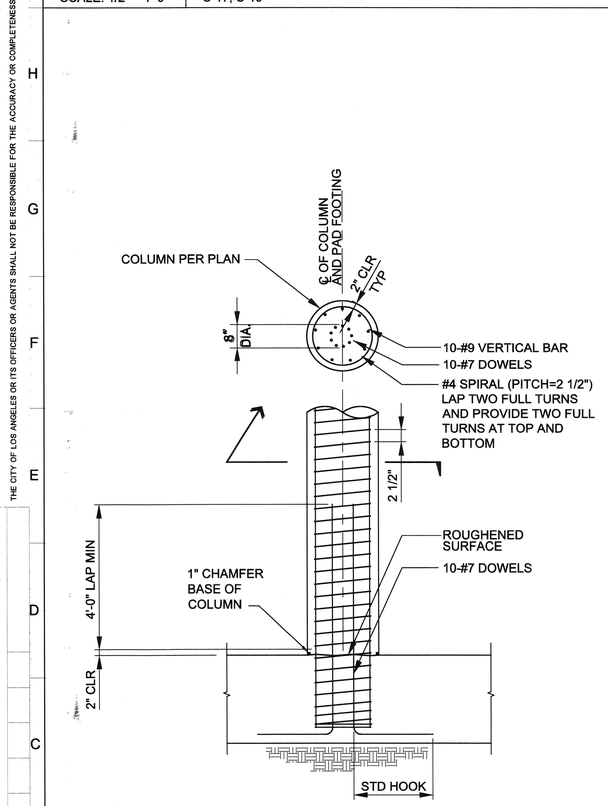
I5 PLAN OF PADS AT WALL BASE JOINT

SCALE: 1" = 1'-0" | S-18



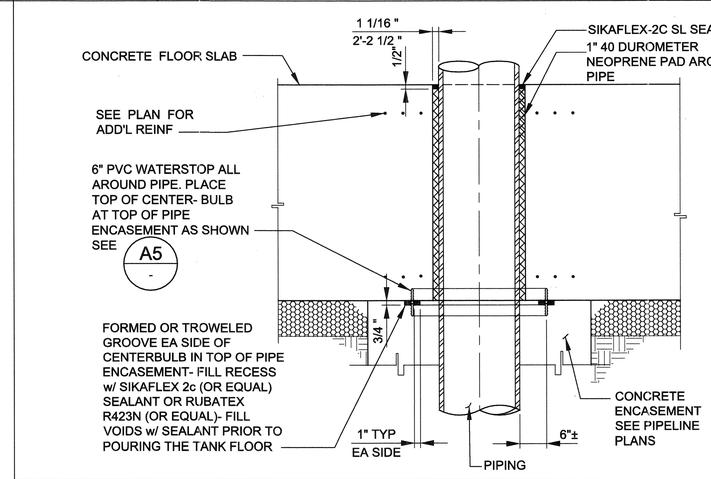
I11 FLOOR SLAB JOINT

SCALE: NTS | S-15



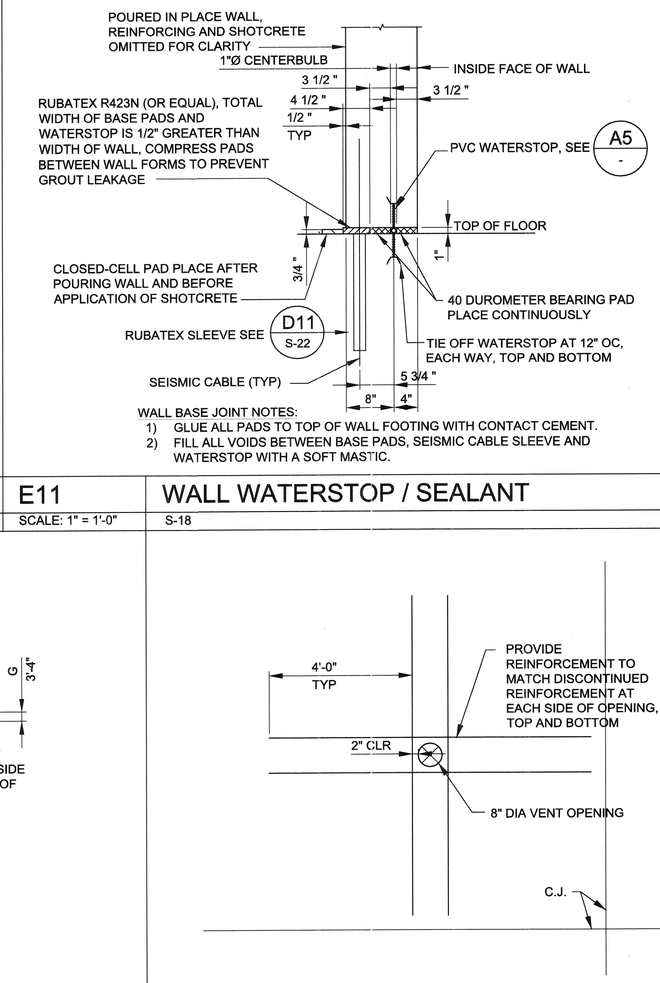
A1 COLUMN

SCALE: 1/2" = 1'-0" | S-17, S-20



E5 PIPE AT FLOOR PENETRATION

SCALE: 1" = 1'-0" | S-15

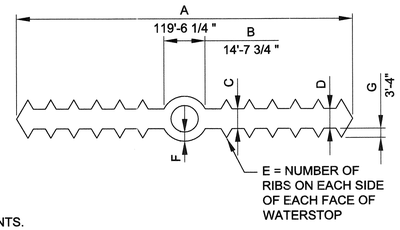


E11 WALL WATERSTOP / SEALANT

SCALE: 1" = 1'-0" | S-18

LOCATION	A	B	C	D	E	F	G
WALL TO ROOF JOINTS, FLOOR TO PIPE PENETRATION	6"	7/8"	3/8"	3/8"	8	9/32"	1/8"
FLOOR SLAB JOINT, ROOF SLAB JOINT & VERTICAL WALL JOINTS *	6"	-	3/8"	1/4"	7	-	1/8"
WALL TO FOOTING RING	9"	1"	3/8"	3/8"	8	1/4"	1/8"

* SEE NOTE 1 BELOW



NOTES:
1. NO CENTERBULB ALLOWED IN WATERSTOP FOR VERTICAL JOINTS.
2. ALL SPLICES SHALL BE MADE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. SUBMIT SHOP DRAWINGS PRIOR TO INSTALLATION OR SPLICING WATERSTOPS.
3. SEE SPECIFICATIONS FOR MATERIAL REQUIREMENTS.

A5 PLASTIC WATERSTOP SCHEDULE

SCALE: NTS | S-20, S-21

A12 ADD REINF @ ROOF VENT

SCALE: 1/2" = 1'-0" | S-16

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BUREAU OF ENGINEERING

LA DPW ENGINEERING Serving the People Designing the Future

DATE: BY: REVISIONS: NO.

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER CHUN NG No. S 3583 CIVIL STATE OF CALIFORNIA EXP. 06/30/11

CITY ENGINEER
DATE:
LIC. NO. CA SE 3583

GARY LEE MOORE, P.E.

DESIGN GROUP
ENGINEER: ERIC NG
DESIGNED BY: NGANHA VU
DRAWN BY: SOO MAY LEE
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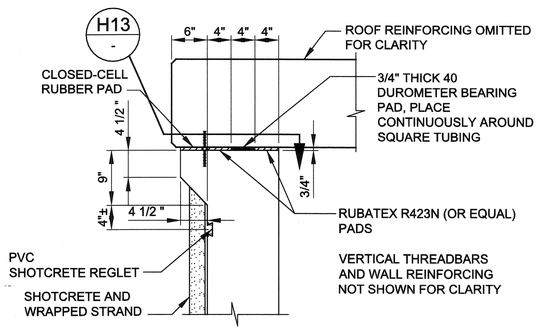
BLACK & VEATCH Corporation Los Angeles, California

BROWN AND CALDWELL LOS ANGELES, CALIFORNIA

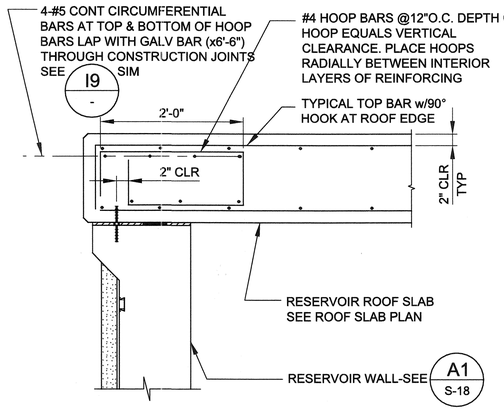
SHEET TITLE: STRUCTURAL DETAILS 3
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

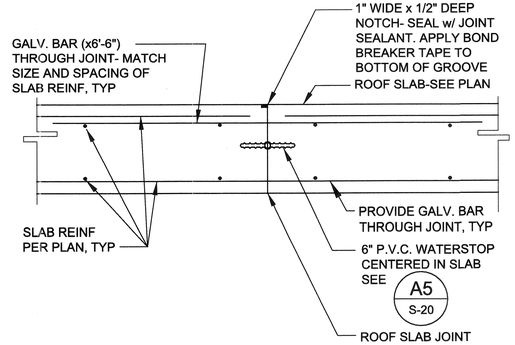
WORK ORDER NO.
EW40019F
DRAWING NO.
S-20
SHEET ~~70~~ 22 OF ~~108~~ 60 SHEETS



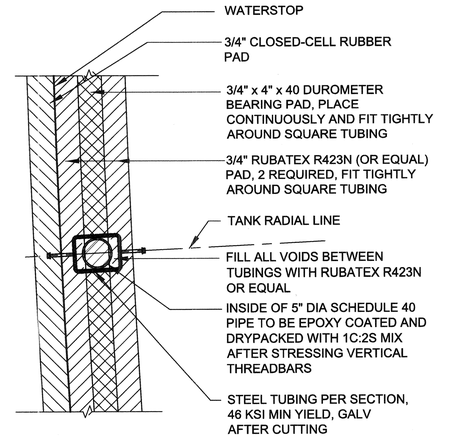
I1	ROOF TO WALL JOINT
SCALE: 1" = 1'-0"	S-18



I5	REINF AT ROOF PERIMETER
SCALE: 1" = 1'-0"	S-19

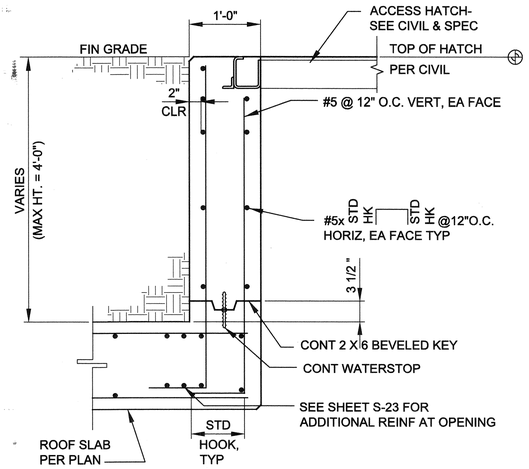


I9	ROOF SLAB CONST JOINT
SCALE: 1" = 1'-0"	S-16

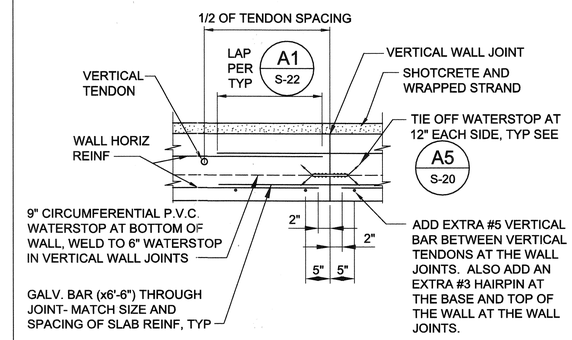


WALL TO ROOF CONNECTION NOTES:
1) GLUE ALL PADS TO TOP OF WALL WITH CONTACT CEMENT
2) FILL ALL VOIDS BETWEEN WALL, ROOF PADS AND TUBING WITH A SOFT MASTIC.

H13	WALL TO ROOF CONNECTION
SCALE: 1" = 1'-0"	

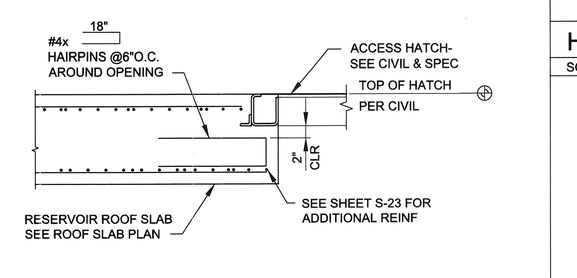


E1	ROOF HATCH
SCALE: 1" = 1'-0"	S-16

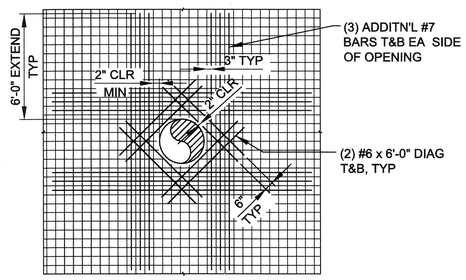


NOTES:
1. REQUIRED: 12 VERTICAL WALL JOINTS, EVENLY SPACED.
2. CONTRACTOR TO SUBMIT LOCATIONS OF WALL JOINTS FOR APPROVAL BY ENGINEER OF RECORD.

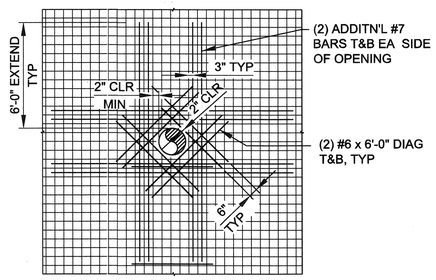
E5	VERTICAL WALL JOINT
SCALE: 1" = 1'-0"	S-14, S-18



E9	ROOF HATCH
SCALE: 1" = 1'-0"	S-16



A1	ADDITIONAL REINF @ 24" & 30" PIPE PENETRATION
SCALE: NTS	S-15, S-21



A5	ADDITIONAL REINF @ 18" OR SMALLER PIPE PENETRATION
SCALE: NTS	S-15, S-21

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LA DPW ENGINEERING Designing The Future

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GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP

ENGINEER: ERIC NG
DESIGNED BY: NGANHA VU
DRAWN BY: SOO MAY LEE
CHECKED BY: ERIC NG
APPROVED BY: SIMON WONG

DATE:

LIC. NO. CA 6E 3583

VERTICAL CONTROL: NGVD29, 1985 ADJ
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SHEET TITLE: STRUCTURAL DETAILS 4
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. S-21

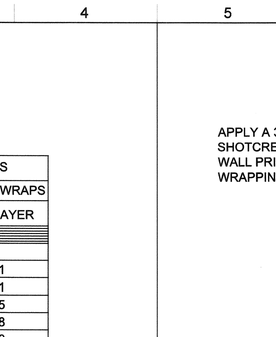
SHEET 23 OF ~~70~~ 60 ~~408~~ SHEETS

CIRCUMFERENTIAL PRESTRESSING FORCES		
HEIGHT ABOVE TOP OF FOOTING (FEET)	INITIAL PRESTRESSING WALL FORCE (KIPS/FT.)	NO. OF WRAPS 1ST LAYER
16'-0"		
14'-3" TO 16'-0"	NO WRAPS	
13'-0" TO 14'-3"	132	11
10'-0" TO 13"-0"	55	11
7'-0" TO 10'-0"	75	15
4'-0" TO 7'-0"	90	18
0'-8" TO 4'-0"	135	30
0'-8"	NO WRAPS	

SEE CIRCUMFERENTIAL PRESTRESSING NOTE 5 ON S-14 FOR STRAND SIZE

I1 PRESTRESSING SCHEDULE

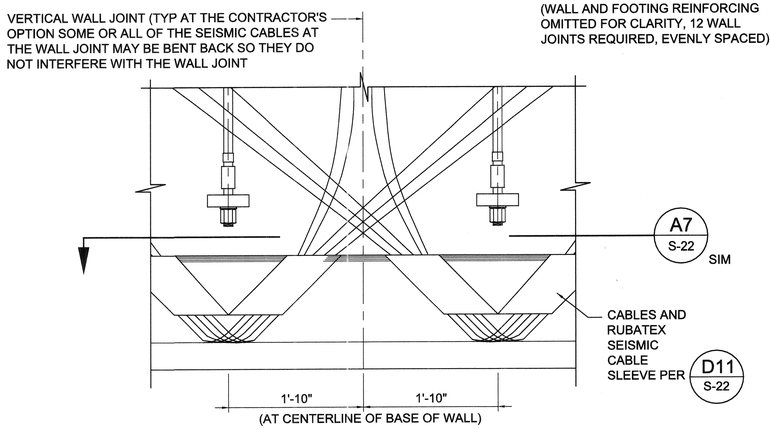
SCALE: NTS | S-18



NOTES:
1. INNER LAYER(S) OF STRAND WRAPPING SHALL BE COVERED WITH A MINIMUM OF 3/8" SHOTCRETE.
2. STRAND WRAP SPACING AND LAYER LIMITS SHALL BE DETERMINED BY THE STRAND WRAPPING CONTRACTOR AND SUBMITTED FOR REVIEW.
3. SEE D1 ON S-22 FOR WRAPPING ANCHORS LOCATIONS (CONTRACTOR TO PROVIDE ANCHOR DETAIL FOR REVIEW)

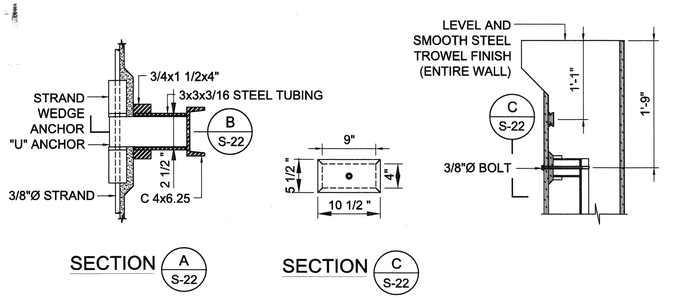
I5 WALL PRESTRESS WRAPPING

SCALE: NTS | S-18



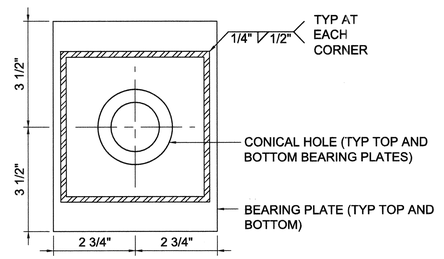
I11 ELEVATION OF VERTICAL WALL JOINT

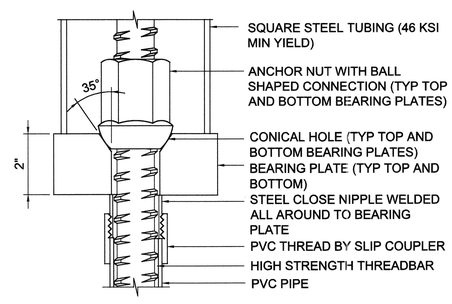
SCALE: NTS | S-15, S-18



D1 WALL ANCHOR LOCATIONS

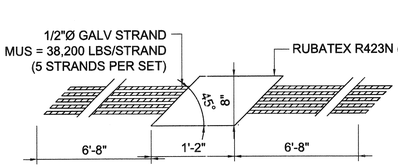
SCALE: NTS | S-22





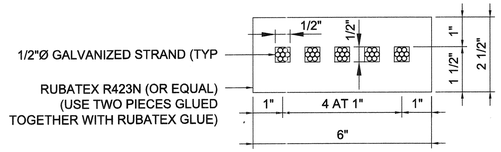
D6 THREADBAR, NUT & BEARING PLATE

SCALE: NTS | S-18



PLAN OF SEISMIC CABLE SET AT BASE OF WALL

(312 SETS TOTAL, PLACE TWO SETS AT EACH VERTICAL THREADBAR, ONE IN EACH DIRECTION, CABLES MAY BE PREBENT 45° ON FOOTING SIDE OF SLEEVE)

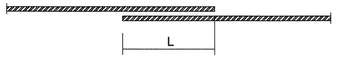


SECTION OF SEISMIC CABLE SET AT BASE OF WALL

D11 SEISMIC CABLE SET AT BASE OF WALL

SCALE: NTS | S-22

REINFORCING LAP SPLICE SCHEDULE			
BAR	f'c=4000 L (inches)	f'c=4500 L (inches)	f'c=5000 L (inches)
3	25	24	22
4	33	31	29
5	41	39	36
6	49	47	44
7	71	67	63
8	81	77	72



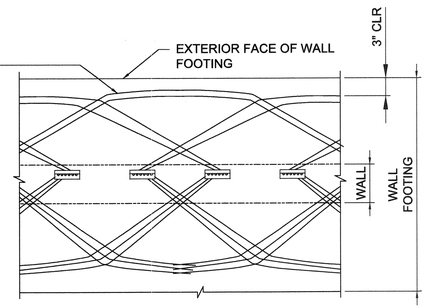
NOTES:
1. LAPS SHOWN IN THIS TABLE ARE CLASS B, CATEGORY 3 TYPE SPLICES. LAP LENGTH IS BASED UPON SMALLER OF TWO BARS BEING SPLICED WHEN NOT THE SAME SIZE.
2. INCREASE LAP LENGTHS BY A FACTOR OF 1.3 FOR HORIZONTAL REINFORCEMENT SO PLACED THAT MORE THAN 12 INCHES OF CONCRETE IS CAST IN THE MEMBER BELOW THIS REINFORCEMENT.

A1 STANDARD BAR SPLICES

SCALE: NTS | S-14

FAN SEISMIC CABLES IN HORIZONTAL PLANE IN FOOTING, MIN CLEARANCE BETWEEN ENDS OF STRANDS IN BOTTOM OF FOOTING SHALL BE 4"

NOTE:
SEISMIC CABLE SET MAY BE PLACED ON EITHER SIDE OF FOOTING, 3" CLEARANCE TO EDGE OF FOOTING MUST BE MAINTAINED



A7 PLAN OF SEISMIC CABLES IN WALL FOOTING

SCALE: NTS | S-22

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DATE: BY:
NO. REVISIONS:
STRUCTURE NO.
INDEX NO.

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS
GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
ENGINEER: ERIC NG
DESIGNED BY: NGANHA VU
DRAWN BY: SOO MAY LEE
CHECKED BY: ERIC NG
APPROVED BY: SIMON WONG
DATE:
LIC. NO. CA SE 3583

SIMON WONG ENGINEERING
9968 Hibert Street, 2nd floor, San Diego, CA 92131
Tel. (858) 566-3113
Fax. (858) 566-6844

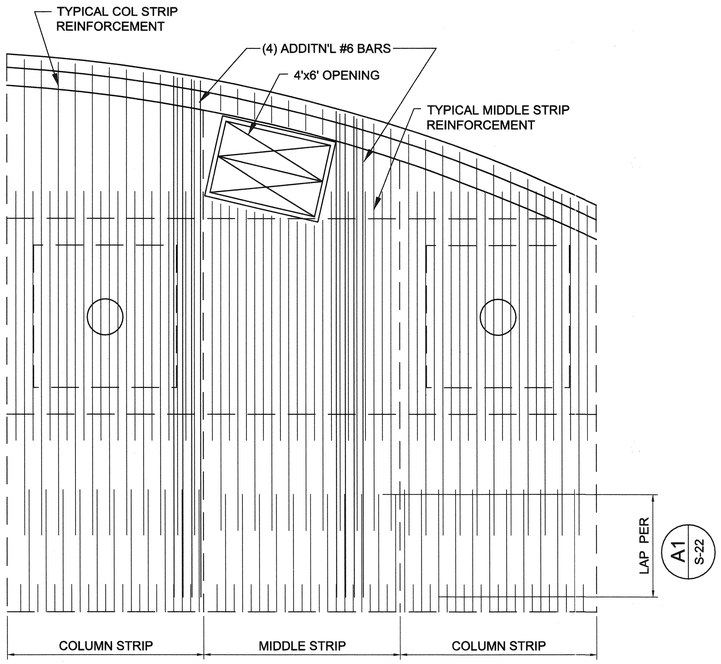
BLACK & VEATCH Corporation, Los Angeles, California

BROWN AND CALDWELL, LOS ANGELES, CALIFORNIA
VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

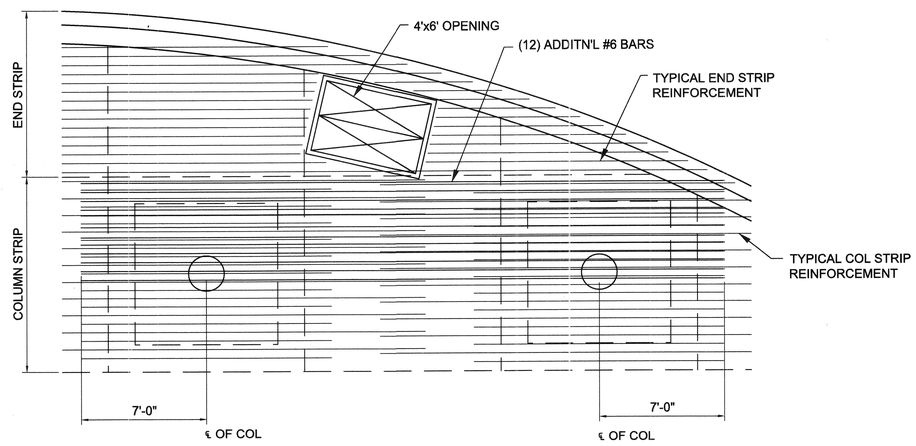
SHEET TITLE: STRUCTURAL DETAILS 5
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE, LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F
DRAWING NO. S-22
SHEET 24 OF 60 SHEETS

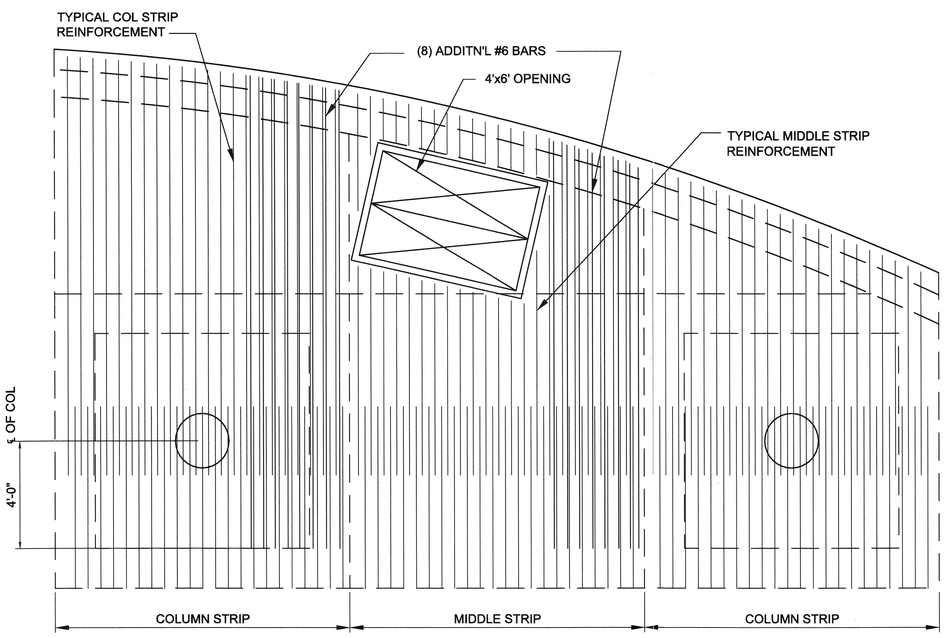
Sheet Version 2.0
$FILE$ $DATE$ $TIME$



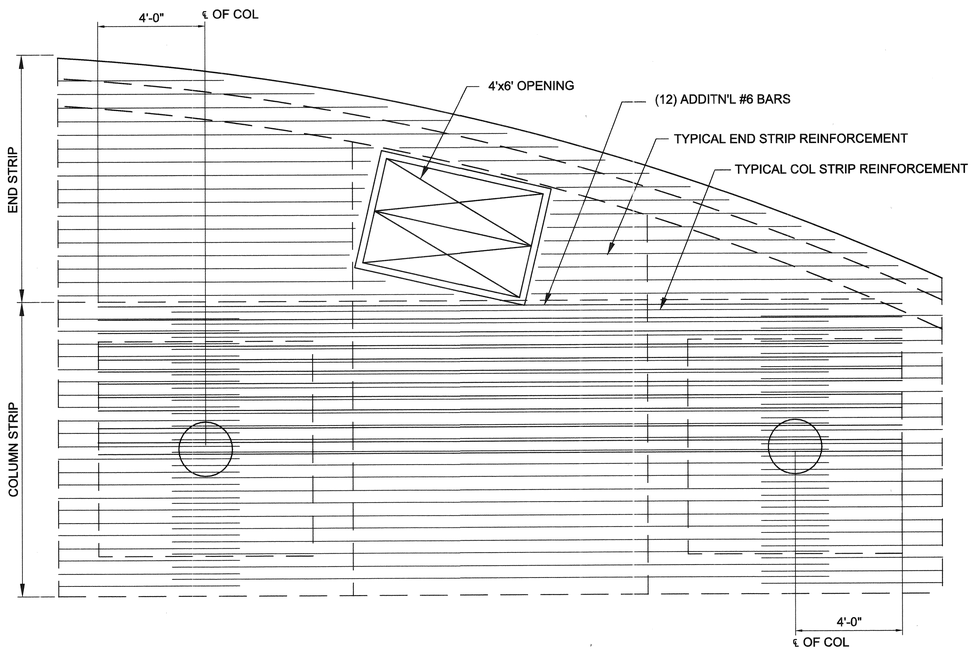
G1	ROOF SLAB TOP REINFORCING
SCALE: 1/4" = 1'-0"	S-16, S-21



G9	ROOF SLAB TOP REINFORCING
SCALE: 1/4" = 1'-0"	S-16, S-21



A1	ROOF SLAB BOTTOM REINFORCING
SCALE: 3/8" = 1'-0"	S-16, S-21



A9	ROOF SLAB BOTTOM REINFORCING
SCALE: 3/8" = 1'-0"	S-16, S-21

REVISION DATES (DESIGN STAGE ONLY)
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SIMON WONG ENGINEERING
9988 Hibert Street, 2nd floor Tel.: (858) 566-3113
San Diego, CA 92131 Fax: (858) 566-8844

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS • BUREAU OF ENGINEERING

LA DPW ENGINEERING Building the Future Designing the Future

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP

ENGINEER: ERIC NG
DESIGNED BY: NGANHA VU
DRAWN BY: SOO MAY LEE
CHECKED BY: ERIC NG
APPROVED BY: SIMON WONG

LIC. NO. CA SE 3583 DATE:

SHEET TITLE: STRUCTURAL DETAILS 6

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

DATE: BY:
NO. REVISIONS:

STRUCTURE NO.

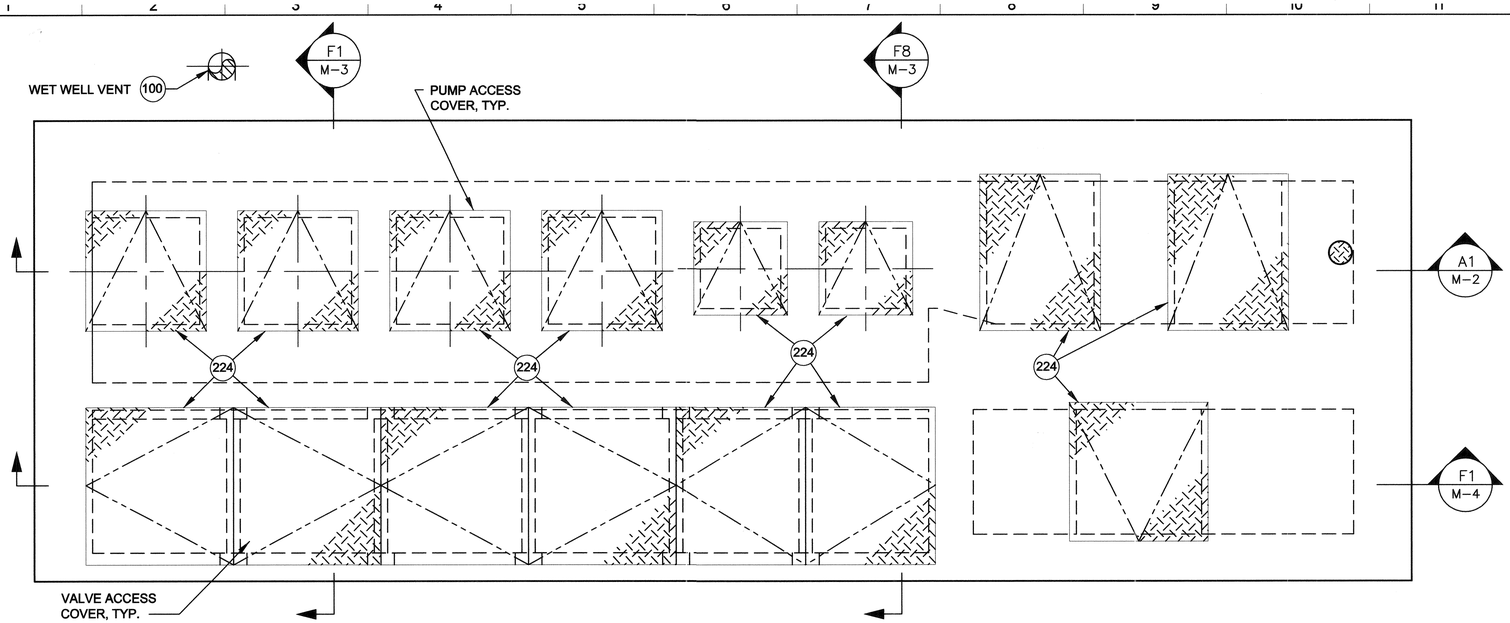
INDEX NO.

REGISTERED CIVIL ENGINEER ERIC CHUN NG No. 3583 EXP. 03/31/11 CIVIL CALIFORNIA

WORK ORDER NO. EW40019F

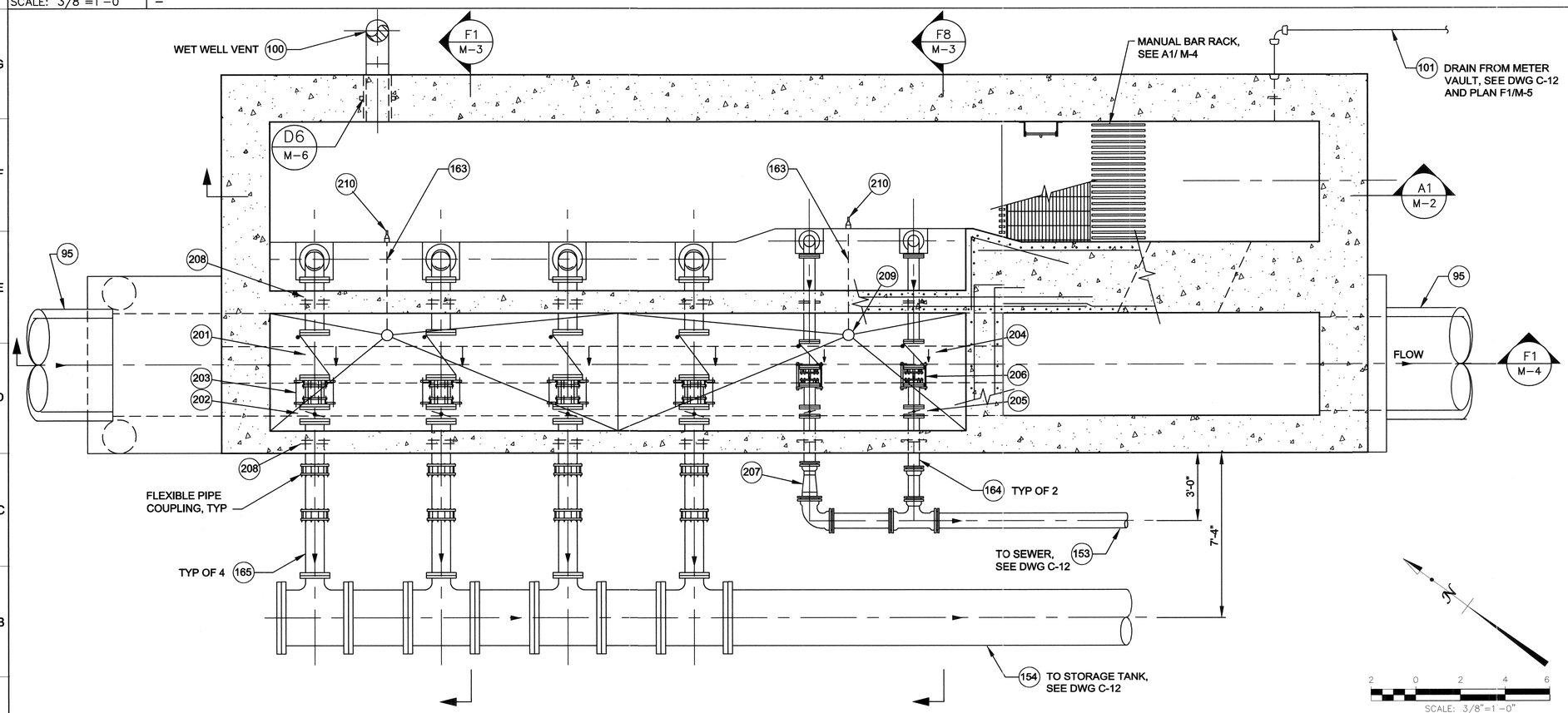
DRAWING NO. S-23

SHEET ~~73~~ 25 OF ~~108~~ 60 SHEETS



H1 TOP PLAN

SCALE: 3/8"=1'-0"



A1 PLAN AT 22.00

SCALE: 3/8"=1'-0"

CONSTRUCTION SYMBOLS:

(95) 51" RCP STORM DRAIN, D1500. CASE 2 BEDDING.

(100) 12" SCHEDULE 40, PVC VENT PIPE.

(101) 3" DRAIN PIPE, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250

(153) 8" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350

(154) 30" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250

(163) 2" DRAIN PIPE, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250

(164) 6" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350

(165) 10" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250

(201) 10" CHECK VALVE, TYP OF 4

(202) 10" ISOLATION BUTTERFLY VALVE, TYP OF 4

(203) 10" RESTRAINED EQUIPMENT CONNECTION JOINT, TYP OF 4

(204) 6" CHECK VALVE, TYP OF 2

(205) 6" ISOLATION BUTTERFLY VALVE, TYP OF 2

(206) 6" RESTRAINED EQUIPMENT CONNECTION JOINT, TYP OF 2

(207) 6" X 8" INCREASER

(208) WALL PENETRATION, SEE A1/M-3, A4/M-3, AND A7/M-3, TYPICAL.

(209) 2" FLOOR DRAIN SEE A1/M-7, TYPICAL OF 2

(210) 2" RUBBER CHECK VALVE, TIDEFLEX TF-2 BY RED VALVE, OR EQUAL.

(224) CONTRACTOR SHALL FURNISH RECESSED LOCKS ON ALL EQUIPMENT AND ACCESS HATCHES

NOTES:

1. FOR MECHANICAL SYMBOLS, SEE R-4.

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Los Angeles, California

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS • BUREAU OF ENGINEERING

GARY LEE MOORE, P.E.
CITY ENGINEER

DESIGN GROUP
ENGINEER: NICK CILIC
DESIGNED BY: AL GEORGE
DRAWN BY: AL GEORGE
CHECKED BY: DOUGLAS B. ROBISON
APPROVED BY: ROBERT MARTIN FINN

LIC. NO. C25565
DATE:

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STORM DRAIN PUMPING STATION MECHANICAL PLANS

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. M-1

SHEET 74 OF 108 SHEETS

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REGISTERED PROFESSIONAL ENGINEER MARTIN FINN No. C25565 CIVIL STATE OF CALIFORNIA

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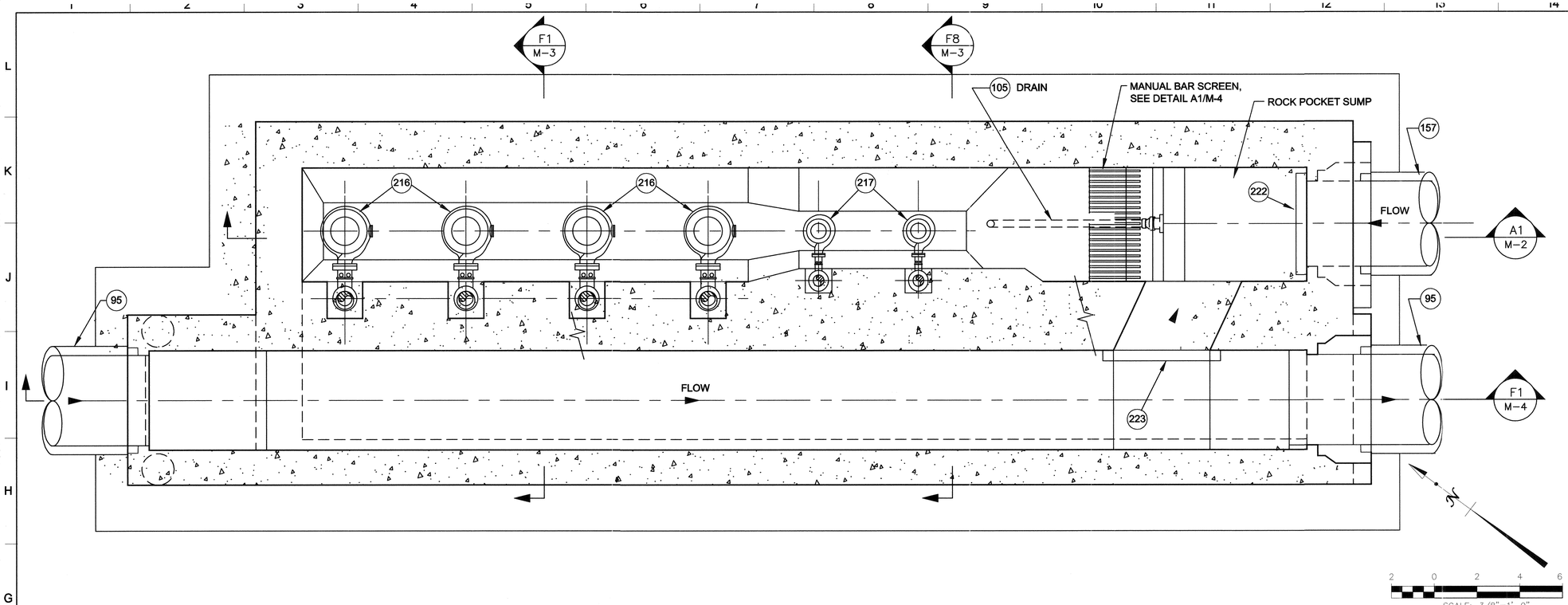
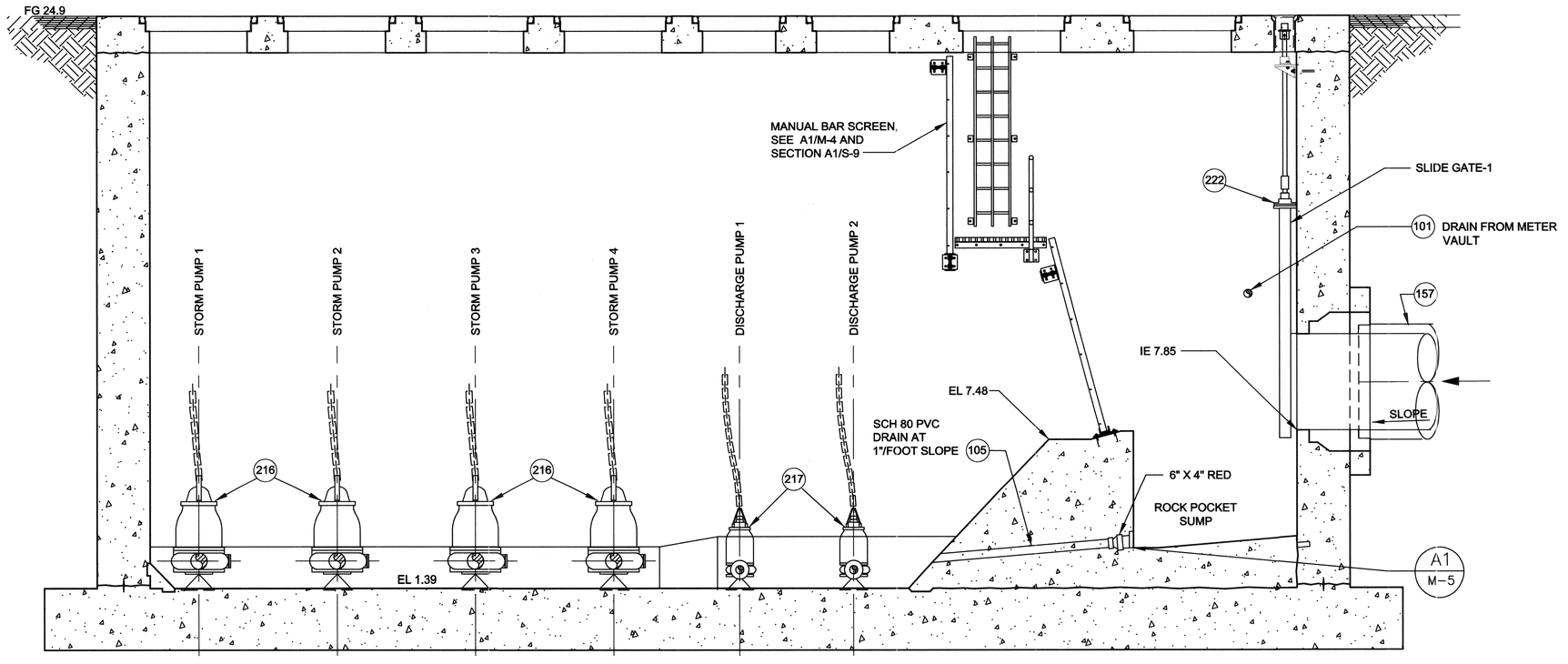


G1 PUMPING STATION PLAN AT 13.00

SCALE: 3/8"-1'-0"



A1 PUMPING STATION SECTION

SCALE: 3/8"-1'-0" | M-1, M-2

CONSTRUCTION SYMBOLS:

(95) 51" RCP STORM DRAIN, D1500. CASE 2 BEDDING.

(101) 3" DRAIN PIPE, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250

(105) 4" DRAIN PIPE, SCHEDULE 40 PVC

(157) 48" RCP STORM DRAIN, D1500 CASE 2 BEDDING

(216) STORM PUMPS 1-4. 30 HP SUBMERSIBLE, CONSTANT SPEED, CENTRIFUGAL PUMPING UNITS. DESIGN FLOW 2250 GPM AT 26 FEET TDH. REFERENCE SECTION 11510 FOR ADDITIONAL FLOW CONDITIONS AND PUMP REQUIREMENTS.

(217) DISCHARGE PUMPS 1 & 2. 15 HP SUBMERSIBLE, VARIABLE SPEED, CENTRIFUGAL PUMPING UNITS. DESIGN POINT #1: 450 GPM @ 23 FEET TDH. DESIGN POINT #2: 675 GPM @ 31 FEET TDH REFERENCE SECTION 11520 FOR ADDITIONAL FLOW CONDITIONS AND PUMP REQUIREMENTS.

(222) STAINLESS STEEL SLIDE GATE -1 PER REQUIREMENTS OF SECTION 11815. DESIGN SEATING HEAD AND UNSEATING HEAD OF 18 FEET. INSTALL SEAL BETWEEN SLIDE GATE AND WALL.

(223) STAINLESS STEEL SLIDE GATE -2 PER REQUIREMENTS OF SECTION 11815. DESIGN SEATING HEAD AND UNSEATING HEAD OF 14 FEET. INSTALL SEAL BETWEEN SLIDE GATE AND WALL.

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NO. REVISIONS: DATE: BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 CIVIL STATE OF CALIFORNIA

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E. CITY ENGINEER DATE:

LIC. NO. C25565

DESIGN GROUP	
ENGINEER:	NICK CILIC
DESIGNED BY:	AL GEORGE
DRAWN BY:	AL GEORGE
CHECKED BY:	DOUGLAS B. ROBISON
APPROVED BY:	ROBERT MARTIN FINN

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH
Corporation
Los Angeles, California

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STORM DRAIN PUMPING STATION MECHANICAL PLAN AND SECTION

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. M-2

SHEET 27 OF ~~75~~ 60 ~~408~~ SHEETS

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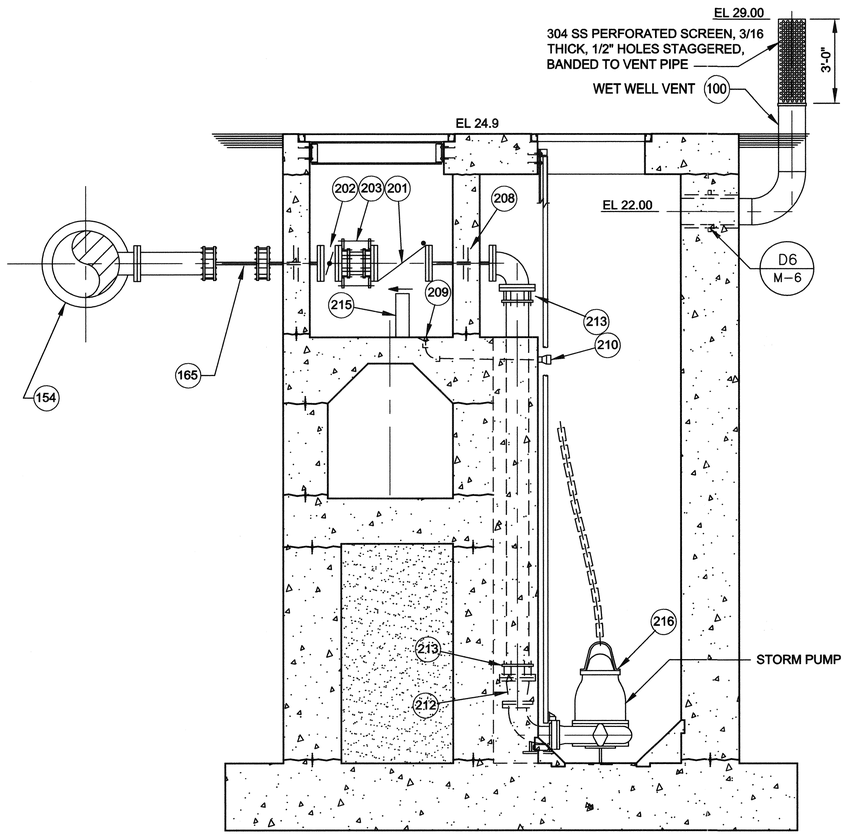
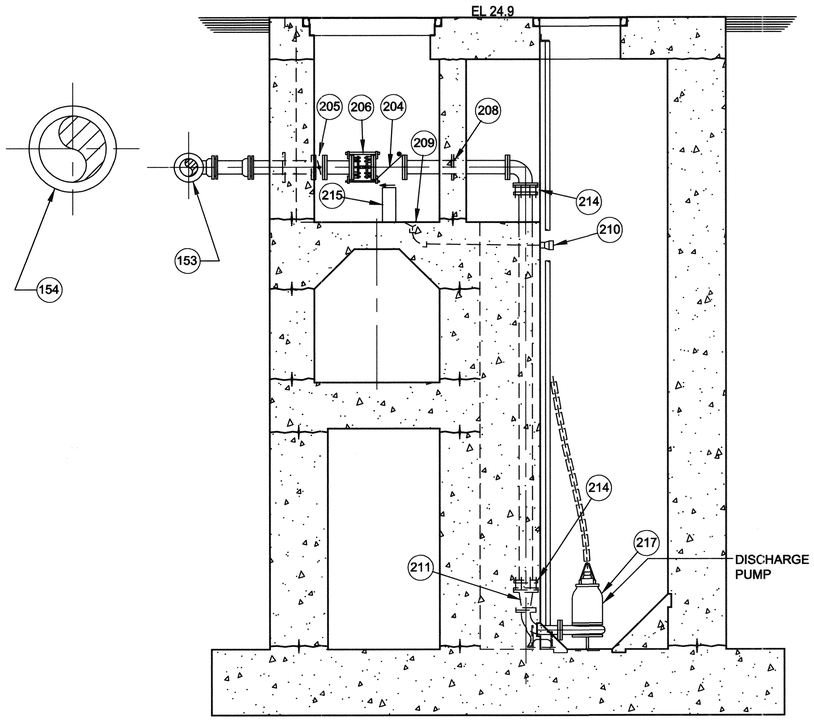


F1 PUMPING STATION SECTION
SCALE: 3/8"=1'-0" | M-1, M-2



F8 PUMPING STATION SECTION
SCALE: 3/8"=1'-0" | M-1, M-2

CONSTRUCTION SYMBOLS:

(100) 12" PVC BENT PIPE SCHEDULE 40

(153) 8" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350

(154) 30" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250

(165) 10" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250

(201) 10" CHECK VALVE

(202) 10" ISOLATION BUTTERFLY VALVE

(203) 10" RESTRAINED EQUIPMENT CONNECTION JOINT

(204) 6" CHECK VALVE

(205) 6" ISOLATION BUTTERFLY VALVE

(206) 6" RESTRAINED EQUIPMENT CONNECTION JOINT

(208) WALL PENETRATION, SEE A1/M-3, A4/M-3, AND A7/M-3, TYPICAL.

(209) 2" FLOOR DRAIN, SEE A1/M-7.

(210) 2" RUBBER CHECK VALVE, TIDEFLEX TF-2 BY RED VALVE, OR EQUAL.

(211) 4" X 6" INCREASER

(212) 6" X 10" INCREASER

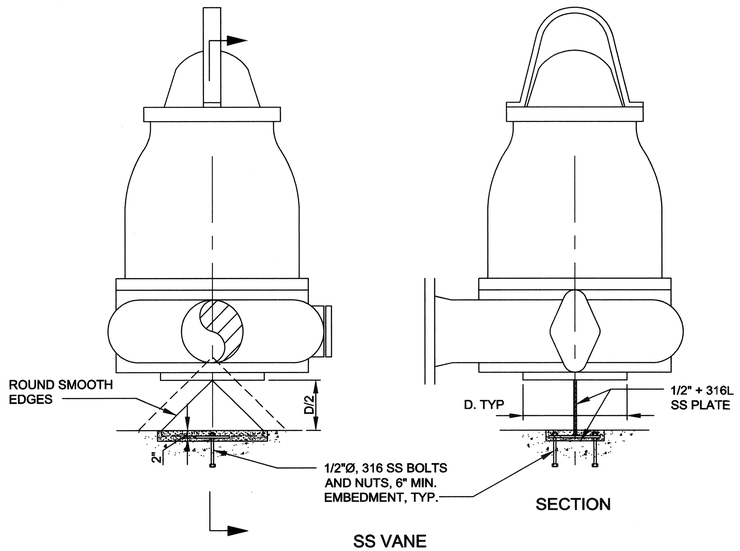
(213) 10" RESTRAINED FLANGE COUPLING ADAPTOR

(214) 6" RESTRAINED FLANGE COUPLING ADAPTOR

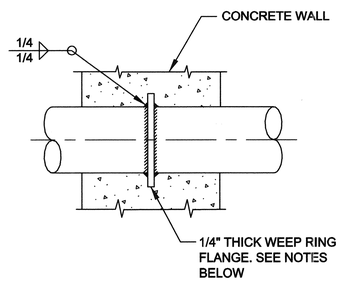
(215) CONCRETE SADDLE SUPPORT UNDER CHECK VALVE, SEE A5/S-6.

(216) STORM PUMPS 1-4. 30 HP SUBMERSIBLE, CONSTANT SPEED, CENTRIFUGAL PUMPING UNITS. DESIGN FLOW 2250 GPM AT 26 FEET TDH. REFERENCE SECTION 11510 FOR ADDITIONAL FLOW CONDITIONS AND PUMP REQUIREMENTS.

(217) DISCHARGE PUMPS 1 & 2. 15 HP SUBMERSIBLE, VARIABLE SPEED, CENTRIFUGAL PUMPING UNITS. DESIGN POINT #1: 450 GPM @ 23 FEET TDH DESIGN POINT #2: 675 GPM @ 31 FEET TDH REFERENCE SECTION 11520 FOR ADDITIONAL FLOW CONDITIONS AND PUMP REQUIREMENTS.



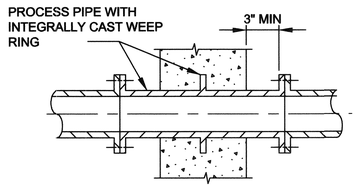
A1 VANE FOR SUBMERSIBLE PUMPS
SCALE: NO SCALE | M-2, M-3



NOTES:

1. PROVIDE 3-INCH MINIMUM CLEARANCE BETWEEN REINFORCING STEEL AND FERROUS METAL PENETRATION.
2. WEEP RING SHALL HAVE A MINIMUM DIAMETER EQUAL TO THE PIPE DIAMETER PLUS 3-INCHES.

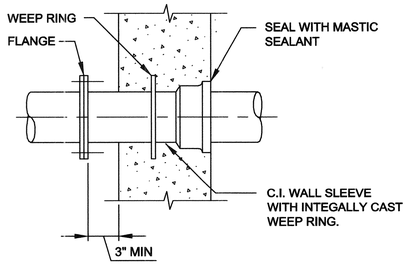
A7 TYPE A WALL PENETRATION
SCALE: NO SCALE | M-1, M-3, M-6, M-7



A10 TYPE B WALL PENETRATION
SCALE: NO SCALE | M-1, M-3, M-6, M-7

NOTES:

1. CONTRACTOR TO VERIFY ALL WET WELL DIMENSIONS BASED ON PUMP MANUFACTURER.



A13 TYPE C WALL PENETRATION
SCALE: NO SCALE | M-1, M-3

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GARY LEE MOORE, P.E.
CITY ENGINEER
DATE:
LIC. NO. C25565
DESIGN GROUP

ENGINEER:	NICK CILIC
DESIGNED BY:	AL GEORGE
DRAWN BY:	AL GEORGE
CHECKED BY:	DOUGLAS B. ROBISON
APPROVED BY:	ROBERT MARTIN FINN

NO. | REVISIONS: | DATE: | BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 12-31-11 CIVIL STATE OF CALIFORNIA

SHEET TITLE: STORM DRAIN PUMPING STATION MECHANICAL SECTIONS AND DETAILS 1

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

WORK ORDER NO. EW40019F

DRAWING NO. M-3

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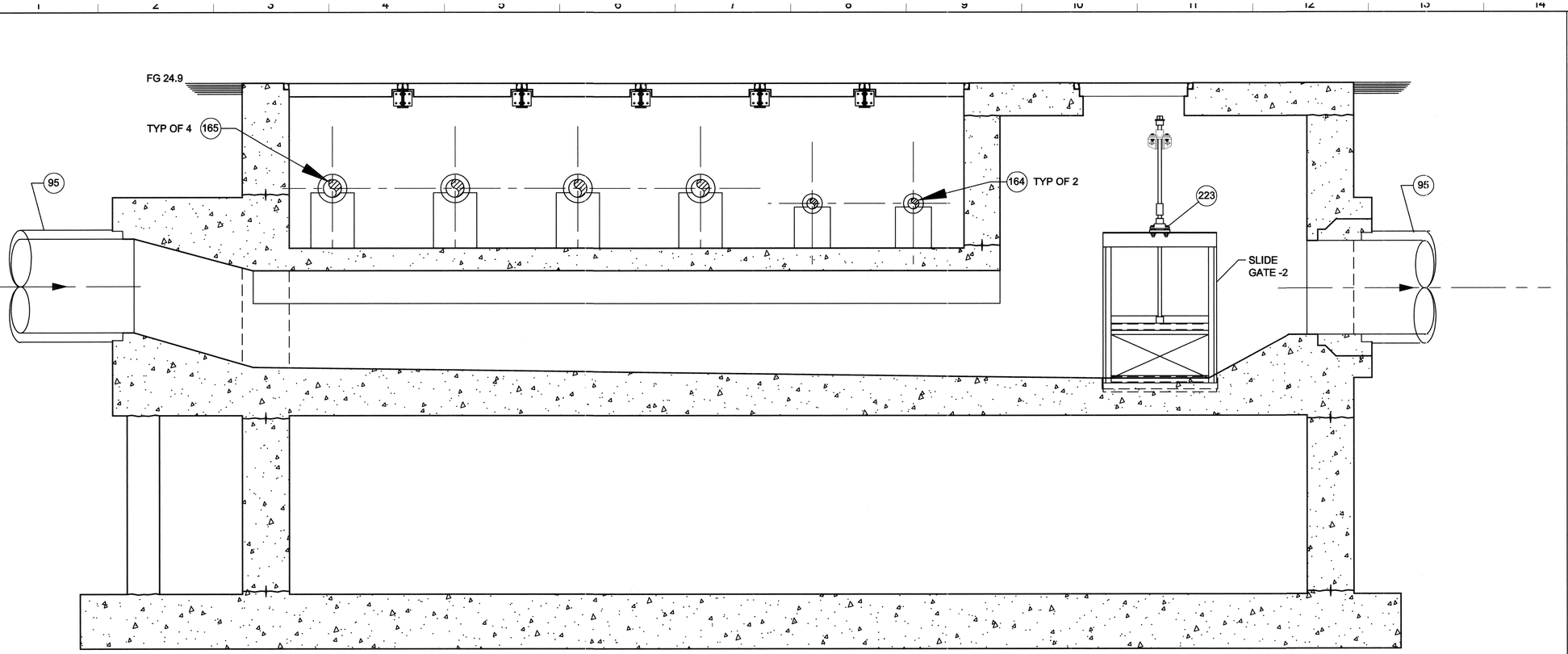
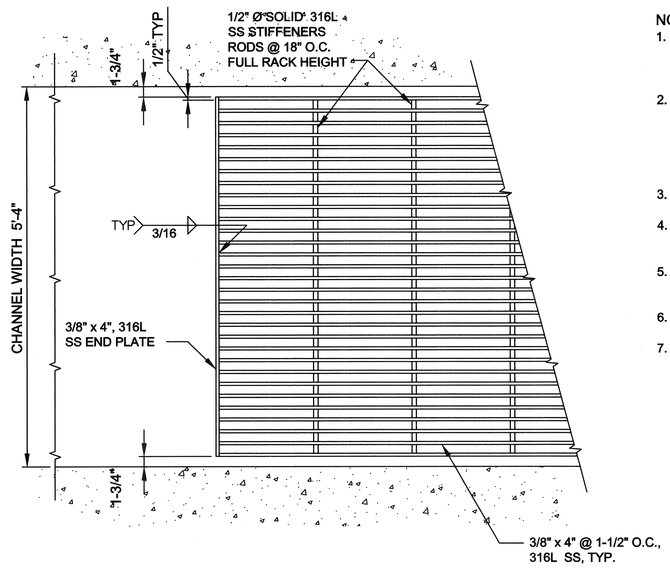


F1 PUMPING STATION SECTION

SCALE: 3/8"=1'-0" | M-1, M-2

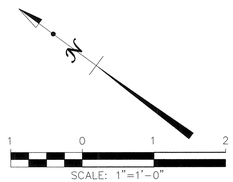


A1 BAR SCREEN PLAN

SCALE: 1"=1'-0" | M-1, M-2

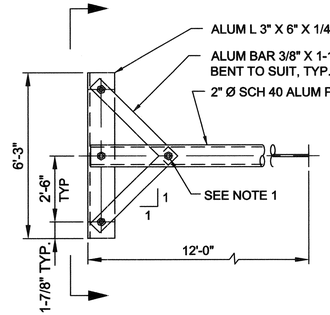
NOTES:

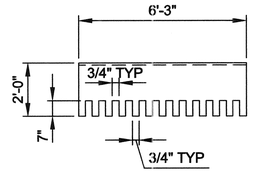
1. THE BAR SCREEN SHALL CONSIST OF 3/8-INCH THICK BY 4-INCH WIDE (IN THE DIRECTION PARALLEL TO THE WATER FLOW) RECTANGULAR TYPE 316 STAINLESS STEEL BARS FASTENED FIRMLY AND ACCURATELY AT TOP AND BOTTOM.
2. THE BARS SHALL BE STRAIGHT AND INCLINED AT 75 DEGREES FROM THE HORIZONTAL ON VERTICAL AS SHOWN IN THE DOWNSTREAM DIRECTION, AND SHALL SPAN THE FULL WIDTH OF THE CHANNEL. THE BAR SCREEN SHALL EXTEND FROM BOTTOM OF PUMP STATION TO THE HEIGHT SHOWN.
3. THE BAR SCREEN SHALL BE FIRMLY ANCHORED TO THE STRUCTURAL SUPPORTS (SEE A1/S-9).
4. WELDING SHALL BE DONE BY A FABRICATOR LICENSED BY OR A WELDER CERTIFIED BY THE DEPARTMENT OF BUILDING AND SAFETY OF THE CITY OF LOS ANGELES.
5. ALL WELDING SHALL CONFORM TO THE REQUIREMENTS OF THE STRUCTURAL WELDING CODE AWS D1.1 (LATEST EDITION).
6. WELDS SHALL BE UNIFORM IN SIZE AND APPEARANCE AND FREE OF PINHOLES, POROSITY, AND OTHER DEFECTS.
7. FOR ADD'L DETAILS SEE G8/S-6, A1/S-6, AND G12/S-6.



A9 BAR SCREEN RAKE

SCALE: 1-1/2"=1'-0" | M-4





SECTION

NOTE:

1. ASSEMBLE BAR SCREEN RAKE WITH 1/2" Ø STAINLESS STEEL HEX HEAD BOLTS WITH LOCK NUTS.
2. CONTRACTOR SHALL CONFIRM COMPATIBILITY WITH BARSCREEN.

CONSTRUCTION SYMBOLS:

(95) 51" RCP STORM DRAIN, D1500. CASE 2 BEDDING.

(164) 6" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350

(165) 10" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250

(223) STAINLESS STEEL SLIDE GATE -2 PER REQUIREMENTS OF SECTION 11815. DESIGN SEATING HEAD AND UNSEATING HEAD OF 14 FEET. INSTALL SEAL BETWEEN SLIDE GATE AND WALL.

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REVISION DATES (DESIGN STAGE ONLY)
12.09.02

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BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation
Los Angeles, California

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

LA DPW ENGINEERING Setting the Pace, Changing the Future

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 CIVIL STATE OF CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER
LIC. NO. C25565
DATE:

ENGINEER:	NICK CILIC
DESIGNED BY:	AL GEORGE
DRAWN BY:	AL GEORGE
CHECKED BY:	DOUGLAS B. ROBISON
APPROVED BY:	ROBERT MARTIN FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STORM DRAIN PUMPING STATION MECHANICAL SECTION AND DETAILS 2

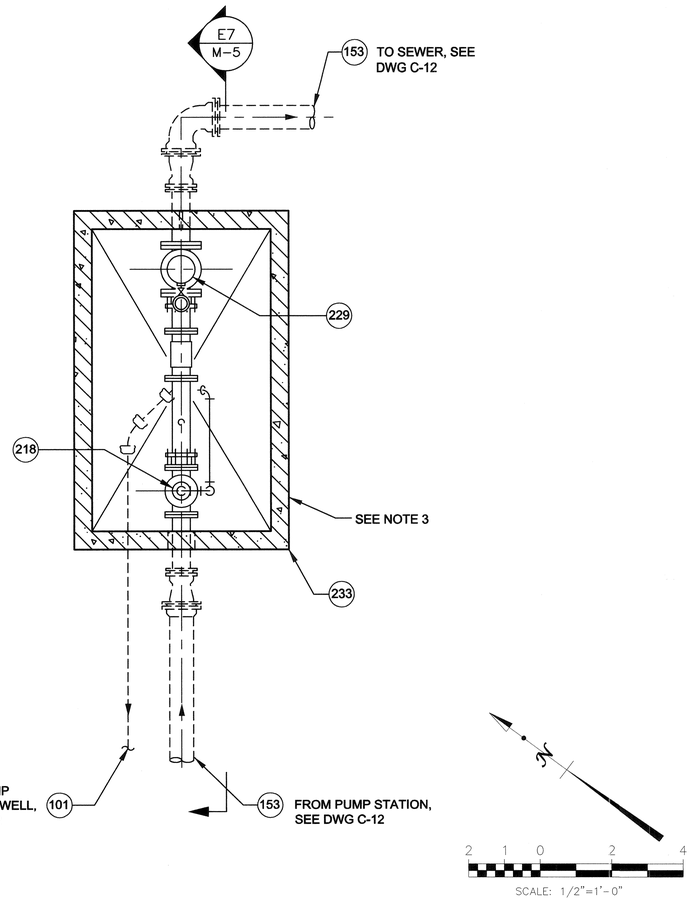
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

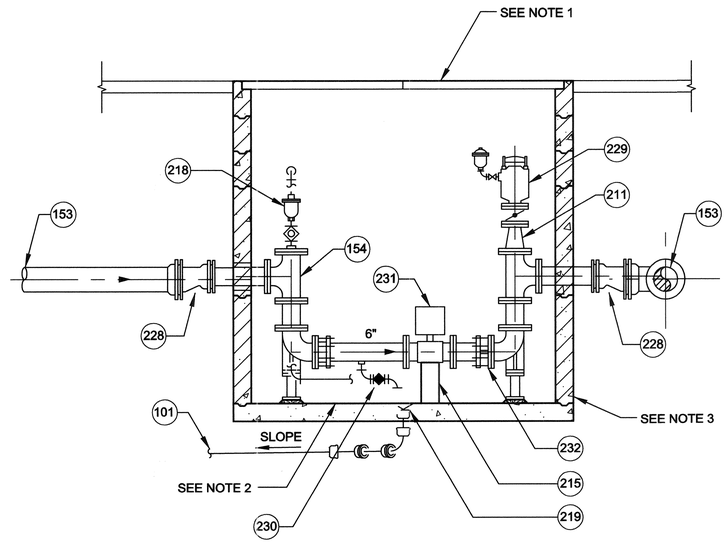
WORK ORDER NO. EW40019F

DRAWING NO. M-4

SHEET ~~77~~ 29 OF ~~108~~ 60 SHEETS



E1 METER VAULT PLAN
SCALE: 1/2"=1'–0" | C–12



E7 METER VAULT SECTION
SCALE: 1/2"=1'–0" | M–5

CONSTRUCTION SYMBOLS:

(101) 3" DRAIN LINE, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250

(153) 8" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350

(154) 6" FORCE MAIN, AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350

(211) 4" X 6" INCREASER

(215) CONCRETE SADDLE SUPPORT UNDER MAG METER, SEE A5/S-6.

(218) 1" AIR RELEASE VALVE

(219) 3" FLOOR DRAIN WITH NO BACKWATER VALVE. SEE A4/M-7.

(228) 6" X 8" ECC REDUCER, FLAT TOP

(229) 4" SEWAGE COMBINATION AIR VALVE PER SECTION 15830

(230) 1" DRAIN CONNECTION WITH PLUG VALVE ISOLATION

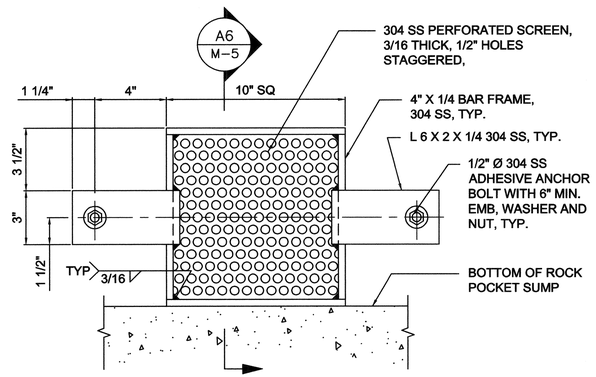
(231) 4" MAG METER FIT 01

(232) 6" RESTRAINED FLANGE COUPLING ADAPTER

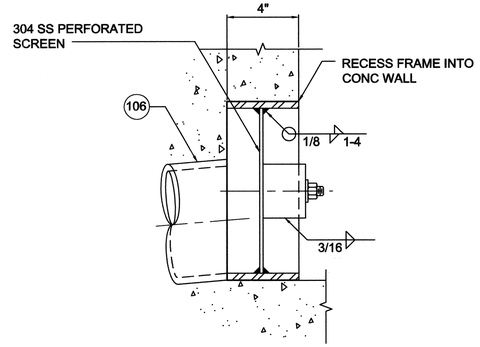
(233) 5'-0" X 8'-6" X 9'-0" PRECAST CONCRETE VAULT WITH SPRINT ASSISTED GALV. TRAFFIC COVER. SEE SPEC 02726.

NOTES:

1. SPRING ASSISTED ACCESS DOOR COVER PER SPEC. SECTION 05500. CONTRACTOR SHALL FURNISH RECESSED LOCKS ON ACCESS HATCHES.
2. SLOPE CONCRETE FLOOR 1% TO DRAIN.
3. FOR STRUCTURAL DESIGN SEE DRAWING S-13.



A1 SUMP SCREEN
SCALE: 3"=1'–0" | M–2



A6 SUMP SCREEN SECTION
SCALE: 3"=1'–0" | M–5

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LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation
Los Angeles, California

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12.09.02

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LA DPW ENGINEERING Serving The Public With Pride and Dedication

GARY LEE MOORE, P.E. CITY ENGINEER | DATE:
LIC. NO. C25565

DESIGN GROUP	
ENGINEER:	NICK CILIC
DESIGNED BY:	AL GEORGE
DRAWN BY:	AL GEORGE
CHECKED BY:	DOUGLAS B. ROBISON
APPROVED BY:	ROBERT MARTIN FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STORM DRAIN PUMPING STATION MECHANICAL FLOW METER PLAN AND SECTION

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN No. C25565 STATE OF CALIFORNIA

STRUCTURE NO.

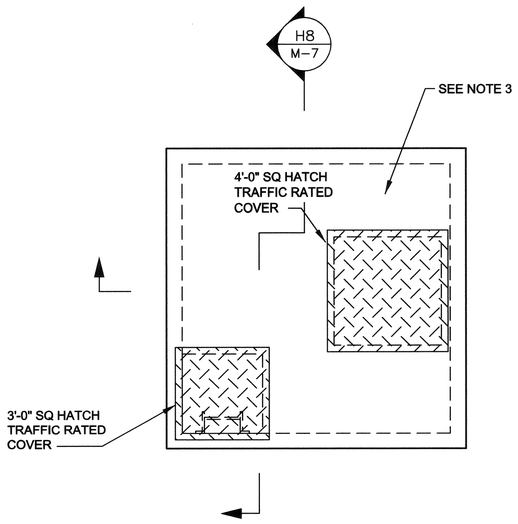
INDEX NO.

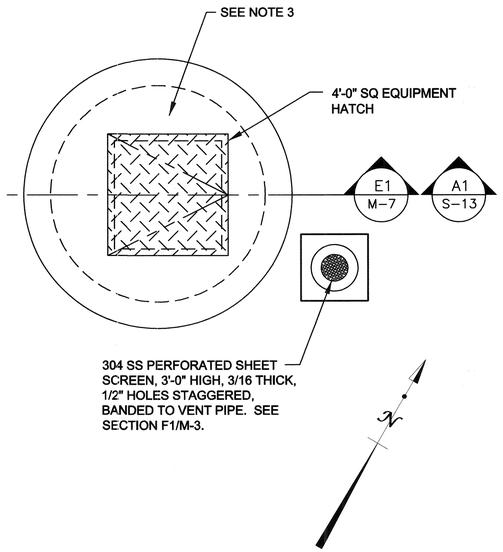
DATE: BY: | NO. REVISIONS:

WORK ORDER NO. EW40019F

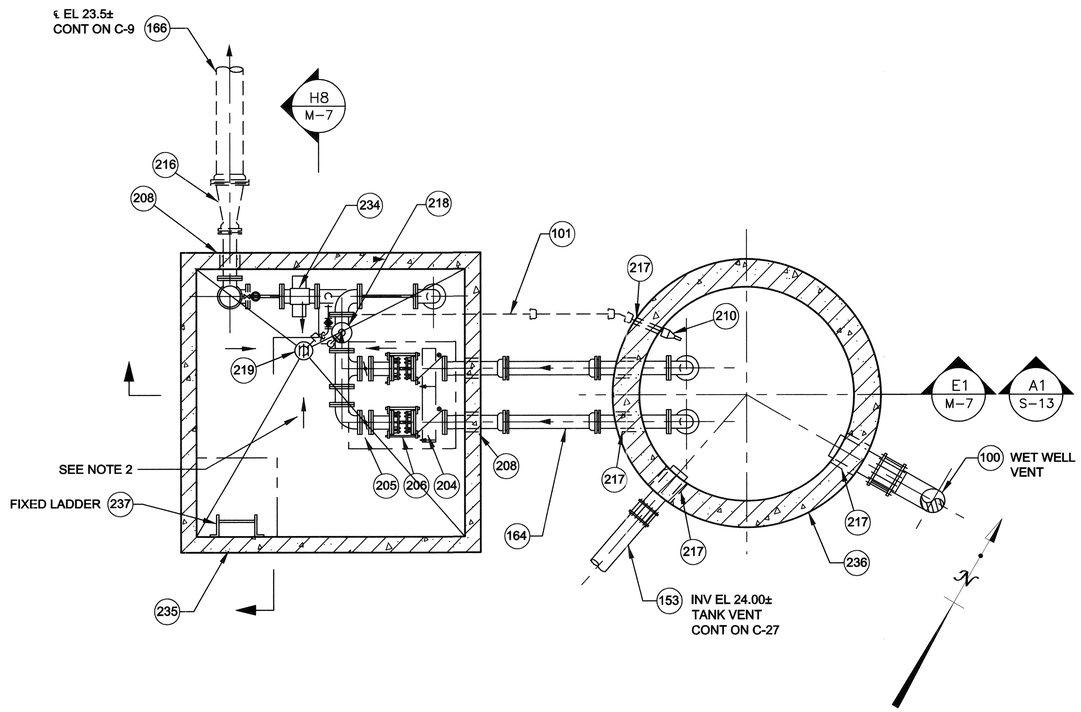
DRAWING NO. M-5

SHEET 30 OF 60 SHEETS
~~78~~ ~~100~~

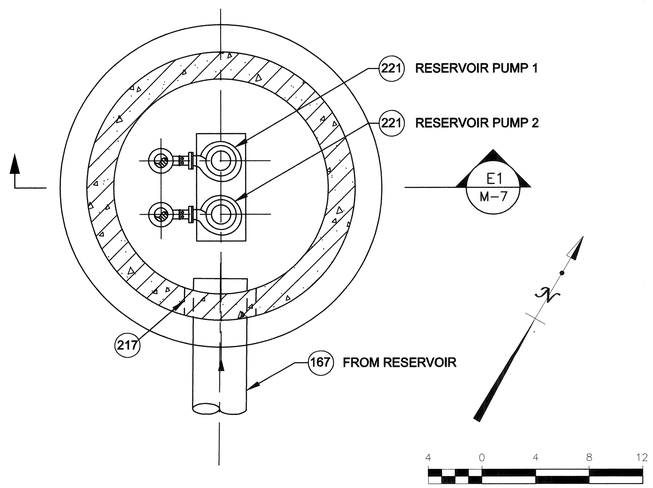




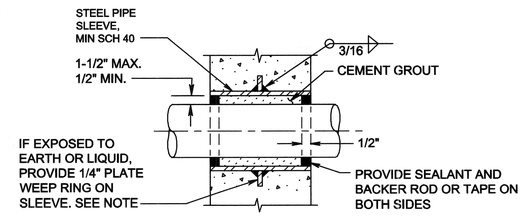
F1 MAG METER VAULT TOP PLAN
SCALE: 3/8"=1'-0" –



F9 MAG METER VAULT PLAN AT EL 26.00
SCALE: 3/8"=1'-0" –



A1 MAG METER VAULT PLAN AT EL 12.00
SCALE: 3/8"=1'-0" –



A6 TYPE E WALL PENETRATION
SCALE: NO SCALE M-1, M-3, M-6, M-7

CONSTRUCTION SYMBOLS:

(100) 12" VENT
SCHEDULE 40 PVC

(101) 3" DRAIN LINE
AWWA C151 DUCTILE IRON PIPE,
PRESSURE CLASS 250

(153) 8" TANK VENT.
AWWA C151 DUCTILE IRON PIPE,
PRESSURE CLASS 350

(164) 6" DRAIN LINE
AWWA C151 DUCTILE IRON PIPE,
PRESSURE CLASS 250

(166) 12" DRAIN LINE
AWWA C151 DUCTILE IRON PIPE,
PRESSURE CLASS 250

(167) 24" DRAIN LINE
AWWA C151 DUCTILE IRON PIPE,
PRESSURE CLASS 250

(204) 6" CHECK VALVE, TYP OF 2

(205) 6" ISOLATION BUTTERFLY VALVE,
TYP OF 2

(206) 6" RESTRAINED EQUIPMENT
CONNECTION JOINT, TYP OF 2

(208) WALL PENETRATION, SEE A1/M-3,
A4/M-3, AND A7/M-3, TYPICAL.

(210) 3" RUBBER CHECK VALVE, TIDEFLEX
TF-2 BY RED VALVE, OR EQUAL.

(216) 6" X 12" ECCENTRIC INCREASER
(FLAT TOP)

(217) WALL PENETRATION, SEE A6/M-6, TYPICAL.

(218) 1" AIR RELEASE VALVE.

(219) 3" FLOOR DRAIN WITH NO BACKWATER
VALVE. SEE A4/M-7.

(221) RESERVOIR PUMPS 1 & 2.
20 HP SUBMERSIBLE, VARIABLE SPEED,
CENTRIFUGAL PUMPING UNITS.
DESIGN POINT #1: 450 GPM @ 28 FEET TDH
DESIGN POINT #2: 675 GPM @ 36 FEET TDH
REFERENCE SECTION 11520 FOR
ADDITIONAL FLOW CONDITIONS AND PUMP
REQUIREMENTS.

(234) 6" MAG METER (FIT 02)

(235) 10'-0"(ID) X 10'-0"(ID) X 7'-6" PRECAST
CONCRETE VAULT WITH TRAFFIC
RATED COVERS. SEE SPEC.
SECTION 02726.

(236) 10'-0" OD X 8'-0" ID X 27'-6" PRECAST
CONCRETE PIT WITH TRAFFIC
RATED COVERS. SEE SPEC.
SECTION 02726.

(237) FIXED LADDER. SEE G8/S-5 AND
G12/S-5.

NOTES:

1. CONTRACTOR SHALL FURNISH RECESSED LOCKS ON ALL EQUIPMENT AND ACCESS HATCHES.
2. SLOPE CONCRETE FLOOR 1% TO DRAIN.
3. ADJUST TOP ELEVATION AND SLOPE TO MEET EXISTING SIDEWALK AND CURB FLUSH.

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH
Corporation
Los Angeles, California

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

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BUREAU OF ENGINEERING

LA DPW ENGINEERING Serving THE Present, Designing THE Future

GARY LEE MOORE, P.E.
CITY ENGINEER
DATE:
LIC. NO. C25565

DESIGN GROUP	
ENGINEER:	NICK CILIC
DESIGNED BY:	AL GEORGE
DRAWN BY:	AL GEORGE
CHECKED BY:	DOUBLAS B. ROBISON
APPROVED BY:	ROBERT MARTIN FINN

NO. REVISIONS: DATE: BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 12-31-11 STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

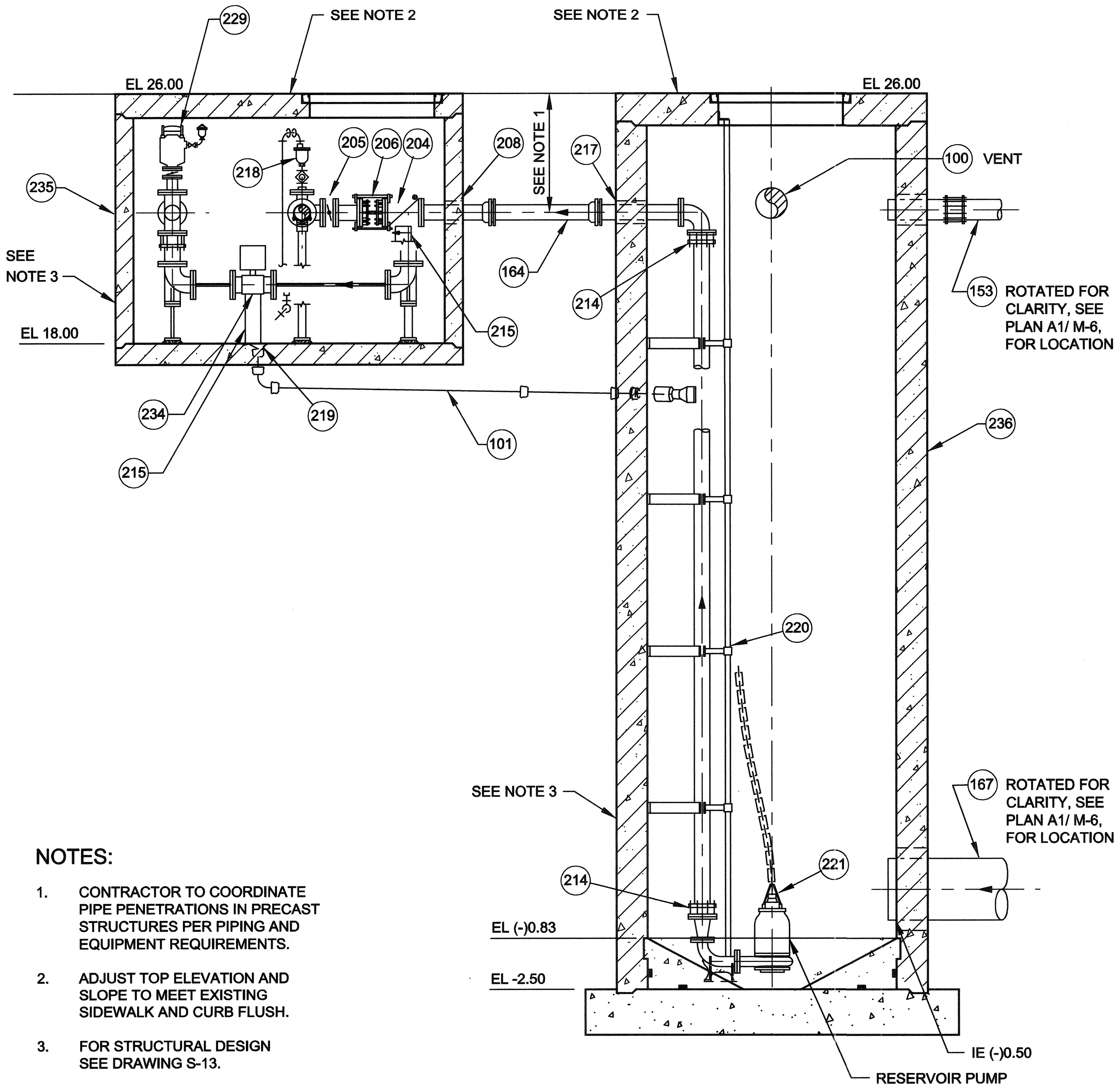
SHEET TITLE: RESERVOIR PUMPING STATION
MECHANICAL PLANS AND DETAILS

PROJECT: PENMAR WATER QUALITY
IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE
LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F

DRAWING NO.
M-6
31 60
SHEET ~~79~~ OF ~~108~~ SHEETS

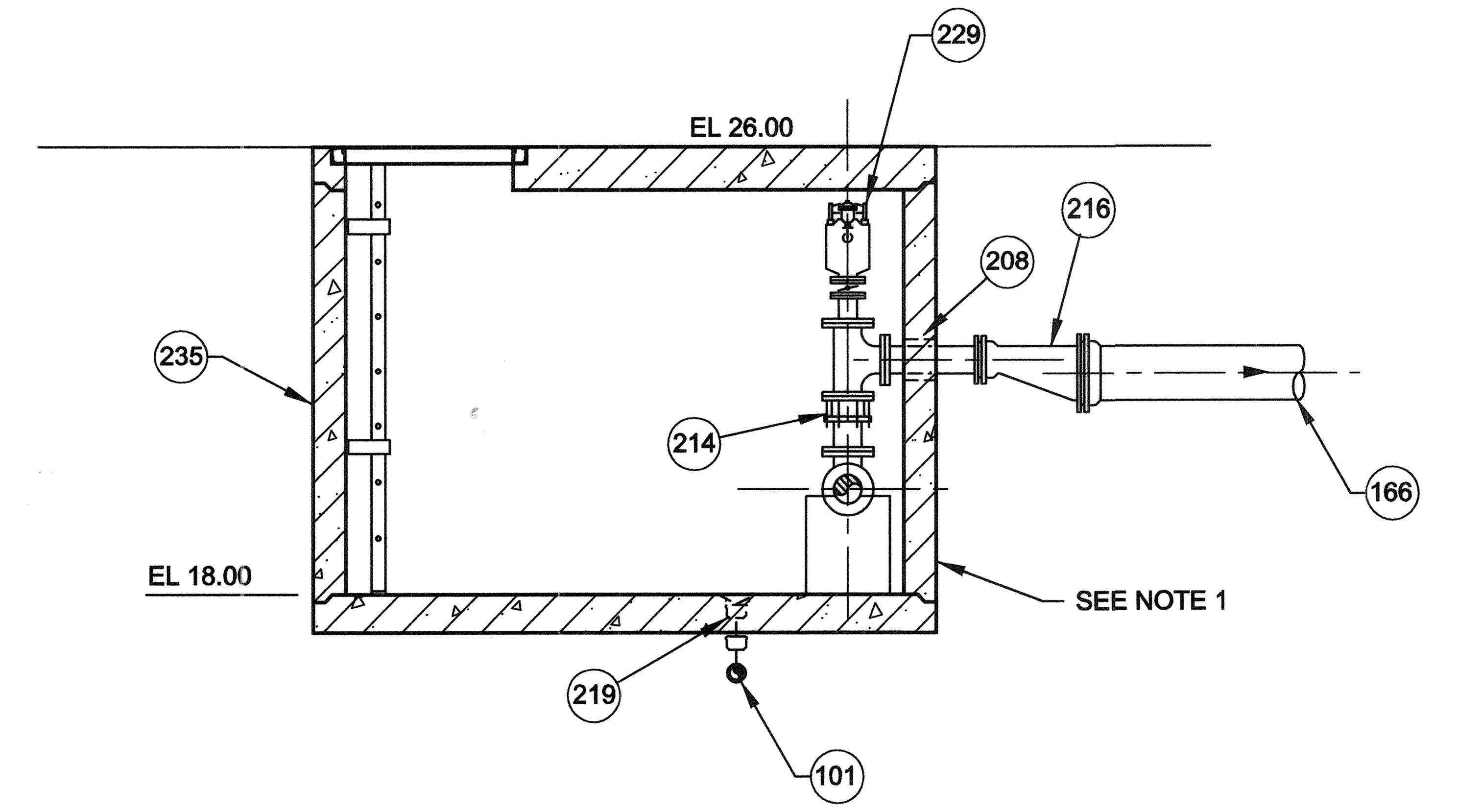


NOTES:

1. CONTRACTOR TO COORDINATE PIPE PENETRATIONS IN PRECAST STRUCTURES PER PIPING AND EQUIPMENT REQUIREMENTS.
2. ADJUST TOP ELEVATION AND SLOPE TO MEET EXISTING SIDEWALK AND CURB FLUSH.
3. FOR STRUCTURAL DESIGN SEE DRAWING S-13.

E1 MAG METER VAULT SECTION

SCALE: 3/8"=1'-0" M-6

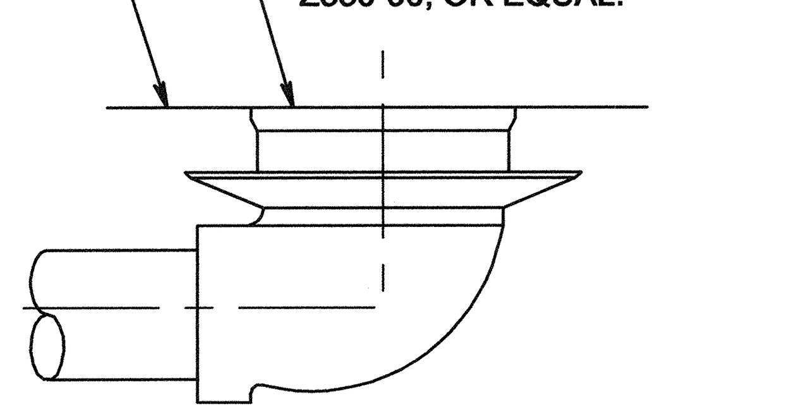


NOTES:

1. FOR STRUCTURAL DESIGN SEE DRAWING S-13.

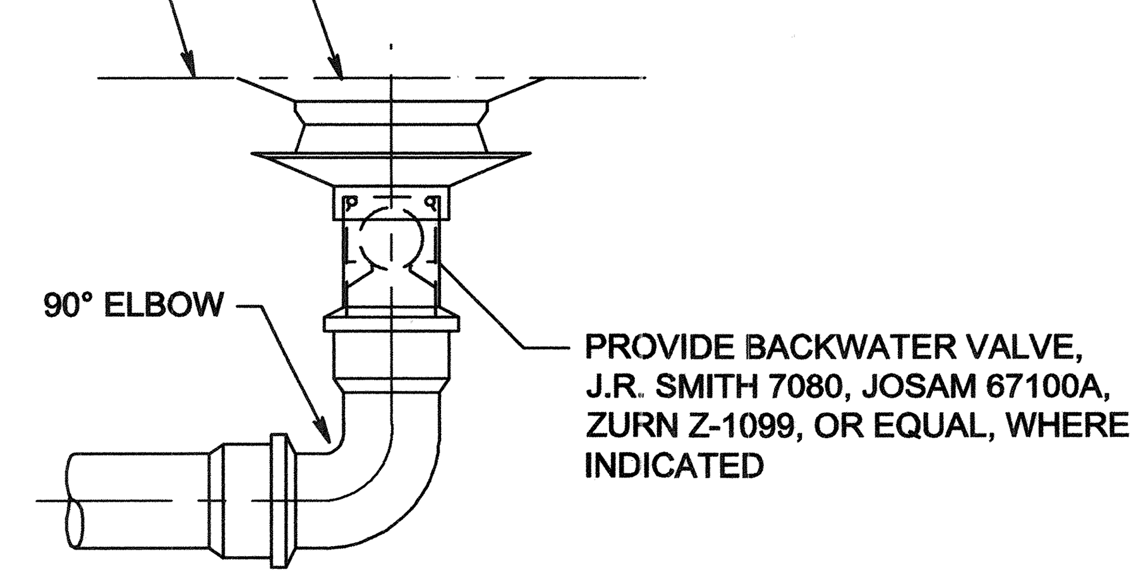
H8 MAG METER VAULT SECTION

SCALE: 3/8"=1'-0" M-6



A1 TYPE I FLOOR DRAIN

SCALE: NO SCALE M-1, M-3



A4 TYPE II FLOOR DRAIN

SCALE: NO SCALE M-5, M-6, M-7

CONSTRUCTION SYMBOLS:

- (100) 12" VENT PIPE SCHEDULE 40 PVC
- (101) 3" DRAIN LINE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
- (153) 8" TANK VENT. AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 350
- (164) 6" DRAIN LINE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
- (166) 12" DRAIN LINE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
- (167) 24" DRAIN LINE AWWA C151 DUCTILE IRON PIPE, PRESSURE CLASS 250
- (204) 6" CHECK VALVE, TYP OF 2
- (205) 6" ISOLATION BUTTERFLY VALVE
- (206) 6" RESTRAINED EQUIPMENT CONNECTION JOINT
- (208) WALL PENETRATION, SEE A1/M-3, A4/M-3, AND A7/M-3, TYPICAL.
- (214) 6" RESTRAINED FLANGE COUPLING ADAPTOR.
- (215) CONCRETE SADDLE SUPPORT UNDER MAG METER OR CHECK VALVE. SEE A5/S-6.
- (216) 6" X 12" ECCENTRIC INCREASER (FLAT TOP)
- (217) WALL PENETRATION, SEE A6/M-6.
- (218) 1" AIR RELEASE VALVE
- (219) 3" FLOOR DRAIN WITH NO BACKWATER VALVE. SEE A4/M-7.
- (220) DISCHARGE PIPE AND GUIDE RAIL SUPPORT, TYP.
- (221) RESERVOIR PUMPS 1 & 2. 20 HP SUBMERSIBLE, VARIABLE SPEED, CENTRIFUGAL PUMPING UNITS. DESIGN POINT #1: 450 GPM @ 28 FEET TDH DESIGN POINT #2: 675 GPM @ 36 FEET TDH REFERENCE SECTION 11520 FOR ADDITIONAL FLOW CONDITIONS AND PUMP REQUIREMENTS.
- (229) 4" SEWAGE COMBINATION AIR VALVE PER SECTION 15830
- (234) 6" MAG METER (FIT 02)
- (235) 10'-0"(ID) X 10'-0"(ID) X 7'-6" PRECAST CONCRETE VAULT WITH TRAFFIC RATE COVERS. SEE SPEC. SECTION 02726.
- (236) 10'-0" OD X 8'-0" ID X 9'-0" PRECAST CONCRETE PIT WITH TRAFFIC RATED COVERS. SEE SPEC. SECTION 02726. MAG METER, SEE A6/S-6.

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NO. REVISIONS: DATE: BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN NO. C25565 Exp. 12-31-03 CIVIL STATE OF CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP LIC. NO. C25565 DATE:

ENGINEER: NICK CILIC

DESIGNED BY: AL GEORGE

DRAWN BY: AL GEORGE

CHECKED BY: DOUGLAS B. ROBISON

APPROVED BY: ROBERT MARTIN FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ

HORIZONTAL CONTROL: NAD83, EPOCH 1991.6

SHEET TITLE: RESERVOIR PUMPING STATION MECHANICAL SECTIONS

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. M-7

SHEET ~~80~~ 32 OF ~~108~~ 60 SHEETS

LIGHTING AND RECEPTACLES

8 — NO. OF FIXTURES IN AREA
FC — FIXTURE TYPE (REFER TO LIGHTSPEC SHEET)
4/40 — FIXTURE IDENTIFICATION, NUMBER OF LAMPS/LAMP WATTAGE
8'-0" — MOUNTING HEIGHT

3a — FLUORESCENT LIGHTING FIXTURE (TYPE AND MOUNTING AS NOTED)
CIRCUIT IDENTIFIER: WHEN SHOWN ADJACENT TO FIXTURE IDENTIFIES CIRCUIT NUMBER AND OPTIONAL SWITCH.
EXAMPLE: CIRCUIT 3, CONTROLLED BY SWITCH a.

PE — INCANDESCENT OR HID FIXTURE (PE=INTEGRAL PHOTO ELECTRIC CELL, WHERE SHOWN) WALL MOUNTED FIXTURE.

LIGHTING FIXTURE (POLE OR STANCHION MOUNTED)

PE — DARK ENDED QUADRANT INDICATES FACE ILLUMINATED

PHOTO ELECTRIC CELL

EMERGENCY LIGHTING UNIT (BATTERY POWERED)

2W, $a, TMR — TOGGLE SWITCH
SUBSCRIPT INDICATES CIRCUIT CONTROLLED
SUPERSCRILPT INDICATES: BLANK-1 POLE, 20A, 120V, 2W-WAY, 3W-3 WAY, 4W-4 WAY 120V, K-KEY OPERATED, P-WITH PILOT LIGHT, M-3 POSITION MOMENTARY CONTACT, CENTER "OFF", OR MANUAL MOTOR STARTER "TMR" INDICATES INTERGRATED TIMER W/BYPASS

F — DUPLEX CONVENIENCE RECEPTACLE, 2 POLE, 3 WIRE, 120V, MOUNTING HEIGHT + 18", UON. F-INDICATES FLOOR MOUNTED, WP-OUTDOOR WEATHER PROOF

RECEPTACLE (RATINGS AS SHOWN ON DRAWINGS)

CONDUCTORS AND RACEWAY NOT SHOWN IN CABLE AND RACEWAY SCHEDULE (UNSCHEDULED)

PANELBOARD — HOME RUN - SEE PANELBOARD, SWIITCHBOARD, OR MCC SCHEDULE FOR CIRCUIT INFORMATION. HOME RUNS ARE NOT LIMITED TO PANELBOARDS, SWITCHBOARDS, OR MCC'S.

1"C,-3#10, #10G — RACEWAY SIZE WITH CONDUCTOR CONTENTS AND SIZES.

BRANCH CIRCUITING. CONDUCTOR SIZE IS #12 AWG. UNLESS OTHERWISE SPECIFIED. MORE THAN TWO CONDUCTORS IN A CIRCUIT SHOWN WITH HATCH LINES THUS:

TOTAL NUMBER OF CONDUCTORS- NOT INCLUDING EQUIPMENT GROUNDING CONDUCTOR(S) AND A MINIMUM 3/4" EXPOSED CONDUIT OR 1" EMBEDDED CONDUIT. EQUIPMENT GROUNDING CONDUCTOR ALWAYS REQUIRED. CONTRACTOR SHALL SIZE UNSCHEDULED CONDUIT PER NEC GUIDELINES.

TOTAL NUMBER OF NEUTRALS

LAYOUTS

PXXXA (① ② ③)

① FUNCTION:
H-MEDIUM VOLTAGE — PC-POWER AND CONTROL
P-LV POWER — FO-FIBEROPTIC
C-CONTROL — PA-PUBLIC ADDRESS
S-SIGNAL — T-TELEPHONE
V-SECURITY — F-FIRE
② LOOP NO. ③ OPTIONAL SUFFIX

EXISTING RACEWAY OR WIRING SYSTEM
CONDUIT BENDS AWAY FROM OBSERVER
CONDUIT BENDS TOWARD OBSERVER
CONDUIT RUN - CHANGE IN ELEVATION
G — GROUND WIRE, SIZE AS NOTED
GROUND CONNECTION, BOLTED TYPE
GROUND CONNECTION, EXOTHERMIC TYPE
G — GROUND PLATE
EMBEDDED IN SLAB, BELOW GRADE, IN WALL, OR DUCTBANK
G — GROUNDING PIGTAIL
GROUND ROD
GROUND ROD AND WELL
J — JUNCTION BOX
M — MOTOR
FIELD MOUNTED DEVICE
MAGNETIC MOTOR STARTER
PB — PULL BOX

COMMUNICATIONS AND MISCELLANEOUS

BELL
ALARM HORN
HORN
E — ELECTRICAL DEVICE OR OUTLET AS NOTED ON DRAWINGS
TC — WALL MOUNTED THERMOSTAT
SOUND POWERED TELEPHONE OUTLET
TELEPHONE OUTLET
S — PAGING HANDSET
EXISTING EQUIPMENT CALLOUT

CONTROL DIAGRAMS

OFF / ON — ON-OFF SWITCH
LOS — NORMALLY CLOSED PUSHBUTTON, MOMENTARY TYPE, LOS LOCK-OUT-STOP
NORMALLY OPEN PUSHBUTTON, MOMENTARY TYPE
1CR — NORMALLY OPEN INTERLOCK (1CR DENOTES THAT CONTACT IS ASSOCIATED WITH CONTROL RELAY #1)
1CR — NORMALLY CLOSED INTERLOCK (1CR DENOTES THAT CONTACT IS ASSOCIATED WITH CONTROL RELAY #1)
PANEL TERMINAL
CONTROL STATION LOS-LOCKOUT STOP

CONTROL DIAGRAMS CONTINUED

TIMER CONTACT, NORMALLY OPEN, TIME DELAY TO CLOSE AFTER COIL IS ENERGIZED
TIMER CONTACT, NORMALLY CLOSED, TIME DELAY TO OPEN AFTER COIL IS ENERGIZED
TIMER CONTACT, NORMALLY OPEN, TIME DELAY TO OPEN AFTER COIL IS DE-ENERGIZED
TIMER CONTACT, NORMALLY CLOSED, TIME DELAY TO CLOSE AFTER COIL IS DE-ENERGIZED
M 1 — MOTOR STARTER CONTACTOR
CR 1 — RELAY, AR-ALARM, CR-CONTROL, TR-TIME DELAY, NUMBER IDENTIFIES RELAY
21 — PROTECTIVE RELAY DEVICE, NUMBER REFERS TO ANSI C37.2 DEVICE FUNCTION NUMBER
SOLENOID VALVE
THERMAL OVERLOAD RELAY
MOTOR SPACE HEATER
HIGH RESISTANCE NUETRAL GROUNDING RESISTOR
ETM — ELAPSED TIME METER
POTENTIOMETER
SURGE SUPRESSOR
MTR — MOTOR
KWH — KILOWATT HOUR METER OR VAR-VARMETER (KW-KILOWATTMETER)
A — A-AMMETER, V-VOLTMETER
AS — SWITCH, AS-AMMETER, VS-VOLTMETER
CLF — FUSE (CLF INDICATES CURRENT LIMITING FUSE)
FUSE WITH BLOWN FUSE INDICATOR
R — INDICATING LIGHT : R=RED, G=GREEN, Y=YELLOW W=WHITE, B=BLUE, A=AMBER
CONDUCTOR, CONNECTED
CONDUCTOR, NOT CONNECTED
3 POSITION SELECTOR SWITCH WHERE SHOWN INDICATES SPRING RETURN TO CENTER POSITION INDICATED.
2 POSITION SELECTOR SWITCH
TORQUE SWITCH
LEVEL SWITCH
PRESSURE SWITCH
POSITION SWITCH
TEMPERATURE SWITCH
FLOW SWITCH

SINGLE LINES

M — METERING
2 — MOTOR (NUMBER INDICATES HORSEPOWER)
TRANSFORMER
ISOLATION TRANSFORMER
600/5 3 — CURRENT TRANSFORMER (3 INDICATES NUMBER OF CT'S, 600/5 INDICATES XFMR RATIO)
CURRENT TRANSFORMER WINDOW TYPE
3 — POTENTIAL (VOLTAGE) TRANSFORMER (3 INDICATES NUMBER OF PT'S)
TRANSFORMER CONNECTION (DELTA-WYE W/ GROUNDED NEUTRAL)
INCOMING LINE
CONNECTOR, PLUG DRAW OUT TYPE
DRAW OUT TYPE POWER CIRCUIT BREAKER
52 — DRAW OUT TYPE 15KV VACUUM CIRCUIT BREAKER
STRESS CONE
POTHEAD
TEST DEVICE
CAPACITOR
BATTERY
K — KIRK-KEY INTERLOCK
30 / 100 — THERMAL MAGNETIC BREAKER, 30 INDICATES TRIP AMPS, 100 INDICATES FRAME SIZE, 3 POLE UNLESS OTHERWISE NOTED
3 / MCP — MOTOR CIRCUIT PROTECTOR 3 INDICATES CONTINUOUS RATING, 3 POLE UNLESS OTHERWISE NOTED
1 — FULL VOLTAGE, NON-REVERSING MAGNETIC MOTOR STARTER, 1 INDICATES NEMA SIZE. SEE SPECIFICATIONS FOR TYPE OF BRANCH CIRCUIT PROTECTION
AC COMBINATION FULL VOLTAGE MAGNETIC STARTER, REVERSIBLE
AC COMBINATION FULL VOLTAGE MAGNETIC STARTER, TWO SPEED, TWO WINDING
SA — SURGE ARRESTOR
LIGHTNING ARRESTOR AND GROUND
TVSS — TRANSIENT VOLTAGE SURGE SUPPRESSOR
R — RESISTOR
CABLE BUS. AMPACITY AS SHOWN
30A NF — DISCONNECT SWITCH, 30A INDICATES SWITCH CONTINUOUS RATING IN AMPS NF INDICATES NON FUSIBLE
COMBINATION DISCONNECT SWITCH WITH POWER RECEPTACLE
SB — SHORTING TERMINAL BLOCK

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DATE: BY:
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REGISTERED PROFESSIONAL ENGINEER ★ LOZANO ★ ELECTRICAL ★ STATE OF CALIFORNIA
No. 18659 Exp. 12-31-10

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS
GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
ENGINEER: ERICK LOZANO LIC. NO. 18659
DESIGNED BY: ISABEL ARANGO
DRAWN BY: ISABEL ARANGO
CHECKED BY: FRANK SHADAN
APPROVED BY: ROBERT FINN

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation Los Angeles, California

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5
SHEET TITLE: SYMBOLS AND ABBREVIATIONS SHEET 1
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F
DRAWING NO. E-1
SHEET 33 OF ~~81~~ 60 ~~108~~ SHEETS

ABBREVIATIONS
THE FOLLOWING LIST IS IN ADDITION TO THOSE ABBREVIATIONS DEFINED ON OTHER DRAWINGS

A	AMPERES, AMMETER
AC	ALTERNATING CURRENT
ADJ	ADJUSTABLE
AF	AMPERE FRAME
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AIC	AMPERES INTERRUPTING CAPACITY
AL	ALUMINUM
AR	ALARM RELAY
AS	AMMETER SELECTOR SWITCH
ASC	ADJUSTABLE SPEED CONTROL
AT	AMPERE TRIP
ATO	AUTO THROWOVER
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
BCP	BREAKER CONTROL PANEL
BCW	BARE COPPER CONDUCTOR
BKR	BREAKER
BTD	BEARING TEMPERATURE DETECTOR
C	CONDUIT
CAT 5	CATEGORY 5
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
CKT	CIRCUIT
CLG	CEILING
CND	CONDUIT
CO	CONDUIT ONLY
COMPR	COMPRESSOR
COMPT	COMPARTMENT
CDR	CONDUCTOR
CONT	CONTROL
CONTD	CONTINUED
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CS	CURRENT SENSOR
CT	CURRENT TRANSFORMER
CU	COPPER
D	DEMAND METER
DB	DIRECT BURIAL/DISTRIBUTION BOARD
DC	DIRECT CURRENT
DECR	DECREASING
DET	DETAIL
DIAG	DIAGRAM
DISC	DISCONNECT
DP	DISTRIBUTION PANEL
DPC	DISTRIBUTED PROCESS CONTROLLER
DS	DISCONNECT SWITCH
EL	ELEVATION
EMER	EMERGENCY
ENCL	ENCLOSURE/ENCLOSED
EQUIP	EQUIPMENT
ETM	ELAPSED TIME METER
EXH	EXHAUST
EXIST, (E)	EXISTING
EXP	EXPLOSION PROOF
F	FREQUENCY, FREQUENCY METER
FACP	FIRE ALARM CONTROL PANEL
FCB	FIBER CABINET
FCP	FIELD CONTROL PANEL
FDR	FEEDER
FIN	FINISHED
FLEX	FLEXIBLE
F.O.	FIBER OPTIC
FOC	FIBER OPTIC CABLE
FP	FIELD PANEL
FS	FLOW SWITCH
FTU	FIBER TERMINATION UNIT
FUT	FUTURE
FVNR	FULL VOLTAGE NON REVERSING
FVR	FULL VOLTAGE REVERSING
G	GREEN GROUND CONDUCTOR, GENERATOR
GF	GROUND FAULT TRIP
GALV	GALVANIZED
GEN	GENERATOR
GFI	GROUND FAULT INTERRUPTER
GFR	GROUND FAULT RELAY
GND	GROUND
GRS	GALVANIZED RIGID STEEL CONDUIT

H	HAZARDOUS
H/A	HAND/AUTO
HOA	HAND/OFF/AUTO
HOR	HAND/OFF/REMOTE
HH	HAND HOLE
HMI	HUMAN-MACHINE INTERFACE
HP	HORSEPOWER
HRG	HIGH RESISTANCE GROUND
HT	HEIGHT
HTR	HEATER
HS	HAND SWITCH
HV	HIGH VOLTAGE (GENERALLY ABOVE 600V)
HZ	HERTZ (CYCLES PER SECOND)
IET	INSTANTANEOUS ELECTRONIC TRIP
IL	INDICATING LAMP
INCAND	INCANDESCENT
INST	INSTANTANEOUS
INSTR	INSTRUMENT
INTLK	INTERLOCK
INCR	INCREASING
I/O	INPUT/OUTPUT
JB	JUNCTION BOX
KCM	THOUSAND CIRCULAR MILS
KVA	KILOVOLT-AMPERES
KW	KILOWATTS
KWH	KILOWATT HOUR
LC	LIGHTING CONTACTOR
LCP	LOCAL CONTROL PANEL
LDS	LEVEL DIFFERENTIAL SWITCH
LO	LUGS ONLY
LOR	LOCAL-OFF-REMOTE
LOS	LOCK-OUT STOP
LP	LIGHTING PANEL
LR	LOCAL-REMOTE
LS	LEVEL SWITCH
LT	LONG TIME DELAY
LTG	LIGHTING
LV	LOW VOLTAGE (GENERALLY BELOW 600V)
LTPU	LONG TIME PICKUP
M	MOTOR, MOTOR CONTACTOR
MA	MILLIAMPERE
MAX	MAXIMUM
MB+	MOD BUS +
MBS	MAINTENANCE BYPASS SWITCH
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MH	MANHOLE
MIN	MINIMUM
MOV	MOTOR OPERATED VALVE
MR	MOTOR CONTACTOR RELAY
MS	MAGNETIC STARTER
MSB	MAIN SWITCH BOARD
MSG	MAIN SWITCHGEAR
MSH	MOISTURE SWITCH HIGH
MSP	MOTOR STARTER PANEL
MTD	MOUNTED
MTS	MANUAL TRANSFER SWITCH
MTG HT	MOUNTING HEIGHT
MV	MILLIVOLTS
N, (N)	NEW, PNEUMATIC
N/A	NOT APPLICABLE
NA	NON-AUTOMATIC
NC	NORMALLY CLOSED
NF	NON FUSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NP	NAMEPLATE
NTS	NOT TO SCALE
OC	ON CENTER, OVER CURRENT
OL'S	OVERLOADS
P	POLE, PHASE
PA	PUBLIC ADDRESS
PB	PULL BOX
PBD	PANELBOARD
PDS	PRESSURE DIFFERENTIAL SWITCH
PE	PHOTO ELECTRIC CELL
PH & ϕ	PHASE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PLS	POLES
PM	POWER METER
PNL	PANEL CONTROL OR INSTRUMENT
PO	POWER ONLY
PP	POWER PANEL
PS	PRESSURE SWITCH
PR	PAIR
PRI	PRIMARY
PROVIDE	FURNISH, INSTALL AND CONNECT
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE
PWR	POWER
PW	PART WINDING

RECP	RECEPTACLE
REQD	REQUIRED
RGS	RIGID GALVANIZED STEEL CONDUIT
RIO	REMOTE I/O
RMS	ROOT MEAN SQUARE
RTD	RESISTANCE TEMPERATURE DETECTOR
RVNR	REDUCED VOLTAGE NON REVERSING
RVSS	REDUCED VOLTAGE SOLID STATE
SCH	SCHEDULE
SEC	SECONDARY, SECONDS
SEL	SELECTOR
SGR	SWITCHGEAR
SH	SHIELDED
SPEC	SPECIFICATIONS
SPDT	SINGLE POLE DOUBLE THROW
SPST	SINGLE POLE SINGLE THROW
SS	SPEED SWITCH
S/S	SELECTOR SWITCH
STPU	SHORT TIME PICKUP
ST	SHORT TIME DELAY
SUB	SUBSTATION
SV	SOLENOID VALVE
SWI	SWITCH
SBD	SWITCHBOARD
SWGR	SWITCHGEAR
TACH	TACHOMETER
TB	TERMINAL BLOCK
TC	TIME CLOCK, TIME CONTROLLER, TIME DELAY CLOSE, TEMPERATURE CONTROLLER
TD	TRANSDUCER
TDU	TERMINAL DISTRIBUTION UNIT
TR	TIME DELAY RELAY
TDAD	TIME DELAY AFTER DEENERGIZATION (OFF DELAY)
TDAE	TIME DELAY AFTER ENERGIZATION (ON DELAY)
TEL	TELEPHONE
TEMP	TEMPERATURE
TF	TRICKLING FILTER
TFPS	TRICKLING FILTER PUMP STATION
TO	TIME DELAY OPEN
TS	TEMPERATURE SWITCH
TSH	TEMPERATURE SWITCH HIGH
TUB	ACRONYM FOR STARTER IN MCC OR CONTROL PANEL
TYP	TYPICAL
UG	UNDERGROUND
UNSW	UNSWITCHED
UON	UNLESS OTHERWISE NOTED
V	VOLTMETER
VA	VOLT-AMPS
VFD	VARIABLE FREQUENCY DRIVE
VS	VOLTMETER SELECTOR SWITCH
VSD	VARIABLE SPEED DRIVE
W	WATTMETER
W/	WITH
W/O	WITHOUT
WH	WATT-HOUR METER
WP	WEATHERPROOF
WR	WELDING RECEPTACLE
WS	TORQUE SWITCH
WTD	WINDING TEMPERATURE DETECTOR
XS	MISCELLANEOUS SWITCHES (VIBRATION, ETC)
XFMR	TRANSFORMER
ZS	POSITION (LIMIT) SWITCH

ANSI DEVICE NUMBER	DESCRIPTION
5	STOPPING DEVICE
15	FREQUENCY MATCHING
25	SYNCHRONIZING CHECK
26	FIELD TEMPERATURE
27	UNDER VOLTAGE
32	REVERSE POWER RELAY
37	UNDERCURRENT
38	BEARING TEMPERATURE
40	FIELD FAILURE
41	FIELD CIRCUIT BREAKER
46	REVERSE PHASE OR PHASE BALANCE
47	PHASE SEQUENCE
49	THERMAL RELAY
50	INSTANTANEOUS OVER CURRENT
51	TIME OVER CURRENT
52	AC CIRCUIT BREAKER
59	OVER VOLTAGE
63	LIQUID PRESSURE RELAY
64	GROUND PROTECTION
67	DIRECTIONAL OVER CURRENT
70	RHEOSTAT
71	LIQUID-LEVEL RELAY
72	DC CIRCUIT BREAKER
74	ALARM RELAY
81	FREQUENCY RELAY (O=OVER, U=UNDER)
86	LOCK OUT RELAY
87	DIFFERENTIAL RELAY
90	REGULATING DEVICE
99	POWER MONITORING

NOTES:

1. NOT ALL ABBREVIATIONS ARE LISTED. FOR OTHER ABBREVIATIONS REFER TO ANSI Y14.38 (FORMERLY Y1.1)
2. SEE DRAWINGS PI1, PI2 FOR ADDITIONAL SYMBOLS AND ABBREVIATIONS.
3. SEE DRAWING R1 FOR DESIGNATION SYSTEMS.
4. SEE DRAWINGS E1 FOR ADDITIONAL SYMBOLS AND NOTES.
5. IDENTIFICATIONS (ID), SIZES, RATINGS, LOCATIONS AND SIMILAR INFORMATION SHOWN ASSOCIATED WITH SYMBOLS ARE OPTIONAL; EXAMPLES OF SUCH INFORMATION ARE SHOWN WITH SOME SYMBOLS FOR CLARITY.
6. THE ELECTRICAL AND INSTRUMENTATION DRAWINGS USE THE SINGLE LINE DIAGRAMS AND PANEL SCHEDULES IN CONJUCTION WITH SHOWING THE LOCATION OF THE ELECTRICAL/INSTRUMENTATION SOURCES AND LOADS/DEVICES ON THE PLAN DRAWINGS TO DEPICT THE WORK. THE CONTRACTOR SHALL USE THESE DOCUMENTS TO DETERMINE AND PROVIDE THE NECESSARY RACEWAY AND WIRING SYSTEM FOR EACH CIRCUIT. THE TYPE OF RACEWAY AND WIRE USED SHALL BE AS SPECIFIED.
7. IF EQUIPMENT SUPPLIED BY MANUFACTURER HAS A LARGER LOAD THAN INDICATED ON THE SINGLE LINE DIAGRAM, THE CONSTRUCTION MANAGER SHALL BE NOTIFIED. THE CABLE, CONDUIT AND ELECTRICAL EQUIPMENT SHALL BE SIZED AS REQUIRED, TO ACCOMMODATE THE HIGHER VALUE.
8. THE LOCATION OF THE CONTROL STATIONS SHOWN ON THE PLAN DRAWINGS ARE DIAGRAMMATIC AND THE ACTUAL LOCATION SHALL BE COORDINATED IN THE FIELD WITH THE CONSTRUCTION MANAGER.
9. THE EXACT LOCATION OF THE MOTORS AND ACCESSORIES ARE NOT SHOWN. THE CONTRACTOR SHALL COORDINATE WITH STRUCTURAL,MECHANICAL, AND VENDOR SHOP DRAWINGS FOR CONDUIT STUB-UP AND TERMINATION LOCATIONS.
10. THE CONSTRUCTION DETAILS SHALL BE USED WHERE APPLICABLE.
11. ALL EQUIPMENT SHALL BE LABELED WITH NAMEPLATES. PROVIDE A DESCRIPTION OF THE EQUIPMENT AND THE EQUIPMENT NUMBER ON NAMEPLATES. PROVIDE NAMEPLATES PER SECTION 16010.
12. PROVIDE NAMEPLATES AT EQUIPMENT (MCC OR PANEL), AND CONTROL STATIONS. NAMEPLATES SHALL INCLUDE EQUIPMENT NUMBER AND DESCRIPTION SHOWN. PROVIDE LEGENDS FOR PILOT DEVICES AT CONTROL STATIONS CLEARLY DESCRIBING THE FUNCTION OF THE PILOT DEVICE.

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LOS ANGELES, CALIFORNIA

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Los Angeles, California

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GARY LEE MOORE, P.E.
CITY ENGINEER
DATE:
LIC. NO. 18859

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DESIGNED BY: ISABEL ARANGO	
DRAWN BY: ISABEL ARANGO	
CHECKED BY: FRANK SHADAN	
APPROVED BY: ROBERT FINN	

REVISIONS: NO. DATE: BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ERICK I. LOZANO No. 18859 ELECTRICAL STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: SYMBOLS AND ABBREVIATIONS SHEET 2

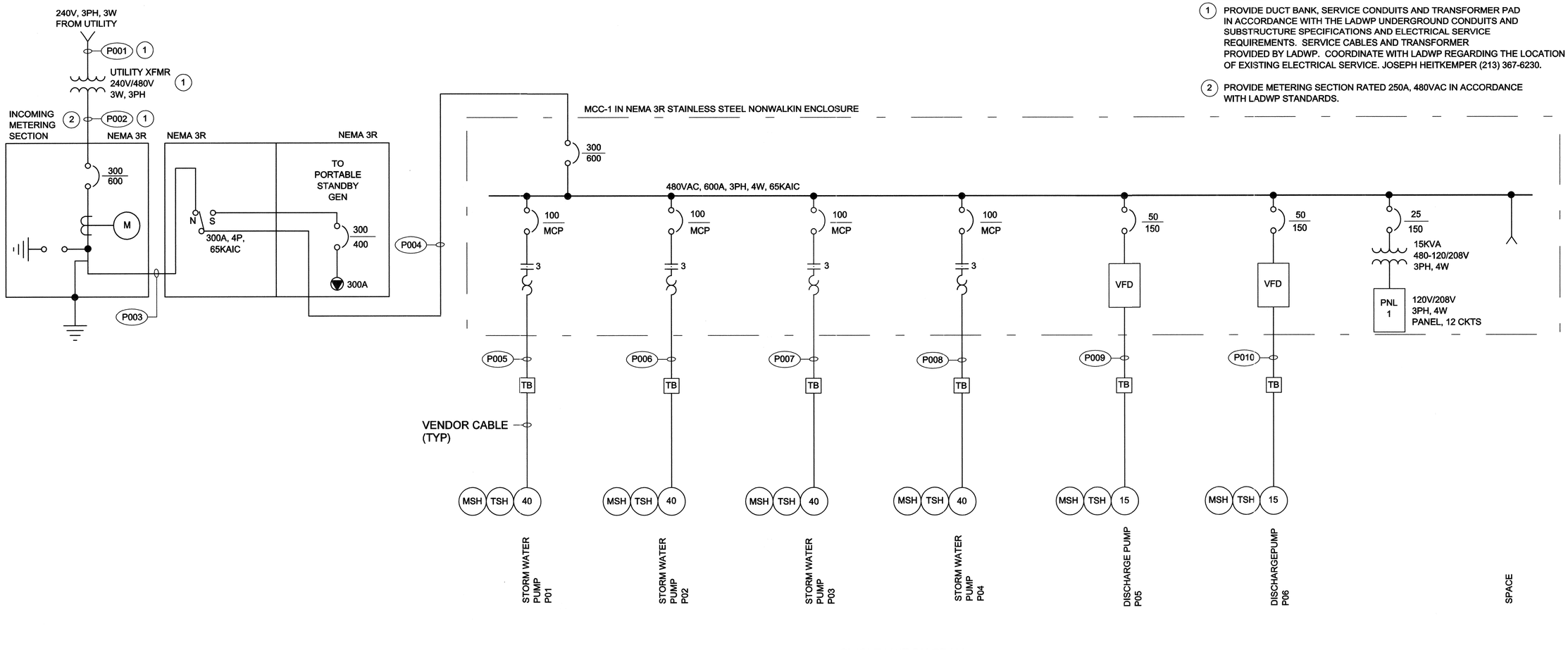
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. E-2

SHEET 34 OF ~~82~~ 60 ~~408~~ SHEETS

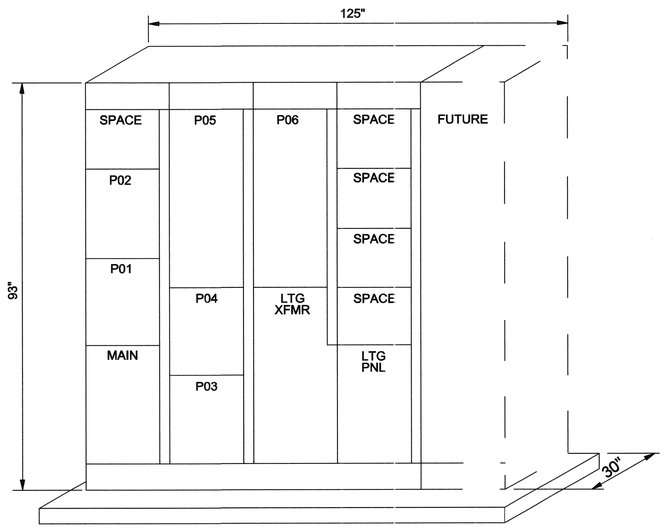


KEY NOTES:

1. PROVIDE DUCT BANK, SERVICE CONDUITS AND TRANSFORMER PAD IN ACCORDANCE WITH THE LADWP UNDERGROUND CONDUITS AND SUBSTRUCTURE SPECIFICATIONS AND ELECTRICAL SERVICE REQUIREMENTS. SERVICE CABLES AND TRANSFORMER PROVIDED BY LADWP. COORDINATE WITH LADWP REGARDING THE LOCATION OF EXISTING ELECTRICAL SERVICE. JOSEPH HEITKEMPER (213) 367-6230.
2. PROVIDE METERING SECTION RATED 250A, 480VAC IN ACCORDANCE WITH LADWP STANDARDS.

SINGLE LINE DIAGRAM

MCC-1 LOAD SCHEDULE		
EQUIPMENT	HP	F.L. AMPS
P01	40	52
P02	40	52
P03	40	52
P04	40	52
P05	15	21
P06	15	21
XFMR	15KVA	18.0
25% P01		13
TOTAL		281



MCC-1 ELEVATION (IN NEMA 3R STAINLESS STEEL NONWALKIN ENCLOSURE)

N.T.S.

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GARY LEE MOORE, P.E.
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APPROVED BY:	ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STORM DRAIN PUMPING STATION
SINGLE LINE DIAGRAM

PROJECT: PENMAR WATER QUALITY
IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE
LOS ANGELES, CA 90291

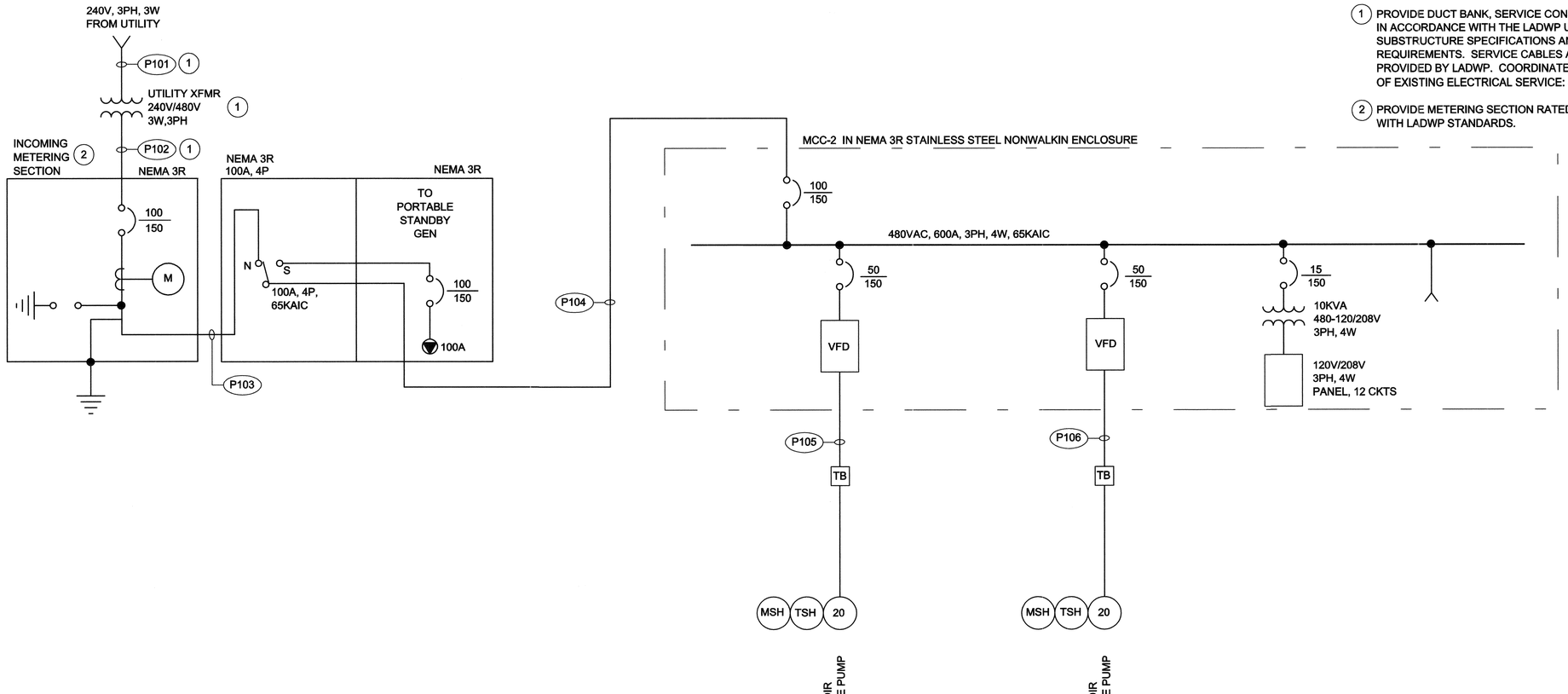
WORK ORDER NO.
EW40019F

DRAWING NO.
E-3

SHEET 35 OF 60 SHEETS
~~83~~ ~~408~~

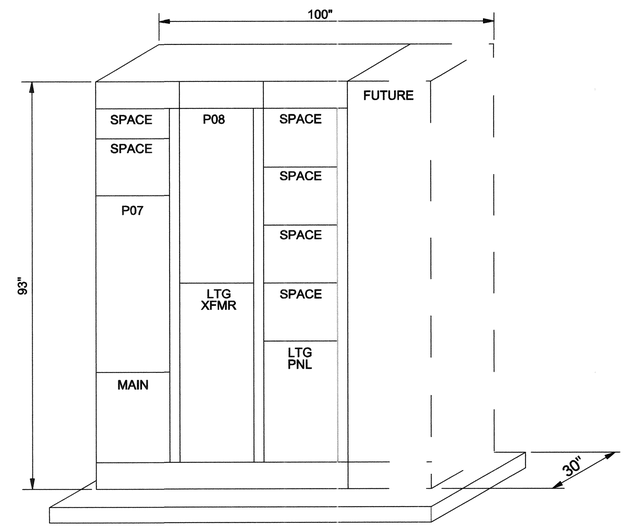
KEY NOTES:

1. PROVIDE DUCT BANK, SERVICE CONDUITS AND TRANSFORMER PAD, IN ACCORDANCE WITH THE LADWP UNDERGROUND CONDUITS AND SUBSTRUCTURE SPECIFICATIONS AND ELECTRICAL SERVICE REQUIREMENTS. SERVICE CABLES AND TRANSFORMER PROVIDED BY LADWP. COORDINATE WITH LADWP REGARDING THE LOCATION OF EXISTING ELECTRICAL SERVICE: JOSEPH HEITKEMPER (213) 367-6230.
2. PROVIDE METERING SECTION RATED 100A, 480VAC IN ACCORDANCE WITH LADWP STANDARDS.



SINGLE LINE DIAGRAM

MCC-2 LOAD SCHEDULE		
EQUIPMENT	HP	F.L. AMPS
P07	20	27
P08	20	27
XFMR	10KVA	12
25% P07		6.75
TOTAL		72.75



MCC-2 ELEVATION (IN NEMA 3R STAINLESS STEEL NONWALKIN ENCLOSURE)
N.T.S.

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STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ★ LOZANO ★ No. 18659 ★ CIVIL ★ STATE OF CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER DATE:

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APPROVED BY:	ROBERT FINN	

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH
Corporation
Los Angeles, California

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: RESERVOIR PUMPING STATION SINGLE LINE DIAGRAM

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

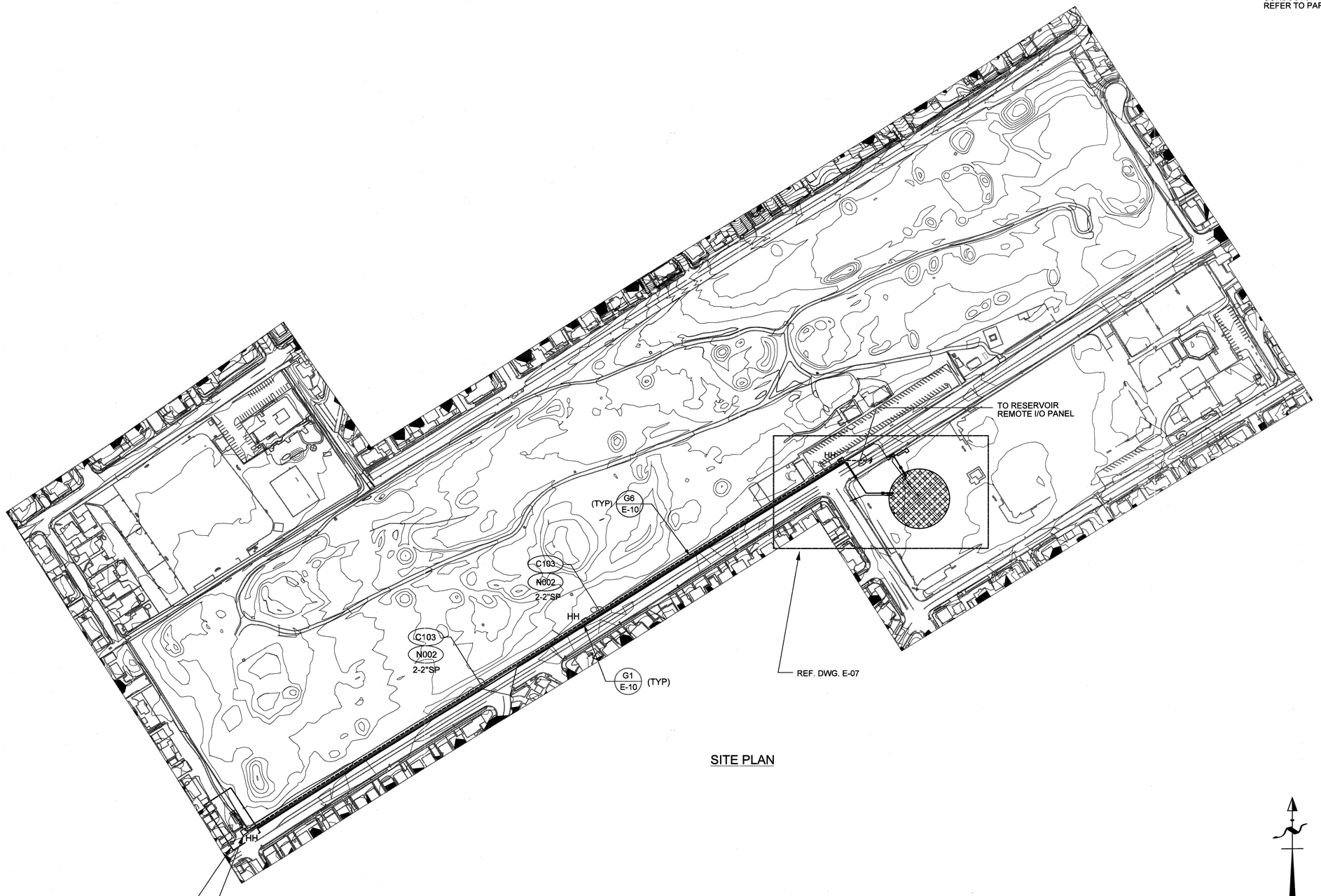
WORK ORDER NO. EW40019F

DRAWING NO. E-4

SHEET 84 OF 108 SHEETS

NOTES:

1. ROUTE DUCTBANK PARALLEL WITH PIPE. SEE CIVIL DRAWING C-1 SECTION VIEW.
2. INSTALL A HANDHOLE EVERY 150' TO FACILITATE CONDUCTOR INSTALLATION IN THE DUCTBANK. REFER TO PARAGRAPH 16050-3.2.



SITE PLAN

0 150 300 450
SCALE 1"=150'

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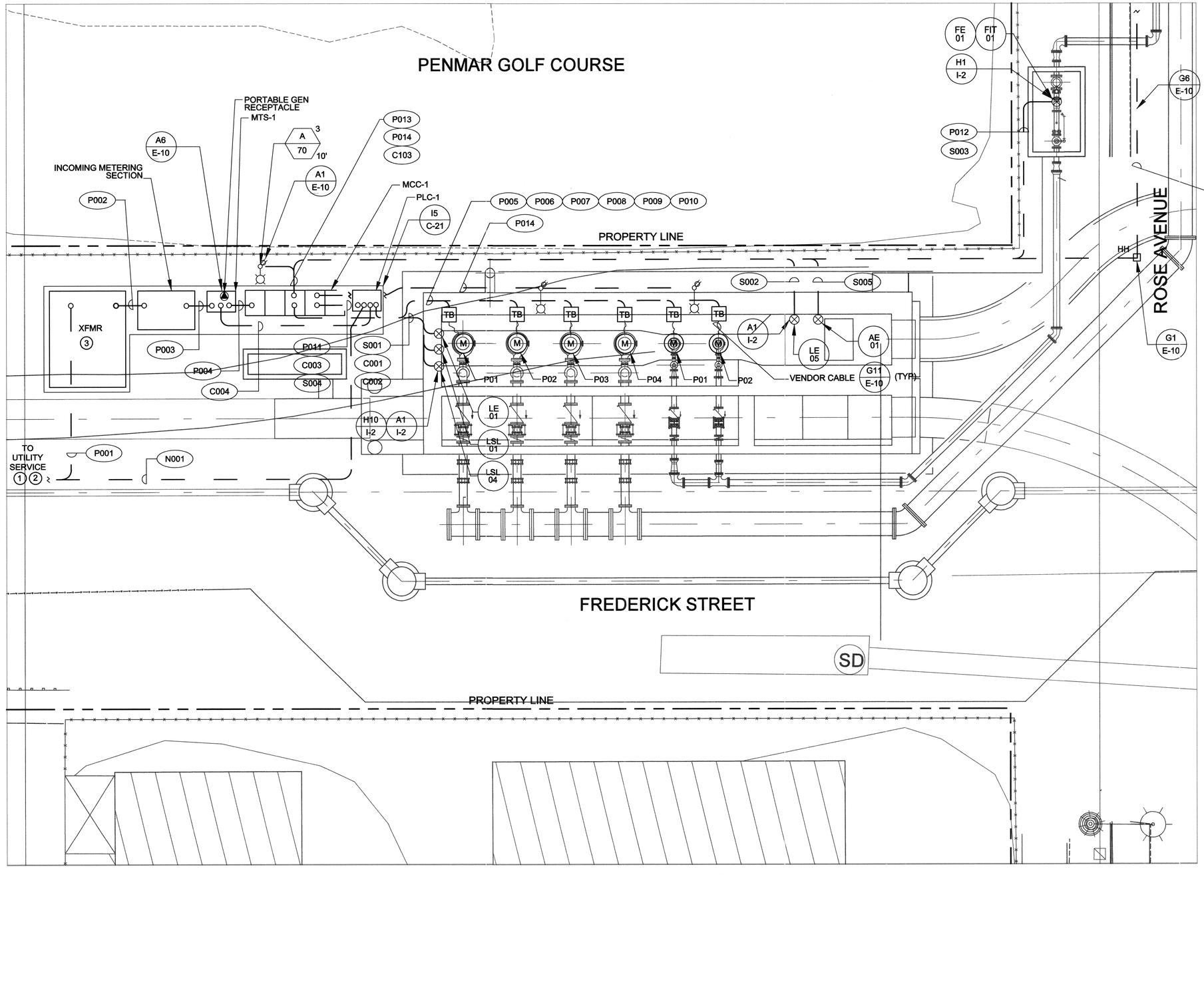
VERTICAL CONTROL:	NGVD29, 1985 ADJ
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5
SHEET TITLE:	RESERVOIR PUMPING STATION ELECTRICAL SITE PLAN
PROJECT:	PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
ADDRESS:	1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F

DRAWING NO.
E-5

SHEET 37 60 OF ~~85~~ ~~408~~ SHEETS



KEY NOTES:

1. ROUTE CONDUIT TO UTILITY POLE # 297336M LOCATED IN ALLEY APPROXIMATELY 150 FEET AWAY. COORDINATE WITH LADWP FOR SERVICE CONNECTION; SEE DWG E-3 AND SECTION 16010 FOR ADDITIONAL REQUIREMENTS.
2. ROUTE CONDUIT TO UTILITY POLE # 297336M. COORDINATE WITH VERIZON FOR SERVICE CONNECTION; KRISTY SHIGO 310-264-5128, SEE SECTION 16010 FOR ADDITIONAL REQUIREMENTS.
3. SUB-BASE TRANSFER PAD AND GROUNDING SHALL BE CONSTRUCTED PER DWP STANDARD DETAIL, DRAWING NUMBER UB721-07.

SCALE 1"=5'

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

Sheet Version 2.0

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH
Corporation
Los Angeles, California

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

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NO. REVISIONS: DATE: BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER * ELECTRICAL * STATE OF CALIFORNIA * GARY LEE MOORE * No. E 18659 * EXP. 12-31-10

GARY LEE MOORE, P.E. CITY ENGINEER DATE:
LIC. NO. 18659

DESIGN GROUP
ENGINEER: ERICK LOZANO
DESIGNED BY: ISABEL ARANGO
DRAWN BY: ISABEL ARANGO
CHECKED BY: FRANK SHADAN
APPROVED BY: ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STORM DRAIN PUMPING STATION ELECTRICAL PLAN

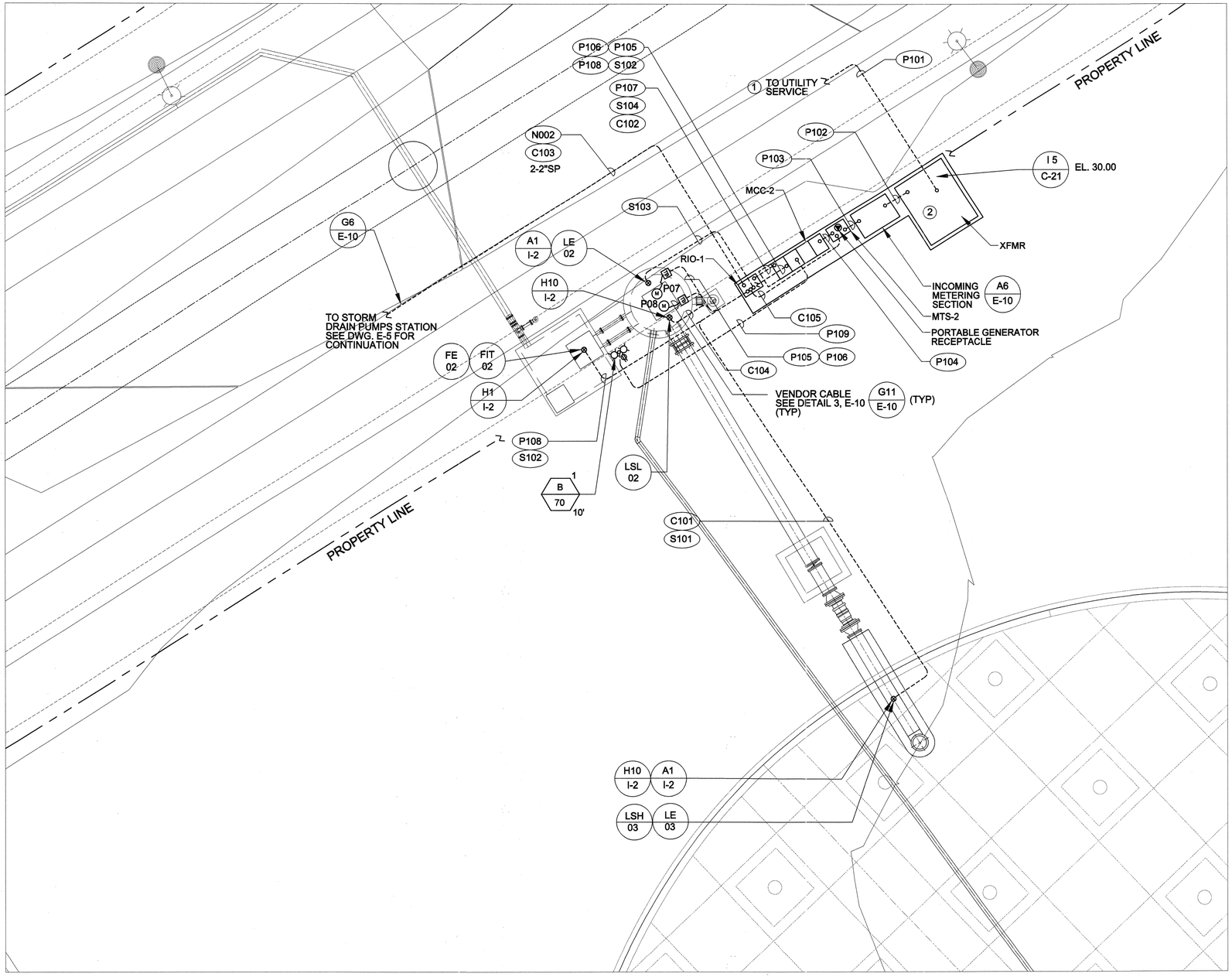
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. E-6

SHEET 38 OF ~~106~~ 66 SHEETS



KEY NOTES:

1. ROUTE CONDUIT TO UTILITY POLE # 304284M LOCATED NEAR CORNER OF PENMAR AND ROSE AVE. APPROXIMATELY 250 FEET AWAY. COORDINATE WITH LADWP FOR SERVICE CONNECTION; SEE DWG E-4 AND SECTION 16010 FOR ADDITIONAL REQUIREMENTS.
2. SUB-BASE TRANSFER PAD AND GROUNDING SHALL BE CONSTRUCTED PER DWP STANDARD DETAIL, DRAWING NUMBER UB721-07.

8 6 4 2 0 4 8 12 16
SCALE 1/8"=1'-0"

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NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ★ ERICK J. LOZANO ★ No. E18559 Exp. 12-31-10 ★ ELECTRICAL ★ STATE OF CALIFORNIA

CITY ENGINEER
GARY LEE MOORE, P.E.
DATE:

DESIGN GROUP	
ENGINEER:	ERICK LOZANO
	LIC. NO. 18559
DESIGNED BY:	ISABEL ARANGO
DRAWN BY:	ISABEL ARANGO
CHECKED BY:	FRANK SHADAN
APPROVED BY:	ROBERT FINN

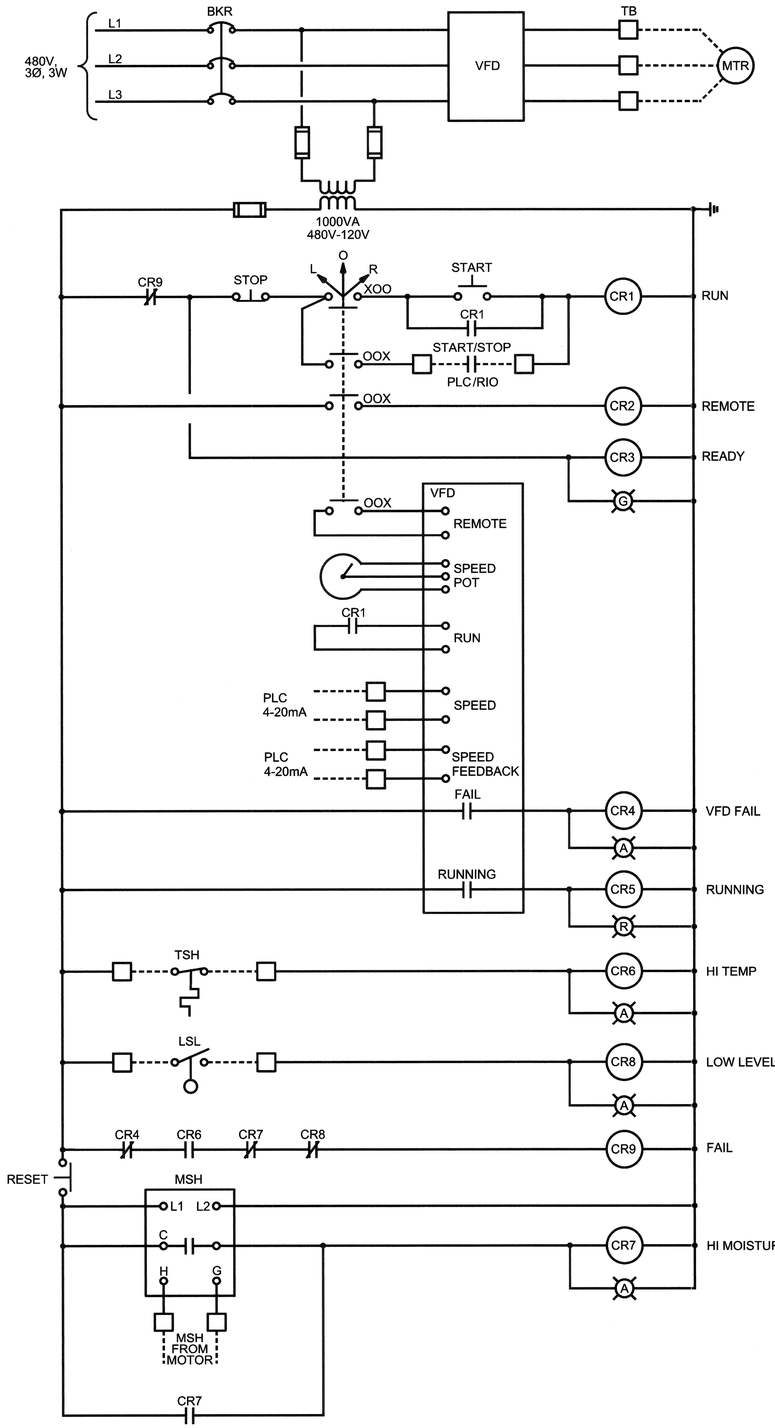
VERTICAL CONTROL:	NGVD29, 1985 ADJ
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5
SHEET TITLE:	RESERVOIR PUMPING STATION ELECTRICAL PLAN
PROJECT:	PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS:	1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F
DRAWING NO.
E-7
SHEET 39 OF 87 SHEETS ~~60~~ ~~108~~

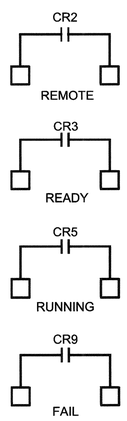
REVISION DATES (DESIGN STAGE ONLY)
12.09.02

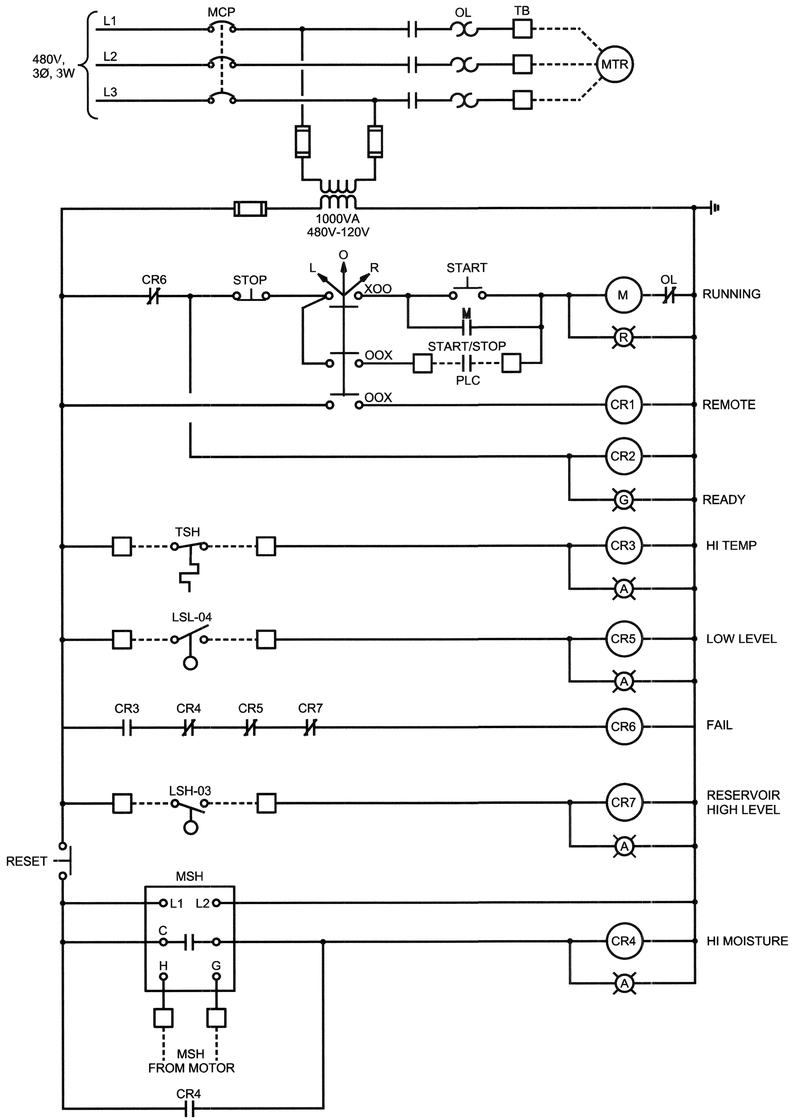
Sheet Version 2.0

$FILE$ $DATE$ $TIME$

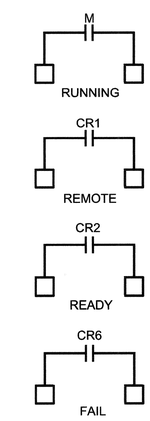


DISCHARGE AND RESERVOIR PUMPS SCHEMATIC
P05, P06, P07, P08





STORM PUMP SCHEMATIC
P01, P02, P03, P04



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REVISION DATES (DESIGN STAGE ONLY)
12.09.02

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STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER * STATE OF CALIFORNIA * ELECTRICAL * ERICK LOZANO * EXP. 12-31-10

CITY ENGINEER
GARY LEE MOORE, P.E.
DATE:
LIC. NO. 18659

DESIGN GROUP	
ENGINEER:	ERICK LOZANO
DESIGNED BY:	ISABEL ARANGO
DRAWN BY:	ISABEL ARANGO
CHECKED BY:	FRANK SHADAN
APPROVED BY:	ROBERT FINN

VERTICAL CONTROL:	NGVD29, 1985 ADJ
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5
SHEET TITLE:	STORM DRAIN PUMPING STATION ELECTRICAL SCHEMATIC DIAGRAM
PROJECT:	PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
ADDRESS:	1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F
DRAWING NO.
E-8
SHEET ~~88~~ 40 OF ~~408~~ 68 SHEETS

SDPS CABLE AND CONDUIT SCHEDULE

CONDUIT#	SIZE	CONDUCTS	FROM	TO	NOTES
P001	2-5"		UTILITY	UTILITY XFMR	
P002	2-5"		UTILITY XFMR	METERING BOARD	
P003	3"	3#350 MCM, #4 GND	METERING BOARD	MTS-1	
P004	3"	3#350 MCM, #4 GND	MTS-1	MCC-1	
P005	1"	3#6, #8 GND, 6#14	MCC-1	P01	
P006	1"	3#6, #8 GND, 6#14	MCC-1	P02	
P007	1"	3#6, #8 GND, 6#14	MCC-1	P03	
P008	1"	3#6, #8 GND, 6#14	MCC-1	P04	
P009	1"	3#10, #10 GND, 6#14	MCC-1	P05	
P010	1"	3#10, #10 GND, 6#14	MCC-1	P06	
P011	1"	2#12, #12 GND	PNL-1	PLC-1	
P012	1"	2#12, #12 GND	PNL-1	FIT-01	
P013	1"	2#12, #12 GND	PNL-1	LTG, RECEPTACLE	
P014	1"	2#12, #12 GND	PNL-1	LTG, RECEPTACLE	
C001	1"	2#14, #14 GND	MCC-1	LSL-01	
C002	1"	2#14, #14 GND	MCC-1	LSL-04	
C003	1.5"	60#14, #14 GND	MCC-1	PLC-1	
C004	1"	4#14, #14 GND	PLC-1	MTS-1	
S001	1"	MFR SUPPLIED	LIT-01	LE-01	LIT INSIDE PLC PANEL
S002	1"	MFR SUPPLIED	LIT-05	LE-05	LIT INSIDE PLC PANEL
S003	1"	1#16 TSP	PLC-1	FIT-01	
S004	1.5"	4-1#16 TSP	MCC-1	PLC-1	
S005	1"	1 PR #16TSP	AIT-01	AE-01	AIT INSIDE PLC PANEL
N001	2"	CAT 6	TEL UTILITY	PLC-1	
N002	2"	FIBER OPTIC CABLE	PLC-1	RIO-1	

RDPS CABLE AND CONDUIT SCHEDULE

CONDUIT#	SIZE	CONDUCTS	FROM	TO	NOTES
P101	2-5"		UTILITY	UTILITY XFMR	
P102	2-5"		UTILITY XFMR	METERING BOARD	
P103	3"	3#1, #8 GND	METERING BOARD	MTS-2	
P104	3"	3#1, #8 GND	MTS-2	MCC-2	
P105	1"	3#8, #10 GND, 6#14	MCC-2	P07	
P106	1"	3#8, #10 GND, 6#14	MCC-2	P08	
P107	1"	2#12, #12 GND	PNL-2	RIO-1	
P108	1"	2#12, #12 GND	PNL-2	FIT-02	
P109	1"	2#12, #12 GND	PNL-2	LTG, RECEPTACLE	
C101	1"	2#14, #14 GND	MCC-1	LSH-03	
C102	2"	20#14, #14 GND	MCC-2	RIO-1	
C103	2"	8#14, #14 GND	RIO-1	MCC-1	
C104	1"	2#14, #14 GND	MCC-2	LSL-02	
C105	1"	4#14, #14 GND	RIO-1	MTS-2	
S101	1"	MFR SUPPLIED	LIT-03	LE-03	LIT INSIDE RIO PANEL
S102	1"	1#16 TSP	RIO-1	FIT-02	
S103	1"	MFR SUPPLIED	LIT-2	LE-02	LIT INSIDE RIO PANEL
S104	1.5"	4-1#16 TSP	MCC-2	RIO-1	

STORM DRAIN PUMPING STATION PANELBOARD SCHEDULE

CKT NO	LOAD	QTY	VA PHASE A	VA PHASE B	VA PHASE C	BRKR A/PLS	CKT NO	LOAD	QTY	VA PHASE A	VA PHASE B	VA PHASE C	BRKR A/PLS
1	FIT-01	1	50			20/1	2	SPARE	1				20/1
3	PLC-1	1		1000		20/1	4		1				20/1
5	LTG, RECEPTACLE	3			432	20/1	6		1				20/1
7							8						
9							10						
11							12						
	PHASE VA SUBTOTALS		50	1000	432			PHASE VA SUBTOTALS		0	0	0	
								PHASE VA TOTALS		50	1000	432	
								PANELBOARD VA TOTALS		1482			
								LCL (25%)		370.5			
								PANELBOARD AMPS TOTALS		5.1			

* INDICATES GFI TYPE CIRCUIT BREAKER

* CIRCUIT BREAKERS SHALL BE PROVIDED WITH ADJUSTABLE ELECTRONIC TRIP UNITS.

PANELBOARD: PNL-1
VOLTAGE: 120/208 VAC
PHASE: 3Ø
WIRE: 4
BUS SIZE: 50A
MAIN BREAKER: 100A

EQUIPMENT TAG PNL-1
LOCATION: SDPS
MOUNTING: MCC-1
TYPE: -
SHORT CIRCUIT: 10KAIC
LOCATION DRAWING: E-06

RESERVOIR PUMPING STATION PANELBOARD SCHEDULE

CKT NO	LOAD	QTY	VA PHASE A	VA PHASE B	VA PHASE C	BRKR A/PLS	CKT NO	LOAD	QTY	VA PHASE A	VA PHASE B	VA PHASE C	BRKR A/PLS
1	FIT-02	1	50			20/1	2	SPARE	1				20/1
3	RIO-1	1		500		20/1	4		1				20/1
5	LTG, RECEPTACLE	1			348	20/1	6		1				20/1
7							8						
9							10						
11							12						
	PHASE VA SUBTOTALS		50	500	348			PHASE VA SUBTOTALS		0	0	0	
								PHASE VA TOTALS		50	500	348	
								PANELBOARD VA TOTALS		898			
								LCL (25%)		224.5			
								PANELBOARD AMPS TOTALS		3.1			

* INDICATES GFI TYPE CIRCUIT BREAKER

* CIRCUIT BREAKERS SHALL BE PROVIDED WITH ADJUSTABLE ELECTRONIC TRIP UNITS.

PANELBOARD: PNL-2
VOLTAGE: 120/208 VAC
PHASE: 3Ø
WIRE: 4
MAIN BREAKER: 50A
BUS SIZE: 100A

EQUIPMENT TAG PNL-2
LOCATION: RDPS
MOUNTING: MCC-2
TYPE: -
SHORT CIRCUIT: 10KAIC
LOCATION DRAWING: E-07

LIGHTING FIXTURE SCHEDULE

TYPE	VOLTS	LAMPS	DESCRIPTION
A	120V	70W HPS	OUTDOOR LUMINAIRE MOUNTED ON ROUND DARK BRONZE POLE. THERMAL SHOCK-RESISTANT, HYDROFORMED REFLECTOR, VANDAL RESISTANT, RUGGED, DIE-CAST, SOFT CORNER, ALUMINUM SQUARE HOUSING WITH LAMP. LITHONIAN: KAD-705-R3-RPD04-QRS-VG-LP1-***.
B	120V	70W HPS	2 OUTDOOR LUMINAIRES SUPPORTED BY A TENON MOUNTING SLIPFITTER, 2@180° AND MOUNTED ON ROUND DARK BRONZE POLE. THERMAL SHOCK-RESISTANT, HYDROFORMED REFLECTOR, VANDAL RESISTANT, RUGGED, DIE-CAST, SOFT CORNER, ALUMINUM SQUARE HOUSING WITH LAMPS. LITHONIAN: KAD-705-R3-RPD04-QRS-VG-LP1-***.

REVISION DATES (DESIGN STAGE ONLY)
12.08.09
12.09.02

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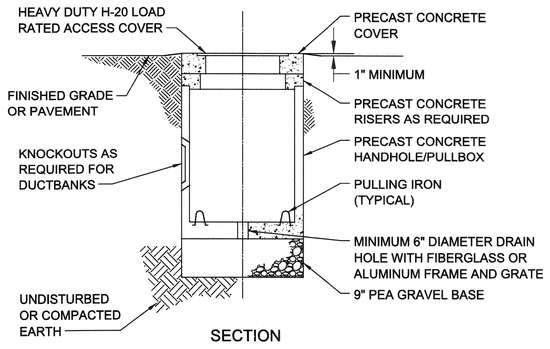
STRUCTURE NO.
INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ★ ERICK LOZANO ★ No. 12-10 ★ ELECTRICAL ★ STATE OF CALIFORNIA

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS
GARY LEE MOORE, P.E. CITY ENGINEER DATE:
DESIGN GROUP LIC. NO. 18659
ENGINEER: ERICK LOZANO
DESIGNED BY: ISABEL ARANGO
DRAWN BY: ISABEL ARANGO
CHECKED BY: FRANK SHADAN
APPROVED BY: ROBERT FINN
VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5
SHEET TITLE: STORM DRAIN PUMPING STATION CABLE AND CONDUIT SCHEDULE
PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291
WORK ORDER NO. EW40019F
DRAWING NO. E-9
SHEET 41 OF 60 SHEETS

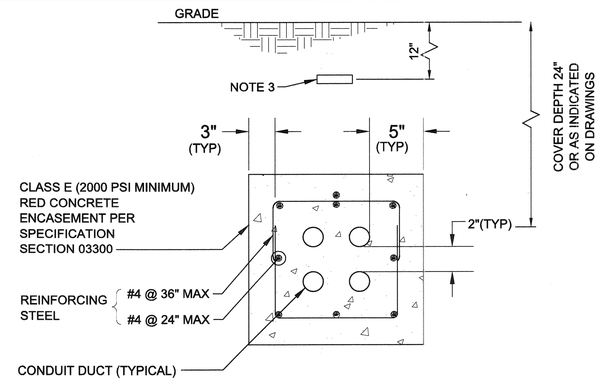


SECTION

NOTES:

1. HANDHOLE/PULLBOX LOCATION PER DRAWINGS.
2. MINIMUM INTERIOR DIMENSIONS SHALL BE 2' x 2' x 3'D UON.
3. BOND DUCTBANK GROUND CONDUCTORS TOGETHER.
4. MANHOLE INTERIOR SPACE: CLASSIFIED AS CORROSIVE AREA PER SPECIFICATION DIVISION 16.

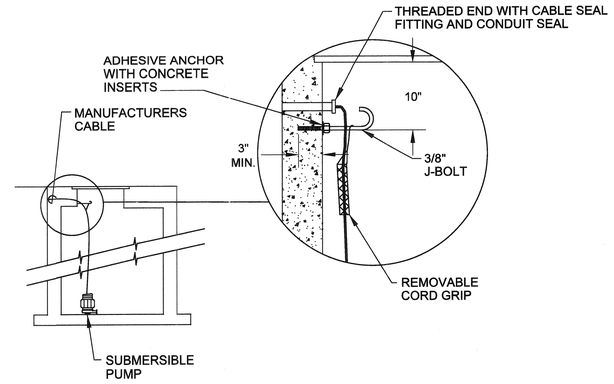
G1	ELECTRICAL HANDHOLE
SCALE: N.T.S.	E-5, E-6, E-7



NOTES:

1. REFER TO SPECIFICATION DIVISION 16 FOR DUCTBANK CONSTRUCTION REQUIREMENTS.
2. NUMBER AND SIZE OF ELECTRICAL DUCTS AS INDICATED ON DRAWINGS OR SCHEDULES.
3. OSHA APPROVED 6" WIDE RED WARNING TAPE (IDEAL DU-601 OR EQUAL).
4. DIMENSIONS ARE MINIMUM AND TYPICAL FOR OUTSIDE SURFACES.
5. SADDLE-TYPE CONDUIT SPACERS REQUIRED EVERY 8' (CARLON SNAP-LOC, SNAP-N-STAC, OR EQUAL).

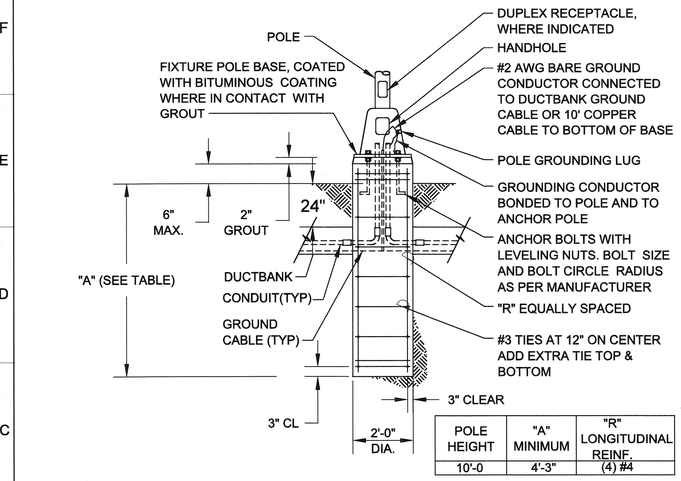
G6	REINFORCED CONCRETE ENCASED DUCTBANK
SCALE: N.T.S.	E-5, E-6, E-7



NOTES:

1. 316 STAINLESS STEEL HARDWARE.
4. PROVIDE REMOVABLE ELECTRICAL CABLE SEAL

G11	SUBMERSIBLE PUMP INSTALLATION
SCALE: N.T.S.	E-5, E-6, E-7

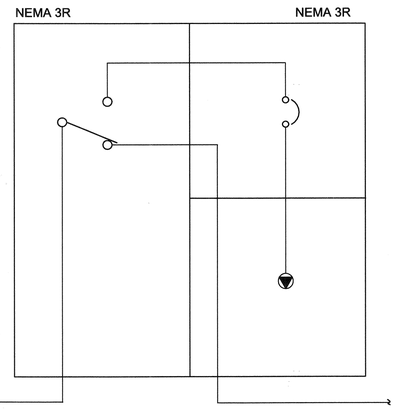


POLE HEIGHT	"A" MINIMUM	"R" LONGITUDINAL REINF.
10'-0	4'-3"	(4) #4

NOTE:

1. FOUNDATION SHALL BEAR AGAINST ORIGINAL SOIL OR 90% COMPACTED BACKFILL OF APPROVED TYPE

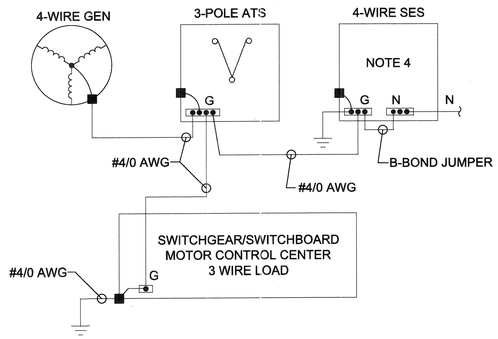
A1	POLE BASE
SCALE: N.T.S.	E-6, E-7



NOTE:

1. TRANSFER SWITCH SHALL BE A 480V, 3 PHASE, 4 POLE, NON-AUTOMATIC, OPEN-TRANSITION TYPE.
2. GENERATOR STANDBY RECEPTACLE SECTION SHALL HAVE 2 COMPARTMENTS, ONE FOR THE MOLED CASE CIRCUIT BREAKER RATED AS SHOWN ON THE SINGLE LINE DIAGRAM AND THE SECOND COMPARTMENT FOR THE GENERATOR RECEPTACLE.
3. GENERATOR RECEPTACLE SHALL BE 480V, 3 PHASE, 4 POLE, PIN AND SLEEVE RECEPTACLE.

A6	NON-AUTOMATIC TRANSFER SWITCH
SCALE: N.T.S.	E-6, E-7



GEN: STANDBY GENERATOR
ATS: AUTOMATIC TRANSFER SWITCH
SES: SERVICE ENTRANCE SECTION
G: GROUND (GROUNDING CONDUCTOR)
B: BOND NEUTRAL TO GROUND AT SES AND GENERATOR
N: NEUTRAL

NOTES:

1. REFERENCE NEC 250-20 HANDBOOK FIGURES
2. BOND NEUTRAL TO GROUND, DO NOT INSTALL NEUTRAL FROM SES TO ATS.
3. BOND NEUTRAL TO GROUND, DO NOT INSTALL NEUTRAL FROM GENERATOR TO ATS.
4. LABEL PER NEC 702.8 A - SIGNS

A11	3-PHASE, 4-WIRE SYSTEM,NEUTRAL NOT USED
SCALE: N.T.S.	E-6, E-7

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LA DPW ENGINEERING Serving the Present, Designing the Future

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP
ENGINEER: ERICK LOZANO LIC. NO. 18659
DESIGNED BY: ISABEL ARANGO
DRAWN BY: ISABEL ARANGO
CHECKED BY: FRANK SHADAN
APPROVED BY: ROBERT FINN

DATE: BY:
NO. REVISIONS:

STRUCTURE NO.
INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ERICK LOZANO No. 18659 Exp. 12-31-10 ELECTRICAL STATE OF CALIFORNIA

VERTICAL CONTROL: NGVD29, 1988 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: ELECTRICAL DETAILS

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. E-10

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12.09.02

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VALVE AND ACTUATOR SYMBOLS

N.O. NORMALLY OPEN
N.C. NORMALLY CLOSED

- GATE VALVE (N.O. / N.C.)
- GLOBE VALVE (N.O. / N.C.)
- PLUG VALVE (N.O. / N.C.)
- BALL VALVE (N.O. / N.C.)
- BUTTERFLY VALVE
- CHECK VALVE
- DOUBLE LEAF CHECK VALVE
- BALL CHECK VALVE
- PINCH VALVE
- ANGLE VALVE
- DIAPHRAGM VALVE
- NEEDLE VALVE
- BALANCING COCK
- KNIFE GATE VALVE
- CIRCUIT BALANCING VALVE
- TELESCOPING VALVE
- RELIEF VALVE
- FLOAT VALVE
- MUD VALVE

F.O. FAIL OPEN
F.C. FAIL CLOSED
F.I.P. FAIL IN PLACE

- THREE-WAY VALVE (W/TYPICAL FAIL POSITION) (F.O.)
- FOUR WAY VALVE (W/TYPICAL FAIL POSITION) (F.O.)
- PRESSURE REDUCING VALVE
- BACK PRESSURE SUSTAINING VALVE
- VALVE WITH HAND OPERATOR (SV)
- SOLENOID OPERATED VALVE
- ELECTRICAL MOTOR OPERATED VALVE (M)
- PISTON OPERATED VALVE
- DIAPHRAGM OPERATED VALVE
- THERMOSTATICALLY CONTROLLED VALVE
- VACUUM REGULATION VALVE
- AUTOMATIC SWITCHOVER

PIPE LINE DEVICE SYMBOLS

- MUD VALVE
- TRAP (T)
- DRAIN (D)
- STEAM VENT
- FLAME TRAP
- FLAME TRAP WITH THERMAL SHUTOFF VALVE
- INJECTOR
- SEPARATOR
- FILTER
- CAP OR PLUG
- BLIND FLANGE
- MANUAL AIR VENT
- AUTOMATIC AIR VENT
- ADJUSTABLE WEIR GATE
- FLOW BALANCING COCK
- SLUICE GATE (NORMALLY OPEN) STOP GATE
- SLUICE GATE (NORMALLY CLOSED) STOP GATE
- FLAP GATE
- UNION
- STRAINER
- REDUCER OR INCREASER
- SEDIMENT TRAP
- CALIBRATION CHAMBER
- PULSATION DAMPENER
- INSULATION
- SLIDE GATE (NORMALLY OPEN)
- SLIDE GATE (NORMALLY CLOSED)
- SIGHT GLASS
- DIFFUSER
- STATIC MIXER
- AIR AFTERCOOLER

MECHANICAL EQUIPMENT

- CENTRIFUGAL PUMP
- SUBMERSIBLE SUMP PUMP
- NON-CLOG VERTICAL PUMP
- GEAR PUMP OR GEAR PUMP DISPLACEMENT)
- ROTARY LOBE PUMP
- PROGRESSIVE CAVITY PUMP
- DIAPHRAM PUMP
- VERTICAL PUMP IN A CAN
- BLOWER OR FAN
- COMPRESSOR
- ROTARY LOBE COMPRESSOR
- LIQUID RING BLOWER OR COMPRESSOR
- SILENCER
- INLET AIR FILTER-SILENCER
- MIXER
- MIXER
- SUBMERSIBLE PUMP
- GRINDER
- PLATE TYPE HEAT EXCHANGER
- SPIRAL HEAT EXCHANGER
- SHELL AND TUBE TYPE HEAT EXCHANGER

- RIGHT ANGLE GEAR (RAG)
- TANK
- WASTE GAS BURNER
- ENGINE
- ADJUSTABLE SPEED CONTROL (ELEC) (ASC)
- ADJUSTABLE SPEED DRIVE (MECH) (ASD)
- GENERATOR
- HORIZONTAL SURFACE MIXER
- SIGHT GLASS
- BOILER
- PERISTALTIC PUMP
- CUT-THROAT FLUME
- PARSHALL FLUME

PROCESS AND SIGNAL

- MAIN PROCESS FLOW (WITH TYPICAL DIRECTION OF FLOW SHOWN)
- SECONDARY PROCESS FLOW
- INSTRUMENT SUPPLY, PROCESS TAPS
- PNEUMATIC SIGNAL
- CAPILLARY TUBE
- ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)
- ELECTROMAGNETIC OR SONIC SIGNAL (UNGUIDED)
- SOFTWARE OR DATA LINK
- MECHANICAL LINK
- HYDRAULIC
- ES — ELECTRIC POWER SUPPLY 120VAC 60 HZ UON
- SA — SERVICE AIR SUPPLY
- IA — INSTRUMENT QUALITY AIR SUPPLY
- 2W — WATER SUPPLY 1W, 2W, 3W, ETC.

MECHANICAL EQUIPMENT IDENTIFICATION

WASTEWATER PUMPS 1,2,3 } EQUIPMENT NAME

EQUIPMENT NUMBERS
WWP101
WWP102
WWP103

- SPEC: — SPECIFICATION REFERENCE
- TYPE: — EQUIPMENT TYPE
- Q: — CAPACITY
- HEAD: — DISCHARGE RATING PRESSURE
- HP: — MOTOR POWER

DRAWING CROSS REFERENCE SYMBOLOGY FOR PROCESS AND SIGNAL LINES

LINE CROSS REFERENCE SYMBOL LOCATION IDENTIFICATION LETTERS

FROM — TO

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REVISION DATES (DESIGN STAGE ONLY)
12.09.02

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NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER * CIVIL * LOZANO * No. E 18659 Exp. 12-31-10 * ELECTRICAL * STATE OF CALIFORNIA *

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E.
CITY ENGINEER

DATE:	
LIC. NO.	18659
DESIGN GROUP	
ENGINEER:	ERICK LOZANO
DESIGNED BY:	ISABEL ARANGO
DRAWN BY:	ISABEL ARANGO
CHECKED BY:	FRANK SHADAN
APPROVED BY:	ROBERT FINN

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation
Los Angeles, California

VERTICAL CONTROL:	NGVD29, 1985 ADJ
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5
SHEET TITLE:	LEGEND AND SYMBOLS PROCESS AND INSTRUMENTATION
PROJECT:	PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE I
ADDRESS:	1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F

DRAWING NO.
PI-1

SHEET 43 OF ~~91~~ 60 ~~408~~ SHEETS

INSTRUMENTATION SYMBOLS

SPECIAL OR INSTRUMENT FUNCTION DESIGNATIONS

Σ	ALGEBRAIC ADDITION
$\pm$, + , −	BIAS
AVG	AVERAGE
×	MULTIPLY
÷	DIVIDE
$\sqrt{\ }$	EXTRACT SQUARE ROOT
X^n OR $X^{1/n}$	RAISE TO POWER
f(X)	CHARACTERIZE
1:1	BOOST AND ISOLATE
▷	HIGHEST VALUE SELECTION
◁	LOWEST VALUE SELECTION
REV	REVERSE
GAF	GAP ACTION FLOATING
S & H	SAMPLE AND HOLD
SRG	SPLIT-RANGING
E/P, I/P (TYPICAL)	FOR INPUT/OUTPUT CONVERTERS USING FOLLOWING SIGNALS: E - VOLTS H - HYDRAULIC I - CURRENT O - ELECTROMAGNETIC OR SONIC P - PNEUMATIC R - RESISTANCE A - ANALOG D - DIGITAL
% OR P	PROPORTIONAL CONTROL ACTION
$\int$ OR I	INTEGRAL CONTROL ACTION
$\frac{d}{dt}$ OR D	DERIVATIVE CONTROL ACTION
1 - 0	ON - OFF CONTROL ACTION
△ 1 - 0	DIFFERENTIAL GAP CONTROL ACTION
1:3, 2:1 (TYPICAL)	GAIN OR ATTENUATE
HA	HAND-AUTO SELECTION
HOA	HAND-OFF-AUTO SELECTION
HOR	HAND-OFF-REMOTE
JOA	JOG-OFF-AUTO SELECTION
JOR	JOG-OFF-REMOTE
LF	LEAD-FOLLOW SELECTION
LR	LOCAL - REMOTE
MA	MANUAL - AUTO
OL	OVERLOAD
RDY	READY
SS	START-STOP
DPC	DISTRIBUTED PROCESS CONTROL

PRIMARY ELEMENT SYMBOLS

- ORIFICE PLATE
- VENTURI OR FLOW TUBE
- THERMAL FLOW ELEMENT (T)
- PITOT TUBE
- MAGNETIC FLOW ELEMENT (M)
- SONIC FLOWMETER (DOPPLER OR TRANSIT TIME)
- VARIABLE AREA FLOW METER (ROTAMETER)
- RUPTURE DISK
- FLOW STRAIGHTENING VANES
- CHEMICAL SEAL
- TEMPERATURE WELL
- INLINE PESSURE SENSOR

FUNCTION IDENTIFICATION

FIRST LETTER(S)		SUCCEEDING LETTERS		
MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A ANALYSIS		ALARM		
B BURNER (FLAME)			CONTROL	CLOSE
C CONDUCTIVITY				
D DENSITY	DIFFERENTIAL			
E POTENTIAL (ELEC)		PRIMARY ELEMENT		
F FLOW RATE	RATIO			
G FIRE, SMOKE		GLASS		
H HAND				HIGH
I CURRENT (ELEC)		INDICATE		
J POWER	SCAN			
K TIME	TIME RATE CHANGE		CONTROL STATION	
L LEVEL		PILOT LIGHT		LOW MIDDLE
M MOISTURE	MOMENTARY			
N EQUIPMENT STATUS				
O DISSOLVED OXYGEN		ORIFICE		OPEN
P PRESSURE		TEST CONNECTION		
Q QUANTITY	INTEGRATE			
R RADIATION		RECORD		
S SPEED, FREQUENCY	SAFETY		SWITCH	
T TEMPERATURE			TRANSMIT	
U MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V VIBRATION			VALVE, DAMPER	
W WEIGHT, FORCE		WELL		
X UNCLASSIFIED		UNCLASSIFIED	UNCLASSIFIED	
Y EVENT, STATUS			RELAY, COMPUTE	
Z POSITION			MISC. ACTUATOR	

MISCELLANEOUS

- SEAL WATER CONTROL UNIT (C)
- PURGE OR FLUSHING DEVICE (P)
- RESET FOR LATCH-TYPE OPERATOR (R)
- QUICK-CONNECT FITTING
- 3-WAY PNEUMATIC PILOT VALVE
- PISTON OPERATOR W/SOLENOID PILOT (S)
- AUTOMATIC SAMPLER (AS)
- ULTRASONIC LEVEL TRANSMITTER
- FLOAT SWITCH
- HEATER ELEMENT
- FLEXIBLE LINE

INSTRUMENT TAG NUMBERS

F IC 3106 A

- A — SUFFIX - USED ONLY WHEN 2 OR MORE INSTRUMENTS WOULD OTHERWISE HAVE THE SAME TAG NUMBER.
- 3106 — INSTRUMENT NUMBERS
- 3 — PLANT AREA
- IC — SUCCEEDING LETTERS
- F — MEASURED OR INITIATING VARIABLE

} FUNCTIONAL IDENTIFICATION (SEE LEGEND)

I/O SYMBOLS

- ANALOG OUTPUT
- ANALOG INPUT
- DISCREET OUTPUT (OR)
- DISCREET INPUT

INSTRUMENT AND FUNCTION SYMBOLS

- FIELD MOUNTED INSTRUMENT
- FACE MOUNTED INSTRUMENT ON MAIN PANEL, OPERATOR ACCESSIBLE
- INSTRUMENT MOUNTED ON/IN MAIN PANEL, OPERATOR INACCESSIBLE
- FACE MOUNTED INSTRUMENT ON FIELD PANEL, OPERATOR ACCESSIBLE
- INSTRUMENT MOUNTED ON/IN FIELD PANEL, OPERATOR INACCESSIBLE
- MULTIFUNCTION INSTRUMENT WITH SHARED HARDWARE (USED FOR "VIDEO DISPLAY SYSTEMS")
- COMPUTER FUNCTION
- E34C — CONTROL DIAGRAM NUMBER
- INTERLOCKING OR SEQUENTIAL CONTROL FUNCTION
- PROGRAMMABLE LOGIC CONTROL FUNCTION

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LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation
Los Angeles, California

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DATE: BY:
NO. REVISIONS:

STRUCTURE NO.

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REGISTERED PROFESSIONAL ENGINEER * LOUANO * 18659 * Exp. 12-31-10 * ELECTRICAL * STATE OF CALIFORNIA

GARY LEE MOORE, P.E.
CITY ENGINEER
DATE:
LIC. NO. 18659

DESIGN GROUP	
ENGINEER:	ERICK LOZANO
DESIGNED BY:	ISABEL ARANGO
DRAWN BY:	ISABEL ARANGO
CHECKED BY:	FRANK SHADAN
APPROVED BY:	ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: LEGEND AND SYMBOLS
PROCESS AND INSTRUMENTATION

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. PI-2

SHEET 44 OF ~~92~~ 60 SHEETS

PLC / SCADA

STOP PUMPS

	STOP/ START	AUTO/ MANUAL	OUT OF SERVICE	LD/ STBY
	HS 06	HS 06	YL 06	HS 06
	HS 05	HS 05	YL 05	HS 05
	DELAY TIMER HS 03			
	HS 04	HS 04	YL 04	HS 04
	HS 03	HS 03	YL 03	HS 03
	HS 02	HS 02	YL 02	HS 02
	HS 01	HS 01	YL 01	HS 01

RESERVOIR HIGH LEVEL PI-4

PI-4 RESERVOIR PUMP STOP

FIC 01 FLOW CONTROL

	TROUBLE	WARNING	LEVEL	SS	SPEED	SPEED FEEDBACK	IN REMOTE	FAIL	READY	RUN
	YA 01B	YA 01A	LI 05	HS 05	SK 05	SI 05	YL 05	NL 05	YL 05	NL 05
				HS 05	SK 05	SI 05	YL 05	NL 05	YL 05	NL 05
				HS 04			YL 04	NL 04	YL 04	NL 04
				HS 03			YL 03	NL 03	YL 03	NL 03
				HS 02			YL 02	NL 02	YL 02	NL 02
				HS 01			YL 01	NL 01	YL 01	NL 01
			LI 01			FI 01				

120VAC AIT 01 LIT 05

START STOP MCC (VFD) LOR RESET HS

READY YL VFD FAIL YA RUNNING YL POT HS

HI TEMP YA LOW LEVEL YA HI MOISTURE YA

START STOP MCC LOR RESET HS

RUNNING YL READY YL TEMP YA

LOW LEVEL YA RESERVOIR HI LEVEL YA HI MOISTURE YA

RESERVOIR HI LEVEL

LOW LEVEL

120VAC LIT 01

PI-4 RESERVOIR HIGH LEVEL

51" SD

STORM DRAIN DIVERTER CHANNEL

51" SD

SLIDE GATE -2

DIVERTER CHANNEL

EXISTING STORM DRAIN

EXISTING STORM DRAIN

OVERFLOW WEIR, TYP.

(24.0' ELE) H2S,LEL, COMB AE 01

(24.0' ELE) LE 05

HIGH MOISTURE

HIGH TEMPERATURE

LOW LEVEL

12"V

(24.0' ELE) LE 01

AIR RELEASE VALVE

SEWAGE COMBINATION AIR VALVE, TYP

8" PD

SEWER

120VAC

FIT 01

FE 01

M

1"

D

6" PD

10" PD

30" PD

PI-4

DRAIN WITH BACKWATER VALVE, TYP

MANUAL BAR SCREEN

27" SD

SLIDE GATE -1

6" D

4" D

ROCK SUMP

(4.5' ELE) LSL 01

(5.2' ELE) LSL 04

MSH TSH M

DISCHARGE PUMP 2 P06

DISCHARGE PUMP 1 P05

STORM PUMP 4 P04

STORM PUMP 3 P03

STORM PUMP 2 P02

STORM PUMP 1 P01

PUMPS	FLOW POINTS (GPM)	HEAD (FT)	HP
DISCHARGE	450 675	23 31	15
STORM	2250	26	40

DISCHARGE PUMPS	LEVEL CONTROL ON	OFF
LEAD	7.85	5.00
STANDBY	—	—

STORM PUMPS	LEVEL CONTROL ON	OFF
LEAD	8.50	7.40
FOLLOW 1	8.83	8.50
FOLLOW 2	9.16	8.83
FOLLOW 3	9.15	9.16

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LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation Los Angeles, California

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12.09.02

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LA DPW ENGINEERING Powering the Future

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-			
-			
-			

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ★ STATE OF CALIFORNIA ★ ELECTRICAL ★ LOZANO ERICK No. 18659 Exp. 12-31-10

GARY LEE MOORE, P.E. CITY ENGINEER DATE:

DESIGN GROUP

ENGINEER: ERICK LOZANO LIC. NO. 18659

DESIGNED BY: ISABEL ARANGO

DRAWN BY: ISABEL ARANGO

CHECKED BY: FRANK SHADAN

APPROVED BY: ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ

HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STORM DRAIN PUMPING STATION PROCESS AND INSTRUMENTATION

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

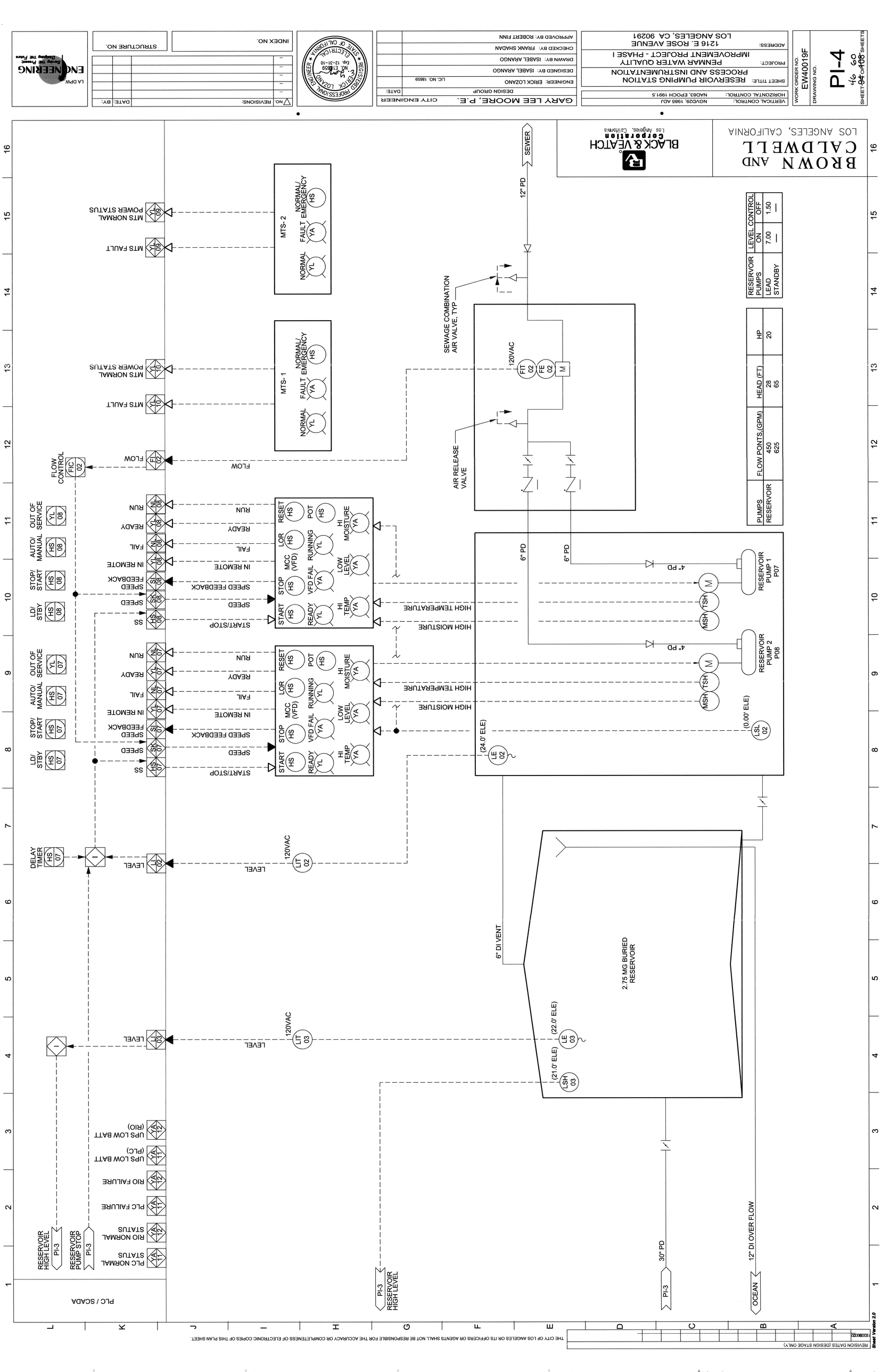
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO.

PI-3

SHEET ~~93~~ 45 OF ~~108~~ 60 SHEETS



VERTICAL CONTROL:	NGVD29, 1985 ADJ	SHEET TITLE:	RESERVOIR PUMPING STATION
HORIZONTAL CONTROL:	NAD83, EPOCH 1991.5		PROCESS AND INSTRUMENTATION
		PROJECT:	PENMAR WATER QUALITY
			IMPROVEMENT PROJECT - PHASE I
		ADDRESS:	1216 E. ROSE AVENUE
			LOS ANGELES, CA 90291

ENGINEER: ERICK LOZANO	LIC. NO. 18659	GARY LEE MOORE, P.E.	CITY ENGINEER
DESIGNED BY: ISABEL ARANGO		DESIGN GROUP	DATE:
DRAWN BY: ISABEL ARANGO			
CHECKED BY: FRANK SHADAN			
APPROVED BY: ROBERT FINN			

REGISTERED PROFESSIONAL ENGINEER * STATE OF CALIFORNIA * ELECTRICAL * GARY LEE MOORE * No. E18659 * Exp. 12-31-10

NO.	REVISIONS:	DATE:	BY:

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STRUCTURE NO.

LA DPW Doing The Right Things For Less

ENGINEERING

WORK ORDER NO. EW40019F

DRAWING NO. PI-4

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46 60

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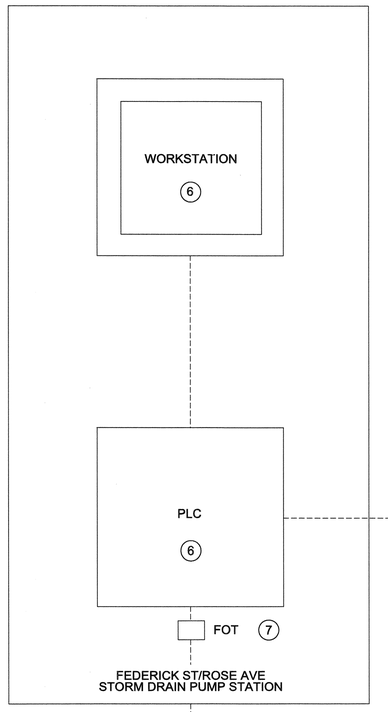
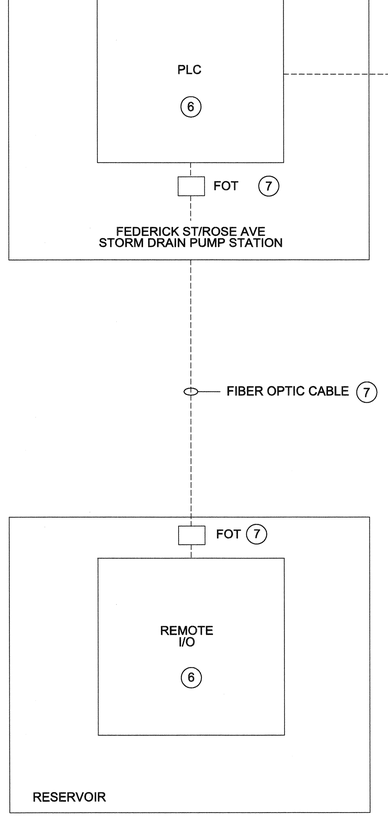


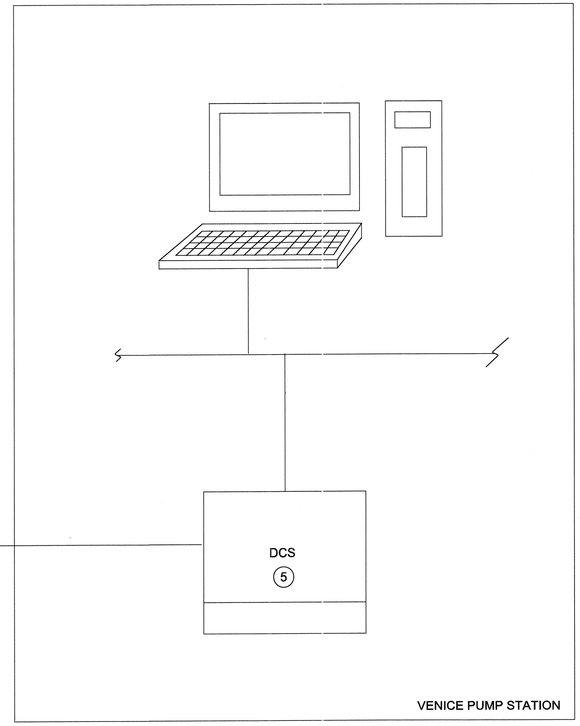


PROVIDED BY CONTRACT

EXISTING

4 1 2 3

MODEM — 4 WIRE FULL DUPLEX PRIVATE LINE (VERIZON) — MODEM



SYMBOLS:

FOT FIBER OPTIC TRANSCEIVER

NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH THE TELEPHONE COMPANY REGARDING WIRING AND CONNECTIONS BETWEEN THE COMMUNICATIONS LINK FOR THE CITY SCADA SYSTEM AND THE PLC.
2. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY COMMUNICATIONS MODULES AND CABLES TO COMPLETE THE COMMUNICATIONS LINK AT THE PROJECT AND THE VENICE PUMP STATION.
3. TEKCOM MODEL 202 (EXISTING)
4. CONTRACTOR SHALL PROVIDE MODEM COMPATIBLE WITH CITY EXISTING MODEM TEKCOM MODEL 202.
5. CITY WILL CREATE DATA POINTS AND ASSIGN TO GRAPHIC SCREENS.
6. REFER TO SPEC 17405 FOR PLC, REMOTE I/O, AND WORKSTATION REQUIREMENTS.
7. REFER TO 16123 FOR MULTIMODE FIBER OPTIC DATA COMMUNICATION SYSTEM REQUIREMENTS.

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BLACK & VEATCH Corporation
Los Angeles, California

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LA DPW ENGINEERING Serving The Present, Building For The Future

GARY LEE MOORE, P.E.
CITY ENGINEER
DATE:
LIC. NO. 18659

THIS PLAN WAS ELECTRONICALLY SIGNED AND STAMPED

REGISTERED PROFESSIONAL ENGINEER ERICK LOZANO No. 18659 Exp. 12-31-10 ELECTRICAL STATE OF CALIFORNIA

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

	DESIGN GROUP
ENGINEER:	ERICK LOZANO
DESIGNED BY:	ISABEL ARANGO
DRAWN BY:	ISABEL ARANGO
CHECKED BY:	FRANK SHADAN
APPROVED BY:	ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ.
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STORM DRAIN PUMPING STATION PLC NETWORK COMMUNICATION DIAGRAM

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F

DRAWING NO.
I-1

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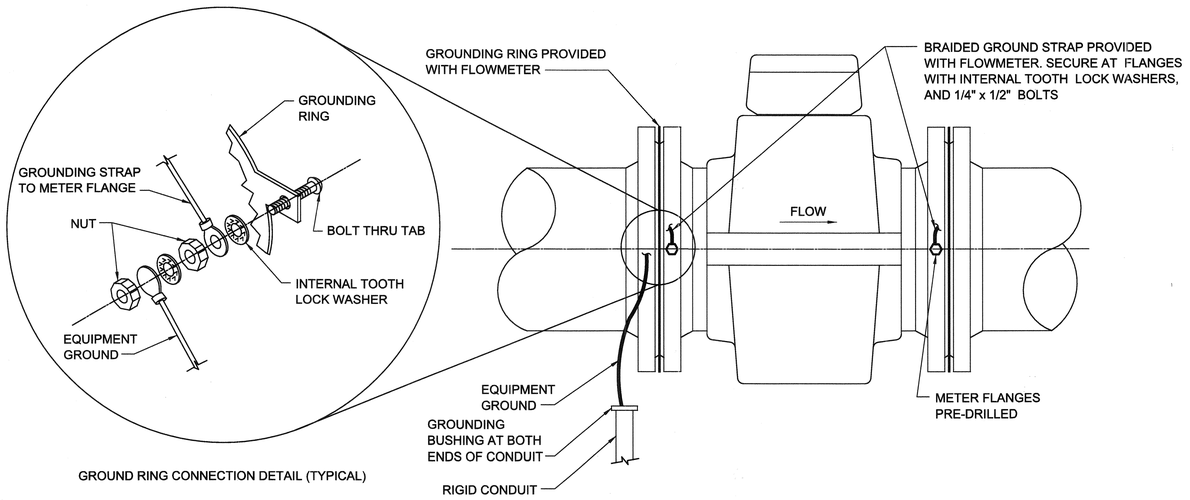
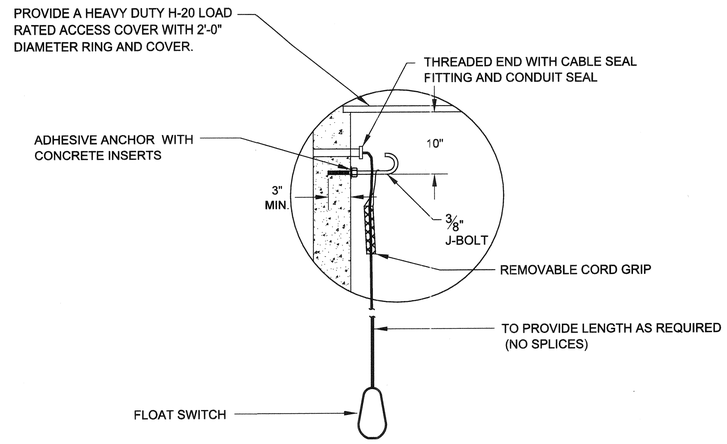


GROUND RING CONNECTION DETAIL (TYPICAL)

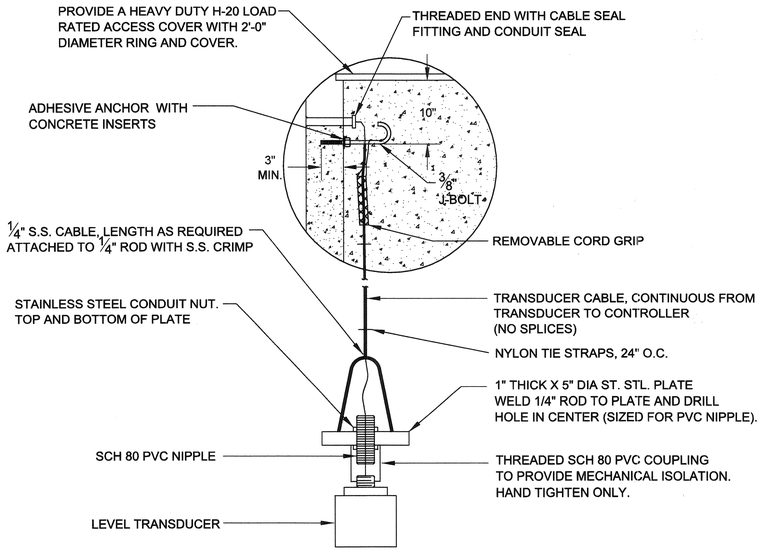
H1 FLOW METER GROUNDING

SCALE: N.T.S. | E-3, E-4



H10 FLOAT SWITCH

SCALE: N.T.S. | E-3, E-4



A1 LEVEL TRANSDUCER

SCALE: N.T.S. | E-3, E-4

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CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS
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REGISTERED PROFESSIONAL ENGINEER ★ ERICK LOZANO ★ No. 18559 Exp. 12-31-10 ★ ELECTRICAL ★ STATE OF CALIFORNIA

CITY ENGINEER
GARY LEE MOORE, P.E.
DATE:

DESIGN GROUP	
ENGINEER: ERICK LOZANO	LIC. NO. 18559
DESIGNED BY: ISABEL ARANGO	
DRAWN BY: ISABEL ARANGO	
CHECKED BY: FRANK SHADAN	
APPROVED BY: FRANK SHADAN	

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STORM DRAIN PUMPING STATION INSTRUMENT DETAILS

PROJECT: PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO.
EW40019F

DRAWING NO.
I-2

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WORKSITE TRAFFIC CONTROL PLAN NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LABOR AND MATERIAL INVOLVED IN THE REMOVAL, INSTALLATION, AND MAINTENANCE OF ALL STRIPING, PAVEMENT MARKINGS, SIGNING, BARRICADING, DELINEATORS, ETC., SHOWN ON THESE WORKSITE TRAFFIC CONTROL PLANS (WTCP) AND AS CONSTRUCTION STAGING NECESSITATES. CONFLICTING STRIPING AND PAVEMENT MARKINGS SHALL BE REMOVED BY WET SANDBLASTING/GRINDING IN ACCORDANCE WITH THE CITY OF LOS ANGELES DEPARTMENT OF TRANSPORTATION (LADOT) SPECIFICATION NO. 79-016-10. PAINTING THE EXISTING STRIPING OVER WITH BLACK PAINT IS NOT PERMITTED. TEMPORARY REFLECTIVE PAVEMENT MARKERS (SEE LADOT STANDARD PLAN S-453.0) SHALL BE MAINTAINED BY THE CONTRACTOR ADJACENT TO THE SCAR OF THE SANDBLASTED CENTERLINE OR TAPED-OVER CENTERLINE. CONFLICTING RAISED PAVEMENT MARKERS SHALL BE REMOVED. THERMOPLASTIC SHALL BE USED FOR ALL ROUGH AND UNEVEN SURFACES AND AS REQUIRED BY THE LADOT ENGINEER. PAINT MAY BE USED ON SMOOTH SURFACES. DETOUR TAPE IS NOT PERMITTED.

2. THE CONTRACTOR SHALL PERFORM WORK IN ONLY ONE STAGE AT A TIME. THE CONTRACTOR SHALL ONLY UTILIZE THAT PORTION OF THE DESIGNATED "WORK AREA" WHICH IS NEEDED FOR CONSTRUCTION AT ANY GIVEN TIME.

3. THE CONTRACTOR SHALL CONTACT LADOT ~~CENTRAL~~ Western DISTRICT SECTION AT ~~(213) 972-4990~~ 310 - 575-8138 AT LEAST FIVE (5) WORKING DAYS (TO INSPECT MARK OUT) PRIOR TO THE INSTALLATION OF ANY TEMPORARY STRIPING FOR ALL CONSTRUCTION STAGES. LADOT RESERVES THE RIGHT TO OBSERVE THESE WORKSITE TRAFFIC CONTROL PLANS IN USE AND TO MAKE NECESSARY CHANGES AS FIELD CONDITIONS WARRANT. ANY CHANGES SHALL SUPERSEDE THESE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLACEMENT OF ANY ADDITIONAL TRAFFIC CONTROL DEVICES NECESSARY TO ASSURE PUBLIC SAFETY AT ALL TIMES DURING CONSTRUCTION.

4. ALL CONSTRUCTION RELATED WARNING SIGNS SHALL BE IN BLACK LEGEND WITH ORANGE BACKGROUND AND IN CONFORMANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) (LATEST EDITION) AND THE MUTCD CALIFORNIA SUPPLEMENT.

5. THE STRIPING AND SIGNING SHOWN FOR REMOVAL ON THESE PLANS MAY BE DIFFERENT THAN WHAT EXISTS AT TIME OF INSTALLATION OF A CONSTRUCTION STAGE. THE CONTRACTOR SHALL REMOVE ALL CONFLICTING SIGNING AND STRIPING, WHETHER OR NOT IT IS DEPICTED ACCURATELY. EXISTING SIGNS THAT ARE IN CONFLICT WITH THESE PLANS SHALL BE REMOVED OR COVERED BY THE CONTRACTOR AND RESTORED UPON REMOVAL OF THE WTCP.

6. FOR OTHER REQUIREMENTS RELATED TO TRAFFIC CONTROL PLANS AND WORK AREA MAINTENANCE, THE CONTRACTOR SHALL FOLLOW THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (CALIFORNIA MUTCD) (LATEST EDITION), THE "WORK AREA TRAFFIC CONTROL HANDBOOK" (WATCH MANUAL) (LATEST EDITION), AND ALL RELATED SECTIONS OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, INCLUDING SECTION 7-10 "PUBLIC CONVENIENCE AND SAFETY," AND 302-4.4 "PUBLIC CONVENIENCE AND TRAFFIC CONTROL."

7. THE CROSSWALKS ACROSS THREE LEGS OF ANY SIGNALIZED INTERSECTION SHALL BE MAINTAINED AT ALL TIMES. "NO PED CROSSING" (R9-3a) SIGNS SHALL BE INSTALLED WHEN A PAINTED CROSSWALK IS UNAVAILABLE FOR USE DUE TO CONSTRUCTION AND AFFECTED PEDESTRIAN SIGNAL HEADS SHALL BE COVERED OR REMOVED.

8. THE CONTRACTOR SHALL INSTALL R3-18 (NO LEFT AND NO U-TURN) SIGNS AT INTERSECTIONS WHERE THE LEFT TURN LANE HAS BEEN CLOSED FOR CONSTRUCTION. SIGNS SHOULD BE INSTALLED ON TRAFFIC SIGNAL MAST ARMS AND FAR LEFT OF THE INTERSECTION OR AT LOCATIONS WHERE THEY WILL BE CLEARLY VISIBLE BY THE THRU TRAFFIC.

9. THE CONTRACTOR SHALL NOTIFY M.T.A. AT (213) 922-4632 OR ANY OTHER AFFECTED TRANSIT SERVICES AT LEAST FIVE (5) WORKING DAYS PRIOR TO CONSTRUCTION.

10. ALL TRAFFIC CONTROL DEVICES SHALL BE KEPT IN THEIR PROPER POSITION AT ALL TIMES, AND SHALL BE REPAIRED, REPLACED, OR CLEANED AS NECESSARY TO PRESERVE THEIR APPEARANCE AND CONTINUITY.

11. THE CONTRACTOR SHALL PROVIDE FLAGGERS AS DEEMED NECESSARY BY LADOT. A FLAGGER SHALL USE ONLY THE APPROVED OCTAGONAL STOP/SLOW PADDLE, SHALL WEAR AN ORANGE SAFETY VEST (PADDLE AND VEST MUST BE REFLECTORIZED FOR NIGHT WORK), AND HARD HAT, AS REQUIRED BY THE WATCH MANUAL, AND MUST BE PROPERLY TRAINED BY THE CONTRACTOR IN PERFORMING THE WORK SAFELY. APPROPRIATE ADVANCE SIGNS MUST BE INSTALLED, PER THE WATCH MANUAL.

12. TEMPORARY TRAFFIC CONTROL DEVICES SHALL BE REMOVED FOLLOWING COMPLETION OF EACH CONSTRUCTION STAGE AND THE PERMANENT TRAFFIC CONTROL DEVICES SHALL BE RESTORED BY THE CONTRACTOR UPON REMOVAL OF WTCP STRIPING AND SIGNING.

13. SIGNS, DELINEATORS, BARRICADES, ETC., SHALL CONFORM TO THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (CALIFORNIA MUTCD) (LATEST EDITION) AND THE BROWN BOOK (LATEST EDITION).

14. THE CONTRACTOR SHALL NOTIFY LADOT'S SIGNAL MAINTENANCE SUPERVISOR AT (213) 485-7721 FIVE (5) WORKING DAYS PRIOR TO ANY EXCAVATION OR CONSTRUCTION WITHIN 10 FEET OF EXISTING TRAFFIC SIGNAL DETECTOR LOOPS, CONDUIT, INTERCONNECTS, OR ATSAC FIBER OPTIC CABLE.

15. ANY DAMAGE TO TRAFFIC SIGNAL DETECTOR LOOPS, CONDUITS, INTERCONNECTS, OR FIBER OPTIC CABLE SHALL BE REPAIRED IMMEDIATELY BY THE CONTRACTOR AT THEIR OWN EXPENSE. DELAYS IN REPAIR OF INTERCONNECT OR ATSAC FIBER OPTIC CABLE WILL REQUIRE THE PAYMENT OF LIQUIDATION DAMAGES TO THE CITY OF LOS ANGELES DEPARTMENT OF TRANSPORTATION. IMMEDIATELY NOTIFY LADOT SIGNAL REPAIR PERSONNEL AT (213) 485-7721 OF ANY DAMAGES.

16. FOR THE TEMPORARY "TOW AWAY NO STOPPING ANY TIME" SIGNS, THE CONTRACTOR SHALL CONTACT THE LADOT SPECIAL TRAFFIC CONTROLS OFFICE AT (213) 485-2298 AT LEAST FIVE (5) WORKING DAYS IN ADVANCE OF EACH NEW CONSTRUCTION STAGE. THE INSTALLATION OF THE TEMPORARY "TOW AWAY NO STOPPING ANY TIME" SIGNS AT PARKING METER ZONES SHALL INCLUDE COVERING METER HEADS AND THE ASSOCIATED PARKING RESTRICTION.

17. PRIOR TO THE REMOVAL OF AN EXISTING CURB/SIDEWALK IN A PARKING METER ZONE, THE CONTRACTOR SHALL CONTACT LADOT THE PARKING METER SUPERVISOR AT (213) 485-4230 FOR METER HEAD REMOVAL.

18. THERE SHALL BE NO STORAGE OF CONSTRUCTION MATERIALS OR EQUIPMENT OUTSIDE THE DESIGNATED WORK AREA INDICATED IN THE WTCP. STORAGE OF CONSTRUCTION MATERIALS OR EQUIPMENT WITHIN THE DESIGNATED AREA SHALL BE DONE IN A MANNER SO AS NOT TO CREATE VISIBILITY OBSTRUCTIONS TO THE MOTORING PUBLIC.

19. THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL FUNCTIONAL DRIVEWAYS AT ALL TIMES AND SHALL COORDINATE WITH RESIDENTS AND BUSINESSES ANY CLOSURE OR LIMITED ACCESS RESTRICTION TO THEIR DRIVEWAYS. IF CONSTRUCTION NECESSITATES, THE CONTRACTOR SHALL REVISE THE WORKSITE TRAFFIC CONTROL PLANS TO CHANGE THE SETUP AND ALLOW ACCESS TO A DRIVEWAY THAT IS SHOWN TO BE BLOCKED ON THE BID DOCUMENTS. REVISED WORKSITE TRAFFIC CONTROL PLANS SHALL BE PREPARED PER LADOT STANDARDS, SIGNED AND SEALED BY A REGISTERED TRAFFIC AND CIVIL ENGINEER, AND SUBMITTED TO LADOT FOR APPROVAL.

20. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE RESTORATION OF STRIPING AND PAVEMENT MARKINGS TO THE ORIGINAL CONDITION USING THERMOPLASTIC MATERIALS, UNLESS OTHERWISE INSTRUCTED BY LADOT. LADOT WILL INSPECT AND APPROVE ANY CONTRACTOR MARKOUT BEFORE THE FINAL INSTALLATION OF STRIPING BY THE CONTRACTOR. THE CONTRACTOR SHALL NOTIFY LADOT CENTRAL DISTRICT AT (213) 972-4990 FIVE (5) WORKING DAYS PRIOR TO PROJECT COMPLETION DATE.

21. LOCATION AND SPACING OF TEMPORARY SIGNS AND DELINEATORS SHALL CONFORM TO THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (CALIFORNIA MUTCD) (LATEST EDITION), OR AS DIRECTED BY THE LADOT ENGINEER.

22. THE CONTRACTOR SHALL PROVIDE CHANGEABLE MESSAGE SIGNS AS FIELD CONDITIONS/DETOURS WARRANT, AND AS DEEMED NECESSARY BY LADOT, EVEN IF THEY ARE NOT SHOWN ON THESE PLANS.

23. THE CONTRACTOR SHALL REFER TO THE TEMPORARY TRAFFIC SIGNAL PLANS FOR ADDITIONAL WORK TO BE COMPLETED PRIOR TO IMPLEMENTING THE WTCP STAGES OR CONCURRENTLY WITH THE WTCP STAGES, AS DETERMINED BY LADOT.

24. IMPLEMENTATION OF ALL WORK SHOWN ON THE WORKSITE TRAFFIC CONTROL PLANS, INCLUDING INSTALLATION AND REMOVAL OF SIGNING AND STRIPING, PAVEMENT MARKINGS, TRAFFIC CONTROL EQUIPMENT, AND ANY TRAFFIC SIGNAL WORK SHALL NOT BE PERFORMED DURING PEAK TRAFFIC HOURS. THE CONTRACTOR SHALL ONLY PERFORM SUCH WORK BETWEEN THE HOURS OF 9 AM AND 3 PM. ANY ADDITIONAL LANE CLOSURE NOT INDICATED ON THESE PLANS MUST BE APPROVED BY LADOT. APPROVED LANE CLOSURES, OTHER THAN THOSE SHOWN ON THESE PLANS, WILL NOT BE PERMITTED DURING PEAK TRAFFIC HOURS.

25. CONSTRUCTION FENCE GATES SHALL BE INSTALLED TO BE OPENED INWARD, AWAY FROM THE SIDEWALK AND STREET, AND BE SECURELY FASTENED WITH LIMITERS IN PLACE TO PREVENT ACCIDENTAL OR UNINTENTIONAL OPENING INTO THE SIDEWALK OR STREET. GATES WIDER THAN 10 FEET SHALL BE SLIDING GATES.

26. A FLAGGER SHALL BE STATIONED AT EACH CONSTRUCTION FENCE GATE WHILE IT IS OPEN DURING CONSTRUCTION ACTIVITY TO ASSIST THE MOVEMENT OF PEDESTRIANS, CONSTRUCTION VEHICLES, AND EQUIPMENT INTO CITY STREETS.

27. THE TRAFFIC SIGNAL CONTROLLER, SIGNAL STANDARDS, AND OTHER ASSOCIATED SIGNAL EQUIPMENT, INCLUDING TRAFFIC SIGNAL PULL BOXES, MUST BE ACCESSIBLE AT ALL TIMES TO LADOT TRAFFIC SIGNAL REPAIR (TSR) PERSONNEL. FENCES AND WALLS MUST BE INSTALLED TO PERMIT ACCESS BY TSR PERSONNEL AT ALL TIMES.

28. UNLESS K-RAILS AND CRASH CUSHIONS ARE INSTALLED, THE CONTRACTOR SHALL PROVIDE A MINIMUM 5' SHOULDER FROM ANY OPEN EXCAVATION.

29. K-RAIL ENDS, TRAFFIC SIGNAL PLATFORMS, AND FIXED OBJECTS SHALL BE PROTECTED BY CRASH CUSHIONS OR BY A QUADGUARD SYSTEM, UNLESS THEY ARE LOCATED MINIMUM 15' AWAY FROM THE TRAVELED WAY. FOR A 20' K-RAIL SECTION, THE HORIZONTAL TAPER SHALL NOT EXCEED 5' PER K-RAIL (MAXIMUM TAPER RATE 4:1).

LEGEND

1. = EXISTING STRIPING & MARKINGS TO REMAIN
   = EXISTING STRIPING & MARKINGS TO BE REMOVED
   = PROPOSED STRIPING & MARKINGS
2. = EXISTING SIGN AND POST
   = EXISTING SIGN AND POST TO BE REMOVED OR RELOCATED
   = PROPOSED SIGN AND POST
3. (S) = SIGNALIZED INTERSECTION
4. R/C = EXISTING RED CURB MARKINGS TO REMAIN
   R/C = EXISTING RED CURB MARKINGS TO BE REMOVED
   R/C = PROPOSED RED CURB MARKINGS
5. = EXISTING BIKE LANE PAVEMENT MARKINGS TO REMAIN
   = EXISTING BIKE LANE PAVEMENT MARKINGS TO BE REMOVED
   = PROPOSED BIKE LANE PAVEMENT MARKINGS
6. 28" TRAFFIC CONE WITH 13" REFLECTIVE MARKER
7. 28" CHANNELIZER WITH 13" REFLECTIVE MARKER (SURFACE MOUNTED WITH FLEXIBLE BASE)
8. TYPE II BARRICADE
9. TYPE II BARRICADE WITH SIGN
10. TYPE III BARRICADE
11. TYPE III BARRICADE WITH SIGN
12. CRASH CUSHION ARRAY "TS11" PER CALTRANS REVISED STD. PLAN T2
13. 20' LONG CONCRETE K-RAIL BARRIER
14. 10' LONG CONCRETE K-RAIL BARRIER
15. QUADGUARD CZ CRASH CUSHION SYSTEM, OR APPROVED EQUAL CONTACT: TRAFFIC CONTROL SERVICE, INC. (800-222-8274)
16. FLASHING ARROW BOARD (BATTERY OPERATED)
17. TEMPORARY CHAIN LINK FENCE
18. WORK ZONE LIMITS

RESTORATION STRIPING NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LABOR AND MATERIAL INVOLVED IN THE MARKOUT, AND INSTALLATION OF ALL RESTORATION STRIPING/PAVEMENT MARKINGS.

   THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR REMOVAL OF ALL CONFLICTING DETOUR STRIPING, SIGNING, AND OTHER DETOUR-RELATED TRAFFIC CONTROL DEVICES PRIOR TO THE INSTALLATION OF THE FINAL STRIPING.

   IF THERE IS NO RESTORATION PLAN IN THIS PACKAGE, THE CONTRACTOR SHALL CONTACT LADOT GEOMETRIC DESIGN FOR THE LATEST STRIPING PLANS.

2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAINTING OF ALL EXISTING STRIPING THAT HAS BEEN DAMAGED DURING THE CONSTRUCTION PROCESS.

3. WHEN THE EXISTING LANE(S) WILL REMAIN OPEN AFTER THE MARKOUT IS ACCOMPLISHED, THE MARKOUT SHALL CONSIST ONLY OF MARKED CONTROL POINTS. WHEN THE MARKOUT WILL BE DONE AS PART OF A CONTINUOUS OPERATION TO MODIFY STRIPING, THEN THE MARKOUT SHALL BE BY HEAVY PAINT BRUSH MARKINGS OVER A PULLED ROPE IN THE RESPECTIVE WHITE AND YELLOW COLORS OF THE PROPOSED STRIPING.

   STRIPING AND PAVEMENT MARKINGS SHALL BE IN HOT APPLIED ALKYD THERMOPLASTIC IN ACCORDANCE WITH LADOT SPECIFICATION NOS. 51-005-10 AND 76-012-15. PRIMER AND SEALERS ARE REQUIRED AND SHALL CONFORM TO LADOT SPECIFICATION NO. 76-012-15.

4. THE CONTRACTOR SHALL CONTACT LADOT ~~CENTRAL~~ Western DISTRICT OFFICE AT ~~(213) 972-4990~~ 310 575-8138 AT LEAST 5 WORKING DAYS BEFORE BEGINNING MARKOUT. THE CONTRACTOR SHALL CORRECT ALL ERRORS IN MARKOUT REQUESTED BY LADOT. THE INSTALLATION OF THERMOPLASTIC STRIPING MAY PROCEED ONLY AFTER APPROVAL OF MARKOUT BY THE LADOT DISTRICT ENGINEER.

5. TEMPORARY REFECTIVE RAISED PAVEMENT MARKERS SHALL BE MAINTAINED ADJACENT TO ANY TEMPORARY CENTERLINE, MARKOUT CENTERLINE OR SCAR OF A SANDBLASTED CENTER, AS APPLICABLE, AS PER LADOT STANDARD PLAN NO. S-453.0.

WORKSITE TRAFFIC CONTROL PLANS – CONSTRUCTION NOTES
PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE 1
W.O. EW40019F

TC-1

REVIEWED May 28 20 09
Transportation Engineer

RECOMMENDED ____ 20 ____
Senior Transportation Engineer

ACCEPTED May 28 20 09
for Principal Transportation Engineer

INSTALLATION DATES
MARKOUT BEGAN: ____
MARKOUT COMPLETED: ____
STRIPING COMPLETED: ____
References:

CITY OF LOS ANGELES
DEPARTMENT OF TRANSPORTATION
RITA L. ROBINSON, GENERAL MANAGER

TITLE SHEET

Thomas Guide	District	PROJECT NO.	DRAWING NO.	
671-J4	W		D-0111	1/10

DATE / BY / SUPERVISOR DISTRICT SIGNALS
DATE / BY
DATE / BY
BASE / CHECK / DESIGN

DATE / PRINCIPAL T.E. / T.E./SR. T.E. / REVISION DESCRIPTION / NO.

PLAN PREPARED BY:
NAME 5/27/09 DATE

FPL FPL and Associates, Inc.
Traffic • Transportation • Civil • CAD
10 Corporate Park, Suite 310
Irvine, California 92606
(949) 252-1688

REGISTERED PROFESSIONAL ENGINEER — ALEXANDER D. ZUPANSKI — No. C 59351 — Exp. 06-30-09 — CIVIL — STATE OF CALIFORNIA

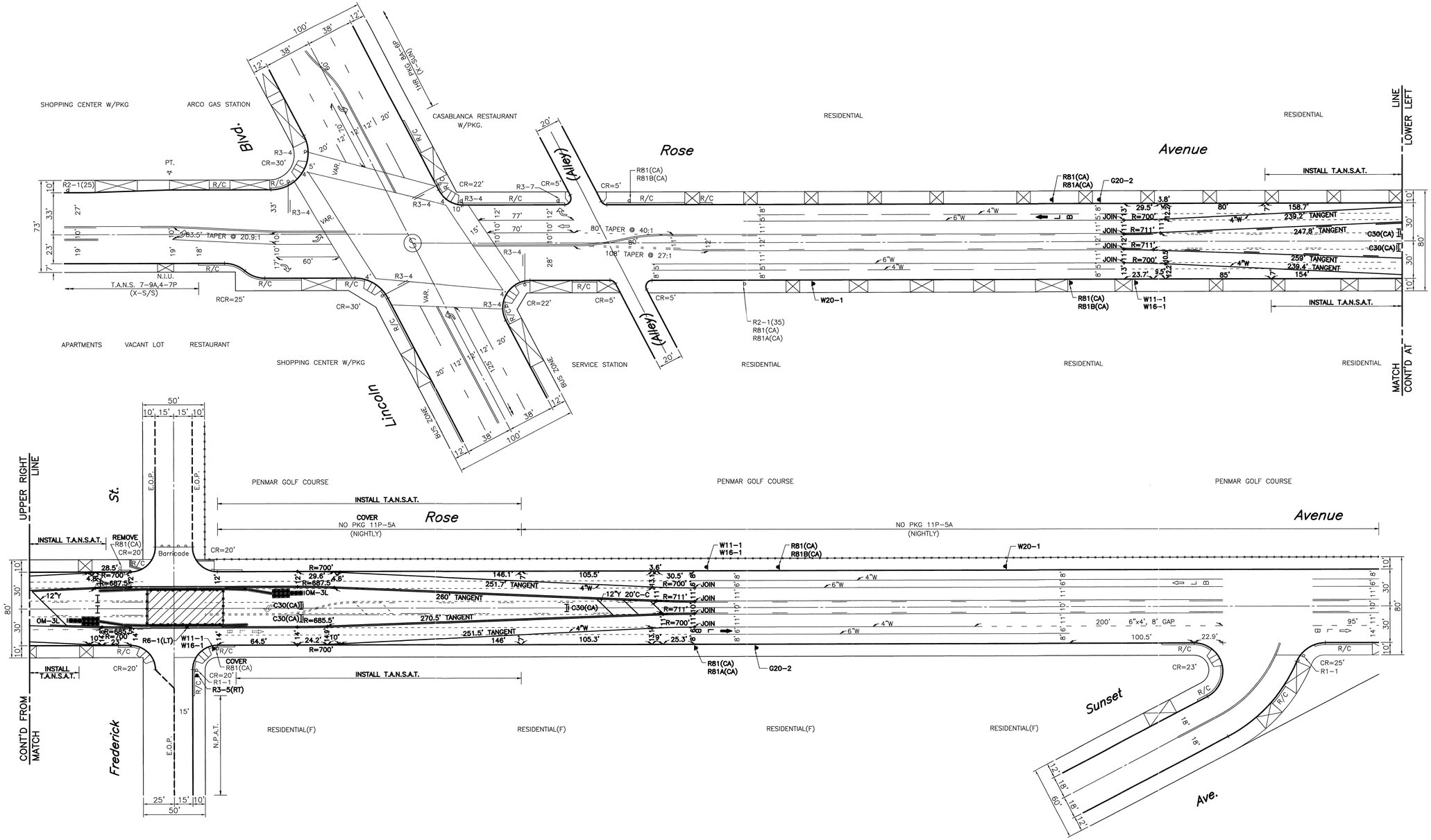
REGISTERED PROFESSIONAL ENGINEER — ALEXANDER D. ZUPANSKI — No. TR 2400 — Exp. 06-30-09 — TRAFFIC — STATE OF CALIFORNIA

CONSULTANT BUSINESS TAX REGISTRATION NUMBER : 217989-0001-1

1"=20' ORIGINAL MAP SCALE 1"=40'
20 10 0 20 40 60 80 100 FEET
40 20 0 40 80 120 160 200 FEET

SCALES | HORIZ. 1"= | VERT. 1"=

SHEET ~~97~~ 49 OF ~~108~~ 60 | INDEX NUMBER



WORKSITE TRAFFIC CONTROL PLAN (STAGE 1)
PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE 1
W.O. EW40019F

TC-2

REVIEWED	RECOMMENDED	ACCEPTED
May 28 20 09	20	May 28 20 09
Transportation Engineer	Senior Transportation Engineer	for Principal Transportation Engineer

INSTALLATION DATES	CITY OF LOS ANGELES
MARKOUT BEGAN:	**DEPARTMENT OF TRANSPORTATION**
MARKOUT COMPLETED:	RITA L. ROBINSON, GENERAL MANAGER
STRIPING COMPLETED:	ROSE AVENUE
References: A-4560.dwg Field Check	LINCOLN BLVD. TO SUNSET AVE.

Thomas Guide	District	PROJECT NO.	DRAWING NO.	
671-J4	W		D-0111	2/10

PLAN PREPARED BY: _____ NAME 5/29/09 DATE

FPL FPL and Associates, Inc.
Traffic • Transportation • Civil • CAD
10 Corporate Park, Suite 310
Irvine, California 92606
(949) 252-1688

REGISTERED PROFESSIONAL ENGINEER — ALEXANDER D. ZUPANSKI — No. C 59351 — Exp. 06-30-09 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ALEXANDER D. ZUPANSKI — No. TR 2400 — Exp. 06-30-09 — TRAFFIC — STATE OF CALIFORNIA

CONSULTANT BUSINESS TAX REGISTRATION NUMBER : 217989-0001-1

ORIGINAL MAP SCALE 1"=20' / 1"=40'

20	10	0	20	40	60	80	100 FEET
40	20	0	40	80	120	160	200 FEET

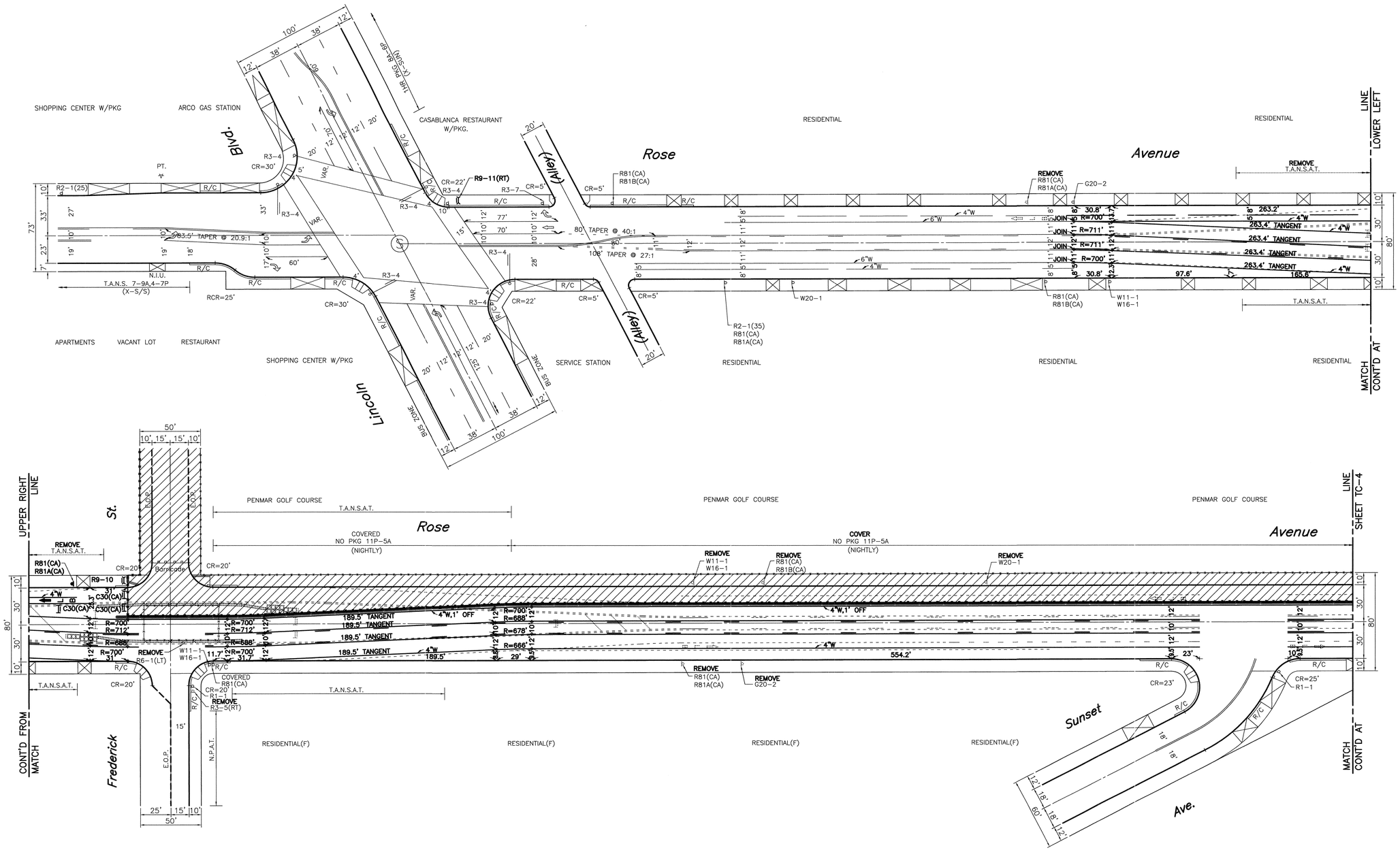
SCALES HORIZ. 1"=40' VERT. 1"=

SHEET ~~98~~ 50 **OF** ~~108~~ 60 **INDEX NUMBER**

LANE CLOSED	END ROAD WORK
C30(CA)	G20-2
OM-3L	ONLY R3-5(RT)
ONE WAY R6-1(LT)	BIKE LANE R81(CA)
BEGIN R81A(CA)	END R81B(CA)
W11-1	SHARE THE ROAD W16-1
ROAD WORK AHEAD W20-1	

NO.	REVISION DESCRIPTION	DATE	BY

BASE / CHECK / DESIGN — SUPERVISOR / DISTRICT SIGNALS — T.E./SR. T.E. — PRINCIPAL T.E.



LANE CLOSED C30(CA) | SIDEWALK CLOSED AHEAD CROSS HERE R9-11

BIKE LANE R81(CA) | BEGIN R81A(CA)

WORKSITE TRAFFIC CONTROL PLAN (STAGE 2)
PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE 1
W.O. EW40019F

TC-3

REVIEWED May 28 20 09
Transportation Engineer

RECOMMENDED 20
Senior Transportation Engineer

ACCEPTED May 28 20 09
Principal Transportation Engineer

INSTALLATION DATES

MARKOUT BEGAN:

MARKOUT COMPLETED:

STRIPING COMPLETED:

References:
A-4560.dwg
Field Check

CITY OF LOS ANGELES
DEPARTMENT OF TRANSPORTATION
RITA L. ROBINSON, GENERAL MANAGER

ROSE AVENUE
LINCOLN BLVD. TO GLENAVON AVE.

Thomas Guide	District	PROJECT NO.	DRAWING NO.	
671-J4	W		D-0111	3/10

SCALE: 1"=40'

PLAN PREPARED BY:
NAME 5/27/09 DATE

FPL and Associates, Inc.
Traffic • Transportation • Civil • CAD
10 Corporate Park, Suite 310
Irvine, California 92606
(949) 252-1688

REGISTERED PROFESSIONAL ENGINEER ALEXANDER D. ZUPANSKI No. C 59351 Exp. 06-30-09 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ALEXANDER D. ZUPANSKI No. TR 2400 Exp. 06-30-09 TRAFFIC STATE OF CALIFORNIA

CONSULTANT BUSINESS TAX REGISTRATION NUMBER : 217989-0001-1

1"=20' / 1"=40' ORIGINAL MAP SCALE
20 10 0 20 40 60 80 100 FEET
40 20 0 40 80 120 160 200 FEET

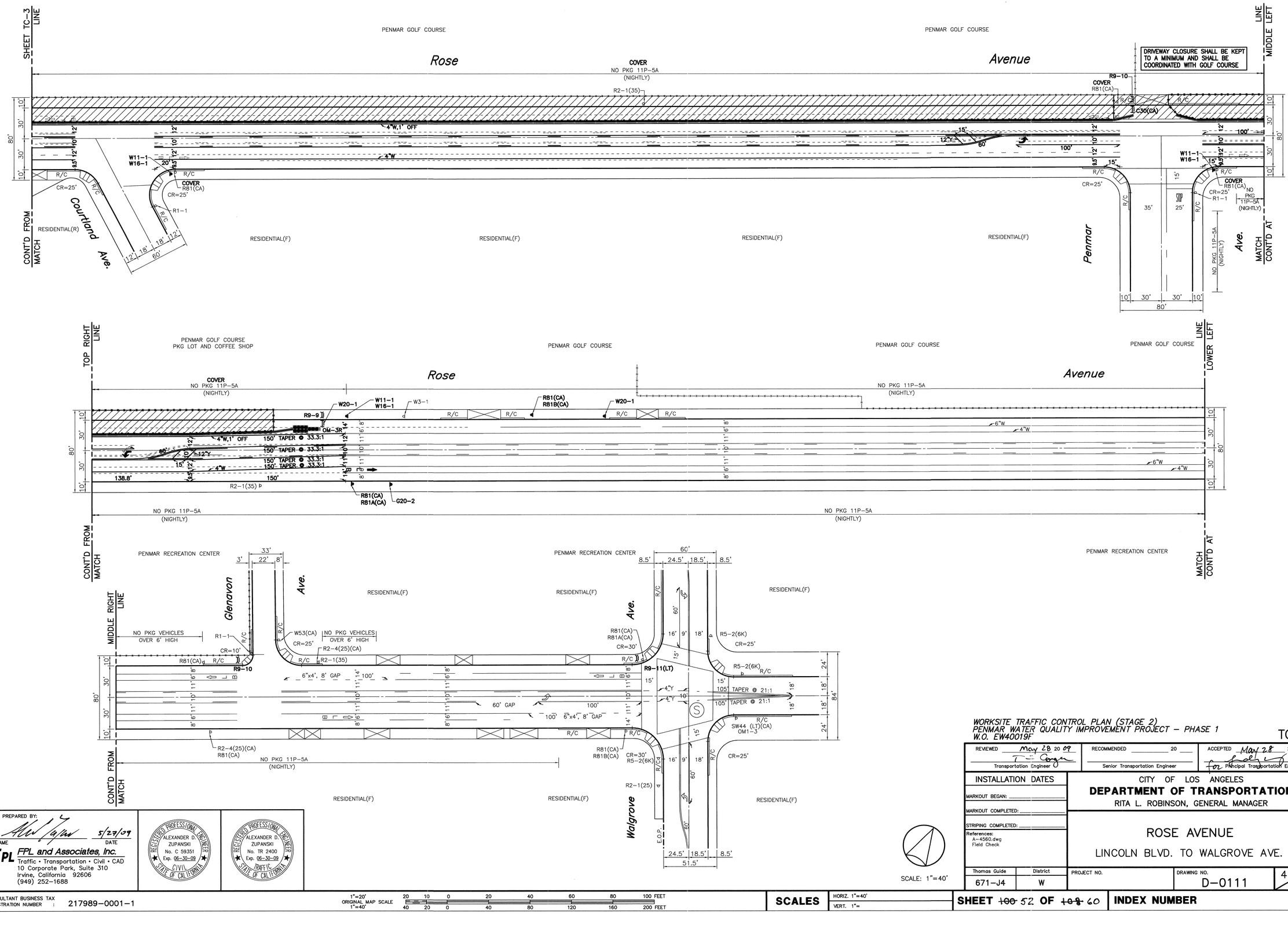
SCALES HORIZ. 1"=40' VERT. 1"=

SHEET ~~99~~ 51 OF ~~108~~ 60 | **INDEX NUMBER**

NO.	REVISION DESCRIPTION	BY	DATE

T.E./SR. T.E. | PRINCIPAL T.E.

BASE | CHECK | DESIGN | DISTRICT SIGNALS | SUPERVISOR



END ROAD WORK	OM-3R
G20-2	
SIDEWALK CLOSED	SIDEWALK CLOSED USE OTHER SIDE
R9-9	R9-10
SIDEWALK CLOSED AHEAD CROSS HERE	ROAD CLOSED
R9-11	R11-2
W11-1	SHARE THE ROAD W16-1

WORKSITE TRAFFIC CONTROL PLAN (STAGE 2)
PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE 1
W.O. EW40019F

TC-4

REVIEWED May 28 20 09
Transportation Engineer

RECOMMENDED ____ 20 ____
Senior Transportation Engineer

ACCEPTED May 28 20 09
for Principal Transportation Engineer

INSTALLATION DATES

MARKOUT BEGAN: ____

MARKOUT COMPLETED: ____

STRIPING COMPLETED: ____

References:
A-4560.dwg
Field Check

CITY OF LOS ANGELES
DEPARTMENT OF TRANSPORTATION
RITA L. ROBINSON, GENERAL MANAGER

ROSE AVENUE
LINCOLN BLVD. TO WALGROVE AVE.

Thomas Guide	District	PROJECT NO.	DRAWING NO.	
671-J4	W		D-0111	4 / 10

PLAN PREPARED BY:
NAME 5/27/09 DATE

FPL FPL and Associates, Inc.
Traffic • Transportation • Civil • CAD
10 Corporate Park, Suite 310
Irvine, California 92606
(949) 252-1688

REGISTERED PROFESSIONAL ENGINEER — ALEXANDER D. ZUPANSKI — No. C 59351 — Exp. 06-30-09 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ALEXANDER D. ZUPANSKI — No. TR 2400 — Exp. 06-30-09 — TRAFFIC — STATE OF CALIFORNIA

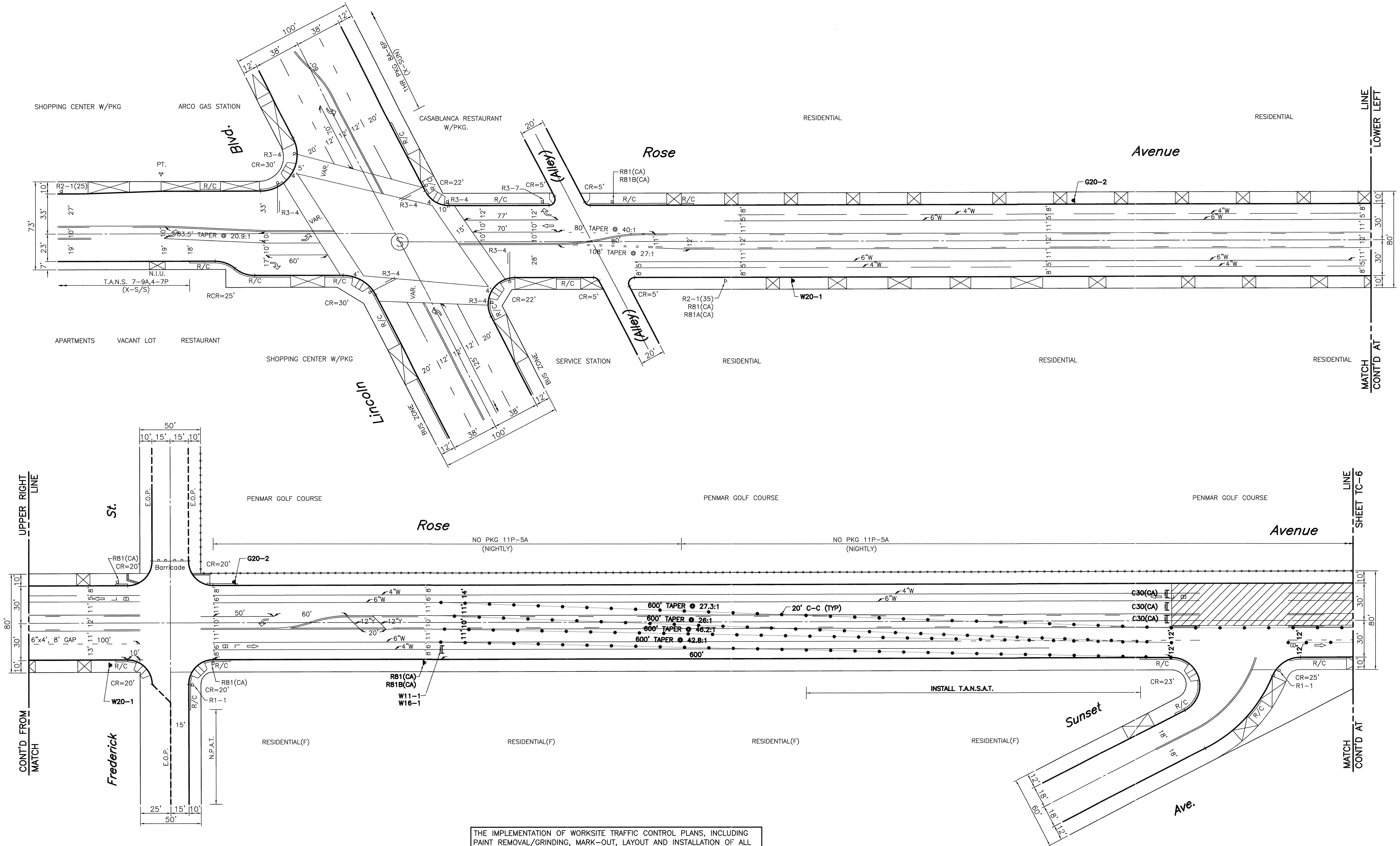
CONSULTANT BUSINESS TAX REGISTRATION NUMBER : 217989-0001-1

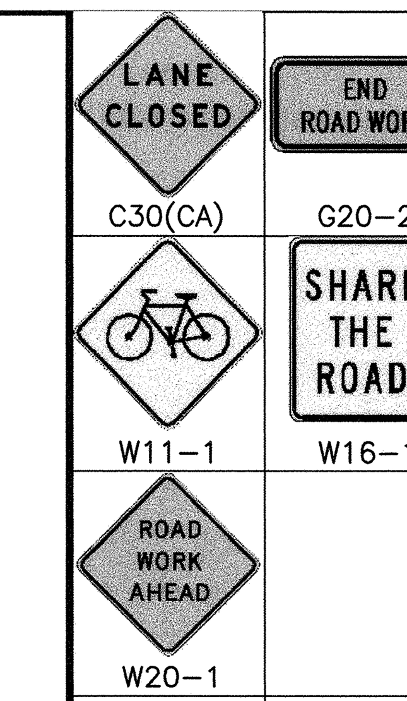
1"=20' ORIGINAL MAP SCALE 1"=40'
20 10 0 20 40 60 80 100 FEET
40 20 0 40 80 120 160 200 FEET

SCALES HORIZ. 1"=40' VERT. 1"=

SHEET ~~100~~ 52 **OF** ~~108~~ 60 **INDEX NUMBER**

NO.	REVISION DESCRIPTION	BY	DATE
	PRINCIPAL T.E.		DATE
	T.E./SR. T.E.		
	SUPERVISOR DISTRICT SIGNALS	BY	DATE
	BASE CHECK DESIGN	BY	





THE IMPLEMENTATION OF WORKSITE TRAFFIC CONTROL PLANS, INCLUDING PAINT REMOVAL/GRINDING, MARK-OUT, LAYOUT AND INSTALLATION OF ALL TRAFFIC CONTROLS INCLUDING SIGNAL WORK AND STRIPING SHALL ONLY TAKE PLACE DURING OFF-PEAK HOURS: 9:00 A.M.-3:00 P.M. THE CONTRACTOR SHALL REQUEST APPROVAL FROM LADOT FOR ANY ADDITIONAL TEMPORARY LANE CLOSURES THAT ARE NOT INDICATED OR SPECIFIED ON THESE PLANS, REGARDLESS OF THE DURATION OR TIME PERIOD.

For reference only

THIS PLAN ASSUMES COMPLETION OF RESTORATION STRIPING PER SHEETS PD-1 AND PD-2

SCALE: 1"=40'

WORKSITE TRAFFIC CONTROL PLAN (STAGE 3)
PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE 1
W.O. EW40019F

TC-5

~~REVIEWED~~ 20__ Transportation Engineer	~~RECOMMENDED~~ 20__ Senior Transportation Engineer	~~ACCEPTED~~ 20__ Principal Transportation Engineer

INSTALLATION DATES
MARKOUT BEGAN:
MARKOUT COMPLETED:
STRIPING COMPLETED:
References:
A-4560.dwg
Field Check

CITY OF LOS ANGELES
DEPARTMENT OF TRANSPORTATION
RITA L. ROBINSON, GENERAL MANAGER

ROSE AVENUE
LINCOLN BLVD. TO GLENAVON AVE.

Thomas Guide	District	PROJECT NO.	DRAWING NO.	
671-J4	W		D-0111	5/10

PLAN PREPARED BY:
[signature] 5/27/09
NAME DATE

FPL and Associates, Inc.
Traffic • Transportation • Civil • CAD
10 Corporate Park, Suite 310
Irvine, California 92606
(949) 252-1688

REGISTERED PROFESSIONAL ENGINEER ALEXANDER D. ZUPANSKI No. C 59351 Exp. 06-30-09 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ALEXANDER D. ZUPANSKI No. TR 2400 Exp. 06-30-09 TRAFFIC STATE OF CALIFORNIA

CONSULTANT BUSINESS TAX REGISTRATION NUMBER : 217989-0001-1

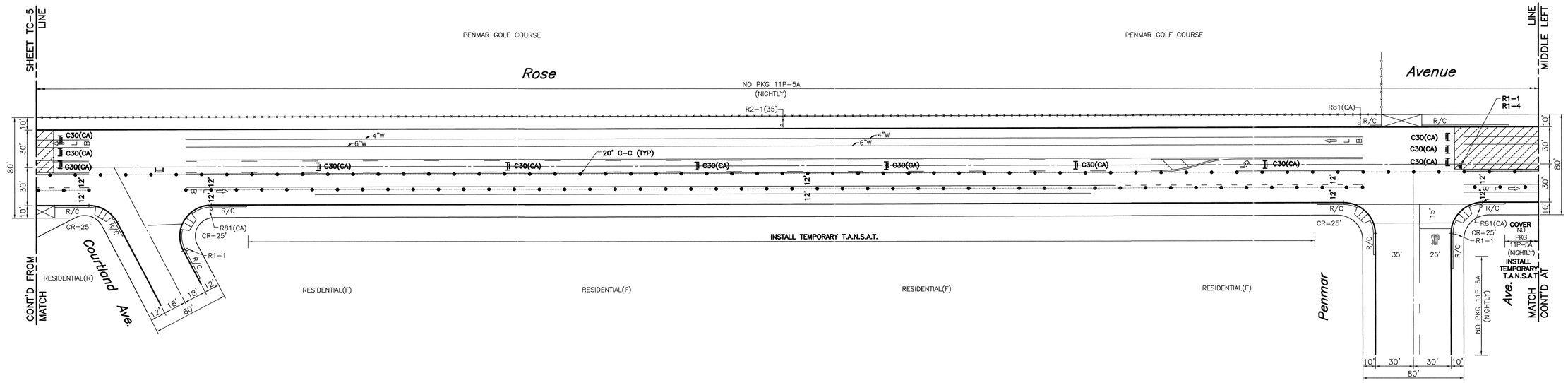
1"=20' ORIGINAL MAP SCALE 1"=40'
20 10 0 20 40 60 80 100 FEET
40 20 0 40 80 120 160 200 FEET

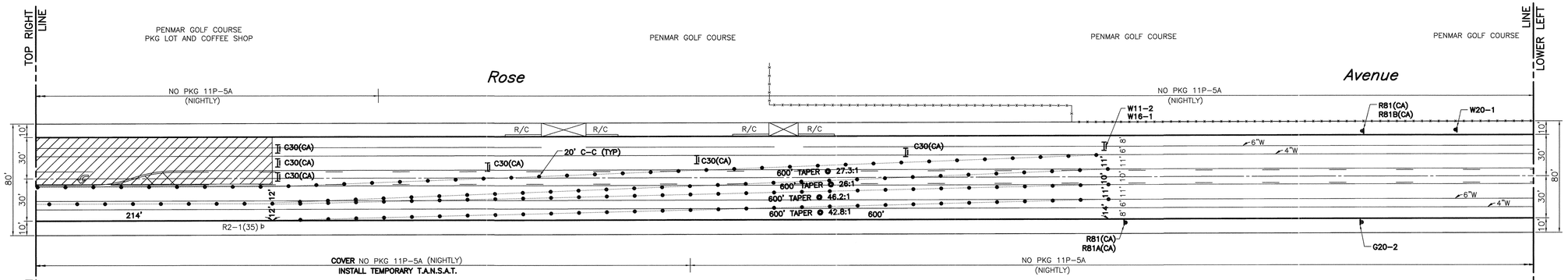
SCALES HORIZ. 1"=40' VERT. 1"=

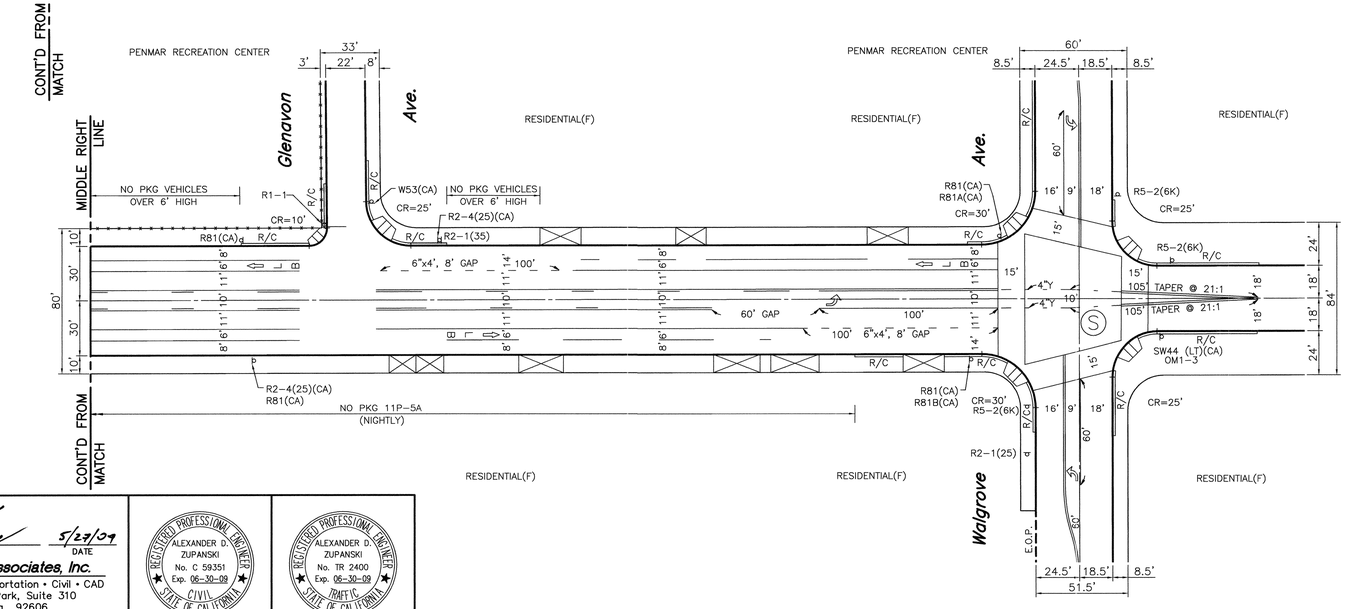
SHEET ~~101~~ 53 **OF** ~~108~~ 60 **INDEX NUMBER**

DATE	BY	SUPERVISOR	DISTRICT	SIGNALS	DATE	BY	BASE	CHECK	DESIGN

NO.	REVISION DESCRIPTION	T.E./SR. T.E.	PRINCIPAL T.E.	DATE







THIS PLAN ASSUMES COMPLETION OF RESTORATION STRIPING PER SHEETS PD-1 AND PD-2

THE IMPLEMENTATION OF WORKSITE TRAFFIC CONTROL PLANS, INCLUDING PAINT REMOVAL/GRINDING, MARK-OUT, LAYOUT AND INSTALLATION OF ALL TRAFFIC CONTROLS INCLUDING SIGNAL WORK AND STRIPING SHALL ONLY TAKE PLACE DURING OFF-PEAK HOURS: 9:00 A.M.-3:00 P.M. THE CONTRACTOR SHALL REQUEST APPROVAL FROM LADOT FOR ANY ADDITIONAL TEMPORARY LANE CLOSURES THAT ARE NOT INDICATED OR SPECIFIED ON THESE PLANS, REGARDLESS OF THE DURATION OR TIME PERIOD.

For reference only

SCALE: 1"=40'

WORKSITE TRAFFIC CONTROL PLAN (STAGE 3)
PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE 1
W.O. EW40019F

TC-6

REVIEWED 20	RECOMMENDED 20	ACCEPTED 20
Transportation Engineer	Senior Transportation Engineer	Principal Transportation Engineer

INSTALLATION DATES

MARKOUT BEGAN: _____

MARKOUT COMPLETED: _____

STRIPING COMPLETED: _____

References:
A-4560.dwg
Field Check

CITY OF LOS ANGELES
DEPARTMENT OF TRANSPORTATION
RITA L. ROBINSON, GENERAL MANAGER

ROSE AVENUE
LINCOLN BLVD. TO WALGROVE AVE.

Thomas Guide	District	PROJECT NO.	DRAWING NO.	
671-J4	W		D-0111	6/10

PLAN PREPARED BY:
NAME _____ DATE 5/29/09

FPL and Associates, Inc.
Traffic • Transportation • Civil • CAD
10 Corporate Park, Suite 310
Irvine, California 92606
(949) 252-1688

REGISTERED PROFESSIONAL ENGINEER
ALEXANDER D. ZUPANSKI
No. C 59351
Exp. 06-30-09
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ALEXANDER D. ZUPANSKI
No. TR 2400
Exp. 06-30-09
TRAFFIC
STATE OF CALIFORNIA

CONSULTANT BUSINESS TAX REGISTRATION NUMBER : 217989-0001-1

1"=20' ORIGINAL MAP SCALE 1"=40'
20 10 0 20 40 60 80 100 FEET
40 20 0 40 80 120 160 200 FEET

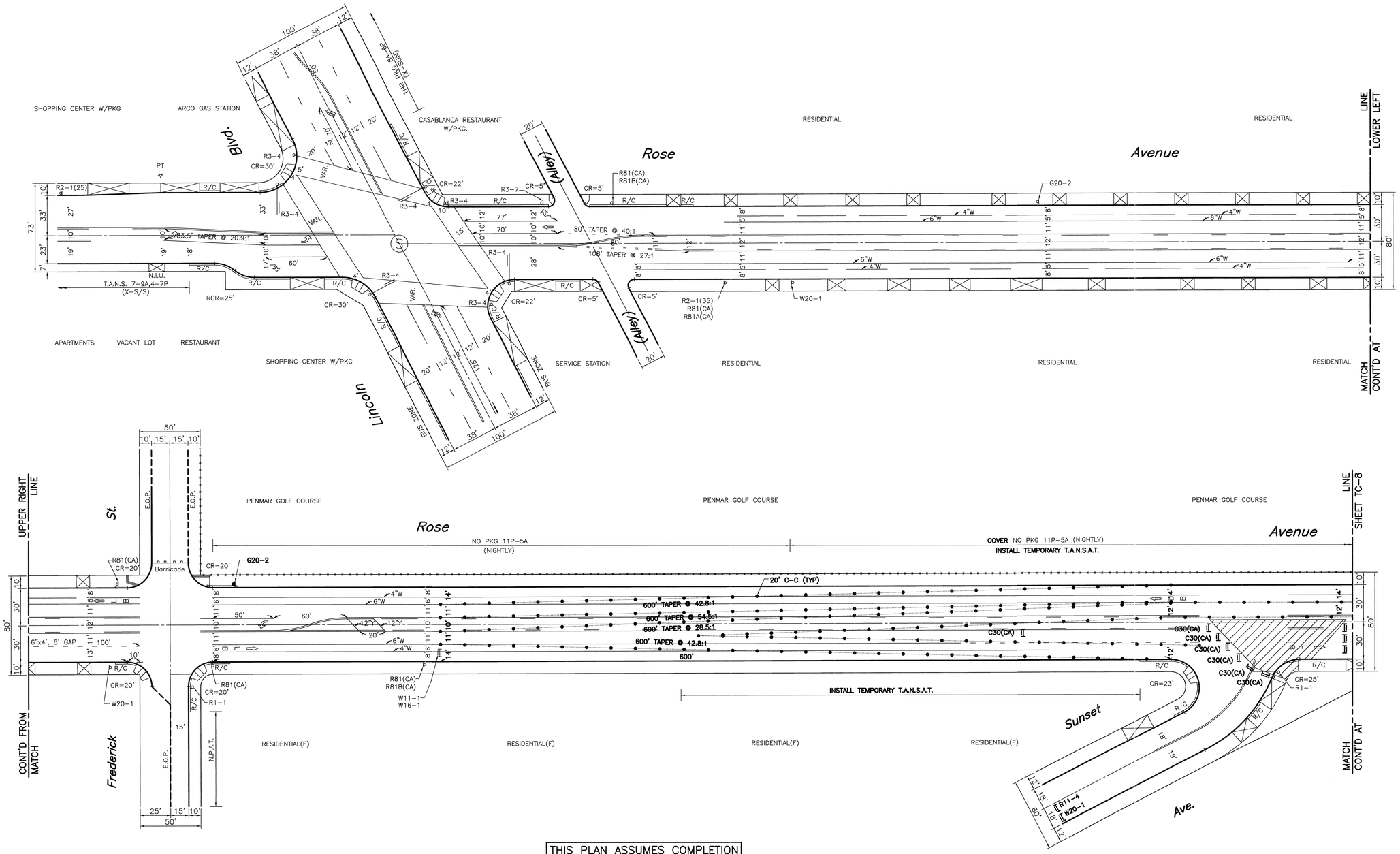
SCALES HORIZ. 1"=40' VERT. 1"=

SHEET ~~102~~ 54 OF ~~108~~ 60 **INDEX NUMBER**

LANE CLOSED C30(CA)	END ROAD WORK G20-2
BIKE LANE R81(CA)	BEGIN R81A(CA)
W11-1	SHARE THE ROAD W16-1
ROAD WORK AHEAD W20-1	

NO.	REVISION DESCRIPTION	BY	DATE

PRINCIPAL T.E. | T.E./SR. T.E. | SUPERVISOR DISTRICT SIGNALS | BASE CHECK DESIGN



THIS PLAN ASSUMES COMPLETION OF RESTORATION STRIPING PER SHEETS PD-1 AND PD-2

THE IMPLEMENTATION OF WORKSITE TRAFFIC CONTROL PLANS, INCLUDING PAINT REMOVAL/GRINDING, MARK-OUT, LAYOUT AND INSTALLATION OF ALL TRAFFIC CONTROLS INCLUDING SIGNAL WORK AND STRIPING SHALL ONLY TAKE PLACE DURING OFF-PEAK HOURS: 9:00 A.M.-3:00 P.M. THE CONTRACTOR SHALL REQUEST APPROVAL FROM LADOT FOR ANY ADDITIONAL TEMPORARY LANE CLOSURES THAT ARE NOT INDICATED OR SPECIFIED ON THESE PLANS, REGARDLESS OF THE DURATION OR TIME PERIOD.

For reference only

SCALE: 1"=40'

LANE CLOSED C30(CA) | END ROAD WORK G20-2
ROAD CLOSED TO THRU TRAFFIC R11-4 | W11-1
SHARE THE ROAD W16-1 | ROAD WORK AHEAD W20-1

WORKSITE TRAFFIC CONTROL PLAN (STAGE 4)
PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE 1
W.O. EW40019F

TC-7

REVIEWED 20__	RECOMMENDED 20__	ACCEPTED 20__
Transportation Engineer	Senior Transportation Engineer	Principal Transportation Engineer

INSTALLATION DATES
MARKOUT BEGAN: _____
MARKOUT COMPLETED: _____
STRIPING COMPLETED: _____
References:
A-4560.dwg
Field Check

CITY OF LOS ANGELES
DEPARTMENT OF TRANSPORTATION
RITA L. ROBINSON, GENERAL MANAGER

ROSE AVENUE
LINCOLN BLVD. TO GLENAVON AVE.

Thomas Guide	District	PROJECT NO.	DRAWING NO.	
671-J4	W		D-0111	7/10

DATE | BY | REVISION DESCRIPTION | NO.
DATE | BY | SUPERVISOR DISTRICT SIGNALS
DATE | BY | T.E./SR. T.E. PRINCIPAL T.E.
BASE | CHECK | DESIGN

PLAN PREPARED BY:
NAME _____ DATE 5/27/09
FPL FPL and Associates, Inc.
Traffic • Transportation • Civil • CAD
10 Corporate Park, Suite 310
Irvine, California 92606
(949) 252-1688

REGISTERED PROFESSIONAL ENGINEER ALEXANDER D. ZUPANSKI No. C 59351 Exp. 06-30-09 CIVIL STATE OF CALIFORNIA

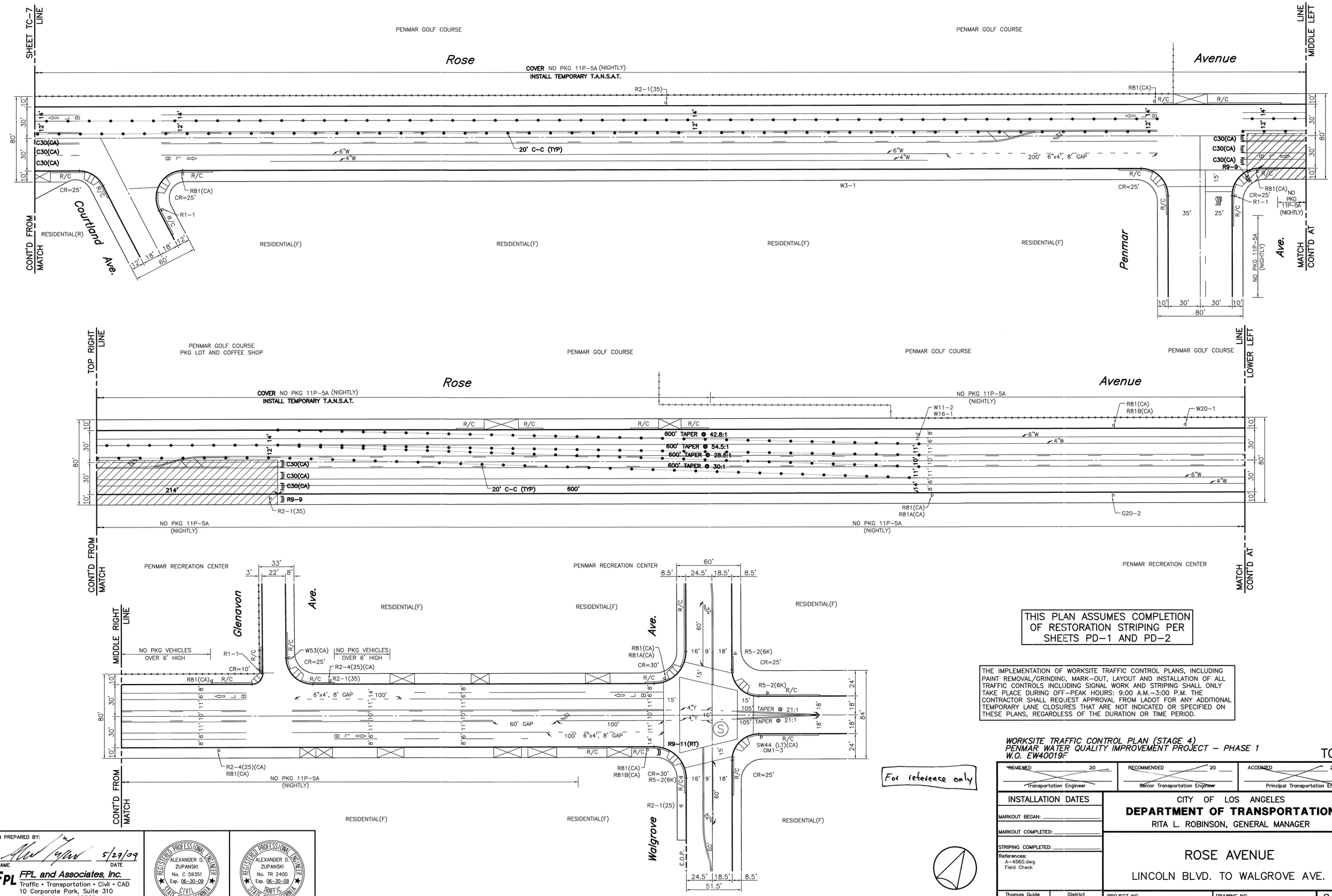
REGISTERED PROFESSIONAL ENGINEER ALEXANDER D. ZUPANSKI No. TR 2400 Exp. 06-30-09 TRAFFIC STATE OF CALIFORNIA

CONSULTANT BUSINESS TAX REGISTRATION NUMBER : 217989-0001-1

1"=20' ORIGINAL MAP SCALE 1"=40'
20 10 0 20 40 60 80 100 FEET
40 20 0 40 80 120 160 200 FEET

SCALES HORIZ. 1"=40' VERT. 1"=

SHEET ~~103~~ 55 OF ~~108~~ 60 **INDEX NUMBER**



LANE CLOSED C30(CA) | END ROAD WORK G20-2
W11-1 | SHARE THE ROAD W16-1
ROAD WORK AHEAD W20-1 | SIDEWALK CLOSED R9-9
SIDEWALK CLOSED AHEAD CROSS HERE R9-11

WORKSITE TRAFFIC CONTROL PLAN (STAGE 4)
PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE 1
W.O. EW40019F

TC-8

REVIEWED	RECOMMENDED	ACCEPTED
20	20	20
Transportation Engineer	Senior Transportation Engineer	Principal Transportation Engineer

INSTALLATION DATES
MARKOUT BEGAN:
MARKOUT COMPLETED:
STRIPING COMPLETED:
References:
A-4560.dwg
Field Check

CITY OF LOS ANGELES
DEPARTMENT OF TRANSPORTATION
RITA L. ROBINSON, GENERAL MANAGER

ROSE AVENUE
LINCOLN BLVD. TO WALGROVE AVE.

Thomas Guide	District	PROJECT NO.	DRAWING NO.	
671-J4	W		D-0111	8/10

PLAN PREPARED BY:
NAME
5/23/09 DATE
FPL and Associates, Inc.
Traffic • Transportation • Civil • CAD
10 Corporate Park, Suite 310
Irvine, California 92606
(949) 252-1688

REGISTERED PROFESSIONAL ENGINEER ALEXANDER D. ZUPANSKI No. C 59351 Exp. 06-30-09 STATE OF CALIFORNIA CIVIL
REGISTERED PROFESSIONAL ENGINEER ALEXANDER D. ZUPANSKI No. TR 2400 Exp. 06-30-09 STATE OF CALIFORNIA TRAFFIC

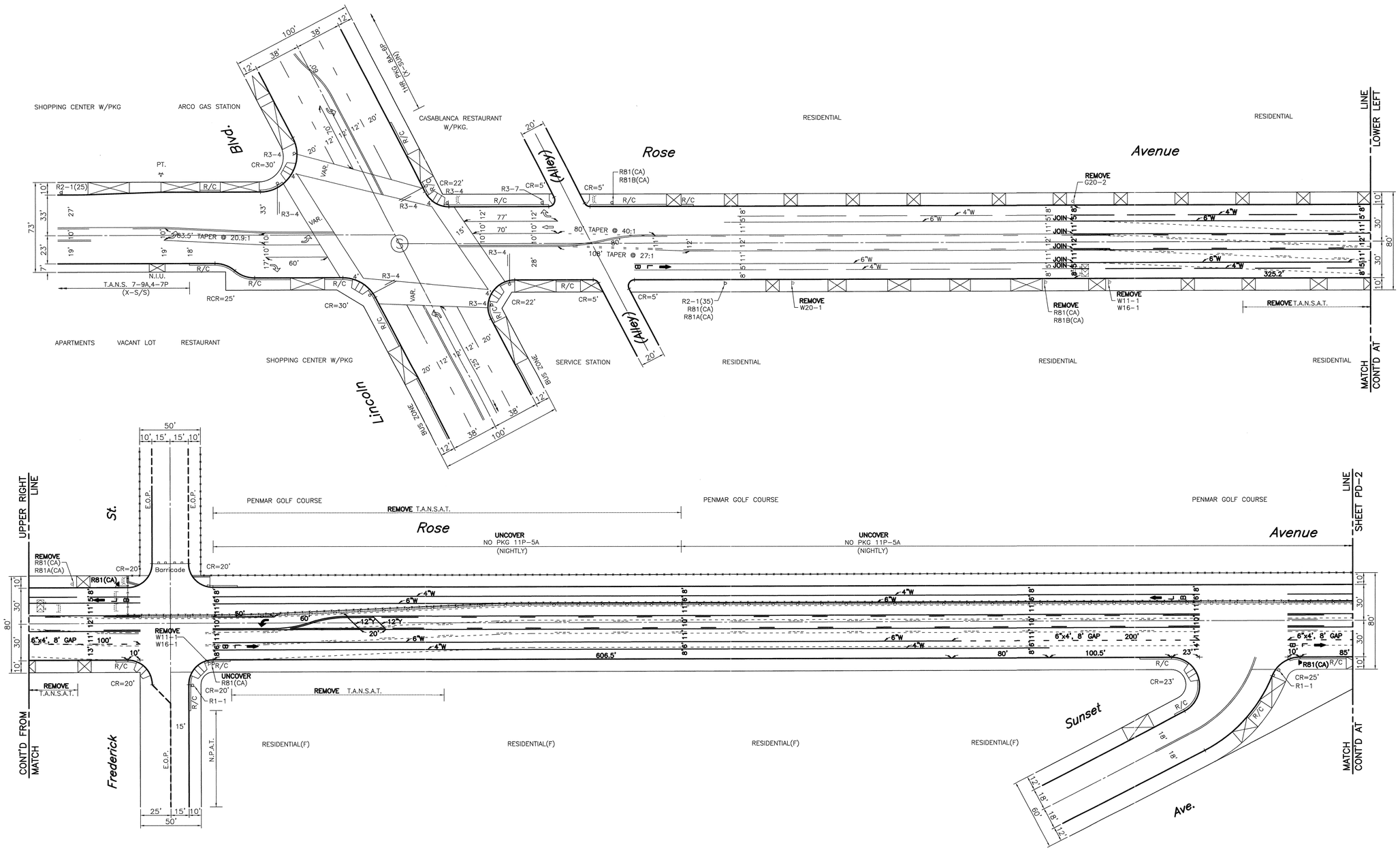
CONSULTANT BUSINESS TAX REGISTRATION NUMBER : 217989-0001-1

1"=20' ORIGINAL MAP SCALE 1"=40'
20 10 0 20 40 60 80 100 FEET
40 20 0 40 80 120 160 200 FEET

SCALES HORIZ. 1"=40' VERT. 1"=

SHEET ~~104~~ 56 OF ~~108~~ 60 **INDEX NUMBER**

NO.	REVISION DESCRIPTION	BY	DATE
	PRINCIPAL T.E.		
	T.E./SR. T.E.		
	SUPERVISOR		
	DISTRICT		
	SIGNALS		
	BASE		
	CHECK		
	DESIGN		



BIKE LANE
R81(CA)

RESTORATION SIGNING AND STRIPING
PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE 1
W.O. EW40019F

PD-1

REVIEWED	RECOMMENDED	ACCEPTED
May 28 20 09	20	May 28 20 09
Transportation Engineer	Senior Transportation Engineer	for Principal Transportation Engineer

INSTALLATION DATES
MARKOUT BEGAN:
MARKOUT COMPLETED:
STRIPING COMPLETED:
References:
A-4560.dwg
Field Check

CITY OF LOS ANGELES
DEPARTMENT OF TRANSPORTATION
RITA L. ROBINSON, GENERAL MANAGER

ROSE AVENUE
LINCOLN BLVD. TO GLENAVON AVE.

Thomas Guide	District	PROJECT NO.	DRAWING NO.	
671-J4	W		D-0111	9/10

SCALE: 1"=40'

PLAN PREPARED BY:
NAME 5/27/09 DATE
FPL and Associates, Inc.
Traffic • Transportation • Civil • CAD
10 Corporate Park, Suite 310
Irvine, California 92606
(949) 252-1688

REGISTERED PROFESSIONAL ENGINEER — ALEXANDER D. ZUPANSKI — No. C 59351 — Exp. 06-30-09 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ALEXANDER D. ZUPANSKI — No. TR 2400 — Exp. 06-30-09 — TRAFFIC — STATE OF CALIFORNIA

CONSULTANT BUSINESS TAX REGISTRATION NUMBER : 217989-0001-1

1"=20' ORIGINAL MAP SCALE 1"=40'
20 10 0 20 40 60 80 100 FEET
40 20 0 40 80 120 160 200 FEET

SCALES HORIZ. 1"=40' VERT. 1"=

SHEET ~~105~~ 57 **OF** ~~108~~ 60 **INDEX NUMBER**

NO.	REVISION DESCRIPTION	BY	DATE
	BASE / CHECK / DESIGN	SUPERVISOR / DISTRICT SIGNALS	T.E./SR. T.E. / PRINCIPAL T.E.

SHEET PD-1 LINE

PENMAR GOLF COURSE

Rose

UNCOVER
NO PKG 11P-5A
(NIGHTLY)

R2-1(35)

PENMAR GOLF COURSE

Avenue

LINE
MIDDLE LEFT

UNCOVER
R81(CA)

R/C

80'
10' 30' 30' 10'

8' 11' 10' 11' 8'

6"W 4"W

95'

REMOVE
W11-1
W16-1

20'

82'

486.8'

50'

78'

18'

14'

182.2'

12'

15'

60'

6"x4', 8' GAP

200'

100'

CONT'D FROM
MATCH

RESIDENTIAL(R)

Courtland Ave.

CR=25'

12' 18' 18' 12'
60'

UNCOVER
R81(CA)
CR=25'
R1-1

RESIDENTIAL(F)

RESIDENTIAL(F)

RESIDENTIAL(F)

RESIDENTIAL(F)

Penmar

35'

25'

REMOVE
W11-1
W16-1

UNCOVER
R81(CA)
CR=25'
R1-1

NO PKG 11P-5A
(NIGHTLY)

NO PKG 11P-5A
(NIGHTLY)

Ave.

MATCH
CONT'D AT

TOP RIGHT LINE

PENMAR GOLF COURSE
PKG LOT AND COFFEE SHOP

PENMAR GOLF COURSE

PENMAR GOLF COURSE

PENMAR GOLF COURSE

LINE
LOWER LEFT

Rose

Avenue

UNCOVER
NO PKG 11P-5A
(NIGHTLY)

REMOVE
W11-1
W16-1

REMOVE
W20-1

NO PKG 11P-5A
(NIGHTLY)

JOIN

60'

12'

15'

288.8'

R2-1(35)

REMOVE
R81(CA)
R81A(CA)

REMOVE
G20-2

NO PKG 11P-5A
(NIGHTLY)

NO PKG 11P-5A
(NIGHTLY)

CONT'D FROM
MATCH

PENMAR RECREATION CENTER

PENMAR RECREATION CENTER

PENMAR RECREATION CENTER

MATCH
CONT'D AT

MIDDLE RIGHT LINE

Glenavon Ave.

NO PKG VEHICLES
OVER 6' HIGH

R1-1

CR=10'

R81(CA)

W53(CA)

CR=25'

R2-4(25)(CA)

R2-1(35)

RESIDENTIAL(F)

RESIDENTIAL(F)

Ave.

R81(CA)
R81A(CA)
CR=30'

R5-2(6K)

CR=25'

6"x4', 8' GAP

100'

60' GAP

105' TAPER @ 21:1

SW44 (LT)(CA)
OM1-3

R2-4(25)(CA)
R81(CA)

NO PKG 11P-5A
(NIGHTLY)

R81(CA)
R81B(CA)
CR=30'
R5-2(6K)

R2-1(25)

Walgrove

E.O.P.

RESIDENTIAL(F)

RESIDENTIAL(F)

RESIDENTIAL(F)

RESTORATION SIGNING AND STRIPING
PENMAR WATER QUALITY IMPROVEMENT PROJECT – PHASE 1
W.O. EW40019F

PD-2

REVIEWED	RECOMMENDED	ACCEPTED
May 28 20 09	20	May 28 20 09
Transportation Engineer	Senior Transportation Engineer	for Principal Transportation Engineer

INSTALLATION DATES

MARKOUT BEGAN: _____

MARKOUT COMPLETED: _____

STRIPING COMPLETED: _____

References:
A-4560.dwg
Field Check

CITY OF LOS ANGELES
DEPARTMENT OF TRANSPORTATION
RITA L. ROBINSON, GENERAL MANAGER

ROSE AVENUE
LINCOLN BLVD. TO WALGROVE AVE.

Thomas Guide	District	PROJECT NO.	DRAWING NO.	
671-J4	W		D-0111	10/10

DATE / BY / REVISION DESCRIPTION / NO.

PRINCIPAL T.E. / T.E./SR. T.E. / SUPERVISOR / DISTRICT / SIGNALS

BASE / CHECK / DESIGN

PLAN PREPARED BY:

NAME _____ DATE 5/29/09

FPL FPL and Associates, Inc.
Traffic • Transportation • Civil • CAD
10 Corporate Park, Suite 310
Irvine, California 92606
(949) 252-1688

REGISTERED PROFESSIONAL ENGINEER
ALEXANDER D. ZUPANSKI
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CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ALEXANDER D. ZUPANSKI
No. TR 2400
Exp. 06-30-09
TRAFFIC
STATE OF CALIFORNIA

SCALE: 1"=40'

CONSULTANT BUSINESS TAX REGISTRATION NUMBER : 217989-0001-1

1"=20' ORIGINAL MAP SCALE 1"=40'

20 10 0 20 40 60 80 100 FEET
40 20 0 40 80 120 160 200 FEET

SCALES HORIZ. 1"=40' VERT. 1"=

SHEET ~~106~~ 58 **OF** ~~108~~ 60

INDEX NUMBER

City of Los Angeles
Department of Building and Safety

Current Version 1

Grading Pre-Inspection Report

Address: **1216 E ROSE AVE**
Council District: **11** Permit Application: **09030-10000-02964**

Work Description:
CONSTRUCT 185' DIA X 20' 0" DEEP UNDERGROUND RESEVOIR AND 10' DIA. x 28' 0" DEEP UNDERGROUND PUMPS TATION. EXCAVATION AND GRADING OF APPROXIMATELY 33,000 C.Y. AND 19,000 C.Y. OF EXPORT.

Inspector/Telephone: **AL GAMBLE, (310) 914-3935**
Inspection District: **WLA**
Inspection Date: **07/15/2009**

Property Posted: **Yes** Posting Date: **7-13-09** Posting Fees Paid? **Yes**
Tract: **RANCHO LA BALLONA** Block: Lot(s): **LT 4 EROLINDA C DE YORBA 9.9222 ACRE**

Approved Graded Lot: **No**	Bearing Value:
Fill Over 100 Feet: **No**	Buttress Fill: **No**
Slope of Surface: **Descending**	Natural Soil Classification 1804.2: **PER SOIL REPORT**
	Cut: degrees Height: ft in
Fill: degrees Height: ft in	
Natural: **3** degrees Height: **3ft** in	Slide Area: **No**
Sewer Available: **Yes**	PSDS Sized Per Code:
Site is **Above** Street	Roof Gutters: **No**
Condition of Street for Drainage Purposes	Recommended Termination of Drainage
Driveway Grade: **% - Existing**	Maximum Rough Grade Allowed: **%**

	GRADING APPROVAL TO ISSUE PERMIT(S)
	OK TO ISSUE. SEE BELOW FOR COMMENTS.
X	DO NOT ISSUE UNTIL BELOW REQUIREMENTS HAVE BEEN SATISFIED.

X	1. A grading permit is required for excavation and backfill.
	2. A retaining wall permit is required. .
X	3. OSHA permit required for vertical cuts 5 feet or over.
	4. All footings shall be founded in undisturbed natural soil per Code.
	5. Design for expansive soil or submit a soils report to the grading division per information bulletin P/BC 2008-116 and 91.1805.8.
	6. In the event excavations reveal unfavorable conditions, the services of a soils engineer and/or geologist may be required.
X	7. Soils report(s) are required. Submit three copies (1 original and 2 copies), with appropriate fees, to the Grading Section for review and approval.
X	8. Incorporate all recommendations of the approved Soils report(s) and Department letters dated TO COME into the plans. Soils Engineer to sign plans.
	9. Site is subject to mudflow. Comply with provisions of Section 91.7014.3. Geological and soils report required.
	10. Buildings shall be located clear of the toe of all slopes which exceed a gradient of 3 horizontal to 1 vertical as per Section 91.1805.3.1.
	11. Footings shall be set back from the descending slope surface exceeding 3 horizontal to 1 vertical as per Section 91.1805.3.7.
	12. Swimming pools and spas shall be set back from descending and ascending slopes as per Section 91.1805.3.3.
	13. Department approval is required for construction of on or over slopes steeper than 2 horizontal to 1 vertical.
X	14. Provide complete details of engineered temporary shoring or slot cutting procedures on plans. Call for inspection before excavation begins.
X	15. All concentrated drainage, including roof water, shall be conducted, via gravity, to the street or an approved location at a 2% minimum. Drainage to be shown on the plans.
	16. A Registered Deputy Inspector is required.
X	17. All fill or backfill shall be compacted by mechanical means to a minimum 90% relative compaction as determined by ASTM method D-1557. Subdrains shall be provided where required by Code.
X	18. Specify on the plans: "The soils engineer is to approve the key or bottom and leave a certificate on the site for the grading inspector. The grading inspector is to be notified before any grading begins and, for bottom inspection, before fill is placed. Fill may not be placed without approval of the grading inspector."
	19. Existing non-conforming slopes shall be cut back at 2:1 (26 degrees) or retained. All concentrated drainage, including roof water, shall be conducted, via gravity, to the street or an approved location at a 2% minimum. Drainage to be shown on the plans.
	20. All cut or fill slopes shall be no steeper the 2:1 (26 degrees).
	21. Stake and flag the property lines in accordance with a licensed survey map. .
	22. Approval required by the Department for .
	23. Approval required by the Department of Public Works, Urban Forestry Division, for native tree protected ORD. 177,040. Phone # (213) 847-3077
	24. This is a preliminary pre-inspection only - base on limited information. When complete plans (and possibly calculations and/or required reports) are submitted for a permit, a new pre-inspection and fee will be required.

** Additional requirements: **IMPORT-EXPORT HEARING REQUIRED. COMPACTION REPORT REQUIRED.**

Construction of new occupied buildings or major additions to buildings on sites located in any of the Seismic Hazard Zones (liquefaction, Landslide or Alquist-Priolo Fault Zone) will require a geology and/or soil engineering report. For questions call (213) 482-0480.

Field form completed by **AL GAMBLE**

Signature _____ **Date** __/__/____

Back to Pre-Inspection Work List

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

BOARD OF BUILDING AND SAFETY COMMISSIONERS
MARSHA L. BROWN, PRESIDENT
VAN AMBATIELOS, VICE-PRESIDENT
VICTOR H. CUEVAS
HELENA JUBANY
ELENORE A. WILLIAMS

CITY OF LOS ANGELES
CALIFORNIA

ANTONIO R. VILLARAIGOSA
MAYOR

DEPARTMENT OF BUILDING AND SAFETY
201 NORTH FIGUEROA STREET
LOS ANGELES, CA 90012

ANDREW A. ADELMAN, P.E.
GENERAL MANAGER

RAYMOND CHAN
EXECUTIVE OFFICER

GEOLOGY AND SOILS REPORT APPROVAL LETTER

September 4, 2009

Log # 67666-01
SOILS/GEOLOGY FILE - 2

City of Los Angeles
1149 S. Broadway, 6th Floor
Los Angeles, CA 90015

TRACT: Rancho La Ballona (MR 17-77/79)
LOT: PT. Lot. 4
LOCATION: 1216 E. Rose Avenue

CURRENT REFERENCE REPORT/LETTER(S)	REPORT NO.	DATE(S) OF DOCUMENT	PREPARED BY
Supplement	207328001	08/11/2009	Ninyo & Moore
Response Report	"	08/10/2009	"

PREVIOUS REFERENCE REPORT/LETTER(S)	REPORT NO.	DATE(S) OF DOCUMENT	PREPARED BY
Department Correction Letter	Log # 67666	05/28/2009	LADBS
Geology/Soil Report	207328001	06/13/2008	Ninyo & Moore

The referenced reports containing geotechnical recommendations for the Penmar Water Quality Improvement Project, have been reviewed by the Grading Division of the Department of Building and Safety. Exploration performed indicates that the artificial fill thickness overlying the naturally-occurring alluvium varies, from about 3 feet to a maximum observed thickness of about 15 feet. The depth to groundwater is about 20 to 25 feet below ground surface (bgs), but is anticipated to be present at depths as shallow as 10 feet bgs. New structures, will include: a diversion structure; pump station; underground reservoir; and underground force main piping. Per pg. 2 of the 06/13/2008 report, temporary shoring, construction de-watering, related settlement monitoring and grading should be anticipated as part of the Phase 1 Design Elements. As stated, static settlement induced by the proposed structures are anticipated to be negligible. The reports are acceptable, provided the following conditions are complied with:

1. Final plans shall include but not be limited to: a detailed construction plan and scaled cross-sectional details; shoring details as to how lateral support to the public way or any adjacent structures will be maintained during construction; location of well points etc., to facilitate construction de-watering.
2. A grading permit shall be obtained.
3. Dewatering shall be performed under the direction of the consultants, prior to excavation.
4. Prior to excavation, an initial inspection shall be called at which time sequence of construction de-watering, shoring, protection fences and dust and traffic control will be scheduled.

5. The geologist and soils engineer shall review and approve the detailed plans prior to issuance of any permits. This approval shall be by signature on the plans which clearly indicates that the geologist and soils engineer have reviewed the plans prepared by the design engineer and that the plans include the recommendations contained in their reports.
6. A copy of the subject and appropriate referenced reports and this approval letter shall be attached to the District Office and field set of plans. Submit one copy of the above reports to the Building Department Plan Checker prior to issuance of the permit.
7. All recommendations of the reports which are in addition to or more restrictive than the conditions contained herein shall be incorporated into the plans.
8. The applicant is advised that the approval of this report does not waive the requirements for excavations contained in the State Construction Safety Orders enforced by the State Division of Industrial Safety.
9. Braced and cantilevered shoring shall be designed for a minimum EFP as specified on Figure 2 and 3, respectively, of the report dated 08/11/2009 and all surcharge loads shall be included into the final design.
10. Retaining walls up to a maximum height of 35 feet with a level backslope shall be designed for a minimum equivalent fluid pressure as recommended on Fig. 7 of the report dated 06/13/2008, and all hydrostatic, dynamic and surcharge pressures shall be included into the final design. All basement retaining walls shall be designed for at-rest pressure.
11. The underground reservoir and pump station shall be designed: (i) to be supported on a mat foundation, as recommended; (ii) shall incorporate provisions for anticipated differential settlements in excess of one-fourth inch; and (iii) shall be designed for uplift, as recommended.
12. Structures (other than the underground reservoir and pump station), may be constructed "at-grade" provided they are not sensitive to seismically-induced settlement.
13. Shoring shall be designed for a maximum lateral deflection of 0.5 inches, as recommended.
14. A program for shoring monitoring shall be included as part of the final plans and shall be implemented to the satisfaction of the soils engineer.
15. The soils engineer shall review and approve the shoring plans prior to issuance of the permit.
16. The installation and testing of tie-back anchors shall comply with the recommendations included in the report or the standard sheets titled "Requirement for Tie-back Earth Anchors", whatever is more restrictive.
17. Installation of shoring and settlement monitoring related to construction, shall be performed under the inspection and approval of the soils engineer and/or the deputy grading inspector responsible to the soils engineer.
18. All friction pile or caisson drilling and installation shall be performed under the continuous inspection and approval of the soils engineer.
19. The geologist and soils engineer shall inspect all excavations to determine that conditions anticipated in the report have been encountered and to provide recommendations for the correction of hazards found during grading.
20. Existing uncertified fill shall not be used for support of foundations, concrete slabs or new fill.
21. As recommended, all foundations shall bear entirely on competent naturally-occurring alluvium or shall bear

entirely on newly-placed certified compacted fill placed on competent naturally-occurring alluvium, but not both.

22. Compacted fill shall extend beyond the foundations a minimum distance equal to the depth of the fill below the bottom of the foundations or a minimum of 5 feet whichever is greater, as recommended.
23. Slabs placed on approved compacted fill shall be at least 3½ inches thick and shall be reinforced with ½-inch diameter (#4) reinforcing bars spaced maximum of 16 inches on center each way. Concrete floor slabs placed on expansive soil shall be placed on a 4-inch fill of coarse aggregate or on a moisture barrier membrane. The slabs shall be at least 3½ inches thick and shall be reinforced with ½-inch diameter (#4) reinforcing bars spaced maximum of 16 inches on center each way.
24. The seismic design shall be based on the site Class "D" as recommended. All other seismic design parameters shall be reviewed by LADBS building plan check.
25. All man-made fill shall be compacted to a minimum 90 percent of the maximum dry density of the fill material per the latest version of ASTM D 1557. Where cohesionless soil having less than 15 percent finer than 0.005 millimeters is used for fill, it shall be compacted to a minimum of 95 percent relative compaction based on maximum dry density (D1556). Placement of gravel in lieu of compacted fill is allowed only if complying with Section 91.7011.3 of the Code.
26. Prior to the placing of compacted fill, a representative of the consulting soils engineer shall inspect and approve the bottom excavations. He shall post a notice on the job site for the LADBS Grading Inspector and the Contractor stating that the soil inspected meets the conditions of the report, but that no fill shall be placed until the LADBS Grading Inspector has also inspected and approved the bottom excavations. A written certification to this effect shall be filed in the final compaction report filed with the Grading Division of the Department. All fill shall be placed under the inspection and approval of the soils engineer. A compaction report together with the approved soil report and Department approval letter shall be submitted to the Grading Division of the Department upon completion of the compaction. The engineer's certificate of compliance shall include the grading permit number and the legal description as described in the permit.
27. Prior to the pouring of concrete, a representative of the consulting soils engineer shall inspect and approve the foundation excavations. He shall post a notice on the job site for the LADBS Building Inspector and the Contractor stating that the work so inspected meets the conditions of the report, but that no concrete shall be poured until the LADBS Building Inspector has also inspected and approved the foundation excavations. A written certification to this effect shall be filed with the Department upon completion of the work.

STEPHEN DAWSON
Engineering Geologist II

ANDRZEJ T. SZPIKOWSKI
Geotechnical Engineer II

Log # 67666-01
(213) 482-0480

c: John Biggs - Brown & Caldwell (Applicant)
Ninyo & Moore
WLA District Office

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation
Los Angeles, California

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS • BUREAU OF ENGINEERING

LA DPW ENGINEERING Serving the Present, Shaping the Future

GARY LEE MOORE, P.E. CITY ENGINEER
DATE:
LIC. NO. 28095

ENGINEER:	DESIGN GROUP
DESIGNED BY:	DOUGLAS B. McCARTNEY
DRAWN BY:	DENNIS SIMONSON
CHECKED BY:	DENNIS SIMONSON
APPROVED BY:	DOUGLAS B. ROBISON
	ROBERT FINN

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: GRADING PRE-INSPECTION AND SOILS REPORTS
PROJECT: AMENDMENT A, PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I
ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA. 90291

DATE: BY: NO. REVISIONS:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER ROBERT MARTIN FINN No. C25565 12-31-10 CIVIL STATE OF CALIFORNIA

WORK ORDER NO. EW40019F
DRAWING NO. R-9
SHEET ~~107~~ 59 OF ~~108~~ 60 SHEETS

Sheet Version 2.0
$FILE$ $DATE$ $TIME$

Los Angeles Regional Uniform Code Program

STRUCTURAL OBSERVATION REPORT FORM

STRUCTURAL OBSERVATION *means the visual observation of the structural system, for general conformance to the approved plans and specifications, at significant construction stages and at completion of the structural system. Structural observation does not include or waive the responsibility for the inspections required by Section 108, 1701 or other sections of the code.*

Report No. _____

This report includes all construction work through _____ day of _____, 20__ Page No. ____ of ____

Project Address: 1216 E Rose Ave		Structural Observer of Record (SOR):	Phone No. of SOR:
Building Permit No.: 09020-10000-01485	Structural Observation performed by:	Professional Lic./Reg. No. of Observer:	Phone No. of Observer:

OBSERVED STRUCTURAL ELEMENTS AND THEIR CONNECTIONS

FOUNDATION	WALL	FRAMES	FLOOR	ELEMENTS/ CONNECTION OBSERVATION LOCATION
☐ Footing, Stem Walls,	☐ Concrete	☐ Steel Moment Frame	☐ Concrete	
☐ Mat Foundation	☐ Masonry	☐ Steel Braced Frame	☐ Steel Deck	
☐ Caisson, Piles, Grade Beams	☐ Wood	☐ Concrete Moment Frame	☐ Wood	
☐ Retaining Foundation Hillside Special Anchors	☐ Others:	☐ Masonry Wall Frame	☐ Others:	
☐ Others:		☐ Others:		

NOTED DEFICIENCIES with the proposed corresponding corrective actions with respect to general conformance with the approved plans or in the load path: (*A final report by the structural observer which states that all observed deficiencies have been resolved is required before acceptance of the work by the building officials.*)

I DECLARE THAT THE FOLLOWING STATEMENTS ARE TRUE TO THE BEST OF MY KNOWLEDGE:

1. **I AM THE ENGINEER OR ARCHITECT RETAINED BY THE OWNER TO BE IN RESPONSIBLE CHARGE FOR THE STRUCTURAL OBSERVATION IN ACCORDANCE WITH THE REQUIREMENTS OF THE CITY OF LOS ANGELES.**
2. **I, OR ANOTHER ENGINEER OR ARCHITECT WHO I HAVE DESIGNATED ABOVE AND IS UNDER MY RESPONSIBLE CHARGE, HAS PERFORMED THE REQUIRED SITE VISITS AT EACH SIGNIFICANT CONSTRUCTION STAGE TO VERIFY IF THE STRUCTURE IS IN GENERAL CONFORMANCE WITH APPROVED PLANS AND SPECIFICATIONS;**
3. **ALL NOTED DEFICIENCIES WHICH REMAIN TO BE CORRECTED HAVE BEEN INDICATED ABOVE;**
4. **I RECOMMEND THAT ACCEPTANCE OF THE STRUCTURAL SYSTEMS BY THE CITY OF LOS ANGELES BE WITHHELD UNTIL ALL OBSERVED DEFICIENCIES ARE CORRECTED.**

SIGNATURE OF STRUCTURAL OBSERVER DATE STAMP OF STRUCTURAL OBSERVER)

INFform.08 (Part 1) (Rev. 1/1/2007) www.ladbs.org

Los Angeles Regional Uniform Code Program

Committee I-3: Structural Observation

STRUCTURAL OBSERVATION PROGRAM AND DESIGNATION OF THE STRUCTURAL OBSERVER

PROJECT ADDRESS: 1216 E Rose Ave PERMIT APPL. NO.: 09020-10000-01485

Description of Work: Construct 185' DIA X 20' Deep Underground Reservior

Owner: City of Los Angeles, BOE Architect: None Engineer: Jerry Simon / Robert Finn

STRUCTURAL OBSERVATION
(only checked items are required)

Firm or Individual to be responsible for the Structural Observation:

Name: Brown and Caldwell (Jerry Simon) Phone: (714) 730-7600 Calif. Registration: 68080

FOUNDATION	WALL	FRAME	DIAPHRAGM
☐ Footing, Stem Walls, Piers	☑ Concrete	☐ Steel Moment Frame	☐ Concrete
☑ Mat Foundation	☐ Masonry	☐ Steel Braced Frame	☐ Steel Deck
☐ Caisson, Piles, Grade Beams	☐ Wood	☐ Concrete Moment Frame	☐ Wood
☐ Stepp g/Retain g Foundation, Hillside Special Anchors	☐ Others:	☐ Masonry Wall Frame	☐ Others:
☐ Others:		☐ Others:	

DECLARATION BY OWNER

I, the Owner of the project, declare that the above listed firm or individual is hired **by me** to be the Structural Observer.

Signature Date

DECLARATION BY ARCHITECT OR ENGINEER OF RECORD (required if the Structural Observer is different from the Architect or Engineer of Record)

I, the Architect or Engineer of record for the project, declare that the above listed firm or individual is designated by me to be responsible for the Structural Observation.

Signature License No. Date

INFform.08 (Part 2) (Rev. 1/1/2007) www.ladbs.org

REVISION DATES (DESIGN STAGE ONLY)
12.09.02

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

Sheet Version 2.0

$FILE$ $DATE$ $TIME$

BROWN AND CALDWELL
LOS ANGELES, CALIFORNIA

BLACK & VEATCH Corporation
Los Angeles, California

CITY OF LOS ANGELES • DEPARTMENT OF PUBLIC WORKS • BUREAU OF ENGINEERING

LA DPW ENGINEERING Serving the Public Designing THE Future

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO.

INDEX NO.

REGISTERED PROFESSIONAL ENGINEER MARTIN FINN NO. 025565 CIVIL STATE OF CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP

ENGINEER:	DOUGLAS B. McCARTNEY	LIC. NO. 28095
DESIGNED BY:	DENNIS SIMONSON	
DRAWN BY:	DENNIS SIMONSON	
CHECKED BY:	DOUGLAS B. ROBISON	
APPROVED BY:	ROBERT FINN	

VERTICAL CONTROL: NGVD29, 1985 ADJ
HORIZONTAL CONTROL: NAD83, EPOCH 1991.5

SHEET TITLE: STRUCUTURAL OBSERVATION REPORT

PROJECT: AMENDMENT A PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I

ADDRESS: 1216 E. ROSE AVENUE LOS ANGELES, CA 90291

WORK ORDER NO. EW40019F

DRAWING NO. R-10

SHEET ~~100~~ 60 OF ~~100~~ 60 SHEETS

BUREAU OF ENGINEERING

PENMAR WATER QUALITY IMPROVEMENT PROJECT
PHASE I
WORK ORDER NO. EW40019F

MASTER
GENERAL CONDITIONS
GENERAL REQUIREMENTS
TECHNICAL SPECIFICATIONS
APPENDIX A - GEOTECHNICAL REPORTS
APPENDIX B – STANDARD DRAWINGS
APPENDIX C – PERMITS AND APPROVALS

Proposition O – Clean Water Bond Program

City of Los Angeles
California

Department of Public Works
Bureau of Engineering

ENGINEERING
SERVING THE PRESENT; DESIGNING FOR THE FUTURE

Bureau of Engineering
Department of Public Works
City of Los Angeles

Penmar Water Quality Improvement Project, Phase 1

Specifications
Draft Table of Contents

March 2009

Division 00 — General Conditions

GENERAL CONDITIONS
TABLE OF CONTENTS

00100 DEFINITIONS (9/18/07)

Unless otherwise stated, the words "directed, required, permitted, ordered, instructed, designated, considered necessary, prescribed, approved, acceptable, satisfactory," or words of like meaning, refer to actions, statements, judgments, conclusions, and decisions within the responsibility of the Engineer or the Inspector.

Addenda: Written documents issued during the Bidding Period which modify, supersede, or supplement the original Contract Documents.

Additions and Amendments to the Standard Specifications for Public Works Construction (SSPWC): Also known as the “Brownbook”. Previous editions of the document were titled Standard Plan S-610.

“as shown”, “as indicated”, or “as specified”: These words are understood to be followed by the phrase "in the Contract Documents."

Bid: The offer of the Bidder submitted on the prescribed forms setting forth the price(s) for the Work.

Bid Proposal: The notice that informs prospective Bidders of the opportunity to submit a Bid, bidding procedures and other requirements.

Bid Guaranty: The certified check or Bidder’s Surety Bond accompanying the Bid as a guaranty that the Bidder will enter into a contract with the Board for the performance of the Work.

Bidder: The person or persons, partnership, firm or corporation submitting a Bid or proposal for the Work defined in the Contract Documents.

Bidding Period: The time period allocated to the Bidder to enable preparation of a Bid.

Board: The Board of Public Works, of the City of Los Angeles.

Bond: Bid bond, performance and payment bond or other instrument of security.

“Brownbook”: City of Los Angeles, Department of Public Works, Additions and Amendments to the SSPWC.

Calendar day: All days beginning with the date specified in the Notice to Proceed, and ending with the date the City issues the Statement of Completion.

Change Order: A written order to the Contractor signed by the Engineer directing an addition, deletion or revision in the Work, or an adjustment in the Contract Price or time which is issued after the effective date of the Contract and effects less modification than is effected by a Supplemental Agreement. A Change Order may or may not also be signed by the Contractor.

County Sealer: The Director of Weights & Measures of the County of Los Angeles.

City: The City of Los Angeles, a municipal corporation.

Claim: A written demand or assertion by one of the parties seeking, as a matter of right, an interpretation of the Contract Documents, payment of money, extension of time or other relief. The party asserting the Claim must set forth the facts and circumstances for which the other party is responsible.

Code: Codes of the State of California as well as any other Federal or local law, statute, ordinance, rule or regulation.

Contract: The agreement between the City and the Contractor for the Work described in the Contract Documents.

Contract Documents: Includes, but is not limited to, the Notice Inviting Bids, Bid Proposal, Notice(s) to Bidders, Contractor's Bid, Performance bond, Payment bond, General and Supplementary Conditions, Special Provisions, General Requirements, Federal and State Requirements, Standard and Reference Specifications, Technical and Nontechnical Specifications, Geotechnical Baseline Report, Geotechnical Design Summary Report, Soil Reports and Subsurface Investigation Reports, Standard Plans, Plans, Summary of First Notice Replies, and Addenda, Plan Clarifications, Request for Information, Supplemental Agreements, Change Orders issued after Contract award and other documents designated by the Engineer.

Contract Price: The total amount of money for which the Contract is awarded.

Contract Unit Price: The amount stated in the Bid for a single unit of an item of Work.

Contractor: A person or persons, partnership, firm or corporation licensed by the State of California as a general contractor. The terms "Prime Contractor" and Contractor are synonymous.

Contractor's Representative: A representative of the Contractor present at the site to supervise, organize, coordinate and direct daily construction activities and who is authorized to receive and fulfill instructions from the Engineer or Inspector.

"days": Consecutive calendar days unless otherwise specifically stated.

Drawings: See Plans.

"easement": Permission to access or utilize property not owned by the City.

Engineer: The City Engineer, head of the Bureau of Engineering, or an authorized representative.

Equal: See "or equal".

Final Field Acceptance: Verification by the Final Inspector that all physical corrections required by the Final Inspection Correction List have been completed. This verification will be evidenced by issuance of a Statement of Completion, which will establish the date of the completion of the Work.

GBR: See Geotechnical Baseline Report.

GDR: See Geotechnical Data Report.

General Conditions: Instructions to the Contractor setting forth its responsibilities and the City's responsibilities for proper execution of the Work indicated herein.

General Requirements: Division 1 of the Specifications.

Geotechnical Baseline Report: This report establishing the baselines for geotechnical conditions anticipated to be encountered during underground and subsurface construction. This report establishes the basis for identification of changed site/ground conditions.

Geotechnical Data Report: This report contains factual information gathered during exploration and design. It may include logs of exploratory borings, laboratory test data, and geologic, seismic or environmental data.

“Greenbook”: Standard Specifications for Public Works Construction (SSPWC) published by Public Works Standards, Inc, latest edition.

“holiday”: In reference to days, the holidays and dates as observed by the City. A list of such holidays is available from the Board office.

Illegal Subcontractor Substitution: Anyone other than the Bid-listed or approved subcontractor(s) performing any portion of the Work designated to be performed by said subcontractor without prior approval of the Inspector.

“immediately notify”: The obligation to cause verbal notification of Engineer and Inspector of some condition or event as soon as possible upon discovery or knowledge of the condition or event and in all instances, no more than two (2) hours.

Inspector: The Inspector of Public Works, (Director of the Bureau of Contract Administration), or an authorized representative designated by the Bureau of Contract Administration.

“jobsite”: The area upon or in which the Contractor’s operations are carried on and such other areas adjacent thereto as may be designated as such by the Contract Documents.

“law”: Any Federal, State or local law, statute, ordinance, rule, regulation or Code.

“liquidated damages”: The amount the Contractor shall pay to the City, as determined by rates and amounts as fixed in the Contract Documents, due to the Contractor’s failure to complete the Work within the time specified.

“non-conforming work”: Unapproved construction, defective work or damaged materials that does not fully comply with the Contract Documents.

Notice of Award: The written notice by the City to the successful Bidder stating that upon compliance by the successful Bidder of required conditions, the City will execute the Contract.

Notice to Proceed: The written notice by the City to the successful Bidder stating that the Work or portions of the Work shall commence.

Notice to Withhold: The written notice by the City to the Contractor advising that certain payments shall be withheld due to unacceptable execution of the Work by the Contractor.

“or equal”: In reference to products, equipment, or materials proposed by the Contractor for use in the Work.

Partial Acceptance: Any portion of the Work that has been completed in accordance with the plans and specifications and has been accepted in writing by the Inspector ("Statement of Partial Completion" form).

"person": Any individual, firm, association, partnership, corporation, trust, joint venture, or other legal entity.

Plans: The drawings, profiles, cross sections, shop drawings, and supplemental drawings, or reproductions thereof, issued or approved by the Engineer, which show the location, character, dimensions or details of the Work.

Private Contract: Work subject to City inspection, control, and approval, involving private funds, not administered by the City.

Project: The Work and/or construction operations executed through the performance of this Contract.

Project Manual: See Contract Documents.

Protest: See Claim.

Reference Specifications: Those bulletins, standards, rules, methods of analysis or test, codes, and specifications of other agencies, engineering societies, or industrial associations referred to in the Contract Documents. These refer to the edition, including amendments in effect and published at the time of advertising the project, adopted by the Board, if applicable, unless specifically referred to by edition, volume, or date.

"right of entry": Written permission from an owner of a facility or property to access the facility or property for a specific purpose.

Special Provisions: Any provision which supplements or modifies the Specifications.

Specifications: Written requirements describing the commercial, legal, technical and nontechnical aspects of the project. Specifications include but are not limited to Terms, Provisions, General Conditions, General Requirements, Technical Specifications, Equipment Schedules, and all revisions made to the specifications in Addenda, and Change Orders.

Standard Plans or "Std. Plan": Details of standard structures, devices or instructions referred to on the Plans or in the Specifications by title or number.

State: The State of California.

Statement of Completion: A form issued by the Bureau of Contract Administration following Final Inspection and upon completion of all physical corrections required by the Final Inspection Correction List. This shall signify the acceptance of all field work and establish the date of completion of the Work.

Statement of Partial Completion: A form issued by the Bureau of Contract Administration following Partial Final Inspection and upon completion of all physical corrections required by the Partial Final Inspection Correction List. This shall signify the acceptance of a specific portion, or portions, of the Work to be so utilized or otherwise placed into service.

Subcontractor: Any individual, firm, or corporation, other than an employee of the Contractor, having a direct contract with the Contractor or with any other subcontractor for the performance of the Work. A Subcontractor is a contractor who is licensed pursuant to California Business and Professions Code, Section 7000 et. seq. A Subcontractor does not have any direct contract with the City related to the project.

Subcontractor Substitution: Anyone other than the Bid-listed or approved subcontractor(s), including the Contractor, performing any portion of the Work designated to be performed by said subcontractor.

Sub-subcontractor: A "Sub-Subcontractor" is a Subcontractor, within the definition of that term, who has a contract with a Subcontractor and has no Contract with the City related to the project.

Supervision: With reference to supervision by the Engineer, the performance of obligations, and the exercise of rights, specifically imposed upon and granted to the City in becoming a party to the Contract. Except as specifically stated herein, supervision by the City shall not mean active and direct superintendence of details of the Work.

Supplemental Agreement: A written amendment of the Contract Documents, signed by the Contractor and City.

Supplier: An individual, organization, or firm who may not be required for the purposes of the Work to be licensed pursuant to California Business and Professions Code as a contractor, or subcontractor, within the meanings of those terms as defined herein above, who provides equipment and/or materials for the Work, to the Contractor, a Subcontractor, or a Sub-Subcontractor, including that fabricated to a special design, but who does not perform labor at the site except for labor or labor supervision required by some manufacturers as part of their equipment installation for warranty or other purposes. The term "supplier" also includes fabricator, manufacturer, or vendor.

Surety: Any individual, firm or corporation bound with and for the Contractor for the acceptable performance, execution and completion of the Work, and for the satisfaction of all obligations incurred.

Unauthorized Subcontractor Substitution: Any reduction, increase, or other change to any Subcontractor dollar amount without written approval by the Inspector.

Unavoidable Delay: Delay arising from causes beyond the control and without the fault or negligence of the Contractor and its Subcontractors at all tiers, and solely due to acts of God, acts of government in its sovereign capacity, riots, insurrections, wars, fires, floods, earthquakes, tidal waves, epidemics, quarantine restrictions, industry-wide strikes, freight embargoes, or unusually severe weather.

Work: Includes all material, labor, utility services, tools, expendable equipment, and all appliances, machinery, transportation, appurtenances and specified services necessary to perform and complete the Contract; and such additional items not specifically indicated or described that can be reasonably inferred as belonging to the item described or indicated and as required by good practice to provide a complete and operable satisfactory system or structure. As used herein, "provide" shall be understood to mean "furnish and install, complete in place."

Workday: All days beginning with the date specified in the Notice to Proceed, and ending with the date the City issues the Statement of Completion, except for the following days:

A) Saturday,

B) Sunday,

C) any day designated as a holiday by the City,

D) any day designated as a holiday in a Master Labor Agreement binding the Contractor,

E) any day the Contractor is prevented from working for cause as established by "Unavoidable Delay" of these General Conditions; and

F) any day the Contractor is prevented from working during the first five (5) hours of the workday with at least sixty percent (60%) of the normal Work force for cause as established by "Unavoidable Delay" of these General Conditions.

Worksite: See "jobsite."

00101 THRU 00199 NOT USED

00200 SCOPE (10/17/01)

The work to be performed under this Contract shall consist of furnishing all tools, equipment, materials, supplies and manufactured articles, all transportation, services, including fuel, power and water, and essential communications, and the performance of all labor, Work, required calculations testing, inspections or operations, or operations required for the fulfillment of the Contract, in strict accordance with the specifications, schedules, and Plans, all of which are made a part hereof, and including such detail sketches as may be furnished by the Engineer from time to time during the construction in explanation of said Plans. The Work shall be complete and all material, and services incidentals, quality or not specifically called for quality and conditions noted, in the Specifications, or not shown on the Plans, which may be necessary for complete and proper construction to carry out the Contract in good faith and a satisfactory manner shall be performed, furnished, and installed by the Contractor at no increase in cost to the City.

00201 AUTHORITY OF THE BOARD, ENGINEER, AND INSPECTOR (5/2/02)

The Board has the final authority in all matters affecting the Work. The Contractor shall promptly comply with instructions from the Engineer or the Inspector.

The Engineer is authorized to require performance of the Work consistent with the meaning of the Plans and the Contract Documents. On all questions related to the interpretation of Plans or Specifications, the decision of the Engineer is final and binding. As authorized by the Board, the Engineer may issue Change Orders to increase, decrease or modify the scope of work.

The Inspector is authorized to enforce compliance with the Contract Documents, to determine the acceptability, quality and quantity of materials and workmanship, administer requirements with respect to subcontracts, and to prepare and process progress payment estimates. Unless otherwise ordered by the Board, the Inspector's determination of satisfactory performance is a condition precedent to payment under this Contract. For such matters, the decision of the Inspector is final and binding. In the event of a dispute between the Contractor and the Inspector, the latter is authorized to reject materials or suspend the Work until any questions at issue can be referred to and decided by the Board or, in engineering matters, by the Engineer.

The Inspector is authorized to sample and test all materials to be incorporated into the Work. The Inspector may delegate this authority to sample materials and perform tests to the Department of General Services, Standards Division, or other approved agencies.

The Engineer may delegate street lighting matters to the Director of the Bureau of Street Lighting.

00202 INTENT OF CONTRACT DOCUMENTS (2/09/95)

The Contract Documents are complementary, and what is called for by one part shall be as binding as if called for by all. The intent of the Documents is to include all Work consistent therewith and reasonably inferable therefrom as being necessary for completion of the contract. Materials or Work described in words that indicate the proper execution and a well known technical or trade designation shall be held to refer to such recognized standards.

It is understood and agreed that the written terms and provisions of the Contract Documents represent the entire and integrated agreement between the parties hereto and supersede all prior negotiations, representations, or agreements, either written or oral. The Contract Documents shall not be construed to create any contractual relationship of any kind between the Engineer (or the Inspector) and the Contractor.

00203 NOT USED (9/18/07)

00204 PLANS AND SPECIFICATIONS (9/18/07)

As shown on the Plans or described in the Specifications, each element of the Work must be furnished complete, finished and functional. Whether shown or not, include all materials and ancillary equipment necessary to provide a complete installation. The Plans, Specifications and other Contract Documents are intended to be complementary and cooperative to describe and provide for a complete project. Anything in the Specifications and not on the Plans, or on the Plans and not in the Specifications, shall be as though shown or mentioned in both. Details shown for an item of Work are typical and shall apply to similar items of Work.

Do not deviate from the Plans and Specifications without written authorization from the Engineer.

The Engineer does not warrant the accuracy of scaled dimensions. Dimensions indicated by figures or numerals shall govern. Larger scale drawings shall take precedence over smaller scale drawings. Detailed drawings will take precedence over general drawings.

The Engineer may furnish additional details pertaining to the Work and the same shall be considered part of the Contract.

References made to other specifications and codes refer to the edition including amendments in effect and published at the time of advertising the project, unless specifically referred to by edition, volume, or date as noted in the Contract Documents.

00205 PRECEDENCE OF CONTRACT DOCUMENTS (9/18/07)

In resolving inconsistencies or ambiguities among two (2) or more components of the Contract Documents, the more stringent requirements shall prevail. The secondary priority will be based upon the precedence of the documents. The precedence shall be:

1. Permits from other agencies as may be required by law.

2. Bid Proposal

3. General Conditions

4. General Requirements

5. Technical Specifications

6. Plans

7. Geotechnical Baseline Report

8. Geotechnical Data Report

9. Brownbook

10. Greenbook

11. Standard Plans

12. Reference Specifications

13. Reference Plans

Supplemental Agreements, Change Orders, Engineer's written interpretations and clarifications, and Addenda, will take precedence over all other components of the Contract Documents.

00206 ACCURACY OF PLANS AND SPECIFICATIONS (12/6/01)

Omissions from the Plans and Specifications shall not relieve the Contractor from the responsibility of furnishing, making, or installing all items required by law or usually furnished, made, or installed in a project of the scope and character indicated by the Plans and Specifications.

The Plans show conditions as they are supposed or believed by the Engineer to exist, but it is not intended or to be inferred that the conditions as shown thereon constitute a representation or warranty, expressed or implied, by the City or its officers, that such conditions are actually existent, nor shall the City, or any of its officers, be liable for any loss sustained by the Contractor as a result of any variance between conditions as shown on the Plans, and the actual conditions revealed during progress of the Work or otherwise, except as indicated in "Differing Site Conditions" of these General Conditions.

00207 EXAMINATION OF COVERED WORK (12/6/01)

If any Work is covered without inspection, approval or consent of the Inspector, an examination may be required by the Inspector. The cost for uncovering the work, inspection, testing required by the Inspector, remedial work and restoring the work is at the Contractor's expense.

00208 UNNOTICED DEFECTS (10/17/01)

The Contractor is responsible for ensuring that all Work complies with the Contract Documents. Upon discovery, all defective or noncompliant Work must be immediately repaired or replaced by the Contractor. Failure by the Engineer or the Inspector to condemn or reject non-conforming Work shall not constitute acceptance or implied acceptance of such Work.

00209 CODES AND REGULATIONS (10/17/01)

The Contractor shall perform the Work in accordance with all applicable regulations, laws, and ordinances, even though such requirements may not be specifically mentioned in the Specifications or shown on the Plans.

It is not the responsibility of the Contractor to ensure that the Contract Documents comply with applicable laws, statutes, codes and regulations. If the Contractor believes that any part of the Contract Documents does not comply, the Contractor shall promptly notify the Engineer in writing. Do not proceed with those affected Work items until the Engineer issues written instructions to the Contractor.

If the Contractor proceeds with those Work items without written instruction from the Engineer, the Contractor will bear the costs and impacts of any corrective work.

00210 LENGTH OF WORKDAY AND WORK WEEK (9/18/07)

Eight (8) hours of labor shall constitute a calendar day's work for employees of the Contractor under this Contract. Said employees shall be paid not less than the prevailing wage rate for the first eight (8) hours work of each day.

Unless noted elsewhere in the Contract documents, a working day shall be Monday through Friday, and work shall be between 7:00 a.m. and 4:00 p.m., unless otherwise approved by the Engineer or the Board or revised by City Ordinance.

When work in excess of eight (8) hours per day, or forty (40) hours during any one (1) week is performed, wages for all hours over eight (8) hours in any day or over forty (40) hours during any one (1) week shall be paid at the prevailing wage rate, as required by City, state and federal requirements.

00211 PAYMENT OF EMPLOYEES (12/6/01)

The Contractor and each Subcontractor shall pay each employee engaged in Work on the project under this Contract in compliance with the Federal and State wage provisions indicated on the appropriate page of the Bid Proposal (General Instruction and Information for Bidders), and "Length of Workday and Work Week" of these General Conditions.

The certified payroll and the Statement of Compliance shall be submitted to the Inspector by the Contractor and all Subcontractors performing Work on the project, regardless of dollar amount or type of contract.

If there is a difference between the Federal and State minimum wage rates for similar classifications of labor, the Contractor and its Subcontractors shall pay not less than the higher wage rate. When the Contractor intends to use a craft or classification not shown on the general prevailing wage determinations, it will be required to pay the wage rate of that craft or classification most closely related to it as shown in the general prevailing wage determinations. In case of disagreement between the Contractor and the City, the Inspector shall make the final determination as to the prevailing wages for the Work.

00212 CONVICT-MADE MATERIALS (12/6/01)

Unless otherwise noted, no materials manufactured or produced in a penal or correctional institution shall be incorporated in the project under this Contract.

00213 SALES OR USE TAX / EXEMPTION FROM FEDERAL EXCISE TAX (10/17/01)

Purchases of materials and equipment which will be incorporated or installed permanently in the Work, or which will be used in the operation of the Contractor or Subcontractors, and not incorporated in the Work, are not exempt from City of Los Angeles and California State Sales or Use Taxes as applicable.

Purchase of materials and equipment which will be incorporated or installed permanently in the Work are exempt from Federal excise tax in effect at the time of purchase, as applicable. Prices included in the Contract amount shall reflect such exemptions. A Federal Tax Exemption Certificate will be furnished by the City, on request, as acknowledgment that materials and equipment for which exemption is requested by the Contractor, is valid where provided for the exclusive use of the City. Lists of exempt articles provided by the Contractor and Subcontractor shall be submitted to the City by the Contractor. Purchases of materials and equipment which will be used in the operations of the Contractor or Subcontractors and not incorporated in the Work are not exempt from excise tax.

00214 NONDISCRIMINATION IN EMPLOYMENT (10/17/01)

The Contractor shall comply with all of the provisions of the Los Angeles Administrative Code, Mandatory Provision Pertaining to Nondiscrimination in Employment.

The Contractor shall submit Monthly Ethnic Composition of Work Force Reports to the Inspector indicating the number of employees in the various work categories and ethnic groups and gender on forms furnished by the City.

Nondiscrimination Clause: "The Contractor shall not discriminate during the performance of this Contract against any employee or applicant for employment because of employee's or applicant's race, religion, national origin, ancestry, sex, age, sexual orientation or physical handicap." The Contractor shall include the same Nondiscrimination Clause in all subcontracts awarded under this Contract.

If conflicts exist between these provisions and the Federal Rules and Regulations governing the same, the more stringent requirements shall prevail.

00215 APPRENTICE UTILIZATION (4/12/95)

Any Contract awarded hereunder will require the Contractor to comply with the provisions of the California Labor Code relating to apprentice employment and training; and will require the Contractor to assume full responsibility for compliance with said section with respect to all Apprenticing Occupations involved in the Project. (Compliance with said Apprentice Utilization provisions of the Labor Code is not required for Public Works contracts involving less than $30,000 or less than twenty (20) Working days in duration).

00216 LAWS AND REGULATIONS (9/18/07)

The Contractor shall observe and comply with all Federal, State, and local laws, ordinances, Codes, orders, and regulations which in any manner affect those engaged or employed on the Work, the materials used in the Work, or the conduct of the Work. If any discrepancy or inconsistency should be discovered in this Contract in relation to any such law, ordinance, Code, order, or regulation, the Contractor shall report the same in writing to the Engineer. The Contractor shall indemnify and hold harmless the City, and its officers, agents, and employees, against all claims or liability arising from violation of any such law, ordinance, Code, order, or regulation, whether by itself or by its employees or Subcontractors as stated in these Contract Documents. Any particular law or regulation specified or referred to elsewhere in these specifications shall not in any way limit the obligation of the Contractor to comply with all other provisions of Federal, State, and local laws and regulations.

00217 PERMITS AND CONSTRUCTION EASEMENTS (9/18/07)

The Contractor shall obtain and pay for all permits necessary for performance of the Work. Within thirty (30) calendar days after the Notice to Proceed, the Contractor shall obtain and pay all costs incurred and submit to the Engineer copies of all permits required for the construction and installation of all Work called for on this project.

When the Bid Proposal provides an allowance for “Permits”, only certain types of permits and certain permit fees are reimbursable. The reimbursable permit must be exclusively for permanent Work shown on the Plans and reimbursement will be limited to the actual permit fee shown on the permit’s receipt. The allowance for “Permits” cannot be used for any other costs such as those necessary to physically obtain the permit. The allowance for “Permits” also cannot be used for contractor-designed items, annual permits, temporary construction, or general permits that are useable for other projects. The Contractor will only be reimbursed for those permits that are included in the list below, unless otherwise specified:

1) Night Work, overload, grading, excavation, demolition, foundation, and building permits.

2) Electrical permits.

3) Mechanical permits.

4) Plumbing permits.

5) South Coast Air Quality Management District permits.

6) Fire sprinkler permit.

7) All Federal, State, County and City issued permits.

Rights of ways, easements, or rights of entry for the Work will be provided by the City. The Contractor shall make arrangements, pay for, and assume all responsibility for acquiring, using, and disposing of Work areas and facilities temporarily required which are necessary in addition to those provided by the City. The Contractor shall indemnify and hold the City harmless for all claims for damages caused by such actions.

00218 PARTIES EXCLUDED FROM FEDERAL PROCUREMENT AND NON PROCUREMENT PROGRAMS (10/17/01)

A list of individuals, firms and organizations which have been debarred, suspended or have voluntarily excluded themselves from Federal Procurement and Non Procurement Program is maintained by US General Services Administration. A copy can be obtained from Superintendent of Documents, US Government Printing Office, Washington, DC 20402, Tel: (202) 783-3238.

The City will not conduct business with an individual, firm or organization, and the Contractor shall not employ or otherwise utilize any Subcontractor, supplier or equipment vendor at any tier which is on the U.S. General Services Administration "List of Parties Excluded from Federal Procurement and Non Procurement Programs". The Contractor shall not utilize or otherwise employ any Subcontractors or suppliers on the list of nonresponsible bidders maintained by the City Bureau of Contract Administration.

00219 BUSINESS TAX REGISTRATION CERTIFICATES (11/21/01)

The Contractor represents that it has, or will obtain upon award, the Business Tax Registration Certificate(s) required by the Los Angeles City Business Tax Ordinance. The Contractor shall maintain, or obtain as necessary, all such Certificates required of it under said Ordinance and shall not cause or allow any such Certificate to be revoked or suspended.

The City requires all firms that have business activity within the City of Los Angeles to pay City business taxes.

Payments for goods or services will be withheld unless proof of tax compliance is provided to the City. All firms and individuals that do business with the City will be required to provide a Business Tax Registration Certificate number or an exemption number as proof of compliance with Los Angeles City business tax requirements in order to receive payment for goods or services.

The Tax and Permit Division of the City Office of Finance has the sole authority to determine whether a firm is covered by business tax requirements.

00220 CONTRACTOR PROPOSED ALTERNATES AND "OR EQUALS" (12/6/01)

Unless otherwise noted, the Contractor may propose products, equipment, or materials to be an "or equal" to those specified in the Contract. These proposals must be submitted within thirty (30) days after Notice to Proceed along with sufficient substantiating data for the Engineer to determine equivalence. The substantiating data must demonstrate equivalence in terms of function, performance, reliability, quality, and general configuration to the items specified in the Contract Documents. The Engineer will be the sole arbiter of equivalence. Proposals that are submitted late or with incomplete substantiation are "Not Equal" and subject to summary rejection.

Contractor-proposed "or equals" that are accepted by the Engineer shall be coordinated with other items of Work and incorporated into the Work without time extensions and at no additional cost to the City.

00221 CONTRUCTION AND DEMOLITION WASTE MANAGEMENT (9/18/07)

Unless higher percentages are specified in other sections of the Specifications, the Contractor shall divert a minimum of 75% of all inert debris and 50% of all other demolition and construction debris from the project. A Waste Management Plan, as detailed in "Construction and Demolition Waste Management" (CDWM) of the General Requirements, shall be submitted by the Contractor and approved by the Engineer prior to starting Work. The Waste Management Plan must show that at least 75% of all inert construction and demolition waste material and 50% of all other construction and demolition waste material generated by the project will be recycled or reused. If the Contractor believes it is not feasible to attain this goal for this project, the Contractor may apply for an exemption at the time the Waste Management Plan is submitted.

A completed Solid Waste Diversion and Disposal Report and all required documentation must be submitted to the Bureau of Contract Administration with every Contract Payment Request form as detailed in the CDWM requirements.

Upon completion of the work and as a condition of final acceptance, the Contractor shall submit to the Engineer the final Solid Waste Diversion and Disposal Report demonstrating compliance with the approved Waste Management Plan.

Failure to meet the minimum diversion requirements as detailed above will result in penalties as detailed in the CDWM requirements. These penalties may be appealed as described in the CDWM requirements.

00222 THRU 00299 NOT USED

00300 FINANCIAL LIABILITY (4/12/95)

The City's liability under this Contract shall not exceed the City's appropriation to fund the Contract at the time of Contract award. However, if the City shall appropriate funds for any successive years, the City's maximum liability shall not exceed the extent of such appropriation, subject to the terms and conditions of this Contract.

00301 CONTRACTOR'S OBLIGATIONS (3/26/02)

Only competent workers shall be employed on the Work.

Any person employed who is found by the Inspector to be incompetent, disorderly or otherwise objectionable, or who fails or refuses to perform Work properly, acceptably and as directed shall be immediately removed from the Work by the Contractor and not be reemployed on the Work.

The Contractor, at its sole cost and expense, shall perform all labor and services and furnish all the materials, tools, and appliances, except as hereinafter otherwise definitely provided, necessary or proper for performing and completing the Work required, in the manner and within the time stipulated in these specifications. The Contractor shall furnish, erect, maintain, and remove the construction plant and such temporary works as may be required. If, at any time before the commencement or during the progress of the Work or any part of it, the Contractor's methods or appliances appear to the Engineer or the Inspector to be unsafe, inefficient, or inadequate for securing the safety of the workers, the quality of the Work required, or the rate of progress stipulated, the Engineer or the Inspector may order the Contractor to increase their safety and efficiency or to improve their character, and the Contractor shall comply with such orders at its own expense. Neither the making of such demands by the Engineer nor the failure to make such demands shall relieve the Contractor of its obligation to secure the safe conduct of the Work, the quality of Work required, and the rate of progress stipulated in the Contract. The Contractor shall be fully responsible for the safety, efficiency, and adequacy of its plant, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance, or operation.

All of the labor shall be performed and materials furnished pursuant to and in strict conformance with the Contract Documents, and in accordance with approved shop drawings. The Contractor shall complete the entire Work to the satisfaction of the Inspector and in accordance with the Specifications and Plans herein mentioned, at the prices fixed in the Contract.

Where articles or materials are especially manufactured or fabricated for delivery under these specifications, the Contractor shall at all times employ such workforce, plant, materials, and tools as will be sufficient to complete the performance of the Contract and every part thereof within the time limits stipulated herein. If the Contractor fails to employ sufficient workforce, plant, materials, tools, or to maintain adequate progress, the Engineer may require an increase in progress at any point or points or a modification of Plans and procedure in such a manner as to accelerate the Work. Failure to adequately staff the project shall be just cause for the City to terminate the Contract.

00302 CONTRACTOR'S REPRESENTATIVE AT THE SITE (1/30/03)

A technically qualified and English-speaking project representative shall be designated in writing as the Contractor's Representative at the job site, who shall supervise the Work and shall provide competent supervision of the Work until its completion. The Contractor's Representative shall be assigned full time and exclusively to this project. Alternate representatives with qualifications equal to or better than the previous representative may be designated. The Contractor's Representatives shall have at least five (5) years of verifiable experience as the person primarily responsible for supervision of the Work on projects of the same or similar size and nature as this project. Within five (5) days after the Notice of Award the Contractor shall provide a statement to the Engineer and the Inspector with the following:

1) Identification and resume, showing the qualifications and experience of the Contractor's Representative and the alternate appointed to act in the place of the Contractor's Representative.

2) References of not less than two (2) previous projects on which the Contractor's Representative and the alternate had supervisory responsibility on a project of a similar nature and at least one-half or more of the cost of this project. Such references shall include names, addresses, and telephone numbers of owner representatives who worked on the project as well as project information such as project type, size, location and duration.

The Engineer and the Inspector reserve the right to disapprove any candidate named as the Contractor's Representative or alternate who fails to meet the provisions set forth herein. The Engineer and the Inspector reserve the right to remove, without any right to work on the project, either the Contractor's Representative or alternate, who in the sole opinion of the Engineer or the Inspector, has demonstrated incompetence, lack of ability, or other unsuitability to perform supervision of the Work.

If the Contractor's Representative or alternate leave the employ of the Contractor, the Contractor will be required to replace the individual(s) and fulfill the requirements of this Article within fifteen (15) calendar days. In no event shall any Work proceed in the absence of an approved representative.

The Contractor's Representative or alternate shall have full authority to act on behalf of the Contractor, including, but not limited to final approval of Change Orders and Supplemental Agreements. All directions given by the Engineer or the Inspector to said representative or alternate shall be considered as having been given to the Contractor. Such instructions given by the Engineer or the Inspector to the Contractor's Representative or alternate will be confirmed in writing. All instructions and directions given by the Engineer or the Inspector will be limited to matters properly falling within the Engineer's or the Inspector's authority as specified in "Authority of the Board, Engineer and Inspector" of these General Conditions.

The Contractor's Representative or alternate shall be present at the worksite at all times while Work is in progress. Failure to observe this requirement constitutes a suspension of the Work by the Contractor, until such time the Contractor's Representative or alternate is again present at the worksite. All Work performed while the Contractor's Representative or alternate is absent from the worksite is ineligible for payment. Work performed in violation of these provisions shall be removed and reconstructed, refabricated, or reinstalled under the required supervision. The Contractor is ineligible for time extensions or additional payment for costs or impact that directly or indirectly are caused by said suspension. Those ineligible costs and impacts include what the Contractor may incur for slowdown, delays, idled equipment, removals, reconstruction, refabricating, reinstalling and other. During such periods of noncompliance when the Contractor's Representative is not on site, written instructions issued by the Engineer or the Inspector to *any* employee of the Contractor is considered adequate notice to the Contractor.

Whenever the Work is defined as being suspended under the provisions of this Article, any such suspension in excess of ten (10) calendar days shall constitute just cause for the City to terminate the Contract under the provisions of "Termination of Contract by City (Contractor Default)" of these General Conditions.

00303 FAMILIARITY WITH PLANS AND SPECIFICATIONS (9/18/07)

It shall be the responsibility of the Contractor to be thoroughly familiar with all details of the Project, including the work of the Contractor's forces and all Subcontractors. The Contractor shall call the following to the attention of both the Engineer and the Inspector in writing within twenty-four (24) hours of discovery, before any Work is performed:

1) Errors and omissions in the Plans and Specifications, including, but not limited to, code violations, typographical errors and notational errors where ambiguity or inadequate description exists;

2) Work on the Plans or in the Specifications which, if so constructed, would result in a conflict or interference with other Work or the Work of other trades, including the location of fixtures and equipment;

3) Existing improvements visible at the job site, for which no existing disposition is made on the Plans or in the Specifications but which could reasonably be assumed to interfere with the satisfactory completion of the improvements contemplated by the Plans and Specifications.

Failure to notify shall constitute a waiver by the Contractor of any claim for delay or other damages occasioned by such defect. If the Contractor proceeds with the Work without instructions from the Engineer, the incorrect Work shall be removed and corrections made to comply with the Engineer's instructions, at no cost to the City.

00304 JOB CONDITIONS (9/18/07)

The Contractor shall determine the nature and types of work to be performed, ascertain all conditions affecting construction procedure and sequencing of Work operations in the execution of the Work, including condition of available roads and streets, or clearances, restrictions and other limitations affecting transportation and ingress and egress to the job site. This determination must be made during the Bidding Period with any costs and impact included within the Bid.

The Contractor shall observe any "Site Security" restrictions described in the General Requirements or the Plans.

Whenever the Work requires entry into an operating plant, occupied building, working facility or other secured location, observe the following unless otherwise noted:

1) No vehicles are allowed except delivery trucks and Contractor's identified vehicles and equipment.

2) It shall be the Contractor's sole responsibility to arrange and pay for offsite employee parking and to provide transportation from the parking area to the Work site.

3) The Contractor shall fully cooperate with all authorities on the job site and other contractors not related to the Work of this Contract who might be at the job site.

4) The Contractor shall fully comply with all regulations in force at the job site.

00305 JOB BULLETIN BOARD (11/27/01)

When a Field Office is required, the Contractor shall provide and mount a Job Bulletin Board at the field office in a location where it can be readily seen by all of the Contractor employees. The bulletin board shall be substantially built to a minimum size of 900 mm high x 1200 mm wide (3' x 4') shall be fitted with a framed safety glass door and lock. The glass on the outside shall be protected with a 12 mm x 12 mm (½" x ½") galvanized wire mesh screen permanently attached to the frame. The bulletin board shall be finished inside and outside with two (2) coats of an exterior paint.

00306 RESPONSIBILITY FOR SITE (10/17/01)

The Contractor is in full charge of and responsible for the job site and the Work. The "Interface/ Coordination Requirements" of the General Requirements describe interfaces with other contractors working on the job site. No other operations of any nature shall be performed except as specifically authorized in the Contract Documents or as authorized by the Engineer.

The Contractor shall exercise care not to damage improvements and adjacent land. The Contractor shall correct any damage caused within seventy-two (72) hours by restoring the land and improvements damaged to their original condition and shall indemnify and hold the City harmless for any such damage as specified in “Indemnification” of these General Conditions.

00307 WORKMANSHIP AND MATERIALS (4/12/95)

All materials, parts and equipment furnished by the Contractor for the Work shall be new, high grade and free from defects. Materials and work quality shall be subject to the Inspector’s approval.

00308 INJURY AND ILLNESS PREVENTION - SAFETY MEASURES (9/18/07)

Safety is the responsibility of the Contractor. The Contractor shall observe and comply with the safety provisions of all applicable laws, building and construction Codes, safety and health regulations of the California Code of Regulations, and with applicable City Safety Policies.

Every employer (Prime Contractor and/or Subcontractor) employed on the Project shall establish, implement, and maintain an effective Injury and Illness Prevention Program in accordance with Section 3203 of the General Industry Safety Orders.

Each Contractor/Subcontractor shall make the applicable Injury and Illness Prevention Program specific for site conditions and type of Work to be performed on the Project.

Each prime Contractor and Subcontractor working on the Project shall make its Injury and Illness Prevention Program available to the Inspector and the Engineer prior to beginning any Work on the Project.

If a work procedure or site condition exists that violates the Contractor’s/Subcontractor’s Injury and Illness Prevention Program or any other safety standard, the Engineer or Inspector may order the Contractor to immediately comply with said safety provisions, and the Contractor shall comply with such orders at its own expense. If the Contractor fails to act promptly, the Engineer or Inspector is authorized to suspend the Work. Failure of the Engineer or the Inspector to make such demands shall not relieve the Contractor of its obligations to secure the safe conduct of the Work.

If a work procedure or site condition creates an immediate hazard to the health or safety of the public, City employees, property, or a licensee, the City may suspend all work on the project. Without prior notice, the City may also correct such hazardous conditions using other forces or contractors, at the Contractor’s sole expense. Any delays or impacts arising on the Work as a result of such an emergency shall be at the sole expense of the Contractor with no time extension, additional reimbursement for extended overhead, or interest on monies due, allowed for the Contractor.

First aid facilities and supplies shall be kept and maintained by the Contractor at the site of the Work.

The Contractor shall cause all persons within the construction area to wear protective helmets. In addition, all employees of the Contractor and its Subcontractors shall be provided with, and required to use, personal protective and life saving equipment set forth in California Construction Safety Orders and the OSHA Safety and Health Standards for Construction.

The Contractor shall provide safety equipment, material, and assistance to City personnel to properly inspect all phases of the Work, including final inspection. Such equipment, material and assistance shall include, but not be limited to testing for the presence of explosive or toxic gases and oxygen deficiency in confined spaces, blowers, ventilators, first aid supplies and equipment, ladders, scaffolds, shoring, and personnel for standby assistance as required. Personal safety devices such as harnesses, lanyards, and self-contained breathing apparatus will be provided by the Bureau of Contract Administration, unless

otherwise noted. When the Work requires specialized safety equipment, the Contractor shall provide new sets of such equipment, the training deemed necessary by the Inspector, and maintenance of such equipment. When asbestos is being removed, the requirements of the CCR, Title 8, Div. 1, Chapter 4, Subchapter 4, "Construction Safety Orders," and Subchapter 7, "General Industry Safety Orders," shall be implemented.

In cases involving exposure of City personnel to toxic/hazardous materials and/or elements, the City Personnel Department, Occupational Safety Office, shall have field review authority over the Contractor's operations.

For additional requirements, refer to "Safety and Preconstruction Safety Conference" of the General Requirements.

00309 PROTECTION OF PERSONS AND PROPERTY AND RESTORATION OF EXISTING IMPROVEMENTS (9/18/07)

The Contractor shall not destroy, remove, or otherwise disturb any existing survey monuments or reference points without authorization from the Engineer. No pavement breaking or excavation shall be started until all survey monuments or other reference points that will be disturbed by the construction operations have been properly referenced by the Engineer. It shall be the Contractor's responsibility to notify the Engineer and the Inspector of the time and location that Work will be done. Such notification shall be sufficiently in advance of construction so that there will be no delay due to waiting for survey points to be satisfactorily referenced for restoration. All survey monuments or reference points disturbed, without authorization by the Engineer, shall be accurately restored by the City at the Contractor's sole expense after all street or roadway resurfacing has been completed.

Unless otherwise noted, all construction operations shall preserve existing drainage paths, vehicular and pedestrian access. The Contractor shall also regularly attend to dust, mud, trash, noise, debris, and etceteras, caused by their construction operations to prevent a public nuisance.

All paved areas including asphalt concrete berms cut or damaged as a result of construction shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. All temporary and permanent pavement shall conform to the requirements of the affected pavement owner. All pavement which is subject to partial removal shall be neatly saw cut in straight lines.

In order to obtain a satisfactory junction with adjacent surfaces, the Contractor shall saw cut back and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.

Where sidewalks have been removed for purposes of construction, the Contractor shall place suitable temporary sidewalks, properly protected, promptly after backfilling and shall maintain them in satisfactory condition until the final restoration thereof has been made.

When existing planted areas are regraded, or removed and replaced because of the Contractor's operations, the soil in these areas shall be prepared and the area replanted-in-kind. All landscape materials shall conform to the requirements of the owner of the affected planted area.

All utilities encountered along the line of the Work shall be maintained continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the Engineer are made. Utilities shall include, but not be limited to, all above or below-ground conduit, pipes, ducts, cables, and

appurtenances associated with oil, gas, water, steam, irrigation, process, sewer, storm drain, wastewater, air, electrical, power, instrumentation, communication, telephone, cable, TV, and lighting systems, whether or not owned by the City.

The Contractor shall protect all existing utilities and improvements not designated for removal. Potholing for utilities and structures shown or addressed on the drawings shall be accomplished at the Contractor's expense. The Contractor shall determine the exact locations and depths of all utilities indicated on the Drawings. The Contractor shall make exploratory excavations of all utilities. The Contractor, in conformance with City Ordinance No. 150,478, shall pothole existing subsurface installations carrying unstable substances to determine their locations and elevations before commencing excavation. All such exploratory excavations shall be performed as soon as practicable after award of the Contract and in any event, a sufficient time in advance of construction to avoid possible delays to the Contractor's Work. When such exploratory excavations show the utility location as indicated on the Drawings to be in error, the Contractor shall so notify the Inspector and the Engineer. The Contractor should not rely upon plan designation of location of underground utilities. The number of exploratory excavations and extent of potholing required shall be that number which is sufficient to determine the alignment and grade of the utility. These costs are a part of the Bid.

Prior to any excavation in the vicinity of any existing underground facilities, the Contractor shall notify the Inspector and the Engineer, and the respective authorities representing the owners or agencies responsible for such facilities, not less than three (3) Workdays, nor more than five (5) Workdays, of their intention to begin excavation. The Contractor shall make arrangements for and provide access such that a representative of said owners or agencies may be present during such Work.

Before commencing any excavation, the Contractor shall obtain an Underground Service Alert (USA) inquiry I.D. number. Two workdays, shall be allowed after the I.D. number is obtained and before the excavation work is started so that utility owners can be notified. If the utility owner is the City, a confirmation number indicating the City has been notified shall be obtained by USA and/or the Contractor from the appropriate City department. The I.D. number together with the date acquired shall be reported to the Inspector when calling for inspection. I.D. numbers will not be given more than ten (10) Workdays before starting excavation work.

Unless otherwise indicated on the Plans or Specifications, where the proper completion of the Work requires the temporary or permanent removal and/or relocation of an existing utility or other improvement, which is shown on the Plans, the Contractor shall, at its own expense, remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement to a place and in a manner as directed by the Engineer, and the owner of the facility. In all cases of such temporary removal or relocation, restoration to former location shall be accomplished by the Contractor in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal. When utilities that are to be removed are encountered within the area of operations, the Contractor shall notify the Engineer not less than fifteen (15) days in advance for necessary measures to be taken to prevent interruption of service.

The Contractor shall notify the Engineer thirty (30) calendar days in advance of any proposed connection, and shall notify the Engineer and the Inspector twenty-four (24) hours prior to the actual connection, to any existing utility.

Any utility or improvement which is damaged by the Contractor shall be immediately repaired at the Contractor's expense, to a condition equal to, or better than, the condition it was in prior to such damage or temporary relocation. If the Contractor fails or refuses to promptly repair the utility or improvement, the City may perform the necessary Work at the Contractor's expense. The Contractor will also not be entitled to any time extension, additional reimbursement, extended overhead, or interest on monies due. The Contractor is not relieved of provisions of this Article even in the event such damage occurs after backfilling or is not discovered until after completion of backfilling.

All repairs to a damaged improvement shall be inspected and approved by the Inspector and an authorized representative of the improvement owner before being concealed by backfill or other Work. In case of damage, which in the opinion of the Engineer or the Inspector, threatens the safety of persons or property, the Contractor shall immediately make all repairs necessary for removal of the hazard. Should the Contractor fail to promptly take all necessary action, the City has the option to remove any hazard resulting from damages caused by the Contractor at the Contractor's expense without waiving any other rights the City may have. The Contractor will also not be entitled to any time extension, additional reimbursement, extended overhead, or interest on monies due.

In the event that the Contractor damages any existing utilities that are not shown on the Plans or the locations of which are not made known to the Contractor prior to excavation, the Contractor shall immediately notify the Inspector and take all measures necessary to prevent further damage. The Contractor shall then immediately make a written report to the Engineer and shall make repairs as directed by the Engineer.

Notwithstanding that an existing utility or substructure is not shown on the original Plans and Specifications, if the existence and location thereof was made known to the Contractor prior to excavation, the utility or substructure constitutes an existing known condition, and the Contractor is responsible for protecting the utility or substructure.

Damage to a utility known to the Contractor shall be repaired at the Contractor's expense.

00310 NON-CONFORMING WORK (1/30/03)

Except as set forth in this Article, all non-conforming Work and materials, in place or not, shall be removed immediately from the site or corrected to conform to all requirements of the Contract Documents, by the Contractor, at the sole expense of the Contractor.

If the Contractor fails to remove, replace or correct any non-conforming Work or materials within seventy-two (72) hours of discovery, the Inspector or the Engineer may cause such Work or materials to be removed and replaced. Such removal and replacement shall be at the sole expense of the Contractor with no entitlement to time extensions, additional reimbursement, extended overhead, or interest on monies due. In addition, all such cost shall be deducted from any amounts that are due or may become due to the Contractor.

Failure of the Inspector or the Engineer to notify the Contractor of any non-conforming Work shall not constitute acceptance of any non-conforming Work. The Contractor's obligation to remove, replace or correct any non-conforming Work, whenever discovered, shall continue to the end of the guaranty-warranty period provided for in "Guaranty-Warranty" of the General Requirements. The City reserves and retains all rights and remedies at law against the Contractor and their Surety for correction of any and all latent defects discovered after the guaranty-warranty period.

Any delays or impacts arising on the Work as a result of construction, fabrication or delivery of non-conforming work or materials shall be at the Contractor's sole expense, with no time extension, additional reimbursement for extended overhead, or interest on monies due allowed.

Examination of covered Work may be ordered by the Engineer or the Inspector for any reason. The Work shall be uncovered by the Contractor and if such Work is found to be in accordance with the Contract Documents, the City will issue a Change Order authorizing payment for the cost of examination and replacement. If such Work is found to be not in conformance with the Contract Documents, the Contractor shall correct the non-conforming Work and the cost of examination and correction of the non-conforming Work shall be borne solely by the Contractor.

Failure of the Contractor to comply with the requirements of this Article shall constitute default of the Contract by the Contractor and the City may terminate the Contract as provided for in Termination of Contract by City (Contractor Default).

00311 SUBCONTRACTORS AND SUB-SUBCONTRACTORS (9/18/07)

The Contractor shall perform on the site and with its own organization not less than fifty percent (50%) of the total Contract Price, unless a different percentage is designated in the Bid Proposal. Any items designated "specialty items" in the Bid Proposal may be performed by subcontract and the amount of all such "specialty items" may be deducted from the Contract Price before computing the amount of Work required to be performed by the Contractor with its own organization. The dollar value included in the percentage performed by the Contractor shall include the value of labor, materials and equipment to be incorporated or used in the Work and directly purchased by the Contractor and shall not include the value of Work, including labor, materials and equipment, incorporated or used in the Work, performed or provided by Subcontractors.

To be eligible for award of this Project, the Board requires Bidders to subcontract a minimum of its total Bid to qualified Subcontractors, as discussed in the “Mandatory Subcontracting Minimum (MSM) Requirements” of the Bid Proposal. Failure to list Subcontractors and the subcontracted dollar amounts on the applicable pages of the Bid Proposal to satisfy the MSM is cause for the Bid to be declared nonresponsive and rejected by the Board.

Bidders must list all Subcontractors in the Bid, regardless of the dollar amount of the work to be performed, if the Bidder wishes to have the Subcontract amount credited toward meeting both the MSM and MBE/WBE levels of participation of the Project. Subcontractors added to the project following acceptance of the Bid and award of the Project will not be credited toward meeting the required MSM and/or MBE/WBE levels of participation for this Project.

MSM credit will not be given to a joint venture partner listed as a Subcontractor by a joint venture.

Listed vendors and/or Suppliers will be limited to 60% of their listed dollar value toward achieving both the MSM and the anticipated MBE/WBE levels of participation for this Project, unless the vendor and/or Supplier manufactures or substantially alters the materials/supplies.

The designated percentage of the total Contract Price the Contractor is to perform may not be reduced below that level by the addition of Subcontractor’s added after Award of the Project.

The Inspector, acting on behalf of the Board, will be responsible for approval of all Subcontractors, whether Bid-listed or not, and all Sub-subcontractors employed on the Project.

Each Subcontractor who will perform Work or render services in an amount in excess of one-half of 1 percent of the Contractor’s total Bid or $10,000.00, whichever is greater, must be listed in the original Bid.

Subletting or Subcontracting of any portion of the Work in excess of one-half of 1 percent of the Contractor’s original total Bid or $10,000.00, whichever is greater, for which no Subcontractor was designated in the original Bid shall only be permitted in cases of public emergency or necessity, and then only after a finding reduced to writing as a public record of the Inspector setting forth the facts constituting the emergency or necessity.

If the Contractor fails to specify a Subcontractor, or if the Contractor specifies more than one Subcontractor for the same portion of Work to be performed under the Contract in excess of one-half of 1 percent of the Contractor’s total original Bid or $10,000.00, whichever is greater, the Contractor agrees that it is fully qualified to perform that portion of Work itself, and that it shall perform that portion itself.

The Contractor shall set forth in its Bid the following: The name, location of the place of business, telephone number, California State Contractor's License Number and dollar amount of each Subcontractor who will perform Work, labor, service, supply specifically fabricated materials or equipment in an amount in excess of one-half of 1 percent of the Contractor's total Bid, or $10,000.00, whichever is greater.

The Contractor shall list only one Subcontractor for each portion of Work as defined by the Contractor in its Bid.

Acceptance by the Board of its Bid is dependent upon each Bid listed Subcontractor, and all subsequently approved additional Subcontractors, performing the dollar value of Work listed or approved. Any reduction, increase, or other change to any Subcontract amount without prior approval is considered an Unauthorized Subcontractor Substitution and is subject to a penalty of ten (10) percent of the Subcontract amount, whether Bid-listed or not. A Subcontract dollar value increased or reduced as the result of a Change Order issued by the Engineer to add or delete from the original scope of Work shall not be subject to a penalty for an Unauthorized Subcontract Substitution.

Acceptance by the Board of its Bid shall not entitle Subcontractors to recognition for any direct or contractual relationship with the City, nor shall it constitute approval of the use of any materials other than those specified.

The Contractor shall be responsible for all acts of all Subcontractors at all tiers. The Contractor shall coordinate all work performed by subcontractors in the interest of the City.

All Subcontractors who will be working on the Project shall be approved in writing by the Inspector prior to beginning Work, regardless of the dollar amount of Work to be performed, and whether or not they were listed in the original Bid.

Requests for approval of all Subcontractors, or request for substitution of a Subcontractor, shall be made in writing to the Inspector, and said request shall contain the following information for each Subcontractor:

1) Project Name

2) Project Work Order Number

3) Subcontractor's Name

4) Subcontractor's Address

5) Subcontractor's Phone Number

6) Subcontractor's Status (WBE, MBE, OBE)

7) Subcontractor's State of California Contractor License Number

8) Subcontractor's City Business Tax Registration Certificate Number (BTRC)

9) Dollar amount of Subcontract work to be performed

10) Description of Subcontract work to be performed

Failure to provide any of the information listed will result in denial of approval until such time as the information is provided.

Failure to obtain approval of the Inspector prior to each Subcontractor performing Work on the Project may result in suspension of Work by that Subcontractor, removal of Work performed by unapproved Subcontractors, assessment of penalties, and possible sanctions against the Contractor.

Additional Subcontractors may be added after the time of original Bid. The value of Work to be performed by additional Subcontractors may not be greater than one-half of 1 percent of the Contractor's original total Bid or ten thousand dollars ($10,000.00), whichever is greater, unless the Subcontractor will be performing Work added by Change Order causing changes or deviations from the original Contract.

The Contractor shall provide the dollar amount of Work to be performed in all requests for additional Subcontractors. Failure to specify a dollar amount of Work to be performed will result in denial of additional Subcontractors until such time as the amount is provided.

Failure of the Contractor to request and obtain approval for a reduction in either a Bid-listed Subcontract amount or the Subcontract amount of a Subcontract added after the original Bid shall result in a penalty of ten percent of the Subcontract amount.

A Contractor whose Bid is accepted may not:

1) Substitute any person as Subcontractor in place of a Subcontractor listed in the original Bid, except that the Inspector, acting on behalf of the Board, may consent to the substitution of another Subcontractor for one of the following situations:

   A) When the Subcontractor listed in the original Bid or proposal after having had a reasonable opportunity to do so fails or refuses to execute a written contract, when that written contract, based upon the general terms, conditions, plans and specifications for the project involved or the terms of that Subcontractor's written bid, is presented to the subcontractor by the Contractor.

   B) When the listed Subcontractor becomes bankrupt or insolvent.

   C) When the listed Subcontractor fails or refuses to perform its subcontract.

   D) When the listed Subcontractor fails or refuses to meet the bond requirements of the Contractor as set forth herein.

   E) When the Contractor demonstrates to the Inspector's satisfaction that the name of the Subcontractor was listed as a result of an inadvertent clerical error.

   F) When the listed Subcontractor is not licensed pursuant to the State of California Contractor's License Law.

   G) When the listed Subcontractor refuses to obtain a City of Los Angeles Business Tax Receipt Certificate (BTRC).

   H) When the Inspector concurs with the Contractor that the Work being performed by the listed Subcontractor is unsatisfactory and not in substantial accordance with the Contract Documents, or the listed Subcontractor is delaying or disrupting the progress of the work.

   I) When the listed Subcontractor fails to submit an Affirmative Action Plan acceptable to the Inspector.

   J) When the Board determines that a listed Subcontractor is not a responsible contractor.

2) Permit a Subcontract to be voluntarily assigned or transferred or allow it to be performed by anyone other than the original Subcontractor listed in the original Bid, without the consent of the Inspector.

3) Other than in the performance of Change Orders causing changes or deviations from the original Contract, sublet or Subcontract any portion of the Work in excess of one half of 1 percent of the Contractor's total Bid as to which its original Bid did not designate a Subcontractor.

4) Reduce the dollar amount of a Bid-listed Subcontract without the written approval of the Inspector.

A request for substitution of any Subcontractor, whether Bid-listed or not, must be made in writing to the Inspector and must include letter(s) of explanation as to the reason for the requested substitution.

It is considered a substitution if anyone other than the Bid-listed and/or approved Subcontractor(s), including the Contractor, performs any portion of the Work designated to be performed by said Subcontractor.

Failure to obtain approval for a Subcontractor substitution may result in rejection of the affected Work, penalties assessed for failure to obtain approval, and possible sanctions by the City.

All substitutions of Subcontractors, whether MBE/WBE or not, shall be approved in writing by the Board prior to any Work being performed by the substituting Subcontractor.

The Contractor shall conduct a Good Faith Effort prior to approval of any requested Subcontractor substitution, regardless of the status (WBE/MBE/OBE/DBE) of the contractor being substituted for. For MBE/WBE Subcontractor substitution requests, the Contractor shall comply with the Good Faith Effort requirements of Part III (F) (2) of the Bid Proposal. The Good Faith Effort for any requested Subcontractor substitution must be reviewed and approved by the Special Research and Investigation Section of the General Services Division of the Bureau of Contract Administration, whether the Subcontractor was Bid listed or approved after the Award of the Project.

There shall be no decrease in dollar value of Work to be performed by Subcontractors approved as a substitute for a Bid-listed Subcontractor without a change in scope of the Work to be performed by the originally Bid-listed Subcontractor. Written evidence of a change of scope must be provided by the Engineer prior to approval of a change in dollar value of a Bid-listed Subcontractor.

Prior to approval of the Contractor's request for substitution, the Inspector shall give notice in writing to the Subcontractor affected by the Contractor's request to substitute and of the reasons for the request. The notice shall be served by certified or registered mail to the last known address of the Subcontractor. The listed Subcontractor who has been so notified shall have five (5) Workdays within which to submit written objections to the substitution. Failure to file these written objections within five (5) Workdays of notification shall constitute the listed Subcontractor's consent to the substitution. Notification by the Inspector may be made by phone in lieu of written notification via certified or registered mail if agreed to by the listed Subcontractor and followed by written request. Upon notification by phone, the listed Subcontractor may file written objections within five (5) days of notification.

If written objections are filed, the Inspector shall give notice of at least five (5) Workdays to the listed Subcontractor of a hearing on the Contractor's request for substitution.

The Contractor, as a condition to assert a claim of Inadvertent Clerical Error in the listing of a Subcontractor, shall within two Workdays after the time of the original Bid opening by the Board give written notice to the Inspector and copies of such notice to both the Subcontractor he claims to have listed in error and the intended Subcontractor who had bid to the Contractor prior to Bid opening.

Written notice of an Inadvertent Clerical Error shall be forwarded within two (2) days after the time of the original Bid opening by every Contractor claiming such an error. Failure to forward such notice within the time prescribed shall make any such subsequent claim of Inadvertent Clerical Error invalid.

Any listed Subcontractor who has been notified by the Contractor of an Inadvertent Clerical Error shall be allowed six (6) Workdays from the time of the Bid opening to submit to the Inspector and to the Contractor written objection to the Contractor's claim of Inadvertent Clerical Error. Failure of such listed Subcontractor to file such written notice within the six (6) Workdays shall constitute agreement that an advertent clerical error was made.

The Inspector shall, in the absence of compelling reasons to the contrary, consent to the requested substitution based on an Inadvertent Clerical Error if:

1) The Contractor, the Subcontractor listed in error, and the intended Subcontractor each submit an affidavit to the Inspector along any additional information as the parties may wish to submit that an Inadvertent Clerical Error was in fact made, provided that the affidavits from each of the three parties are filed within eight (8) Workdays from the time of the original Bid opening, or

2) If such affidavits are filed by both the Contractor and the intended Subcontractor within eight days of the original Bid opening but the Subcontractor whom the Contractor claims to have listed in error does not submit within six (6) Workdays, to the Inspector and to the Contractor, written objection to the Contractor's claim of Inadvertent Clerical Error as provided in this article.

If such affidavits are filed by both the Contractor and the intended Subcontractor but the listed Subcontractor has, within six (6) Workdays from the time of the original Bid opening, submitted to the Inspector and to the Contractor written objection to the Contractor's claim of Inadvertent Clerical Error, the Inspector shall investigate the claims of all parties and schedule a public hearing before the Board to determine the validity of such claims. Any determination shall be based on the facts contained in the declarations submitted under penalty of perjury by all three parties and supported by testimony given to the Board. The Board may, on its motion or that of any other party, admit testimony of other Contractors, any Bid registries or depositories, or any other party in possession of facts, which may have a bearing on the decision of the Board. The findings of the Board shall be final.

00312 RESPONSIBILITY OF CONTRACTOR TO ACT IN EMERGENCY (11/21/01)

When an emergency arises creating an imminent hazard to persons or threatening the loss or damage to property, the Contractor shall take prudent action without instruction from the City. The Contractor shall immediately notify the Engineer and the Inspector of any emergency action taken. During such emergencies, if the Contractor fails to act, the Engineer or Inspector may instruct the Contractor to take action. Should the Contractor still fail to act, the Engineer or Inspector may respond to the emergency with other forces or contractors at the Contractor's sole expense. Claims for additional time, compensation or interest will be rejected if the Contractor's actions or inaction created the emergency. Similarly, any Claims will be offset by the amount that the Contractor's actions or inaction aggravated the emergency.

00313 ASSIGNMENT (2/09/95)

The Contractor shall not assign, transfer, convey or otherwise dispose of this Contract or any of the proceeds thereunder unless written consent of the City has been obtained. No right under this Contract or claim for any proceeds due or to become due hereunder shall be asserted against the City, or persons acting for the City, by reason of any so-called assignment, transfer or conveyance of this Contract or any part thereof unless such assignment, transfer or conveyance has been authorized by the written consent of the City. The instrument of assignment, transfer or conveyance shall contain a clause subordinating

the claim of the assignee, transfer or conveyor to all prior liens for services rendered or materials supplied for the execution of the Work.

00314 NOTIFICATION OF HAZARDOUS SUBSTANCES (10/17/01)

The existing facilities or Jobsite may contain asbestos, PCBs, corrosives, carcinogens, or other hazardous materials. Should the Contractor or any of its Subcontractors, while performing Work on or in the vicinity of existing facilities, unexpectedly encounter any material identified in the California Code of Regulations, Title 8, as a hazardous material not shown on the Plans or addressed in the specifications, or have reason to believe that any other material encountered may be a hazard to human health and safety and/or the environment, the Contractor shall stop the Work, cordon off the affected area to secure entry, and shall immediately notify the Inspector and the Engineer. Removal and disposal of the hazardous material not shown on the Plans or addressed in the specifications, if the Engineer deems it necessary, will be done by and at the expense of the City. The City will provide the Contractor, upon request, with copies of Material Safety Data Sheets (MSDS) covering hazardous materials identified by the Contractor that are encountered in existing facilities during the course of the Work and that are not removed by the City.

In the event that the Contractor is delayed in the completion of the Contract solely because of such hazardous materials or conditions not previously identified in the Contract Documents, the Contractor shall be entitled to an extension of time in accordance with "Unavoidable Delay" of these General Conditions.

For new construction Work and for all Contractor furnished supplies and equipment that may contain hazardous materials, the Contractor shall develop and implement a written Hazard Communication Program for its employees in accordance with the California Code of Regulations. The Contractor's basic written Hazard Communication Program shall be submitted to the Engineer and the Inspector prior to the start of Work at the site, and shall be revised and kept current as required by the continuing progress of the Work. The Contractor's Hazard Communication Program shall also include the MSDS for all hazardous materials the Contractor will be using at the facility. All provisions concerning MSDS for hazardous materials shall be met before the hazardous material is delivered to the site.

The Engineer shall be provided with three (3) copies and the Inspector with four (4) copies of the Contractor's written Hazard Communication Program, Contractor provided MSDS, and all revisions and modifications thereto.

The Contractor and Subcontractors shall comply with all State and Federal statutes and regulations on training, handling, storage, public notification, and disposal of hazardous materials and hazardous wastes. In the event that the Contractor or its Subcontractors spills or releases hazardous materials, the Contractor shall immediately notify the Inspector and the Engineer and any required agencies of the spill or release and the Contractor shall stop the Work, and cordon off the affected area to secure entry. Removal and disposal of the hazardous material, if the Engineer deems it necessary, will be done by the City at the Contractor's expense. Further, the Contractor shall notify the Engineer and the Inspector when hazardous materials are brought on-site and when hazardous materials and hazardous wastes are removed from the site. Hazardous Materials brought on site shall be accompanied by four (4) copies of MSDS, which shall be provided to the Inspector before such materials are unloaded.

00315 INDEPENDENT CONTRACTOR (10/21/99)

The Contractor represents that it is fully experienced and properly qualified to perform the class of Work required for the Contract and that it is properly licensed, equipped, organized and financed to perform the Work. The Contractor shall be an independent contractor. The Contractor is not an agent of the City in the performance of the Contract, and shall maintain complete control over its employees and its Subcontractors and Suppliers of any tier. Nothing contained in the Contract or any Subcontract awarded

by the Contractor shall create any relationship between any Subcontractor and the City. The Contractor shall perform the Work in accordance with its own methods, in compliance with the terms of the Contract.

00316 INDEMNIFICATION (10/17/01)

Except for the active negligence or willful misconduct of the City, the Contractor undertakes and agrees to defend, indemnify and hold harmless, through legal counsel acceptable to the City, the City, and any and all of the City's Boards, Officers, Agents, Employees, Assigns, and Successors in Interest from and against all suits and causes of action, claims, losses, demands and expenses, including, but not limited to, attorney's fees and cost of litigation, damage or liability of any nature whatsoever, arising out of or related to the performance or nonperformance by Contractor or its Subcontractors, Sub-Subcontractors, or Suppliers, of any tier, of any portion of the construction of the Project, including but not limited to Contractor's negligent acts, errors, omissions, breach of contract, breach of warranty (express or implied), or willful misconduct.

It is agreed that such defense and indemnity shall extend to the City's Architect/Engineer or other Design Consultant providing services under written agreement with the City covering any portion of the Project. Provided, however, that the Design Consultant shall be solely responsible for the enforcement of any request made by said Consultant for indemnification or defense by the Contractor. It is further provided that the City shall have no liability whatsoever for any failure of the Contractor to comply with any request from the consultant for indemnity or defense.

It is further agreed that the defense and indemnity obligations of the Contractor under this Article shall not extend to the liability of the Design Consultant or its agents, employees or subconsultants, arising as a result of such indemnitee's own active negligence, errors or omissions or from (1) the preparation or approval of maps, Plans, opinions, reports, surveys, change orders, designs or Specifications, or (2) the giving of or failure to give directions or instructions by the indemnitee provided that such giving or failure to give is the primary cause of the damage or injury.

00317 INSURANCE (9/18/07)

These provisions apply unless otherwise noted in the General Requirements.

A) GENERAL

During the term of this Contract and without limiting the Contractor's indemnification of the City, the Contractor shall provide and maintain at its own expense, insurance having the limits customarily carried and actually arranged by the Contractor but not less than the amounts and types listed on the Insurance Requirements Form in these Contract Documents, covering its operations hereunder subject to the following conditions as they may variously apply:

1) ADDITIONAL INSURED/ADDITIONAL INTEREST/LOSS PAYEE

The City, its Boards, Officers, Agents, and Employees shall be included as:

a) Additional Insureds in all required General Liability and Property Insurance and Additional Interests in all required Automobile Liability insurance.

b) Named Insureds in all required Owners and Contractors Protective Liability insurance policies.

c) Loss Payee As Its Interest May Appear in all required property, fidelity or Surety coverages.

The City and other listed above need not be named on Workers' Compensation/Employer's Liability, Professional Errors and Omissions and Second-party Legal Liability coverages (such as Garage Keepers' Legal).

2) INSURANCE APPROVAL

All insurance required hereunder shall conform to the City requirements established by Charter, ordinance or policy. Evidence of insurance shall be submitted to the Department's Risk Control Coordinator and approved by the City Attorney prior to commencement of any Work or tenancy under this Contract in accordance with the Los Angeles Administrative Code.

3) ALTERNATIVE PROGRAMS

Alternative Risk Financing mechanisms such as Risk Retention Groups, Risk Purchasing Groups, off-shore carriers and captive insurance programs are subject to review of their financial statements by the City before an approval can be granted by the City Attorney.

4) ADMITTED CARRIER/LICENSED CALIFORNIA BROKER

Insurance shall be obtained from brokers or carriers authorized to transact insurance business in California. Surplus lines insurance from carriers who are not admitted in California must be submitted through a California-licensed broker or agent.

Surplus lines coverage must also contain a Service of Suit provision whereby the underwriters will submit as necessary to any court of competent jurisdiction in California and agree that all matters arising thereunder will be determined in accordance with the law and practice of such court. It must further give the name and address of the underwriter's agent for service of process located within California or must nominate the California Insurance Commissioner as such agent.

5) PRIORITY OF COVERAGE

The Contractor’s insurance shall not call on the City’s program for contributions.

6) CANCELLATION/REDUCTION IN COVERAGE NOTICE

With respect to the interest of the City, if an insurance company elects to cancel insurance before the stated expiration date, or declines to renew in the case of a continuous policy, or materially reduces the coverage period by changing the retroactive date (if any), or the extended discovery period (if any), or reduces the stated limits other than by impairment of an aggregate limit, or materially reduces the scope of coverage which affects the City’s interest, the company will provide the City at least thirty (30) calendar days prior written of such election. Notice will be made by receipted delivery addressed as follows: CAO-RISK MANAGEMENT, MAIL STOP 132, CITY HALL EAST 1240, 200 NORTH MAIN STREET, LOS ANGELES, CA 90012-4190. It is understood, however, that such notice to the City shall not affect the company's right to give a lesser notice to the Named Insured in the event of nonpayment of premium. (L.A. Admin. Code Section 11.54).

7) ACCEPTABLE EVIDENCE

The appropriate City Special Endorsement forms, contained in Volume 1 of these Contract Documents, are the preferred form of evidence of insurance. Alternatively, the

Contractor may submit two (2) certified copies of the policy or other evidence acceptable to the City Attorney containing language which complies with subparagraphs 1) through 6) above.

With respect to Professional Liability insurance, either a signed copy of the Policy Declarations Page or a letter from the Contractor's insurance broker certifying coverage, together with a thirty (30) day cancellation notice endorsement in favor of the City as specified in subparagraph 6) will satisfy this requirement.

8) SEPARATION OF INSUREDS

Except with respect to the insurance company's limits of liability, each liability insurance policy shall apply separately to each insured against whom a claim or suit is brought. The inclusion of any person or organization as an insured shall not affect any right which such person or organization would have as a claimant if not so included.

9) RENEWAL

Once the insurance has been approved by City, evidence of renewal of an expiring policy may be submitted on a manually signed renewal endorsement or certificate form. If the policy or carrier has changed, however, new evidence as specified in paragraphs 1) through 8) above, must be submitted.

B) AGGREGATE LIMITS/REDUCTION IN COVERAGE

If any of the required insurance coverages contain aggregate limits, or apply to other operations or tenancy of the Contractor not related to this Contract, the Contractor shall give the City prompt, written notice of any incident, occurrence, claim, settlement or judgment against such insurance which in the Contractor's best judgment may diminish the protection such insurance affords the City. Further, the Contractor shall immediately take all reasonable and available steps to restore such aggregate limits or shall provide other insurance protection for such aggregate limits. The City may, at its option, specify a minimum acceptable aggregate for each line of coverage required.

The Contractor shall not make any substantial reductions in scope of coverage (e.g., elimination of contractual liability or reduction of discovery period) which may affect the City's protection without the City's prior written consent.

C) SELF-INSURANCE AND SELF-INSURED RETENTIONS

Self-insurance programs and self-insured retention in insurance policies are subject to separate approval by the City upon review of evidence of the Contractor's financial capacity to respond. Additionally, such programs or retention must provide the City with at least the same protection from liability and defense of suits as would be afforded by first-dollar insurance.

D) MODIFICATION OF COVERAGE

The City reserves the right at any time during the term of this Contract to change the amounts and types of insurance required hereunder by giving the Contractor ninety (90) calendar days advance written notice of such change. If such change should result in substantial additional cost to the Contractor, the City agrees to negotiate additional compensation.

E) FAILURE TO PROCURE INSURANCE

The required coverage and limits are subject to availability on the open market at reasonable cost as determined by the City. Non-availability or non-affordability must be documented by a letter from the Contractor's insurance broker or agent indicating a good faith effort to procure the required insurance and showing, as a minimum, the names of the insurance carriers and the declinations or quotations received from each.

Within the foregoing constraints, the Contractor's failure to procure or maintain required insurance or a self-insurance program during the entire term of this Contract shall constitute a material breach of this Contract under which the City may immediately suspend or terminate this Contract or, at its discretion, procure or renew such insurance to protect the City's interests and pay any and all premiums in connection therewith, and recover all monies so paid from the Contractor.

F) UNDERLYING INSURANCE

The Contractor shall be responsible for requiring indemnification and insurance as it deems appropriate from its consultants, agents and Subcontractors, if any, to protect the Contractor's and the City's interests, and for ensuring that such persons comply with any applicable insurance statutes. The Contractor is encouraged to seek professional advice in this regard.

G) WORKERS' COMPENSATION

By signing this Contract, the Contractor hereby certifies that it is aware of the provisions of Section 3700 et seq., of the Labor Code which require every employer to be insured against liability for Workers' Compensation or to undertake self-insurance in accordance with the provisions of that Code, and that it will comply with such provisions at all such times as they may apply during the performance of the Work pursuant to this Contract.

A waiver of subrogation in favor of the City will be required when Work is performed on City premises under hazardous conditions.

H) ALL RISK BUILDER'S RISK/INSTALLATION FLOATER

During the course of construction, the Contractor shall secure and maintain an All Risk Builder's Risk Insurance policy covering loss, damage or destruction of property, including materials in transit and stored on and off site, in an amount equal to the value of the construction and materials on hand.

An Installation Risk or "Floater" Policy, written to cover only specific types of equipment during construction, may be provided to cover damage to Work or high valued equipment or materials.

Coverage shall remain in force until the Work is completed and accepted by the City. Acceptable evidence of coverage shall be in the form of an endorsement to the policy which names the City as an Additional Named Insured and as Loss Payee As Its Interest May Appear.

I) TYPICAL COVERAGES REQUIRED

The coverages required in A above shall be at least as broad as:

1) General Liability: Insurance Services Office Commercial General Liability coverage (Occurrence Form CG 00 01).

2) Automobile Liability: Insurance Services Office Form Number CA 00 01 (Ed. 1/87) covering Automobile Liability, code 1 (any auto).

3) Professional Liability: If applicable, errors and omissions liability appropriate to the consultant's profession, with a discovery period of not less than twelve (12) months after completion of Work or termination of Contract.

J) TYPICAL LIMITS OF LIABILITY

Unless otherwise specified in Form Gen. 146/IR, the Contractor shall maintain limits no less than:

1) General Liability: $1,000,000 per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability or other form with a general aggregate limit is used, either the general aggregate shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.

2) Automobile Liability: $1,000,000 per accident for bodily injury and property damage, combined or equivalent in split limits.

3) Employer's Liability: $1,000,000 per accident for bodily injury or disease.

1) Professional Liability: $1,000,000 per occurrence.

K) CONTRACT BONDS

Before the execution of the Contract by the Board, the Bidder shall file with the Board Surety bonds satisfactory to the Board in the amounts and for purposes noted below. Bonds shall be duly executed by a responsible corporate Surety, authorized to issue such bonds in the State of California and secured through an authorized agent with an office in California. Bonds shall be issued by a Surety who is listed in the latest revision of U.S. Department of Treasury Circular 570, is authorized to issue bonds in California, and whose bonding limitation shown in said circular is sufficient to provide Bonds in the amount required by the Contract. The Bidder shall pay all Bond premiums, costs, and incidentals. On Contracts estimated by the Engineer to be less than $2 million, Bonds may be obtained from an insurance company with a Certificate of Authority from the California Insurance Commissioner authorizing the company to write Surety insurance within the State of California.

Each Bond shall be signed by both the Bidder and the Surety, and the signature of the authorized agent of the Surety shall be notarized.

The Bidder shall provide two good and sufficient surety bonds. The "Payment Bond" (Material and Labor Bond) shall be for not less than one hundred percent (100%) of the Contract Price, to satisfy claims of material suppliers and of mechanics and laborers employed by it on the Work. The bond shall be maintained by the Contractor in full force and effect until the Work is accepted by the Board, and until all claims for materials and labor are paid, and shall otherwise comply with the California Civil Code.

The "Performance Bond" shall be for one hundred percent (100%) of the Contract Price to guaranty faithful performance of all Work, within the time period prescribed, in a manner satisfactory to the Board, and that all materials and Workmanship will be free from original or developed defects, and comply with requirements and guaranty specified in “Guaranty-Warranty” of the General Requirements.

Should any Surety at any time be unsatisfactory to the Board, notice will be given the Contractor to that effect. No further payments shall be deemed due or will be made under the Contract until a new Surety shall qualify and be accepted by the Board.

Changes in the Work, or extensions of time, made pursuant to the Contract, shall in no way release the Contractor or Surety from its obligations. Notice of such changes or extensions shall be waived by the Surety. In addition to the bonds detailed above, the Contractor shall provide a guarantee bond as detailed in "Guaranty-Warranty" of the General Requirements.

00318 SERVICE OF NOTICE (2/09/94)

The delivering of any notice, instruction, claim or protest, or other written communication, personally to the Contractor or the Contractor's Representative or to the Engineer, the Inspector, or to the City Clerk of the City shall constitute service therefore upon the Contractor, the Engineer, the Inspector, or the City, respectively.

The depositing of a post-paid (Registered Mail) wrapper directed to the official address of the Contractor, the Engineer, the Inspector, or the City in any post office, of any notice, instruction, claim or protest, or written communication, shall be deemed sufficient service thereof upon the Contractor, the Engineer, the Inspector, or the City, respectively, and the date of said service shall be the day following the date of postmark.

The official address of the Contractor shall be the address given in the accepted Bid or such other address as the Contractor may subsequently designate in writing either to the Engineer or to the City. The official address of the Engineer, the Inspector, and the City will be supplied to the Contractor after the award.

00319 AGENT TO ACCEPT SERVICE (10/21/99)

The Contractor shall maintain within Los Angeles County a duly authorized agent as identified in the Article entitled Service of Notice to accept service of legal process on its behalf, and shall keep the City advised of such agent's name and address during the duration of the Contract and for three (3) years after the Final Payment, or as long as the Contractor has warranty obligations under the Article entitled "Guaranty-Warranty" of General Requirements, whichever period terminates later. In the event that no such duly authorized agent is on file with the City, the Contractor agrees that the Secretary of State of the State of California shall be the Contractor's agent for service of legal process.

00320 THRU 00399 NOT USED

00400 TEMPORARY SUSPENSION OR DELAY OF WORK (9/18/07)

If the Work of the Contract is suspended or delayed, the Contractor shall so notify the Engineer within twenty-four (24) hours after the start thereof. If the Contractor is entitled to reimbursement for such suspension or delay, as specified hereinafter, the Contractor shall submit a completely detailed statement of the costs thereof, to the Engineer, within twenty (20) calendar days after the termination thereof. Failure to submit such statement of costs or notification within the time specified shall be deemed a waiver of any claims for delay or damages or both by the Contractor.

If the Work of the Contract is suspended or delayed through no fault of the City, except as provided for in Unavoidable Delay of these General Conditions, all expenses and losses shall be borne by the Contractor with no time extension, additional reimbursement for extended overhead, or interest on monies due, allowed to the Contractor.

If the Work of the Contract is suspended or delayed by an act of the City, or by failure of the City to furnish required information, and the Contractor thereby incurs expenses or sustains losses which could not have been avoided by the judicious handling of forces and equipment, and if by a diligent prosecution of the Work the Contractor could not have completed the Work before such suspension, the Contractor will be paid such amount as the Engineer may find to be a fair and reasonable compensation for such part of the Contractor's actual loss. In no case shall any compensation be made to cover any loss other than actual cash paid for wages, rental of equipment, and materials used in protection of the Work, all of which must be supported by satisfactory written evidence. Such wages shall not include the wages or salary of any individual not necessary for protection of the Work. The Contractor shall not be entitled to any mark-up for overhead or profit on damages or for extended duration or for interest on monies due for work satisfactorily completed prior to the suspension or delay.

The Contractor shall maintain complete and accurate daily records of all costs due to delay, clearly distinguishing them from the costs of other portions of the Work, and shall submit a detailed written report of such costs to the Engineer and the Inspector within twenty (20) calendar days of incurring the delay. Failure to comply shall result in waiver by the Contractor to any claims for additional payment and schedule change. In addition, the Contractor shall submit evidence of any cause of delay specified herein if it has not already done so.

As soon as practicable, following receipt of such report and evidence, if required, the Engineer will determine the nature and extent of such costs and will, if the Engineer finds that payment is due, issue a Change Order therefor, subject to the provisions in "Change Orders" of the General Requirements. If the Engineer determines that payment is not due, the Contractor will be so advised in writing. Should the Contractor disagree with such finding, Contractor may submit a notice of protest to the Engineer as provided in Claims and Protests. The Contractor shall provide the Engineer with access to its daily cost records or certified copies thereof as requested. All such records shall be retained by the Contractor and open to inspection and audit by the City and the Engineer. Except for the additional compensation provided hereinbefore, the Contractor shall have no claim for damage or compensation for any delay or hindrance whether or not contemplated by the Contract.

00401 UNAVOIDABLE DELAY (10/17/01)

Should the Contractor be obstructed or delayed in the completion of the Work from causes beyond its control and without its fault or negligence, and solely due to acts of God, acts of government in its sovereign capacity, riots, insurrections, wars, fires, floods, earthquakes, tidal waves, epidemics, quarantine restrictions, industry-wide strikes, freight embargoes, or unusually severe weather, it shall be entitled to a noncompensable extension of time.

The Contractor shall only be entitled to a noncompensable extension of time for Unavoidable delay in the Work which negatively impacts the critical path of the approved project schedule, and causes the Work of the project to extend beyond the approved Contract Completion date.

The Contractor shall be entitled to a noncompensable time extension only if it notifies the Engineer and the Inspector immediately at the time the Contractor is prevented from proceeding with the Work and follows with written notification of the causes of the delay within five (5) calendar days from the beginning of any delay. Also, the Contractor shall notify the Engineer and the Inspector immediately at the end of the delay and follow up with written notification of the cessation of delay within five (5) calendar days from the end of the delay.

Any claim for a time extension shall be made in writing within twenty (20) calendar days after the conclusion of the delay. The Engineer and the Inspector shall ascertain the facts and the extent of the delay and extend the time for completing the Work if, in their judgement, the findings of fact justify such an extension. The Engineer's decision shall be final and conclusive, subject only to appeal as provided by Claims and Protests.

00402 ARCHAEOLOGICAL AND PALEONTOLOGICAL DISCOVERIES (9/18/07)

If items of archaeological or paleontological interest are discovered, the Contractor shall immediately cease excavation in the area of discovery and shall not continue until ordered by the Engineer. When resumed, excavation operations within the area of discovery shall be as directed by the Engineer.

Such discoveries include antiquated dwelling sites, stone implements or other artifacts, animal bones, human bones, fossils and the like. The Contractor shall be entitled to an extension of time and compensation in accordance with the provisions of Temporary Suspension or Delay of Work.

00403 COORDINATION WITH OTHER CONTRACTS (1/30/03)

The Board may allow other work at the site by the City's own forces, utility owners or other direct contracts. If such other work to be performed was not noted in the Contract Documents, written notice thereof will be given to the Contractor prior to starting any such other work; and, if the Contractor believes that such performance will involve additional expense to the Contractor or requires additional time and the parties are unable to agree as the extent thereof, the Contractor may make a claim therefor as provided under Claims and Protests.

Paving of roadway areas shall be withheld until planned utility changes or installations have been made under City permits and until verifications of completion of all such changes or installations have been received by the Inspector. The Contractor is responsible for assuring that verifications are submitted by the utilities. Underground final inspection and acceptance of sewer and storm drain installations shall precede paving operations.

The Contractor shall afford each utility owner and other contractor who is a party to such a direct contract (or the City, if the City is performing the additional work with City employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work, and shall properly connect and coordinate the Work with theirs. The Contractor shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. The Contractor shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of the Engineer and the others whose work will be affected. The duties and responsibilities of the Contractor under this Article are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of the Contractor in said direct contracts between the City and such utility owners and other contractors.

If any part of the Contractor's work depends upon proper execution or results of the work of any such other contractor or utility owner or the City, the Contractor shall inspect and promptly report to the Engineer in writing any delays, defects or deficiencies in such work that renders it unavailable or unsuitable for such proper execution and results. The Contractor's failure to do so will constitute an acceptance of the other Work as fit and proper for integration with the Contractor's Work. The exception is latent defects in the other work.

00404 TERMINATION OF CONTRACT BY CITY (CONTRACTOR NOT AT FAULT) (9/18/07)

The Contract may be terminated, in whole or in part, at any time, by the City, at its sole discretion, without cause and for the City's convenience. Such termination will be accomplished by delivery of a written "Notice of Termination" to the Contractor, specifying the extent to which performance of the Work under the Contract or portion of the Contract shall be terminated and the date upon which such termination shall become effective.

After receipt of a Notice of Termination, except as otherwise directed by the City, the Contractor shall:

1) Stop Work under the Contract on the date and to the extent specified in the Notice of Termination.

2) Notify the City in writing of all outstanding orders, Subcontracts and contracts entered into by Contractor for performance of the Work, including the (I) name and address of the vendor, supplier or Subcontractor; (ii) a copy of the complete contract, order or Subcontract; (iii) an accounting of the Work performed and compensation earned by the vendor, supplier or Subcontractor, and (iv) such other information as the City may request to assist it in determining whether to terminate or accept assignment of the order, Subcontract or contract.

3) Upon written notice by City, terminate all Subcontracts, orders and contracts, of any tier, related to the performance of the Work that the City determines shall be terminated and not assigned. Place no further orders or Subcontracts for Goods or services, except as may be necessary for completion of that portion of the Work that has not been assigned.

4) Place no further orders or Subcontracts for Goods or services, except as may be necessary for completion of that portion of the Work that has not been terminated.

5) Settle outstanding liabilities and Claims arising out of such termination of orders and Subcontracts, with the Acceptance of the City if required (which Acceptance shall be final for the purposes of this Article).

6) Assign to the City in the manner, at the times, and to the extent directed by the City all of the rights, titles, and interests of the Contractor under such orders, contracts and Subcontracts so terminated.

7) Transfer title and deliver to the City in the manner, at the times and to the extent directed by it, the fabricated or unfabricated parts, Work in process, completed Work, supplies, and other Goods procured as a part of, or acquired in connection with the performance of the Work terminated; and completed or partially completed plans, drawings, information and other items that would have been required (per the Specifications) to be furnished to the City if the Contract had been completed.

8) Use its best efforts to sell the property of the types referred to above in the manner, at the times, to the extent, and at the price(s) directed or authorized by the City, providing that the:

   A) Contractor is not required to extend credit to any purchaser;

   B) Contractor may acquire any such property under the prescribed conditions; and/or proceeds of any such transfer or disposition are applied or otherwise credited to reduce payments made by the City to the Contractor under the Contract.

9) Take any action that may be necessary, or that the City may direct, for the protection and preservation of the property related to the Contract that is in the possession of the Contractor and in which the City has or may acquire an interest.

10) Complete performance of that portion of the Work that has not been terminated by the Notice of Termination, as applicable and in accordance with the Contract.

After receipt of a Notice of Termination for the City's convenience, the Contractor shall submit its termination Claim to the City requesting payment of such sums as are permitted under the terms of this Article, in the form and with the certification(s) prescribed by the City for Claims and Protests. Such Claim

shall be submitted promptly but in no event later than thirty (30) days from the effective date of termination, unless one or more extensions are granted in writing by the City upon written request by the Contractor during such six-month period or authorized extension thereof. However, the City may receive and act upon any termination Claim at any time after the thirty (30) days period or any extension thereof, if it determines that the facts justify such action. Upon failure of the Contractor to submit its termination Claim within the time specified, the City will determine the amount due the Contractor, if any, on the basis of information available, and will pay the Contractor the amount so determined. Such determination shall be final and binding and payment shall be in full settlement for the Work performed under the Contract.

Subject to the provisions of this Article, the Contractor and the City may agree upon the total or partial amount to be paid to the Contractor by reason of the total or partial termination pursuant to this Article. The agreed upon amount shall under no circumstances include any sum for lost profits on the terminated portion of the Work or for consequential damages, of any kind. If agreement is reached, the Contract will be amended by Modification accordingly and the Contractor will be paid the agreed upon amount.

In the event of failure of the Contractor and the City to agree on the total amount to be paid the Contractor by reason of the termination of Work pursuant to this Article, the City will pay the Contractor the amounts determined by the City as follows, exclusive of any amounts agreed upon in accordance with the preceding Paragraph:

The Contractor's actual cost for the Work properly performed by the Contractor as of the date of termination, including a 5% allowance for profit on such costs; plus, the reasonable cost of preserving and protecting property; plus, other reasonable costs incidental to the termination of the Work under the Contract, including expense incurred to determine the amounts due; provided however, that the maximum payable or paid for any portion of the completed Work shall not exceed the values listed in the corresponding bid item of Schedule of Values.

The total sum to be payable or paid to the Contractor, exclusive of the settlement amounts described in the Paragraph immediately above, shall not exceed the total Contract Price less the:

1) Payments made previously by the City for the Work; plus

2) A prorated portion of the total Contract Price for the terminated portion of the Work as determined by the Engineer.

Except for normal spoilage and to the extent that the City will have otherwise expressly assumed the risk of loss, the fair value (as determined by the City) of property that is destroyed, lost, stolen, or damaged (so as to become undeliverable to the City or other buyer as described above) shall be excluded from the amounts paid to the Contractor.

In arriving at the amount due the Contractor under this Article, a deduction shall be made for the following:

1) Any claim that the City may have against the Contractor in connection with the Contract; and

2) The agreed upon price for and/or proceeds from the sale of goods or other items acquired or sold by the Contractor that have not been otherwise recovered by or credited to the City.

Under such terms and conditions as it may prescribe and at its sole discretion, the City may make partial payments against costs incurred by the Contractor in connection with terminated portion of the Contract whenever the City decides that the aggregate of such payments is within the amount to which the Contractor is entitled hereunder. If the total of such payments is in excess of the amount finally agreed upon or determined to be due under this Article, such excess shall be payable by the Contractor to the

City upon demand together with interest at a rate equal to that set forth in California Code of Civil Procedure, Section 685.010.

Under no circumstances shall the Contractor be entitled to anticipatory or unearned profits or consequential damages as a result of a termination of partial termination under this Article, or for any other termination by the City. The payment to the Contractor determined in accordance with this Article shall constitute the exclusive remedy of the Contractor for termination hereunder.

Anything contained in the Contract to the contrary notwithstanding, a termination under this Article shall not waive any right or claim to damages that the City may have; the City may pursue any course of action that it may have by law or under the Contract; and shall not relieve Contractor of its warranty obligations with respect to any Work performed prior to such termination.

If the termination hereunder is only for a part of the Work, the Contract Price shall be reduced by the amount of the Contract Price applicable to the portion of the Work which is terminated, including overhead and profit, on the basis of one or more of the following:

1) Unit prices stated in the Contract or agreed upon by the City and the Contractor.

2) A lump sum determined by the Engineer, based on the estimate costs including overhead and profit of the terminated portions of the Work.

00405 TERMINATION OF CONTRACT BY CITY (CONTRACTOR DEFAULT) (9/18/07)

In the event of conduct by the Contractor which is determined by the Engineer or the Inspector to constitute default, the City may either suspend the Work under the provisions of Temporary Suspension or Delay of Work of these General Conditions or, upon ten (10) calendar days' written notice to the Contractor, terminate the Contract as provided herein. Default by the Contractor shall occur whenever it shall declare bankruptcy; become insolvent or assign its assets for the benefit of its creditors; fail to provide materials, equipment, or workmanship meeting the requirements of the Specifications; disregard or violate provisions of the Contract Documents or the Engineer's or the Inspector's instructions; cause a material breach of the Contract; fail to prosecute the Work according to the approved progress schedule; or fail to provide a qualified representative, competent workers or Subcontractors. Upon request, the Contractor will be provided a hearing by the Board to contest the recommendation of the Engineer or the Inspector as to default by the Contractor.

In the event the Contract is terminated pursuant to this Article, the City may take possession of the Work and of all materials, tools, equipment, and property of the Contractor, which have been provided in connection with the Work, and may complete the Work by whatever method or means the City may select. The unpaid balance of the Contract cost for completing the Contract Work shall be used to complete the Work in accordance with the Contract Documents. If cost of completing the Work exceeds the unpaid balance, the Contractor shall pay the excess amount to the City. If such cost is less than the unpaid balance, the Contractor shall not have claim to the difference except to such extent as may be necessary, in the opinion of the Engineer, to reimburse the Contractor or the Contractor's sureties for any unpaid expense properly incurred for materials, tools, equipment, property, and labor devoted to the prosecution of the Work, or which the City shall have received the benefit. In computing such expenses, as it relates to equipment and property, the salvage value at completion of Work shall be deducted from the salvage value at the time the Contract was terminated, and the difference shall be considered as an expense. If after termination for failure of the Contractor to fulfill contractual obligations (Contractor Default), it is determined by a Court of competent jurisdiction that the Contractor had not failed to fulfill contractual obligations, the termination shall be deemed to have been for the convenience of the City. In such an event, adjustment of the Contract Price shall be made as provided in Termination of Contract by City (Contractor Not at Fault)".

00406 PARTIAL ACCEPTANCE (9/18/07)

The City shall have the right to utilize or place into service any item of equipment or other usable portion of the Work prior to completion of the entire project. The Engineer will notify the Contractor in writing identifying the specific portion or portions of the Work to be so utilized or otherwise placed into service. Following inspection by the Bureau of Contract Administration's Final Inspector and completion of a Partial Final Inspection Correction List, a "Statement of Partial Completion" will be issued.

It shall be understood by the Contractor that until a "Statement of Partial Completion" is issued, all responsibility for care and maintenance of all items or portions of the Work to be placed in use shall be borne by the Contractor. Upon issuance of a "Statement of Partial Completion", the City will accept responsibility for the protection and maintenance of all such items or portions of the Work described in the written notice, and it is further understood that the manufacturer's warranties of any affected equipment will commence not later than the date for commencement of the warranties indicated on the "Statement of Partial Completion". However, the Contractor shall retain full responsibility for satisfactory operation of the total project and the Contractor's guarantee period shall commence only after the issuance of the Statement of Completion. Such guarantee of total systems operation shall include that portion or portions of work covered by the "Statement of Partial Completion".

The issuance of a "Statement of Partial Completion" for any part of the Work shall not relieve the Contractor of its obligation to promptly remedy any omissions and latent or unnoticed defects in the Work covered by the "Statement of Partial Completion". The City shall have the right to restrict the Contractor's use of the occupied portion of the Work but shall allow the Contractor reasonable access to complete or correct items required by the Contract Documents.

The City may, if the Work is progressing satisfactorily, release part of the retention on portions of the Work for which a "Statement of Partial Completion" has been issued, provided that the following conditions have been met:

1) Partial Final Inspection corrections have been completed to the satisfaction of the Inspector on the portions of work to be utilized or placed into service;

2) The Contractor submits a written request to the Inspector for release of retention which includes a verifiable valuation of the identified portions of the Work covered by the "Statement of Partial Completion";

3) Impacted Subcontractors, major suppliers and the Contractor's Surety all agree in writing to release of retention;

4) There are no Stop Notices on file with the Board against the Contractor involving any portion of the affected Work; and

5) Both the Engineer and Inspector agree that a portion of the retention should be released for the affected Work.

00407 FINAL ACCEPTANCE (02/21/08)

When all work has been completed to the satisfaction of the Inspector, the Inspector shall request in writing a Full Final Inspection be performed by the Final Inspector. The Full Final Inspection conducted by the Final Inspector may include the Contractor and the Engineer. A Final Inspection Correction List will be provided to the Contractor and the Engineer upon completion of the Final Inspection. All corrections listed on the Final Inspection Correction List shall be completed within thirty (30) days of issuance of the Final Inspection Correction List. Failure to complete all corrections within thirty (30) days

of issuance of the Final Inspection Correction List shall result in the Final Inspection being performed again.

The date of completion of the Project shall be the date of Final Field Acceptance of the Project when all physical corrections have been completed. The Final Inspector will issue the Statement of Completion indicating the date of Final Field Acceptance of the Project.

If there are no physical corrections to be completed following the Full Final Inspection, the Final Inspector will issue the Statement of Completion indicating the date of Final Field Acceptance of the Project.

Final Field Acceptance of the Project shall establish the following:

1) Start date of the Contractor's material and workmanship Guaranty-Warranty for the total Project.

2) Start date of any equipment or material warranties which had not previously been started.

3) Date the City assumes responsibility for maintenance, security, and safety of the Project.

Upon issuance of the Statement of Completion by the Final Inspector and completion of all administrative requirements of the contract, the Inspector of Public Works and City Engineer shall prepare a Joint Report which contains the recommendation of the Inspector of Public Works that the Board accept the Project. The Board will formally accept the project based on the information contained in the Joint Report.

00408 LIQUIDATED DAMAGES (9/18/07)

Time is of the essence in completing the Work required by the Contract. If the Contractor fails or refuses to complete the Work or any part thereof within the time fixed by the terms of the Contract, or any approved extension thereof, the actual damage to the City due to the delay will be difficult or impossible to determine. In lieu thereof, the Contractor shall pay to the City, as fixed and agreed, liquidated damages for each day of delay in completion, the sum or sums as set forth in the Contract Documents. The Contractor shall be liable for the amount thereof. The City reserves the right, however, to terminate the Contractor's completion of the Work, charging against the Contractor and its sureties any excess cost occasioned the City thereby, together with liquidated damages accruing until such time as the City may reasonably complete the Work.

Permitting the Contractor to continue and complete the Work, or any portion thereof, after the time fixed herein for completion, or after the expiration of any extensions of said time, shall in no way operate as a waiver on the part of the City of any of its rights under the Contract.

00409 THRU 00499 NOT USED

00500 CHANGES AND EXTRA WORK (9/18/07)

The Engineer may, at any time, without notice to the Sureties, by written order designated or indicated to be a Change Order, order performance of extra work or make any change, addition or deletion in the Work, including but not limited to changes in the Specifications including Plans and designs; in the time, method or manner of performance of the Work; in the City furnished facilities, equipment, materials, services, or site; or directing acceleration in the performance of the Work.

Upon receipt of such Change Order, the Contractor shall promptly proceed with the Work covered thereby, which shall be performed in accordance with the provisions of the Contract Documents except as otherwise specifically provided.

In the event that Contractor receives any written order or direction by the Engineer or Inspector that is not so designated or indicated to be a Change Order, but which Contractor believes to constitute an extra, change, addition or deletion in the Work, then Contractor shall, prior to performance of any Work related thereto, give written notice to the Engineer and Inspector confirming Contractor's belief that such order or direction is believed to be a Change Order within one (1) working day of Contractor's receipt of such order or direction. Compensation for the extra, change, addition, or deletion in the Work will be in accordance with the provisions of "Change Orders" of the General Requirements.

Contractor conclusively waives any right to additional compensation, costs, expenses, damages or extension of time associated with an extra, change, addition or deletion to the Work that is performed by Contractor without either (i) a written order signed by the Engineer designated or indicated to be a Change Order and any change, addition or deletion, or (ii) a written notice issued by Contractor in accordance with the provisions of this Article.

During the progress of the Work, it may be necessary for the Engineer to issue written field orders in the form of an Emergency Change Order. Upon receipt, The Contractor shall immediately proceed with the Engineer's written directive to the limits described in Authority of the Board, Engineer, and Inspector.

Except as provided in this Article, no other order, statement, or conduct of the Engineer or Inspector shall be treated as a change under this Article or shall entitle the Contractor to an adjustment in the Contract Price or Contract Completion Date.

Except for claims based on defective Specifications, no Claim for any change under this Article shall be allowed for any costs incurred more than twenty (20) calendar days before the Contractor gives written notice as required. Except as otherwise provided in the Contract Documents, in the case of defective specifications for which the Engineer is responsible, the adjustment shall include any increased cost the Contractor reasonably incurred in attempting to comply with those defective specifications.

If the Contractor intends to assert a Claim for an adjustment in the Contract Price under this Article, it must, within twenty (20) calendar days after receipt of a written Change Order or the furnishing of a written confirmation notice as hereinbefore specified, submit a written statement to the Engineer setting forth the general nature and monetary extent of such claim and all factual grounds therefor, including documented actual costs. The Contractor may include the statement of claim in the written notice as hereinbefore specified. Failure to comply with the twenty (20) calendar day notice requirement shall be deemed a waiver of Claims by the Contractor.

No adjustment shall be made under this Article for any suspension, delay, interruption, change or any other cause, to the extent that an adjustment is provided for or excluded under any other provision of the Contract.

Recovery of compensation, costs, expenses or damages resulting from delay, disruption, hindrance, or interference in the performance of the Work (including without limitation interruption of schedules, extended, excess or extraordinary field overhead and indirect overhead costs, loss of productivity and the impact, ripple or cumulative effect on other Work), shall not be permitted, and all rights thereto are conclusively waived by Contractor.

No Claim by the Contractor shall be allowed if the Claim is made after final payment under this Contract.

00501 DIFFERING SITE CONDITIONS (9/18/07)

Upon discovery and before further disturbance of any differing site conditions, the Contractor shall immediately notify the Inspector and the Engineer, followed by a written notice to the Engineer within twenty-four (24) hours of subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents; or unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the Work of the character provided for in this Contract; or materially differing from that represented in the Contract Documents which the Contractor believes may be hazardous waste (as defined in the California Health and Safety Code and is required to be removed to a Class I, Class II or Class III disposal site in accordance with provisions of existing law).

The Engineer will promptly investigate the conditions. If the Engineer finds that conditions materially differ and will cause an increase or decrease in the Contractor's cost or the time required to perform any part of the Work, the Engineer will adjust the Contract by Change Order.

If the Contractor disagrees with the Engineer's determination the Contractor may request an adjustment to the Contract Price or Contract Completion Date. Within twenty (20) calendar days after it first discovered, or should have discovered in the exercise of diligence and extreme care, the existence of such Differing Site Condition, submit a written statement setting forth a detailed cost breakdown described in "Change Orders" of the General Requirements. The statement must include the Contractor's basis and calculation of the costs saved or incurred, detailed information demonstrating the effect on the Contractor's schedule of performance (in the same manner as required by the Contract Documents for requesting an extension of time), identification of the Escrow Bid Documents that formed the basis of the Contractor's Bid to perform the Work affected by such conditions, and a complete and detailed explanation of the factual basis for the request.

Failure by the Contractor to strictly comply with the requirements of this Article concerning the timing and content of any notice of Differing Site Conditions or of any request for adjustment in Contract Price or Contract Completion Date based on Differing Site Conditions shall be deemed a waiver of any Claim by the Contractor for increase in the Contract Price or extension of the Contract Completion Date by reason of such conditions.

No Claim by the Contractor for an adjustment hereunder shall be allowed if asserted after final payment under this Contract.

00502 THRU 00599 NOT USED

00600 CLAIMS AND PROTESTS (9/18/07)

A Claim that involves an extra, change, addition or deletion to the Work as set forth in Changes and Extra Work shall arise upon issuance of a final decision of the Engineer denying, in whole or in part, a request for adjustment in the Contract Price or Contract Completion Date; provided however, that failure to comply with the requirements of the articles for Changes and Extra Work or Differing Site Conditions shall be conclusively deemed to constitute grounds to deny such Claim.

A Claim that does not involve an extra, change, addition or deletion to the Work may be asserted only if the Contractor shall immediately and prior to performing the Work affected thereby give written notice to the Engineer and the Inspector of such circumstances and of Contractor's intention to file a Claim based thereon. Unless otherwise directed by the Engineer, the Contractor shall proceed without delay to perform the Work and to conform to any order, instruction, or decision of the Engineer with respect thereto.

The Contractor shall, within twenty (20) calendar days after it first knew, or in the exercise of diligence and extreme care should have known, of the circumstances giving rise to the Claim, file a written Claim with the Engineer, stating in detail all objections, grounds and reasons therefor. The Contractor shall, upon instruction by the Engineer or the Inspector, provide, within ten (10) days or such other time as agreed to between the Engineer, and the Contractor, any and all documents, records or other materials identified by the Engineer or the Inspector as necessary for the resolution of the Contractor's Claim.

Claims seeking time extensions shall be accompanied by such documentation as is required by "Contractor's Construction Schedule and Reports" of the General Requirements. Claims seeking recovery of compensation or adjustments to the Contract Price, whether or not based on extras, changes, additions or deletions to the Work, shall be in the form of Change Order Cost Quotations prepared in accordance with and subject to all of the requirements of "Change Orders" of the General Requirements, including without limitation the prohibition on use of "total cost" and "modified total cost" methodologies.

Contractor waives all rights to assert any claims or seek any relief in the form of extensions of time or recovery of additional compensation, costs, expenses, damages from the City that are not presented as a Claim in the manner specified and within the time stated herein. Contractor further hereby agrees that in the interest of avoiding the additional expense and potential inequity of piecemeal resolution of Claims, all decisions by Engineer shall be final and binding not only as to all matters asserted in the Claim, but also as to all matters (including without limitation all rights to extensions of time and recovery of extra compensation, costs, expenses and damages) not asserted in the Claim that were known to Contractor, or that could have been reasonably discovered by Contractor in the exercise of diligence and extreme care, at the time of submission of the Claim and that are in any way related to the subject matter of the Claim. All orders, instructions and decisions of the Engineer or the Inspector will be limited to matters properly falling within their respective authority as specified in Authority of the Board, Engineer and Inspector.

The Contractor will be informed of the Engineer's or the Inspector's decision within thirty (30) days after the Contractor last submits data pertinent to the Claim previously mentioned. In the case of a Claim that involves an extra, change, addition or deletion to the Work as set forth in Changes and Extra Work, if the Contractor accepts the decision of the Engineer or Inspector, then the Contractor and City shall enter into a Change Order adjusting the Contract Price and Contract Completion Date in accordance with such decision. In case a Claim does not involve an extra, change, addition or deletion to the Work as set forth in Changes and Extra Work and the Contractor accepts the decision of the Engineer or Inspector, then the Contractor and City shall enter into a Change Order setting forth the terms of the decision and, if appropriate, its effect on the Contract Price or Contract Completion Date. If the Contractor does not accept the decision of the Engineer or Inspector, it is recommended that further appeal of the Engineer's decision be conducted in accordance with the Issue Resolution Ladder, as defined in "Opportunity to Partner" of the General Requirements. If the dispute cannot be settled, the Contractor must elevate the appeal to the Dispute Review Board (if provided for under the terms of the General Requirements) or to the Board of Public Works (if the Contract Documents do not provide for a Dispute Resolution Board) in writing within twenty (20) calendar days after receipt of the Engineer's decision. The Board shall afford the Contractor an opportunity to be heard and to offer evidence in support of its appeal. All determinations of the Board with respect to Claims shall be final and binding.

In all matters concerning the validity, interpretation, performance, effect or otherwise of the Contract, the Federal regulations (if and to the extent expressly incorporated by reference in the Contract Documents), the laws of the State of California, and the Charter of the City of Los Angeles shall govern and be applicable. Pending final disposition of a Claim, the Contractor shall proceed diligently with the performance of the Contract and in accordance with the previously mentioned decision.

Any Claim, including without limitation any Claim filed on behalf of or having its source in a claim by Subcontractor, Sub-Subcontractor, or Supplier, at any tier, which the Contractor chooses to make to the City, shall be accompanied by the certification language set forth below signed by a responsible

managing officer of the Contractor's organization, who has the authority to sign Subcontracts or Purchase Orders on behalf of the Contractor, and who has personally investigated and confirmed the truth and accuracy of the matters set forth in such certification. Submission of certification in accordance herewith is a condition precedent to the City's consideration of or decision on the Claim and to the filing and maintenance of any legal action or proceeding to enforce or recover monies under such Claim. Failure to submit such a certification along with the Claim shall result in the Claim being returned to the Contractor without any decision, and shall waive the Contractor's right to pursue the Claim either on its own behalf or on behalf of such Subcontractor or Supplier.

I hereby certify under penalty of perjury that I am a managing officer of _____(Contractor's name)_____ and that I have reviewed the Claim presented herewith on Contractor's behalf and/or on behalf of (Subcontractor's/Supplier's name(s))___ and that the following statements are true and correct:

1) The facts alleged in or that form the basis for the Claim are true and accurate; and,

2) Contractor does not know of any facts or circumstances, not alleged in the Claim, that by reason of their not being alleged render any fact or statement alleged in the Claim materially misleading; and,

3) Contractor has, with respect to any request for money or damages alleged in or that forms the basis for the Claim, reviewed the job cost records (including those maintained by Contractor and by any Subcontractor or Supplier, of any tier, that is asserting all or any portion of the Claim) and confirmed with mathematical certainty that the losses or damages suffered by Contractor and /or such Subcontractor or Supplier were in fact suffered in the amounts and for the reasons alleged in the Claim; and,

4) Contractor has, with respect to any request for extension of time or claim of delay, disruption, hindrance or interference alleged in or that forms the basis for the Claim, reviewed the job schedules (including those maintained by Contractor and by any Subcontractor or Supplier, of any tier, that is asserting all or any portion of the Claim) and confirmed on an event-by-event basis that the delays or disruption suffered by Contractor and /or such Subcontractor or Supplier were in fact experienced for the durations, in the manner, and with the consequent effects on the time and/or sequence of performance of the Work, as alleged in the Claim; and,

5) Contractor has not received payment from City for, nor has Contractor previously released City from, any portion of the Claim.

Signature: _____

Name: _____

Title: _____

Company: _____

Date: _____

No Claim by the Contractor shall be allowed if made after final payment under this Contract.

00601 COMMENCEMENT OF STATUTE OF LIMITATIONS (11/21/01)

Any applicable statute of limitations shall commence to run and any alleged cause of action by the Contractor against the City arising out of or related to the Project shall be deemed to have accrued in any

and all events no later than 30 days after Contractor's submittal of its last application for progress payment of Contract or Change Order Work satisfactorily performed.

00602 GOVERNING LAW (11/21/01)

The terms and conditions of this Contract shall be construed and interpreted under, and all respective rights and duties shall be governed by, the laws of the State of California. Wherever applicable each provision of these Contract Documents shall be interpreted in such a manner as to be effective and valid under applicable law, but if any provision of these Contract Documents shall be prohibited by or invalid under applicable law, such provision shall be ineffective to the extent of such prohibition or invalidity, without invalidating the remainder of such provision or the remaining provisions of these Contract Documents.

Unless otherwise provided in this Contract, all claims, counterclaims, disputes and other matters in question between the City and the Contractor arising out of or relating to this Contract or the breach of it will be decided by a Court of competent jurisdiction. It is understood that this Contract is executed and to be performed within the City and County of Los Angeles.

00603 VENUE (2/09/95)

This Contract will be executed and performed within the City and County of Los Angeles, California.

00604 NO WAIVER OF RIGHTS (4/12/95)

Neither the inspection by the City, nor any order by the City for payment of money, nor any payment for or acceptance of the whole or any part of the Work by the City, nor any extension of time, nor any possession taken by the City, shall operate as a waiver of any provision of this Contract, or any power herein reserved to the City, or any right to damages herein provided, nor shall any waiver of any breach in this Contract be held to be a waiver of any other or subsequent breach.

00605 ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE (4/12/95)

The acceptance by the Contractor of final payment shall release the City, the Engineer, the Inspector, their officers, agents, representatives, or employees, as representatives of the City, from all claims and all liability to the Contractor for all things done or furnished in connection with the Work and every act of the City relating to or arising out of the Work.

00606 PATENTS AND COPYRIGHTS (10/17/01)

The Contractor shall include in its Bid the patent fees or royalties on any patented article or process which may be furnished or used in the Work. The Contractor shall indemnify and hold the City harmless from any legal action that may be brought for infringement of patents. The Contractor's attention is directed to "Notice of Patents, Data, and Copyright Regulations" of the Federal Labor Standards.

The Contractor shall bear all costs arising from the use of patented goods and /or processes used on and/or incorporated into the Work. When use of these goods and/or processes is judged to be an infringement and their use is banned, the Contractor, at its own expense, shall, with concurrence of the Engineer, do one of the following:

1) Secure for the City the right to continue using goods and/or processes by suspension of the injunction or by procuring a license(s);

2) Replace said goods and/or processes with non-infringing goods and /or processes;

3) Modify said goods and/or processes so that they become non-infringing; or

4) Remove said goods and/or processes and refund the sum paid therefor without prejudice to any other rights of the City.

The preceding shall not apply to any goods manufactured to the detailed design of the City contained in the Contract Documents.

00607 PUBLIC RECORDS ACT (4/06/00)

All records, documents, Plans, specifications and all other information relating to the conduct of the City's business, including information submitted by the Contractor, shall become the exclusive property of the City and except as provided by law shall be deemed public records. Said information shall be subject to the provisions of the California Public Records Act (Government Code Sections 6250 et seq.).

Under no circumstances will the City be responsible or liable to the Contractor, submitter or any other party for the disclosure of any records or information submitted to the City, regardless of whether such records or information are labeled "Trade Secret", "Confidential", or "Proprietary" (or words to similar effect) and regardless of whether the disclosure is required by law or a court order or occurs through inadvertence, mistake, or negligence on the part of the City or its officers, employees, and/or contractors.

The City will not advise as to the nature or content of documents entitled to protection from disclosure under the California Public Records Act", including interpretations of the Act or the definition of "Trade Secret". The submitting party shall be solely responsible for all determinations made under the Act, and where appropriate for clearly and prominently marking each and every page or sheet of information with "Trade Secret", "Confidential", or "Proprietary". Each submitting party is advised to contact its own legal counsel concerning the California Public Records Act and its applicability to the submitting party's own circumstances.

In the event of litigation concerning the disclosure of any information submitted by the submitting party, the City's sole involvement will be as a stakeholder, retaining the information until otherwise ordered by a court. The submitting party, at its sole expense and risk, shall be responsible for any and all fees and costs for prosecuting or defending any action concerning the information, and shall indemnify and hold the City harmless from all costs and expenses including attorneys' fees, in connection with such action.

END OF SECTION

Division 01 — General Requirements

TABLE OF CONTENTS
DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01111
ABBREVIATIONS AND REFERENCE STANDARDS

1.1 ABBREVIATIONS

A. The abbreviations herein, together with others in general use, are applicable to this Project Manual, Contract Drawings, and other Contract Documents.

B. All abbreviations and symbols used on Contract Drawings for structural steel construction shall conform to those given by the "Manual of Steel Construction" published by the American Institute of Steel construction, Inc.

C. Common Usage: Whenever the following abbreviations are used, they shall have the meanings indicated:

ABAN	Abandon
ABAND	Abandoned
ABUT	Abument
ABS	Acrylonitrile – butadiene – styrene
AC	Asphalt concrete
ACP	Asbestos cement pipe
ACWS	Asphalt concrete wearing surface
ADA	Americans with Disabilities Act
AGB	Alley grating basin
AL	Allowance
ALT	Alternate
AMER STD	American Standard
AQMD	Air Quality Management District
ARHM	Asphalt-rubber hot-mix
ATSAC	Automated Traffic Surveillance and Control System
AT&T	Local and long distance telephone company (formerly SBC and Pacific Bell)
AWG	American Wire Gage (nonferrous wire)
BAGR	Bridge approach guard railing
BB	Beginning of Bridge
BC	Beginning of curve
BCR	Beginning of curb return
BDRY	Boundary
BF	Bottom of footing
BM	Bench mark
BMP	Best Management Practice
BPW	Board of Public Works
BSJ	Bell and spigot joint
BSL	Bureau of Street Lighting
BVC	Beginning of vertical curve
B/W	Back of wall
C/C	Center to center
CAB	Crushed aggregate base
CAC	California Administrative Code
CAP	Corrugated aluminum pipe
CASQA	California Storm Water Quality Association
CB	Catch Basin
Cb	Curb
CBP	Catch Basin Connection Pipe
CBR	California Bearing Ratio
CCR	California Code of Regulations

CCTV	Closed Circuit TV
CF	Curb face or Cubic foot
C&G	Curb and gutter
CGB	Curbside grating basin
CFR	Code of Federal Regulations
CIDH	Cast-in-drilled-hole
CIP	Cast iron pipe or Cast-in-place
CIPP	Cast-in place pipe
CL	Clearance, center line
CLF	Chain link fence
CLSM	Controlled Low Strength Material
CMB	Crushed miscellaneous base
CMC	Cement mortar-coated
CML	Cement mortar-lined
CMP	Corrugated Metal Pipe
CO	Cleanout (sewer)
COL	Column
CONC	Concrete
CONN	Connection
CONST	Construct, Construction
COORD	Coordinate
CQC	Contractor Quality Control
CSP	Corrugated steel pipe
CTB	Cement treated base
CV	Check valve
CY	Cubic yard
D	Load of pipe
dB	Decibels
DBE	Disadvantaged Business Enterprise
DBL	Double
DF	Douglas fir
DFT	Dry Film Thickness
DIA	Diameter
DIP	Ductile iron pipe
DL	Dead load
DMBB	Double metal beam barrier
DT	Drain Tile
DWG	Drawing
DWPPS	Los Angeles Department of Water & Power, Power System
DWPWS	Los Angeles Department of Water & Power, Water System
DWY	Driveway
DWY APR	Driveway approach
EA	Each
EB	End of bridge
EC	End of curve
ECR	End of curb return
EF	Each face
EG	Edge of gutter
EGL	Energy grade line
El	Elevation
ELC	Electrolier lighting conduit
ELT	Extra long ton
ENGR	Engineer, Engineering
EP	Edge of pavement
EPA	Environmental Protection Agency
ESA	Environmentally Sensitive Area
ESAL	Equivalent Single Axle Load
ESRP	Emergency Spill Response Plan
ESMT	Easement

ETB	Emulsion-treated base
EVC	End of vertical curb
EXC	Excavation
EXP JT	Expansion joint
EXST	Existing
F	Fahrenheit
F&C	Frame and cover
F&I	Furnish and install
FAB	Fabricate
FAS	Flashing arrow sign
FD	Floor drain
FDN	Foundation
FED SPEC	Federal Specification
FG	Finished grade
FH	Fire hydrant
FL	Flow line
FRP	Fiberglass reinforced plastic
FRPM	Fiberglass reinforced plastic mortar
FS	Finished surface
FTA	Fully traffic actuated
FT-LB	Foot-pound
FTG	Footing
FW	Face of wall
GA	Gauge
GALV	Galvanized
GC	Grade change
GCASP	State General Construction Activity Stormwater Permit
GIP	Galvanized iron pipe
GL	Ground line or grade line
GM	Gas meter
GP	Guy pole
GR	Grade
GRTG	Grating
GSP	Galvanized steel pipe
GTE	General Telephone Company
H	High or height
HB	Hose bib
HC	House connection
HDPE	High density polyethylene
HDWL	Headwall
HGL	Hydraulic grade line
HORIZ	Horizontal
HP	Horsepower
HPG	High pressure gas
HPS	High pressure sodium (Light)
HS	High strength
HYDR	Hydraulic
ID	Inside diameter
INCL	Including
INSP	Inspection
INV	Invert
IP	Iron pipe
IPW	Inspector of Public Works
JC	Junction chamber
JCT	Junction
JS	Junction structure
JT	Joint
L	Length
LAAC	Los Angeles Administrative Code

LAB	Laboratory
LADBS	Los Angeles Department of Building and Safety
LADGS	Los Angeles Department of General Services
LADOT	Los Angeles Department of Transportation
LACDPW	Los Angeles County Department of Public Works
LAMC	Los Angeles Municipal Code
LARWQCB	Los Angeles Regional Water Quality Control Board
LAT	Lateral
LB	Pound
LD	Local depression
LF	Linear foot
LH	Lamp hole
LL	Live load
LOL	Layout line
LONG	Longitudinal
LP	Lamp post
LPS	Low pressure sodium (Light)
LS	Lump sum
LTS	Lime treated soil
MA	Mast Arm
MAINT	Maintenance
MAX	Maximum
MB	Metal beam
MBB	Metal beam barrier
MBGR	Metal beam guard railing
MBE	Minority Business Enterprise
MCR	Middle of curb return
MEAS	Measure
MED	Median
MH	Manhole, maintenance hole
MIL SPEC	Military Specification
MISC	Miscellaneous
MOD	Modified, modify
MON	Monument
MSM	Mandatory subcontracting minimum
MTA	Metropolitan Transportation Authority (of LA County)
MTH	Month
MTL	Material
MULT	Multiple
MUTCD	Manual on Uniform Traffic Control Devices
MVL	Mercury vapor light
MWD	Metropolitan Water district
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCP	Nonreinforced concrete pipe
OBE	Other Business Enterprise
OBS	Obsolete
OC	On center
OD	Outside diameter
OE	Outer edge
OH	Overhead
OPP	Opposite
ORIG	Original
OSA	Office of the State Architect
OSHA	Occupational Safety and Health Administration (Dept. Of Labor)
PACBELL	Pacific Bell (Pacific Telesis Group)
PAV	Pressure Aging Vessel
PB	Pull box
PC	Point of curvature

PCC	Portland cement concrete or Point of compound curvature
PCVC	Point of compound vertical curve
PE	Polyethylene
PG	Performance Graded
PI	Point of intersection
PL	Property line
PMB	Processed miscellaneous base
POC	Point on curve
POT	Point on tangent
PP	Power pole
PRC	Point of revere curve
PRVC	Point of reverse vertical curve
PSI	Pounds per square inch
PT	Point of tangency
PVC	Polyvinyl chloride
PVMT	Pavement
PVT R/W	Private right-of-way
Q	Rate of flow in cubic feet per second
QA	Quality Assurance
QC	Quality Control
QUAD	Quadrangle, Quadrant
R	Radius
R&O	Rock and oil
R/W	Right-of-way
RA	Recycling agent
RAC	Recycled asphalt concrete
RAP	Reclaimed asphalt pavement
RBAC	Rubberized asphalt concrete
RC	Reinforced concrete
RCB	Reinforced concrete box
RCC	Rail Construction Corporation
RCE	Registered civil engineer
RCP	Reinforced concrete pipe
RCV	Remote control valve
REAS	Rubberized Emulsion-Aggregate Slurry
REF	Reference
REINF	Reinforced or reinforcement
RES	Reservoir
RGE	Registered geotechnical engineer
RR	Railroad
RSE	Registered structural engineer
RTE	Registered traffic engineer
RTFO	Rolling Thin Film Oven
S	Slope
SCAQMD	South Coast Air Quality Management District
SCCP	Steel cylinder concrete pipe
SCG	Southern California Gas Company
SCHED	Schedule
SCRRA	Southern California Regional Rail Authority
SD	Storm drain
SDR	Standard thermoplastic pipe dimension ratio (ratio of pipe O.D. to minimum wall thickness)
SE	Sand Equivalent
SEC	Section
SF	Square foot
SI	International System of Units (Metric)
SOCB	Side opening catch basin
SPEC	Specifications
SPPWC	Standard Plans for Public Works Construction

SR	Standard ratio
SRJ	Steel ring joint (for RCP)
SS	Sanitary sewer
SSB	Select sub-base
SSPWC	Standard Specifications for Public Works Construction
ST HWY	State highway
STA	Station
STD	Standard
STR	Straight
STR GR	Straight grade
STRUC	Structural/Structure
SW	Sidewalk
SWD	Sidewalk drain
SWMP	Storm Water Management Plan
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State (of California) Water Resources Control Board
SY	Square yard
TAN	Tangent
TC	Top of curb
TCP	Traffic control plan
TEL	Telephone
TF or T/F	Top of footing
TH	Test hole
TOPO	Topography
TR	Tract
TRANS	Transition
TS	Traffic signal or transition structure
TSC	Traffic signal conduit
TSS	Traffic signal standard
TW	Top of wall
TYP	Typical
USA	Underground Service Alert
V	Volt
VAR	Varies, Variable
VB	Valve box
VC	vertical curve
VCP	Vitrified clay pipe
VECP	Value Engineering Change Proposal
VERT	Vertical
VOL	Volume
VT	Variable thickness
W	Wider or width
WATCH	Work Area Traffic Control Handbook
WBE	Women Business Enterprise
WDID	Waste Discharge Identification Number
WI	Wrought iron
WM	Water meter
WPCP	Water Pollution Control Plan
WPJ	Weakened plane joint
WUT	Western Union Telegraph
WWECP	Wet Weather Erosion Control Plan
XCONN	Cross connection
XSEC	Cross section

D. Institutions: Wherever the following abbreviations are used they shall have the meanings indicated:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute

ACRI	Air Conditioning and Refrigeration Institute
ADA	Americans with Disabilities Act
AGA	American Gas Association
AGMA	American Gear Manufacturers' Association
AI	Asphalt Institute
AISC	American Institute of Steel Construction
AISI	American Iron & Steel Institute
AITC	American Institute of Timber Construction
AAMA	American Architectural Manufacturer's Association
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
AQMD	Air Quality Management District
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASQC	American Society for Quality Control
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Building Hardware Manufacturer's Association
CAC	California Administrative Code
CAL/ABL	State of California/Architectural Barriers Laws
CAL/OSHA	State of California/Occupational Safety and Health Administration
CALTRANS	California Department of Transportation
CASQA	California Stormwater Quality Association
CBM	Certified Ballast Manufacturers
CITY	City of Los Angeles
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
EIA/TIA	Electronic Industries Association
EPA	Environmental Protection Agency
ETL	Department of Building & Safety Electrical Test Laboratory
FCI	Fluid Control Institute, Inc.
FIA	Factory Insurance Association
FM	Factory Mutual Association
FS	Federal Specifications
GA	Gypsum Association
GRI	Geosynthetic Research Institute
ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
LA	City of Los Angeles
LABC	City of Los Angeles Building Code
LAMC	City of Los Angeles Municipal Code
NAAMM	National Architectural Association of Metal Manufacturers
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFC	National Fire Code
NFPA	National Fire Protection Association
NWMA	National Wood Manufacturer's Association
NWWDA	National Wood Window and Door Association

NOAA	National Oceanic and Atmospheric Administration (Dept. of Commerce)
OSA	Office of the State Architect
OSHA	Occupational Safety and Health Administration (Dept. of Labor)
PCA	Portland Cement Association
RA	Rule of General Application – Department & Safety
RCSC	Research Council on Structural Connections of the Engineering Foundation
SAMA	Scientific Apparatus Manufacturer's Association
SDI	Steel Deck Institute
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
SWRCB	State Water Resources Control Board
UBC	Uniform Building Code, International Conference of Building Officials
UL	Underwriters Laboratories, Inc.
USGS	United States Geological Survey
VERIZON	Verizon Communications (Formerly General Telephone & Electronics
WATCH	Work Area Traffic Control Handbook
WCLIB	West Coast Lumber Inspection Bureau
WCRSI	Western Concrete Reinforcing Steel Institute
WIC	Woodwork Institute of California
WRI	Wire Reinforcement Institute
WWPA	Western Wood Products Association

1.2 REFERENCE STANDARDS

A. Applicable Publications: Whenever in these Specifications / Project Manual references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Work is advertised for bids shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.

B. Specialists' Assignments: In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the CONTRACTOR has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the Work; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the CONTRACTOR.

C. Codes And Safety Standards: Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to or exceed the applicable requirements of the following Codes and Safety Standards.

1. Applicable Codes:

a. City of Los Angeles Building Code

b. City of Los Angeles Mechanical Code

c. City of Los Angeles Plumbing Code

d. City of Los Angeles Fire Code

e. City of Los Angeles Electrical Code

(1) References herein to "Building Code" shall mean City of Los Angeles Building Code. Similarly references to "Mechanical Code," "Plumbing Code," "Fire Code," and "Electric Code" shall mean City of Los Angeles Mechanical Code, City of Los Angeles Plumbing Code, City of Los Angeles Fire Code, and City of Los Angeles Electric Code respectively.

2. Applicable Safety Standards:

a. OSHA Regulations for Construction

b. OSHA Standard

c. Cal-OSHA

(1) References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

(2) References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

(3) References herein to "Cal-OSHA" shall mean State of California, Department of Industrial Relations, as amended to date, and all changes and amendments there to which are effective as of the date of construction.

(4) The latest edition of the codes as approved and adopted for use by the CITY as of the date of award shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto.

D. Standard Specifications: References in the Contract Documents to "Standard Specifications" shall mean the Standard Specifications for Public Works Construction, including all current supplements, addenda, and revisions thereof.

E. Standard Plans: References herein to "Standard Plans" shall mean the Standard Plans issued by the City of Los Angeles which drawings are hereby incorporated in and made a part of these Contract Documents, and copies of which are available for a fee.

F. Conflict Between Codes, Safety Standards, Reference Standards, Drawings And Other Contract Documents: In case of conflict between codes, reference standards, drawings and other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the ENGINEER for clarification and directions prior to ordering or providing any materials or labor. The CONTRACTOR shall bid for the most stringent requirements.

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SECTION 01112
DESCRIPTION OF WORK

PART 1 -- GENERAL

1.1 SCOPE OF WORK

A. The work covered under this contract will be performed in the following locations in the City of Los Angeles: (1) Frederick Street; (2) Rose Avenue; and (3) Penmar Recreation Area.

B. The overall project will consist of the construction of a diversion structure, pump station, reservoir, reservoir pump station, associated utility relocations, force main piping, and sewer upsizing for the City of Los Angeles.

C. The work to be performed under this contract includes the following:

1. Diversion Structure
2. Pump Station
3. Reservoir
4. Reservoir Pump Station
5. Utility relocation at Frederick Street (water and sewer)
6. Force main piping:
    a. Pump Station to sewer maintenance hole
    b. Pump Station to Reservoir
    c. Reservoir Pump Station to sewer maintenance hole
7. Sewer upsizing
    a. Oakwood Ave (Segment 56103050-56103052A)
    b. Rialto Court (Segment 56101127-56101128A)
    c. Crescent Place (Segment 56103128-56103126A)
    d. Abbot Kinney (Segment 56103346-56103155A)
8. Traffic Control
9. Restoration
    a. Rose Avenue
    b. Frederick Street
    c. Penmar Recreation Center

1.2 EQUIPMENT PROCUREMENT

A. General: The CONTRACTOR shall provide, supply, fabricate, construct, deliver (FOB site) and install for the City of Los Angeles (CITY) the equipment and systems in accordance with the Contract Documents.

B. Minimum Process Requirements: The equipment and systems supplied by the CONTRACTOR shall be capable of satisfying the process requirements as set forth in the Contract Documents.

C. General Compliance: All electrical equipment, control panels and cabinets, components, devices, etc. shall be in accordance with the provisions of APPROVAL OF ELECTRICAL EQUIPMENT of these GENERAL REQUIREMENTS.

D. Internet Based Construction Management System:

1. The CONTRACTOR will be required to use the City's internet-based collaborative project management website, managed by e2020, to conduct all communication with other members of the project team. This shall include all submissions to the ENGINEER, including, but not limited to, shop drawing submittals, RFIs, change order cost proposals, change orders, daily reports, and letters. All requirements for hard copies of shop drawings as per SHOP DRAWINGS/SUBMITTALS of these General Requirements will still apply.

2. The CONTRACTOR must be able to scan and print all documents up to 11"x17". For shop drawings larger than 11"x17" and for all product samples and color charts, the CONTRACTOR will upload the submittal transmittal to the system and provide the hard copies and samples to the ENGINEER. The review time for the submittal will not begin until the hard copies are received.

3. The CONTRACTOR is required to provide a high speed internet connection for use by the CONTRACTOR and the ENGINEER/INSPECTOR for the duration of the project.

PART 2 -- PRODUCTS (Not Applicable)

PART 3 -- EXECUTION

A. Work Restrictions

1. All work in the LA County storm drains (located on Fredrick St. and Rose Ave.) shall be limited to April 15 through October 15 to avoid blocking stormwater flows during the rainy season, unless otherwise directed by the Engineer. Refer to GR Section 01125.

2. Seed lawn planting shall begin during the window of April 15th through September 15th, in order to establish warm season grass. If the Contractor is not ready to start seeding within these dates, the CITY will grant non-compensable delay days for the landscaping work only to the Contractor in order to establish the warm season grass. The number of non-compensable days added will be the difference in days between when the Contractor is ready to hydroseed and the next April 15th. The balance of the work must be completed within the contract time allowed and the landscaping work must be completed within the extended time to avoid liquidated damages.

* * * * * *

SECTION 01113
DIVISIONS OF TECHNICAL SECTIONS OF PROJECT MANUAL

1.1 THE REQUIREMENT

A. The Technical Section of the Project Manual, including the General Conditions and General Requirements, are arranged into the Construction Specifications Institute (C.S.I.) sixteen (16) Divisions - Section format with an additional Division 17 for Instrumentation and Controls. Each "Section" constitutes a unit of work and related "Sections" are grouped under broad generic headings called Divisions.

B. The organization of the Technical Sections of the Project Manual into Division, Sections, and articles shall not control or limit the CONTRACTOR in dividing the work among Subcontractors, a Sub-subcontractor, or to establish the extent of work to be performed by any trade. The CONTRACTOR shall be solely responsible for all subcontract arrangements of work regardless of the Project Manual organization.

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SECTION 01114
ISSUANCE OF DRAWINGS AND THE PROJECT MANUAL

1.1 THE REQUIREMENT

A. Unless otherwise provided in the Contract Documents, the ENGINEER will furnish to the CONTRACTOR ten (10) sets each of the Drawings, Project Manual and, where applicable, Geotechnical Design Summary Report (GDSR) without charge. Additional sets desired by the CONTRACTOR or Subcontractors will be furnished upon request, but at the CONTRACTOR'S expense.

B. All Drawings, Specifications, Special Provisions, and copies thereof are the property of the CITY. They are not to be used on other work. All necessary bid documents will be available to prospective bidders. Bidders will be issued Plans and Specifications for a fee. This fee is stated in the NOTICE INVITING BIDS.

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SECTION 01115
MANDATORY PROVISIONS

1.1 THE REQUIREMENT

A. Any mention in the Divisions of this Project Manual which follow the General Requirements or indication on drawings of articles, materials, operations, or methods requires that the CONTRACTOR provide each item mentioned or indicated, of quality or subject to qualifications noted; perform according to conditions stated, each operation the same prescribed; and provide therefore all necessary labor, equipment, and incidentals, even though such mention of articles, materials, operations, methods, quality, qualifications, or conditions is not expressed in complete sentences.

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SECTION 01120
INTERFACE / COORDINATION REQUIREMENTS

1.1 THE REQUIREMENT

A. The CONTRACTOR will be performing work on an operating sewer line. Under these conditions, precautions will be necessary to ensure that no damage occurs to this existing facility, including but not limited to piping, utilities, roads, and structures that are to remain in operation and including those to be modified or replaced.

B. The sewer system must be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the service provided. The CONTRACTOR shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in continuous operation during the construction period. Any temporary facilities, materials, equipment and labor required to achieve this objective shall be included in the Contract price. At the completion of work, all such temporary facilities, materials, and equipment remaining shall be removed from the site.

C. As approved by the ENGINEER, all or portions of the existing facility may be taken out of service for short periods of time corresponding with expected instances of minimum impact. The CONTRACTOR shall notify the ENGINEER not less than thirty calendar (30) days in advance to determine the feasibility of taking a utility/operation out of service. If the ENGINEER determines that the utility/operation can be taken out of service, the CONTRACTOR shall then request the shutdown on standard forms provided by the ENGINEER. Such requests shall be submitted to the ENGINEER not less than fifteen (15) calendar days before the requested date of the shutdown and shall include: dates, times, locations, procedures, and drawings showing materials and procedures proposed to be used. If any of the information changes, an additional fifteen (15) calendar days may be required after such changes are reported to the ENGINEER. Approval when granted will always be conditional. If granted, approval of the request, including date and time, will be given three (3) calendar days before the proposed shutdown. Additionally all preparations outlined in the submitted procedures shall be demonstrated to the ENGINEER and shall be completed twenty-four (24) hours before the shutdown. This shall include, but not be limited to, all tools, equipment, materials, excavations, operation of fans, pumps, etc. Should the CONTRACTOR fail to meet this requirement, the ENGINEER shall reserve the right to cancel such scheduled shutdown at no cost to the CITY and, furthermore, the CONTRACTOR shall reimburse the CITY for preparation costs incurred.

D. Vehicular and pedestrian traffic adjacent to the laydown area and/or within the jobsite must be maintained. If an existing street in the CONTRACTOR'S Work area is to be demolished or obstructed, the CONTRACTOR shall be responsible for providing access through or around the effected area, including signs, barricades, and lights, as approved by the ENGINEER and any local agencies having jurisdiction over any public access areas. The CONTRACTOR shall follow WATCH standards and California Manual on Uniform Traffic Control Devices for all traffic, including a minimum traffic lane of ten (10) feet for vehicles and four (4) feet for pedestrians.

E. The CONTRACTOR shall not park any vehicles, including concrete, hauling and delivery trucks, in any street at any time unless approved by the ENGINEER. Access must be maintained at all times for emergencies, sampling, equipment operations, maintenance, and like items.

F. At no time shall security of the site be compromised. If for any reason the CONTRACTOR finds it necessary to breach any existing perimeter fences or walls, permission of the ENGINEER shall first be obtained. The CONTRACTOR shall then request the alteration on forms provided by the ENGINEER. Requests shall include reasons for the alteration, times, boundary limits, special safety measures, proposed traffic rerouting with widths of such route, and a map detailing the above. The request shall also set forth details of repair of the wall or fences and shall establish a

timetable for completion of the repairs. The repaired wall or fence shall be the same height as, and of comparable quality and appearance to the previously existing construction. Such requests shall be submitted to the ENGINEER not less than fifteen (15) calendar days before the requested date of the access alteration. If any of the information changes, an additional fifteen (15) calendar days may be required after the changes are brought to the attention of the ENGINEER. Approval when granted will always be conditional. Final approval of the request, including date and time, will be given three (3) calendar days in advance. The CONTRACTOR shall provide interim security over the duration of the breach.

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SECTION 01125
ACTIVE STORM DRAINAGE SYSTEM REQUIREMENTS

1.1 THE REQUIREMENT

A. The Penmar project involves construction activity on an active storm drainage system that is to remain functional at all times. The Contractor shall submit a proposed low flow diversion plan to the Engineer for approval prior to implementation.

B. The Contractor may install temporary low-flow dams not more than 2-feet in height to collect incidental drainage at locations within 100' upstream of the construction activity, or at other locations as approved by the Engineer, and is to provide pumping facilities as required for removing the collected low-flow drainage water, sediment, and all other materials collected. Disposal of the pumped collected low-flow drainage water, and all other materials, is to be arranged by the Contractor in accordance with all applicable regulations. Contractor shall submit storm drain bypass plan to Engineer for review and approval before installing any system to divert storm drain flows.

C. The Contractor is to remove the low flow drainage dams completely and thoroughly and also remove all construction equipment and loose materials and supplies from the construction areas subject to flooding within four hours of written notice provided by the Engineer.

D. Contractor shall limit all work in LA County storm drains to April 15 through October 15. Permit to perform work is attached in Appendix C of these specifications.

E. The Contractor is not allowed to stockpile construction supplies, or materials, or to store equipment in areas subject to flooding by the passage of storm flow at any time.

F. The costs of removal of the temporary dams and of any other work made necessary by the issuance of an Engineer's four-hour-notice to vacate the construction area are included in the price bid and no additional compensation will be allowed.

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SECTION 01140
CONTRACTOR'S USE OF THE PREMISES

PART 1 -- GENERAL

1.1 SUMMARY

A. This Section applies to all situations in which the CONTRACTOR or his representatives, including but not necessarily limited to, suppliers, Subcontractors, employees and field engineers, who enter upon the CITY'S property.

B. CONTRACTOR shall commence the Contract Work and provide security and protection to existing facility and job site within 15 days from the issuance of Notice-To-Proceed.

C. Related Work:

1. Documents affecting works of this Contract include, but are not necessarily limited to the GENERAL CONDITIONS, DIVISION 1 - GENERAL REQUIREMENTS, and other Sections of the Project Manual.

2. DESCRIPTION OF WORK in Section 01112.

3. CONSTRUCTION FACILITIES in Section 01520.

4. SITE INVESTIGATION in Section 01711.

5. MOBILIZATION in Section 01721.

1.2 ACCESS TO THE JOB-SITE

A. As instructed by the Consultant or ENGINEER, CONTRACTOR shall restrict CONTRACTOR'S employees to the immediate Work areas on the job-site and in no way go beyond the Work limits or as otherwise directed by the ENGINEER.

B. Use of crane, equipment and/or man lift, catwalk/platform to transport materials, equipment, supplies and the CONTRACTOR'S personnel to the Work area shall be in conformance with the requirements of the local governing agencies. The CONTRACTOR shall furnish the CITY with a duplicate copy of the operating permit of the equipment prior to its use.

1.3 NOT USED

1.4 CONTRACTOR'S USE OF THE PREMISES

A. Not used.

B. Exercise care during Contracted Work operations not to interfere with or damage the following listed facilities:

1. Penmar Golf Course

2. Ball fields not designated as part of the construction working area. The ball fields will not be in operation during construction.

C. Not used.

D. All items, materials and equipment remaining in the existing structures and on the premises (job site), which are not specified to be salvaged in Item C above or elsewhere, shall become the property of the CONTRACTOR and shall be removed from the job site. The CITY makes no claims or assumes any value in any of these items, materials and/or equipment if they are removed from the structures or the job site or vandalized prior to and/or during the Contract period. The CITY assumes no responsibility for any additional operation or works as a result of the conditions described herein.

1.5 PARKING

A. No parking of CONTRACTOR'S vehicles will be allowed on the job-site except for the purposes of unloading and/or loading as directed by the ENGINEER. CONTRACTOR shall not use new paved areas for loading or unloading. All traffic controls in the Work area shall conform to the Work area Traffic Control Handbook (WATCH), latest edition.

C. CONTRACTOR'S employees are advised to park on adjacent CITY streets and shall observe CITY parking restrictions posted on such streets.

D. CONTRACTOR shall obtain and pay for a "Street Use Permit" in order to park his vehicles, equipment and CONTRACTOR'S Field Office at Street Division, Bureau of Street Services, 600 S. Spring Street, Suite 400, (213) 485-5668. Such "Street Use" shall be fenced off from street traffic as required. Upon completion of Contracted Work, such street area shall be left in a clean and safe condition ready for use by the public. Wherever CONTRACTOR and CONTRACTOR'S employees' vehicles are located on the street or "Street Use" area or on the job-site, all such vehicles shall be kept locked at all times.

E. NOT USED

1.6 SECURITY

A. Restrict the access of all persons entering upon the CITY'S property in connection with the Contracted Work to the Access Route and to the actual site of the work.

B. All employees of the CONTRACTOR who will be engaged in the construction of this project will be screened by the CITY for proper identification and good behavior. Candidates of good standing will be issued a temporary pass. CONTRACTOR shall furnish the CITY, a list of employees for approval prior to start of this project.

C. In addition to other responsibilities specified in other Sections of these GENERAL REQUIREMENTS, and the GENERAL CONDITIONS, the CONTRACTOR shall be responsible for the security of all its construction equipment, materials, tools, facilities, and vehicles (personal, private, or contractual) while performing the work of this Contract. This requirement shall be effective twenty-four (24) hours per day for the duration of the Contract.

D. CONTRACTOR shall furnish and maintain approved type site security protection between the Work areas and other areas. All such site security protection shall remain for the duration of this Contract.

E. CONTRACTOR shall furnish and maintain additional site security protection, as directed by the ENGINEER, INSPECTOR or other authorities having jurisdiction, at no additional cost to the CITY.

1.7 PROTECTIONS

A. Required:

1. Where necessary for the safety of the public and the protection of the adjacent street improvements and adjacent properties. Provide and maintain adequate protections, fences and gates and barricades to separate Work areas from areas outside the job-site limits. Such protections shall comply with provisions of Section 01 120 – INTERFACE / COORDINATION REQUIREMENTS and Section 01520 – CONSTRUCTION FACLITIES of the GENERAL REQUIREMENTS, and shall remain in place during extent of this Contract or as otherwise directed by the INSPECTOR.

2. CONTRACTOR shall provide protections, barricades, signs, etc., as necessary so that persons will be protected from the Work areas where trenching and excavations occur for foundation, underground utilities, underground fuel storage tanks etc. on the job-site. Upon completion of such work operations, such protections shall be removed.

3. All equipment, material, soil, debris and any heavy loaded object shall not be stock piled in adjacent area to create any surcharging to the trench or excavation.

1.8 REPAIR OF DAMAGES

A. Required: Repair or replace any damage to existing facilities under CONTRACTOR'S protection. Failure to repair or replace any damage shall be considered CONTRACTOR'S default and grounds for Contract termination.

B. Methods: Repair or replace damaged work with new materials as necessary to restore the damaged areas or surfaces to a condition equal to and matching such conditions existing prior to damage or start of Work of this Contract, to the full satisfaction of the ENGINEER at no added cost to the CITY. Submit repair method for approval as required by the ENGINEER.

1.9 INTERRUPTION OF SERVICES

A. CONTRACTOR shall make all provisions to accomplish Contracted Work without undue interference with the CITY'S operations of the existing facilities on the job-site premises.

1.10 NON-INTERFERENCE WITH OTHERS

A. CONTRACTOR shall confine Contracted Work operations to the immediate boundaries of the job-site and shall execute work operations in a manner to minimize interference with CITY operations and/or work operations of other CONTRACTORS working on the premises; as directed by the ENGINEER.

B. CONTRACTOR shall provide and maintain adjacent pedestrian and vehicular accesses in accordance with Work area Traffic Control Handbook (W.A.T.C.H.), latest edition.

C. CONTRACTOR shall obtain approval of ENGINEER and local authorities having jurisdiction such as Department of Transportation, Police Department, etc. prior to any street or alley closure.

1.11 UNDERGROUND SERVICE ALERT

A. Before commencing any excavation, the CONTRACTOR shall obtain an underground service alert inquiry I.D. Number by calling 1 (800) 422-4133. Two (2) working days shall be allowed after the I.D. Number is obtained and before the excavation work is started so that utility owners can

be notified. The I.D. Number must be reported to the Bureau of Contract Administration when calling for inspection. I.D. Numbers will not be given more than ten (10) calendar days prior to starting excavation work.

1.12 JOB SAFETY

A. CONTRACTOR shall observe all safety rules and regulations of the Los Angeles City Building Code and CAL/OSHA as applicable to the safety of the CONTRACTOR, CONTRACTOR'S personnel and CITY employees during Contracted Work operations and especially during asbestos removal operations.

1.13 HAZARDOUS WORK CONDITIONS

A. Perform all Work operations of this Contract in accordance with the latest applicable requirements of Federal, State, County, and City of Los Angeles Safety Codes including that of Los Angeles City Fire Department.

B. CONTRACTOR shall provide adequate fire extinguishers on the premises during the Contract period. Type and sizes as recommended by the National Board of Fire Underwriters as necessary to control a particular kind of fire and instruct his employees as to the use of such fire extinguishers.

C. Place all such fire extinguishers ready for use in the immediate area where the hazardous work operations will occur.

D. CONTRACTOR shall take special precautions in the use of acetylene torches, welding equipment, tar pots and kettles when working in a hazardous area.

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SECTION 01150
STORAGE OF MATERIALS AND EQUIPMENT

1.1 THE REQUIREMENT

A. All materials and equipment shall be stored and protected in accordance with the manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weatherproof, climate controlled enclosures. Where indoor storage is required, the equipment shall be stored inside a completely enclosed building, with the temperature controlled between 60 degrees Fahrenheit and 100 degrees Fahrenheit (60°F – 100°F) and a maximum relative humidity of ninety percent (90%) noncondensing.

B. For exterior storage of material or equipment, the materials or equipment shall be placed on sloped supports above ground. Material or equipment subject to deterioration shall be covered with an impervious covering. Where necessary ventilation and heating shall be provided to avoid condensation.

C. The CONTRACTOR shall exercise all measures necessary to ensure preservation of the quality, quantity, and fitness of the materials or equipment and shall perform the manufacturers recommended maintenance of the material or equipment.

D. The CONTRACTOR shall inspect the material and equipment, and submit a written monthly report to the INSPECTOR listing all the equipment stored, the results of their inspection, and the maintenance performed.

E. The materials and equipment shall not show signs of pitting, rust, decay or other deleterious effects of storage when incorporated in to the work.

F. Pumps, motors, electrical equipment, and other equipment with anti-friction or sleeve bearings shall be stored in weather tight structures maintained at a temperature above sixty degrees Fahrenheit (60°F). Electrical equipment, controls, and insulation shall be protected against moisture and water damage. All space heaters furnished in electrical equipment shall be immediately energized and operated continuously until the equipment is placed into service.

G. The CONTRACTOR shall grant the INSPECTOR and ENGINEER access to the storage facility at any time and assist the INSPECTOR and ENGINEER in conducting a full view, piece by piece, inventory of all such material or equipment.

H. The CONTRACTOR shall absorb any and all cost incurred to store, protect, and maintain the materials and equipment without modification to the Contract amount.

I. For CITY furnished equipment delivered to the site, the CONTRACTOR shall take all necessary measures to protect the equipment from damage due to the CONTRACTOR’s activities. The CONTRACTOR shall also ensure that all measures required by the CITY’s vendor to preserve and protect their equipment are maintained and are not disturbed including, but not limited to, providing for the continuous operation of space heaters furnished in electrical equipment.

J. Storage of Equipment and Materials in Public Streets:

1. Construction materials shall not be stored in streets, roads, or highways for more than five (5) calendar days after unloading. All materials or equipment not installed or used in construction within five (5) calendar days after unloading shall be stored elsewhere by the CONTRACTOR at its expense unless authorized additional storage time.

2. Construction equipment shall not be stored at the Worksite before its actual use on the Work nor for more than five (5) calendar days after it is no longer needed. Time necessary for repair or assembly of equipment may be authorized by the ENGINEER.

3. Excavated material, except that which is to be used as backfill in the adjacent trench, shall not be stored in public streets unless otherwise permitted. After placing backfill, all excess material shall be removed immediately from the site.

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SECTION 01212
FIXED CASH ALLOWANCE ITEMS

1.1 THE REQUIREMENT

A. A fixed cash allowance has been allocated to each of the following items of the Bid Breakdown (see Bid Proposal). Requirements for each Fixed Cash Allowance Item are specified in the GENERAL REQUIREMENTS (GR) and GENERAL CONDITIONS (GC) sections referenced below. Overhead and Profit, at the rates listed below, shall be added to the actual invoiced amount.

Bid Item No.	Description	Overhead and Profit
1.	Allowance for CITY'S office/supplies (GR-Section 01212)	5%
2.	Allowance for Differing Site conditions (GR Section 01253)	per GR Section 01254
3.	Allowance for Payment of Permits (GR Section 01294)	0%
4.	Allowance for Opportunity to Partner (GR Section 01353)	0%
5.	Allowance for Additional Potholing (GR Section 01732)	per GR Section 01254
6.	Allowance for Start Up Assistance (GR Section 01750)	per GR Section 01254
7.	Allowance for Process Overview, Operations and Safety Training (GR Section 01820)	5%
8.	Allowance for Community Mitigation, Archeological and Paleontological Monitoring (GR Section 01562)	5%
9.	Allowance for City Inspection (GR Section 01453)	0%

B. If these items are not executed, or are only partially executed, or the allowance for any item is not expended or partially expended, then a deductive Change Order shall be issued for the amount that is not expended. If, however, these items are over expended (with CITY'S prior approval), then an appropriate Change Order shall be executed in accordance with the provisions of the GENERAL REQUIREMENTS Section 01254 –- PAYMENT FOR CHANGES AND EXTRA WORK, except for Overhead and Profit wherein the above listed rates shall apply.

C. The CITY'S office supply allowance is to be used at the CITY'S discretion to purchase office supplies or office equipment, repairs to offices or equipment, pay telephone bills, or reference documents etc. The office supply allowance is only for items requested that are in addition to those required by Sections 01520 and 01722. The CONTRACTOR shall be reimbursed the actual invoice amount plus the markup allowed by Section A, above.

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SECTION 01251
CHANGE ORDER REQUESTS

1.1 THE REQUIREMENT

A. All quotations for preliminary change orders for extras, changes, additions, or deletions to the Work as described in CHANGES AND EXTRA WORK of the GENERAL CONDITIONS shall be submitted to the ENGINEER, in writing, on the Change Order Cost Quotation Form provided by the ENGINEER, and in conformance with the requirements of CHANGE ORDERS of the GENERAL REQUIREMENTS (See Attachment 01251-A1). The quotation shall be firm for a period of not less than sixty (60) calendar days from the date of receipt of the quotation by the ENGINEER. The CONTRACTOR shall submit its written cost quotation and Time Impact Analysis not later than fifteen (15) days after being requested to provide such quotation, unless the ENGINEER allows more time. Delays in submitting quotations beyond the fifteen (15) days set forth herein, which cause a delay in the issuance of a Change Order or a delay to the completion date of the project, shall not be cause for a claim or a time extension under the Contract.

B. The ENGINEER'S request for quotation on a preliminary change shall not be considered authorization to proceed with the changed work prior to the issuance of a final Lump Sum or Time & Material Change Order, unless directed otherwise, in writing, by the ENGINEER, nor shall such request constitute justification for a delay to the existing Work or a time extension under the Contract.

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(SEE ATTACHMENT)

ATTACHMENT TO SECTION 01251

Attachments to General Requirements Section 01251 consists of one (1) document, as follows:

ATTACHMENT NUMBER	TITLE OF ATTACHMENT	NUMBER OF PAGES IN THIS ATTACHMENT
01251-A1	Change Order Cost Summary Form	1

Change Order (Lump Sum and/or Time & Materials) Work

		Direct Labor	Direct Materials	Direct Equipment		Totals
(1):	Lump Sum Work by Prime Contractor	$	$	$		
(2):	"T&M" Work by Prime Contractor	$	$	$		
(3):	Subtotal - Direct Work (Prime Contractor)	$	$	$		
(4):	All Lump Sum Work by subcontractors (any tier)	$	$	$		
(5):	All "T&M" Work by subcontractors (any tier)	$	$	$		
(6):	Subtotal - Direct Work (all subcontractors)	$	$	$		$
					Add each of the three columns across and enter to the right.	
(3)+(6)=(7):	Total - Direct Costs	$	$	$		$
(8):	Markup	(20% of direct labor) $	(15% of direct mat'l) $	(15% of direct equip) $		$
(9):	Prime Contractor Markup for subcontractors				5% of line (6) direct sub work	$
(10):	Bonds & Insurance				1% of line (7) all direct work	$
(11):	Additional amount (if any) permitted by Contract					$
(12):	**GRAND TOTAL**				Add sums of lines) (7), (8), (9), (10) and (11)	$

SECTION 01253
DIFFERING SITE CONDITION

1.1 THE REQUIREMENT

A. The Geotechnical Baseline Report (GBR) presents the geotechnical basis for the effect of geologic and geotechnical conditions upon the construction. The GBR is to be considered as establishing the only geotechnical baseline for all anticipated subsurface and physical conditions for the purposes of the construction. If actual subsurface or latent conditions physical conditions differ materially from those indicated in the GBR, and are of such a nature as to cause an increase or decrease in the cost of performance of the Work, or a change in the construction methods required for performance of the Work, which results in an increase or decrease in the cost of the Work, the City shall make an adjustment in the Contract Price and Contract Completion Date and the Contract Documents shall be modified accordingly. It is understood by the parties hereto that the GBR is the only standard that is to be applied for determining CONTRACTOR'S rights to an adjustment of the Contract Price or Contract Completion Date by reason of unforeseen or unexpected subsurface or latent physical conditions. All other geotechnical data, reports, and other information provided to the CONTRACTOR are not included in or made a part of the Contract Documents, nor are such other data, reports or information warranted, impliedly or expressly, as to accuracy, completeness or use.

B. The CONTRACTOR shall notify the ENGINEER, in writing, within twenty-four (24) hours of any subsurface latent conditions or physical conditions encountered which CONTRACTOR believes, or should have suspected in the exercise of diligence and extreme care, to constitute Differing Site Conditions as described in this Section. Such written notice shall include a detailed statement of the following facts concerning such conditions: (i) their location; (ii) their nature and extent; (iii) the baseline conditions described the GBR that formed the basis of the CONTRACTOR'S expectations regarding the conditions that would be encountered. The ENGINEER shall promptly investigate the conditions. If the ENGINEER finds that conditions materially differ and will cause an increase or decrease in the CONTRACTOR'S cost or the time required to perform any part of the Work under this Contract, whether or not changed as a result of such conditions, the ENGINEER shall, after receipt of the CONTRACTOR'S written statement, make an equitable adjustment and modify the Contract in writing.

C. If the CONTRACTOR intends to assert a claim for an adjustment in the Contract Price or Contract Completion Date under this Article, it must, within twenty (20) calendar days after receipt of such determination as to whether a Differing Site Condition exists, submit a written statement setting forth a detailed cost breakdown in the form required by GENERAL REQUIREMENTS Section 01254 (PAYMENT FOR CHANGES AND EXTRA WORK) setting forth the basis of CONTRACTOR'S calculation of the costs saved or incurred, detailed information demonstrating the effects on the Contractor's schedule of performance in the same manner as required by the Contract Documents for obtaining approval of extensions of time, identification of the portions of the Escrow Bid Documents (including without limitation the GBR baseline statements referred to in the Escrow Bid Documents as required by Section 01351 (Escrow Bid Documents) of the General Requirements) that formed the basis of CONTRACTOR'S bid estimate to perform the Work affected by such conditions, and a complete and detailed explanation of the factual basis for the CONTRACTOR'S request.

D. Failure by CONTRACTOR to strictly comply with the notice requirements of this Section concerning the timing and content of any notice of Differing Site Conditions or of any request for equitable adjustment based on Differing Site Conditions pertaining to clear identification of GBR baseline statements used in preparation of CONTRACTOR's bid shall be deemed waiver of any claim by the CONTRACTOR for increase in the Contract Price or extension of the Contract Completion Date by reason of such conditions.

E. CONTRACTOR'S rights to compensation for (i) delay, disruption, hindrance, interference, schedule compression, and the impact, ripple or cumulative effect thereof; or (ii) additional supervision, administration, excess, extended or extraordinary overhead, loss of productivity, or similar costs, expenses or damages incurred as a result of or related to any claim of Differing Site Conditions shall be limited to such sums as are allowable under COMPENSATION FOR DELAY, DISRUPTION, AND UNANTICIPATED OVERHEAD of the GENERAL CONDITIONS.

F. No claim by the CONTRACTOR for an adjustment hereunder shall be allowed if asserted after final payment under this Contract

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SECTION 01254
CHANGE ORDERS

1.1 The Requirement

A. Payment to the Contractor, or credit to the City, for any change, addition, deletion or extra to the Work, or settlement of any Claim, covered by any Change Order, shall be determined by the methods set forth herein. The Engineer may change the Plans and Specifications, character of the Work, or quantity of Work provided the total arithmetic dollar value of all such changes, both additive and deductive, does not exceed twenty-five percent (25%) of the Contract Price. Should it become necessary to exceed this limitation, the change shall be by written Supplemental Agreement between the Contractor and the City, which shall be executed by a Change Order.

B. Unless otherwise stipulated, "Unit Prices" and "Stipulated Prices" include all costs necessary to furnish, install and complete the Work. The "Unit Prices" and "Stipulated Prices" include all direct costs for labor, equipment and materials, all insurance and bond costs, all field and office supervisors and assistants, all onsite project administration, security costs, the cost of small tools and consumables, incidental job burdens, and all general home office expenses and no separate allowance will be made therefor. Assistants to field and office supervisors include all clerical, stenographic, and general office help. Incidental job burdens include, but is not limited to, office equipment and supplies, temporary toilets, telephone, utilities, safety equipment, warning devices, personal protective equipment, and conformance to OSHA requirements. Project administration includes, but is not limited to, review and coordination, estimating, engineering, scheduling, and expediting relative to Change Orders, and updating and furnishing Record Drawings to incorporate changes, schedule update, supervision not applied solely to the Work of the Change Order, home office salaries and expenses, and City of Los Angeles Business Tax.

C. Unit Prices:

1. Unit prices stipulated in the Bid or itemized in the approved Schedule of Values shall be utilized, where they are applicable and determined reasonable by the Engineer. In the event that the Change Order results in a change in the original quantity of more than twenty-five percent (25%), either increase or decrease, then either the Engineer or the Contractor may request a review of the unit price to determine if a new unit price shall be mutually determined by negotiation. Any new unit price mutually determined under this Subsection shall only apply to the units in excess of one hundred twenty five percent (125%) of the original quantity for overruns. In case of underruns, the unit price stipulated in the Bid shall be applied to the first twenty-five percent (25%) of the actual quantity of work performed and the new mutually determined price shall be applied to the quantity between twenty-five percent (25%) and seventy-five percent (75%) of the original quantity.

2. Renegotiated unit prices or unit prices for new items added to the Contract by Change Order shall be determined in accordance with Subsections B through G. Whether stipulated in the Bid, itemized in the approved Schedule of Values or renegotiated, the unit prices used for payment constitute the total adjustment with no further costs owed for overhead, impact, profit, delay or impact to unchanged portions of the Contract, or any other reason. The unit price shall be full and final compensation as described in Subsection D.

3. The cost proposals for renegotiated unit prices shall be presented in accordance with the provisions of Subsections B through G. Should any Bid Item be deleted in its entirety, the amount bid for that bid item shall be subtracted from the total Contract amount. The Contractor shall be paid only for the actual cost incurred prior to the notification of such deletion for that Bid Item.

D. Lump Sum:

1. The Engineer and the Contractor may mutually determine a total sum for the Changed/ Extra Work. The Contractor shall summarize the total cost and furnish a breakdown of the proposed lump sum costs satisfactory to the Engineer in accordance with Subsections B through G. Such lump sum costs shall be full and final compensation as described in Subsection D. The Contractor's quotation shall conform to the requirements of Section 01251- Change Order Requests, and be submitted in the Change Order Cost Summary Form provided (see Attachment 01251-A1). The Change Order Cost Summary Form cannot be used to nullify or supercede any specification or contractual provision.

2. If the method or amount of payment cannot be agreed prior to performing the Changed/ Extra Work, the Engineer may unilaterally issue a Change Order in the amount determined reasonable by the Engineer for the Changed/ Extra Work and direct the Contractor to proceed immediately. The Engineer also has the option to issue a Change Order directing the Work be done on a Time and Materials basis with the Contractor providing all labor, equipment, and materials necessary to complete the Work in a satisfactory manner and within a reasonable period of time. Estimates for lump sum quotations and accounting for Time and Materials work shall be limited to direct expenditures necessitated specifically by the subject Changed/ Extra Work, and shall be segregated as follows:

   a. Labor, up to and including working general foremen, who are directly assigned to the Changed/ Extra Work. Employees identified as superintendents or non-working general foremen shall not be charged as labor on Changed/ Extra Work. The labor costs shall include actual documented payroll costs including wages, payroll taxes as established by law (i.e., FICA, Federal and State Unemployment Taxes), fringe benefits as established by negotiated labor agreements, and any insurance costs (such as Worker's Compensation and General Liability Insurance but shall not include Automobile Liability Insurance or any other insurance costs). A detailed breakdown of those subcomponents of labor costs, by all crafts shall be submitted to the Engineer, by the Contractor and all Subcontractors, for approval, as part of the documentation of labor costs, within ten (10) working days after issuance of the Notice to Proceed. No other subcomponents of labor costs shall be considered, unless approved in writing by the Engineer.

   b. The labor cost is not allowed to be increased by using labor classifications with paygrades higher than necessary to accomplish the Work.

   c. Materials: The cost of materials used in performing the Changed/ Extra Work will be the cost, including sales tax and freight, to the purchaser, whether Contractor, Subcontractor or other forces, from the supplier thereof, except as follows:

      (1) Cash or trade discounts available to the purchaser shall be credited to the City notwithstanding the fact that such discounts may not have been taken by the Contractor.

      (2) For materials secured by other than a direct purchase and direct billing to the purchaser, the cost shall be deemed to be the price paid to the actual supplier as determined by the Engineer. Supplier markup, except for actual costs incurred in the handling of such materials, will not be allowed.

      (3) Payment for materials from sources owned wholly or in part by the purchaser shall not exceed the price paid by the purchaser for similar materials from said sources on contract items or the current wholesale price for such materials delivered to the Jobsite, whichever price is lower.

(4) If, in the opinion of the Engineer, the cost of materials is excessive, or the Contractor does not furnish satisfactory evidence of the cost of such materials, then the cost shall be deemed to be the lowest current wholesale price for the quantity concerned, delivered to the Jobsite less cash or trade discount. The City reserves the right to furnish materials for the Work and no claim shall be made by the Contractor for costs and profit on such materials.

(5) For the purposes of this Section, a "Supplier" is defined as any person or persons, firm or business, who supplies materials of construction and/or permanent equipment, but who does not perform any portion of the Work of the Contract on site, for the Contractor, except that labor or labor supervision which may be required by some manufacturers as part of their equipment installation for warranty or other purposes.

d. Equipment Costs, including ownership, lease or rental costs, as well as operating costs, for individual equipment units whose replacement value is in excess of $500. Transportation and set up costs shall be included, but only if the equipment is imported to the worksite solely to perform work on the Changed/ Extra Work described in the Change Order and the Contractor can demonstrate that the changed work cannot or could not be performed economically with equipment already at the site. Equipment costs shall be determined in accordance with the requirements set forth in Subsection G.

e. Small tools, equipment, consumables and incidental costs: No separate payment will be made for the use of small tools or equipment with a replacement value of $500 or less. This applies to tools and equipment owned by the Contractor or its subcontractors of any tier. Also, no separate payment will be made for fuel, lubricants, tool or equipment repairs, tool or equipment maintenance, consumables, drinking water, sanitary facilities or other incidentals. These costs are already included as a part of Markup.

f. Subcontractor Costs, including their overhead and profit, provided that such costs are direct costs to the Contractor for performing the Changed/ Extra Work as set forth in Subsections B through G.

E. Time and Materials Work

1. The costs of all Changed/Extra Work submitted under the Time and Materials (T&M) method shall be formulated in accordance with the provisions of Subsections B through I.

2. Unless otherwise stipulated on the Change Order, the “Not-to-Exceed” amount for all T&M Change Orders is $25,000. The Contractor is responsible for tracking costs and for notifying the Engineer in writing when costs approach 50% and 75% of the “Not-to-Exceed” amount. In addition, if the Changed/Extra Work cannot be completed within the “Not-to-Exceed” limit, the Contractor shall notify the Engineer in writing, and in a timely manner, that the limit requires an increase. The City will only reimburse eligible costs up to the “Not-to-Exceed” amount.

3. The Contractor shall notify the Inspector at the beginning of each day when Changed/Extra Work is being performed. The Contractor shall notify the Inspector of the Changed/Extra Work being performed and describe the personnel involved, whether by Contractor forces or by its subcontractors at any tier. Failure to notify the Inspector prior to the start of Changed/Extra Work serves as the Contractor’s waiver to claim for compensation on that day.

4. For each working day, the Contractor shall submit a “Daily Report of Time and Material Work” to the Inspector. The “Daily Report” consists of Bureau of Contract Administration Form B CA-165 for labor supplied, and Form B CA-166 for equipment and materials

supplied. The Inspector will only consider Forms that are properly completed as described below.

a. Separate forms must be used for labor and for equipment/materials.

b. Labor, equipment, material or expenditures that are not included on Bureau of Contract Administration Forms BCA-165 and/or BCA-166 are ineligible for payment. There will be no exceptions to this requirement. It is the responsibility of the Contractor to include any and all items of labor, equipment, or material for which it requests compensation for each day's work completed.

c. Information required on the Labor form shall include name of personnel, personnel classification, and only the number of hours worked on Changed/Extra work for the day being reported. Since the overhead allowance already includes all necessary supervision, any hours for additional supervision or non-working foremen are ineligible for additional payment. The premium pay for a general foreman is eligible for payment only if the general foreman is a working foreman and a general foreman was required by a Union Labor Agreement or otherwise approved by the Inspector. The general foreman rate is eligible for payment only during the time that a general foreman was required for the Changed/Extra Work.

d. Information required on the Equipment/Material form shall include Contractor-owned equipment and/or tools, and rented equipment or tools for which compensation is requested. Information shall include the type of equipment, size of equipment, equipment identification number, appurtenances, and only the number of hours worked on the Changed/Extra work.

e. The only allowable materials are materials delivered to the job site and/or incorporated only into the Changed/Extra work. The allowable materials shall be listed on the T&M sheet for the day that they are delivered to the job site and/or incorporated into the Changed/Extra work.

f. Delivery ticket(s) and/or bill(s) of lading for rental equipment and/or tools delivered to the site and/or material incorporated into the work for the day being reported must be attached with the T&M sheet for that day. No payment will be allowed for materials and/or rented equipment unless receipt(s) or bill(s) of lading is attached. If the request for payment is not substantiated by original vendor/supplier invoices, acceptable copies of original invoices, or other documentation acceptable to the Inspector, the City may establish the cost of the item(s) at the lowest possible wholesale price or rental rate applicable while the work was being performed.

g. Failure to submit the required "Daily Report of Time and Material Work" by the close of the next working day shall waive all rights for that day unless otherwise approved by the Inspector. Work that cannot be substantiated by a "Daily Report", approved and signed by the Inspector, is ineligible for payment.

h. The Contractor is responsible for preparing the "Daily Report" for work by its Subcontractors and submitting the Forms to the Inspector on time.

i. The Contractor must have each "Daily Report" verified by the Inspector. After the "Daily Report" is approved by the Inspector, both the Contractor and Inspector sign the report. The original "Daily Report" is retained by the Inspector with a copy provided to the Contractor.

j. When the "Daily Report" is signed by the Inspector and the Contractor, it is binding on the Contractor and its Subcontractors.

k. When agreed to by the Inspector, the Contractor may submit a supplemental "Daily Report" for labor, materials, or equipment for which the Contractor requests compensation but failed to list on the original daily report.

(1) These supplemental forms shall be marked "SUPPLEMENTAL".

(2) Unless otherwise approved by the Inspector, the supplemental forms may only be submitted for approval up to two (2) working days following the date when the work was performed.

l. No payment will be allowed for labor, materials, or equipment included on T &M sheets not signed by the Contractor and the Inspector. Payment will not be allowed for labor, materials, or equipment included on T&M sheets signed by anyone other than the Inspector or the Inspector's immediate supervisor.

F. General:

1. It is the intent of the City to settle all Change Orders full and final at the time the Change Order is issued. Therefore, the following paragraph will be incorporated, in writing, on all Change Orders:

a. "The compensation (time and cost) set forth in a Change Order comprises the total compensation due the Contractor, all Subcontractors, and all Suppliers, for the Work or change defined in the Change Order, including impact on unchanged work. By signing the Change Order, the Contractor acknowledges and agrees on behalf of himself, all Subcontractors, and all Suppliers, that the stipulated compensation includes payment for all work contained in the Change Order, plus all payment for the interruption of schedules, extended field overhead costs, delay, and all impact, ripple effect or cumulative impact on all other work under this Contract. The signing of the Change Order indicates that the Change Order constitutes full mutual accord and satisfaction for the change, and that the time and/or cost under the Change Order constitutes the total equitable adjustment owed the Contractor, all Subcontractors, and all Suppliers as a result of the change. The Contractor, on behalf of himself, all subcontractors, and all Suppliers, agrees to waive all rights, without exception or reservation of any kind whatsoever, to file any further claim related to this Change Order. No further claim or request for equitable adjustment of any type for any reasonably foreseeable cause shall arise out of or as a result of this Change Order or the impact of this Change Order on the remainder of the Work under this Contract."

2. Costs which shall not be paid in Change Orders under this Contract include, but are not limited to, interest costs of any type; claim preparation or filing costs; legal expenses; the costs of preparing or reviewing proposed Change Orders or Change Order proposals; lost revenue; lost profits; lost income or earnings; rescheduling costs; costs of idled equipment when such equipment is not at the site or has not yet been employed on the Work; lost earnings or interest on unpaid retainage; claims consulting costs; and the costs of corporate officer or staff visiting the site; any compensation due to the fluctuation of foreign currency conversion or exchange rates; loss of other business; changes in taxes or increased tax rates of any kind or any costs identified as unallowable under the provisions of the Federal Acquisition Regulations.

3. Extensions of time shall be based solely upon the effect of delays to the Work as a whole. Extensions of time shall not be granted for delays to the Work, unless the Contractor can clearly demonstrate, through analysis of the current updated schedule, that the delay to the Work as a whole arose or will arise from causes other than normal weather, beyond the control and without fault or negligence of the Contractor, or any Subcontractor, at any tier, and that such delays did or will, in fact, delay the progress of the Work as a whole. The Contractor shall not be entitled to a time extension unless it submits a Time Impact Analysis which is a calculation of the extent of the delay to the end date of the Work and which shows that the Work has been or will be extended beyond the current Contract completion

date. A Time Impact Analysis is a scheduling procedure which utilizes the networking techniques (fragnets) and a written analysis of the facts associated with the alleged delay to demonstrate the effect of the alleged delay on the critical path of the schedule. A "fragnet" is defined as a sequence of new activities and/or activity revisions that are proposed to be added to the existing current updated schedule to demonstrate (mathematically and graphically) the influence of the alleged delay on the end date of the Work and shall be the sole method for incorporating delays and impacts into the schedule. The objective of a Time Impact Analysis is to pinpoint, isolate, and quantify all time impact associated with a specific issue and determine its time relationship to past or current delays. Time extensions shall not be allowed for delays to parts of the Work that are not on the critical path of the currently approved monthly updated project schedule. Time extensions shall not be granted, nor delay damages of any kind whatsoever paid to the Contractor, until all available float, slack, or contingency time on the project is used and the end date of the Work is moved beyond the current, adjusted Contract completion date.

4. The cost summary, cost breakdowns and requests for cost reimbursement submitted by the Contractor (for delay, disruption, hindrance and interference associated with the changes, additions, deletions or extras) shall be itemized in a manner that, with mathematical certainty and without reliance upon probabilities or inferences, segregates the direct, actual reimbursable costs associated with each individual, change, addition, deletion, extra and (on an event-by-event basis) each individual delay or disruption event. Such cost summaries, breakdowns or requests shall not be based, in whole or in part, upon any methodology (such as "total cost" or "modified total cost" methodologies) that purports to calculate the Contractor's additional costs of performance of the extra, change, addition or deletion (including without limitation the additional costs of delay, disruption or other impact) based on the difference between Contractor's total actual Project or line item costs (with or without fee) and its original bid estimate for the Project or any original bid estimate line item. In connection with the foregoing, Contractor represents and warrants that it has the ability to generate and maintain complete and accurate cost accounting records that will reflect (i) the actual costs incurred or saved for each individual item of Extra Work, change, addition, deletion (including without limitation any costs of associated delay, disruption, interference, hindrance and the cumulative impact of each extra, change, addition, deletion on other parts of the Work); and, (ii) on an event-by-event basis, the effect of each delay or disruption that forms the basis of each request for extension of time, regardless of their scope, number, complexity, cumulative effect, or time of issuance or occurrence.

5. Except as provided in "Compensation For Delay, Disruption, Unanticipated Overhead" of the General Conditions, Contractor shall have no right to recovery of any compensation, costs, expenses or damages resulting from delay, disruption, interference, or hindrance in the performance of the Work (including without limitation interruption of schedules, excess or extraordinary extended field and indirect overhead costs, loss of productivity and the impact, ripple or cumulative effect on other Work).

6. Contractor waives any claim or rights and remedies based on abandonment, quantum merit, rescission or other similar legal theory by reason of any of the following circumstances, which the Contractor acknowledges and agrees are within the reasonable contemplation of the parties: (i) changes, additions, deletions and extras to the Work after execution of the Contract and issued from time to time throughout the period of construction, regardless of their scope, number, cumulative value, or complexity, to correct errors, omissions, conflicts, and ambiguities in the Contract Documents, or to implement discretionary changes to the scope of Work requested by the City; (ii) the issuance and performance of changes, additions, deletions and extras in a manner that is not in sequence with the as-built or as-planned progress of the Work; (iii) changes due to Differing Site Conditions; (iv) suspensions of the Work or parts thereof, or limitations on access to portions or all of the Work, for the convenience of City or in the interests of the Project; (v) delay or disruption to the Work due to failure of the City, Engineer or Inspector to timely perform any contractual obligation.

G. Markups – Overhead and Profit:

1. In addition to the direct expenditures specified for labor, materials and equipment in Subsection B, a lump sum will be paid for all overhead and profit, including: All insurance costs other than specifically mentioned in this Section, all field and office supervisors and assistants, all onsite project administration, security costs, the cost of small tools and consumables, incidental job burdens, and all general home office expenses and no separate allowance will be made therefor. Assistants to field and office supervisors include all clerical, stenographic, and general office help. Incidental job burdens include, but is not limited to, office equipment and supplies, temporary toilets, telephone, utilities, safety equipment, warning devices, personal protective equipment, and conformance to OSHA requirements. Project administration includes, but are not limited to, review and coordination, estimating, engineering, scheduling, and expediting relative to Change Orders, and updating and furnishing Record Drawings to incorporate changes, schedule update, supervision not applied solely to the Work of the Change Order, home office salaries and expenses, and City of Los Angeles Business Tax. Such lump sum shall conform to the following schedule of percentages of the total amount of direct expenditures of the Contractor and subcontractors.

Changed/ Extra Work - Direct Expenditures	Markup Percentage
Contractor direct labor	20%
Contractor direct materials, equipment, other items and expenditures	15%
Subcontractor (of any tier) direct labor	20%
Subcontractor (of any tier) direct materials, equipment, other items and expenditures	15%
Contractor administrative fee for subcontractors' (of any tier) direct materials, equipment, other items and expenditures	5%

2. Bonds and Insurance: An additional allowance of one percent (1%) of all direct costs (less markup) is allowed.

3. Add/ Deduct Changes:

   a. The overhead rates determined above shall be applied to all additive Change Orders, except those utilizing as-bid Unit Prices or Stipulated prices listed in the Bid Proposal.

   b. Any change in the Work involving both extras and credits shall show a net total cost, including subcontracts. Allowances for overhead and profit to the net total cost, as specified herein above, shall be applied if the net total cost is an extra; overhead and profit allowances shall not be applied if the net total cost is a credit. The estimated cost of deductions shall be based on labor and material prices on the date the Contract was signed.

H. City Furnished Materials, Equipment and Services: The Engineer reserves the right to furnish materials, equipment and services deemed expedient for use on the Changed/Extra Work. The Contractor shall have no claim for profit or overhead on the cost of such materials, equipment and services.

I. Equipment Costs:

1. The rates for rental or leased equipment shall not exceed the rates listed in the Rental Rate Blue Book (the Blue Book) published by Primedia Information, Inc., San Jose, California, as adjusted to the regional area of the Work under this Contract. For T&M Change Orders, the rates are established by the actual paid invoice(s) that comply with the requirements of Subsections G.1 and G.3. Owned equipment costs shall not exceed the rates established by Subsection G.2. The most recent published edition in effect at the commencement of actual equipment use shall be used.

2. The rates paid for any rented or leased equipment or tools shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance and all incidental costs associated with the operation of the equipment or tools.

3. It is the responsibility of the Contractor to include any appurtenances added to equipment which would increase the basic rate for said equipment (i.e., hoe-ram, oversize bucket, etcetera) as established in the acceptable rental rate guide. All equipment and/ or tools shall be acceptable to the Inspector, in good working condition, suitable for the purpose for which it is to be used, and necessary to complete the Changed/Extra Work. Payment will be based on the manner in which the equipment was actually powered, operated and modified per the equipment manufacturer's recommendations.

4. Rented or Leased Equipment:

   a. For equipment rented or leased (including lease with purchase option) in arm's length transactions from outside vendors, the Contractor shall be paid the actual invoiced, rented or leased rates provided that the invoiced lease or rental rates do not exceed the rates set forth in the Blue Book. Arm's length rental or lease transactions are those in which the firm involved in rental or lease of such equipment is not associated with, owned by, have common management, directorship, facilities, or stockholders with the firm renting the equipment. Submittal by a Contractor of a rental or leased invoice from the lessor will be prima facie proof of compliance with the above. However, such invoices are not conclusive proof; if questioned, the burden of proof remains with the Contractor. In no event shall the leased equipment rate billed to the City be at rates exceeding those prescribed in the following table:

Actual Usage (Change Order & Contract Work Combined)	Payment Category
Less than 8 hours	Hourly Rate
8 or more hours but less than 7 days	Daily Rate
7 or more days but less than 30 days	Weekly Rate
30 calendar days or more	Monthly Rate

   b. When in Use: Actual equipment use time documented by the Inspector shall be the basis that the equipment was utilized on the changed work and paid for under the Change Order. In addition to the lease or rental rate, equipment-operating costs shall not exceed the estimated hourly operating rate as set forth in the Blue Book. The hours of operation shall be based upon actual equipment usage on the changed work as recorded by the Inspector. For multiple shift work sequences, the allowable equipment rate shall not exceed fifty percent (50%) of the base rate, for second or third shifts.

   c. When Idle: Idle equipment is equipment on site and necessary to perform the Work under the change but not in actual use due solely to the impact of the changed work. Equipment operating costs due to idle time, documented by the Inspector, shall be paid at the rate determined in "G" (1) above. Idle time shall include a reasonable time allowance to and from the project site.

   d. Payment for equipment or tools shall be limited to hours actually worked on the Changed/Extra Work if the equipment or tool is already on site for Work under the original Contract. No "standby" time will be paid for equipment already on site for Work under the original Contract.

   e. If equipment or tools are used intermittently and, when not in use, could be returned to the rental source at less expense than holding it at the work site, it shall be returned, unless the Contractor elects to keep it at the work site at no expense to the City.

5. Owned and Other Equipment: Equipment rates for owned equipment or equipment provided in other than arm's length transactions shall not exceed the total hourly costs as set forth in the Caltrans "Labor Surcharge and Equipment Rental Rates" effective at the time the work is performed. (The Caltrans equipment rental rates are available on the internet at http://www.dot.ca.gov/hq/construc/equipmnt.html.) If the equipment is not listed in Caltrans, then the Rental Rate Blue Book shall be used. When using the Blue Book, the hourly rate for any period less than 7 days shall be the weekly rate divided by 40, plus the Operating Cost. Except as noted herein below, this equipment hourly rate plus the estimated operating cost per hour from the Blue Book will be paid for each hour the equipment actually performs the Changed/ Extra Work. Daily records listing the equipment units and their respective operators, identification code, and actual usage on the Work under the Change Order, as certified at the end of each work day (or work shift if the Work is being performed in multiple work shift sequence) by the Inspector shall be the record upon which actual equipment use shall be based. For multiple shift work sequences, the Caltrans overtime factor shall be applied (When using the Blue Book one-half the Non-Operating Cost will be deducted for second and third shifts. The Non-Operating Costs are the Blue Book monthly or weekly/40 rates, as applicable.). It is agreed that this rate shall represent payment in full for all the Contractor's direct costs.

   a. When Idle: Payment for equipment necessary to be on the site to complete the Work, but not in actual use due solely to the impact of the changed work, shall be paid per the table in Caltrans Standard Specifications Section 9-1.03A(3b), provided that its presence and necessity on the site has been documented by the Inspector, and further provided that the equipment was idled solely by actions of the City. (When using the Blue Book the payment for idle time shall not exceed fifty percent (50%) of the Non-Operating Cost.) Idle equipment time will only be paid as a function of delays specifically directed or caused by the City's actions. In no event shall the idle time claimed in a day for a particular piece of equipment exceed the normal work schedule established for the project - usually eight (8) hours per day or forty (40) hours per week, and excluding Saturdays, Sundays, and holidays. For multiple shift work sequence, the allowable idle equipment rate shall not be allowed, for second or third shifts. It is agreed that this rate shall represent payment in full for all the Contractor's direct costs.

6. Equipment Haulage and Set Up Costs: Documented and actual equipment haulage and set up costs shall be paid for, if applicable as set forth in Subsection B.3.

7. Other Equipment Cost Guides: In the event that a piece of equipment used on a Change Order is not listed in Caltrans or the Blue Book, costs may be derived from the Associated General Contractor's of America Equipment Ownership Guide, the Associated Equipment Dealers Guide, or the Equipment Rate Guide published by the U.S. Army Corps of Engineers as adjusted appropriately for the type of work and use and the regional area of the Work under this Contract.

J. Records:

1. At any time should the Contractor deviate substantially from the schedule, method and sequence of operation, equipment, cost or pricing data furnished by the Contractor and agreed to by the City in connection with the Change Order or should the City determine that any price negotiated in connection with the Change Order is defective due to such deviation or the fault of the Contractor, the City reserves the right to reduce the Change Order cost and reissue the Change Order at the amount in which the City determines to be the actual costs to complete the change.

2. Whenever any material or process is indicated or specified by patent or a proprietary name, or by name of a manufacturer in the Change Order, such direction shall not relieve the Contractor's responsibility or obligation to perform work in accordance with the contract requirements. The Contractor shall be solely responsible for, and have control over construction means, methods, techniques, sequences and procedures, coordination of all portions of the contract and Change Order work.

3. The Contractor shall on a weekly basis submit an approximate accounting of the amount expended on the Time and Materials work to date and an estimate of the Impact to the time of performance of work.

4. Partial Payments for Time and Materials Work: Progress payments for Time and Materials work shall only be made if the anticipated cost of the changed work is in excess of $100,000 and/or the time to perform the changed work will exceed two (2) months duration. To receive payments for Time and Materials work, the Contractor shall submit to the Engineer an invoice of the daily reports which were verified by the Inspector, with details and documents, verifying the Contractor's and Subcontractor's actual costs incurred for the Time and Materials work as set forth in Subsections B through H. Costs shall be submitted within thirty (30) calendar days after the T&M work has been satisfactorily completed unless an extension of time for submittal is authorized in writing by the Inspector.

K. Field Office Overhead - Rate Per Day:

1. Subject to the provisions of this Subsection and "Compensation For Delay, Disruption And Unanticipated Overhead" of General Conditions, for each day of approved time extension due solely to extras, changes, and additions to the Work, Contractor shall be entitled to compensation for additional Daily Field Office Overhead as set forth herein. As a further condition to the Contractor's right to such additional compensation, the Contractor shall submit a detailed listing of the Daily Field Office Overhead cost components which are time related. The individual cost components shall represent costs which have been or will be incurred or increased as a sole or direct result of the time extension. This listing may include, but is not limited to, onsite project management, supervision, engineering, and clerical salaries; onsite office utilities and rent; onsite company vehicles and their operating expenses; site maintenance and security expenses. Daily Field Office Overhead costs which are unaffected by the increased time or time extension in the Change Order shall not be allowable costs of the Daily Field Office Overhead rates. These cost components include, but are not limited to, acquisition and installation of plant, stationary equipment, temporary construction facilities, utilities and office furnishings (unless such items are rented or leased); the preparation of the site including clearing, grubbing, grading, and fencing; and mobilization and demobilization expenses. The listing of the Daily Field Office Overhead cost components described above must be based on the Contractor's actual Field Office Overhead costs. This listing must be submitted with the first Change Order proposal that includes a time extension request per Subsection D. If the Contractor's time related Daily Field Office Overhead cost changes for subsequent compensable delays, then the Contractor shall submit a new Daily Field Office Overhead rate based on the Contractor's time related Daily Field Office Overhead costs at the time of the subsequent delay. If change order work is performed during a compensable delay, any Daily Field Office Overhead costs paid by that change order shall be deducted from the compensation owed for additional Daily Field Office Overhead during the same time period.

2. The Daily Field Office Overhead rate shall be multiplied by the number of days the Contract is to be extended in the Change Order, and shall then be added to the agreed upon costs of the Change Order. No markup for overhead costs and no profit allowance shall be allowed on the Extended Daily Field Office Overhead cost component of the Change Order. The derivation of an extended home office overhead rate and its application to Contract time extensions shall not be allowed.

3. The information submitted above shall be submitted in sufficient detail to allow review, and shall be prepared in accordance with generally accepted accounting principles and applicable portions of the Federal Acquisition Regulations. The Engineer shall have the right to have an audit of the Contractor's costs performed, at the Contractor's sole expense, if the costs submitted are considered by the Engineer to be excessive, questionable, or unsupported. The overhead rates determined above shall be applied to all additive Change Orders, except those utilizing original as-bid unit prices under Subsection A.

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SECTION 01255
PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA

1.1 THE REQUIREMENT

A. If the ENGINEER determines that any price, including profit or fee, negotiated in connection with any Change Order under this Contract, or any cost reimbursable under this Contract, was increased because:

1. the CONTRACTOR furnished cost or pricing data which was not accurate, complete, and current as certified in the CONTRACTOR'S Certificate of Current Cost or Pricing Data;

2. a Subcontractor or prospective Subcontractor furnished cost or pricing data was submitted in support of a subcontract cost estimate furnished by the CONTRACTOR but which was not accurate, complete, and/or current as of the date certified in the CONTRACTOR'S Certificate of Current Cost or Pricing Data; or,

3. the CONTRACTOR or a Subcontractor or prospective Subcontractor, at any tier, furnished any data not within subsection 1.1A(1) or 1.1A(2),above, which was not accurate as submitted;

4. then the price shall be reduced accordingly, and the Contract shall be modified in writing as may be necessary to reflect such reduction. However, any reduction in the Contract price due to defective subcontract data of a prospective Subcontractor, when the subcontract was not subsequently awarded to such Subcontractor, will be limited to the amount (plus applicable overhead and profit allowances) by which the actual subcontract or actual cost to the CONTRACTOR if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the CONTRACTOR; provided that the actual subcontract price was not affected by defective cost or pricing data.

B. The following certification from the CONTRACTOR is required to be provided on all Change Order quotations or requests for equitable adjustment in excess of ten-thousand dollars ($10,000).

CERTIFICATION OF CURRENT COST
AND PRICING DATA

This is to certify that, to the best of my knowledge and belief, cost or pricing data submitted in writing, or specifically identified in writing if actual submission of the data is impracticable, to the CITY in support of CONTRACTOR is to insert appropriate identification such as Change Order quotation, proposal quotation, price adjustment, etc. are accurate, complete, and current as of CONTRACTOR to insert date.

CONTRACT NO.: _____
PROPOSED CHANGE ORDER NO.: _____
FIRM: _____
NAME: _____
TITLE: _____
DATE: _____
SIGNATURE: _____

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SECTION 01270
MEASAUREMENT OF QUANTITIES FOR UNIT PRICE WORK

1.1 THE REQUIREMENT

A. General:

1. Unless otherwise specified, quantities of work shall be determined from measurements or dimensions in horizontal planes. However, linear quantities of pipe, piling, fencing and timber shall be considered as being the true length measured along longitudinal axis.

2. Unless otherwise provided in Specifications, volumetric quantities shall be the product of the mean area of vertical or horizontal sections and the intervening horizontal or vertical dimension. The planimeter shall be considered an instrument of precision adapted to measurement of all areas.

B. Methods of Measurement:

1. Materials and items of Work which are to be paid for on basis of measurement shall be measured in accordance with methods stipulated in the particular sections involved.

C. Certified Weights:

1. When payment is to be made on the basis of weight, the weighing shall be done on certified platform scales or, when approved by the ENGINEER, on a completely automated weighing and recording system. The CONTRACTOR shall furnish the ENGIENER with duplicate licensed weighmaster's certificates showing actual net weights. The CITY will accept the certificates as evidence of weights delivered.

D. Units of Measurement:

1. Measurements shall be in accordance with Section 01420 – UNITS OF MEASURE of the GENERAL REQUIREMETNS. A metric ton or "tonne" is equal to 1,000 kilograms and the unit of liquid measure is a Liter (in U.S. Standard Measures, a pound is an avoirdupois pound; a ton is 2,000 pounds avoirdupois; and the unit of liquid measure is a gallon).

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SECTION 01291
NOTICE TO WITHHOLD AND/OR STOP NOTICE

1.1 THE REQUIREMENT

A. When a "Notice to Withhold" or "Stop Notice" is served upon the CITY, or the Board, pursuant to the lien statutes of the State of California, to withhold sufficient funds from payments to the CONTRACTOR in support of a claim resulting from default by the CONTRACTOR in payment for labor or materials used in prosecution of the Contract, the CITY shall withhold from payment due the CONTRACTOR an amount of money equal to the amount of the claim stated in the "Notice to Withhold" or "Stop Notice," and an additional amount equal to twenty-five percent (25%) of the amount of said claim, to defray the costs of litigation in the event of court action on the claim, for a total withholding of one and one quarter (1-1/4) times the stated amount of the claim. At the discretion of the CITY, the CITY may allow the CONTRACTOR to file with the CITY the bond referred to in the Civil Code of the State of California after which said monies will not be withheld on account of such "Notice to Withhold" or "Stop Notice."

B. In the event the Contract is terminated for CONTRACTOR default, any funds due the CONTRACTOR and retained by the CITY in accordance with PARTIAL PAYMENTS of these GENERAL REQUIREMENTS, shall become the property of the CITY to the extent necessary to repay to the CITY any excess in the Contract Price above the cost of the Work completed at the time of termination. After issuance of Notice To Discontinue Work, no further payments will be made to the CONTRACTOR for the Work covered by the notice until completion of work and final settlement has been made.

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SECTION 01292
PAYMENTS

1.1 PAYMENT FOR MOBILIZATION

A. Payment for mobilization shall be limited to those items of work described in MOBILIZATION of these GENERAL REQUIREMENTS. Whether Mobilization is included as a Contract Bid Item in the Bid Proposal Form or specified as part of the lump sum in the Contract Documents, the amount shall include full compensation for furnishing the labor, materials, tools, equipment and incidentals for all of the Work involved in mobilization in advance of construction operations. The CONTRACTOR shall submit to the ENGINEER for approval the Contract Price Breakdown with the amount established for mobilization.

B. The CONTRACTOR shall submit to the INSPECTOR for approval a breakdown of the amount established for mobilization. Total payment (100%) for obtaining insurance and bonds will be made upon proof of payment for those items. The payment for all other items of mobilization will be made when those items of mobilization have been completed and as specified below:

1. When the monthly partial payment estimate of the amount earned, not including the amount earned for mobilization, is five percent (5%) or more of the original Contract amount, the total amount earned for mobilization may be up to fifty percent (50%) of the Contract item price for mobilization. This amount will be included in the said estimate for payment.

2. When the monthly partial payment estimate of the amount earned, not including the amount earned for mobilization, is ten percent (10%) or more of the original Contract amount, the total amount earned for mobilization may be up to seventy-five (75%) of the Contract item price for mobilization. This amount will be included in the said estimate for payment.

3. When the monthly partial payment estimate of the amount earned, not including the amount earned for mobilization, is twenty percent (20%) or more of the original Contract amount, the total amount earned for mobilization may be up to ninety-five percent (95%) of the Contract item price for mobilization. This amount will be included in the said estimate for payment.

4. When the monthly partial payment estimate of the amount earned, not including the amount earned for mobilization, is fifty percent (50%) or more of the original Contract amount, the total amount earned for mobilization may be up to one hundred percent (100%) of the Contract item price for mobilization. This amount will be included in the said estimate for payment.

C. The adjustment provisions in CHANGE ORDERS of these GENERAL REQUIREMENTS, and the retention of funds provisions in this Section, shall not apply to the Contract lump sum item for Mobilization.

D. When other Contract items are adjusted as provided in CHANGE ORDERS of these GENERAL REQUIREMENTS, if the costs applicable to such item of work include mobilization costs, such mobilization costs will be deemed to have been recovered by the CONTRACTOR by the payments made for mobilization and will be excluded from consideration in determining compensation under said Article.

E. When the Contract does not include a Contract pay item for mobilization as specified above, full compensation for any necessary mobilization required shall be considered as included in the prices paid for the various Contract items of work involved and no additional compensation will be allowed.

1.2 PAYMENT FOR PERMITS

A. The Contractor shall obtain and pay for all permits necessary for performance of the Work in accordance with the provisions of PERMITS AND CONSTRUCTION EASEMENTS of the GENERAL CONDITIONS. If the Bid Proposal provides an allowance for Permits, the CONTRACTOR shall include in the Bid the amount stipulated under PERMITS in the SCHEDULE OF WORK AND PRICES in the Bid Proposal as an allowance for the costs of all required permits. Costs shall be limited to the actual fees paid to the agencies and will be reimbursed based on original receipts only and no overhead or profit shall be added to the cost of the permits. The CONTRACTOR shall deliver to the ENGINEER with each permit the original receipt. After all permits have been obtained and delivered, the actual costs of all permits shall be reviewed by the CONTRACTOR and the ENGINEER. If the total costs differ from the amount set forth in the SCHEDULE OF WORK AND PRICES, the Contract Price shall be adjusted by a Change Order for the difference between the total actual costs and the amount included in the Bid, as an additional amount due the CONTRACTOR or a credit to the CITY, as appropriate.

1.3 MONTHLY PROGRESS PAYMENTS

A. General

1. The quantities listed in the Bid schedule will not govern final payment. Payment to the CONTRACTOR will be made only for actual quantities of Contract items constructed in accordance with the Plans and Specifications. Upon completion of construction, if the actual quantities show either an increase or decrease from the quantities given in the Bid schedule, the Contract Unit Prices will prevail subject to the provisions of CHANGE ORDERS of these GENERAL REQUIREMENTS.

2. The unit and/or lump sum prices to be paid shall be full compensation for the items of work and all appurtenant work, including furnishing all materials, labor, equipment, tools, and incidentals.

3. Payment will not be made for materials wasted or disposed of in a manner not called for under the Contract. This includes rejected material not unloaded from vehicles, material rejected after it has been placed, and material placed outside of the Plan lines. No compensation will be allowed for disposing of rejected or excess material.

4. Payment for work performed or materials furnished under an Assessment Act Contract will be made as provided in particular proceedings or legislative act under which such Contract was awarded.

5. Whenever any portion of the Work is performed by the CITY at the CONTRACTOR'S request, the cost thereof shall be charged against the CONTRACTOR, and may be deducted from any amount due or becoming due from the CITY.

6. Whenever immediate action is required to prevent injury, death, or property damage, and precautions which are the CONTRACTOR'S responsibility have not been taken and are not reasonably expected to be taken, the CITY may, after reasonable attempt to notify the CONTRACTOR, cause such precautions to be taken and shall charge the cost thereof against the CONTRACTOR, or may deduct such cost from any amount due or becoming due from the CITY. CITY action or inaction under such circumstances shall not be construed as relieving the CONTRACTOR or its Surety from liability.

7. Guarantee periods shall not be affected by any payment, but shall commence on the date equipment or material is placed into service at the direction of the CITY. In the event such items are not placed into service, prior to partial or final completion of the project, the guarantee period will commence on the date of completion.

8. If the Contract comprises two or more major units of work readily separable and divisible, and for which separate prices are stipulated in the Contract, the CONTRACTOR may make separate requests for progress payment on each such unit, and the CITY will make such progress payments, statement of completion, acceptance, retention, and final payment in accordance with the procedure specified above for the entire Contract.

9. The making of any payment to the CONTRACTOR under this Contract shall not relieve the CONTRACTOR of any obligations hereunder. The CONTRACTOR is obligated to complete the Contract in its entirety and to deliver to the CITY such acceptably completed work, finished product or structure as is specified in the Contract, at the time or times specified. Until this Contract is fully performed by the CONTRACTOR, and the Work, product, or structure produced thereby is accepted by the CITY, the CONTRACTOR shall also be obligated to repair, replace, restore, or rebuild any fully or partially completed work or structure, or any materials or equipment required to be provided under the Contract which may be damaged, lost, stolen, or otherwise injured in any way. This particular obligation of the CONTRACTOR, with respect to any major unit of the type mentioned in this Section, will terminate upon the completion by the CONTRACTOR and acceptance by the CITY of such major unit.

B. Monthly Request for Payment

1. Unless otherwise prescribed by law, three (3) working days prior to the last work day of each month, or other such date mutually agreed upon by the CONTRACTOR and the INSPECTOR, the CONTRACTOR shall prepare and submit to the INSPECTOR, an estimate of the cumulative amount and value of acceptable Work performed by the CONTRACTOR at the Jobsite up to that date. The value of the completed Work shall be based on the approved Schedule of Values in accordance with the provisions of SCHEDULE OF VALUES/CONTRACT PRICE BREAKDOWN of these GENERAL REQUIREMENTS. Said amount shall also include the value of all acceptable materials and equipment for the Contract that have been delivered and suitably stored but not yet used in the Work, subject to the requirements of this Section.

2. The CONTRACTOR will be required to make all monthly requests for payment on the CITY'S Contract Payment Request Form. CONTRACTOR shall submit Contract Payment Request Form with the approved Payment Request estimate of work to the INSPECTOR. That form requires that the CONTRACTOR certify, under penalty of perjury, to the following:

   a. No workers were required or permitted to work more than eight (8) hours in any one calendar day, except in cases of emergency, and except as provided by law.

   b. Not less than the prevailing rates of wages, as set forth in the Contract for this Work, have been paid all laborers, workers, and mechanics employed to perform this Work.

   c. There were no substitutions of Subcontractors, no assignment or transferences of Subcontractors or Sub-Subcontractors, except as approved by the Board of Public Works.

   d. All of the provisions of Los Angeles Administrative Code, Section 10.8, pertaining to non-discrimination in employment have been complied with.

C. Payments for undelivered equipment, specifically manufactured equipment to be incorporated into the Work, excluding "off the shelf" or catalog items, will be made when all of the following conditions exist:

1. The equipment must be specifically designated in the Technical Specifications for partial payment prior to delivery,

2. The equipment to be specifically manufactured for the Project could neither be readily utilized on, nor diverted to, another job; and,

3. A fabrication period of more than six (6) months is anticipated.

D. On lump-sum Contracts the INSPECTOR'S estimate of the monthly payment due the CONTRACTOR is an estimate of work acceptably completed and will not be required to be made by strict measurement.

E. Upon verification and approval by the INSPECTOR, the progress payment estimate shall be forwarded to the Payment Section of the Bureau of Contract Administration for processing.

F. Payment to the CONTRACTOR shall be made within 30 days after an undisputed and properly submitted payment request is received from the CONTRACTOR by the Bureau of Contract Administration Payment Section.

G. The CITY shall retain a portion of the amount otherwise due to the CONTRACTOR, as follows:

1. Retention of ten percent (10%) will be held on the original Contract value on each approved payment claim until the amount paid of the original Contract equals fifty percent (50%). The INSPECTOR may then, at its sole discretion, discontinue further retention on the original Contract value for all subsequently approved payment claims.

2. At any time during the course of the Contract, the INSPECTOR may, at its sole discretion, reinstate the ten percent (10%) retention.

3. In the event the Contract is terminated for CONTRACTOR default, any funds due the CONTRACTOR and retained by the CITY in accordance with these provisions, shall become the property of the CITY to the extent necessary to repay to the CITY any excess in the Contract Price above the cost of the Work completed at the time of termination. After issuance of Notice To Discontinue Work, no further payments will be made to the CONTRACTOR for the Work covered by the notice until completion of work and final settlement has been made.

H. Additional deductions will be made from each monthly payment request for amounts due the CITY as follows:

1. Equipment or materials furnished by the CITY.

2. Services rendered to the CONTRACTOR by the CITY.

3. Amounts due the CITY for liquidated damages under the terms of the Contract.

4. Amounts required to be deducted by federal, state, or local governmental authority or other provisions of these Contract Documents.

I. From the balance thus determined will be deducted the amount of all previous payments, and the remainder shall constitute the monthly payment due the CONTRACTOR.

J. The monthly payments may be withheld or reduced, for the following reasons:

1. If the CONTRACTOR is not diligently or efficiently complying with the express intent of the Contract;

2. If there are unresolved Notices of Non-Compliance;

3. If Technical Manuals are not submitted;

4. If Record Drawings are not kept up-to-date;

5. If progress photographs are not submitted;

6. If construction schedules are not submitted in accordance with these General Requirements; or

7. If the Solid Waste Diversion and Disposal Report is not submitted with progress payment estimate.

8. Failure of the CONTRACTOR to maintain insurance as required by the CONTRACT.

9. Upon written request of the ENGINEER.

K. The CONTRACTOR shall promptly submit the following in response to requests by the INSPECTOR:

1. All information and records necessary to determine the cost of the Work for purposes of estimating monthly payment.

2. All itemized statements, in a form satisfactory to the INSPECTOR, of the actual cost of all acceptable materials delivered by the CONTRACTOR to the site.

L. The making of any payment to the CONTRACTOR shall not relieve the CONTRACTOR from Contractual obligations. These payments shall not be construed as the transfer of ownership of any equipment or materials to the CITY.

M. Responsibility of ownership shall remain with the CONTRACTOR who shall be obligated to store, protect, repair, replace, rebuild or otherwise restore any fully or partially completed work or structure for which payment has been made. The CONTRACTOR shall replace any materials or equipment required to be provided under the Contract which may be damaged, lost, stolen, or otherwise degraded in any way prior to acceptance of the Work under the Contract.

N. Escrow Account for Retention Payments

1. Under Section 22300 of the Public Contract Code, the CONTRACTOR has the option to deposit securities with an Escrow Agent as a substitute for the CITY withholding the required 10% retention from progress payments to ensure performance of any contract entered into between the CITY and the CONTRACTOR. Provided adequate value of securities is on deposit with the Escrow Agent, retention payments are then made directly to the CONTRACTOR by the CITY. As an option, Section 22300 also permits the CONTRACTOR to have retention payments made directly to the Escrow Agent, with no requirement for the CONTRACTOR to deposit securities with the Escrow Agent. If the CONTRACTOR requests neither of the above alternatives, the retention funds will be retained by the CITY and invested by the City Treasurer, in which case, interest earned will accrue to the benefit of the CITY.

2. Under the terms of the Escrow agreement, the CONTRACTOR has the option to arrange to deposit securities up front for up to the full 10% of the total amount of the Contract (Option "A"), or to have the CITY make payments directly to the Escrow Agent for the amount the CITY withholds for the required retentions with no requirement for the CONTRACTOR to deposit securities in advance (Option "B"). These arrangements are set forth in the Escrow Agreement.

3. At the CONTRACTOR'S request, the Bureau of Accounting will provide the necessary paperwork to establish the Escrow Account. For information contact:

City of Los Angeles
Office of Accounting
200 N. Spring Street
9th Floor, City Hall
Los Angeles, CA 90012
(213) 978-0994

1.4 PAYMENT FOR MATERIALS OR EQUIPMENT DELIVERED AND STORED ON THE JOBSITE

A. Materials and/or equipment are eligible for partial payment when delivered and stored at the Worksite as follows:

1. Each individual piece of the material or equipment must be valued at $5,000 minimum.

2. The materials and equipment are intended for permanent installation.

3. The materials or equipment are specifically delineated in the Contract, specially manufactured for this project and not readily useable on other projects.

4. The CONTRACTOR shall store the materials and equipment as required in STORAGE OF MATERIALS AND EQUIPMENT in these GENERAL REQUIREMENTS.

5. Living, perishable, degradable or standard stocked items are ineligible.

B. The partial payment is limited to the lesser of 1) Ninety-five percent (95%) of the invoice cost, or 2) The bid item amount less an estimate by the City for installation.

C. The CONTRACTOR shall include cost-loaded scheduling activities for items of material and equipment that the CONTRACTOR intends to request " Partial Payment for Materials or Equipment Delivered and Stored on the Job Site".

D. The CONTRACTOR shall provide all documentation necessary to establish the cost of such materials and equipment for the "Schedule of Values".

E. Prior to start of Work, the CONTRACTOR shall provide the INSPECTOR with a list of all materials or equipment proposed to receive partial payment under the provisions of this Article, along with its supplier, fabricator or manufacturer.

F. Change orders and/or time extensions will not be issued for any costs or impacts related to compliance with this section, including documentation, special handling, or special storage.

1.5 PAYMENT FOR MATERIALS OR EQUIPMENT STORED OFF THE JOBSITE

A. Partial payment for materials or equipment stored off the Jobsite shall be subject to the following conditions:

1. Payment will not be made for any materials or equipment unless each individual piece of the material or equipment becomes a permanent part of the Work and has a value of more than $5,000.

2. The materials and/or equipment are required by the Specifications, and are specifically manufactured for the Project and could not readily be utilized or diverted to another job.

3. No payment will be made for living or perishable plant material, or for degradable materials such as rock, sand, cement, or for reinforcing steel, miscellaneous piping, off the shelf and catalog items, or similar items, until they are incorporated into the Work.

4. Payment for the materials or equipment stored shall not exceed sixty percent (60%) of the invoice cost of the materials or equipment. Percent of the invoice paid shall be at the discretion of the CITY. The amount paid shall not exceed the total amount of the Bid item less an amount estimated for installation.

B. The CONTRACTOR shall include cost loaded activities for the materials and equipment, for which payment will be requested, in the Schedule of Values. The CONTRACTOR shall provide all documentation necessary to establish the cost of the materials or equipment.

C. All suppliers, fabricators, or manufacturers who intend to furnish materials or equipment to the CITY must file a notice with the CITY in accordance with the State of California lien laws.

D. Each supplier, fabricator or manufacturer shall file a list, with the INSPECTOR, indicating the materials or equipment to be furnished to the Project. They shall also provide a notarized declaration from their company indicating the employees authorized to sign a nunconditional release for the company. The persons signing the declaration and the unconditional release shall be identified by name and title.

E. Each request for payment shall include a notarized Unconditional Release that conforms to the California Civil Code for no less than 60% of the invoice cost of the materials or equipment. The release shall be signed by an authorized employee identified in the corporate declaration. The request shall include the suppliers invoice for the materials or equipment.

F. The CONTRACTOR shall store the materials and equipment as required in STORAGE OF MATERIALS AND EQUIPMENT of these GENERAL REQUIREMENTS, in a bonded warehouse or facility approved by the INSPECTOR. The storage site shall be located within fifty (50) miles of the geographic limits of the CITY. The materials and equipment shall be physically segregated from all other materials or equipment within the facility and shall be identified as being the "PROPERTY OF THE CITY OF LOS ANGELES". The CONTRACTOR shall exercise all measures necessary to ensure preservation of the quality, quantity, and fitness of such materials or equipment and shall perform the manufacturers' recommended maintenance of the materials or equipment. The CONTRACTOR shall inspect the materials and equipment, and submit a monthly written report to the INSPECTOR listing all the equipment stored, results of their inspection, and the maintenance performed.

G. The CONTRACTOR shall grant the INSPECTOR and the ENGINEER access to the storage facility at any time and assist the INSPECTOR and the ENGINEER in conducting a full view, piece by piece, inventory of all such material or equipment.

H. The CONTRACTOR shall provide all additional insurance necessary to insure the materials or equipment against loss of damage. The insurance provided shall be provided as stated in INSURANCE of the GENERAL CONDITIONS. The insurance shall cover the material or equipment, while stored at the approved site, while in transit to the Jobsite, while being off-loaded at the site and until the material or equipment is incorporated into the Work and the CONTRACT is accepted by the BOARD.

I. The CONTRACTOR shall be responsible for any damage to, defects therein, mis-fabrication thereof, or loss of the materials or equipment.

J. The CONTRACTOR shall be responsible for any resulting project delays or consequential damages as if the CONTRACTOR were the owner of the material or equipment until it is incorporated in the Work and accepted by the CITY.

K. The CONTRACTOR shall absorb any and all cost incurred to meet the requirements of this article without modification in the Contract amount.

L. The CONTRACTOR shall present the storage arrangements in writing and sign a Security Agreement, which shall be submitted to the INSPECTOR for approval by the City Attorney. This agreement shall set forth the terms of ownership, storage and insurance necessary to insure the material or equipment against damage or loss.

1.6 FINAL PAYMENT

A. Final Payment of all monies owed the CONTRACTOR shall be made within 60 days of the date of Final Field Acceptance by the Final Inspector after deducting all prior payments and all amounts to be withheld under the provisions of the Contract, including the following items:

1. Liquidated damages, as applicable;

2. "Disputed Funds" including, but not limited to, the following:

a. Penalty and/or restitution for failure of the CONTRACTOR to pay prevailing wages as required by the contract.

b. Penalty for failure of the CONTRACTOR to receive approval of all Subcontractor(s) prior to said Subcontractor working on the project.

c. Penalty for failure of the contractor to receive approval for Subcontractor substitution(s).

d. Penalty for failure of the contractor to receive approval for a reduction in the dollar amount paid a bid-listed and/or approved Subcontractor;

3. Lien claims or Stop Notices filed on behalf of suppliers, Subcontractors, and labor performed in connection with the project; except, that upon submittal of a Stop Notice Release Bond issued by an approved Surety Company executed in favor of the CONTRACTOR, the CITY will release such portion of the retained funds to said CONTRACTOR that is being held solely to cover Stop Notice Claims.

B. No claim of the CONTRACTOR under this Article shall be allowed unless the CONTRACTOR has given the required written notice. Nor shall a claim by the CONTRACTOR for an equitable adjustment hereunder be allowed if asserted after final payment under this Contract.

C. The acceptance by the CONTRACTOR of final payment and retention shall release the CITY, its officers, agents, representatives or employees, as representatives of the CITY, from all claims and all liability to the CONTRACTOR for all matter in connection with the Work and all acts of the CITY relating to or arising out of the Work.

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SECTION 01298
SCHEDULE OF VALUES / CONTRACT PRICE BREAKDOWN

1.1 THE REQUIREMENT

A. The Schedule of Values shall be used as a basis for determining progress payments on a lump sum contract or any designated lump sum bid item. The Schedule of Values shall be a schedule of cost loaded construction activities equal, in total, to the lump sum bid and shall be in such form and sufficient detail to correctly represent a reasonable apportionment of the lump sum. Prior to submitting an invoice for payment, the CONTRACTOR shall have submitted a detailed Schedule of Values and obtained approval from the INSPECTOR.

B. Each lump sum bid item on the Schedule of Work and Prices, as set forth in the Bid must be broken down separately. The breakdown of each lump sum bid item must cover the cost of construction required by the Drawings and Project Manual for that item. The sum of the values for the construction activities, within a bid item, must equal the total bid amount for that item. The breakdown shall include subcontract amounts which shall not deviate from the amounts submitted in the Bid Proposal. The CONTRACTOR shall provide certification from the Subcontractors certifying the subcontract amounts.

C. Each activity in the Schedule of Values shall delineate one construction activity. For example, the placement of concrete between construction joints, the construction of an electrical duct bank or pipeline between points A & B. The costing for each activity should include all costs for the labor and materials or equipment required to complete the activity. For example, concrete construction activities should include all costs for the forming, placing of reinforcement, placing concrete and curing. The cost for pipeline construction activities should include materials, equipment and installation including pipeline supports or thrust blocks. The excavation and backfill for a pipeline or structure may be separate activities. The Contract Price breakdown shall include the itemized costs for the plant establishment and any maintenance services to be performed before the final project acceptance is made. No non-construction activity shall be cost loaded.

D. The CONTRACTOR shall use cost loaded construction activities from the Construction Schedule as a Schedule of Values. Each construction activity shall be encoded to its bid item and a sort provided for each bid item totaling the cost loaded amount. The total of the Cost Loaded amounts for each bid item shall equal the amount bid for that item. The total of the Schedule of Values shall equal the current Contract value at all times. At any time during the progress of the Work of the Contract the INSPECTOR reserves the right to review the cost loading of the Schedules of Values and direct necessary revisions. When requested by the INSPECTOR, the CONTRACTOR shall provide all information necessary to substantiate the cost loading.

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SECTION 01311
PRECONSTRUCTION SAFETY CONFERENCE

1.1 THE REQUIREMENT

A. The CONTRACTOR'S Project Manager, Project Engineer, Safety Coordinator and Superintendent(s) shall attend a Pre-Construction Safety Conference conducted by the INSPECTOR and the ENGINEER. The CONTRACTOR will be informed of the date, time, and location of the Pre-Construction Safety Conference by the ENGINEER. The Pre-Construction Safety Conference shall take place within twenty-one (21) calendar days after Notice of Award and prior to the start of any Work at the site. The CONTRACTOR shall select additional personnel from its field staff, vendors, suppliers, and manufacturers, and from every Subcontractor, at any tier, to attend the Pre-Construction Safety Conference.

B. The CONTRACTOR shall provide to the ENGINEER and the INSPECTOR, at the Pre-Construction Safety Conference, the following documents:

1. Injury and Illness Prevention Program which shall address site specific concerns and shall also Include the following, as a minimum:

   a. Occupational Injury and Illness Investigation and Reporting System, including a system for providing all injury reports to the INSPECTOR and the ENGINEER.

   b. Safety Inspection System.

   c. Hazard Communication Program.

   d. Methods of identifying hazards including a procedure for notifying the INSPECTOR and the ENGINEER when a hazard is identified.

   e. Training Documentation System.

   f. Safety Communication and Remediation Procedures.

   g. Making the CONTRACTOR'S employees and all Subcontractors and supplier personnel aware of the biological health hazards due to working at a wastewater treatment or a pumping plant. As a minimum, this subject shall be a topic for the CONTRACTOR'S weekly safety meetings at least once each quarter. See Attachments 01311-A1 through 01311-A4.

   h. Other specific safety activities which pertain to the Work.

2. Identification of person(s) responsible for safety of this site, who will be assigned to the site during the performance of the work, for the CONTRACTOR and all Subcontractors at any tier.

3. Emergency Action and Fire Prevention Plan.

4. Hazardous Materials Procurement, Storage, Handling, Waste Control and Disposal Procedures.

   a. The CONTRACTOR's Lock Out/Tag Out, Confined Space Entry, Hazardous Materials/Waste Control and all other site specific safety programs shall meet or exceed the Bureau of Sanitation's standards for this site. These standards are available to the CONTRACTOR upon request from the ENGINEER.

5. It shall be the CONTRACTOR'S responsibility to assure that all field forces know and obey all safety and emergency procedures to be maintained at the job site. The CONTRACTOR shall further assure that a supervisor is present at all times during any field work who is knowledgeable of and responsible for the enforcement of the CONTRACTOR'S required safety procedures.

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(SEE ATTACHMENTS)

ATTACHMENTS TO SECTION 01311

Attachments to General Requirements Section 01311 consists of four (4) documents, as follows:

ATTACHMENT NUMBER	TITLE OF ATTACHMENT	NUMBER OF PAGES IN THIS ATTACHMENT
01311-A1	Biological Health Hazards to Wastewater treatment Workers	2
01311-A2	HIV in Wastewater Not a Threat	2
01311-A3	Concerns and Sanitary Practices to Prevent Disease Transmission From Sludge, Sewage, and Plant Effluents	2
01311-A4	Comparison of the Major Forms of Hepatitis	1

Biological Health Hazards to Wastewater Treatment Workers

Municipal wastewater generally contains four major types of human pathogenic (disease causing) organisms: bacteria, viruses (Hepatitis A), protozoa, and helminths (parasitic worms) (EPA 1985).[4] These four disease types are classified as **waterborne** and originate in the human digestive tract.

Though highly diluted, **bloodborne** pathogens such as the Human Immuno deficiency Virus (HIV) is assumed to be present in wastewater from sources such as spent condoms or blood-stained cotton, bandages or sanitary napkins. Studies indicate that the risk of bloodborne pathogen transmission by wastewater appears to be minimal.[1] If good hygiene practices are observed, the risk is essentially zero.

Transmission of disease from wastewater to a host has four requirements:

1) An infectious agent must be present.

2) The infectious agent must be present in sufficient numbers to cause infection. (Since concentrations of pathogens vary in wastewater, it is safest to consider them sufficient to cause infection).

3) A susceptible host must be available (the wastewater worker).

4) An appropriate portal of entry (eyes, broken skin, mouth) into the host must exist or be created (USDHHS, 1990).[2]

The portal of entry could be one of the following:

1) Direct sewage splash in the mouth, eyes or open wound.

2) Inhalation or ingestion of wastewater aerosols. These aerosols may settle on any surface which could be transferred to the hands and later the mouth during eating, drinking or smoking.

3) Needle sticks to persons involved in cleaning settling tanks.

Of the four requirements for disease transmission, the only one that can be controlled with certainty is preventing a portal of entry of pathogens to the wastewater worker. This involves observing common sense hygiene practices such as:

1) A majority of infectious materials is carried on the hands. Wastewater workers are well advised to keep their fingers away from the nose, mouth, and eyes (no smoking or eating) until their hands have been thoroughly cleaned. Frequent hand washing should be a habit.

2) Wearing personal protective equipment such as gloves and protective clothing. Dust mist respirators are available for workers who desire to use them as an extra prevention measure to minimize inhalation of aerosols.

3) Keep wounds covered by sterile bandages and change bandages frequently to make certain that contamination is not becoming trapped underneath. Waterproof gloves may also be necessary.

The risk of disease transmission from wastewater to wastewater workers has been studied for some time. Some of the conclusions of these studies are presented below:

In general terms, the risk of disease transmission appears to be quite low for those who frequently encounter sewage (Clark et al., 1976).[1]

“Given what is known about the survivability of HIV, the concentrations of HIV in body fluids, the dilution of the waste stream, and the risk of infection by exposure to contaminated fluids, it appears unlikely that transmission of HIV could occur in a wastewater treatment setting.”[1]

“Opportunities exist for wastewater treatment workers to be exposed to pathogenic bacteria, viruses, and parasites from biological aerosols or contact with contaminated materials and surfaces in the plant....However, the slightly increased risk of infection resulting from exposure to wastewater does not appear to translate into increased over disease incidence among wastewater treatment plant workers.”[3]

1. Johnson, R.W., et al (1994) HIV and the Bloodborne Pathogen Regulation: implications for the wastewater industry. Water Environment Research Vol. 66 Pp. 684-691

2. EPA/625/R-92/013 Environmental Regulations and Technology: Control of Pathogens and Vector Attraction in Sewage Sludge. U.S.E.P.A. 1992 P5

3. Bitton, G. Wastewater Microbiology. Wily-Liss, N.Y. 77-100,247-256.

Additional references:

Casson, L.W., (May/June 1992) HIV survivability in wastewater. Water Environment Research. Pp. 213-215

Gover, N. HIV in Wastewater Not A Threat, Water Environment and Technology, (December 1993) P. 23

HIV in Wastewater Not a Threat

According to the Center for Disease Control (CDC) in Atlanta, Ga., wastewater contaminated with the Human Immunodeficiency Virus (HIV) poses virtually no risk to wastewater treatment plant operators. Because HIV is a blood-borne disease, the CDC does not consider the water-borne route a possibility for transmission.

The virus that causes Acquired Immune Deficiency Syndrome (AIDS) has been a hotly debated issue among wastewater treatment plant operators. Recent studies, including one conducted at the University of Pittsburgh in 1992, have indicated that the virus is stable in wastewater. But this Pittsburgh study, "HIV Survivability in Wastewater", (Water Environment Research, May-June 1992), concluded that, "HIV is fairly stable in wastewater for up to 12 hours but experiences a 2 to 3 log reduction in infectivity after 48 hours."

The problem arises, says a CDC source, when these studies conducted in a laboratory setting are compared with what happens in the real world or in wastewater. Such laboratory studies are of interest to the academic and scientific community because they provide insight into how a virus behaves, says the CDC. However, they do not reflect what happens in the natural environment.

As the CDC points out, these laboratory studies use high concentrations of the virus, in reality, a person infected with HIV has very low levels of the virus in his or her bloodstream. Unlike bacteria and fungi, HIV is unable to multiply outside a living host cell.

According to Jim Kreissi, environmental engineer with the EPA's Center for Environmental Research Information in Cincinnati, Ohio, "HIV is not shed in the feces of infected individuals, as is poliovirus and other enteric viruses. Its only means of getting into wastewater is by mixing of water with blood, semen, saliva, or tears prior to entering the sewer system. Therefore, concentrations of HIV in wastewater should be quite low".

To dilute levels of HIV that may be present in wastewater also would encounter a hostile environment, according to the CDC. They would be subject to hostile conditions, such as disinfectants and other chemicals, high concentrations of other microorganisms, and changes in temperature and pH. The number that would survive in wastewater therefore would be infinitesimally small.

However, the most significant obstacle to HIV infection--from any source--is how it enters the body. It must enter through the bloodstream. According to the CDC, the only recognized transmission mechanisms for HIV are needles, sexual intercourse, and mother-to-baby transmittal. "Theoretically, the only way you could get HIV infection from wastewater is if you were injected with rather large amount of it, which is hardly likely", says a CDC source.

"It is dangerous to assume that mere presence of the virus ensures it will cause disease", says the CDC source, "The disease is not transmitted by wastewater".

Other Pathogens May Pose Threats

While the risk of HIV transmission from wastewater is virtually nonexistent, there are a variety of other pathogens in wastewater that could pose a threat to treatment plant operators.

As with HIV, the most significant factor affecting the risk for infection is how a microorganism enter the body. Pathogens that enter through the nose and eyes, for example, may pose a risk to treatment plant operators.

Infection may occur when microorganisms become airborne when wastewater is agitated or sprayed. Pathogens then may be inhaled or may contact the eyes. Dirty hands also may result in the inadvertent pathogen transmission to the mouth or eyes.

While there is a risk of disease transmission from some pathogens found in wastewater, treatment plant operators can minimize the risks by following hygiene and first aid protocol, and by wearing suitable protective clothing.

--Nancy Gover, National Small Flows Clearinghouse, Morgantown, W.V.

CONCERNS AND SANITARY PRACTICES
TO PREVENT DISEASE TRANSMISSION
FROM SLUDGE, SEWAGE, AND PLANT EFFLUENTS

WHAT IS OF CONCERN

X Sewage, sludge, and undisinfected plant effluents should be assumed to contain pathogenic organisms which can be transmitted by ingestion, contact with open wounds, or inhalation of contaminated aerosols..

X Typical types of pathogens and examples known to be transmitted by sewage and sludge include:

Type of Agent	Disease
Virus	Infectious hepatitis, polio
bacteria	cholera, typhoid, salmonellosis, dysentery
protozoa	amoebic dysentery, giardiasis
intestinal worms	roundworms, pinworms, tapeworms

X Some diseases can be transmitted through punctures in the skin. Bacteria may be covered over and trapped by flesh, creating an anaerobic environment for growth. Tetanus is the most common disease of this type.

WHAT IS NOT OF CONCERN

X Sewage/sludge is not considered a mode of transmission for such diseases as cancer, herpes, gonorrhea, syphillus, legionnaires disease, and most other diseases not associated with the intestinal tract (mumps, measles, colds).

X HIV virus could be present in sewage at low concentrations because of the potential discharge of blood or other bodily fluids from infected persons to the sewer system. However, the risk of infection from sewage is considered to be extremely low and no reported cases have ever been associated with sewage contact.

X Sewage/sludge is odorous. However, odorous gases evolved from sewage/sludge, such as H_2S, and other gases such as CH_4 and CO_2, are not considered health hazards in well ventilated areas. However, in confined spaces and poorly ventilated spaces these gases can become toxic (in the case of H_2S) or result in low oxygen conditions (in the case of CH_4 and CO_2). Caution must be exercised when entering enclosed, unventilated or poorly ventilated areas such as sewers or maintenance holes.

X Sewage/sludge does not contain volatile compounds or materials at concentrations that would cause health concerns for short term exposure by inhalation.

PROPER HYGIENE PRACTICES

X Years of plant operation have shown that common sense and personal hygiene practices are effective in preventing disease among workers exposed to contaminated material such as sludge, sewage, or plant effluents.

X It is important to avoid ingestion and contact with open wounds and sores.

X Reasonable precautions should be taken to avoid unnecessary direct contact with contaminated material.

1) When working on equipment which has been contaminated, the equipment should first be hosed off using potable water if at all possible. Plant effluent should be used to hose-off sludge only if potable water is not available.

2) Rubber gloves should be used whenever possible when working on contaminated equipment or surfaces and should always be used if it is necessary to directly contact sewage or sludge.

3) Eye protection should be worn if there is danger of getting contaminated material in the eyes.

4) Work should be momentarily suspended in areas in which sludge is being hosed-down if there is a likelihood of direct contact with washing or overspray.

5) Smoking should not be allowed in operating areas because of the frequent hand-to-mouth contact.

6) Eating should not be allowed in operating areas.

7) Masks should be used if there is a risk of aerosols or droplets such as might occur if effluent is sprayed in the air. Face shields should be used if there is a risk of direct facial contact with a spray.

X It is always good practice to wash your hands with soap and water before eating. This is often difficult on a construction site. However, if you should come in contact with contaminated material or work in a sewage or sludge processing area, it is very important that your hands be washed with strong soap and water, and fingernails scraped before eating. The type of soap is less important than thorough use of soap.

X Open cuts, sores, or breaks in the skin should be protected against exposure. Remember, bandages are usually not waterproof.

X Contaminated clothing should be kept separate from other household clothing and washed separately in hot water (not warm or cold) with detergent and chlorine bleach. Lysol Laundry Sanitizer or similar products can be used as a disinfectant substitute for chlorine bleach if color fading is a concern.

X When a worker is exposed to heavy contamination, i.e. exposure over large areas of the body or soaked clothing, it is recommended that the worker shower and change clothing as soon as possible after the exposure, and before returning home. Visible contamination should be removed from the clothing before it is taken home.

X Contaminated clothing should be washed per the above instructions before rewearing.

X If a worker should ingest contaminated material or have his/her eyes contaminated, the worker should rinse out the mouth or eyes with potable water and be sent to the emergency hospital for treatment. Gamma globulin is often administered in such cases to reduce the risk of infection.

X Reasonable caution and respect, but not fear, should be the guiding principles.

COMPARISON OF THE MAJOR FORMS OF HEPATITIS

TYPE: **Also Known As:**	**HEPATITIS "A"** **Infectious Hepatitis**	**HEPATITIS "B"** **Serum Hepatitis**	**HEPATITIS "C"** **Non-A Non-B Hepatitis**	**HEPATITIS "D"** **Delta Hepatitis**
FEATURES:	Most common type. Seldom chronic. Usually mild. Contagious. Transmitted only by those who have active Hepatitis "A" Liver damage with necrosis and inflammation	Highly contagious. Transmitted by the ill and carriers. Mortality (1% - 4%) is higher than for Hepatitis A (<0.5%)	Non- "A" Non- "B" hepatitis. Similar to "A" May become chronic. Occasionally leads to liver failure. Can increase risk or cirrhosis. Contagious.	
CAUSATIONS:	Swallowing material that contains active hepatitis "A" virus, e.g. feces, contaminated food, water, objects. Anal & oral sex. Rarely blood transfusions.	Injection of body fluid that contains active hepatitis "B" virus. Body fluid that contains active hepatitis "B" virus entering broken skin or mucous membranes. Blood/body fluid contaminated objects. Oral, anal, and vaginal sex.	Injection of body fluid that contains active hepatitis "C" virus. Body fluid that contains active hepatitis "C" virus entering broken skin or mucous membranes. Blood/body fluid contaminated objects. Blood transfusions (rare). Oral, anal, and vaginal sex.	Similar to hepatitis "B"
PEOPLE AT RISK:	Workers exposed to wastewater. Healthcare workers. Sexual partners of people ill with hepatitis "A". Family members of people ill with hepatitis "A". Shellfish eaters	Heathcare workers. Sexual partners of people ill with hepatitis "B" virus. I.V. drug users. Sexually active (many partners).	Healthcare workers. Sexual partners of people ill with hepatitis "C" or (rarely) carriers of hepatitis "C". I.V. drug users. Sexually active (many partners).	Only occurs in people who also have hepatitis "B"
PREVENTION:	Careful hygiene (fecal-oral transmission). Routine hand washing after possible contact. Sexual fidelity or abstinence.	Universal Precautions. Routine hand washing after contact. Sexual fidelity or abstinence. Abstinence from I.V. drug use.	Universal Precautions	Similar to hepatitis "B".

SECTION 01312
PROJECT MEETINGS

PART 1 -- GENERAL

1.1 DESCRIPTION

A. Work Included: Required to enable orderly review during pre-installation conference and progress of Contracted Work, and to provide for systematic discussion of installation problems and other construction problems arisen, the ENGINEER will conduct project meetings throughout the construction period.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, GENERAL CONDITIONS, DIVISION 1 - GENERAL REQUIREMENTS

2. The CONTRACTOR'S relations with his Subcontractors and materials suppliers, and discussions relative thereto, are the CONTRACTOR'S responsibility and normally are not part of project meetings content.

3. Pretesting Procedural Conference in Section 01453 – SAMPLING, TESTING AND FABRICATION INSPECTION of the GENERAL REQUIREMENTS.

4. CONTRACTOR'S CONSTRUCTION SCHEDULE AND REPORTS in Section 01321 of the GENERAL REQUIREMENTS.

1.2 SUBMITTALS

A. Conform to provisions of Section 01330 – SHOP DRAWINGS / SUBMITTALS of GENERAL REQUIREMENTS.

B. Agenda Items: To the maximum extent practicable, advise the ENGINEER at least twenty-four (24) hours in advance of project meetings regarding items to be added to the agenda or requesting the cancellation of any Meeting.

C. Minutes:

1. The ENGINEER will compile minutes of each project meeting and will furnish one copy to the CONTRACTOR, INSPECTOR, and all other involved parties.

2. Recipients of copies may make and distribute such other copies as they wish.

3. Special denotation mutually agreed by all parties shall be used in Meeting Minutes to identify old and new business, to distinguished new discussion/statement made in subsequent meeting from previous meetings, or any revision to any part of the minutes.

1.3 QUALITY ASSURANCE

D. For those persons designated by the CONTRACTOR to attend and participate in project meetings, provide required authority to commit the CONTRACTOR to solutions agreed upon in

the project meetings. Refer to provisions indicated in Section 00727 - CONTRACTOR'S REPRESENTATIVE AT THE SITE of the GENERAL CONDITIONS.

PART 2 -- PRODUCTS (NOT APPLICABLE)

PART 3 -- EXECUTION

3.1 MEETING SCHEDULE

A. Except as noted below for Preconstruction Meeting, project meetings will be held bi-weekly or as otherwise directed by the ENGINEER.

B. Coordinate as necessary to establish mutually acceptable schedule for additional meetings.

3.2 MEETING LOCATION

A. The ENGINEER will establish the meeting location. To the maximum extent practicable, meetings will be held in CONTRACTOR'S job office at the Jobsite.

3.3 PRECONSTRUCTION MEETING

A. Preconstruction Meeting will be scheduled to be held within fifteen (15) working days after the City has issued the Notice to Proceed.

4. Provide attendance by authorized representatives of the CONTRACTOR and major Subcontractors.

5. The ENGINEER will advise other interested parties.

B. Minimum Agenda: Data will be distributed and discussed on at least the following items.

1. Organizational arrangement of CONTRACTOR'S forces and personnel, and those of the subcontractors, and materials suppliers.

2. Organizational arrangement of the CITY'S forces and personnel, such as the Project Manager, ENGINEER, INSPECTOR, and other authorized representatives.

3. Channels and procedures for communication.

4. Construction schedule, including sequence of critical work.

5. Contract Documents, including distribution of required copies of original Documents and revisions.

6. Processing of Shop Drawings and other data submitted to the ENGINEER for review.

7. Processing of Bulletin, addenda, field decisions, Requests for Information and Change Orders.

8. Rules and regulations governing performance of the Work.

9. Procedures for site security, Project quality control, housekeeping, and related matters.

10. It is the responsibility of the CONTRACTOR for Job Site Safety & First Aid, however, it shall be on the agenda.

11. Procedures to request air monitoring services, soil inspection, survey, etc. if specified, shall be provided by the CITY.

12. Emergency Information: The names, addresses, telephone and fax numbers of the CONTRACTOR, and Subcontractors, or their representatives, shall be filed with the ENGINEER prior to start of Contracted Work.

3.4 PROJECT MEETINGS

A. Attendance:

1. To the maximum extent practicable, the Project Superintendent and other representatives who have full knowledge of the project and full authority to act for the CONTRACTOR shall represent the CONTRACTOR at Project Meetings throughout the progress of the Work. All representatives must conform to the provisions indicated in Section 00727 - CONTRACTOR'S REPRESENTATIVE AT THE SITE of the GENERAL CONDITIONS.

2. Subcontractors, materials suppliers, and others may be invited to attend these Project Meetings in which their aspect of the Work is involved.

3. CONTRACTOR may not cancel or be absent from any meeting without advanced approval from the ENGINEER. The CONTRACTOR must submit a written request with reason to the ENGINEER twenty-four (24) hours before the scheduled meeting. If approved, the CONTRACTOR shall notify all parties of the cancellation.

B. Minimum Agenda:

1. Review, revise as necessary, and approve minutes of previous meeting.

2. Review progress of the Work since last meeting. Review actual starts and finish dates of activities.

3. Review status (total complete and outstanding) of submittal for approval, Request-for-Information and Change Orders.

4. Identify old and new problems, which impede planned progress, identify responsible party for the follow-up actions. Mutually agree to a common solution and date of correction.

5. Develop corrective measures and procedures to regain lost time on the planned schedule.

6. Review Weekly Progress Reports including the forecasts as required in Section 01 311 – CONTRACTOR'S CONSTRUCTION SCHEDULE AND REPORTS of the GENERAL REQUIREMENTS.

7. Status of Record drawings and the Record Project Manual.

8. Jobsite Walk-Through. Record all discussion and follow-up actions.

9. Any Jobsite health and/or accident or safety issues.

C. Revisions to Minutes:

1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.

2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.

3. Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

3.5 SITE MEETINGS

A. Required when necessary to enable orderly review and discussion of site conditions and problems requiring solution during the progress of the contracted work. Notify the ENGINEER of the need for additional site meetings as early as possible to resolve the problem without any impact to the Project Schedule.

B. Provide necessary labor, tools, and equipment such as shoring, scaffolding, ladder, etc. to gain access to the site.

C. CONTRACTOR or CONTRACTOR'S authorized representative shall be present at all times.

D. All discussion and follow-up actions shall be recorded by the ENGINEER and the minutes shall be distributed at the next meeting or at earliest time.

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SECTION 01313
WORK BY CITY OR OTHERS

1.1 THE REQUIREMENT

A. The CONTRACTOR shall be responsible for ascertaining the nature and extent of any simultaneous, collateral and essential work by others. The CITY, its employees and contractors, and others, shall have the right to operate within or adjacent to the worksite to perform such work. The waterline relocation is separate from this and to be completed by others

B. The CITY, the CONTRACTOR, their employees, Subcontractors and others, shall coordinate their operations and cooperate to hold interference to a minimum.

C. The CONTRACTOR shall include in its Bid and schedule all costs and time involved as a result of coordinating its work with others. The CONTRACTOR shall not be entitled to additional compensation from the CITY for damages resulting from such simultaneous, collateral and essential work. The CONTRACTOR'S coordinating efforts shall include redeployment of his work forces to other parts of the Work.

D. Should the CONTRACTOR be delayed by the CITY, and such delay could not reasonably have been foreseen and prevented by the CONTRACTOR, the ENGINEER will determine the extent of the delay, the effect of the delay on the project as a whole, and any commensurate extension of time.

E. The CONTRACTOR is required to notify affected CITY offices of Work to be done as specified in the following table:

Item	Office of LADOT to be notified	Cost to be borne by	Required Notice (working days)
Work on signal – controlled intersection	Traffic Signal Inspector: Central Area: (213) 485-1071 Western Area: (213) 485-6834 Valley Area: (818) 756-7846 ASTAC Project Engineer: (213) 485-2815	Contractor	3
Traffic Signal and Interconnect damage	Signal Superintendent: Daytime: (213) 847-2991 After Hours: (213) 485-2046	Contractor	Immediate
Parking meter damage	Parking Meter Supervisor: (213) 485-2273	Contractor	Immediate
Parking meter removal and replacement	Parking Meter Planning Supervisor: (213) 847-4230	City**	5
Material and labor by LADOT	Scheduling: Sign/Striping: (213) 485-2185 Signal: (213) 485-2194		
Traffic Sign removal, relocation and replacement	Appropriate District Transportation Engineer*:		
Parking restrictions, changes relating to temporary striping	Central District: (213) 485-2284	City	10
Final traffic striping and pavement marking	East Valley District: (818) 756-8441	Contractor	5

Item	Office of LADOT to be notified		Cost to be borne by	Required Notice (working days)
Temporary Traffic Control Plan	Hollywood District:	(213) 485-4282	Contractor	30
Temporary striping installation mark out	West Valley District:	(818) 756-8784	Contractor	2
Offsite Detour Signs	Western District Southern District:	(310) 575-8138 (310) 548-7651	Contractor	5
Placement of temporary “No Parking” signs	Special Traffic Control Section:	(213) 485-2298	Contractor	4

***** For B-Permit projects, notify citywide investigations (213) 580-5211.

******On B-Permit projects, the costs shall be charged to the permittee as required by Section 62.110 of the Los Angeles Municipal Code.

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SECTION 01321
CONTRACTOR'S CONSTRUCTION SCHEDULE AND REPORTS

1.1 THE REQUIREMENT

A. It is expressly understood and agreed that the time of beginning, the rate of progress, and the time of completion of the Work are of the essence of this Contract. The Work shall be executed with such progress as required to prevent any delay to other CONTRACTORS working on other contracts at the site, the Contract milestones, and the general completion of the Contract.

B. The CONTRACTOR shall employ or retain the services of a Construction Scheduler who shall have at least two years verifiable experience as the person primarily responsible for preparing and maintaining detailed project schedules on projects of the same or similar size and nature as this project. The CONTRACTOR shall submit a resume of the Construction Scheduler for ENGINEER'S approval prior to the start of Work. The Construction Scheduler is required to attend all meetings pertaining to scheduling and progress of the Work.

C. Within seven (7) calendar days after Notice of Award, the ENGINEER will schedule and conduct a Preconstruction Scheduling Conference to commence development of the required project schedule. At this meeting, the requirements of this Section, as they apply to the Contract, will be reviewed with the CONTRACTOR. The CONTRACTOR shall be prepared to review and discuss methodology for the schedule and sequence of operations plus cost loading methodology. The schedule shall be a CPM schedule using Primavera Project Management or Contractor.

D. The Contractor shall include the effects of adverse weather in the construction schedule in terms of working days (wds). The number of wds, Monday through Friday excluding any day designated as a holiday by the City or in a Master Labor Agreement binding the Contractor, of normal adverse weather per month is as follows: January-3 wds, February-2 wds, March-3 wds, April-1 wd, October-1 wd, November-2 wds, December-2 wd. Unusually severe weather (see GC 00401) is defined as the number of working days over what is normal adverse weather, as defined in the previous sentence. For partial months, the aforementioned numbers shall be prorated and rounded to the nearest whole number. There shall be no extension of time for adverse weather unless the Contractor is prevented from working during the first five (5) hours of a workday with at least sixty percent (60%) of the normal work force on more days per month than listed above. Even if there is unusually severe weather, a non-compensable extension of time will not be granted unless the other conditions required by GC 00401 are met, negative impact to the critical path and delay beyond the current Contract Completion date in particular.

E. The CONTRACTOR shall prepare and submit to the ENGINEER five (5) copies of the CONTRACTOR'S Construction Schedule within fourteen (14) calendar days after issuance of the Notice to Proceed. The CONTRACTOR'S Construction Schedule shall be comprised of a detailed Network Diagram as described in J of this Section. The CONTRACTOR'S Construction Schedule shall show the dates on which each part or division of the Work is expected to be started and completed, and shall show all submittals which constrain any work activity, allowing a minimum of thirty (30) calendar days for the ENGINEER'S review of each submittal unless a longer period of time is specified elsewhere in these Contract Documents. The CONTRACTOR shall also submit a separate listing of all submittals required under the Contract, showing when each submittal will be submitted. The Work activities making up the schedule shall be of sufficient detail to assure that adequate planning has been done for proper execution of the Work and such that, in the sole judgment of the ENGINEER, it provides an appropriate basis for monitoring and evaluating the progress of the Work. All on-site construction activities shall be cost loaded. The cost value of all on-site construction activities shall equal the Contract value. Submittal and approval of the CONTRACTOR'S Construction Schedule in accordance with the

requirements of this Section is a condition precedent to the receipt of any payments from the CITY under this Contract.

F. The CONTRACTOR'S Construction Schedule shall show the sequence, duration, and interdependence of activities required for the complete performance of all Work. The CONTRACTOR'S Construction Schedule shall begin with the date of issuance of the Notice to Proceed and conclude with the date of Final Completion shown in the Contract.

G. Float, slack time, or contingency within the schedule (i.e., the difference in time between the project's early completion date and the required Contract Completion date), and total float within the overall schedule, is not for the exclusive use of either the CITY or the CONTRACTOR, but is jointly owned by both and is an expiring resource available to and shared by both parties as needed to meet Contract milestones and the Contract Completion Date. Pursuant to the float sharing requirement of the Contract, use of float suppression techniques such as preferential sequencing, special lead/lag logic restraints, extended activity times or imposed dates shall be cause for rejection of the Project Schedule and any revisions or updates. For activities started but not finished, the schedule shall be calculated using remaining duration and the progress override option.

H. Time extensions shall not be granted nor delay damages paid until a delay occurs which is beyond the control and without the fault or negligence of the CONTRACTOR and its Subcontractors or Suppliers, at any tier, which extends actual performance of the Work beyond the current Contract Required Completion Date and the completion date projected by the current, approved, updated schedule. If the delay occurs along a path, which the current approved Construction Schedule update projects late completion prior to addition of any CITY caused delay, then the time extension allowed will be only for the additional delay demonstrated by the approved Time Impact Analysis. Time extensions shall be granted only if they are clearly demonstrated by the CONTRACTOR through the submittal, within fifteen (15) calendar days after the delay occurs, of a Time Impact Analysis which demonstrates the estimated impact on the end date of the Work; is based upon the updated Construction Schedule current as of the month the delay occurred; and demonstrates that the delay cannot be mitigated, offset, or eliminated through such actions as revising the intended sequence of Work or other means. Since float time within the Construction Schedule is jointly owned, it is acknowledged that CITY caused delays on the project may be offset by CITY caused time savings (e.g. critical path submittals returned in less time than allowed by the Contractor approval of substitution requests which result in a savings of time to the CONTRACTOR). In such an event, the CONTRACTOR shall not be entitled to receive a time extension or delay damages until all CITY caused time savings are exceeded and the Contract completion date is also exceeded.

I. If the CONTRACTOR submits a Construction Schedule showing completion of the Work more than thirty (30) calendar days in advance of the Contract completion date, the CONTRACTOR agrees that the ENGINEER may, at no cost to the CITY, decrease the Contract duration by issuance of a Change Order which will change the appropriate Milestone Date(s) and the Contract completion date to the completion date reflected on the Project Schedule. Any approved schedule, revision, or update having an early completion date shall show the time between the early completion date and the current Contract completion date as "project float".

J. Comments made by the ENGINEER on the CONTRACTOR'S Construction Schedule during review will not relieve the CONTRACTOR from compliance with the requirements of the Contract Documents. The review is only for general conformance with the scheduling requirements of Contract Documents. Upon the ENGINEER'S request, the CONTRACTOR and all major Subcontractors (defined herein as being any Subcontractor, Sub-Subcontractor, or Supplier with five (5) per cent or more of the value of the Contract) shall participate in the review of the CONTRACTOR'S Construction Schedule submissions (including the original material, all update submittals, and any resubmittals). All revisions shall be submitted within fifteen (15) calendar days after the ENGINEER'S review.

K. The Detailed Network Diagram shall provide a workable plan for performing the Work, establish and clearly display the critical elements of the Work, forecast completion of the construction, and match the Contract duration in time. It shall be a time scaled logic diagram plotted on 2'x3' size paper. Exclusive of those activities for submittal review and material fabrication and delivery, activity durations shall not be less than one (1) nor more than **ten (10)** working days, unless otherwise approved by the ENGINEER. In addition to the detailed network diagram, the CONTRACTOR shall submit five (5) copies of the following reports with the original submittal:

1. Predecessor/Successor Report or a list showing the predecessor activities and successor activities for each activity in the schedule sorted by Activity Number. The report shall include late dates, early dates, original duration, and total float.

2. A diskette or CD/DVD containing the electronic file of the schedule submittal.

L. An updated Construction Schedule shall be submitted to the ENGINEER with the submittal of the CONTRACTOR'S monthly payment request but not later than the 5th working day of the month. For those activities started but not yet completed at the time of submittal, the updated schedule shall reflect the percentage complete, as agreed between the CONTRACTOR and the INSPECTOR, and an estimate of the remaining duration. The schedule update shall be calculated using remaining durations and the progress override option. The monthly update of the construction schedule shall include five (5) copies of the following:

1. A time scaled logic diagram showing early schedule or actual dates for each activity remaining to be completed, total float, and original and remaining durations.

2. As in J-1, above, the Predecessor/Successor Report sorted by activity number.

3. A complete hard copy listing of all changes from the previous approved schedule (Claim Digger report.) Activities shall not be added nor logic changed without prior acceptance of the Engineer.

4. The data necessary to produce the network diagram and reports on computer diskette(s) or CD/DVD.

M. The submittal of the updated Construction Schedule which satisfies the requirements of this Section, accurately reflects the status of the Work (for all previously accepted activities), and incorporates all approved changes into the schedule, shall be a condition precedent to the processing of the monthly payment application. (Actual and/ or forecast dates for status of additional submittal cycles shall be added without the prior approval of the Engineer.) Updated schedules shall also be submitted at such other times as the ENGINEER may direct. Upon approval of a Change Order or issuance of a notice to proceed with a change, the approved change shall be reflected in the next schedule update submittal by the CONTRACTOR.

N. If completion of any part of the Work, the delivery of equipment or materials, or submittal of CONTRACTOR submittals is behind according to the updated Construction Schedule, and will impact the end date of the Work past the contract completion date, the CONTRACTOR shall submit in writing, a recovery plan acceptable to the ENGINEER for completing the Work by the current Contract completion date, if requested by the ENGINEER.

1. Failure of the CONTRACTOR to submit the Project Schedule or any required resubmittals, schedule revisions, or schedule updates in a timely, accurate manner and in accordance with the requirements of this Section, will result in costs to the CITY which are difficult if not impossible to determine. Therefore, the CONTRACTOR shall pay the CITY liquidated damages in the amount of [$ 200] per calendar day, for every day the schedule submittal, revision, resubmittal, or update is late or incomplete. This amount shall be subtracted from any monies due and shall be forfeited by the CONTRACTOR.

O. As a condition precedent to the release of any retained funds, the CONTRACTOR shall, after substantial completion of the Work has been achieved, submit a final CONTRACTOR'S Construction Schedule which accurately reflects the manner in which the project was constructed and includes actual start and completion dates for all Work activities on the Construction Schedule.

P. Each week the CONTRACTOR shall submit to the ENGINEER and the INSPECTOR a bar graph schedule showing a one (1) week history and a two (2) week forecast. The corresponding CPM activity number shall be on each bar.

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SECTION 01322
CONSTRUCTION PROGRESS PHOTOGRAPHY

PART 1--GENERAL

1.1 SUMMARY

A. Required: Provide photographs taken at the Jobsite at the specified stages of Contracted Work in accordance with provisions of this Section.

1. Take six views of the site at thirty (30) day intervals during the period of Contracted Work.

2. Take first photographs just before CONTRACTOR starts any work operations at the Jobsite.

3. Take final photographs when all Contracted Work has been completed, regardless of time interval since previous photographs were taken.

B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to, GENERAL CONDITIONS, DIVISION 1 - GENERAL REQUIREMENTS and other Sections of the Project Manual.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 – SHOP DRAWINGS / SUBMITTALS of the GENERAL REQUIREMENTS.

B. Except as otherwise directed by the ENGINEER, submit three color prints of each view.

1.3 QUALITY ASSURANCE

A. Secure the services of a photographer who is skilled and experienced in construction photography and whose work samples are acceptable to the ENGINEER.

B. Do not replace the photographer without the ENGINEER'S written approval.

C. Require the photographer to retain the negatives for at least one year following Statement of Completion, and to provide additional prints to the CITY during that period at the prevailing commercial rates for such prints.

D. Do not permit prints to be issued for any other purpose without specific written approval from the ENGINEER.

E. Photographs and prints to be of professional quality; clear, in focus, with high resolution and sharpness, and with minimum distortion.

PART 2-- PRODUCTS

2.1 CONSTRUCTION PHOTOGRAPHS

A. Provide color prints and electronic files of the digital photographs:

1. Size: 8” x 10”

2. Type: Smooth surface, glossy print, single weight paper with white base mounted on muslin or on double weight glossy paper.

B. On the back of each print, in a manner not damaging to the print, identify the following:

1. Job name and address;

2. Location from which photographed;

3. Date of photograph; and

4. Photographer's name and address, and the photograph number.

PART 3-- EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHY

A. View Locations: As directed by the ENGINEER. Location(s) to provide diversified overall view of the Work from a position that is expected to remain accessible throughout progress of the Contracted Work for added photography.

B. Continue to take photographs at same view position of the Works to show continuous progress of the Works until the Works are completed or as directed by the ENGINEER.

C. Notifications: Notify the ENGINEER seven (7) days in advance of proposed day of photography.

D. Weather Conditions: When inclement weather is anticipated, consult with the ENGINEER to determine acceptable alternate arrangements.

E. Timing of Photography: To the maximum extent practicable, take photographs at the same time of day throughout progress of the Contracted Work. Timing shall be approved by the ENGINEER.

F. On Contract Drawing: Photographer to identify each photograph location or by such other means as acceptable to the ENGINEER, to enable future photographs to be taken from the same location and position.

G. Change of Locations: When so directed by the ENGINEER because of construction, change one or more of the locations inside or outside of the building(s).

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SECTION 01323
CONSTRUCTION STATUS REPORTS

1.1 THE REQUIREMENT

A. Weekly Status Report: During the construction phase of the Work, the CONTRACTOR shall submit weekly written status reports to the ENGINEER and the INSPECTOR. The report shall contain a record of inspections and tests, not performed by CITY forces, for all Work accomplished subsequent to the previous report and shall include the following information:

1. Type of work under way during the time frame of the report (e.g., earthwork, concrete work, structural steel erection, equipment manufacturing, component installation).

2. Inspections and tests, and location of inspections and tests that were made.

3. Results of inspections.

4. Reports of tests performed, including those specified, with the results of the tests, and acceptance criteria, including failures and remedial action to be taken. Test results, including all computations, shall be attached to the report form. Where test results cannot be completed by the time the report is submitted, a notation shall be made that the test was performed, including the approximate expected date that test results will be reported.

5. Report of any nonconforming items/activities. Nonconformance report forms designed solely for this purpose shall be utilized.

6. Results of inspections of material and equipment done upon their arrival at the Jobsite and prior to their incorporation into the Work. This includes, but is not limited to, compliance with approved submittals, damage, and proper storage requirements.

7. Offsite quality control activities.

8. Instructions received from the ENGINEER or INSPECTOR.

9. In all cases, the report must be verified and signed by the CONTRACTOR'S representative. The verification is to contain the statement that all supplies and materials incorporated in the Work are in compliance with the terms of the Contract except where noted.

B. Monthly Procurement And Delivery Status Report:

1. The CONTRACTOR shall prepare and submit to the INSPECTOR and the ENGINEER a comprehensive Monthly Procurement and Delivery Status Report covering the procurement and delivery of equipment and materials to the Jobsite. This report shall outline the purchasing status of all material, equipment and contracts. The purchasing status report shall include the following information:

a. Specification, purchase order, and Contract number;

b. Submittal Number;

c. Item or service description;

d. Required job site date; and

e. Project Delivery Date.

2. In addition, this report shall contain a three (3) month "Look Ahead Projection" of all factory tests, shipments to be inspected, or any other supplier activity which the CONTRACTOR, the ENGINEER, or the INSPECTOR, has the right to witness and accept. The report shall detail arrangements which are planned for meeting the witnessing and acceptance requirements, and for recording tests passed.

3. The CONTRACTOR shall obtain a submittal schedule for technical data, Shop Drawings, material and test certificates, O&M manuals, spare parts lists, and other submittals, from each supplier. This schedule shall be monitored and updated on a monthly basis and shall be submitted to the INSPECTOR and the ENGINEER with the Monthly Procurement and Delivery Status Report.

C. Miscellaneous Submittals:

1. Required: CONTRACTOR shall prepare a Daily Construction Report recording the following information concerning events at the job-site and submit duplicate copies to the Consultant or ENGINEER at weekly intervals:

2. List of Subcontractors and Sub-Subcontractors at the site**,** types of works and job location.

3. Approximate count of CONTRACTOR'S personnel at the site**,** name, type of work and job location.

4. Construction equipments at the site.

5. High and low temperatures, general weather conditions.

6. Accidents and unusual events.

7. Meetings and significant decisions.

8. Stoppages, delays, shortages, losses.

9. Meter readings and similar recordings.

10. Emergency procedures.

11. Inspection, Orders and requests of governing authorities**,** type of work.

12. Change Orders received, implemented.

13. Services connected, disconnected.

14. Notice of Non-Compliance, Notice-To-Correct, and Job-Memorandum received.

15. Equipment or system tests and start-ups.

16. Preparation of Record Drawings and Project Manual.

17. Equipment or material delivered to site.

18. Partial completions, occupancies

19. Substantial completions authorized.

*** * * * * ***

SECTION 01330
SHOP DRAWINGS / SUBMITTALS

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish a schedule and list of all required submittals to the ENGINEER, in accordance to CONTRACTOR'S CONSTRUCTION SCHEDULE AND REPORTS of these GENERAL REQUIREMENTS, including required submittals by all Subcontractors.

B. Wherever called for in these Specifications or on the plans, or where required by the ENGINEER, the CONTRACTOR shall furnish to the ENGINEER for review, ten (10) copies of each submittal. The term "submittal" as used herein shall be understood to include detail design calculations, design drawings, shop drawings, fabrication and installation drawings, erection drawings, lists, graphs, operating instructions, catalog sheets, data sheets, samples, and similar items. Unless otherwise required, said submittals shall be submitted to the ENGINEER at a time sufficiently early to allow review of same by the ENGINEER and to accommodate the rate of Construction Progress required under the Contract without delaying the Contract Work and with due regard for the possibility of resubmittals. All submittals shall be in English.

C. All design or shop drawings or other submittals shall be accompanied by the standard "CONTRACTOR'S SUBMITTAL TRANSMITTAL" form. This form may be obtained in quantity from the ENGINEER at reproduction cost. Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, or are incorrectly completed, may be returned, at the ENGINEER'S discretion, for resubmittal.

D. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates a review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the ENGINEER.

E. Shop Drawings shall show in detail the size, sections, and dimensions of all the member(s); the arrangement and construction of all connections and joints; all holes, straps, and other fittings required for attaching work and other pertinent details. When required, engineering computations shall be submitted. The CONTRACTOR shall be responsible for delivering reviewed copies of shop Drawings to all others whose work is dependent thereon. The CONTRACTOR shall maintain at the site of the Project, at all times, a complete file of approved Shop Drawings and manufacturers' data for this Project.

F. Except as may otherwise be provided herein, the ENGINEER will return prints of each submittal to the CONTRACTOR, with its comments noted thereon, within thirty (30) calendar days following their receipt by the ENGINEER. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the ENGINEER by the second submission of a submittal item. The CITY reserves the right to withhold moneys due the CONTRACTOR to cover additional costs of the ENGINEER'S review beyond the second submittal. Submittal will be returned to the CONTRACTOR with one of three (3) markings:

   1. If three (3) copies of a submittal are returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN/PROCEED," formal revision and resubmission of said submittal will not be required.

   2. If three (3) copies of a submittal are returned to the CONTRACTOR marked "MAKE CORRECTIONS NOTED/PROCEED CONDITIONALLY" formal revision and resubmission of said submittal will not be required

3. If one (1) copy of a s ubmittal i s r eturned t o t he C ONTRACTOR m arked "REJECTED-RESUBMIT/DO NOT PROCEED," t he C ONTRACTOR s hall r evise s aid s ubmittal and s hall resubmit ten (10) copies of said revised submittal to the ENGINEER.

G. All W ork f or w hich S hop D rawings a re r equired s hall be p erformed i n accordance w ith t he reviewed and approved copies. Fabrication of an item shall not commence before the ENGINEER has r eviewed t he pertinent s ubmittal a nd returned t he copies t o t he CONTRACTOR m arked either " NO E XCEPTIONS T AKEN/PROCEED," o r "MAKE CORRECTIONS NOTED/PROCEED CONDITIONALLY." Revisions indicated on submittals shall be considered as changes necessary to m eet t he r equirements of t he C ontract D ocuments and shall n ot be t aken as t he ba sis f or claims for extra work.

H. All CONTRACTOR submittals shall be carefully reviewed by an authorized representative of the CONTRACTOR p rior t o submission t o t he E NGINEER. Each s ubmittal shall b e dat ed, s igned, and certified by the CONTRACTOR as being correct and in strict conformance with the Contract Documents. No c onsideration f or r eview by t he E NGINEER of any C ONTRACTOR'S s ubmittal will b e m ade f or any i tems which have n ot be en so certified b y the C ONTRACTOR. All noncertified submittals w ill be r eturned t o t he C ONTRACTOR w ithout ac tion t aken by t he ENGINEER, and a ny del ays caused t hereby s hall be t he t otal r esponsibility of t he CONTRACTOR.

I. Should t he Shop D rawings or m anufacturers dat a (for s ubmittals r equired by t he S tandard Specifications or the specifications) show v ariations from the Contract r equirements, the CONTRACTOR shall make specific mention of such variations in the letter of transmittal, in order that, if acceptable, suitable action may be taken for proper adjustment of the Contract; otherwise the CONTRACTOR will not be relieved of the responsibility for executing the work in accordance with the Contract Documents, and the approved submittals.

J. The E NGINEER'S r eview of C ONTRACTOR'S submittal s hall n ot r elieve t he C ONTRACTOR of the ent ire r esponsibility f or t he c orrectness of d etails an d di mensions and c onformance t o t he Specifications. The CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in the submittal. Any fabrication or other work performed in advance of the receipt of accepted submittals shall be entirely at the CONTRACTOR'S risk and expense. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details.

* * * * * *

SECTION 01350
AUDIT AND ACCESS TO RECORDS

1.1 THE REQUIREMENT

A. The CONTRACTOR shall maintain books, records, estimates, communications, payroll documents and other evidence directly pertinent to performance of Work under this Contract in accordance with generally accepted accounting principles and practices consistently applied for a period of no less than four (4) years from the date of the Project acceptance by the Board of Public Works. The CONTRACTOR shall also maintain the financial information and data used by the CONTRACTOR in the preparation or support of any cost submissions required for this Contract, or any Modifications or claims, and a copy of the cost summary submitted to the CITY. The CITY authorized representatives shall have access, at all times during normal business hours, to such books, records, documents and other evidence for the purpose of inspection, audit and copying. The CONTRACTOR will provide proper facilities for such access and inspection.

B. The CONTRACTOR agrees to make A through G of this Article applicable to this Contract and all Modifications or claims affecting the Contract price. The CONTRACTOR agrees to include A through G of this Article in all his contracts and all tier subcontracts in excess of $10,000, and to make A through G of this Article applicable to all Modifications and claims related to project performance.

C. Audits conducted under this Article shall be in accordance with generally accepted auditing standards and established procedures and guidelines of the reviewing or audit agency.

D. The CONTRACTOR agrees to the disclosure of all information and reports resulting from access to records under A and B of this Article, to the CITY and affected agencies.

E. Records under A and B of this Article shall be maintained and made available during performance of Work under this Contract within the time period specified in A of the Article. In addition, those records which relate to any portion of this Contract, to any Modification, to any dispute, to litigation, to the settlement of claims arising out of such performance, or to costs or items to which an audit exception has been taken, shall be maintained and made available within the time period specified in A of the Article.

F. This right of access Article applies to financial records pertaining to this Contract and all Contract Modifications. In addition this right of access applies to all records pertaining to all contracts, contract modifications, and contract amendments:

   1. To the extent the records pertain directly to Contract performance;

   2. If there is any indication that fraud, gross abuse or corrupt practices may be involved; or

   3. If the Contract is terminated for default or for convenience.

G. Access to records is not limited to the required retention periods. The authorized representatives designated in A of this Article shall have access to records at any reasonable time for as long as the records are maintained.

H. Provided that CITY has made demand for access or audit, pursuant to this Section, CONTRACTOR'S compliance with provisions A through G of this Section shall be a condition precedent to maintenance of any legal action or proceeding by the CONTRACTOR against the CITY and to CONTRACTOR'S right to Progress or Final Payment. Without limitation to the foregoing, or to any other provisions for withholding set forth in the Contract Documents, CITY shall have the right, in its sole discretion and in addition to any right of withholding of retention, to

further withhold from any payment to CONTRACTOR a sum of up to ten percent (10%) of the total amounts set forth in CONTRACTOR'S current, unpaid Application(s) for Payment, until CONTRACTOR has complied with any outstanding and unsatisfied request by CITY for audits under this Section. Upon CONTRACTOR'S compliance with this Section, any monies withheld pursuant to this Paragraph solely due to CONTRACTOR'S failure to permit an audit requested by CITY shall be released to CONTRACTOR.

I. CONTRACTOR hereby consents and agrees that any failure by CONTRACTOR to provide access to records as provided in A through G of this Section shall be specifically enforceable by issuance of a preliminary and/ or permanent mandatory injunction by a court of competent jurisdiction based on affidavits submitted to such court, without the necessity of oral testimony, to compel CONTRACTOR to permit access and inspection of the records or to require delivery of the records to CITY for inspection.

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SECTION 01351
ESCROW BID DOCUMENTS

1.1 THE REQUIREMENT

A. Scope:

1. This Article requires that the three (3) low bidders submit, within the specified time after receipt of bids, one (1) copy of all documentary information including, but not limited to, electronic files generated in preparation of bid prices for this project. This material is hereinafter referred to as "Escrow Bid Documents". The Escrow Bid Documents of the CONTRACTOR will be held in escrow for the duration of the Contract.

2. The successful Bidder agrees, as a condition of the award of the Contract, that the Escrow Bid Documents constitute all of the information used in preparation of the Bid, and that no other bid preparation information shall be considered in resolving disputes or claims. The successful bidder also agrees that nothing in the Escrow Bid Documents shall change or modify the terms or conditions of the Contract Documents.

B. Ownership:

1. The Escrow Bid Documents are, and shall always remain, the property of the CONTRACTOR, subject to joint review by the CITY and the CONTRACTOR as provided herein. The Escrow Bid Documents are proprietary and secret information belonging to the CONTRACTOR and exempt from the Federal Freedom of Information Act, California Public Records Act, and the Los Angeles CITY Freedom of Information Act.

2. The CITY stipulates and expressly acknowledges that the Escrow Bid Documents, as defined herein, constitute trade secrets. This acknowledgment is based on the CITY'S express understanding that the information contained in the Escrow Bid Documents is not known outside the Bidder's business, is known only to a limited extent and only to a limited number of employees of the Bidder, is safeguarded while in the Bidder's possession, is extremely valuable to the Bidder and could be extremely valuable to the Bidder's competitors by virtue of it reflecting the Bidder's contemplated techniques of construction. The CITY acknowledges that the Bidder expended substantial sums of money in developing the information included in the Escrow Bid Documents and further acknowledges that it would be difficult for a competitor to replicate the information contained therein. The CITY further acknowledges that the Escrow Bid Documents and the information contained therein are made available to the CITY only because such action is an express prerequisite to award of the Contract. The CITY acknowledges that the Escrow Bid Documents include a compilation of information used in the Bidder's business, intended to give the Bidder an opportunity to obtain an advantage over competitors who do not know of or use the contents of the documentation. The CITY further agrees to safeguard the Escrow Bid Documents, and all information contained therein, against disclosure to the fullest extent permitted by law.

C. Purpose:

1. The purpose of the Escrow Bid Documents procedure is intended to create a spirit of cooperation in an atmosphere of honesty and candor between the CITY and the CONTRACTOR.

2. Escrow Bid Documents will be used to assist in the negotiation of price adjustments and Change Orders and in the settlement of disputes and claims. They will not be used for pre-award evaluation of the CONTRACTOR'S anticipated methods of construction or to assess the CONTRACTOR'S qualifications for performing the WORK.

D. Format and Contents:

1. Bidders may submit Escrow Bid documents in their usual cost estimation format; a standard format is not required. It is not the intention of this Article to cause the Bidder extra work during the preparation of the Bid, but to ensure that the Escrow Bid Documents will be adequate to enable complete understanding and proper interpretation for their intended use. The Escrow Bid Documents shall be in English.

2. It is required that the Escrow Bid Documents clearly itemize the estimated costs of performing the WORK of each Bid item contained in the Bid schedule. Bid items should be separated into sub-items as required to present a complete and detailed cost estimate and allow a detailed cost review. The Escrow Bid Documents shall include all quantity takeoffs, crew, equipment, calculations of rates of production and progress, copies of quotations from Subcontractors and Suppliers, and memoranda, narratives, add/deduct sheets, and all other information used by the Bidder to arrive at the prices contained in the Bid. Estimated costs should be broken down into the Bidder's usual estimate categories such as direct labor, repair labor, equipment ownership and operation, expendable materials, permanent materials, and subcontract cost, as appropriate. Plant and equipment and indirect costs should be detailed in the Bidder's usual format. The CONTRACTOR'S reallocation of indirect costs, contingencies, markup and other items to each bid item shall be identified.

3. All estimates for items of Work that are based in whole or in part upon any baseline statements or information in the Geotechnical Baseline Report (GBR), shall clearly reference the baseline statements used. CONTRCTOR shall have no right to an adjustment in the Contract Price or the Contract Completion Date (due to Differing Site Conditions of the General Conditions) unless such baseline statements have been clearly identified in the Escrow Bid Documents.

4. All cost shall be identified. For bid items amounting to less than $10,000, estimated units costs are acceptable without a detailed cost estimate, provided that labor, equipment, materials, and subcontracts, as applicable, are included and provided that indirect costs, contingencies, and markups, as applicable, are allocated. Bid documents provided by the CITY need not be included in the Escrow Bid Documents unless needed to comply with the following requirements.

E. Submittal:

1. The Escrow Bid Documents shall be submitted to the Board of Public Works Office, by the three (3) low Bidders, in sealed containers, within forty-eight (48) hours after the time for receipt of Bids. The containers shall be clearly marked on the outside with the Bidder's name, date of submittal, project name and the words "Escrow Bid Documents".

2. The Escrow Bid Documents shall be accompanied with the certification (a sample is included), signed by an individual authorized by the Bidder to execute Bids, stating that the material in the Escrow Bid Documents constitutes all the documentary information used in preparation of the Bid and that the Bidder has personally examined the contents of the Escrow Bid Documents container and has found that the documents in the container are complete.

BID DOCUMENTATION CERTIFICATION

THE UNDERSIGNED HEREBY CERTIFIES THAT THE BID DOCUMENTATION CONTAINED HEREIN CONSTITUTES ALL OF THE INFORMATION USED IN PREPARATION OF THE BID AND THAT I HAVE PERSONALLY EXAMINED THESE CONTENTS AND HAVE FOUND THAT THIS BID DOCUMENTATION IS COMPLETE.

SIGNATURE: _____

NAME: _____

TITLE: _____

FIRM: _____

DATE: _____

3. Within 14 Calendar days following the receipt of bids, the Escrow Bid Documents of the apparent successful Bidder will be examined, organized and inventoried by representatives of the CITY, together with members of the CONTRACTOR'S staff who are knowledgeable of how the Bid was prepared. This examination is to ensure that the Escrow Bid Documents are legible and complete. It will not constitute approval of proposed construction methods, estimating assumptions, or interpretations of Contract Documents. Examination will not alter any condition or term of the Contract.

4. If all the documentation required in Section D, "Format and Contents", has not been included in the original submittal, additional documentation shall be submitted, at the CITY'S sole discretion, within twenty four (24) hours after the original inventory and examination of the Escrow Bid Documents and prior to award of the Contract. The detailed breakdown of estimated costs shall be reconciled and revised, if appropriate, by agreement between the CONTRACTOR and the CITY before making the award. If the Contract is not awarded to the apparent successful Bidder, the Escrow Bid Documents of the Bidder next to be considered for award shall be processed as described above.

5. Submission of complete Escrow Bid Documents is an essential element of the Bidder's responsiveness and a prerequisite to a Contract award. Failure to provide the necessary Escrow Bid Documents within the forty-eight (48) hour time limit, may render the Bid non-responsive. Escrow Bid Documents of the unsuccessful Bidders will be returned following award of the Contract.

6. If any Bidder's Bid is based on subcontracting any part of the WORK, each Subcontractor, whose total subcontract price exceeds five percent (5%) of the total Contract price bid by the Bidder, shall provide separate Escrow Bid Documents to be included with those of the Bidder. Such documents shall be opened and examined in the same manner and at the same time as the examination described above for the apparent successful Bidder.

7. If the CONTRACTOR wishes to subcontract any portion of the WORK after award, the CITY retains the right to require the CONTRACTOR to submit Escrow Bid Documents from the Subcontractor before the subcontract is approved.

F. Storage: The Escrow Bid Documents will be placed in lockable container, with provisions for the Contractor and the City to provide separate locks, for the life of the Contract, and stored in the Public Works Building, 6th floor office. The cost of storage will be paid by the CITY.

G. Examination:

1. The Escrow Bid Documents shall be examined by both the CITY and the CONTRACTOR, at any time deemed necessary by either the CITY or the CONTRACTOR, to assist in the negotiation of price adjustments and Change Orders or the settlement of disputes and claims.

2. Examination of the Escrow Bid Documents is subject to the following conditions:

   a. As trade secrets, the Escrow Bid Documents are proprietary and confidential.

b. The CITY and the CONTRACTOR shall each designate, in writing to the other party and within ten (10) days after execution of the Contract, representatives who are authorized to examine the Escrow Bid Documents, with the exception of the initial reviewers as specified in section 1.1.E.3 above. No other person shall have access to the Escrow Bid Documents.

c. Access to the Escrow Bid Documents may take place only in the presence of duly designated representatives of both the CITY and the CONTRACTOR.

3. The Escrow Bid Documents at all times remain the property of the CONTRACTOR and the CITY will take all reasonable steps necessary to protect confidentiality.

H. Final Disposition:

1. The Escrow Bid Documents will be returned to the CONTRACTOR at such time as the following conditions have been satisfied.

a. The Contract has been completed.

b. Final payment has been issued by the CITY.

c. All litigation has been completed, and a written agreement has been executed between the CITY and the CONTRACTOR that no further litigation will be made.

2. The Escrow Bid Documents will be sealed and promptly returned to the CONTRACTOR by the party in charge of the Escrow Bid Documents. Reproduction of any portion of the Escrow Bid Documents will not be permitted at any time without the written permission of the CONTRACTOR.

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SECTION 01353
OPPORTUNITY TO PARTNER

1.1 THE REQUIREMENT

A. The successful bidder will have the opportunity to enter into a cooperative partnership agreement with the CITY for the contract. Participation in Partnering is highly encouraged. Partnering will create a framework for conflict resolution, improved communications, reduced litigation, and cost containment. During the partnering session, all parties will participate in developing an Issue Resolution Ladder, which will help establish and communicate the chain of command in each organization (See Attachment 01353–A1). Each level of the organization is expected to work cooperatively to resolve issues. However, if issues cannot be resolved in a timely manner or are beyond the authority granted that level, each party understands that the issue must be elevated to the next level.

B. The objective of this Partnering agreement would be effective completion of the Work on time and to achieve a standard of quality that would be a source of pride to both the CITY and the CONTRACTOR. Partnering is intended only to establish an environment of cooperation between the parties and will not affect the terms of this contract.

C. An initial one (1) day training session is recommended to initiate the partnership agreement. The cost of this training, excluding staff labor charges, will be paid from a fixed cash allowance that has been allocated as the bid item Opportunity to Partner in the SCHEDULE OF WORK AND PRICES. No Overhead and Profit shall be added to the cost of the training. If the total cost of the partnering training differs from the amount set forth in the SCHEDULE OF WORK AND PRICES, the Contract Price shall be adjusted by a Change Order for the difference between the total actual cost and the amount included in the Bid, as an additional amount due the CONTRACTOR or a credit to the CITY, as appropriate.

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(SEE ATTACHMENT)

ATTACHMENT TO SECTION 01353

Attachments to General Requirements Section 01353 consists of one (1) document, as follows:

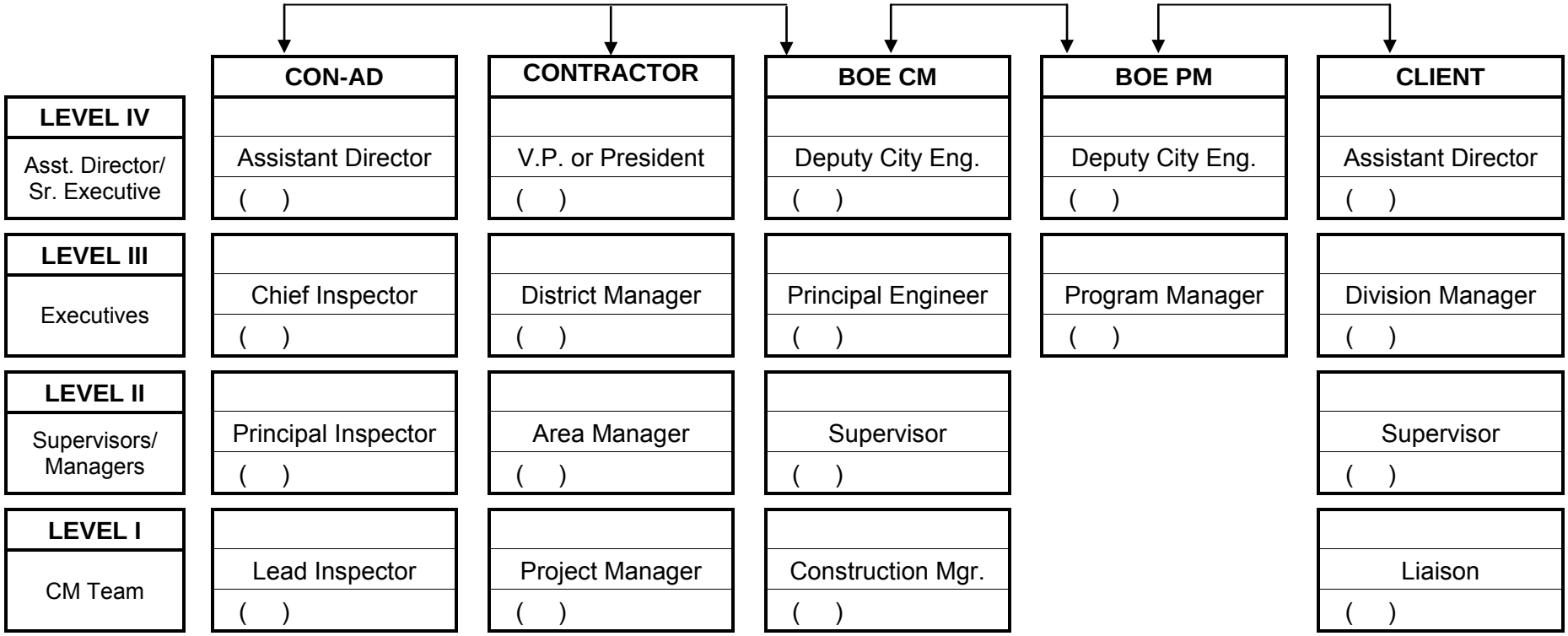
ATTACHMENT NUMBER	TITLE OF ATTACHMENT	NUMBER OF PAGES IN THIS ATTACHMENT
01353-A1	Issue Resolution Ladder – Line Management Form	1

City of Los Angeles, Department of Public Works
Bureaus of Engineering and Contract Administration

Contractor: **{name}**

Project Title: **{title}**

Issue Resolution Ladder – Line Management



SECTION 01410
REGULATORY REQUIREMENTS

PART 1--GENERAL

1.1 SUMMARY OF WORK

A. Building Codes and Regulations:

1. The CONTRACTOR shall perform the Contracted Work in accordance with the requirements of the 2008 Los Angeles City Building Codes and Amendments and all other regulations, laws, and ordinances, even though such requirements are not specifically mentioned in the Project Manual or shown on the Contract Drawings.

2. When the Work required by the Drawings and Project Manual are in conflict with any such law or ordinance, the CONTRACTOR shall notify the ENGINEER. The CONTRACTOR shall comply with the more stringent requirements, unless notified by the ENGINEER and the CONTRACTOR shall not proceed with the Work until the ENGINEER has so ordered.

3. This Section specifies procedural and administrative requirements for compliance with governing regulations, codes, and standards imposed upon the Contracted Work. These requirements include obtaining permits, licenses, inspections, releases, and similar documentation, as well as payments, statements, and similar requirements associated with the regulations, codes, and standards.

B. Related Documents: Contract Documents: Work of this Section shall comply with all the Contract Documents, including General Conditions and Supplementary Conditions and other Sections, DIVISION 1 - GENERAL REQUIREMENTS.

1.2 CODES AND REGULATIONS

A. The design and construction of this Project have been selected and depicted on the Contract Documents in compliance with all applicable codes, which govern the various work, materials, devices, equipment, systems, and procedures in effect at the time the permits for the Projects are issued by the governing agencies. These include, but are not limited to, the following:

1. 2008 CITY of Los Angeles Building Code and Amendments.

2. Los Angeles CITY " Standard Specifications for Public Works Construction", (The Green Book).

3. CAC Title 24.

4. California Building Code (CBC).

5. CAL/OSHA (Occupational and Safety Code).

6. California State Architectural Barrier's Law (CAL/ABL).

7. California State Fire Marshall requirements.

8. California Electrical, Plumbing and Mechanical Codes.

9. Los Angeles CITY Fire Code.

10. State Energy Standards Title 24.

11. Americans with Disabilities Act (ADA).

12. Los Angeles CITY Electrical, Plumbing and Mechanical Codes and Amendments, latest editions.

13. Los Angeles CITY Elevator Code, C.A.C. 3041 and Barclay's California Code of Regulation (Sub-article E620)

14. Los Angeles CITY Municipal Code, latest edition.

15. Uniform Building Code (UBC).

16. All other Codes and Regulations that may be noted in the Technical Sections of the Project Manual.

B. The procedure followed by the ENGINEER has been to contact governing authorities, where necessary, to obtain information needed for the purpose of preparing Contract Documents, recognizing that such information may or may not be of significance in relation to the CONTRACTOR'S responsibilities for performing the Work. Direct contact, by the CONTRACTOR, with such governing authorities can be made for necessary information and decisions that have a bearing on the performance of the Work, if necessary.

C. CONTRACTOR shall be familiar with all codes, regulations and all necessary procedures to obtain and pay for all permits, arrange all inspections, and secure necessary releases or sign-offs, which are prerequisite to any utility service connection work.

D. When conflict or violation of law or codes are found during any inspection by the governing agencies, the CONTRACTOR shall request such allegation of code conflict or violation, or Request of Correction to be on a written form from the governing agencies. The CONTRACTOR shall furnish the ENGINEER and the INSPECTOR each a duplicate copy of such written notice for review.

PART 2—PRODUCTS (NOT APPLICABLE)

PART 3-- EXECUTION

3.1 PERMIT INFORMATION

A. CONTRACTOR shall contact the ENGINEER to obtain the proper CITY **(**owner**)** information to be used in the manifest or notification prior to start of any abatement work.

B. All information used by the CONTRACTOR including the CITY'S (Owner's) and CITY authorized representative's names, addresses and telephone numbers shall be consistent with the information shown on the building permit and plan-check applications obtained by the CITY.

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SECTION 01411
CONFINED SPACE ENTRY

1.1 THE REQUIREMENT

A. Confined Space Entry Program:

1. The CONTRATOR shall be responsible for implementing, administering and maintaining a confined space entry program (CSEP) in accordance with Sections 5156, 5157 and 5158, Title 8, CCR.

2. Prior to starting the Work, the CONTRACTOR shall prepare and submit its comprehensive CSEP to the ENGINEER. The CSEP shall address all potential physical and environmental hazards and contain procedure for safe entry into confined spaces, including, but not limited to, the following:

a. Training of personnel

b. Purging and cleaning the space of materials and residue

c. Potential isolation and control of energy and material inflow

d. Controlled access to the space

e. Atmospheric testing of the space

f. Ventilation of the space

g. Special hazards consideration

h. Personal protective equipment

i. Rescue plan provisions.

3. The CONTRATOR'S submittal shall include the names of its personnel, including Subcontractor personnel, assigned to the project, who will have CSEP responsibilities, their CSEP training, and their specific assignment and responsibility in carrying out the CSEP.

B. Permit-Required Confined Spaces: Entry into permit-required confined spaces, as defined in Section 5157, Title 8, CCR, may be required as a part of the Work. All maintenance holes, tanks, vaults, pipelines, excavations, or other enclosed or partially enclosed spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. The CONTRACTOR shall implement a permit space program prior to performing any Work in a permit-required confined space. A copy of the permit shall be available at all times for review by CONTRATOR and CITY personnel at the Worksite.

C. Payment: Payment for implementing, administering, and providing all equipment and personnel to perform the CSEP shall be included in the bid items for which the CSEP is required.

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SECTION 01412
ENHANCED ELECTRICAL SAFETY POLICY

1.1 The Requirement

A. The Board of Public Works Enhanced Electrical Safety Policy is applicable for all projects with on-site electrical work estimated at $100,000.00 or more. See Proposal Part IV (16) (b).

B. The key elements of the Enhanced Electrical Safety Policy are:

1. Requiring a minimum of 70 percent of all "Journeyman Wiremen" to be graduates of a State of California Approved Electrical Apprenticeship Program or hold a valid C-10 California Contractor's License issued by the State of California.

2. Requiring a minimum of 20 percent of the jobsite electrical workers to be OSHA 10-hour General Industry Safety and Health Certified.

3. Requiring at least one jobsite electrical worker to be OSHA 30-hour General Industry Safety and Health Certified.

C. The Contractor is required to certify their compliance. The Contractor shall complete and sign BCA Form 168 and submit with their Bid Proposal. Failure to sign and submit BCA Form 168 may result in the contractor's bid being deemed non-responsive.

1. To guarantee that required levels of compliance are maintained, the Contractor is required to submit the BCA Form 168 to the Project Inspector prior to commencing work and at any time there are significant changes to staffing levels performing electrical work for the duration of the project.

D. Electrical Work: is defined as placement, installation, erection, or connection of any electrical wires, fixtures, appliances, apparatus, raceways, conduits, solar photovoltaic cells, or any part thereof, which generates, transmits, transforms, or utilizes electrical energy in any form for any purpose, regardless of voltage.

E. Electrical Work: is to be performed by Journeyman Electrician, Transportation System Electrician, Transportation System Technician, or Apprentices currently being trained in a California Approved Electrical Apprenticeship Program under the supervision of a Journeyman electrician.

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ATTACHMENT TO SECTION 01412

Attachments to General Requirements Section 01412 consists of one (1) document, as follows:

ATTACHMENT NUMBER	TITLE OF ATTACHMENT	NUMBER OF PAGES IN THIS ATTACHMENT
01412-A1	Electrical Safety Policy – Implementation Plan BCA Form 168	1

BCA 168
(06/11/07)

DEPARTMENT OF PUBLIC WORKS
Bureau of Contract Administration

ELECTRICAL SAFETY POLICY IMPLEMENTATION PLAN

PROJECT: _____ W.O. _____

INSPECTOR: _____ DATE: _____

THE CONTRACTOR SHALL: PLAN AND IMPLEMENT THE ELECTRICAL SAFETY POLICY IN ACCORDANCE WITH THE BOARD OF PUBLIC WORKS POLICY:

Electrical Work is to be performed by Journeyman Electricians, Transportation System Electrician, Transportation System Technician, or Apprentices currently being trained in a California Approved Electrical Apprenticeship Program under the supervision of a Journeyman Electrician.

APPRENTICES AND JOURNEY-LEVEL WORKERS:

	All apprentices will be registered in a State of California Approved Apprenticeship Program
	The use of Journey-Level workers will comply with all State of California labor laws.

THE WORKFORCE OF PROJECTS DESIGNATED AS REQUIRING "ENHANCED ELECTRICAL SAFETY CRITERIA" SHALL COMPLY WITH THE FOLLOWING

	70% of all "Journeyman Wireman" will be graduates of a State of California Approved Electrical Apprenticeship Program or hold a valid C-10 California Contractor's License issued by the State of California.
	20% of the jobsite electrical workers will be OSHA 10-hour General Industry Safety and Health Certified
	At least one jobsite electrical worker will be OSHA 30-hour General Industry Safety and Health Certified

	The required workforce ratios will be determined by verifying the workforce composition on a daily basis

Electrical Work is defined as placement, installation, erection, or connection of any electrical wires, fixtures, appliances, apparatus, raceways, conduits, solar photovoltaic cells, or any part thereof, which generates, tranmits, transforms, or utilizes electrical energy in any form or for any purpose regardless of voltage.

FAILURE TO FULY IMPLEMENT AND MONITOR THE ELECTRICAL SAFETY POLICY MAY RESULT IN AN ASSESSMENT OF PENALTIES AND/OR POSSIBLE SANCTIONS AGAINST THE CONTRACTOR.

Distribution: Contractor
Job File
Project Engineer

As the contractor's representative, I understand and agree to comply with the above Electrical Safety Policy.

_____ _____
Signature Date

SECTION 01420
UNITS OF MEASURE

1.1 THE REQUIREMENT

A. General:

1. The International System of Units, also referred to as SI or the metric system, is the principal measurement system in these specifications and shall be used for construction, unless otherwise stated in the Contract documents. U.S. Standard Measures, also called U.S. Customary System, are included in parenthesis. SI units an U.S. Standard Measures in parenthesis may or may not be exactly equivalent. If U.S. Standard Measures are specified for us in the contract documents, then all values used for construction shall be U.S. Standard Measures shown in parenthesis. However, certain material specifications and test requirements contained herein use SI units specifically and conversions to U.S. Standard Measure have not been included in these circumstances. When U.S. Standard Measures are not included in parenthesis, then the SI units shall control.

2. Reference is also made to ASTM E 380 for definitions of various units of the SI system and a more extensive set of conversion factors.

B. Units of Measure and Their Abbreviations (abbreviations noted within parentheses):

U.S. Customary Unit (Abbreviations)	Equal to	SI Unit (Abbreviations)
1 mil (= 0.001 in)	=	25.4 micrometer (µm)
1 inch (in)	=	25.4 millimeter (mm)
1 inch (in)	=	2.54 centimeter (cm)
1 foot (ft)	=	0.3048 meter (m)
1 yard (yd)	=	0.9144 meter (m)
1 mile (mi)	=	1.6093 kilometer (km)
1 square foot (ft^2)	=	0.0929 square meter (m^2)
1 square yard (yd^2)	=	0.8361 square meter (m^2)
1 cubic foot (ft^3)	=	0.0283 cubic meter (m^3)
1 cubic yard (yd^3)	=	0.7646 cubic meter (m^3)
1 acre	=	0.4047 hectare (ha)
1 U.S. gallon (gal)	=	3.7854 Liter (L)
1 fluid ounce (fl. oz.)	=	29.5735 milliliter (mL)
1 pound mass (lb) (avoirdupois)	=	0.4536 kilogram (kg)
1 ounce mass (oz)	=	28.3495 kilogram (kg)
1 Ton (= 2,000 lb avoirdupois)	=	0.9072 Tonne (= 1,000 kg)
1 Poise	=	0.1 pascal · second (Pa · s)
1 centistoke (cs)	=	1 square millimeters per second (mm^2/s)
1 pound force (lbf)	=	4.4482 Newton (N)
1 pound per square inch (psi)	=	6.8948 Kilopascal (kPa)
1 pound force per foot (lbf/ft)	=	1.4594 Newton per meter (N/m)
1 foot-pound force (ft-lbf)	=	1.3558 Joules (J)
1 foot-pound force per second ([ft-lbf]/s)	=	1.3558 Watt (W)
1 part per million (ppm)	=	1 milligram/liter (mg/L)

C. Temperature Units and Their Abbreviations (abbreviations noted within parentheses):

Degree Fahrenheit (Abbreviation: °F)	**Degree Celsius (Abbreviation: °C)**
°F = (1.8 x °C) + 32	°C = (°F – 32)/1.8

D. SI Units Commonly Used in Both Systems and their Abbreviations (abbreviations noted within parentheses):

1 Ampere (A)
1 Volt (V)
1 Candela (cd)
1 Lumen (lm)
1 second (s)

E. Common Metric Prefixes and Their Abbreviations (abbreviations noted within parentheses):

kilo (k)	10^{3}
centi (c)	10^{-2}
milli (m)	10^{-3}
micro (μ)	10^{-6}
nano (n)	10^{-9}
pico (p)	10^{-12}

* * * * * *

SECTION 01421
SYMBOLS

1.1 THE REQUIREMENT

A. The symbols as shown shall mean:

Symbol	Definition
Δ	Delta, the central angle or angle between tangents
∠	Angle
%	Percent
'	Feet or minutes
"	Inches or seconds
#	Number
/	Per or (between words)
°	Degree
P ℄	Property line
C ℄	Centerline
S ℄	Survey line or station line

* * * * * *

SECTION 01430
MANUFACTURER'S FIELD SERVICES

1.1 THE REQUIREMENT

A. Prior to the startup of the facility, an experienced, competent, and authorized representative of the manufacturer of each item of equipment incorporated into the Work, for which field services are indicated in specified equipment sections, shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the representative shall revisit the Jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of the ENGINEER. Each manufacturer's representative shall furnish to the ENGINEER and the INSPECTOR a written report certifying that the equipment has been properly installed, and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily. All costs for these services shall be included in the CONTRACTOR'S Bid.

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SECTION 01451
APPROVAL OF ELECTRICAL EQUIPMENT

1.1 THE REQUIREMENT

A. All electrical equipment, control panels and cabinets, components, devices, etc. shall be listed by the Underwriters Laboratories (UL) or approved by a testing laboratory recognized by the CITY or approved by the CITY'S Department of Building and Safety Electrical Testing Lab (ETL). All costs incurred for obtaining these approvals shall be borne by the CONTRACTOR.

B. The CONTRACTOR shall contact the ETL (Telephone 213-485-2376) for cost, schedule, list of the latest approved recognized laboratories and other additional information.

C. Shop Drawings submitted by the CONTRACTOR for all electrical equipment and products shall have prior approval of one of the laboratories stated above, or the drawings will be rejected. No electrical equipment or materials shall be delivered to the Jobsite without UL listing, or a CITY recognized laboratory approval, or ETL approval. Shop Drawings approved by the ENGINEER shall in no way invalidate the requirements set forth in paragraph A.

D. UL listing of individual components or devices installed in control panels and cabinets shall not be construed as UL listing or approval of the assembled control panel or cabinet. The CONTRACTOR shall be solely responsible for determining the approval process time necessary for obtaining the approval of these items such that the project schedule can be maintained. The CONTRACTOR shall submit to the ENGINEER for information a detailed schedule, listing all such items requiring approval, the proposed dates of their submittal, the anticipated approval process time, and the expected date of delivery of these items.

E. The CONTRACTOR shall complete the Procedures and Sign Off Log for all Electrical Intertie with the Plant Form Attachment 01451-A. It shall include all the supporting documents required by the form and shall be signed and dated.

*** * * * * ***

(SEE ATTACHMENTS)

ATTACHMENTS TO SECTION 01451

Attachments to General Requirements Section 01451 consists of two (2) document, as follows:

ATTACHMENT NUMBER	TITLE OF ATTACHMENT	NUMBER OF PAGES IN THIS ATTACHMENT
01451-A1	Procedures and Sign Off Log for Electrical Intertie with the Plant	3
01451-A2	Electrical Summary Data Form	1

PROCEDURES AND SIGN OFF LOG
FOR ELECTRICAL INTERTIE WITH THE PLANT

PROJECT TITLE:_____

CMS PROJECT ENGINEER:_____

PLANT LIASON:_____

ELECTRICAL ENGINEER:_____

ELECTRICAL CONTRACTOR:_____

POWER SOURCE:_____ VOLTS:_____ PHASE:_____

ACTIVITY		SIGN OFF AND DATE				REMARKS
		CM Office	CON. AD	CONTRACTOR	PLANT	
1	Plant to verify receiving the O&M, training and spare parts list.					
2	Coordinate with DWP, if needed.					
3	Attach most recent single line diagram for the facility under test.					
4	Attach As Built or most recent relay settings.					
5	Verify the coordination study includes the current settings for the existing protective devices.					
6	Set and calibrate all protective devices as per approved coordination study.					
7	Satisfactory functional test all tripping interlocking of breakers as per control schematics. Attach lists of all tested breakers.					
8	Satisfactory HI-POT test of all cables 5KV and above as per latest version of IEEE Std. 400 and other standards listed per Specs. Attach test reports.					
9	Satisfactory megger test all 600 V rated wires, attach test reports.					

ACTIVITY		SIGN OFF AND DATE				REMARKS
		CM Office	CON. AD	CONTRACTOR	PLANT	
10	Identify all cables and wires terminations as per Specifications.					
11	Set, calibrate and test pilot wire relays.					
12	Set, test and calibrate all Main and Feeder Breakers as per coordination studies or recommended values.					
13	Obtain B&S sign off.					
14	Obtain ConAd sign off.					

Plant Approval By:_____ **Date:**_____

ELECTRICAL SUMMARY
DATA FORM

EQUIPMENT ITEM: _____

EQUIPMENT COST: _____

EQUIPMENT SUPPLIER: _____

_____

COMPONENT INFORMATION: NAMEPLATE DATE **MANUFACTURER:**	
CITY IDENTIFICAITON NUMBER:	**EQUIPMENT SERIAL NUMBER:**
EQUIPMENT MODEL DESIGNAITON:	**TYPE:**
FRAME SIZE:	**INTERRUPTING RATINGS:**
POWER (KV/KVA):	**PRIMARY VOLTAGE:**
SECONDARY VOLTAGE:	**AMPERAGE:**
PHASE: **HERTZ:**	**INPUT:**
OUTPUT:	**DEGREES C RISE:**
PERCENT IMPEDANCE:	**FUSE SIZE/QUALITIES:**
PHASE: **HERTZ:**	**SERVICE FACTOR**
COMMENTS:	

SECTION 01452
INSPECTION OF THE WORK

1.1 THE REQUIREMENT

A. Whenever the CONTRACTOR intends to carry on the Work of this Contract on a Saturday, Sunday, or holiday, or more than eight (8) hours a day on Monday through Friday, or any variation in the time of the workday as set forth in the GENERAL CONDITIONS, length of the workday and work week, notification shall be given to the INSPECTOR and the ENGINEER of such intention at least forty-eight (48) hours in advance so that inspection may be arranged. No Work shall be allowed during these times without the approval of the INSPECTOR and no demolition will be permitted on Saturdays, Sundays, or holidays without the prior approval of the Board. All CITY inspection required by the CONTRACTOR on holidays, weekends and overtime for the sole convenience of the CONTRACTOR shall be accomplished at the sole expense of the CONTRACTOR by issuance of a deductive Change Order.

B. The Work shall be conducted under the general observation of the ENGINEER and shall be subject to inspection by the INSPECTOR to ensure compliance with the requirements of the Contract Documents. Such inspection may include mill, plant, shop or field inspection, as required. The INSPECTOR shall be permitted access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated. All materials and articles furnished by the CONTRACTOR shall be subject to inspection and no materials or articles shall be used in the Work until they have been inspected and accepted by the INSPECTOR.

C. No Work shall be backfilled, buried, cast in concrete, hidden or otherwise covered until it has been inspected by the INSPECTOR, and other Agencies for which a permit is required. Whenever the CONTRACTOR is ready to backfill, bury, cast in concrete, hide, or otherwise cover any Work under the Contract, the CONTRACTOR shall notify the INSPECTOR not less than forty-eight (48) hours in advance to request inspection before beginning any such Work of covering. Failure of the CONTRACTOR to notify the INSPECTOR at least forty-eight (48) hours in advance of any such inspections shall be cause for the INSPECTOR to require a sufficient delay in the progress of Work to allow time for such inspections and any remedial or corrective work required, and all costs of such delays, including its effect upon other portions of the work, shall be borne by the CONTRACTOR. Any Work so covered in the absence of inspection shall be subject to uncovering at the sole expense of the CONTRACTOR. Where uninspected Work cannot be uncovered, such as in concrete cast over reinforcing steel, all such Work shall be subject to demolition, removal, and reconstruction under proper inspection, and no additional payment will be allowed therefor.

D. The presence of the ENGINEER or the INSPECTOR shall not relieve the CONTRACTOR of the responsibility for the proper execution of the Work in accordance with all requirements of the Contract Documents. Compliance is a duty of the CONTRACTOR, and said duty shall not be avoided by any act or omission on the part of the ENGINEER or the INSPECTOR. If the CONTRACTOR fails to replace any defective or damaged Work or material after reasonable notice, the ENGINEER may withhold progress payment for the Work or material, reserve the right to notify the CONTRACTOR'S Bond and Insurance Companies, and/or may cause such Work or materials to be replaced. The replacement shall be deducted from the amount to be paid to the CONTRACTOR, otherwise the CONTRACTOR shall pay the CITY if there remains insufficient or no amount to be paid by the CITY to the CONTRACTOR.

E. The INSPECTOR shall have the right, at all times and places, to reject any articles or materials to be furnished hereunder which, in any respect, fail to meet the requirements of these specifications, regardless of whether the defect in such articles or materials are detected at the point of manufacture or after completion of the Work at the site. If the ENGINEER or the INSPECTOR, through an oversight or otherwise, has not rejected materials or work which is

defective or which is contrary to the specifications, such material, no matter in what stage or condition of manufacture, delivery, or erection, may be rejected by the INSPECTOR upon discovery. The CONTRACTOR shall promptly remove rejected articles or materials from the site of the Work after notification of rejection. All costs of removal and replacement of rejected articles or materials as specified herein shall be borne by the CONTRACTOR.

F. At the completion of Work, after completion of all corrections, a final inspection will be made by the INSPECTOR, the ENGINEER, and the CONTRACTOR, as applicable. The INSPECTOR will provide a Final Inspection Correction List itemizing all work necessary to complete the Project satisfactorily.

G. When the correction work is found to be in compliance with the Contract Documents, the construction Work will be considered complete and the Contract time will stop. The CONTRACTOR shall proceed with the maintenance work if required by the Contract. If the correction work is found to be non-compliant with the Contract Documents, the Contract time shall be continued to be assessed until the correction is satisfactorily made and accepted by the CITY.

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SECTION 01453
SAMPLING, TESTING AND FABRICATION INSPECTION

1.1 THE REQUIREMENT

A. General:

1. All materials and fabricated articles furnished by the CONTRACTOR shall be subject to inspection and testing and no materials or fabricated articles shall be incorporated into the Work until they have been inspected and accepted by the INSPECTOR. The CONTRACTOR shall ensure that all items requiring shop inspection are inspected at their source by the INSPECTOR or by an independent inspection or testing laboratory (IITL) that has been approved by the INSPECTOR.

2. Fabrication shall be subject to inspection by the INSPECTOR, to ensure strict compliance with the requirements of the Contract Documents. Such inspection shall include mill, plant, shop or field inspection, as required. The INSPECTOR shall be permitted access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated. When a third party INSPECTOR is approved, monthly meetings shall be scheduled with the INSPECTOR at the manufacturing facility to review the progress of the Work and the inspection activities. The INSPECTOR will determine the number of trips based on the manufacturing schedule for the material or fabricated article(s). The CONTRACTOR shall include in the Bid all costs associated with these inspections, except for the costs for CITY personnel as set forth herein which are reimbursed under the Bid Item ALLOWANCE FOR CITY INSPECTION.

3. All fabricated items shall be fabricated from Shop Drawings, which have been submitted to the ENGINEER and approved in accordance with SUBMITTALS of the GENERAL REQUIREMENTS. Shop inspection shall be provided on all materials and/or equipment so designated on the CONTRACTOR'S approved Shop Drawings. The CONTRACTOR shall provide approved Shop Drawings and the corresponding Contract Specification to the IITL for use in the inspection and testing of the items to be fabricated.

4. Any material which is subject to or requires shop inspection and arrives at the Jobsite without inspection by the INSPECTOR or IITL will be rejected by the INSPECTOR and shall be removed from the Jobsite by the CONTRACTOR at the CONTRACTOR'S sole expense.

5. Prior to any fabrication, there shall be a Prefabrication Meeting at the fabricator's location. A representative of the CITY and the IITL, if retained, the CONTRACTOR, the fabricator's plant superintendent and the fabricator's quality control person, shall be present at the Prefabrication Meeting. The items to be discussed are the required inspections, tests and reports, based on the approved Shop Drawings and the corresponding Contract Specifications. The IITL shall submit an inspection plan to the INSPECTOR for approval two (2) weeks prior to the Prefabrication Meeting. The CONTRACTOR is directed to notify the INSPECTOR and the ENGINEER three (3) weeks in advance of the date and time of the Prefabrication Meeting. The CONTRACTOR shall include in the Bid all costs associated with these meetings except for the costs for CITY personnel as set forth herein which are reimbursed under the Bid Item ALLOWANCE FOR CITY INSPECTION.

6. If a Bid Item ALLOWANCE FOR CITY INSPECTION has been included in the SCHEDULE OF WORK AND PRICES in the Bid Proposal, this allowance shall only be used to reimburse the CONTRACTOR for the cost of CITY inspection and travel requirements, as set forth herein, and shall not be used for any portion of the costs of the CONTRACTOR'S independent third party INSPECTOR or inspection laboratory. Reimbursement of approved expenses shall be made on the basis of original invoices and are not subject to markup for

overhead and profit. If at the end of the Project, the total costs differ from the amount set forth in the SCHEDULE OF WORK AND PRICES, the Contract Price shall be adjusted by a Change Order for the difference between the total actual costs and the amount included in the Bid, as an additional amount due the CONTRACTOR or a credit to the CITY, as appropriate.

7. The CONTRACTOR shall coordinate all sampling, testing and fabrication inspections with the INSPECTOR and is responsible for maintaining the inspection schedules. Subject to the terms contained herein, costs for CITY personnel travel will be paid from the Bid item ALLOWANCE FOR CITY INSPECTION. In the event that the scheduled inspection is postponed or delayed by the CONTRACTOR, through no fault of the CITY, and CITY personnel are required to extend their travel duration resulting in additional travel costs, these increased costs, including per diem travel allowances, shall be borne by the CONTRACTOR and are not eligible for payment from the Bid item ALLOWANCE FOR CITY INSPECTION.

B. Samples And Test Specimens:

1. Samples and test specimens required under these Specifications shall be furnished, prepared for testing, and delivered, at no cost to the CITY, in ample time for the completion of the necessary tests and analysis before said article or materials are to be used. The time and location of the delivery shall be designated by the INSPECTOR.

2. In addition to any other inspection or quality assurance provisions that may be specified, the ENGINEER or the INSPECTOR shall have the right to independently select, test, and analyze, at the expense of the CITY, additional test specimens of any or all of the materials to be used. Whenever any portion of the Work fails to meet the requirements of the Specifications, as shown by the results of independent testing or investigation, all costs of such independent inspection and investigation, and all costs of removal, correction, and reconstruction or repair of any such Work, shall be borne solely by the CONTRACTOR.

3. When the manufacturer, fabricator, supplier, or Subcontractor provides the results of tests from samples taken at the mill, factory, or warehouse, the INSPECTOR will accept the test reports provided that the following conditions are met:

   a. The Testing Agency was approved by the INSPECTOR prior to performing the tests, and that all necessary certifications were valid at the time the tests were performed.

   b. The tests were performed in conformity with the Specifications for the specified materials or items.

   c. The reports are made in the form of an affidavit specified hereinafter.

4. Whenever the approved independent testing laboratory or INSPECTOR takes samples of materials other than at the site, the deliveries to the site of materials represented by such samples shall be identified as specified for the specific material. The results of such tests shall be reported to the INSPECTOR in the form of affidavits attested to by the testing agency. Such affidavits shall furnish the following information with respect to the material sampled:

   a. Manufacturer's name and brand.

   b. Place of sampling.

   c. Sufficient information to identify the lot, group, bin, or silo from which the samples were taken.

   d. Amount of material in the lot sampled.

   e. Statement that the material has passed the requirements.

f. Notarized signature and title of the person making the affidavit and the date of execution of the affidavit.

C. Shop Inspection And Testing:

1. Shop inspection is the responsibility of the INSPECTOR and cannot be approved, waived, or otherwise altered by any other CITY Department, Bureau, Division, or individual.

2. The CONTRACTOR is responsible for coordinating shop inspection with the INSPECTOR. The CONTRACTOR is to estimate the time required for Shop testing of the fabricated article(s) or equipment, and so inform the INSPECTOR. The INSPECTOR will inform the CONTRACTOR which CITY personnel will witness the testing.

3. A final inspection by the INSPECTOR may be required prior to shipment.

4. Where the CONTRACTOR is specifically required by the Technical Specifications to demonstrate performance of major equipment prior to delivery, a testing procedure must be developed by the manufacturer and approved by the ENGINEER prior to scheduling the shop performance testing. Both the INSPECTOR and the ENGINEER are required to witness the performance testing. The ENGINEER will evaluate performance-testing data and notify the INSPECTOR whether the equipment meets the performance requirements of the Contract. The INSPECTOR will be responsible for releasing the equipment for delivery to the Jobsite. This procedure will also apply to field performance testing required as a condition precedent to acceptance of the equipment as described under the PARTIAL ACCEPTANCE and FINAL ACCEPTANCE provision of the Contract.

5. Inspection at Locations Within Fifty (50) Miles from CITY:

a. When the CONTRACTOR intends to purchase materials, fabricated products, or manufactured equipment from sources located within fifty (50) miles (80 km) of the geographical limits of the CITY, the CONTRACTOR shall notify the INSPECTOR at least two (2) working days prior to the scheduled date of tests at all stages of manufacture to allow for arrangements specified herein.

b. Except as otherwise provided in these Specifications, performance of the required tests will be by the INSPECTOR, from samples provided by the CONTRACTOR, and the cost of performing the test(s) will be borne by the CITY, except for the costs of any retests which show unsatisfactory results which shall be borne by the CONTRACTOR.

6. Inspection at Locations More Than Fifty (50) Miles From the CITY:

a. When the CONTRACTOR intends to purchase materials, fabricated products, or equipment from sources located more than fifty (50) miles (80 km) outside the geographical limits of the CITY, an IITL approved by the INSPECTOR, shall be engaged by the CONTRACTOR, at the CONTRACTOR'S sole expense, to inspect the materials, equipment and/or process. Approval of the IITL shall be obtained before producing any material or equipment. The IITL shall judge the materials and fabricated articles by the requirements of the Plans and Specifications and approved submittals. The approved or equipment shall be shipped nor shall any processing, fabrication and/or treatment of such materials be done without the required inspection and approval by IITL. Approval by IITL shall not relieve the CONTRACTOR of its responsibility to comply with the Contract requirements.

b. The CITY retains the right to perform inspection or testing at such remote sites with CITY personnel in lieu of a third party inspector. In the vent the CITY exercises this right, the CONTRACTOR shall administer travel arrangements as specified herein Paragraph C. 10, CITY PERSONNEL TRAVEL REQUIREMENTS.

7. Inspection Outside Continental United States:

    a. Requirements and procedures for inspection and testing of materials, fabrication of products and equipment from sources outside the continental United States shall be the same (including the requirement for an accredited inspection agency and/or testing laboratory pre-qualified by the CITY Department of Building and Safety and approved by the INSPECTOR) as provided in the Paragraph C. 7 SHOP INSPECTION & TESTING of this Section. In addition to the requirements of Paragraph C. 10, City Personnel Travel Requirements, of this Section, the CONTRACTOR shall provide the following, the cost of which shall be reimbursed out of the ALLOWANCE FOR CITY INSPECTION:

        (1) A minimum of five (5) calendar days hotel accommodation shall be required for each shop inspection visit made by the INSPECTOR.

        (2) A minimum advance notice of ten (10) working days shall be required for all hold points (mandatory) inspection.

        (3) The approximate rates for allowances given as a guideline in Paragraph C. 10, City Personnel Travel Requirements, of this Section, shall be adjusted to match the rates in the foreign locality for similar types of facilities and amenities.

8. Third Party Inspection Requirements:

    a. The proposed third party inspection and/or testing company must gain approval by the INSPECTOR after award. This approval shall be obtained before producing any material or manufacturing any product or equipment. The approved inspection and/or testing agency shall not sublet or assign its work to any other agency.

    b. The approved third party inspection and/or testing agency shall take direction from, and be responsible to, the INSPECTOR.

    c. The CONTRACTOR shall also comply with requirements regarding the Prefabrication Meeting as contained herein.

    d. The Work and activities of the third party inspection and/or testing agency shall be monitored by the INSPECTOR during monthly meetings to ensure compliance with the Contract Documents.

9. Third Party Testing and Inspection Laboratory Approval Procedures:

    a. The INSPECTOR will approve third party inspection and/or testing agencies/laboratories.

    b. All requests for approval of a third party inspection agency and/or test laboratory shall be in writing from the CONTRACTOR to the INSPECTOR.

    c. The letter requesting approval of a third party test laboratory and/or private inspection agency shall contain all of the following information:

        (1) Complete title of Project.

        (2) Project Work Order Number.

        (3) Name of proposed testing laboratory or inspection agency.

        (4) Address and telephone number(s) of proposed testing laboratory/inspection agency.

        (5) Contact person at proposed testing laboratory/inspection agency.

        (6) Description and history of the proposed test laboratory/inspection agency.

(7) Resume of the inspector(s) who will do the inspection.

(8) Approved submittal number(s) and brief description of item(s) to be inspected or tested, or both.

(9) Name, address, and telephone number(s) of agency where item(s) or material will be fabricated.

(10) Contact person at the fabricators.

(11) Fabrication schedule.

d. The INSPECTOR will notify the CONTRACTOR by letter if the testing laboratory/inspection agency has been approved.

10. CITY Personnel Travel Requirements:

a. The CONTRACTOR shall administer the travel and furnish the following services for CITY personnel who are attending Prefabrication Meetings and performing inspection services.

(1) Purchase airline tickets (Coach Class only).

(2) Make hotel reservations and prepay for the planned number of nights. (Three Star or American Automobile Association (AAA) Three Star approved.)

(3) Make rental car reservations and prepay for the planned number of days if the manufacturer's or fabricator's facility is greater than one (1) mile from the departing and arrival airport or hotel.

(4) The estimated per diem travel allowance will be at least fifty U. S. dollars ($50. 00) per day for meals, en route expenses, and other miscellaneous expenses. CITY personnel will submit an expense statement to the CITY for approval of actual expenses incurred.

(5) For CITY paid advances, the CONTRACTOR shall reimburse the CITY for these actual expenses by deductive Change Order to be deducted from the Bid item, ALLOWANCE FOR CITY INSPECTION.

(6) When requested by the ENGINEER or the INSPECTOR, the CONTRACTOR shall provide an advance check, for the estimated costs of all travel allowance costs, to the ENGINEER or the INSPECTOR, no later than forty eight (48) hours prior to the departure time.

b. As the basis for cost reimbursement under SCHEDULE OF WORK AND PRICES of the Bid Proposal, the CONTRACTOR shall submit receipts or invoices for payment to the ENGINEER with a cover letter referencing the following:

(1) INSPECTOR'S or ENGINEER'S name.

(2) Project title.

(3) Project Work Order Number.

(4) CONTRACTOR'S:

(a) Name

(b) Address

(c) Telephone Number.

(d) CONTRACTOR'S contact person and telephone number(s)

(5) Reference Technical Specification and submittal number.

(6) Purpose of inspection.

(7) Address and location of inspection:

(8) Country

(9) State

(10)City.

(11)Date(s) of inspection.

(12)Description of items enclosed as set forth herein

11. Shop Inspected Equipment/Materials: Without waiving any specific requirement of the Contract Documents, the following items of equipment and/or material are examples of, but not limited to those items that are subject to shop inspection as noted herein below.

12. Shop Inspected Equipment/Materials: Without waiving any specific requirement of the Contract Documents, the following items of equipment and/or material are examples of, but not limited to those items that are subject to shop inspection as noted herein below.

NTS:

1. THE PROJECT ENGINEER SHALL NOT DELETE ANY ITEM FROM THE FOLLOWING TABLE. THE PROJECT ENGINEER SHALL CHECK THE ACCURACY AND REVISE THE TABLE BEFORE FINALIZING THIS SECTION.

2. FOR GREEN BOOK PROJECTS, CHANGE THE NUMBER IN THE SPECIFICATION COLUMN TO "SSPWC" FOR THE APPLICABLE ITEMS.

EQUIPMENT/MATERIAL	SPECIFICATION	SHOP INSPECTION REQUIRED	NOTES
Aluminum Fabrication	05530, 08410	Yes	1
Aluminum Railing	05520	Yes	5
Anodizing	05035, 09800	Yes	18
Asphalt Concrete	02550	Yes	8
Bearing Pads	05120	Yes	31
Bolting	05120	Yes	2
Bitumen	02550, 07160	Yes	18
Boilers	11404	Yes	7
Coatings	Div. 09, 05530	Yes	18

EQUIPMENT/MATERIAL	SPECIFICATION	SHOP INSPECTION REQUIRED	NOTES
Castings	05530	Yes	4, 32
Controls – Electrical	19010	Yes	24
Cabinets – Wood	06200	No	17
Compressors	11373	Yes	20
Cranes	14600	Yes	19
Conveyors	14605	Yes	19
Concrete	03300	Yes	8
Mix Designs – Concrete	03300	Yes	8
Concrete Vaults	02726	Yes	11, 32
Concrete Pipe	02618, 02620	Yes	11
Catch Basins	02726	Yes	11, 32
Chain Link	02830	Yes	18
Doors – Metal	08110	Yes	6
Door Frames	08110	Yes	6
Duct – Fiberglass	15501	Yes	27
Duct – Flexible	15501	No	27
Electrical – Panels	16360	Yes	22
Electrical – Switchgear	16400	Yes	22
Electrical – Transformers	16310	Yes	22
Electrical – Motors	16800	Yes	20
Electrical – Wiring	16050	Yes	24
Electrical – Units	16050	Yes	25
Electrical – Testing	16030	Yes	25
Escalators	14000	Yes	19
Elevators	14000	No	19
Fiberglass	06610	Yes	30
F. G. R. C.	03400	Yes	12
F. G. R. G.	03520	Yes	12
Frames – Metal	05500	Yes	6
Forging	Div. 05	Yes	4

EQUIPMENT/MATERIAL	SPECIFICATION	SHOP INSPECTION REQUIRED	NOTES
Galvanizing	Div. 05	Yes	18
Gratings	Div. 05	Yes	4
Gaskets	07900	Yes	11
Generators	16700	Yes	22
Glue –Lams	06100	No	16
Grout	04230	Yes	13
Gates – Sluice	11293	Yes	21
Gates – Slide	11292	Yes	21
Gypsum	09200	Yes	13
Hoists	14600	Yes	19
Handrails	05520	Yes	5
HVAC	15500	Yes	26 & 18
Linings – Pipe	09800	Yes	18
Lumber	06100	No	16
Lighting – Standards	03400	Yes	10
Lighting – Fixtures	16500	No	23
Lighting – Lamps	16500	No	23
Motors	16800	Yes	20
Maintenance Holes – Frames & Covers	02726	Yes	4, 32
Maintenance Holes – Shafts & Grade Rings		No	11
Metalwork	05500	Yes	1
Mortar	04230	Yes	13
Mechanical	Div. 15	Yes	20
Masonry	04230	No	14
Millwork	06200	No	17
Non-Destructive Testing	05120	Yes	1
Panels – Electrical	16360	Yes	22
Pressure Vessels	13207	Yes	7
Painting (Coating Systems)	09905	Yes	18

EQUIPMENT/MATERIAL	SPECIFICATION	SHOP INSPECTION REQUIRED	NOTES
Precast Concrete	03400	Yes	9, 32
Prestressed Concrete	03100	Yes	9, 32
Plastic Pipe	06000	No	29
Plastic Liner Plate	09800	Yes	29a
Pumps	112XX	Yes	20
Pilings	03400	Yes	1 & 9
Pipe - Steel	15008,15009	Yes	15
Pipe – Ductile Iron	15005	Yes	15
Pipe – Fiberglass	13209	Yes	15
Pipe – RCP	02617	Yes	11
Pipe – VCP	02622	No	15
Pipe – Plastic	15006, 15007	No	29
Pipe – Supports	15020	Yes	15
Pipe – Welding	15000	Yes	1
PVC – Liner	02616	Yes	29a
Railings	05520	Yes	5
Rebar	03200	No	3
Stainless Steel	05500	Yes	1
Steel – Structural	05500	Yes	1
Steel Doors	08110	Yes	6
Steel Supports	05120	Yes	1
Store Fronts	08410	Yes	28
Sluice Gates	11293	Yes	21
Slide Gates	11292	Yes	21
Tanks – Storage	13215	Yes	7
Tanks – Steel	13207	Yes	7
Transformers	16400	Yes	22
Vessels	13000	Yes	7
Vaults	02726	Yes	11, 32
Valves	15100	Yes	20
Welding	05120	Yes	1

EQUIPMENT/MATERIAL	SPECIFICATION	SHOP INSPECTION REQUIRED	NOTES
Wood – Cabinets	06200	No	17
Wood Paneling	06200	No	17

NOTES:

1. Fabrication of ferrous materials, which may include welding, high strength bolting or non-destructive testing shall be shop inspected.

2. Bolting with ASTM A-325 bolts, ASTM A-490 bolts or other alternate fasteners shall require shop inspection. Bolting with ASTM A-307 bolts does not require shop inspection.

3. Reinforcing steel is normally sampled at the Jobsite, but for expediency, the sampling will be performed at the point of fabrication by the CITY'S Standards Division.

4. All forging and castings made at the foundry shall be shop inspected, approved and stamped prior to delivery to the Jobsite.

5. Steel stairways and handrails (ferrous) require shop inspection for welding and specified coatings.

6. Metal door and frame fabrication requires shop inspection.

7. Pressure vessels, tanks, boilers and related equipment do require inspection of fabrication, welding, and testing.

8. Concrete, asphalt concrete and mix designs are inspected at the batch plant. These products are shop inspected for conformance to Specifications and verification by the INSPECTOR.

9. Both pre-cast and pre-stressed concrete are subject to shop inspection and approval before delivery to the Jobsite.

10. Street lighting standards of either steel, aluminum or concrete are required to be shop inspected.

11. Reinforced concrete vaults catch basins, and reinforced pipe are required to be shop inspected. (See Note 9.) Maintenancehole shafts and grade rings without reinforcement or linings do not require shop inspection. Gaskets used for reinforced concrete pipe require testing.

12. FGRC and FGRG (Fiberglass Reinforced Concrete and Fiberglass Reinforced Gypsum) should be manufactured in an approved shop and be shop inspected.

13. Mortar, grout and gypsum shall be inspected at the batch plant, unless the products are mixed at the Jobsite from approved packages under the inspection of the INSPECTOR.

14. Concrete Masonry Units (CMU) shall be inspected and sampled at the Jobsite.

15. Lining and coating of ductile iron pipe and fiberglass pipe, as well as welded supports, are subject to shop inspection. Vitrified Clay Pipe (VCP) is exempt, as are non-welded pipe supports which can be classified as standard or catalog items. The CITY'S Standards Division will provide the inspection and testing for VCP.

16. Shop inspection is not required for lumber, unless it is treated lumber. Glue-laminated products do not require shop inspection. Each "Glue Lam" shall come with an individual Certificate of Compliance.

17. Millwork and wood products are not required to be shop inspected, unless the Specifications call for equivalency or inspection by the Woodworking Institute of California (W. I. C.).

18. Specified coatings including, but not limited to, anodizing, bitumen, epoxy, galvanizing, polyvinylidene fluoride, and pipe linings and coatings shall be shop inspected.

19. Conveying equipment, such as elevators, escalators, or conveyors are exempt from shop inspection. However, the structural framework of the escalators, hoists, cranes and lifts do require inspection.

20. Mechanical equipment, such as compressors, pumps, motors and valves, require shop inspection for fabrication, tests of windings, and any specified coating. Pumps, valves and motors may be exempt if they are standard or catalog items.

21. Fabrications of sluice gates and slide gates are subject to shop inspection for fabrication, welding and coating.

22. Transformers rated at 600 volts and higher, transformers rated at 100 KVA and higher, generators, switchgear motor drives and complex wired panel boards require shop inspection.

23. Lighting fixtures and lamps are considered standard or catalog items and are exempt from shop inspection.

24. Electrical wiring and testing, performed in the shop, requires inspection to verify conformance with applicable Specifications.

25. Shop tests specified in the Specifications including, but not limited to, voltage, grounding, loads, performance, installation, temperature, or noise levels will require shop inspection.

26. HVAC (heating, ventilation and air conditioning) are subject to shop inspection for fabrication and welding. Each component will be evaluated for possible inspection.

27. Sheet metal ductwork is not shop inspected. Flexible ductwork is considered a standard or catalog item and no shop inspection is required. Ductwork made of aluminum, stainless steel, or fiberglass will require shop inspection.

28. Storefronts and wall systems are shop inspected. Fixed windows are standard items and have no need of inspection.

29. Plastic pipe, such as ABS or PVC does not require shop inspection. The pipe will be inspected and sampled for testing at the Jobsite. Extruded plastic liner plate will require shop inspection.

30. Fiberglass products, because of the resins and the fiber reinforcement, do require shop inspection.

31. Elastomeric bearing pads shall be tested according to Cal-Trans Standard Specification Section 51-1. 12H. Sampling will be done by the INSPECTOR.

32. All frame and covers used with or installed on vaults, MH, pullboxes, tree wells, and similar structures in sidewalks, parkways, driveways, streets, and alleys in the public way shall be designed, manufactured and tested according to the latest version of Standard Plan S-601.

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SECTION 01454
WEIGHING AND METERING EQUIPMENT

1.1 THE REQUIREMENT

A. It is the CONTRACTOR'S responsibility to ensure that all scales and metering equipment used for proportioning materials shall be inspected for accuracy and certified within the past twelve (12) months by the State of California Bureau of Weights and Measures, by the County Director or Sealer of Weights and Measures, or by a scale mechanic registered with or licensed by the County.

B. The accuracy of the work of a scale service agency, except as stated herein, shall meet the standards of the California Business and Professions Code and the California Code of Regulations pertaining to weighing devices. A certificate of compliance shall be presented, prior to operation, to the ENGINEER for approval and shall be renewed whenever required by the ENGINEER at no cost to the CITY.

C. All scales shall be arranged so they may be read easily from the operator's platform or area. They shall indicated the true net weight without the application of any factor. The figures of the scales shall be clearly legible. Scales shall be accurate to within one percent (1%) when tested with the plant shut down. Weighing equipment shall be so insulated against vibration or moving of other operating equipment in the plant area that the error in weighing with the entire plant running will not exceed two percent (2%) for any setting nor one-and-one-half percent (1.5%) for any batch.

* * * * * *

SECTION 01455
CALIBRATION OF TESTING EQUIPMENT

1.1 THE REQUIREMENT

A. It is the CONTRACTOR'S responsibility to ensure that testing equipment such as, but not limited to, pressure gages, metering devices, hydraulic systems, force (load) measuring instruments, and strain-measuring devices shall be calibrated by a testing agency acceptable to the ENGINEER at intervals not to exceed twelve (12) months and following repairs, modification, or relocation of the equipment. Calibration certificates shall be provided when requested by the ENGINEER.

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SECTION 01561
ENVIRONMENTAL CONTROL

1.1 THE REQUIREMENT

A. Explosives for Blasting: The use of explosives for blasting purposes on the work shall not be permitted.

B. Fugitive Dust and Smoke Control

1. The CONTRACTOR shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary to prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance as defined by the ENGINEER. The CONTRACTOR shall be responsible for any damage resulting from any dust originating from its operations. The dust abatement measures shall be continued until the CONTRACTOR is relieved of further responsibility by the ENGINEER. No separate payment shall be allowed for dust abatement measures and all costs thereof shall be included in the CONTRACTOR's Bid. The use of water resulting in mud on streets, sidewalks, driveways, shall not be permitted as a substitute for sweeping or other methods of dust control.

2. The CONTRACTOR shall not discharge smoke, dust, or any other air contaminants into the atmosphere in such quantity as will violate the regulations of any legally constituted authority.

3. The CONTRACTOR shall comply with the requirements of Title 8, California Code of Regulations, concerning handling of asbestos dust.

C. Rubbish Control: Through all phases of construction, including suspension of Work and until final acceptance of the Project, the CONTRACTOR shall keep the Worksite and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish and debris. The CONTRACTOR shall dispose of all rubbish and waste materials of any nature occurring at the Worksite and shall establish regular intervals of collection and disposal of such materials and waste. The CONTRACTOR shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Care shall be taken to prevent spillage on haul routes. Any such spillage shall be removed immediately and the area cleaned by the CONTRACTOR. Equipment and material storage shall be confined to areas approved by the ENGINEER. Disposal of all rubbish and surplus materials shall be off the site of construction, at the CONTRACTOR's expense, all in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and the requirements of the OSHA Safety and Health Standards for Construction. All cleanup cost shall be included in the CONTRACTOR's Bid.

D. Sanitation:

1. Fixed or portable chemical toilets shall be provided for the use of the CONTRACTOR's employees. These accommodations shall be maintained in a neat and sanitary condition. Toilets at construction sites shall conform to the requirements of Title 8, California Code of Regulations.

2. Wastewater conveyance and disposal shall not be interrupted. Should the CONTRACTOR disrupt existing sewer facilities, sewage shall be conveyed in closed conduits and disposed of in a sanitary sewer system. Sewage shall not be permitted to flow in trenches or be covered by backfill.

3. The CONTRACTOR shall establish a regular schedule for collection of all sanitary and organic waste. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the INSPECTOR and in accordance with all laws and regulations pertaining thereto. Disposal of all such wastes shall be at the CONTRACTOR's expense.

E. Chemicals:

1. The following paragraph does not relieve the CONTRACTOR from its responsibility for obtaining prior approval from the ENGINEER for chemical usage when otherwise required.

2. The CONTRACTOR shall provide four (4) copies of the MSDS to the INSPECTOR for all chemicals used during project construction or furnished for project operation, prior to bringing them on site, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, which shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer and with all other applicable laws and regulations.

F. Lead Paint Notification:

1. If any paints containing Lead or Chromium are to be physically disturbed or made airborne during the progress of the Work by activities such as abrasive blasting, welding, cutting or torch burning, the CONTRACTOR shall provide appropriate worker protection in accordance with OSHA Lead in Construction Standard and in any other applicable regulations.

2. All paint which is removed or disturbed during the progress of the Work or any demolition debris which contains these paints, either of which contains in excess of 5 ppm (mg/l) Lead or Hexavalent Chromium when tested in accordance with the Waste Extraction Test (WET) method of the California Code of Regulations, Title 22, shall be disposed of as hazardous waste. The CONTRACTOR shall be responsible for such disposal in accordance with all applicable laws and regulations.

G. Hazardous Waste: Hazardous waste generated by the CONTRACTOR at the site shall be disposed of in accordance with NOTIFICATION OF HAZARDOUS SUBSTANCES of the General Conditions.

H. Odor Control: The CONTRCTOR shall furnish all labor, materials, and equipment required and shall carry out effective measures whenever and as often as necessary to prevent the discharge of a nuisance odor from its operation into the atmosphere in such quantity as will violate the regulations of any legally constituted authority. During construction, the CONTRACTOR shall notify the ENGINEER and the INSPECTOR at least forty-eight (48) hours in advance when potential odor-causing activities are scheduled for construction.

I. Drainage Control: The CONTRACTOR shall maintain drainage within and through the Work areas. Earth dams will not be permitted in paved areas. Temporary dams of sandbags, asphaltic concrete, or other acceptable material will be permitted when necessary. Such dams shall be removed from the site as soon as their use is no longer necessary.

J. Graffiti Control: Throughout all phases of Work, including suspension of work, and until final acceptance, the CONTRACTOR shall keep all equipment, field offices, storage facilities and other facilities free of graffiti. Graffiti shall be painted over, masked or cleaned off within twenty-four (24) hours after notification by the INSPECTOR

K. Vermin Control: At the time of acceptance, structures entirely constructed under the Contract shall be free of rodents, insects, vermin, and pests. Necessary extermination work shall be arranged and paid for by the CONTRACTOR as part of the work within the contract time, and shall be performed by a licensed exterminator in accordance with requirements of governing authorities. The CONTRACTOR shall be liable for injury to persons or property and responsible for the elimination of offensive odors resulting from extermination operations.

* * * * * *

SECTION 01562
ENVIRONMENTAL MITIGATION

1.1 THE REQUIREMENT

A. The CONTRACTOR shall mitigate the adverse environmental impacts associated with the Work of the Contract. The CONTRACTOR shall indemnify and hold harmless the CITY from any and all fines, penalties or damages incurred by the CITY for violation of any environmental mitigation measures or permit caused by the CONTRACTOR's failure to comply with environmental mitigation measures of this Article. The measures that the CONTRACTOR shall take to mitigate environmental impacts include, but are not limited to the following:

1. Implement a Fugitive Dust and Erosion Control Plan (FDECP) that meets or exceeds SCAQMD requirements and the CITY'S FDECP for this site.

2. Comply with the General Construction Activity Storm Water Permit and the Storm Water Pollution Prevention Plan for this site.

3. Comply with the requirements of NOTIFICATION OF HAZARDOUS SUBSTANCES of the General Conditions.

4. Protect sensitive habitats and species through the use of fencing, to prohibit construction personnel access to adjacent habitat areas, and with dust control measures of the FDECP, and such other measures that may be called for by the Environmental Impact Report for this project.

5. Comply with the following emission control measures to minimize construction activity emissions, at no additional cost to the CITY:

   a. Stop construction activities during Stage II smog alerts which will be announced to the CONTRACTOR by the ENGINEER;

   b. Reduce construction equipment emissions by shutting off all equipment not in actual use;

   c. Reduce construction-related traffic congestion;

   d. Provide rideshare incentives for construction personnel;

   e. Tune and maintain construction equipment properly;

   f. Use low-sulfur/low nitrogen fuel for construction equipment, if available;

   g. Provide transit incentives for construction personnel;

   h. Configure construction parking to minimize traffic interference;

   i. Minimize obstruction of through-traffic lanes;

   j. Provide a flagperson to facilitate traffic flow and prevent traffic congestion;

   k. Schedule operations affecting roadways for off-peak traffic hours.

B. Prior to start of construction activities, the CONTRACTOR shall submit a Cultural Resources Monitoring and Mitigation Plan (CRMMP) prepared by a qualified archaeologist as defined paragraph 2.1.A The CRMMP shall include, but not be limited to, archaeological monitoring protocol of all ground-disturbing project related construction activities; a construction worker training protocol and program; and cultural resource recovery and processing protocol, including curation and identification of a repository, if cultural resources are discovered. The CRMMP shall be prepared in conformance with applicable California Environmental Quality Act requirements, the "Mitigation Monitoring Program for Penmar Water Quality Improvement"(Attachment #1), the CRMMP is subject to review and approval by the Bureau of Engineering Environmental Management Group (EMG). Scope of work for the CRMMP shall include review of the existing "Cultural Resource Survey Report Penmar Water Quality Improvement and Runoff Reuse Project (ArchaeoPaleo Resources Management Inc., 2009) report (Attachment # 2) and project plans (grading, demolition and excavation plans, as applicable).

C. During construction, the CONTRACTOR shall provide a qualified archaeologist, as defined in paragraph 2.1.A, subject to approval by Bureau of Engineering EMG, to monitor all ground-disturbing activities in connection with the proposed project until the archeological monitor deems there is a low potential for finding cultural materials. Ground-disturbing activities include, but are not limited to boring, trenching, grading, excavating, and foundation demolition. Monitoring shall be done in conformance with applicable California Environmental Quality Act requirements, the adopted " Mitigation Monitoring Program for Penmar Water Quality Improvement" (Addendum #03), and the " Cultural Resources Monitoring and Mitigation Plan" (CRMPP) prepared for this project. Additionally, the archaeological monitor responsible for monitoring the Rialto Court/Crescent Place project area shall also be familiar with historic architectural resources. Upon completion of all ground-disturbing activities, the archaeological monitor shall prepare a written "Archaeological Resources Monitoring Report" documenting activities carried out under the CRMPP. A hard copy of Archaeological Resources Monitoring Report shall be submitted the Bureau of Engineering EMG and the South Central Coastal Information Center within forty-five (45) days of monitoring completion. The archaeologist shall deliver any significant resources identified for curation to a repository identified in the CRMPP.

D. Prior to any excavation in undisturbed soils (undisturbed alluvial deposits), a qualified paleontologist, as defined in 2.1.B shall be retained by the CONTRACTOR , subject to Bureau of Engineering EMG approval, to develop a monitoring fossil remains plan for construction-related activities that could disturb potential unique paleontological resources within the project area. Please note that a paleontological records search specific to this project has not been conducted. The plan shall be implemented during construction and include, but not be limited to, the following:

1. Authority for the paleontologist to halt, temporarily divert, or redirect grading in the area of an exposed fossil to facilitate evaluation and, if necessary, salvage.

2. Provisions for fossil identification and cataloguing before being donated to their final repository.

3. Provision for the preparation of a report detailing results of the monitoring and treatment efforts, listing the fossils collected, and naming the repository. A hard copy of the report shall be submitted to Bureau of Engineering EMG.

E. Prior to the start of construction, the contractor shall submit a noise management plan for review and approval of the project manager. The plan shall include noise monitoring protocol and potential noise reduction measures to be implemented if needed to ensure compliance with the more stringent requirements of the current CITY or local noise ordinances. which may include but not be limited to the following:

1. Temporary sound walls (noise barriers) of a sufficient height, length and configuration so as to provide substantial noise reduction and effectively block the line-of-sight between nearby noise-sensitive receivers and the work zone.

2. Limiting the number of construction equipment operating at one time

3. Use of low-noise-generating construction equipment;

4. Maintenance of mufflers and ancillary noise abatement equipment;

5. Use of vibration pile drivers and other techniques that result in less noise than impact pile drivers;

6. Scheduling high noise producing activities during periods that are least sensitive;

7. Routing construction related truck traffic away from noise-sensitive areas;

8. Reducing construction vehicle speeds.

F. CONTRACTOR shall give advance notice (48 hours) to the residents prior to reducing pedestrian or vehicular access to their properties

2.1 DEFINITIONS

A. Qualified Archaeologist: As defined by the National Park Service Secretary of the Interior Professional Standards for Archaeology, the minimum professional qualifications in archeology are a graduate degree in archeology, anthropology, or closely related field plus:

1. At least one year of full-time professional experience or equivalent specialized training in archeological research, administration or management

2. At least four months of supervised field and analytic experience in general North American archeology, and

3. Demonstrated ability to carry research to completion.

In addition to these minimum qualifications, a professional in prehistoric archeology shall have at least one year of full-time professional experience at a supervisory level in the study of archeological resources of the prehistoric period. A professional in historic archeology shall have at least one year of full-time professional experience at a supervisory level in the study of archeological resources of the historic period.

B. Qualified Paleontologist: As defined by the United States Department of the Interior Bureau of Land Management (BLM Manual Section 8270 - Paleontological Resource Management) a qualified paleontologist is one who is qualified to hold a paleontological resource use permit issued by the BLM as described below

In order to receive a paleontological resource use permit, applicants must be able to demonstrate the following:

1. Professional instruction in a field of paleontology relevant to the work proposed (vertebrate, invertebrate, trace, paleobotany, etc.), obtained through:

a. Formal education resulting in a graduate degree from a n accredited institution in paleontology, or in geology, biology, botany, zoology or anthropology if the major emphasis is in paleontology; OR

b. Equivalent paleontological training and experience including at least 24 months under the guidance of a professional paleontologist who meets qualification (a) above, that provided increased responsibility leading to professional duties similar to those in qualification (a) above; and

   i. Demonstrated experience in collecting, analyzing, and reporting paleontological data, similar to the type and scope of work proposed in the application;

   ii. Demonstrated experience in planning, equipping, staffing, organizing, and supervising crews performing the work proposed in the application;

   iii. Demonstrated experience in carrying paleontological projects to completion as evidenced by timely completion and/or publication of theses, research reports, scientific papers and similar documents.

Students and others who do not meet the qualifications for obtaining a permit may conduct paleontological work under the supervision of an applicant who (a) meets the qualifications and (b) is willing to obtain a permit and be legally responsible for all activities under it. The permit holder must agree to supervise project planning, associated fieldwork, scientific evaluations and recommendations regarding paleontological materials under study, and the writing and submission of reports.

* * * * * *

(SEE ATTACHMENTS)

ATTACHMENTS TO SECTION 01562

Attachments to General Requirements Section 01562 consists of two (2) documents, as follows:

ATTACHMENT NUMBER	TITLE OF ATTACHMENT	NUMBER OF PAGES IN THIS ATTACHMENT
01562-A1	Mitigation Monitoring Program for Penmar Water Quality Improvement	9
01562-A2	Cultural Resource Survey Report Penmar Water Quality Improvement and Runoff Reuse project (ArchaeoPaleo Resources Management Inc., 2009)	104

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MITIGATION MONITORING PROGRAM
FOR

PENMAR WATER QUALITY IMPROVEMENT

W.O. EW40019F

Prepared By

CITY OF LOS ANGELES
BUREAU OF ENGINEERING

June 22, 2009

The California Environmental Quality Act (CEQA) requires public agencies to adopt a reporting or monitoring program for the changes to the project that have been adopted to mitigate or avoid significant effects on the environment (Public Resources Code Section 21081.6). The program must be adopted by the public agency at the time findings are made regarding the project. The State CEQA Guidelines allow public agencies to choose whether its program will monitor mitigation, report on mitigation, or both (14 CCR Section 15097(c)). This mitigation monitoring program contains the elements required by CEQA for the Penmar Water Quality Improvement project.

Project Description

The Penmar Water Quality Improvement project for which this mitigation monitoring program has been developed consists of the following:

> The proposed project consists of the construction of a stormwater diversion structure within the Rose Avenue storm drain, primary and secondary pump station systems, a pretreatment system to screen trash, sediment, oil and grease; an underground detention reservoir, and three force mains for flow conveyance. Phase II of the project would provide further treatment for beneficial use for landscape irrigation at Penmar Golf Course, Penmar Recreation Center and/or Marine Park.
>
> Diverted flows would be conveyed to a pump station constructed within Frederick Street right-of-way northwest of the intersection with Rose Avenue. As sewer capacity allows, a portion of the diverted flow, including dry weather flow would be diverted directly to the sanitary sewer via a force main, from the proposed pump station to the sanitary sewer and ultimately to the Hyperion Treatment Plant. Another portion of the wet weather flow would be diverted via a second force main to an approximately 2.75-million gallon reservoir beneath the Penmar Recreation Center Field 5. Stormwater stored in the reservoir would be held for approximately seventy-two (72) hours after a storm event passes and then discharged at a controlled rate to the sanitary sewer through a combined gravity and pump system that would be constructed adjacent to the reservoir.
>
> The project also includes minor sanitary sewer upgrades on Oakwood Avenue between Millwood Avenue and Rialto Court, on Rialto Court south of Nowita Place, Crescent Place between Rialto Court and Palms Boulevard, and on Abbot Kinney Boulevard at the intersection with Palms Boulevard.
>
> The project is funded by Proposition O, a $500 million Clean Water Bond Measure approved by City of Los Angeles voters November 5, 2004.

Unless otherwise stated, the project will be designed, constructed and operated following all applicable laws, regulations, ordinances and formally adopted City standards (e.g., *Los*

Angeles Municipal Code and Bureau of Engineering *Standard Plans* including the uniform practices established by the Southern California Chapter of the American Public Works Association (e.g., *Standard Specifications for Public Works Construction* and the *Work Area Traffic Control Handbook*) as specifically adapted by the City of Los Angeles (e.g., The City of Los Angeles Department of Public Works *Additions and Amendments to the Standard Specifications For Public Works Construction* (AKA "The Brown Book," formerly Standard Plan S-610)).

Mitigation Measures

The mitigation measures described in the following pages are taken from the Initial Study and Mitigated Negative Declaration for this project. The measures are listed according to the phases of the project during which action must occur to implement the mitigation measure: design, construction and operation.

Within each project phase, the following are identified for each mitigation measure:

(1) A brief description of the impact that is being mitigated (i.e., the objective of the mitigation),
(2) A description of the mitigation measure,
(3) The party who is responsible for the necessary implementing actions,
(4) The necessary implementing action,
(5) The party who is responsible for verifying that the necessary implementing action is taken, and
(6) The primary record documenting the necessary implementing action.

The mechanisms for verifying that mitigation measures have been implemented include design drawings, construction documents intended for use by construction contractors and construction managers, field inspections, field reports, and other periodic or special reports. All records pertaining to this mitigation program will be maintained and made available for inspection by the public in accordance with the City's records management systems.

DESIGN PHASE

Impact	Mitigation Measure	Implementation Responsibility	Implementation Vehicle	Enforcement Responsibility	Record of Implementation
CULTURAL RESOURCES					
Project site and vicinity are located in an area sensitive for historic and prehistoric cultural resources. Measure addresses potential impacts to archaeological resources.	**CUL1**: Archaeological monitoring by a qualified archaeological monitor shall be conducted during all ground-disturbing activities in connection with the proposed project until the archeological monitor deems there is a low potential for finding cultural materials. The archaeological monitor responsible for monitoring the Rialto Court/Crescent Place project area shall also be familiar with historic architectural resources. Ground-disturbing activities include, but are not limited to, pavement/asphalt removal, boring, trenching, grading, excavating, and foundation demolition.	Project Engineer	Project Plans & Specifications	Project Manager	Project Plans & Specifications
	CUL2: Prior to the commencement of construction activities, a Cultural Resources Monitoring and Mitigation Plan (CRMMP) shall be prepared. The CRMMP shall include, but not be limited to, construction monitoring protocol of all ground-disturbing project related construction activities; a construction worker training protocol and program; and cultural resource recovery and processing protocol if cultural resources are discovered. As applicable, the archaeological monitor shall follow the plan during construction.	Project Engineer	Project Plans & Specifications	Project Manager	Project Plans & Specifications
	CUL3: Upon completion of all ground-disturbing activities associated with the project, an Archaeological Resources Monitoring Report shall be prepared, documenting activities carried out under the CRMPP.	Project Engineer	Project Plans & Specifications	Project Manager	Project Plans & Specifications

DESIGN PHASE					
Impact	**Mitigation Measure**	**Implementation Responsibility**	**Implementation Vehicle**	**Enforcement Responsibility**	**Record of Implementation**
Project site is located in an area identified as sensitive for paleontological resources. Measure addresses potential impacts to paleontological resources or site.	**CUL4**: Prior to any excavation in undisturbed soils (undisturbed alluvial deposits), a qualified paleontologist shall be retained to develop a monitoring and fossil remains treatment plan for construction-related activities that could disturb potential unique paleontological resources within the project area. The plan shall be implemented during construction and include, but not be limited to, the following: • Authority for the paleontologist to halt, temporarily divert, or redirect grading in the area of an exposed fossil to facilitate evaluation and, if necessary, salvage. • Provision for fossil identification and cataloguing before being donated to their final repository. • Provision for the preparation of a report detailing results of the monitoring and treatment efforts, listing the fossils collected, and naming the repository.	Project Engineer	Project Plans & Specifications	Project Manager	Project Plans & Specifications

DESIGN PHASE

Impact	Mitigation Measure	Implementation Responsibility	Implementation Vehicle	Enforcement Responsibility	Record of Implementation
NOISE					
Noise generated during construction.	**NOI1**: The contractor shall monitor construction activity adjacent to residential uses. Prior to the start of construction the contractor shall submit a noise monitoring plan for review and approval of the project manager. The plan shall include potential noise reduction measures to be implemented if needed to ensure compliance with the City's Noise Ordinance. Such measures may include but not be limited to the following: • Temporary sound walls (noise barriers) of a sufficient height, length and configuration so as to provide substantial noise reduction and effectively block the line-of-sight between nearby noise-sensitive receivers and the work zone, and • Limiting the number of construction equipment operating at one time.	Project Engineer	Project Plans & Specifications	Project Manager	Project Plans & Specifications
TRANSPORTATION/TRAFFIC:					
Temporary access.	**TRA1**: Contractor shall give advanced notice to the residences whose access to their garage will be impacted.	Project Engineer	Project Plans & Specifications	Project Manager	Project Plans & Specifications

CONSTRUCTION PHASE

Impact	Mitigation Measure	Implementation Responsibility	Implementation Vehicle	Enforcement Responsibility	Record of Implementation
CULTURAL RESOURCES					
Project site and vicinity are located in an area sensitive for historic and prehistoric cultural resources. Measure addresses potential impacts to archaeological resources.	**CUL1**: A qualified archaeological monitor, provided by the contractor and subject to BOE Environmental Management Group's approval, shall monitor all ground-disturbing activities in connection with the proposed project until the archeological monitor deems there is a low potential for finding cultural materials. The archaeological monitor responsible for monitoring the Rialto Court/Crescent Place project area shall also be familiar with historic architectural resources. Ground-disturbing activities include, but are not limited to, pavement/asphalt removal, boring, trenching, grading, excavating, and foundation demolition.	Construction Contractor	Construction Contract	Bureau of Contract Administration	Final Monitoring Report Submittal to the South Central Coastal Information Center (SCCIC)
	CUL2: Prior to the commencement of construction activities, the Contractor shall submit a Cultural Resources Monitoring and Mitigation Plan (CRMMP) prepared by a qualified archaeologist. The CRMMP shall include, but not be limited to, construction monitoring protocol of all ground-disturbing project related construction activities; a construction worker training protocol and program; and cultural resource recovery and processing protocol, including curation and repository, if cultural resources are discovered. As applicable, the archaeological monitor shall implement the CRMMP during construction.	Construction Contractor	Construction Contract	Bureau of Contract Administration	Final Monitoring Report Submittal to the SCCIC
	CUL3: Upon completion of all ground-disturbing activities associated with the project, an Archaeological Resources Monitoring Report shall be prepared, documenting activities carried out under the CRMPP, and significant resources identified for curation shall be delivered to the selected reporsitory.	Construction Contractor	Construction Contract	Bureau of Contract Administration	Final Monitoring Report Submittal to the SCCIC

CONSTRUCTION PHASE					
Impact	**Mitigation Measure**	**Implementation Responsibility**	**Implementation Vehicle**	**Enforcement Responsibility**	**Record of Implementation**
Project site is located in an area identified as sensitive for paleontological resources. Measure addresses potential impacts to paleontological resources or site.	**CUL4**: Prior to any excavation in undisturbed soils (undisturbed alluvial deposits), a qualified paleontologist shall be retained, by the Contractor and subject to BOE Environmental Management Group's approval, to develop a monitoring and fossil remains treatment plan for construction-related activities that could disturb potential unique paleontological resources within the project area. The plan shall be implemented during construction and include, but not be limited to, the following: • Authority for the paleontologist to halt, temporarily divert, or redirect grading in the area of an exposed fossil to facilitate evaluation and, if necessary, salvage. • Provision for fossil identification and cataloguing before being donated to their final repository. • Provision for the preparation of a report detailing results of the monitoring and treatment efforts, listing the fossils collected, and naming the repository.	Construction Contractor	Construction Contract	Bureau of Contract Administration	Final Monitoring Report Submittal and fossil submittal, if applicable, to selected repository

CONSTRUCTION PHASE

Impact	Mitigation Measure	Implementation Responsibility	Implementation Vehicle	Enforcement Responsibility	Record of Implementation
NOISE					
Noise generated during construction.	**NOI1**: The contractor shall monitor construction activity adjacent to residential uses. Prior to the start of construction the contractor shall submit a noise monitoring plan for review and approval of the project manager. The plan shall include potential noise reduction measures to be implemented if needed to ensure compliance with the City's Noise Ordinance. Such measures may include but not be limited to the following: • Temporary sound walls (noise barriers) of a sufficient height, length and configuration so as to provide substantial noise reduction and effectively block the line-of-sight between nearby noise-sensitive receivers and the work zone, and • Limiting the number of construction equipment operating at one time.	Construction Contractor	Project Plans & Specifications	Bureau of Contract Administration	Bureau of Contract Administration Records
TRANSPORTATION/TRAFFIC:					
Temporary access.	**TRA1**: Contractor shall give advanced notice to the residences whose access to their garage will be impacted.	Construction Contractor	Project Plans & Specifications	Bureau of Contract Administration	Bureau of Contract Administration Records

CULTURAL RESOURCE SURVEY REPORT

Penmar Water Quality Improvement and Runoff Reuse Project

Prop O - Clean Water Bond Program
Community of Venice, City of Los Angeles
Los Angeles County, California
W.O. No. EW40019F

Prepared For:

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May 2009

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EXECUTIVE SUMMARY

This document discusses the findings of a Phase I Cultural Resource Inventory Assessment conducted by the ArchaeoPaleo Resource Management, Inc. (APRMI) staff at the request of Brown and Caldwell (the Client), on behalf of the City of Los Angeles-Department of Public Works (Lead Agency), for the *Penmar Water Quality Improvement and Runoff Reuse Project, W.O. No. EW40019F* (the Project). Specifically, this Report of Findings (ROF) includes the results of a cultural resource inventory for all known prehistoric and historic resources located on and around the Project site. This ROF also includes the results of the research regarding historic architectural resources, such as buildings, structures, and objects. Additionally within this document, the results of an archival record search conducted at the South Central Coastal Information Center located on the campus of California State University in Fullerton, the findings from historic map reviews, additional archival and literature searches, initial Native American contact, and a pedestrian survey of the proposed Project area is included. This Phase I Cultural Resource Inventory Assessment of the Project area was requested by the Client and is in keeping with compliance protocol of the California Environmental Quality Act (CEQA) and the regulatory requirements of the City of Los Angeles, inclusive of the community of Venice. It is our understanding that no federal funds were used on this project.

The proposed Project area is located immediately adjacent to the Penmar Municipal Golf Course and Penmar Recreation Center (Penmar Project Area), as well as, an associated pipeline route that traverses along Oakwood Avenue between Rialto Court and Millwood Avenue (Oakwood Avenue Project Area), along Rialto Court between Shell Avenue and Crescent Place, proceeds west along Crescent Place to Palms Boulevard (Rialto Court/Crescent Place Project Area), and at the intersection of Abbot Kinney Boulevard and Palms Boulevard (Abbot Kinney Boulevard Project Area), within the community of Venice, California; an annexed portion of the City of Los Angeles, as described in the Project Description section of this report. All Project Areas sections of the Area of Potential Effect (APE) were surveyed for cultural (prehistoric and historic archaeological) resources and historic architectural resources (buildings, structures, and objects) on January 2, 2009 and then again on March 24, 2009 following additional Project location information by the APRMI Principal Investigator and an APRMI architectural historian/archaeologist. The visibility of the ground surface was <5% as a result of modern golf course development and community recreational development, park landscaping, paved roadways, and residential development. No cultural resources of archaeological type (prehistoric or historic), or structures of historic significance as defined by the CEQA and NHPA, were identified within three of the four Project Areas (Penmar Project Area, Oakwood Avenue Project Area, and Abbot Kinney Project Area) during the site survey.

However, the Rialto Court/Crescent Place Project Area exhibits historic architectural resources of unknown historic significance (circa 1910-1960), as defined by the CEQA and NHPA, as well as at the local level, immediately

adjacent to the Project Area of Potential Effect (APE). Therefore, it is recommended that an archaeological monitor familiar with historic architectural resources be present during the Rialto Court/Crescent Place Project construction activities. The Project Area APE lies near the properties within a collection of private residences at the lot northwest of the intersection Rialto Court and Crescent Place but within the 30 foot right-of-way owned by the City of Los Angeles.

Although unlikely to be directly affected, a contingency plan should be in place if Project construction activities at the Rialto Court/Crescent Place Project Area require ground disturbance. This contingency plan should include a Phase II assessment of those historic properties identified within the right-of-way of the sewer line and any additional underground utilities (such as electric and/or gas) proposed for relocation and upgrade at the aforementioned lot located northwest of the intersection of Rialto Court and Crescent Place. The Phase II assessment of historic architectural cultural resources should be conducted by a qualified architectural historian as defined per Secretary of Interior Standards. The recommended Phase II assessment of historic architectural cultural resources should be a counterpart study to any archaeological construction monitoring activities. This potential Phase II Study is necessary only if the proposed construction activities at the Rialto Court/Crescent Place Project Area require ground disturbance of any kind.

The archival research reviewed and the Native American resource information gathered, revealed that prehistoric, historic, and multi-component (both prehistoric and historic) cultural resources, as well as, historic architectural cultural resources, may possibly be located on site and that there are known sites present within ¼-mile, ½-mile, and 1-mile of the Project area. Additionally, numerous historic-era residential buildings (circa 1935-1960) are present immediately adjacent to many of the Project areas. As a result of the lack of ground surface visibility during the site survey, combined with the cultural resource archival research results and Native American input, it is recommended a qualified archaeological monitor be present during construction-related earth-moving activities since there is the possibility that archaeological resources of prehistoric and/or historic type may be uncovered.

INTRODUCTION

Purpose of Study

The City of Los Angeles, Department of Public Works, has initiated a planning study for the potential construction of a subterranean force main conduit system to redirect and convey storm-water runoff and dry-weather flows away from the beaches of the Santa Monica Bay, into a proposed 2.75-million gallon underground reservoir. The Project will utilize California *Measure 'O' Clean Water Bond Program* funds. Therefore, the Project is required to comply with the protocol set forth in the CEQA. Cultural resources, as considered by the CEQA and the NHPA, are part of the affected environment. As a result, the Lead Agency must identify and assess the potential for historic significance, in which previously known or newly identified cultural resources may be at risk of adverse effect. Additionally, the Lead agency must mitigate any adverse effect for those cultural resources (if any) identified as historically significant, per criteria set forth in the CEQA and the NHPA. This Report of Findings provides the results of a Phase I inventory of cultural resources, per the requirements of the CEQA and the local laws and ordinances.

Project Area Description

A large portion of the Project is located at the Penmar Municipal Golf Course (Penmar Project Area), in the unincorporated community of Venice, and within the municipal jurisdiction of the City of Los Angeles. The Penmar Municipal Golf Course is bisected by the mutual boundary of the City of Santa Monica and the community of Venice at its northwestern-most quadrant. However, the entire Project area is located just south of the governmental boundary of the City of Santa Monica and entirely within the residential community of Venice.

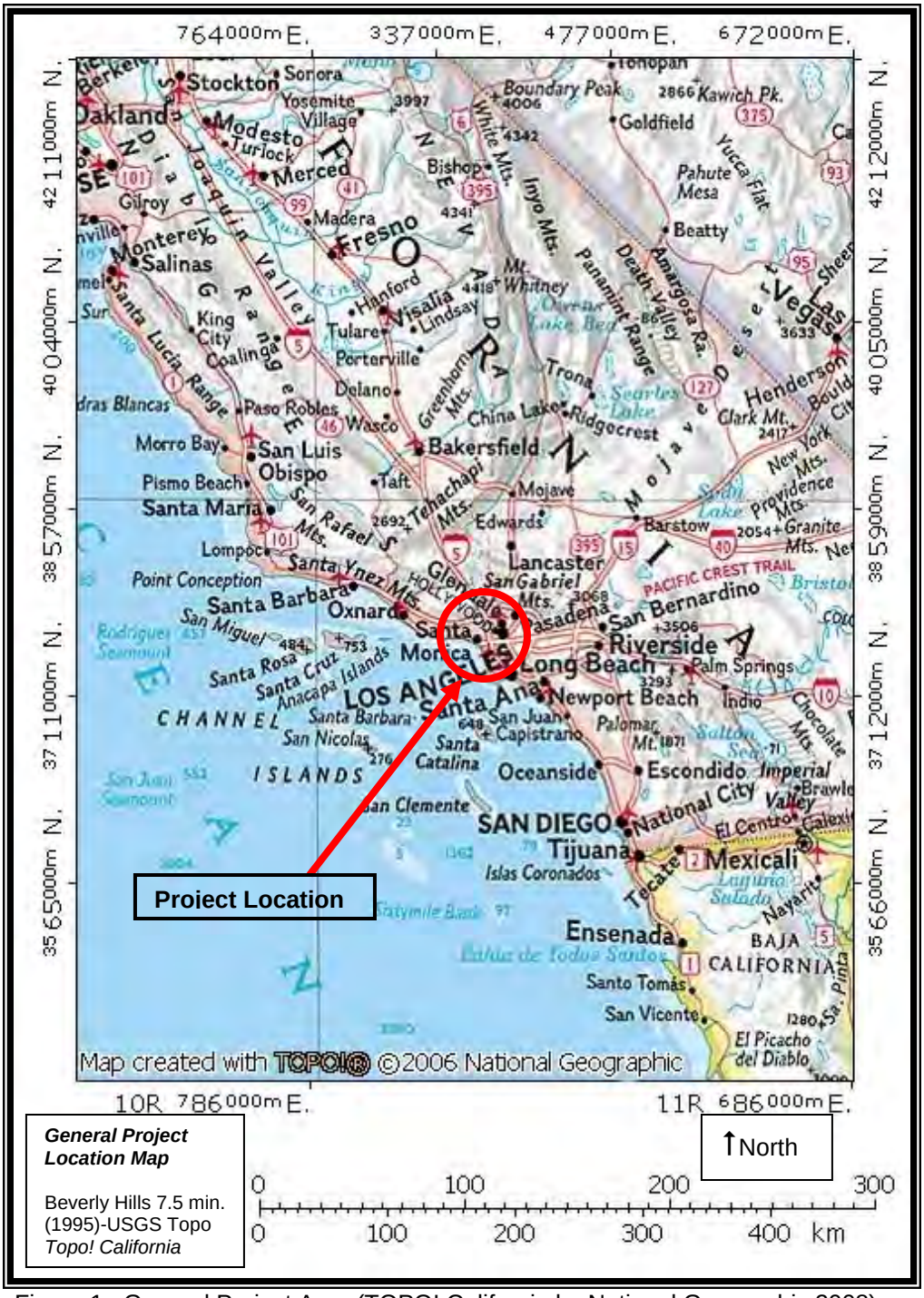
The Penmar Project Area consists of the construction of a pipeline route for proposed sump-pump system, three subterranean force mains, and an underground reservoir. The pipeline route at the Penmar Project Area is located along Rose Avenue on the south side of the golf course property. The reservoir is located within the adjacent Penmar Recreation Center grounds, which is south of the golf course. Specifically, the three proposed subterranean force mains that tie into the proposed sump-pump system is located beneath the roadbed and storm water flow ditch in the alley between Warren Avenue in the north, and Rose Avenue in the south. The proposed subterranean force mains between the proposed sump-pump and the proposed reservoir are located within the road bed of Rose Avenue, between Frederick Street in the west, through the parking lot of the Penmar Municipal Golf Course, and just to the east of Walnut Street, in the east. The proposed subterranean 2.75 million-gallon reservoir is located beneath the Penmar Recreation Center grounds, due south of Rose Avenue and the Penmar Municipal Golf Course club house, north of Lake Street, and east of Penmar Avenue. The roadways are consistent with mid-20th Century mixed use; residential development and public facilities (golf-course and recreational park). Existing utilities in Rose Avenue, and a domestic service waterline to a residence

at the northwestern corner of the intersection of Rose Avenue and Frederic Street, will be relocated and/or upgraded to accommodate the aforementioned Penmar Project Area activities. The specific design and location of the utility relocation and/or upgrade activities, to include gas and electrical service lines, is unknown at this time.

The remainder of the Project is comprised of three additional project areas for the purpose of utility relocation and "upgrading approximately 650 feet of trunk sanitary sewer" (Brown and Caldwell 2008: TM8-5) south of the Penmar Project Area in order to accommodate the overall design of the conveyance system via the proposed sump-pump, three force mains, and the underground reservoir. The three additional project areas are located as follows;

- Oakwood Avenue Project Area: 250-feet along Oakwood Avenue, from approximately 100-feet north of the intersection of Oakwood Avenue and Palms Boulevard to the northwest, and southward to the intersection of Oakwood Avenue and Rialto Court to the southeast.
- Rialto Court/Crescent Place Project Area: 145-feet along the alleyway of Rialto Court, from the intersection of Rialto Court and Nowita Place to the north, and southward to the point-of-intersect with Crescent Place, and an additional 180-feet along the narrow (~6-feet in width) Crescent Place paved pedestrian trail and westward to the intersection of Crescent Place and Palms Boulevard to the west. The Crescent Place paved pedestrian trail represents a remnant vacated street. For reasons unknown, the "homeowner's yards have extended out over the sewer alignment" (Brown and Caldwell 2008: TM 8-14). The reality of this situation is that the APE may be located within the private properties of the homeowners developed residential lots at the northwest corner of the intersection of Rialto Court and Crescent Place.
- Abbot Kinney Boulevard Project Area: 75-feet across the northeastern portion of the intersection of Abbot Kinney Boulevard in the southeast and Palms Boulevard to the northeast.

With the exception of the Rialto Court/Crescent Place Project Area, the specific design and location of the utility relocation and/or upgrade activities, to include gas and electrical service lines, is unknown at this time. The proposed construction activities at the Rialto Court/Crescent Place, specific to the sewer line only, will involve manhole access to the sewer line, and internal pipe reaming. This procedure this will eliminate the need for ground disturbance. However, it is unclear as to the design and location of the utility relocation activities (gas and electrical) within this Project Area.



General Project Location Map

Beverly Hills 7.5 min. (1995)-USGS Topo
Topo! California

Figure 1. General Project Area (TOPO! California by National Geographic 2008).

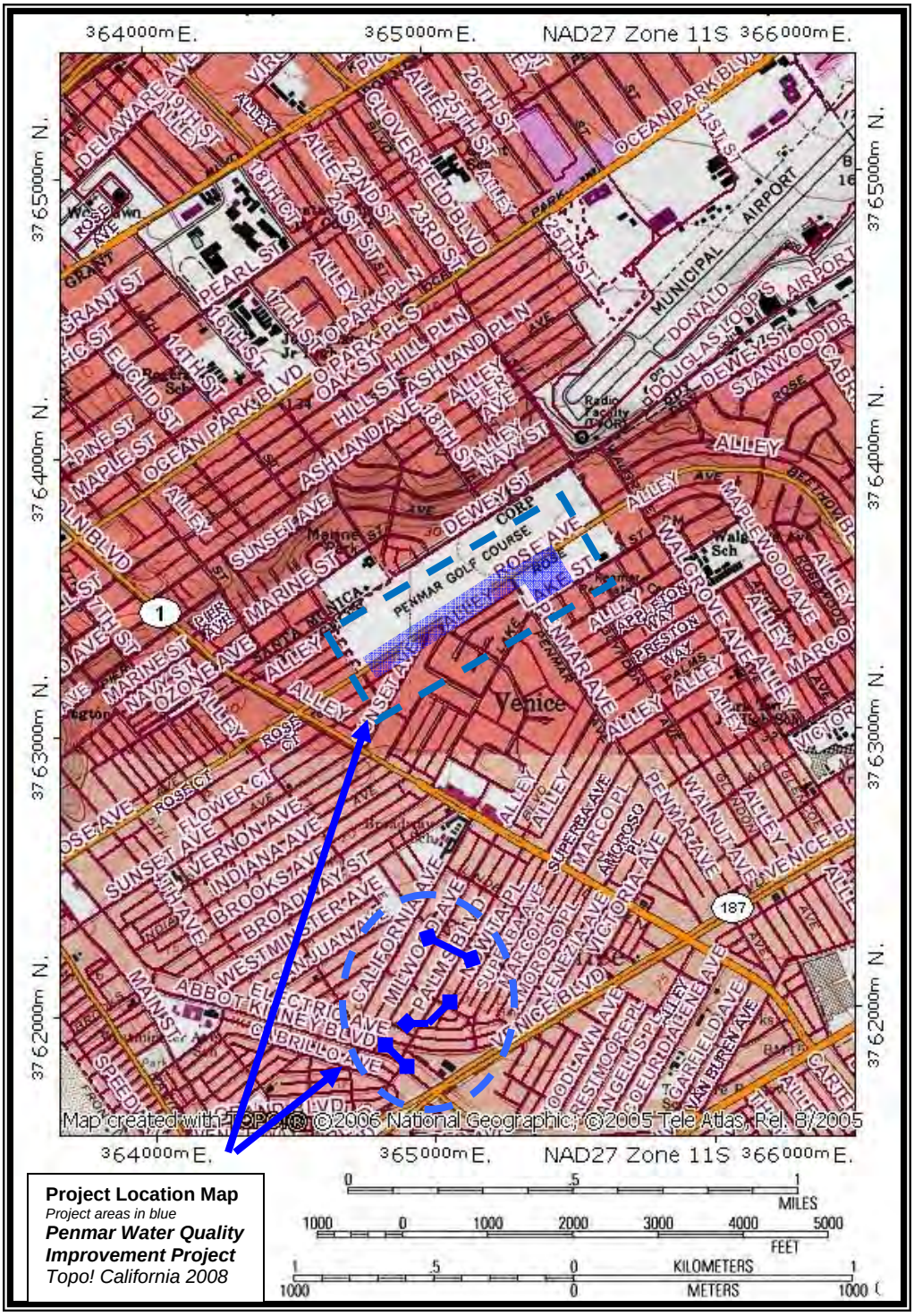


Figure 2. Project Location Map (TOPO! California by National Geographic 2008).

The Area of Potential Effect (APE) for the Project is considered the entire construction footprint. Construction work that is sensitive to cultural resources

includes asphalt and concrete removal, tree removal, grubbing, trenching, drilling, mass grading, jack and bore operations, as well as other types of construction-related earth-moving activities. With regard to this project, the APE would be limited to the area where the proposed force main conduits (3 pipes) and laterals, sump pump, and reservoir excavations are located, as well as, the sewer upgrades of all Project areas, and any new excavation/trenching relevant to the relocation of existing utilities, such as gas and electrical service lines. This would confine the Project APE of the Penmar Project Area to the aforementioned roadbed of Rose Ave, alleyway between Warren and Rose Avenues, the intersection of Rose Avenue and Frederick Street, and parking lot at the Penmar Municipal Golf Course, and the western-half of the grounds at the Penmar Recreation Center. The Project APE of the Oakwood Avenue Project Area and the Abbot Kinney Boulevard Project Area would be confined to their respective roadbeds. The Project APE of the Rialto Court/Crescent Place Project Area would include the roadbed and 5-feet either side of the sewer line bisecting the aforementioned lot at the northwest corner of Rialto Court and Crescent Place. Construction staging areas would also be included as part of the APE if earth-moving activities are proposed, such as for trailer stabilization or water/sanitary sewer tank location.

Topographically, the Project is located on the Beverly Hills, Calif., 7.5' series United States Geological Survey topographic quadrangle (1966 Photorevised 1995), Township 1S, Range 15W (no section numbers); San Bernardino Base Meridian. Given the lack of section numbers, and to better identify the Penmar Project area, the specific map location for the Penmar Project area is presented below (Table 1), in Universal Transverse Coordinates (UTM), the common geographic measurement system utilized by archaeologists, with latitude and longitude (Lat/Long) correlation, calibrated against the North American Datum 1927 (NAD 27).

Coordinate Location	UTM (Zone 11)	Lat/Long
Northwest	364721mE 3763260mN	118° 27′ 53″ 34° 0′ 10″
Northeast	365370mE 3763441mN	118° 27′ 28″ 34° 0′ 17″
Southwest	365400mE 3763635mN	118° 27′ 27″ 34° 0′ 23″
Southeast	365457mE 3763493mN	118° 27′ 24″ 34° 0′ 19″

Table 1. Geographic location information for the Penmar Project area

The ecological environment of the Project Areas consists of modern-era landscape and streetscape, ornamental and imported flora intermixed within the built environment. The Penmar Municipal Golf Course ecological environment primarily consists of domesticated sod grass (specific to golf course landscapes),

contoured and manicured terrain, to include planned walking and golf-cart trails, pine trees, some ornamental trees, and occasional vine-plants (i.e. bougainvillea) along the perimeter chain link fence. The Penmar Recreation Center is a community park, and the ecological environment consists of domesticated sod grass, ornamental trees, baseball fields and associated grandstand/bleacher seating, and sidewalk areas.

The surface geology of the region is primarily Pleistocene non-marine deposits (Qc) overlain by surficial sediments of alluvial gravels, sand, silt-clay (Qa) originating primarily in the Santa Monica Mountains (Transverse Mountain range), to include gravel and sands of stream channels (Dibblee Jr. 1991). The Santa Monica Mountains, to the north, are comprised of similar material and the metamorphous bedrock of the Franciscan Formation. The Penmar Project Area in particular, lies at the base of a marine terrace (Qom) on which the Santa Monica Municipal Airport lies. The steep slope of the terrace was cut at one time by sea wave action and/or currents, much as the sea cliffs near the Santa Monica Pier and other parts of the current Southern California coast line. The ocean level within recent geologic time (within the Pleistocene and early Holocene) has been altered as much as three hundred feet below the current sea level and one hundred feet above that same level (Colburn n.d.). The general rise in the Los Angeles Basin has contributed to the current elevation of this nearby marine terrace. The elevation of the multiple Project Areas is currently approximated between 25 to 30-feet above sea level.

The Baldwin Hills are located to the southeast and are part of the Inglewood-Newport fault system. The surficial geology of the Baldwin Hills is comprised of upper Pliocene marine deposits (Pu), Pleistocene marine and non-marine terrace deposits (Qm), all overlain by recent quaternary alluvium (Qal) (Jennings and Strand 1991). Even though paleontologic research was not required for this project, a limited amount of information is stated in this report for informational purposes.

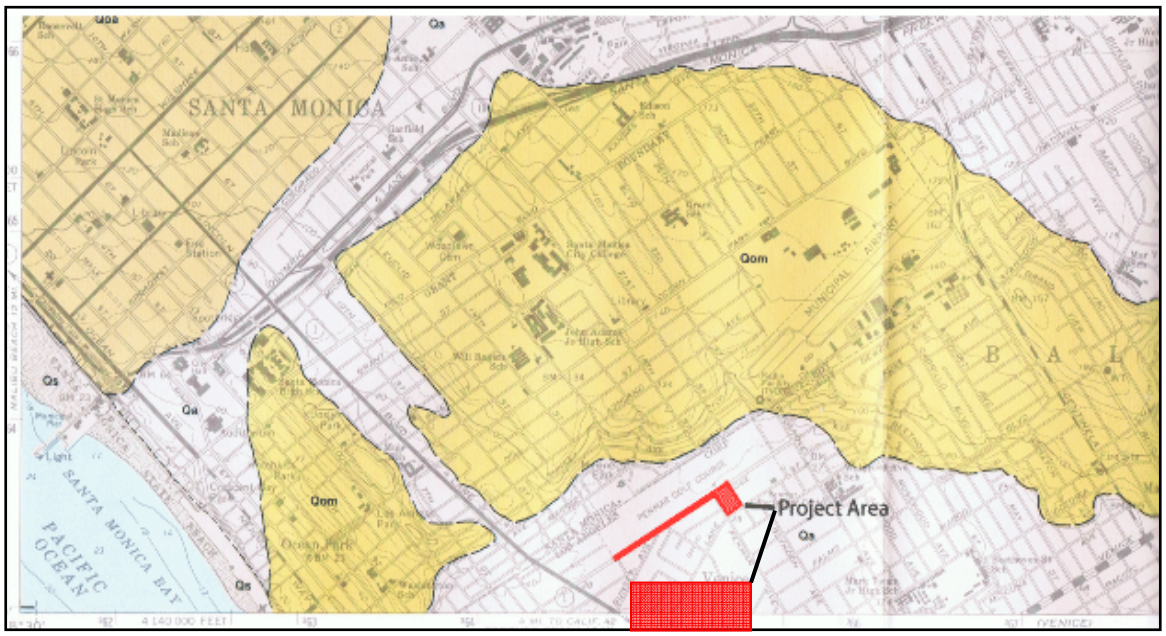


Figure 3. Geologic Surface Deposit of Penmar Project Area (based on Dibblee 1991) located within the red areas. The top area is located around Penmar Golf Course and the larger block area denotes streets along the pipeline route.

Regulatory Requirements

Cultural resources are defined as (1) prehistoric and historic archaeological sites, (2) historic buildings, structures, and objects, (3) traditional cultural properties and (4) sacred sites. Paleontologic resources are comprised of fossilized remains, to include fossils sites, fossil-bearing strata and the related paleontologic, geologic and geographic data. This section of the report identifies the federal and state regulatory requirements that preserve and protect cultural and paleontological resources. While this project is controlled by the more stringent CEQA requirements, the federal statutes are listed for continuity, clarification, and for the overlapping of statutes only, and they do not apply to this project. While paleontologic regulations are included in this section, APRMI was not requested to provide a paleontologic assessment for the Project.

Federal Regulations

- ***Antiquities Act of 1906***

  The Antiquities Act of 1906 (16 USC § 431 *et seq*.), provides for the establishment and preservation of national monuments, historic landmarks, and historic or prehistoric structures, or other items of interest on federally owned lands. Additionally, Section 433 of this act prohibits the purposeful taking, excavation, damage, and destruction of historic or prehistoric ruins, monuments, or other objects of antiquity on federally owned lands.

- ***National Environmental Policy Act of 1969***

  The NEPA of 1969, specifically P.L. 91-190, 83 Stat. 852, 42 USC §§ 4321-4327, mandates the preservation of "important historic, cultural, and natural aspects of our national heritage" (§101.b4).

- ***Section 106 of the National Historic Preservation Act***

  > "The head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking in any State and the head of any Federal department of independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure or object that is included in or eligible for inclusion in the National Register [of Historic Places (NRHP)]. The head of any such Federal agency shall afford the Advisory Council on Historic Preservation [The Council], established under Title II of this Act, reasonable opportunity to comment with regard to such and undertaking." [16 U.S.C. § 470f]

An effect, or "adverse effect," as defined by 36 CFR § 800.5 (a)(1), is as follows:

> "…when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register [NRHP] in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association."

To further clarify the meaning of what constitutes as adverse effect, 36 CFR § 800.5 (a)(2) identifies the following: physical destruction, alteration that is not in keeping with the *Secretary of the Interiors Standards for the Treatment of Historic Properties* per 36 CFR §68, removal, change of use, alteration of property setting, relocation, application of intrusive elements, neglect, change of ownership (federal to non-federal).

The NHPA (16 U.S.C. § *et seq*) defines an historic resource as significant if eligible for inclusion in the NRHP as defined by one of four eligibility criteria set forth in 36 CFR § 60.4. A determination of historic resource significance is carried out via implementation of the Section 106 process of the NHPA, as set forth by the Council per 36 CFR § 800 "Protection of Historic Properties." Such significant historic resources can include archaeological sites of pre-historic or historic context, historic buildings, structures, or objects, of state, local, or federal importance, and should retain integrity of location, design, setting, feeling, association, material, and/or workmanship; and be:

(A) Associated with events which have made a significant contribution to the broad patterns of our history, or
(B) Associated with the lives of persons significant in our past, or
(C) Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of master, or possess high artistic value, or are representative of significant and distinguishable entity of which the component may lack individual distinction, or
(D) Yield, or are likely to yield, data important to our understanding of prehistory and/or history.

State Regulations

- ***California Register of Historical Resources***

The California State Historical Resources Commission established the California Register of Historical Resources (CRHR), utilized by state and local agencies, to include private groups or citizens, as a means to,

> "…identify, evaluate, register, and protect California's historic resources. The Register [CRHR] is the authoritative guide to the state's significant historical and archaeological resources. The California Register [CRHR] program encourages public recognition and protection of resources of architectural, historical, archaeological and cultural significance, identifies historical resources for state and local planning purposes, determines eligibility for state historic preservation grant funding and affords certain protections under the California Environmental Quality Act [CEQA]."

- ***California Environmental Quality Act (Section 15064.5)***

A significant historical resource, as defined by CEQA, is referred to as a "Historical Resource." Such Historical Resources have been determined eligible for inclusion in the California Register of Historical Resources per Title 14, California Code of Regulations (CCR), § 15064.5(a)(3), or are historically significant at a local level, such as a city, town, community, or county. This includes historic properties eligible for inclusion on the NRHP per PRC § 5024.1. A cultural resource is considered historically significant under CEQA [Title 14, CCR § 15064.5(a)(3)] provided the resources retains integrity and meets one of four criteria:

(A) Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage, or
(B) Associated with the lives of persons important in our past, or
(C) Embody the distinctive characteristics of type, period, region, or method of construction, or represent the work and an important creative individual, or possesses high artistic values, or
(D) Yielded, or likely to yield, information important to the understanding of prehistory or history.

- ***Public Resources Code 21083.2***

Public Resources Code § 21083.2 (a) pertains to archaeological resources, specifically, those determined significant per the CEQA.

> (a) As part of the determination made pursuant to Section 21080.1, the lead agency shall determine whether the project may have a significant effect on archaeological resources. If the lead agency determines that the project may have a significant effect on unique archaeological resources, the environmental impact shall address the issue of the resources. An environmental impact report, if necessary, shall not

> address the issue of non-unique resources. A negative declaration shall be issued with respect to a project if, but for the issue of non-unique archaeological resources, the negative declaration would be otherwise issued.

A "significant effect" upon an historic resource, is considered a "substantial adverse change" per CEQA 15064.5 (b)(1,2); "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historic resource would be materially impaired," possibly resulting in a determination of ineligibility for the CRHR.

- ***Public Resources Code 21084.1***

> "A project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment. For purposes of this section, an historical resource is a resource listed in, or determined to be eligible for listing in, the California Register of Historical Resources. Historical resources included in a local register of historical resources, as defined in subdivision (k) of Section 5020.1, or deemed significant pursuant to criteria set forth in subdivision (g) Section 5024.1, are presumed to be historically or culturally significant for purposes of this section, unless the preponderance of evidence demonstrates that the resource is not historically or culturally significant. The fact that a resource is not listed in, or determined to be eligible for listing in, the California Register of Historical Resources, not included in a local resister of historical resources, or not deemed significant pursuant to criteria set for in subdivision (g) of Section 5024.1 shall not preclude a lead agency from determining whether the resource may be an historical resource for purposes of this section."

The NRHP and CRHR criteria mirror each other in terms of determination of site significance and listing eligibility. As previously stated, an NRHP eligible historic property qualifies for CRHR eligibility; however, the CEQA addresses local resources of historical significance, provided the local resource meets the criteria set forth in [Title 14, CCR § 15064.5(a)(3)].

- ***California State Historical Building Code, CCR Title 24, Part 8***

The California State Historic Building Code (SHBC) is a forty-page document, accessible via the Office of Historic Preservation website. The intent of the SHBC is the appropriate treatment of historical buildings while simultaneously providing for the health and safety of potential occupants, and energy conservation.

> "It is the purpose of the State Historical Building Code to provide regulations and standards for the rehabilitation, preservation, restoration (including related reconstruction) or relocation as applicable to all historical buildings, structures and properties deemed of importance to the history, architecture, or culture of an area by an appropriate local or state governmental jurisdiction. Such standards

and regulations are intended to facilitate the restoration or change of occupancy so as to preserve their original or restored elements and features, to encourage energy conservation and a cost effective approach to preservation, and to provide for reasonable safety from fire, seismic forces or other hazards for occupants and users of such "buildings, structures and properties" and to provide reasonable availability and usability by the physically disabled."

The State Historical Building Code is defined in Sections 18950 to 18961 of Division 13, Part 2.7 of Health and Safety Code (H&SC) Health and Safety Code, a part of California Law.

Los Angeles County Regulatory Guidelines

The County of Los Angeles addresses cultural resources, historic resources, and paleontologic resources in unincorporated areas within its General Plan (Los Angeles County Department of Regional Planning 2008). Los Angeles County defines cultural resources as;

- Inclusive of historic buildings, structures, artifacts, sites, and districts of historic, archaeological or paleontologic significance, and
- Locations of important historical events, and
- Structures, or groups thereof, possessing unique architectural elements or features that reflect a specific historical period within the local region, and
- Other, not as yet, identified cultural resources of local significance within the natural and/or built environment

- ***Preservation of Cultural, Historic, and Paleontologic Resources within the County of Los Angeles***

COUNTY OF LOS ANGELES REGULATORY GUIDELINES

"The County embraces the importance of protecting cultural heritage resources and is guided in development decisions by federal and state programs that officially recognize these resources" (ibid 2008).

CEQA

As described in the State Regulations above.

State Historic Building Code

As described in the State Regulations above.

Senate Bill 18

As described in the State Regulations above.

Archaeological Resources Protection Act, 1979

As described in the Federal Regulations above.

Native American Heritage Act, 1992

As described in the Federal Regulations above.

Los Angeles County Historical Landmarks and Records Commission

This commission undertakes review and recommendation of cultural, historic, and paleontologic resources identified within the unincorporated areas of the county. The responsibilities of the commission include (1) mandated cooperation with the director of the department of the Los Angeles Museum of Natural History; (2) to consider local cultural, historic, and paleontologic resources of significance as a Californian Historical Landmark (CHL), and/or a California Point of Historical Interest (CPHI); (3) to consider local cultural and historic resources of significance for inclusion in the NRHP; (4) the preservation of historic records; (5) the screening and subsequent approval (if any) of applications for donation and installation on county property of commemorative plaques identifying locations of historic significance.

COUNTY OF LOS ANGELES: GOAL, POLICIES, IMPLEMENTATION

GOALS

"Protected cultural heritage resources" (ibid 2008).

POLICIES (as stated in the Los Angeles County General Plan 2008)

Policy C/OS 12.1: Support an inter-jurisdictional collaborative system that protects and enhances the County's cultural heritage resources.

Policy C/OS 12.2: Support the preservation and rehabilitation of historic buildings.

Policy C/OS 12.3: Ensure proper notification procedures to Native American tribes in accordance with Senate Bill 18.

IMPLEMETATION

"Evaluate the efficacy of the Landmarks Preservation Commission [Historical Landmarks and Records Commission] and the designation of historic landmarks within the unincorporated areas of the County" (ibid 2008).

IMPLEMENTATION GUIDELINES for a MODEL PROJECT in CULTURAL RESOURCE AREAS (as stated in the Los Angeles County General Plan 2008)

If a CEQA analysis determines that a project will impact a cultural resource area (historic, cultural, or paleontological), the following guidelines will apply:

1. A literature search for valid archaeological or paleontological surveys shall be conducted (for each initial study of a public or private project).
2. If an impact or potential impact to a cultural resource is anticipated, a study of the project site shall be made by a qualified archaeologist or paleontologist who shall determine the scientific value of finds, if any, and a recommendation as to their preservation or disposition.
3. The County Historical Landmarks Commission must be notified of all cultural, historical, or paleontological findings.
4. All significant impacts to cultural resource sites must be mitigated to the greatest extent feasible, and a reasonable period of time must be allowed to salvage the site.
5. The integrity of significant historical features of the structure and/or site should be maintained to the largest extent possible.
6. The integrity of sightlines to the structure or site should be maintained.
7. Development adjacent to a cultural resource site should consider design guidelines and appropriate building design, setbacks, landscaping, and other factors that will protect the integrity of the cultural resource area.
8. Materials collected during surface surveys or salvage operations should be donated to an appropriate non-profit institution. In the event the property owner wishes to retain possession of the artifacts found, it is desirable that archaeologists or paleontologist be allowed to study and photograph the artifacts.

CITY OF LOS ANGELES GUIDELINES (includes the Community of Venice)

The City of Los Angeles addresses cultural resources, historic resources, and paleontologic resources within its General Plan (City of Los Angeles General Plan 2001).

- ***PRESERVATION of CULUTRAL, HISTORIC, and PALEONTOLOGIC RESOURCES WITHIN THE CITY OF LOS ANGELES***

CITY OF LOS ANGELES REGULATORY GUIDELINES

CEQA

As described in the State Regulations above.

Archaeological Resources Protection Act, 1979

As described in the Federal Regulations above.

Native American Heritage Act, 1992

As described in the Federal Regulations above.

Native American Graves Protection and Repatriation Act (1984 and 1992)
As described in the Federal Regulations above.

- **CITY OF LOS ANGELES: *Archaeological and Paleontological Objective, Policy and Program (as cited in the City of Los Angeles General Plan 2001):***

  - **Objective:** protect the city's archaeological and paleontological resources for historical, cultural, research and/or educational purposes.
  - **Policy**: continue to identify and protect significant archaeological and paleontological sites and/or resources known to exist or that are identified during land development, demolition or property modification activities.
  - **Program**: permit processing, monitoring, enforcement and periodic revision of regulations and procedures.
  - **Responsibility**: departments of ~~*Building and Safety, *City Planning and Cultural Affairs~~ [Office of Historic Resources as of 2006 (City of Los Angeles Office of Historic Resources website < http://preservation.lacity.org/> 2008)] and/or the *lead agency responsible for project implementation.

- ***CITY OF LOS ANGELES: IMPLEMENTATION***

  Cultural Heritage Ordinance; No. 178,402 (Eff. 4-2-07), as cited in Chapter 9 of the Department of City Planning, Article 1, Cultural Heritage Commission (2007)

  <http://www.preservation.lacity.org/files/Cultural%20Heritage%20Ordinance.pdf>

  The complete text of the **Cultural Heritage Ordinance, No. 178,402** can be found at the above referenced website. Portions of the text relevant to the preservation and protection of cultural resources, and in reference to implementation of the ordinance are included here (formatted for this document).

  - ***Sec. 22.171. Purpose of the Commission.***
    The Cultural Heritage Commission (Commission) shall perform those functions relating to historic and cultural preservation of sites, buildings, or structures that embody the heritage, history, and culture of the City.
  - ***Sec. 22.171.6. Duties of the Commission.***
    In addition to the duties set forth in this article, the Commission shall perform those duties imposed on it by Los Angeles Municipal Code Section 12.20.3 relating to Historic Preservation Overlay Zones.
  - ***Sec. 22.171.7. Definition of Monument.***
    For purposes of this article, a Historic-Cultural Monument (Monument) is any site (including significant trees or other plant life located on the site), building or structure of particular historic or cultural significance to the City of Los Angeles, including historic structures or sites in which the broad cultural, economic or social history of the nation, State or community is reflected or exemplified; or which is identified with historic personages or with important events in the main currents of national, State or local history; or which embodies the distinguishing

characteristics of an architectural type specimen, inherently valuable for a study of a period, style or method of construction; or a notable work of a master builder, designer, or architect whose individual genius influenced his or her age.

- ***Sec. 22.171.8. Inspection and Investigation.***
  The Commission, a sub-committee, or the staff of the Department acting on behalf of the Commission shall inspect and investigate any site, building or structure, including but not limited to, touring, or reviewing photographic or videographic records of the site, building or structure, in the City of Los Angeles, which it has reason to believe is or will in the future be a Historic-Cultural Monument. Inspection and investigation shall also include soliciting opinions and information from the office of the Council District in which the site, building or structure is located and from any department or bureau of the City whose operations may be affected by designating the site, building or structure a Monument.
- ***Sec. 22.171.9. List of Monuments.***
  The Department shall compile and maintain a current list of all sites, buildings and structures, which have been designated as Historic-Cultural Monuments (List of Monuments or List).

*Procedural information pertaining to the **Cultural Heritage Ordinance, No. 178,402** can be reviewed at the above referenced website, or via contact with the City of Los Angeles Office of Historic Resources.*

Native American Consultation Regulations

"Consultation means the process of seeking, discussing, and considering the views of other participants, and, where feasible, seeking agreement with them regarding matters arising in the Section 106 process.(36 CFR Section 800.16 (f))" (ACHP 2008: 6).

Native American Consultation within the CEQA protocol

Consultation with Native American tribes, groups, and interested persons, is an important part of the environmental review process. In 2004, the State of California passed legislation that required such consultation as part of the requirements of environmental projects subject to the regulations of the CEQA. This law is referred to as Senate Bill 18 and the responsibility of initiation and follow-through of the Native American consultation process rests with local governmental agencies (city and county). Essentially, implementation of the SB 18 is a reflection of the Section 106 process at the federal level. Information pertaining to its application is included below. Additional information and can be found within the article "*Senate Bill 18: Expanding CEQA for the Protection of California's Traditional Tribal Cultural Places*" by Rachel Struglia, PhD, AICP (2006), at www.oc-apa.org/newsletters/2006_1st_qrtr.pdf; of *The Orange County Planner* (January/February, March 2006), a quarterly publication .

California Senate Bill 18

In September 2004, the California Legislation passed the Senate Bill 18 (SB 18), authored by Senator John Burton, and Governor Arnold Schwarzenegger signed the bill into law. The SB 18 addresses the regulations and manner in which consultation between agencies, undertaking projects affecting the environment, and Native American tribes, groups, and persons interested in the affect the project will have on the environment. The pertinent language of the law is cited below, with the permission of the Governor's Office of Planning Research, as stated in the document "State of California Tribal Consultation Guidelines; Supplement to General Plan Guidelines" (November 14, 2005). For review of the entire document, you may access it online at <www. opr.ca.gov/programs/docs/09_14_05 Updated Guidelines (922).pdf>.

Intent of Senate Bill 18

The intent of SB 18 is to provide California Native American tribes an opportunity to participate in local land use decisions at an early planning stage, for the purpose of protecting, or mitigating impacts to, cultural places. The purpose of involving tribes at these early planning stages is to allow consideration of cultural places in the context of broad local land use policy, before individual site-specific, project-level land use decisions are made by a local government.

SB 18 requires local governments to consult with tribes prior to making certain planning decisions and to provide notice to tribes at certain key points in the planning process. These consultation and notice requirements apply to adoption and amendment of both general plans (defined in Government Code §65300 et seq.) and specific plans (defined in Government Code §65450 et seq.). Although SB 18 does not specifically mention consultation or notice requirements for adoption or amendment of specific plans, existing state planning law requires local governments to use the same processes for adoption and amendment of specific plans as for general plans (see Government Code §65453). Therefore, where SB 18 requires consultation and/or notice for a general plan adoption or amendment, the requirement extends also to a specific plan adoption or amendment.

Background of Senate Bill 18

The principal objective of SB 18 is to preserve and protect cultural places of California Native Americans. SB 18 is unique in that it requires local governments to involve California Native Americans in early stages of land use planning, extends to both public and private lands, and includes both federally recognized and non-federally recognized tribes. This section provides an overview of California Native American cultural places and California Native Americans.

California Native American Cultural Places

SB 18 refers to Public Resources Code §5097.9 and 5097.995 to define cultural place,

- Native American sanctified cemetery, place of worship, religious or ceremonial site, or sacred shrine (Public Resources Code §5097.9).

- Native American historic, cultural, or sacred site, that is listed or may be eligible for listing in the California Register of Historic Resources pursuant to Section 5024.1, including any historic or prehistoric ruins, any burial ground, any archaeological or historic site (Public Resources Code §5097.995).

These definitions can be inclusive of a variety of places. Archaeological or historic sites may include places of tribal habitation and activity, in addition to burial grounds or cemeteries. Some examples are village sites and sites with evidence (artifacts) of economic, artistic, or other cultural activity. Religious or ceremonial sites and sacred shrines may include places associated with creation stories or other significant spiritual history, as well as modern day places of worship. Collection or gathering sites are specific places where California Native Americans access certain plants for food, medicine, clothing, ceremonial objects, basket making, and other crafts and uses important to on-going cultural traditions and identities; these places may qualify as religious or ceremonial sites as well as sites that are listed or eligible for listing in the California Register of Historic Resources.

Native American cultural places are located throughout California because California Native American people from hundreds of different tribes made these lands their home for thousands of years. Due to the forced relocation of tribes by the Spanish, Mexicans, and Americans, most tribes do not currently control or occupy the lands on which many of their cultural places are located. As a result, California Native Americans have limited ability to maintain, protect, and access many of their cultural places.

California Native American Tribes

SB 18 uses the term, California Native American tribe, and defines this term as “a federally recognized California Native American tribe or a non-federally recognized California Native American tribe that is on the contact list maintained by the Native American Heritage Commission” (NAHC). “Federal recognition” is a legal distinction that applies to a tribe’s rights to a government-to-government relationship with the federal government and eligibility for federal programs. All California Native American tribes, whether officially recognized by the federal government or not, represent distinct and independent governmental entities with specific cultural beliefs and traditions and unique connections to areas of California that are their ancestral homelands. SB 18 recognizes that protection of traditional tribal cultural places is important to all tribes, whether federally recognized or not, and it provides all California Native American tribes with the opportunity to participate in consultation with city and county governments for this purpose. As used in this document, the term “tribe(s)” refers to a California Native American tribe(s).

California has the largest number of tribes and the largest Native American population of any state in the contiguous United States. California is home to 109 federally recognized tribes and several dozen non-federally recognized tribes. According to a 2004 California

Department of Finance estimate, the Native American population in California is 383,197.

Tribal governments throughout California vary in organizational forms and size. Some tribes use the government form established under the Indian Reorganization Act of 1934 (25CFR81) with an adopted constitution and bylaws. Other tribes have adopted constitutions and bylaws that incorporate traditional values in governing tribal affairs. Many tribal governments are comprised of a decision making body of elected officials (tribal governing body) with an elected or designated tribal leader. Some tribes use lineal descent as the means of identifying the tribe's leader. In general, tribal governing bodies and leaders serve for limited terms and are elected or designated by members of the tribe. Tribal governments control tribal assets, laws/regulations, membership, and land management decisions that affect the tribe.

Basic Requirements of SB 18

This section provides a brief summary of the statutory requirements of SB 18. Later sections of the Supplement provide additional detail regarding these requirements and offer advice to local governments on how to fulfill the notification and consultation requirements of SB 18.

Responsibilities of OPR

Government Code §65040.2(g) requires the Governor's Office of Planning and Research (OPR) to amend the *General Plan Guidelines* to contain advice to local governments on the following:

- Consulting with tribes on the preservation of, or the mitigation of impacts to, cultural places.

- Procedures for identifying through the Native American Heritage Commission (NAHC) the appropriate California Native American tribes with whom to consult.

- Procedures for continuing to protect the confidentiality of information concerning the specific identity, location, character, and use of cultural places.

- Procedures to facilitate voluntary landowner participation to preserve and protect the specific identity, location, character, and use of cultural places.

Responsibilities of Local Governments

SB 18 established responsibilities for local governments to contact, provide notice to, refer plans to, and consult with tribes. The provisions of SB 18 apply only to city and county governments and not to other public agencies. The following list briefly identifies the contact and notification responsibilities of local governments, in sequential order of their occurrence.

- Prior to the adoption or any amendment of a general plan or specific plan, a local government must notify the appropriate tribes (on the contact list

maintained by the NAHC) of the opportunity to conduct consultations for the purpose of preserving, or mitigating impacts to, cultural places located on land within the local government's jurisdiction that is affected by the proposed plan adoption or amendment. Tribes have 90 days from the date on which they receive notification to request consultation, unless a shorter timeframe has been agreed to by the tribe (Government Code §65352.3).[6]

- Prior to the adoption or substantial amendment of a general plan or specific plan, a local government must refer the proposed action to those tribes that are on the NAHC contact list and have traditional lands located within the city or county's jurisdiction. The referral must allow a 45 day comment period (Government Code §65352). Notice must be sent regardless of whether prior consultation has taken place. Such notice does not initiate a new consultation process.

- Local governments must send notice of a public hearing, at least 10 days prior to the hearing, to tribes who have filed a written request for such notice (Government Code §65092).

Under SB 18, local governments must consult with tribes under two circumstances:

- On or after March 1, 2005, local governments must consult with tribes that have requested consultation in accordance with Government Code §65352.3. The purpose of this consultation is to preserve, or mitigate impacts to, cultural places that may be affected by a general plan or specific plan amendment or adoption.

- On or after March 1, 2005, local governments must consult with tribes before designating open space, if the affected land contains a cultural place and if the affected tribe has requested public notice under Government Code §65092. The purpose of this consultation is to protect the identity of the cultural place and to develop treatment with appropriate dignity of the cultural place in any corresponding management plan (Government Code §65562.5).

Responsibilities of NAHC

The NAHC is charged with the responsibility to maintain a list of California Native American tribes with whom local governments must consult or provide notices (as required in Government Code §65352.3, §65352, and §65092). The criteria for defining "tribe" for the purpose of inclusion on this list are the responsibility of the NAHC. The list of tribes, for the purposes of notice and consultation, is distinct from the Most Likely Descendent (MLD) list that the NAHC maintains.

Upon request, the NAHC will provide local governments with a written contact list of tribes with traditional lands or cultural places located within a city's or county's jurisdiction. These are the tribes that a local government must contact, for purposes of consultation, prior to adoption or amendment of a general plan or specific plan. The NAHC will identify the tribes that must be contacted, based on NAHC's understanding of where traditional lands are located within the State.

For more information on the NAHC's roles and responsibilities, contact the NAHC.

Other Elements of SB 18

In addition to the notice and consultation requirements outlined above, SB 18 amended Government Code §65560 to allow the protection of cultural places in the open space element of the general plan. Open space is land designated in the city or county open space element of the general plan for one or more of a variety of potential purposes, including protection of cultural places.

SB 18 also amended Civil Code §815.3 and adds California Native American tribes to the list of entities that can acquire and hold conservation easements. Tribes on the contact list maintained by the NAHC now have the ability to acquire, on terms mutually satisfactory to the tribe and the landowner, conservation easements for the purpose of protecting their cultural places.

Native American Consultation within the NHPA Protocol

In 2008, the Advisory Council on Historic Preservation issued a handbook to guide and assist lead agencies, and other entities, with the federal Native American consultation process, within the regulatory framework of Section 106 of the NHPA. The information contained below is a summary of pertinent portions the handbook, and does not go into great detail regarding the history and or nuances of the practice of Native American consultation between lead agencies and tribal groups. The entire handbook can be downloaded at the ACHP's website; <www.achp.gov/regs-tribes2008.pdf>.

First and foremost, consultation between lead agencies and Native American tribes should be undertaken at a government-to-government level. This government-to-government consultation is derived from the relationship between the federal government and tribal groups of federally recognized status, per Executive Order 13175 (2000).

> Legally, there is a distinction between Indian tribes who are federally recognized and those who are not. Federal recognition signifies that the U.S. government acknowledges the political sovereignty and Indian identity of a tribe and from that recognition flows the obligation to conduct dealings with that tribe's leadership on a "government-to-government" basis. When federally recognized tribes speak of "government-to-government" consultation, they are often referring to consultation between a designated tribal representative and a designated representative of the federal government.

Executive Order 13175 (2000), *Consultation and Coordination with Tribal Governments* lists as one of its purposes "to strengthen the United States' government-to-government relationships with Indian tribes…" President George W. Bush's 2004 *Presidential Memorandum on Government-to-Government Relationship with Tribal Governments* reaffirmed this policy, stating, "[m]y administration is committed to continuing to work with federally recognized tribal governments on a government-to-government basis and strongly supports and respects tribal sovereignty and self-determination for tribal governments in the United States. "Thus, the government-to-government consultation process continues to embody the unique relationship between the United States and Indian tribes" (ACHP 2008:2).

- **Regulatory Requirements for Native American Consultation**

Federal statutes, or regulations, and Executive Orders provide the legal framework for the context in which consultation between agencies and Native American consultation transpires. It is important to remember that such consultation is required of federal agencies acting as lead agency, whenever a project traverses federal or tribal lands, or whenever a project utilizes federal monies, regardless of the determination of lead agency. The following is full text citation of the broad summaries stated in the federal statutes and Executive Orders pertaining to Native American consultation within the Section 106 process, as presented in the aforementioned Handbook prepared by the ACHP (2008: 1-8).

Statutes

Amended in 1992, the **National Historic Preservation Act of 1966 (NHPA)** is the basis for tribal consultation in the Section 106 review process. The two amended sections of NHPA that have a direct bearing on the Section 106 review process are:

• **Section 101(d)(6)(A),** which clarifies that properties of religious and cultural significance to Indian tribes may be eligible for listing in the National Register of Historic Places; and

• **Section 101(d)(6)(B),** which requires that federal agencies, in carrying out their Section 106 responsibilities, consult with any Indian tribe that attaches religious and cultural significance to historic properties that may be affected by an undertaking.

The Section 106 regulations incorporate these provisions and reflect other directives about tribal consultation from executive orders, presidential memoranda, and other authorities.

• Section 106 requires federal agencies to consider the effects of their undertakings on historic properties and to provide the ACHP an opportunity to comment. Also known as the Section

106 review process, it seeks to avoid unnecessary harm to historic properties from federal actions. The procedure for meeting Section 106 requirements is defined in the Section 106 regulations, 36 CFR. Part 800, “Protection of Historic Properties.”

The Section 106 regulations include both general direction regarding tribal consultation and specific requirements at each stage of the review process. (Section 106 is discussed more fully in the next section, “Consultation with Indian Tribes under Section 106 of NHPA.”)

For more information about the NHPA and the ACHP’s regulations, visit www.achp.gov

Legal Acts

- **The National Environmental Policy Act of 1969 (NEPA)** requires the preparation of an environmental impact statement (EIS) for any proposed major federal action that may significantly affect the quality of the human environment. While the statutory language of NEPA does not mention Indian tribes, the Council on Environmental Quality (CEQ) regulations3 and guidance4 do require agencies to contact Indian tribes and provide them with opportunities to participate at various stages in the preparation of an environmental assessment or EIS. CEQ has issued a Memorandum for Tribal Leaders encouraging tribes to participate as cooperating agencies with federal agencies in NEPA reviews.

- **The American Indian Religious Freedom Act of 1978 (AIRFA)** establishes the policy of the federal government “to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including, but not limited to, access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.”

- **The Native American Graves Protection and Repatriation Act of 1990 (NAGPRA)**, Section 3(c) requires federal land-managing agencies to consult with federally recognized Indian tribes prior the intentional removal or excavation of Native American human remains and other cultural items as defined in NAGPRA from federal lands.

* On tribal lands, planned excavation requires the consent of the appropriate Indian tribe (43 CFR § 10.3).

In instances where a proposed project that is funded or licensed by a federal agency may cross federal or tribal lands, it is the federal land managing agency that is responsible for compliance with NAGPRA. Detailed information about NAGPRA and its implementing regulations is available at the National Park Service (NPS) National NAGPRA Web site.

Executive Orders

- **Executive Order 13175, "Consultation and Coordination with Indian Tribal Governments"** (2000), directs federal agencies to respect tribal self-government and sovereignty, tribal rights, and tribal responsibilities whenever they formulate policies "significantly or uniquely affecting Indian tribal governments." The executive order applies to all federal agencies other than those considered independent federal agencies, encouraging "meaningful and timely" consultation with tribes, and consideration of compliance costs imposed on tribal governments when developing policies or regulations that may affect Indian tribes.

- **Executive Order 13007, "Indian Sacred Sites"** (1996), applies to all federally owned lands except "Indian trust lands." It encourages land managing agencies to:

  • accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners; and

  • avoid adversely affecting the physical integrity of such sites.

- **Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"** (1994), is designed to focus federal attention on the environmental and human health conditions in minority communities and low-income communities. It is also designed to promote non-discrimination in federal programs substantially affecting human health and the environment.

  • Section 6-606 of the order states that, "each federal agency responsibility set forth under this order shall apply equally to Native American programs."

The following information is also cited in its entirety from the handbook to clarify the Section 106 process (ACHP 2008: 8,9), as well as, <www.achp.gov/regs-rev04.pdf >.

Regulatory Principles and General Directions for Section 106 Tribal Consultation

The procedures for meeting Section 106 requirements are defined in the Section 106 regulations, "Protection of Historic Properties" (36 CFR Part 800).9 Under the NHPA, "historic properties" are defined as those properties that are listed on the National Register of Historic Places, or are eligible for such listing.

The regulations provide both overall direction as well as specific requirements regarding consultation at each step of the Section 106 review process. The Section 106 regulations at 36 CFR Section 800.2(c)(2) outline the following important principles and general directions to federal agencies regarding consultation with tribes:

• The agency shall ensure that consultation provides the Indian tribe a reasonable opportunity to identify its concerns about historic properties; advise on the identification and evaluation of historic properties, including those of traditional religious and cultural importance to them; articulate its views on the undertaking's effects on such properties; and participate in the resolution of adverse effects.

• Tribal consultation should commence early in the planning process, in order to identify and discuss relevant preservation issues and plan how to address concerns about confidentiality of information obtained during the consultation process.

• Historic properties of religious and cultural significance to an Indian tribe may be located on ancestral (also referred to as aboriginal) homelands, or on officially ceded lands (lands that were ceded to the U.S. government by the tribe via treaty). In many cases, because of migration or forced removal, Indian tribes may now be located far away from historic properties that still hold such significance for them. Accordingly, the regulations require that agencies make a *reasonable and good-faith effort* 10to identify Indian tribes that may attach religious and cultural significance to historic properties that may be affected by the undertaking, even if tribes now are located a great distance away from such properties and undertakings.

• The agency official shall ensure that consultation under the Section 106 review process should be respectful of tribal sovereignty in conducting consultation and must recognize the government-to-government relationship that exists between the federal government and federally recognized Indian tribes.

• An Indian tribe may enter into an agreement with a federal agency regarding any aspect of tribal participation in the review process. The agreement may specify a tribe's geographic area of interest, types of projects about which they wish to be consulted, or provide the Indian tribe with additional participation or concurrence in agency decisions under Section 106 provided that no modification is made to the roles of other parties without their consent.

The Section 106 regulations recognize an Indian tribe's sovereign authority regarding proposed undertakings *on or affecting its tribal lands* in several ways. The regulations require the federal agency to provide the THPO, as appropriate,11 an opportunity to review, and thus to concur with or object to, agency findings and determinations. The regulations also require federal agencies to invite the THPO (or designated tribal representative, if the tribe has not assumed THPO duties) to sign a Memorandum Of Agreement (MOA) as well as a Programmatic Agreement (PA). If the THPO/tribe terminates consultation, the ACHP must provide comment to the head of the agency rather than execute an agreement without the tribe.

> While the Section 106 regulations are fairly prescriptive in nature, they only direct agencies on what to do and at which stages of the process to engage in consultation. They do not direct exactly how to carry out consultation.

*Refer to the referenced handbook for additional detail on the implementation of Native American consultation within the regulatory framework of the NEPA and NHPA. Specifically, see Section V(A)(3) of the handbook for "tips on how to fulfill this requirement…under the heading 'How do I indentify tribes the must be invited to consult."

Project Personnel

Shannon L. Loftus is a Certified Architectural Historian and Senior Staff Archaeologist for APRMI. She holds a Master of Arts degree in Historic Preservation, with an emphasis on historic structure assessments and evaluations from Savannah College of Art and Design, Savannah, Georgia (2007); and a Bachelor of Arts degree in Anthropology from Union Institute and University, Cincinnati, Ohio (2002). Ms. Loftus is a Registered Professional Archaeologist (RPA) with over nine years experience in Cultural Resource Management (CRM). She satisfies the *Secretary of the Interior's Professional Qualifications Standards* as a professional archaeologist and architectural historian. In addition, she possesses paleontological field experience pertaining to late Pleistocene terrestrial fossils within Los Angeles and Orange Counties.

Robin D. Turner is the Principal Investigator for APRMI. She holds a Masters of Arts degree in Anthropology, with an emphasis on Public Archaeology, from California State University, Northridge (1995); and a Bachelor of Arts degree in Anthropology, from CSU Northridge (1991). Ms. Turner possesses over 20 years of experience in the CRM and the paleontologic field, and has conducted major field and technical investigations throughout southern California. She satisfies the *Secretary of the Interior's Professional Qualifications Standards* as a professional archaeologist. Additionally, Ms. Turner has worked in the paleontologic field for over 20 years. She strictly adheres to the Society for Vertebrate Paleontology Standards as a qualified paleontologist.

BACKGROUND

Geologic and Natural Environment

Topographically, all four of the Project areas are located within the Los Angeles Lowland Province (Hartman 1970), of the Los Angeles Basin; a relatively flat wedge-shaped area between the Transverse and Peninsula Mountain Ranges. Specifically, the Project area is situated a little over 1-mile inland from the Pacific Ocean, south of the Santa Monica Mountains, part of the east/west Transverse Mountain Ranges, and north of Baldwin Hills which is part of the Inglewood-Newport earthquake fault system. The area is also characterized by the east/west Interstate 10, also known as the Santa Monica Freeway to the north, the north/south Pacific Coast Highway, or Highway 1 to the west, and the expansive fine-grained sandy beaches to the west and southwest. The closest body of fresh water is Ballona Creek, part of the ancestral Los Angeles River, several miles to the south.

As previously stated, the surface geology of the area consists mostly of recent alluvial sedimentary deposits overlying the deeper non-marine deposits of the Pleistocene Epoch. The Santa Monica Mountains are located to the north and are comprised of alluvial gravels, sand, silt-clay (Qa), and includes gravels and sands of stream channels, as well as the metamorphic bedrock of the Franciscan Formation (Dibblee Jr. 1991). In particular, the Penmar Project Area lies at the base of a marine terrace (Qom) on which the Santa Monica Municipal Airport also lies. Oceanic tides and/or currents have cut the steep slope of the terrace and the cliffs near the Santa Monica Pier, as with other areas of the current Southern California coast line (e.g., Palos Verdes Peninsula and San Onofre State Beach). The Baldwin Hills are located to the south and are comprised of upper Pliocene marine deposits (Pu), Pleistocene marine and non-marine terrace deposits (Qm), overlain by recent Quaternary alluvium sediments (Qal) (Jennings and Strand 1991).

Historic and recent land-use changes have altered the natural environment of the Project area. Presently, all four of the Project Areas lack a strong presence of the native flora, and is comprised of mixed-use residential and public facility development, to include, modern landscape, streetscape, golf-course landscaping, imported plants and trees interspersed within the built environment.

Ethnographic Setting

The Project Areas are located in a region that was once the territorial homeland of the Gabrielino *Tongva* people, a Shoshonean branch of Takic speakers of the Cupan language group (Bean and Smith 1978). General Gabrielino territory ranged within the Los Angles Basin, from Aliso Creek in the south to Topanga Canyon in the north, and included the four southern Channel Islands, as well as the watersheds of the Los Angeles, San Gabriel, and Santa Ana Rivers (Maki 1995). The Gabrielino were an immigrant population from the Great Basin having displaced the Hokan groups who are believed to have previously inhabited the area (Maki 1995; Kroeber 1925; Harrington 1962).

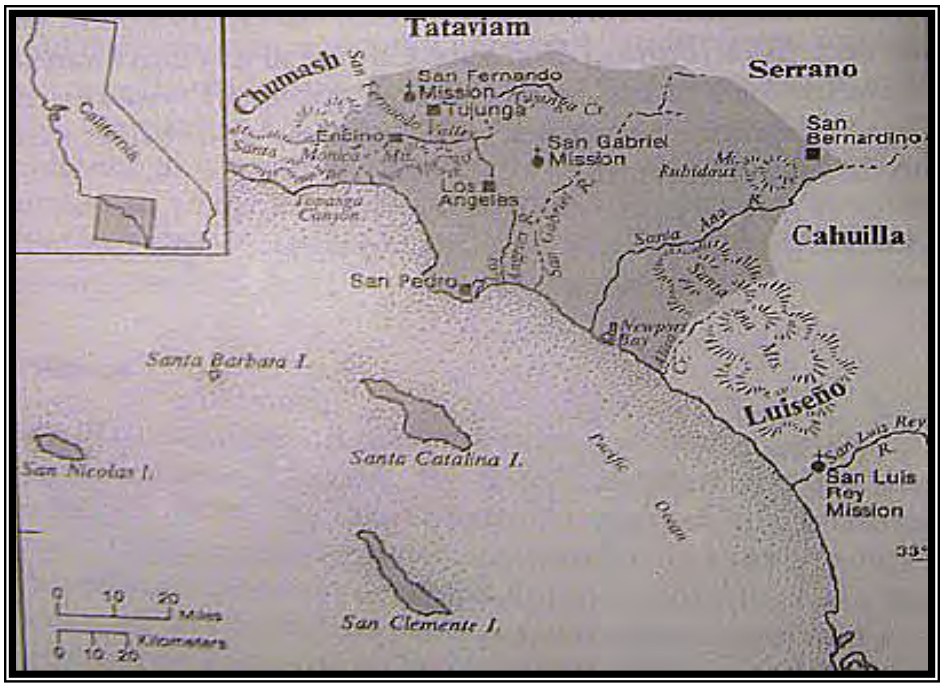


Figure 4. Gabrielino/*Tongva* territory (as depicted in Bean and Smith 1978).

Within this territory, it is estimated that there were in excess of 50 to 100 mainland villages with populations averaging between 50 and 100 people. These villages appeared to have been politically autonomous, and were composed of non-localized lineages led by political elites. This territory contained a broad and diverse ecological environment and resource base, thereby enabling the Gabrielino to facilitate complex trade networks with other coastal groups, such as their Chumash neighbors to the north, and interior groups, such as the Kitanemuk of the Antelope Valley in the northeast. Local goods such as steatite, shell beads, dried fish, and sea otter pelts were exchanged for acorns, seeds, and obsidian of other coastal and interior groups throughout southern California and Arizona (Bean and Smith 1976; Kroeber 1925). This wealth of resources, coupled with a well-developed complex trade network and political system afforded the Gabrielino with one of the wealthiest and most sophisticated California Indian societies in southern California.

Of special importance to the Gabrielino (or *Tongva* people of this localized area) within the Project area was the *Cahuenga*, or "Place of the Little Hills" (Torrence, 1979), that is, the Santa Monica Mountains to the north and northeast of the Project area. Additionally, the mission registers of the San Fernando and San Gabriel Missions identify baptisms for a village within Santa Monica, possibly *Komikranga* (*Comicrabit*), near the mouth of the Santa Monica Canyon (King 1996).

Historic Context

Prehistoric Period

Prior to the Shoshonean immigration from the Great Basin, and subsequent Gabrielino/*Tongva* habitation circa 2500 years-before-present (B.P.), the entire Los Angeles region was possibly occupied in excess of 20,000 years, as evinced by the archaeological discoveries at Ballona Creek, the La Brea Tar Pits, Malaga Cove, and the Los Angeles Basin in general (Starzak 1994: 7). A generally accepted chronology of four distinct Horizons for the region has been devised by W.J. Wallace (1955); A Suggested Chronology for Southern California Coastal Archaeology, in *The Southwestern Journal of Anthropology* 11 (3): 214-230. The generalized themes of Wallace provide the foundation for the regional prehistory and include the **Early Man Period (>12,000 B.P. to 6000 B.P.)**, the **Millingstone Period (6000 B.P. to 1000 B.C.)**, the **Intermediate Period (1000 B.C. to 750 A.D.)**, and the **Late-Prehistoric Period (750 A.D. to European Contact**, or the **Spanish Period ca 1533 to 1821**).

Horizon I, described as the **Early Man Period**, began with the arrival of the first inhabitants of the region approximately 12,000 B.P. to 6,000 B.P. This period is characterized by the presence of nomadic and semi-nomadic hunter-gatherer groups who exploited coastal and inland environments for food and shelter. Many early sites were located on the shorelines of ancient lakes and marshes, as well as, along stream channels and estuaries. These groups appeared to be primarily big game hunters who followed large and medium-sized animals during seasonal rounds.

A summary of the most famous Early Man Period discoveries is included below.

Los Angeles Man

> "The first evidence of human presence here [Los Angeles basin] are the remains of 'Los Angeles Man' dated to 23,000 B.P. and the La Brea Tar Pit female skeleton [La Brea Woman] which was dated to 9000+/- B.P. (Moratto 1984). These and other remains are grouped into what may be called the Early Period which dates from the first occupation of California ca. 7,000 B.P." (Stickel 1994: 7).

Los Angeles Man was discovered in 1936 along the Los Angeles River, north of the Baldwin Hills at Ballona Creek (southeast of the Project area), and within the geologic matrix of a Pleistocene-era streambed. Specifically, the remains were identified as skull and long-bone fragments (Moratto 1984:52-53). "A ^{14}C [Radio-carbon] age of > 23,600 B.P (UCLA-1430) was obtained from collagen samples (too small for a finite date), making the Los Angeles skull the oldest radio-carbon dated human remains in the Western Hemisphere (Berger et al 1971, as cited in Moratto 1984:53)" (Moratto 1984:53). Other testing [aspartic-acid racemization] indicated a date ~26,000 years (Bada et al., 1974, as cited in Moratto 1984:53). Dating of this age has been debated by scientists and still await confirmation.

During the same year (1936) Imperial Mammoth remains were unearthed in the same Pleistocene-era streambed "370m [meters] distant from the human remains" (Clements 1938 as cited in Moratto 1984: 53). Further testing [fluorine content] suggested the mammoth and human remains were possibly contemporaneous (Heizer and Cook 1952, as cited in Moratto 1984: 53).

Angeles Mesa Remains

The remains of six gracile human skeletons were discovered at a moderate depth (6-8 feet) in the sand/clay matrix of the Angeles Mesa, between Los Angeles and Culver City (east of the Project area). "The deep burial, lack of evident disturbance, and permineralization of the bones may imply respectable antiquity (Wallace 1955a, as cited in Moratto 1984: 53)." The remains were never dated, however, and it remains unclear as to their whereabouts, thus temporal assignment of the remains is speculative (Moratto 1984: 53).

Laguna Beach Skull

Many miles south of the Project area, in 1933, the Laguna Beach skull and long bone fragments were discovered in a sandy-loam near the beach. The geologic matrix "was that of late Wisconsin sediments re-deposited during the Holocene" (Moratto 1984: 52). Radio-carbon dating was performed by UCLA [UCLA 1233A] at the request of L.S. B. Leakey; this radio-carbon test of the bone collagen returned the date 17,150 +/- 1470 B.P. (Berger et al. 1971; Borden 1969, as cited in Moratto 1984: 52). A radio-carbon dating test of the skull fragments indicated an age range of >14,800 B.P. [UCLA 1233B] (Protsch 1978, as cited in Moratto 1884: 52).

This find (the skull in particular) was further investigated in the late 1960s via an archaeological excavation. Mussel shell fragments were recovered and subjected radio-carbon testing and yielded dates of 8950 +/- 80 and 8300 +/- 80 B.P. However, the Laguna Beach skull find is scientifically-suspect for;

> "…it is possible that either the shell or collagen age determination, or both, are in error (14C dates derived from bone and shell generally are not as reliable as those from charcoal), or the skull actually may have been found somewhat deeper than remembered. It is not even certain whether the skull that was dated was indeed the original specimen (Bada and Masters 1978: 19" (as cited in Moratto 1984: 52).

However, the Early Man Period is a contentious temporal chronology for "most sites of purported great antiquity (in excess of 15,000 years) are centered in the Mojave [Calico Early Man Site] and Colorado deserts of eastern California, or in coastal southern California" (Goldberg et al. 1999: 17). For example, the La Brea Woman skeletal remains were subjected to additional investigation when "during the 1970s, complex chemical tools [were] used to decontaminate the human bone [La Brea Woman] of intrusive carbon, and a treated collagen sample was

dated to 9000+/- 80 B.P. [UCLA-1229BB] (Berger et al. 1971 as cited in Goldberg et al. 1999: 18).

The Early Man Period is synonymous with the transition from the Late Pleistocene to the Early Holocene Epoch. One of the more notorious Early Man Period cultural trends was the San Dieguito Complex (ca. 10,000 B.P), described as a hunting tradition by Claude Warren in 1968 (Cultural Traditions and Ecological Adaptation on the Southern California Coast, in C. Irwin Williams (editor) *Archaic Prehistory in the Western United States; Portals*: *Eastern New Mexico University Contribution in Anthropology* 1(3) 1-14). This hunting tradition of Warren's is comprised of the following attributes:

> "nomadic big-game hunters, percussion-flaked scrapers and knives; large well-made stemmed, fluted, or leaf-shaped projectile points (Lake Mojave/Silver Lake), crescentics, core/cobble tools of hefty size, hammerstones, bifacial cores, choppers, scraper-planes [as well as, an] absence of milling[stones] indicative of hunting society" (Warren 1968, 1980 and Wallace 1978, as cited in Goldberg et al. 1999: 17).

Other terminologies applied to the cultural traditions of this period include the Paleo Indian Period, Clovis, Folsom, Llano, or Big Game Tradition (Dillon 1994:10-11).

It is believed that the earliest evidence of long-term occupation within the region was circa 9000 B.P., nearly contemporaneous with the termination of the Early Man Period and a marked transition from big-game hunting to a lifestyle of sedentism and permanency (Strauss 2004: 13; Dillon 1994: 13). Dillon (ibid.) states that two different cultural traditions likely overlapped; the hunting tradition of the San Dieguito Complex, and the sedentary seasonally-based hunting-gathering traditions of the Millingstone Complex. The former gave way to the latter circa 6000 B.P and signified a social and cultural evolution toward sedentism, and a diversified subsistence that relied heavily upon seasonal gathering. This shift in subsistence marks the beginning of Horizon II.

Horizon II, also known as the **Millingstone Period**, is based on the presence of the use of culinary tools, began approximately 6,000 B.P and lasted until 1,000 B.C. The hallmarks of the Millingstone Period are (1) extensive use of millingstone implements, such as portable manos and metates (Dillon 1994: 16), suggestive of hard seed processing, and (2) core tools. The earliest portion of this period "…suggests a generalized plant collecting economy in operation, which was supplemented by hunting and fishing. Regional interaction appeared to be limited when compared to later period(s)" (Starzak 1994: 7). The Millingstone Period is indicative of increased sedentism, long-term habitation within an established settlement, cultural adaptation toward the coastal and water perimeters, along lakes, streams, lagoons, and estuaries. There is great diversification of subsistence strategies, such as seasonal rounds-based residential camps (ibid.), during the Millingstone Period; some sites evince a greater reliance upon shellfish, small mammals, and birds, as well as plant resources, and less emphasis upon hunting and fishing.

With respect to the Project area, the cultural tradition associated with the Gabrielino/*Tongva* during the Millingstone Period is the Topanga Complex; typically affiliated with the Santa Monica region of the Los Angeles Basin. However, with respect to the Topanga Complex of the Gabrielino within the Project study area it must be pointed out that,

> "The early Millingstone Horizon in Los Angeles County cannot be definitively associated with any ethno historic Indian group or language family, although we presume that it was basic to most if not all subsequent human settlement. Certainly, in its earliest form it preceded and was completely different from the later Canalino tradition that evolved into the ethno historic Chumash and Gabrielino cultures" (Dillon 1990: 11).

Horizon III is identified as the **Intermediate Period**, a subsistence strategy shift within the Millingstone Period that lasts from approximately 1,000 B.C. to 750 A.D. During the latter part of the Millingstone Period and throughout the Intermediate Period, the mortar and pestle appear extensively in the archaeological record suggesting increased reliance upon the acorn as a dietary staple, and a noticeable shift away from the hard seed exploitation of the earlier Millingstone Period (Starzak 1994: 7; Koerper 1981; Mason et al. 1997:). Additionally, projectile point and faunal remains indicate increased land and sea exploitation as well as seasonal hunting and gathering subsistence strategies (Strauss 2004: 13-14). The artifact assemblages of this period are diverse and include broad leaf shaped blades, heavy stemmed projectile points in association with terrestrial and aquatic bone, antler and bone tools, asphaltum, steatite, the bow and arrow, and arrow shaft straighteners (Goldberg et al 1999: 21). These artifact types are suggestive of possible Shoshonean influence, immigration, and possible Hokan displacement or replacement (Rogers 1929 and Wallace 1978, as cited in Goldberg et al. 1999: 21), or increasing socio-cultural complexity, such as trade (King 1990, Koerper 1981, and Moratto 1984, as cited in Goldberg et al. 1999: 21).

Horizon IV, considered the **Late Prehistoric Period**, began approximately 750 A.D. and terminated at the time of European contact. This period is characterized by greater population density and socio-cultural complexity. There is, beginning approximately 1500 B.P., an increased use of the bow and arrow, bedrock mortars and milling slicks, indicative of the transition from the Intermediate to the Late Prehistoric Period, which continued to the period contact (Goldberg et al. 1999: 22). With respect to the Gabrielino/*Tongva*, there are, as well, large open settlement sites with dense midden deposits, and adaptation to rock shelter habitation along ridge tops and in the upper reaches of canyons.

Since the bow and arrow was widely used during this period, there was a greater reliance upon fishing and sea mammal hunting. The artifact assemblages of this period tend to be more diverse and elaborate, and include evidence of trade goods, indicative of increasing intricacy with respect to trade networks and social contact with other groups. The evidence includes small bird points, mortar and pestle, steatite ornaments, cogged stones, stone discs, perforated stone discs, circular shell fish hooks, bone tools, bone and shell ornaments, asphaltum,

steatite and shell beads, fire affected rock, and elaborate mortuary customs (Goldberg et al. 1999: 22; Mason et al. 1997), and points to increased religious or ceremonial complexity and deity worship, such as the *Chinigchinich* culture (Bissell and Gust 2001: 7) of the Gabrielino/T*ongva*, and other southern California Indian tribes.

With respect to the Gabrielino/*Tongva*, the populace of a settlement tended to be quite large, possibly between 50-200 inhabitants (Bean and Smith 1978: 540), or even larger judging by the statement "…each village generally contained from 500 to 1500 huts" (Reid, in Dakin 1939: 222, as cited in Dillon 1994: 34 [unknown pop.]) and potentially with smaller inland seasonal camp affiliation (Starzak 1994: 8). Gabrielino/*Tongva* houses were said to have been "made of sticks, covered in [and] around with flag (tule) mats worked or platted…" (Reid in Dakin 1939: 222, as cited in Dillon 1994: 34).

The *Chinigchinich* religion is estimated to ca 1500 A.D., the latter part of the Late Prehistoric Period and was relatively new to the Gabrielino/*Tongva* culture at the time of contact with the early Spanish explorers (McCawley 1946: 144, as cited in Bissell and Gust 2001: 7). The *Chinigchinich* religion was one of polytheism that likely influenced the social and cultural values and mores of the Gabrielino/*Tongva*.

> "The center of the Gabrielino/Tongva religion was the Chinigchinich, the last of a series of heroic mythological figures who created mankind, gave instruction on laws and institutions and then died. He then rose to the stars to sit in judgment of the people, rewarding the faithful and punishing those who disobeyed the laws" (Kroeber 1925: 637-638, as referenced in Bissell and Gust 2001: 6).

Kroeber (1925: 637-638) further documented some of the practices of the *Chinigchinich* religion, such as the ceremonial center or *Wankech* (Gabrielino), an enclosure housing a likeness of *Chinigchinich* at each village site, and the association of the religion with the *toloache* cult, a spiritual use of the hallucinogenic datura [Jimsonweed] plant (Kroeber 1925: 622, 640-641; Bean and Shipek 1978:550; and Bissell and Gust 2001: 7).

Additional socio-cultural complexity with regard to the cosmology, or spiritual and religious beliefs, of the Gabrielino/*Tongva* is found in Dillon's work (1994);

> "A church called a *Yobagnar*, which was circular and formed [of] short stakes, with twigs of willow entwined in basket fashion, to the height of three feet. This church was sacred, but was consecrated nevertheless every time it was used. This took the entire day, being done by the seers in a succession of different ceremonies. There was also an unconsecrated one [church] used for the purpose of rehearsing in and teaching children, dedicated to this end, to dance and gesticulate…The only one admitted into the church were the seers and captains, the adult male dancers, the boys training for the purpose, and the female singers. But, on funeral occasion, relatives of the deceased were allowed to enter" (Reid in Dakin 1939: 229, as cited in Dillon 1994: 34-35).

In the mid 16th Century, the Spanish arrived in Gabrielino/*Tongva* territory initiating European Contact with the Native Californians. The chronological periods and temporal affiliation following the time of contact are considered to be

of historic type and are discussed below. In addition, a brief history of the development of the communities of Venice and neighboring Santa Monica are included as well.

Historic Period

Historic cultural resources are generally more than 45 years of age and range from the earliest time of contact with Europeans to around the year 1960. This near 500-year span of time gives ample opportunity for the development of numerous types of cultural resources that may be recorded and possibly evaluated as significant, important, or unique under current cultural resource protection laws. The site types include trails and highways, homesteads and other structures or buildings, remnants of single or time-based use activities such as trash deposits, and historically documented landscape sites such as the camp sites of the Spanish explorer Gaspar de Portola. The following discusses the historic setting in three parts: **The Spanish Period (ca. 1533 to 1821), the Mexican Period (1821 to 1848), and the American Period (1848 to Present).**

The Spanish were the first known Europeans to explore and colonize the land area of what today is known as California. This includes Alta California (presently known as the State of California, U.S.A.), and Baja California, (presently known as the Mexican states of Baja California Norte and Baja California Sur). This summary will focus only on Alta California in general, and more specifically, the Lowland Province of the Los Angeles Basin. This period of time is referred to as **the Spanish Period (circa 1533 to 1821)**.

The early reconnaissance of California began in 1540 with Hernando de Alarcon's ocean expedition traveling northward up the Gulf of California and into the mouth of the Colorado River, thus making those travelers the first Europeans to enter California. From 1542 to 1543, Juan Rodriguez Cabrillo led an ocean expedition to explore the coastal perimeter of California (Laylander 2000). Cabrillo and his crew first stepped ashore at the present day harbor of San Diego, claiming California for the King of Spain in 1542. He is also believed to have made port in the Bay of Santa Monica that same year (Gabriel 2006). The Cabrillo expedition visited most of the Channel Islands and the land near the City of Ventura, and sailed as far north as Monterey Bay, possibly as far north as Point Reyes, although the expedition failed to sight San Francisco Bay.

Later, by the 1560s, Spain controlled all of the Pacific Ocean and the Philippine Islands served as the major commercial outpost in Asia. Galleons out of Manila first sailed northward to the Japan Current, then eastward to the northern California coast, and finally southward to Mexico. Because of the long and arduous trip, many galleons stopped along the coast looking for food and water, thus coming into contact with the local Native Californians, for example, Sir Francis Drake's five week encampment north of the San Francisco Bay in 1579 (Heizer 1947; Lee 1968).

Drake's raids in the Pacific for the English Crown prompted New Spain to undertake additional ocean expeditions to better map California. The ultimate

objective of these Spanish expeditions was the establishment of ports to protect and refurbish the Manila Galleons. Sebastián Vizcaíno, in 1602-1603, mapped and described the coast in great detail and proposed a Spanish settlement in Monterey, although this was not a reality until approximately 170 years later. These early Spanish expeditions made contact with the local Native Californians, facilitated trade networks and set the stage for future Spanish colonization, resulting in the eventual decline of the Native Californian population.

The colonization of California by the Spanish began in 1769 with the arrival of the Franciscan administrator Junípero Serra and the Spanish military under the command of Gaspar de Portolá in San Diego. Thus began the eventual establishment of twenty-one California Missions and Spanish Missionization efforts, the purpose of which was to "convert" the Native Californians to Catholicism within a ten year period and then return the Mission lands to the Indians.

At the time of the Spanish arrival, population estimates of California Indians are placed at about 310,000 individuals. By the end of the Spanish reign, through unhygienic Spanish population centers (essential labor camps), European disease, incarceration of Indians, excessive manual labor demands and poor nutrition, the population declined as a result of over 100,000 fatalities, nearly 1/3 of the California Indians (Castillo 1998).

The year 1821 marks the beginning of the **Mexican Period (1821 to 1848)** and is synonymous with Mexico's independence from Spain. Mexico becomes California's new ruling government, and at first, little changed for the California Indians. The Franciscan missions continued to enjoy the free unpaid labor that the natives provided, despite the Mexican Republic's 1824 Constitution's declaration that the Indians were Mexican citizens. This monopoly of Indian labor by a system which accounted for nearly 1/6 of the land in the state angered the newly land-granted colonial citizens, whose cattle ranches and farms (*ranchos*), not to mention households, also relied on the Indian workforce. The famed *vaqueros* (cowboys) were often Indians or Indian descendents. There were uprisings by Indians. All these factors led to the eventual secularization and collapse of the mission system by 1834. Although return of the Missions' land to the Indians was mandated by original government policy, little land was distributed back to them.

During this time period, citizens from other European countries began to make their presence felt in California. The Russians founded Fort Ross in 1812 north of San Francisco and Americans began to make contact with Mexican colonists. American ships from Boston traded with the towns and Missions mostly for tallow and hides. In addition, American trappers and hunters begin to operate in the state, entering from the east by land. Between 1826 and 1836, it is believed that 41 immigrants of American, French, and German descent arrived in Los Angeles. The first recorded individual was Jedediah Smith (Dillon 1994: 53-54; Goldberg et al. 1999: 29).

American military forces were present within California during the summer of 1846 as a result of the Mexican-American war. In 1847, on January 13, the Treaty of Cahuenga, signed at *Campo de Cahuenga* by Andrés Pico, ended the conflict between the American forces and the Californians within California. Rapidly, Mexican resistance deteriorated and the United States occupied Mexico City in 1848, marking the beginning of the **American Period (1848 to Present)**. California becomes a U.S. holding with the signing of the Treaty of Guadalupe Hidalgo in February of 1848. This treaty ended the Mexican-American war, and ceded much of the southwest (California, Nevada, Utah, and portions of Arizona, New Mexico, Colorado, and Wyoming) to the United States. A month earlier, January 24, 1848, gold was discovered along the American River, near Sacramento. The following year resulted in 100,000 adventurers, known as "49-ers" descending upon California. That same year, 1849, California petitioned Congress for admission to the Union as a "free state." As a result of the Compromise of 1850, California was admitted to the Union as the 31st state on September 9, 1850, and as a slave-free state (www.parks.ca.gov/?page-id=23856; and www.pbs.org/wgbh/aia/part4/4p2951.html).

Meanwhile, California adapted "*An Act for the Government and Protection of Indians*" (Chapter 133, Statutes of California, April 22, 1850) enacting Justices of the Peace jurisdiction in all complaints by, for, or against Indians. The result of this action was the denial of the right of citizenship guaranteed in the Treaty of Guadalupe Hidalgo. In addition, then Governor McDougall promised in his first address to the state legislature "… a war of extermination will continue to be waged between the races until the Indian race becomes extinct…" (Castillo 1998). This law was finally repealed in 1863 with the enactment of President Lincoln's *Emancipation Proclamation*.

At the federal level, Congress had created a commission to validate land claims in California requiring all individuals to present documents regarding the nature of their claims within a two year period. The practical result was the complete dispossession of all the land for all the California Indians. Later, in 1852, Congress authorized three federal officials to make treaties with the California Indians with the goal of extinguishing all land titles and to provide the various Indian tribes reservation land. These federal authorities were poorly equipped to handle this daunting task; few of the Indians could speak English; translators were often non-existent; and many tribes failed to be contacted. The results were treaties which did not fairly represent the California Indians. The signed treaties become known as the "Lost 18 Treaties of 1852." Later that same year, Congress failed to ratify the treaties and they were filed with an injunction of secrecy that was finally removed in 1905 (Castillo 1998). Today, some California Indians do have reservation land, while others remain landless and unrecognized by the U.S. government, and are involved in ongoing legal battles to regain their tradition homeland.

Local Historic Context

The region known as the Santa Monica Bay consists of beach-side communities that include, in-part, Venice and Santa Monica.

The region was named "Santa Monica" by members of the Gaspar de Portola Expedition in 1769, upon finding cool water to drink, and a shady place to rest. "The day, May 4, happened to be St. Monica's day on the religious calendar and as the springs reminded them of the tears St. Monica shed for her erring son Augustine, they [the expedition members] called the area Santa Monica" (Gabriel 2006).

Rancho La Ballona

The information stated below is a historical brief of the *Rancho La Ballona* area, with information provided and clarified by the City of Culver City city historian, Ms. Julie Lugo Cerra. Ms. Cerra assisted with factual corrections to the history of *Rancho La Ballona*, as presented in the archival literature. Ms. Cerra is a descendant of the Lugo and Machado families. These citations are characterized by the personal communication credit, whereas information gleaned from the Culver City website is characterized by "no date" acronym, n.d., as it is unclear when those historical briefs were written.

In 1819 Agustín and Ygnacio Machado along with Felipe and Tomás Talamantes acquired grazing rights on 14,000 acres of land. The brothers, Machado, were sons of a Spanish Soldier-Guard affiliated with the 1781 Rivera Expedition, hailing from Sonora (Mexico), and an early settler at the *El Pueblo de Los Angeles* (Robinson 1939, and personal communication with Julie Lugo Cerra 2009).

> "The family lore relates that Agustín was chosen by virtue of his skills as a horseman to ride his fasted steed, from dawn until dusk, beginning at the foot of the Playa del Rey hills to claim *Rancho La Ballona*, or *Paso de las Carretas*. It stretched to Pico Boulevard (abutting the *Rancho San Vicente y Santa Monica*) and to what we know as Ince Boulevard, where *Rancho Rincón de los Bueyes* began" (Lugo Cerra n.d.).

The *Rancho Rincón de los Bueyes* became home to the Talamantes'. The *Rancho La Ballona* is identified as consisting of the modern-day communities and cities of Venice, Culver City, and West Los Angeles (Loyola Marymount University, Rancho La Ballona Map ca. 1876).

> "We occupied with our grazing stock, houses, and other interest, the place called '*Pass of the Carretas'*," but more generally known by the name *Ballona*" (Robinson 1939).
>
> "This was the statement of Augustin [sic] and Ygnacio Machado and Felipe and Tomás Talamantes. They made this statement on September 19, 1839, in a petition for confirmation of their title. It had been 'about the space of eighteen or nineteen years' they said, 'since they had moved in, under a permit from the military commander Jose de la Guerra y Noriega'" (ibid).
>
> "Another source, Bancroft, indicates the date was probably 1819, for in that year, the Church [at the Pueblo] was protesting, without avail, a cattle-grazing permit

> given by Noriega to these four citizens of Los Angeles. The permit itself, in fact, is not among the United States Land Commission, though it is referred to" (ibid).
>
> "Augustin [sic] and Ygnacio Machado were young men in 1819-so young they would have received no favors from the government, according to family, without taking the older Talamantes brothers [unclear if they were brothers or father and son] into partnership" (ibid).

The Machado brothers ran cattle, planted corn and grapevines. Each brother married and between them had 21 heirs. Ygnacio however, traded his Centinela adobe for "a house in the pueblo [Los Angeles] and two bottles of brandy" (personal communication, Julie Lugo Cerra 2009). Agustín managed the operations of *Rancho La Ballona,* although there were other owners, to include Ygnacio. The Machados maintained provisional title to the land through Spanish rule, the Mexican governance, and United States government oversight. In 1873, the *Rancho La Ballon*a had a free and clear title. The land was subdivided in 1876 as a result of a lawsuit among the family heirs, 8 years following the death of Agustín (1865) (personal communication, Julie Lugo Cerra , 2009).

Rancho San Vicente y Santa Monica

In 1828, the Mexican government granted Don Francisco Sepulveda provisional title to the *Rancho San Vicente y Santa Monica*; land that included the Santa Monica Canyon and Pico Boulevard northeasterly toward the Westwood Region. The Rancho was re-granted by Governor Pio Pico in 1839, minus a portion that was subdivided and its provisional title was granted to Ysidro Reyes and Francisco Marquez as the *Boca de Santa Monica* (the Santa Monica Canyon). The remaining portion of the original Rancho had been re-granted by Governor Pico that same year, 1839. The Rancho was patented by the United States Land Commission in 1881 as 30,000 totaling acres, with ownership identified as that of the widow of Don Francisco Sepulveda.

Venice

Historian Carolyn Elayne Alexander's *"Venice, California"* (1999) book is a photographic history of the development of the ocean-side community. *Venice, California* (1999) is part of the Images of the America series of books produced by Arcadia Publishing. The following synopsis of early development in Venice is drawn from Alexander's (1999) work.

Abbot Kinney was born on the east coast and educated at several upper-crust institutions in the United States as well as in Europe. He was well educated, and at one time served as a translator of Civil War history from French to English, at the request of President Ulysses S. Grant. By the age of 20 he was already an entrepreneur, and in partnership with his brother, formed the Kinney Brothers Tobacco Company. A buying trip brought Abbot Kinney to the shores of California, specifically the San Francisco coast with intent to visit the Sierra Nevada Mountains. However, due to inclement weather, and at the urging of acquaintances, he traveled to southern California for instead.

> "Disembarking in the small village of Los Angeles, Abbot was appalled by the distasteful atmosphere near River Station. Wooden sewer pipes were crushed in numerous places and their contents mixed with everyday mud, as hoof beats from many horse churned the elements together. He located a conveyance to drive him to what is now East Pasadena, and set off as rapidly as possible, to escape the powerful stench of 'The City of Angels'" (Alexander 1999: Introduction).

In time, Kinney made his way to Sierra Madre, where he settled for a time, developed his land (a bluff) which he called Kineola, and produced a blood orange that brought him a semblance of horticultural fame. Following his marriage to Margaret Thornton, daughter of State Supreme Court Justice William Dabney Thornton, he relocated and settled into an Ocean Avenue home in the young community of Santa Monica (ibid).

> "Abbot began land speculating in Los Angeles with proceeds from his tobacco shares. Among other investments, he owned the Abbotsford Inn and inaugurated the Boyle Heights Cable Railway. A man of many accomplishments, he founded libraries, wrote numerous books, and was the chairman on a Yosemite Committee. Kinney also accompanied Helen Hunt Jackson as translator and friend when she made her trip to Indian country, to report on the appalling living conditions to the government. Her book, Ramona, arose out of that effort" (ibid).

Abbot Kinney formed a partnership with his friend and business acquaintance Francis Ryan. Together they purchased the Rancho La Ballona (ca. 1890s) and set about to develop the Ocean Park area of Santa Monica into a replica of Venice, Italy, complete with canal-side residence and gondola transportation. When Mr. Ryan passed away, his widow remarried Mr. T.H. Dudley. Mr. Dudley and Mr. Kinney could not see eye-to-eye, and therefore, Dudley dispensed with his wife's half of the partnership to four businessmen. Neither Mr. Kinney, nor the four men were able to compromise with respect to how to develop the land that he and Mr. Ryan had purchased. The five men opted to divide the land between Mr. Kinney and the four associates by means of a coin toss; the winner would select his half of the Rancho. Mr. "Kinney won, but instead of choosing the developed half of the Ocean Park property, he selected the southern salty marshland" (ibid). Kinney set out to develop his half of the property into the Venice of his dreams. He was laughed at, ridiculed, and although he never did see his dream come to full fruition, portions of the land were developed into canal-side abodes (1904). A portion of this canal system remains today, and Venice developed into its own independent community in 1911, at which time it sought annexation into the City of Los Angeles, but failed.

Santa Monica

Historian Louise Gabriel's "*Early Santa Monica*" (2006) book presents a concise historical context supported with numerous archival photographs and other graphics. *Early Santa Monica* (2006) is also part of the Images of the America series produced by Arcadia Publishing. The following synopsis of the early development in Santa Monica is drawn from Gabriel's (2006) work.

In 1872, Colonel Robert Baker, a former 49-er entrepreneur and stockman, purchased the *Rancho San Vicente y Santa Monica* from Don Francisco Sepulveda's heirs. In pursuit of funding for the purpose of establishing a center of commerce and port at Santa Monica Bay, Col. Baker enlisted the financial support of Senator John Percival Jones (Nevada). Colonel Baker sold three-fourths of the *Rancho San Vicente y Santa Monica* to Senator Jones in 1874. The following year the two men set out to establish Santa Monica as a major commercial center with a shipping port (Gabriel 2006).

> "At one o'clock we will sell at public outcry to the highest bidder the Pacific Ocean, draped with a western sky of scarlet and gold; we will sell a bay filled with white winged ships; we will sell a southern horizon, rimmed with a choice collection of purple mountains, carved in castles and turrets and domes; we will sell a frostless, bracing, warm yet unlangured air braided in and out with sunshine and odored with the breath of flowers" (Tom Fitch-Auctioneer, July 15, 1875; Gabriel 2006).

Interestingly, Colonel Baker had married into a portion of wealth, as a result of his marital union with Arcadia Bandini de Stearns; daughter of California rancher and politician, Don Juan Bandini, and widow of Don Abel Stearns (Padon 1985:4-8), one of the wealthiest men, landowner and cattle rancher in the early days of California.

Santa Monica never developed as a port city or center of commerce. Rather, Santa Monica developed as a residential and resort type community, facilitated by the broad beaches of its "Gold Coast" and proximity to the Hollywood rich and famous, as well as its passenger railroad service to and from Los Angeles. In 1886, Santa Monica incorporated as an independent city. Two years later, Senator Jones provided a deed of title for 300 acres of land for the establishment of the Pacific Branch of the *National Asylum for Disabled Volunteer Soldiers and Sailors of the Civil War*, now known as the *National Home for Disabled Volunteer Soldiers* (Robinson 1939; Bonner 1998; U.S. Department of Veterans Affairs 2006).

The aircraft industrial giant Donald Douglas came to Santa Monica in the early 1920s and was responsible for building the "World Cruisers." These World Cruisers made the first around-the-world-flights, thereby putting Santa Monica on the map, with respect to the aviation community. In 1929, the first women's cross-country air race was held in Santa Monica, and enlisted the likes of Amelia Earhart and Pancho Barnes; the latter beating the former by 24 minutes. In addition, General Dwight D. Eisenhower stated that the Douglas C-47s were instrumental in America's victory in World War II (Gabriel 2006; Pancho Barnes Enterprises, Inc. n.d.).

Pacific Electric/Santa Monica Air Line Railway/Venice Short Line

The steam operated *Los Angeles and Independence Railroad* was built in 1875 and connected Los Angeles to Santa Monica. Two years later, the railroad was sold to the *Southern Pacific Railroad* (SPRR) and remained in service as a steam driven operation until 1908, at which time the rail line was converted to electric.

In 1891, the SPRR completed the construction of the *Long Wharf,* or *Port Los Angeles*, thereby supplementing its railroad service for freight and passenger needs. The structure was one-mile in length, and "was hailed as the largest and longest wharf in the world. It incorporated two sets of rail lines (one standard track and the other narrow gauge) that branched into seven tracks at the seaward end of the wharf" (Bonner 1998; Basten 1974). The selection of San Pedro, in 1897, as a major ocean shipping port severely hampered the growth and development of Santa Monica as a center of commerce, sea shipping, and railroad freight location (Electric Railway Historical Association of Southern California [ERHA] n.d.). The *Long Wharf* was eventually dismantled (Basten 1974).

In 1897 the *Pasadena and Pacific Railroad,* a separate railroad enterprise, more fully developed its rail line between Hill and 4th Street in Los Angeles to the Vineyard Junction, and included a double-tracked meandering rail line that provided service between Vineyard, Santa Monica, Venice, Pico Boulevard, and Broadway in Los Angeles. In 1902 the *Los Angeles Pacific Railroad*, formerly the *Pasadena and Pacific Railroad* further extended its rail service and developed the *Venice Short Line* to provide service to the Ocean Park area, via the Palms Division, a more westerly route from Vineyard to Ocean Park (ERHA n.d.).

Meanwhile, the SPRR leased its right-of-way to various electric railway companies beginning in 1908, the year the rail line was electrified. These electric railways included the *Old Pacific Electric, Los Angeles Pacific, Los Angeles Interurban, Los Angeles & Redondo, Riverside & Arlington, San Bernardino Valley Traction, Redlands Central*, and the *San Bernardino Interurban Railway* (ERHA n.d.). During this time of rapid independent railroad development, Henry Edwards Huntington, a railroad magnate and entrepreneur, had built up his electric railroad system empire, the *Red Car Line*, as well as acquired 51% ownership of the *Pacific Light and Power Company*, thereby monopolizing the electric railroad system in Los Angeles (Walker 2006).

In 1911, the aforementioned electric railway companies of the time merged, and were known as *Pacific Electric* (PE), a shared investment between PE and SPRR. In regards to the Project area, there were two railroads are of historic importance. The first railroad, the PE right-of-way (ROW) was known as the *Santa Monica Air Line.* It was this portion of the *Western District* of the PE that serviced passenger and freight movement between Los Angeles and Ocean Park in Santa Monica. An "Air Line" "literally means a straight line through the air between two points. Therefore, it is used in the railroad industry to indicate a railroad line that directly connects two places without curves or winding routes" (ERHA n.d.).

Within the Project Area, remnants of these earlier electric railroad lines, and a possible trolley line, are identified via some of the streets and avenues located to the south and east of the Oakwood Avenue Project Area, the Rialto Court/Crescent Place Project Area, and the Abbot Kinney Project area. Specifically, Venice Boulevard to the southeast and Electric Avenue to the west,

were at one time rights-of-way locations for electric train/trolley lines within the local area.

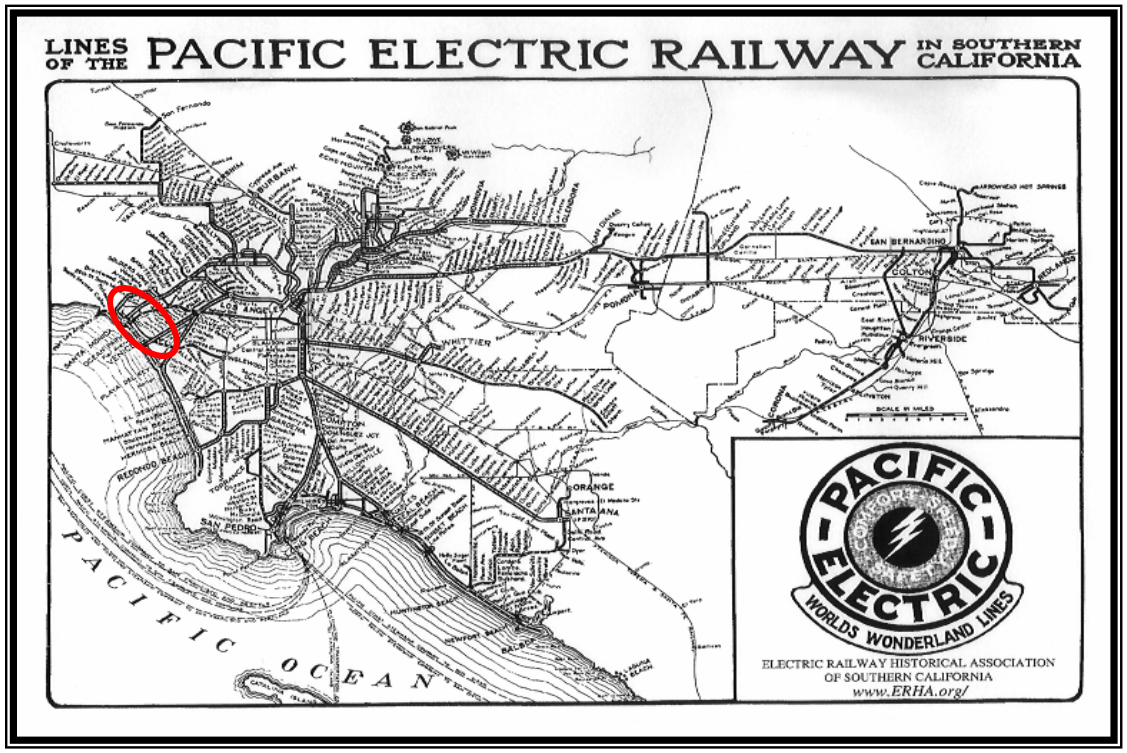


Figure 5. Pacific Electric System Map (ERHA n.d.); General Project vicinity located within red circle.

The second railroad was the *Venice Short Line* that was owned and operated by the PE. However, rapid industrial, commercial, and residential development of the Los Angeles Basin resulted in increased reliance on the automobile. In turn, this change created severe road congestion leading to the evolution of road-based mass transit, otherwise known as bus transportation. Eventually, buses became the mass-transit of choice, and the *Venice Short Line* and the *Santa Monica Air Line* were discontinued and abandoned around the 1950s. The SPRR continued to operate freight lines throughout the Project area until the 1980s (ERHA n.d.).

Figure 6. The Electric Tram, or Motormanette, circa 1920s (ERHA n.d.).

Venice Electric Trams

A novel and unique form of semi-mass transit also existed within the general area apart from what has already bee n discussed and the gondolas within the canals of Venice. More specifically, an electric transportation system that ran between and along the boardwalk of Santa Monica to the Ocean Park Pier in Venice (circa 1910-1029) was called the Motormanette. The "*motormanette"* or electric trams transported roughly a dozen passengers along the aforementioned boardwalk and commercial districts of the area. The reason for their demise is unknown, but likely related to the fire that destroyed the pier in the early 1920s, redevelopment of the area, and the ensuing Great Depression.

ARCHIVAL RESEARCH and RESULTS

The initial cultural resource archival and record search for the Project was undertaken at the South Central Coastal Information Center (SCCIC) located on the campus of California State University, Fullerton by an ArchaeoPaleo Resource Management, Inc. archaeologist. The SCCIC is part of the greater California Historical Resources Information System (CHRIS) which is California's overall informational repository for archaeological and historical documents. The SCCIC houses documents regarding known sites and historical buildings within the Los Angeles, Ventura, and Orange Counties. This research consisted of reviewing all known archaeological reports and literature, a review of the USGS 7.5' Beverly Hills (1966 Photorevised 1995) topographic quadrangle that contains data on historic and prehistoric properties, as well as the 15' and 30' series historic quadrangle maps of Santa Monica dated 1902 (reprinted in 1906), and 1921, and 6' series dated 1926. Additional review of the California Points of Historical Interest (CPHI) and California State Historic Resources Inventory (HRI) lists, the NRHP listing, and the National Historic Landmarks (NHL), and the City of Los Angeles Historic Cultural Monument (HCM) listing was also undertaken. This archival research, map-based and resource inventory review (CPHI, HRI, NRHP, NHL, and HCM), and literature search, yielded a positive result for possible cultural resources within ¼-mile, as well as, identified previously located cultural resources of archaeological type (2) and historic architectural type (1) located within ½-mile and 1-mile of the Project areas (Tables 2, 3 and 4).

In 1985, Beth Padon M.A./RPA, identified six fragments of marine shell on a parcel of land to the northwest of, and immediately adjacent to, the Penmar Municipal Golf Course. Marine shell fragments are often identified as artifact constituents pertaining to prehistoric archaeological sites in coastal regions, since Native Americans and other groups used them as a food substance. The presence of marine shells, in context with other items, would constitute an archaeological site. In this regard, however, Ms. Padon indicated that the shell fragments were likely not culturally related (Padon 1985: 4). However, no additional investigation was conducted to confirm or deny the presence of an archaeological resource in this area. Although unlikely, it is possible that a subsurface archaeological resource may be present.

Archaeological site number CA-LAn-1061/H is a multi-component site consisting of prehistoric and historic artifacts. The site is located approximately .7-mile to the northwest of the Project area, and southwest of a geologic feature historically known as "Indian Hill". The site CA-LAn-1061/H was identified by David Whitley, Ph.D./RPA in 1980 as a light scatter of shellfish fragments associated with chert and chalcedony flaked-stone debitage.

The second archaeological site, CA-LAn-1123 (dually recorded as an isolate, 19-00215) consists of similar materials, although slightly more concentrated, and was identified by Clay Singer, M.A. /RPA, in 1986; a low density scatter of lithic and shellfish fragments, bifacial thinning flakes of chert, and a core-tool of jasper identified in the yard of a private residence located at 726 Copeland Ct, Santa

Monica, CA. Mr. Singer indicated that the site is possibly Early to Middle Period, given the decomposed and weathered state of the shellfish fragments.

Interestingly, Mr. Singer went on to discuss the proximity of CA-LAn-1123 to a place he referred to as "Indian Hill." The term "Indian Hill" appears to refer to "…a scattering of artifacts that have been found in an area roughly banded by Ocean Park Boulevard, Lincoln Boulevard, Rose Avenue, and Main Street, all of which are in the City of Santa Monica" (Frierman 1995: 4), and are likely "…remnants of the former occupation of the hill-like terrace known as Indian Hill" (Singer 1982). Additionally, Mr. Singer garnered additional information from Dr. William Wallace regarding a cogstone artifact recovered at the site, as well as a more specific site location and possible artifact collection.

> "Information thus far developed seems to indicate that the major focus of the site may have been on the northern flank of the hill, the site of the old SMCC campus and the present SM High School campus. Two attempts at contacting someone at SMHS regarding a reputed collection from the site have proved fruitless" (Singer 1982).

Although in close proximity to the aforementioned CA-LAn-1061/H, Mr. Singer does not believe the two sites are related given their near-polar opposite locations down-slope of the hill in question.

The historic architectural resources within ½-mile and 1-mile of the Project Areas include 19-186639, located at 1935 Walgrove Ave; New Life Full Gospel Church. The historic building was constructed in 1955, and has been determined not historically significant, and is currently ineligible for the NRHP and CRHR. Additional historic architectural resources within ½-mile and 1-mile of the four Project areas can be found in Table 4.

A review of Sanborn Fire Insurance Company Map for the Venice District of Los Angeles, dated 1918 with corrections made circa 1950 (Sheet 89), indicates several of the historic properties observed along the Rialto Court/Crescent Place Project area existed prior to 1920. Specific to the Project APE in this area, is the dwelling present circa 1918, and believed to exist today at the aforementioned lot located northwest of the intersection of Rialto Court and Crescent Place.

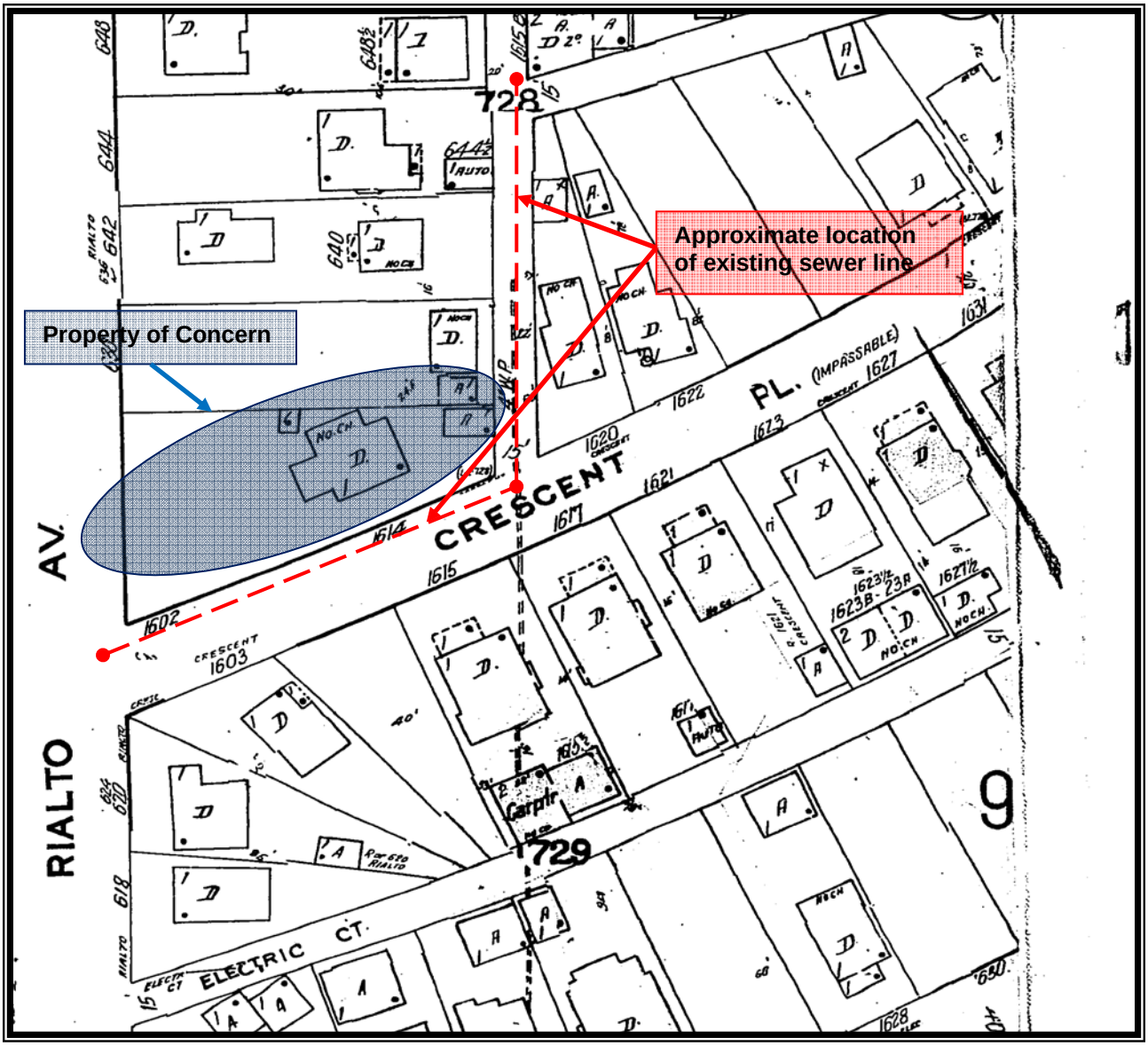


Figure 7. Sanborn Map for Los Angeles-Venice District, Sheet 89, Volume (1918-1950). The lot of concern for the Rialto Court/Crescent Place Project Area is highlighted in blue, and the location of the sewer line is approximated in red.

* Note: Rialto Avenue is now Palms Boulevard, and the un-named alleyway is now Rialto Court.

Author LA #	Report Title	Site	Description	¼ mile	½ mile	½ to 1mile
Padon, Beth (LA1480)	An Archaeological Assessment of Tentative Tract no. 43805, Santa Monica, Los Angeles County, CA	-	Survey	X	-	-
Peak & Associates (LA1975)	Cultural Resource Survey and Clearance Report for the Proposed American Telephone and Telegraph Los Angeles Airport Central Office to the Santa Monica Central Office Fiberoptic Communication Route	-	Survey	X	-	-
Barbara, Sylvia (LA7841)	Project Proposes to Construct Curb Ramps at Various Location on Pacific Coast Highway: Pier Avenue to Topanga Canyon Boulevard and on Route 27 Mulholland Drive	2	survey (sites out of Project area)	-	X	X
Bonner, Wayne (LA9342)	Cultural Resource Records Search and Site Visit for T-Mobile Candidate SV11374E (palms-Redwood ROW), 13329 Palms Boulevard, Los Angeles, Los Angeles County, California	-	records search and survey	-	X	-
Duke, Curt (LA5188)	Cultural Resource Assessment: Cingular Wireless Facility no. LA 907-07 Los Angeles County, CA	-	records search, historic building asses.	-	X	-
Frierman, Jay D. (LA3675)	Phase I Archaeological Survey of Undeveloped Lot at 2870-2809 Lincoln Boulevard, Santa Monica, California 90405	-	records search and survey	-	X	-
Breece, Bill (LA352)	Unknown-missing from SCCIC	-	records search and survey	-	-	X
Singer, Clay (LA1567)	Cultural Resource Survey/Impact Assessment: 733 Hill St., Santa Monica, Los Angeles County, CA	-	records search and survey	-	-	X

Table 2. Archival Records Search Results-Studies

Author and Year	Report Title	Site (19-) or CA-LAn-	Description	¼ mile	½ mile	1+mile
Whitely, David (1980)	SITE RECORD	CA-LAn-1061/H	Prehistoric site		X	-
Marvin-Judith (2001)	SITE RECORD	186639	Historic building	-	-	X
Singer, Clay (1980)	SITE RECORD	CA-LAn-1123	Prehistoric site	-	-	X
Singer, Clay (1980)	SITE RECORD	19-100215	Isolated prehistoric artifacts	-	-	X

Table 3. Archival Records Search Results-Site

HCM #	Name	Address	City, State, and/or National Significance	¼ mile	½ mile	½ to 1mile
927	Strudevant Bungalow	721 Amaroso Place	City	X	-	-
926	Kinney-Tabor House	1310 South Sixth Avenue	City	X	-	-
749	Venice City Hall	681 East Venice Boulevard	City	X	-	-
724	Venice of America Home	1223 Cabrillo Avenue	City	X	-	-
595	Venice Division Police Station	685 Venice Boulevard	City	X	-	-
2510	Venice Library	1406-1414 Electric Avenue/610-614 Cabrillo Ave	National	X		
532	Venice Arcades (including columns/capitals)	67-71 Windward Avenue	City		X	
656	"Binoculars"	340 Main Street	City	-	X	-
270	Canal System	Washington Boulevard; Venice Boulevard; Strongs Drive; Ocean Avenue	City	-	X	-
2370	Canal System	Sherman Canal; Linnie Canal; Howland Canal; Grand Canal; Eastern Canal; Carroll Canal	National	-	X	-
-	SA-ANGA	Location withheld-Traditional Cultural Property/Sacred Burial Ground for Gabrielino Indians	-	-	-	X

Table 4. Archival Records Search Results-City of Los Angeles, Historic Cultural Monuments

SITE SURVEY and ASSESSMENT

Methodology

Shannon Loftus, M.A.H.P. /R.P.A., of APRMI conducted the cultural resource site survey of the Penmar Project APE on January 3, 2009. Ms. Robin Tuner Principal Investigator of APRMI and Ms. Loftus conducted the cultural resource site survey of the remainder of the Project Areas APE on March 23 and 27, 2009, upon receipt of the additional utility upgrade and Project relocation areas. Ms. Loftus walked the Penmar Project area in a single line along the pipeline location and in a zigzag transect pattern at 4 meters apart at the reservoir, force main and pump locations, and associated lay-down or staging areas within the park. The proposed location of the new force main and reservoir were visually assessed for cultural resources of archaeological (prehistoric and historic) and historic architectural type. The surveyed locations included the three new proposed force mains that are to be located within the alley between Warren Avenue southward to Rose Avenue along Frederick Street, and the length of Rose Avenue from Frederick Street and eastward to Penmar Municipal Golf Course parking lot, south across Rose Avenue to the Penmar Recreation Center, northeast of the intersection Penmar Avenue. In addition, the proposed location of the new reservoir within the open park area of the Penmar Recreation Center was surveyed as bound by Penmar Avenue in the north, Lake Street in the south, Penmar Avenue in the West, and roughly Walnut Street in the east. All locations were photographed and GPS coordinates taken. These photographs are attached as Appendix B in this document.

Ms. Turner and Ms. Loftus walked the proposed Project APE, the proposed locations for utility upgrade and relocation of the existing sewer line within the remaining Project Areas (Oakwood Avenue Project Area, Rialto Court/Crescent Place Project Area, and Abbot Kinney Boulevard Project Area). All of these Project Area APE's are located to the north and northwest of the historic Venice Canals system, and are within an area of high-density historic architectural resources, as previously indicated in Table 4 of the Archival Research section. The Project Areas APE were visually assessed for cultural resources and overview photographs taken. These photographs are attached as part of Appendix B in this document.

Survey Results

Penmar Project APE-Archaeological Resources

No new archaeological resources of prehistoric or historic type were identified within the Penmar Project APE. However, visibility of the ground surface was <5% given the paved and landscaped nature of the Project APE.

Penmar Project APE-Historic Architectural Resources

The Penmar Project APE is located within the roadbed of Rose Avenue, the alley between Warren and Rose Avenues, the parking lot of the Penmar Municipal Golf Course, and beneath the grounds of the western half of the Penmar Recreation Center. No historic architectural resources exist within the APE; however, the Project APE passes through a late-historic period of local residential development. Specifically, the residential development is a mix of Ranch Style architecture, circa 1935-1960. Several of the homes evince the California Ranch-Bungalow style, in that the structures still exhibit hangover, or transitional style from the earlier Craftsman Bungalow (circa 1929-1930) and Minimal Traditional (circa 1935-1960) style; typed by wide overhanging eaves, front gabled entries, minimal fenestration, and a simple rectangular style in a concentrated space, as opposed to the later Ranch Style which exhibits a more rambling rectangular layout.

More specifically, several of the dwellings exhibit a post World War II influence that consists of an asymmetrical Tudor-like front gable, which also provides a covered entry to the dwelling, and the aforementioned more rambling rectangular layout. In addition, these front gabled dwellings also exhibit an East Asian influence at the roof line; a slight lift in the roof pitch at the periphery with occasional minimal projection, resulting in a shallow, concave roof-line appearance (Bricker 2000), often associated with Japanese and Chinese architecture.

The Ranch Style home was popularized during the early years of World War II as a result of federal limitations on construction, thereby limiting the available material, resulting in a dwelling of efficiency in design and materials (Bricker 2000), hence the lack of fenestration. During the latter years of the war, as well as post-war, the Ranch Style home became adapted to regional and cultural influence (ibid), to include the East Asian influence described, as a seemingly popular trend in southern California. Equally popular, and also present along the Project APE corridor, is the more simplified Ranch Style that persisted until the late 1960s; built with a rambling layout, low-pitched roof, and minimal fenestration.

The Penmar Municipal Golf Course Clubhouse building is located immediately north and adjacent to the Project APE located within the parking lot. The Clubhouse is a modern-era building (circa 1960s) with a Neo-Mediterranean influence. The building exhibits a Spanish tile roof, colonnaded walkway, multi-lite windows, has side gabled entry, with multiple side gables end-to-end.

Although the Project APE passes through this late-historic period corridor, none of the dwellings are located within the APE (the construction footprint) and none will be adversely affected. Therefore, the dwelling units were not individually inventoried, nor assessed for historic significance per the CEQA or the NHPA. They are noted for their historic nature, and proximity to the Project APE.

Oakwood Avenue Project APE-Archaeological Resources

No new archaeological resources of prehistoric or historic type were identified within the Oakwood Avenue Project APE. However, visibility of the ground surface was <5% given the paved and landscaped nature of the Project APE.

Oakwood Avenue Project APE-Historic Architectural Resources

The Oakwood Avenue Project APE is located within the roadbed of Oakwood Avenue. Specifically, the APE is located 100-feet north of the intersection of Oakwood Avenue and Palms Boulevard in the northwest, and southward to the intersection of Oakwood Avenue and Rialto Court in the southeast.

Immediately adjacent to the APE is a tightly configured residentially developed neighborhood of numerous historic dwellings of various architectural styles and periods, evidentiary of the early 1900s to the latter half of the 20th Century. Examples of architectural styles include; Colonial Revival, Craftsman Bungalow, Minimal Traditional and early Ranch transitional forms, and National Folk, and Hipped Vernacular types, and remodeled/updated varieties of each.

Rialto Court/Crescent Place Project APE-Archaeological Resources

No new archaeological resources of prehistoric or historic type were identified within the Rialto Court/Crescent Place Project APE. However, visibility of the ground surface was <5% given the extremely narrow paved pedestrian trail (approximately 6-feet in width), inaccessibility to the private yards of the homeowners adjacent to the trail, and heavily vegetated and landscaped nature of the Project APE.

Rialto Court/Crescent Place Project APE-Historic Architectural Resources

The Rialto Court/Crescent Place Project APE is located within the City of Los Angeles property right of way and close to private property along the extremely narrow paved pedestrian trail (approximately 6-feet in width) of Crescent Place from Palms Boulevard and eastward to the intersection of Rialto Court. This trail serves as pedestrian access to the rear yards and entrances to numerous historic residences. As previously stated, the sewer line and other utilities (gas and electric) are located near a portion of the private yards of the adjacent residential properties. The Project APE turns northward at the intersection of Rialto Court, and is located within a paved roadbed of an alleyway, to the intersection of Rialto Court and Shell Avenue. This alleyway serves as automobile access to the rear of adjacent historic and modern-era residences. The intersection of Rialto Court and Crescent Place is a transitional corridor between automobile alleyway and pedestrian trail, characterized by a white metal arbor overgrown with ivy and historic Simon brick paver (circa 1930s) footpath.

Immediately adjacent to the APE is a tightly configured residentially developed neighborhood of numerous historic dwellings of various architectural styles and periods, evidentiary of the early 1900s to the latter half of the 20th Century.

Examples of architectural styles include; Colonial Revival, Craftsman Bungalow, Minimal Traditional and early Ranch transitional forms, Modern, and National Folk/Hipped Vernacular types. There is also a "Venice of America" historical residence of local historical society importance located just southeast of the APE along the Crescent Place Trail. Additionally, some of the residences feature contributing elements to their historic setting and location, such as well-developed and tailored landscapes, unique gates and fences reflective of iron-work artistry, wood carving, and such, as wells the occasional custom address placard, some of which indicate a local historic significance of the residence. Some of the homes also feature moderate to extensive remodeling and updating of the original historic buildings.

The lot located northwest of the Rialto Court and Crescent Place intersection is of concern as the sewer line proposed for upgrade lies close to the private yard of the residence(s) but within the city right of way. This property was inaccessible at the time of survey, due to heavy vegetation (tall trees and dense vine type plants), and a stuccoed wall impeding access, along the Crescent Place pedestrian trail. One area of visibility on the north-side of the lot, revealed a two story, salt-box roofed dwelling, with clapboard (or beveled siding), of historic age. The dwelling appears to encroach very close to the fence and wall encompassing the sides (south) and rear (east) of the property. Additional structures may be present as the lot evinces multiple mapped addresses for Crescent Place and Palms Boulevard, but inaccessibility prohibited in-depth visual inventory of the lot.

Abbot Kinney Boulevard Project APE-Archaeological Resources

No new archaeological resources of prehistoric or historic type were identified within the Abbot Kinney Boulevard Project APE. However, visibility of the ground surface was <5% given the paved and landscaped nature of the Project APE.

Abbot Kinney Boulevard Project APE-Historic Architectural Resources

The Abbot Kinney Boulevard Project APE is located within the northeastern portion of the roadbed at the intersection of Abbot Kinney Boulevard and Palms Ave. Immediately adjacent to the APE is a tightly configured commercial and mixed-use residential/commercially developed corridor within the shopping district of downtown Venice. The buildings along the APE are reflective of various architectural styles and periods, evidentiary of the late 1800s, early 1900s, and the mid- latter half of the 20th Century. Examples of architectural styles include; Two-Part Commercial Block, One-Part Commercial Block, Colonial Revival, Craftsman, Minimal Traditional, Art Moderne, Shed, National Folk, and Vernacular types, as well as remodeled/updated varieties of each.

Native American Contact

The Project is located within the traditional homeland territory of the Gabrielino *Tongva* people. In addition, the Project Location is within 1-mile of a known Gabrielino Traditional Cultural Property, known as *Sa-Anga*, a sacred burial ground. A government-to-government level consultation with interested Native American parties is required as part of environmental studies inclusive of public funds (local, state, and/or federal). As part of the due diligence effort put forth by APRMI, the Native American Heritage Commission (NAHC) in Sacramento, California was queried in early January 2009 for input as to a listing of potentially interested parties of California Indian descent. In addition, the NAHC was also asked to provide a list of any known sacred lands may exist with the Project APE. The request to the NAHC was made via letter from APRMI and the NAHC Sacred Land File request form, including full project description and topographic map with highlighted Project APE. Upon receiving the information from the NAHC, APRMI President, Ms. Robin Turner, called each of the Native Americans listed as an interested party to confirm their address and to let them know of the pending documentation that was being sent to them regarding the Project. The telephone calls were made on January 7, 2009 and letter with the Project description and area maps were sent to each individual on the same day. The Native American responses to the contact letter and the final Contact Log are attached as Appendix B of this document. Once the initial contact process has been completed, formal Native American Consultation can begin resulting in a government-to-government discussion between the lead agency and the Native American interested parties.

MANAGEMENT RECOMMENDATIONS

Summary

The Penmar Project Area is surrounded by late-historic era residential development. The Project APE connects to the municipal park facilities of the Penmar Municipal Golf Course and the Penmar Recreational Center. This localized area includes a golf course, ball fields, bleachers, and is landscaped with non-indigenous ornamental plants and grasses. Based on the results of an archival search, literature research, and Native American input, it has been determined that the Penmar Project Area is located within an area of known and/or potential prehistoric resources. During the site survey, ground surface visibility was limited due to modern landscaping and roadway, therefore precluding an accurate visual assessment for prehistoric archaeological sites, features, or artifacts. Although not assessed, the buildings do not appear to possess the qualities of historically significant resources under CEQA or the NHPA, nor do the buildings appear to be adversely affected by proposed Project construction activities, as the building and its setting of location (developed residential lot) are located outside the Project APE.

The Oakwood Avenue Project Area is located within the roadbed of a tightly configured and historic-era residentially developed neighborhood. During the site survey, ground surface visibility was limited due to modern landscaping and roadway, therefore precluding an accurate visual assessment for prehistoric archaeological sites, features, or artifacts. Although not assessed, the buildings do appear to possess the qualities of historically significant resources under CEQA or the NHPA, as well as possibly at the local level. However, the buildings and their setting of location (developed residential lots) do not appear to be adversely affected by proposed Project construction activities, as they are located outside the Project APE.

The Rialto Court/Crescent Place Project Area APE is located immediately adjacent and north of the paved pedestrian trail along Crescent Place, and/or privately owned and developed residential lots of historic residences. In addition, a northward portion of the APE is located within the roadbed of an intersection alleyway along Rialto Court. The Crescent Place trail is bound to north and south by tightly configured and historic-era residentially developed lots. During the site survey, ground surface visibility was limited due to modern landscaping and inaccessibility to the private lots of the historic properties, therefore precluding an accurate visual assessment for prehistoric archaeological sites, features, or artifacts. Although not assessed, the building on the lot located at the northwestern corner of the intersection of Rialto Court and Crescent Place does appear to be historic and may possess the qualities of historically significant resources under CEQA or the NHPA, as well as possibly at the local level. In addition to the historic building at this afore mentioned location, the rest of the buildings along Crescent Place, which includes their setting of location and tailored landscapes, as well as contributing architectural elements (fences, gates, and placards) are considered historic as well. Although it is believed that the

internal sewer pipe reaming proposed at this Project Area will not directly adversely affect the historic properties, there is an elevated risk that ground disturbing activities may be required. If construction related ground disturbing activities are necessary, then the property located (dwelling and landscape) at the lot northwest of Rialto Court/Crescent place would be adversely affected by the Project.

The Abbot Kinney Project Area is located within the roadbed of a tightly configured and historic-era commercial and mixed-use residential/commercially developed shopping district. Locally, the Project Area is overseen by the Abbot Kinney District Association, a non-profit 501c (3) dedicated to the preservation, revitalization, and rehabilitation of this local commercial district (not officially recognized). During the site survey, ground surface visibility was limited due to modern landscaping and roadway, therefore precluding an accurate visual assessment for prehistoric archaeological sites, features, or artifacts. Although not assessed, the buildings do appear to possess the qualities of historically significant resources under CEQA or the NHPA, as well as possibly at the local level. However, the buildings and their setting of location (developed commercial and mixed-use residential/commercial lots) do not appear to be adversely affected by proposed Project construction activities, as they are located outside the Project APE.

Mitigation Recommendations

Archaeological Cultural Resources

The management mitigation recommendations for cultural resources within the four preferred Project Areas and Project alternatives are based on the following; first, as a result of only <5% ground visibility at the time of the site survey process, the APRMI archaeologist was unable to assess the ground surface for potential archaeological resources. As a result of the lack of ground surface visibility, and the potential for the recovery of cultural materials due to surrounding site data found during the archival and literature search and Native American contact stories, it is recommended that the Lead Agency require construction monitoring services by a qualified archaeologist. This monitoring service will help to assure that if cultural resources are uncovered, they will be mitigated to a less-than-significant effect on the cultural resources. If the archaeologist deems that there is a low potential for finding cultural materials once construction activities have began, then construction monitoring would no longer be required. The second mitigation measure recommendation is to implement a Cultural Resources Monitoring and Mitigation Plan (CRMMP) prior to project start up. The CRMMP should include, but not limited to, construction monitoring protocol of all ground disturbing Project related construction activities; a construction worker training protocol and program; and a cultural resource recovery and processing protocol if cultural resources are discovered.

After all cultural resource construction monitoring is complete, if artifact, sites, or features are located; laboratory preparation, analysis, cataloging, curation, and final acceptance to a legal repository will be required. A final Report of Findings will be required to fulfill the federal and state regulations and requirements.

Historic Architectural Cultural Resources

The management mitigation recommendations for historic architectural cultural resources within three of the four preferred Project Areas and Project alternatives is based on the following; the Project Areas APE of the Penmar Project Area, the Oakwood Avenue Project Area, and the Abbot Kinney Project Area are located within roadbeds and do not appear to adversely affect the historic architectural properties (residential or commercial). As a result, no further action is required beyond the aforementioned Cultural Resources Monitoring and Mitigation Plan (CRMMP) prior to Project start up.

The Rialto Court/Crescent Place Project Area APE may lie partially within the residentially developed, and possible historic home-site of the property(ies) located at the lot northwest of the intersection of Rialto Court and Crescent Place, and is immediately adjacent to the narrow (~6-feet in width) paved pedestrian trail along Crescent Place. This is the location where the properties may have encroached onto the 30 foot easement of the city owned right of way. The pipe reaming activities will mitigate all potential effects to these property(ies). As a result of the lack of accessibility to the historic home-site and lack of visual observation due to intense vegetation and landscaping, as well as, limited visual assessment of architectural integrity and historical significance, (to include potential for archaeological cultural materials), due to surrounding site data found during the archival and literature search, to include Native American contact stories, it is recommended that the Lead Agency require construction monitoring services by a qualified archaeologist that is familiar with historic architectural resources, in addition to the following recommendation.

Should ground disturbing activities be required during the internal pipe reaming of the sewer line, then a complete Phase II assessment of the historic significance of the residentially developed lot (known to encompass the aforementioned sewer line and any additional underground utilities proposed for relocation and upgrade activities, to include the proposed new locations of these utilities), should be undertaken.

The location of the sewer line in relation to the known dwelling and any additional dwellings, is approximated, but does not appear to be in conflict with the historic property, although any additional utilities are unknown to APRMI at this time. Given the approximate location of the sewer line and proposed internal pipe reaming, APRMI believes that performing a historic building inventory is unnecessary at this time and beyond the present scope of work. However, should ground disturbance become necessary, this will be considered an adverse affect, and will necessitate the need for a Phase II assessment of the property (dwelling(s) and landscape).

The need for the historic building inventory(ies) is driven by the adverse affect that ground disturbing activities, if necessary, will have upon the setting of location that makes each historic property unique, as well as, possible adverse affect to the building itself if any addition or associated outbuilding structure were built over any of the unknown utilities (sewer, electric, and/or gas). As with the other historic properties immediately adjacent to the Crescent Place trail, the setting of location is a contributing element to the historic properties as it includes the tailored landscaping and unique architectural elements previously described.

The historic building inventory should include preparation of the appropriate State of California Department of Parks and Recreation forms, with photos of buildings, structures, and any objects, to include fencing, as well as documentation of the landscape. Should the need arise for a Phase II assessment, then construction related work must stop while the assessment is conducted. During the Phase II assessment, additional consultation with the property owner(s), and the local historical society of Venice for additional primary and secondary source information, as well as nuanced socio-cultural historical data pertaining to local neighborhood development should be undertaken. The end result of a Phase II will provide the Lead Agency with a finding of determination of historical significance to further assist with forthcoming design and construction methodology, and to fulfill the federal and state regulations and requirements. The historical building assessment (Phase II) should be undertaken by a qualified architectural historian per Secretary of the Interior Standards. In addition, the Phase II should be performed as a counterpart, but separate task, to the aforementioned Cultural Resources Monitoring and Mitigation Plan (CRMMP).

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APPENDIX A

LIST OF ACRONYMS

ACHP	**Advisory Council on Historic Preservation**
APE	**Area of Potential Effect**
APRMI	**ArchaeoPaleo Resource Management, Inc.**
CCR	**California Code of Regulations**
CEQA	**California Environmental Quality Act**
CHL	**California Historical Landmark**
CHRIS	**California Historical Resources Information System**
CPHI	**California Points of Historic Interest**
CRHR	**California Register of Historic Resources**
CRMMP	**Cultural Resources Mitigation and Monitoring Plan**
ERHA	**Electric Railway Historical Association of Southern California**
HCM	**City of Los Angeles, Historic Cultural Monument**
HRI	**Historical Resource Inventory**
NAD	**North American Datum**
NAGPRA	**Native American Graves Protection and Repatriation Act**
NAHC	**Native American Heritage Commission**
NEPA	**National Environmental Policy Act**
NHPA	**National Historic Preservation Act**
NRHP	**National Register of Historic Places**
NHL	**National Historic Landmark**
PE	**Pacific Electric Railroad**
ROW	**Right of Way**
PRC	**Public Resource Code**
ROF	**Report of Findings**
RPA	**Register of Professional Archaeologists**
SCCIC	**South Central Coastal Information Center**
SHBC	**State Historic Building Code (California)**
SPRR	**Southern Pacific Railroad**
SVP	**Society for Vertebrate Paleontology**
UTM	**Universal Transverse Coordinates**

APPENDIX B

PHASE I CULTURAL RESOURCE SURVEY PHOTOGRAPHS

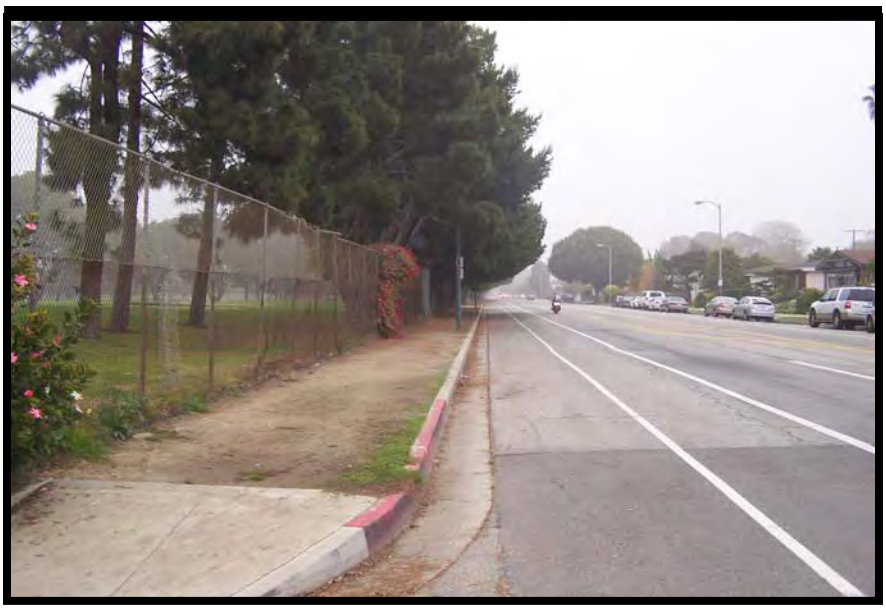

Photo A1. View to north from Rose Avenue at alley and storm-drain ditch between Warren Avenue and Rose Ave (Penmar Project Area).

Photo A2. View to southeast from north side of Rose Avenue and Frederick Street. Notice the late-historic period Ranch style homes (Penmar Project Area).

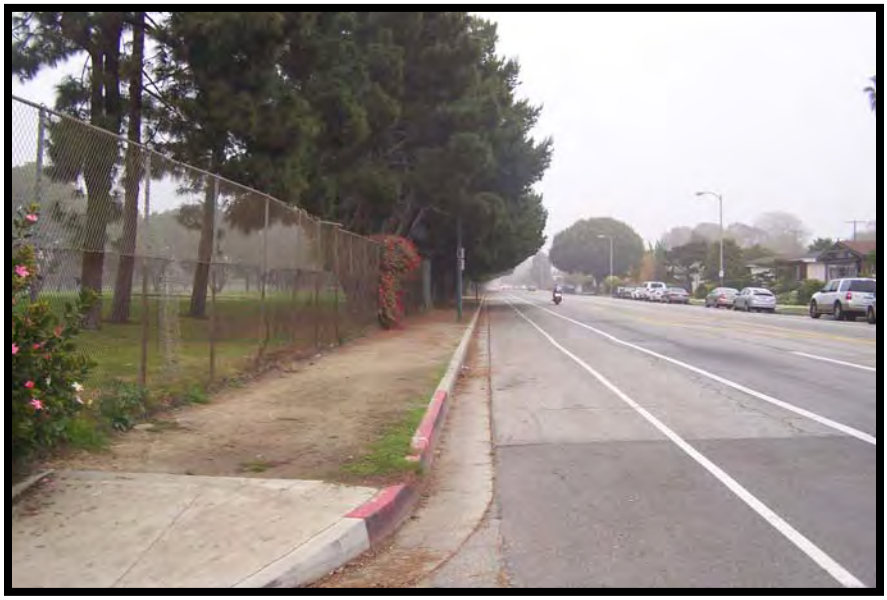

Photo A3. View to east from north side of Rose Avenue at Frederick Street, along proposed trench for force main (3) conduit in Rose Ave (Penmar Project Area).

Photo A4. View to east-northeast from south side of Rose Avenue at Frederick Street, along proposed trench for force main (3) conduits in north half of Rose Avenue. Penmar Municipal Golf Course in background (Penmar Project Area).

Photo A5. View to east-northeast from south side of Rose Avenue at Courtland Street, along proposed trench for force main (3) conduits in north half of Rose Avenue. Penmar Municipal Golf Course in background (Penmar Project Area).

Photo A6. View to southeast from north side of Rose Avenue and Courtland Street. Notice the late-historic period Ranch style home with East Asian influence at the roofline (Penmar Project Area).

Photo A7. View to east-north east from Penmar Avenue and Rose Avenue at the parking lot of the Penmar Municipal Golf Course. The Clubhouse is visible in the right half of the photo, somewhat obscured by the trees and vehicles (Penmar Project Area).

Photo A8. View to east at Penmar Recreation Center, from Penmar Avenue (Penmar Project Area).

Photo A9. View to east at Penmar Recreation Center from Penmar Avenue (Penmar Project Area).

Photo A10. View to east-northeast from western perimeter of ball field at Penmar Recreation Center (Penmar Project Area).

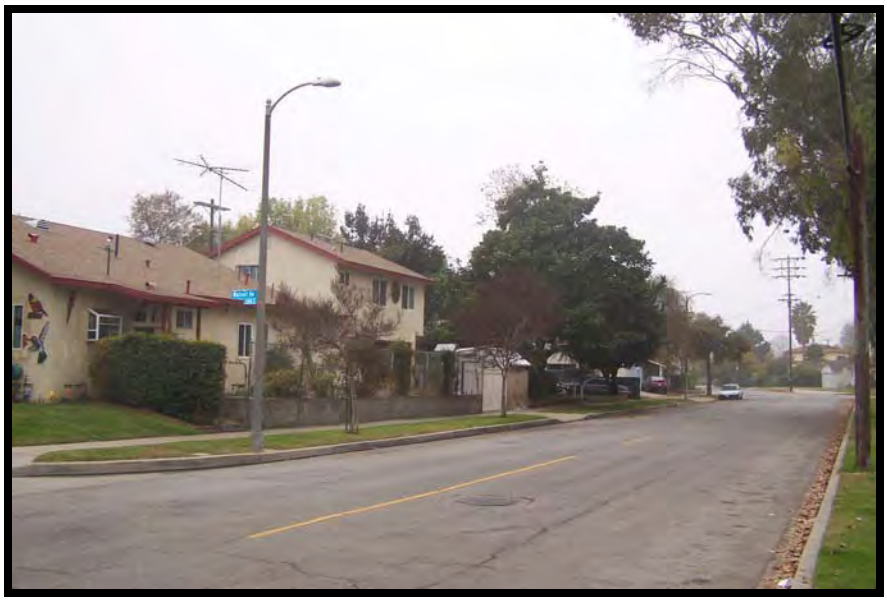

Photo A11. View to west along Lake Avenue, from Walnut Avenue, south of the Penmar Recreation Center (Penmar Project Area).

Photo A12. View north from Lake Street at Penmar Recreation Center. Penmar Municipal Golf Course Clubhouse is in the right-background and parking lot in the left background (Penmar Project Area).

Photo A13. View to northwest along Oakwood Avenue and across Palms Boulevard Intersection (Oakwood Avenue Project Area).

Photo A14. View to southeast along Oakwood Avenue toward Rialto Court intersection (Oakwood Avenue Project Area).

Photo A15. View to southwest, along southern side of street of Oakwood Avenue, southwest of Palms Boulevard (Oakwood Avenue Project Area).

Photo A16. View to northwest, along northern side of street of Oakwood Avenue, southwest of Palms Boulevard (Oakwood Avenue Project Area).

Photo A17. View to southwest of southern side of street, of Oakwood Avenue from Rialto Court (Oakwood Avenue Project Area).

Photo A18. View to northeast, along northern side of street of Oakwood Avenue, from Rialto Court (Oakwood Avenue Project Area).

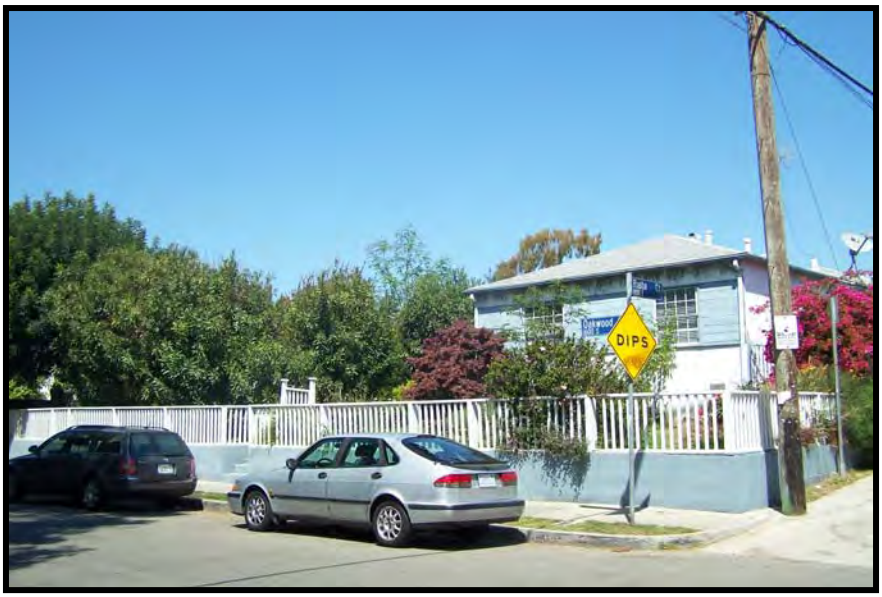

Photo A19. View to northwest at historic residence at intersection of Oakwood Avenue and Rialto Court (Oakwood Avenue Project Area).

Photo A20. View to southeast along southern side of street of Oakwood Avenue, from Rialto Court (Oakwood Avenue Project Area).

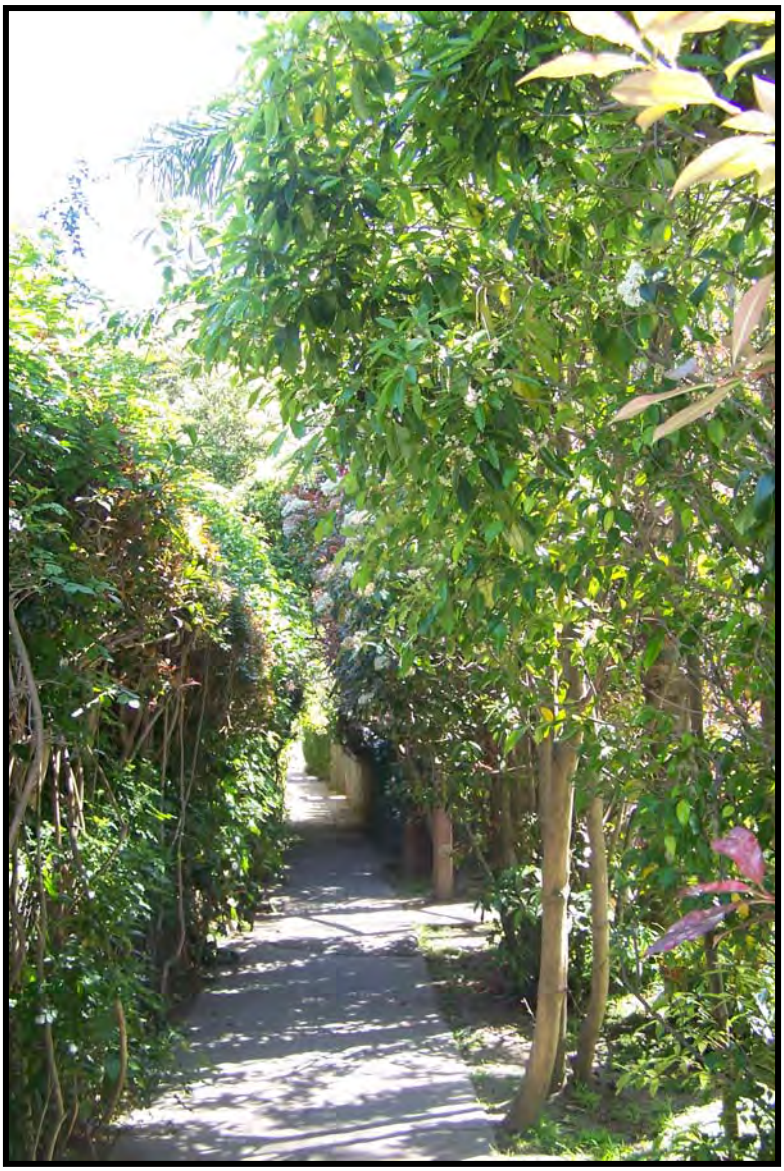

Photo A21. View to east along Crescent Place paved pedestrian trail, from Palms Boulevard (Rialto Court/Crescent Place Project Area).

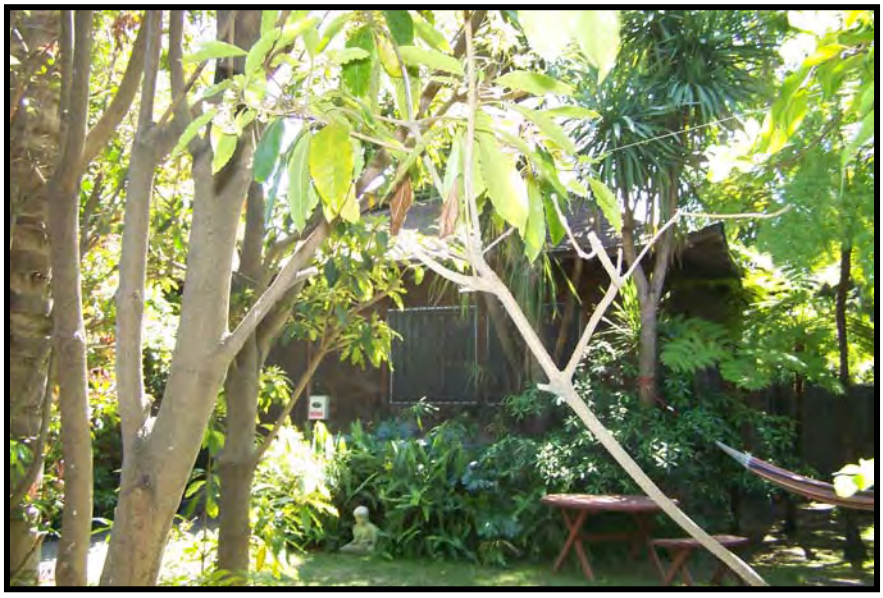

Photo A22. Historic home at southeast corner of Crescent Place and Rialto Court; 1603 Crescent Place (Rialto Court/Crescent Place Project Area).

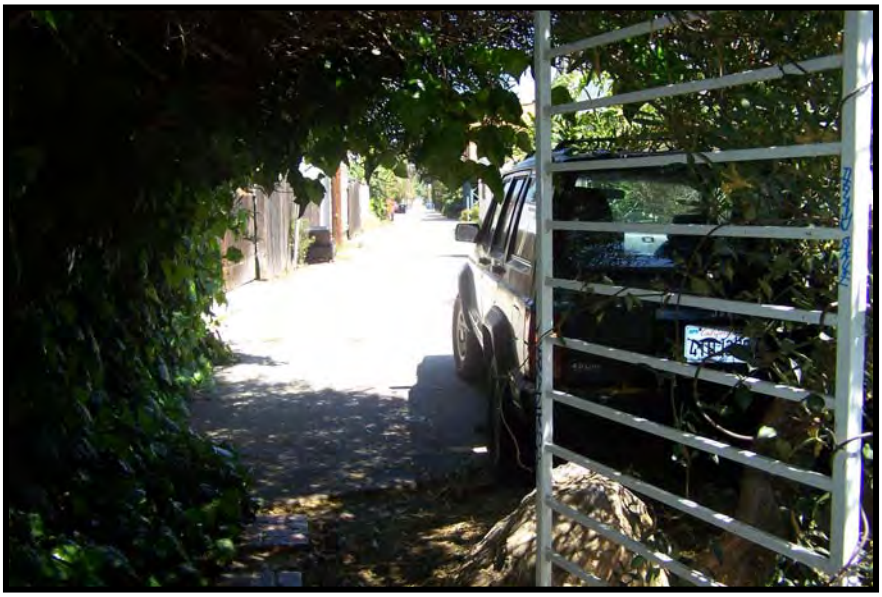

Photo A23. View north at Rialto Court, through the arbor located just west of 1620 Crescent Place (Rialto Court/Crescent Place Project Area).

Photo A24. 1620 Crescent Place, north side of pedestrian paved trail (Rialto Court/Crescent Place Project Area).

Photo A25. 1621 Crescent Place, south side of paved pedestrian trail (Rialto Court/Crescent Place Project Area).

***Note:** 1609, 1615, and 1617 Crescent Place are located along the south side of the pedestrian trail between 1603 and 1621. These three properties were neither visible, nor accessible.

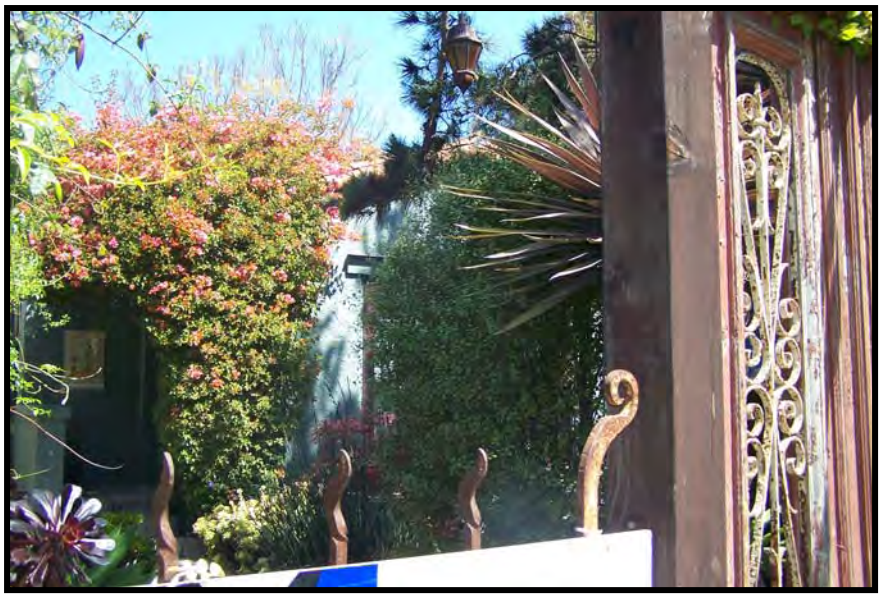

Photo A26 and A27. 1622 Crescent Place, north side of the paved pedestrian trail. Photo A27 illustrates gate feature (Rialto Court/Crescent Place Project Area).

Photo A28. 1624 Crescent Place, north side of the paved pedestrian trail (Rialto Court/Crescent Place Project Area).

Photo A29. 1623(?) Crescent Place, south side of paved pedestrian trail (Rialto Court/Crescent Place Project Area).

***Note:** 1626 Crescent Place was neither visible nor accessible.

Photo A30. 1627(?), 1631(?), and 1633(?) Crescent Place, southside of pedestrian paved trail (Rialto Court/Crescent Place Project Area).

Photo A31. Simon brick paver footpath between Rialto Court and Crescent place (Rialto Court/Crescent Place Project Area).

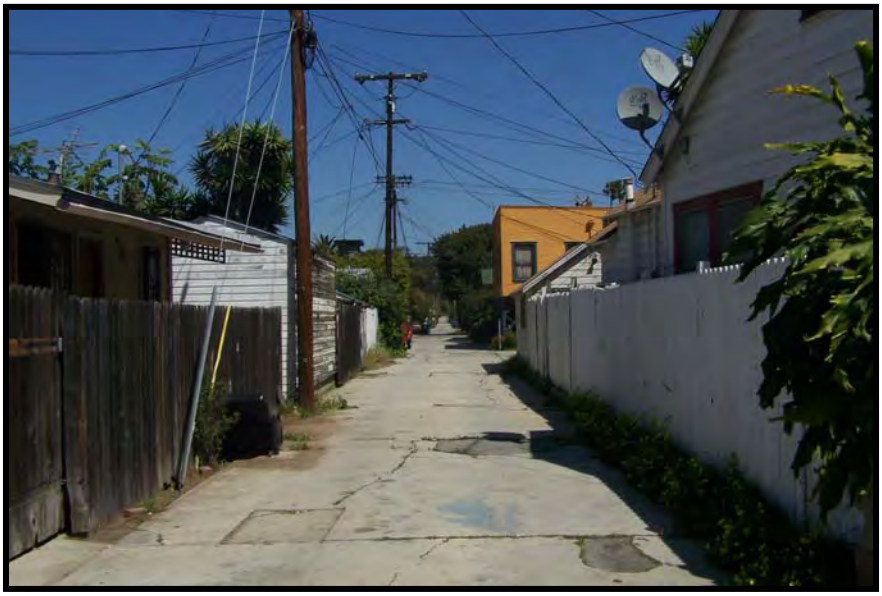

Photo A32. View north along Rialto Court, from Crescent Place (Rialto Court/Crescent Place Project Area).

Photo A33. Rear of 1614 Crescent Place from Rialto Court (Rialto Court/Crescent Place Project Area).

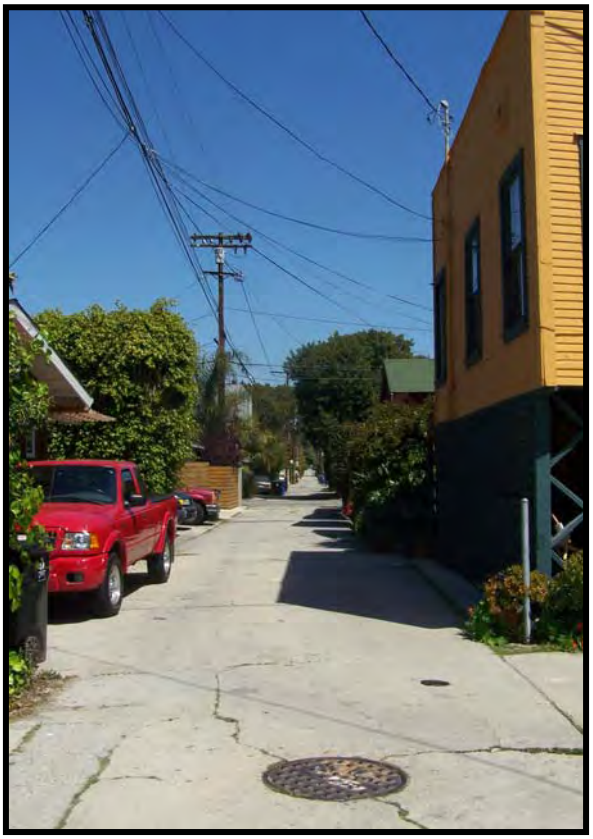

Photo A34. View north along Rialto Court, midway between Crescent Place and Oakwood Avenue (Rialto Court/Crescent Place Project Area).

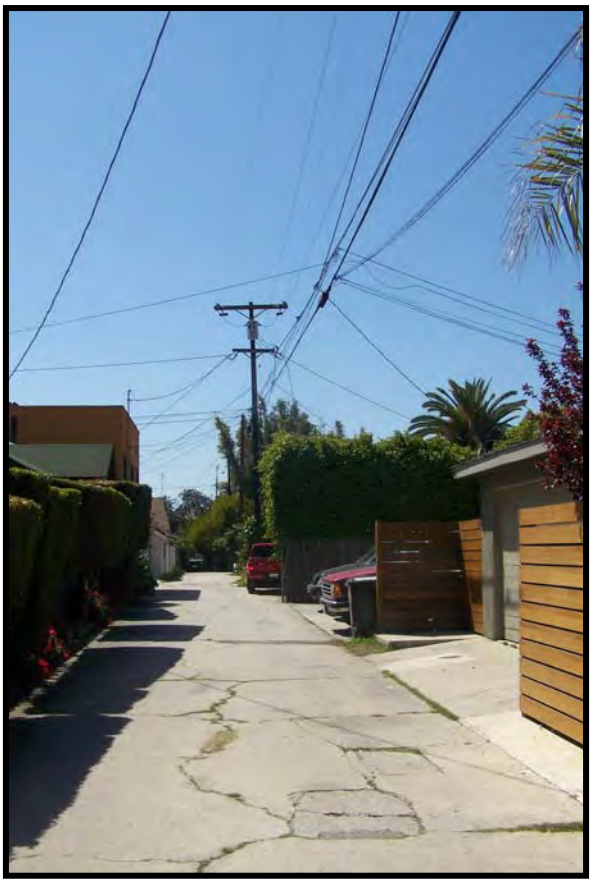

Photo A35. View south along Rialto Court from Oakwood Avenue (Rialto Court/Oakwood Avenue Project Area).

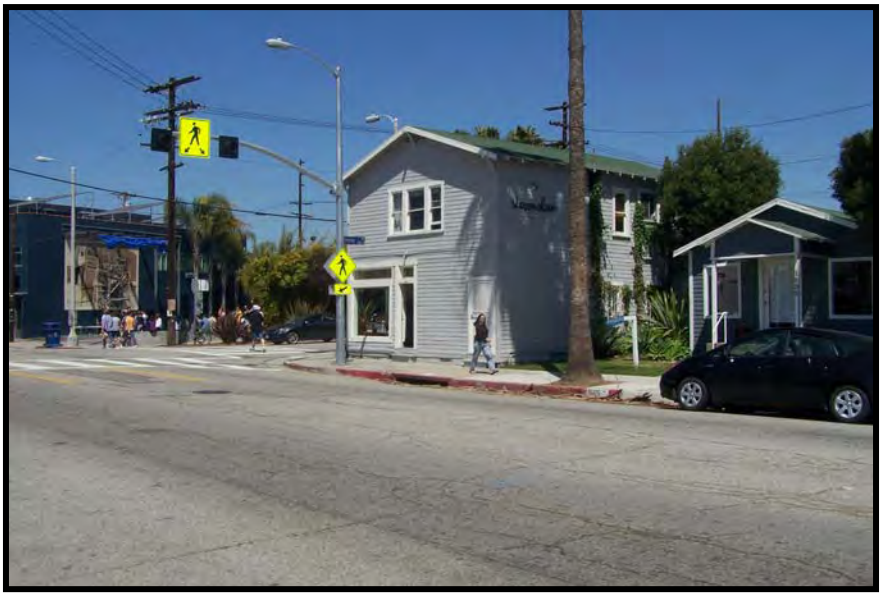

Photo A36. View to northeast at intersection of Palms and Abbot Kinney Boulevard (Abbot Kinney Boulevard Project Area).

Photo A37. View to north side of Abbot Kinney Boulevard, just southeast of intersection of Palms Boulevard (Abbot Kinney Boulevard Project Area).

Photo A38. View to north side of Abbot Kinney Boulevard, southeast of intersection of Palms Boulevard (Abbot Kinney Boulevard Project Area).

Photo A39. View to northeast, north side of Abbot Kinney Boulevard, southeast of intersection of Palms Boulevard (Abbot Kinney Boulevard Project Area).

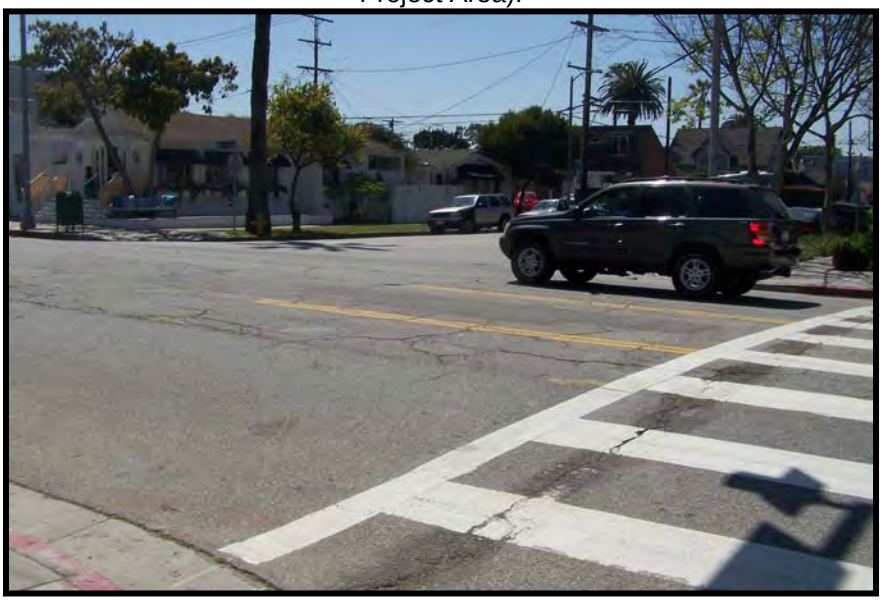

Photo A40. View to southeast across Abbot Kinney Boulevard, from Palms Boulevard Intersection (Abbot Kinney Boulevard Project Area).

Photo A41. View to east-southeast along south side of Abbot Kinney Boulevard, from Palms Boulevard intersection (Abbot Kinney Boulevard Project Area).

APPENDIX C

NATIVE AMERICAN CONTACT CORRESPONDENCE (CONFIDENTIAL)

Native American Contacts Log
LADPW Penmar Water Quality Improvement Project

Name	Affiliation	Contact Type	Comments
Sam Dunlap	Gabrielino. Luiseno, Cahuilla	Talked to Sam by phone on Jan 7, 2009 Sent letter on Jan. 7, 2009	Written response on January 7, 2009 states that a mitigation and monitoring plan be implemented. Per phone conversation, he wants to be part of the NA Consultation process
Cindy Alvitre	Gabrielino	Left voice message on phone on Jan. 7, 2009 Sent letter on Jan. 7, 2009	No written response as of February 10, 2009
John Tommy Rosas	Gabrielino Tongva	Talked to John Tommy by phone on Jan. 7, 2009 Sent letter on Jan. 7, 2009 ***He only wants written correspondence via email***	Email response on January 7, 2009 stated that he is interested in NA Consultation. By phone he stated that the area was sensitive to his family
Anthony Morales	Gabrielino Tongva	Talked to Anthony by phone on Jan. 7, 2009 Sent letter on Jan. 7, 2009	No written response as of February 10, 2009 By phone conversation he stated that the area was sensitive to his family and requests NA Consultation
Robert Dorame	Gabrielino Tongva	Talked to Robert by phone on Jan. 7, 2009 Sent letter on Jan. 7, 2009	Written response received on Jan. 20, 2009. He requests formal consultation and wants to provide NA field monitoring services for project By phone conversation he stated that the area was sensitive to his family & wants involvement

Gabrielino Tongva Nation

A California Tribal Sovereign

Post Office Box 86908 – Los Angeles, CA 90086

Council of Elders

Department of Provisory Government

Sam Dunlap
Tribal Secretary

January 7, 2009

Robin Turner
ArchaeoPaleo Resource Management, Inc.
13368 Beach Ave.
Marina del Rey, CA 90292

Re: LADPW Penmar Water Quality Improvement & Runoff Reuse Project

Dear Ms. Turner,

I would like to take this opportunity to comment on the proposed LADPW Penmar Water Quality Improvement Project. In response to the information received and reviewed I would like to make the following recommendation regarding the proposed project.

It will be the request of this tribal nation that appropriate mitigation measures designed to identify and protect archaeological deposits be included in the project design. A Native American and professional archaeological monitoring component appears to be warranted for this project due to unknown subsurface content that may contain yet to be discovered cultural deposits.

I will look forward to further discussion with you on this matter and to be notified as to the progress of the proposed project. Please feel free to contact me if I can be of further assistance.

Sincerely,

Sam Dunlap
Gabrielino Tongva Nation
(909) 262-9351 cell
samdunlap@earthlink.net

One Tribe – One Nation – One Blood

ArchaeoPaleo Resource Management, Inc.
A full service Archaeology and Paleontology company
SBE/WBE/DBE Certified

January 6, 2009

Ti'At Society
Ms. Cindi Alvitre
6515 E. Seaside Walk, #C
Long Beach, CA 90803

Re: LADPW Penmar Water Quality Improvement and Runoff Reuse Project

Dear Ms. Alvitre,

The City of Los Angeles, Department of Public Works (LADPW), Bureau of Engineering, is considering a project on the south side of the Penmar Golf Course and Recreation Center in Venice as part of the city-wide stormwater improvement undertaking. The Project consists of diverting dry-season and stormwater flow away form the beaches via an existing storm drain and proposed force main. The storm drain will transport the water flow along Fredrick Street southward to a proposed subterranean pumping station (sump pump) near the intersection of Rose Avenue. Eventually, collected water will be pumped away from the sump pump via a proposed force main (also subterranean) eastward along Rose Avenue to a proposed subterranean 2.75 million gallon reservoir located at the Penmar Recreation Center, south of the Penmar Golf Course. Attached to this letter is a copy of the TOPO map showing the general area and a more detailed map showing the subject property.

Our research conducted at the South Central Coastal Information Center housed at California State University at Fullerton found that no prehistoric or historic sites have been previously documented or recorded at this location. Additionally, the ArchaeoPaleo Resource Management, Inc. pedestrian reconnaissance of the Project area did not encounter any surficial sites.

Your name was given to us by the Native American Heritage Commission. Since your ancestral homeland is part of this general vicinity, and even though an EIR/EIS is not required for this project, the LADPW and I would like your input and views to see if you feel that there is any significance to this property site for you and your family. Please send your written responses to my attention at the address at the bottom of this letter. I look forward in hearing from you.

Sincerely,

Robin D. Turner

Robin Turner
President/Principal

ArchaeoPaleo Resource Management, Inc.
A full service Archaeology and Paleontology company
SBE/WBE/DBE Certified

January 6, 2009

Gabrielino Tongva Indians of California Tribal Council
Mr. Robert Dorame, Tribal Chair/Cultural Resources
P. O. Box 490
Bellflower, CA 90707

Re: LADPW Penmar Water Quality Improvement and Runoff Reuse Project

Dear Chairman Dorame,

The City of Los Angeles, Department of Public Works (LADPW), Bureau of Engineering, is considering a project on the south side of the Penmar Golf Course and Recreation Center in Venice as part of the city-wide stormwater improvement undertaking. The Project consists of diverting dry-season and stormwater flow away form the beaches via an existing storm drain and proposed force main. The storm drain will transport the water flow along Fredrick Street southward to a proposed subterranean pumping station (sump pump) near the intersection of Rose Avenue. Eventually, collected water will be pumped away from the sump pump via a proposed force main (also subterranean) eastward along Rose Avenue to a proposed subterranean 2.75 million gallon reservoir located at the Penmar Recreation Center, south of the Penmar Golf Course. Attached to this letter is a copy of the TOPO map showing the general area and a more detailed map showing the subject property.

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Robin D. Turner

Robin Turner
President/Principal

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SBE/WBE/DBE Certified

January 6, 2009

Gabrielino Tongva Nation
Mr. Sam Dunlap, Tribal Secretary
P. O. Box 86908
Los Angeles, CA 90086

Re: LADPW Penmar Water Quality Improvement and Runoff Reuse Project

Dear Secretary Dunlap,

The City of Los Angeles, Department of Public Works (LADPW), Bureau of Engineering, is considering a project on the south side of the Penmar Golf Course and Recreation Center in Venice as part of the city-wide stormwater improvement undertaking. The Project consists of diverting dry-season and stormwater flow away form the beaches via an existing storm drain and proposed force main. The storm drain will transport the water flow along Fredrick Street southward to a proposed subterranean pumping station (sump pump) near the intersection of Rose Avenue. Eventually, collected water will be pumped away from the sump pump via a proposed force main (also subterranean) eastward along Rose Avenue to a proposed subterranean 2.75 million gallon reservoir located at the Penmar Recreation Center, south of the Penmar Golf Course. Attached to this letter is a copy of the TOPO map showing the general area and a more detailed map showing the subject property.

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Sincerely,

Robin D. Turner

Robin Turner
President/Principal

ArchaeoPaleo Resource Management, Inc.
A full service Archaeology and Paleontology company
SBE/WBE/DBE Certified

January 6, 2009

Gabrielino/Tongva San Gabriel Band of Mission Indians
Mr. Anthony Morales, Chairperson
P. O. Box 693
San Gabriel, CA 91778

Re: LADPW Penmar Water Quality Improvement and Runoff Reuse Project

Dear Chairperson Morales,

The City of Los Angeles, Department of Public Works (LADPW), Bureau of Engineering, is considering a project on the south side of the Penmar Golf Course and Recreation Center in Venice as part of the city-wide stormwater improvement undertaking. The Project consists of diverting dry-season and stormwater flow away form the beaches via an existing storm drain and proposed force main. The storm drain will transport the water flow along Fredrick Street southward to a proposed subterranean pumping station (sump pump) near the intersection of Rose Avenue. Eventually, collected water will be pumped away from the sump pump via a proposed force main (also subterranean) eastward along Rose Avenue to a proposed subterranean 2.75 million gallon reservoir located at the Penmar Recreation Center, south of the Penmar Golf Course. Attached to this letter is a copy of the TOPO map showing the general area and a more detailed map showing the subject property.

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Sincerely,

Robin D. Turner

Robin Turner
President/Principal

ArchaeoPaleo Resource Management, Inc.
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SBE/WBE/DBE Certified

January 6, 2009

Tongva Ancestral Territorial Tribal Nation
Mr. John Tommy Rosas, Tribal Administrator
Email address: tattnlaw@gmail.com

Re: LADPW Penmar Water Quality Improvement and Runoff Reuse Project

Dear Administrator Rosas,

The City of Los Angeles, Department of Public Works (LADPW), Bureau of Engineering, is considering a project on the south side of the Penmar Golf Course and Recreation Center in Venice as part of the city-wide stormwater improvement undertaking. The Project consists of diverting dry-season and stormwater flow away form the beaches via an existing storm drain and proposed force main. The storm drain will transport the water flow along Fredrick Street southward to a proposed subterranean pumping station (sump pump) near the intersection of Rose Avenue. Eventually, collected water will be pumped away from the sump pump via a proposed force main (also subterranean) eastward along Rose Avenue to a proposed subterranean 2.75 million gallon reservoir located at the Penmar Recreation Center, south of the Penmar Golf Course. Attached to this letter is a copy of the TOPO map showing the general area and a more detailed map showing the subject property.

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Sincerely,

Robin D. Turner

Robin Turner
President/Principal

SECTION 01563
POLLUTION CONTROL - SEWAGE SPILL
PREVENTION AND RESPONSE REQUIREMENTS

1.1 THE REQUIREMENT

A. General:

1. The CONTRACTOR shall observe and comply with the CITY'S policy of "ZERO SPILLS".

2. The CONTRACTOR shall be in full charge and responsible for the Jobsite, the construction Work of this Contract, and subject to the directions of the ENGINEER or the INSPECTOR.

3. The CONTRACTOR shall observe and comply with all Federal, State, and local laws, ordinances, codes, orders, and regulations which in any manner affect the conduct of the work, specifically as it relates to sewage spills.

4. The CONTRACTOR shall be fully responsible for preventing sewage spillage, containing any sewage spillage, recovery and legal disposal of any spilled sewage, any and all fines, penalties, claims and liability arising from negligently causing a sewage spillage and any violation of any law, ordinance, code, order, or regulation as a result of the spillage.

5. The CONTRACTOR shall exercise care not to damage existing public and private improvements, interrupt existing services and/or facility operations which may cause a sewage spill. Any reasonably anticipated utility and/or improvement which is damaged by the CONTRACTOR shall be immediately repaired at the CONTRACTOR'S expense. In the event that the CONTRACTOR damages an existing utility, interrupts an existing service which causes a sewage spill, the CONTRACTOR shall immediately notify the CITY representatives. The CONTRACTOR shall request and obtain from the ENGINEER an emergency roster of the designated CITY representatives with their respective telephone numbers, pager numbers, and cellular phone numbers. The CONTRACTOR shall take all measures necessary to prevent further damage or service interruption, and to control, contain and clean up the resultant impacts of the damage, service interruption and any resulting sewage spill(s) as mentioned in Section 1.1.A. 6, below.

6. Prior to the start of construction, the CONTRACTOR shall develop and submit to the ENGINEER, for review and approval, a written Spill Response Plan. The Spill Response Plan shall be developed to respond to any construction related sewage spill. This shall include, but is not limited to:

   a. The CONTRACTOR shall identify all nearby waterways, channels, catch basins and entrances to underground existing storm drains and furnishing all of the necessary materials, supplies, tools equipment, labor and other services.

   b. The CONTRACTOR shall make arrangements for an emergency response unit comprised of emergency response equipment and trained personnel to be immediately dispatched to the Jobsite in the event of a sewage spill(s).

   c. The CONTRACTOR shall develop and include an emergency notification procedure, which includes an emergency response roster with telephone numbers and arrangements for backup personnel and equipment and an emergency notification roster of the design CITY representatives. The CONTRACTOR shall designate a primary and secondary representative and include their respective phone numbers, pager numbers,

and cellular phone numbers. The CONTRACTOR's representatives shall be accessible and available at all times to respond immediately to any construction related emergency.

7. If called for in the Plans and/or Specifications, or if sewer bypass is needed to construct the Project, the CONTRACTOR shall continuously monitor the flow levels downstream and upstream of the construction location to detect and possible failure that may cause a sewage backup and spill. The CONTRACTOR shall include the means and methods of monitoring the flow in their Spill Response Plan.

   a. In case of sewage spill, the CONTRACTOR shall act immediately without instructions from the CITY, to control the spill and take all appropriate steps to contain it in accordance with their Spill Response Plan. The CONTRACTOR shall immediately notify the CITY representatives of the spill and all actions taken. The CONTRACTOR shall, within three (3) working days from the occurrence of the spill, submit to the ENGINEER a written confirmation describing the following information related to the spill: the location on a current Thomas Bros. guide map; the nature and volume; the date and time; the duration; the cause; the type of remedial and/or preventive actions taken; and the water body impacted and results of any necessary monitoring. Requests for additional compensation for the handling of the spill shall be submitted to the ENGINEER as a construction claim. The CONTRACTOR shall assure the validity, accuracy, and correctness of the claim under penalty of perjury. The ENGINEER may institute further corrective actions, as deemed necessary, to fully comply with existing law, ordinance, code, order or regulation. The CONTRACTOR shall be responsible for all costs incurred for the corrective actions.

   b. It shall be the CONTRACTOR's responsibility to assure that all field forces, including Subcontractors, know and obey all safety and emergency procedures, including the Spill Response Plan, to be maintained and followed at the Jobsite.

B. Sewer Bypass:

1. The CONTRACTOR shall provide temporary means to maintain and handle the sewage flow in the existing system as required to complete the necessary construction.

2. The CONTRACTOR shall prepare and submit a detailed bypass plan to the ENGINEER for approval of the ENGINEER and the facility OWNER before the bypass is installed.

3. The CONTRACTOR shall size the bypass system to handle the peak flow of the system. The CONTRACTOR shall include a one-hundred percent (100%) backup in the bypass system. The CONTRACTOR shall utilize the backup system to mitigate any additional wet weather flows, perform the necessary maintenance and repairs on the bypass system, and exercise and ensure the operability of the backup system. Each pump, including the backup pumps, shall be a complete unit with its own suction and discharging pumping. The CONTRACTOR shall operate the backup bypass system for a minimum of twenty-five percent (25%) of the time on a weekly basis. The backup bypass system shall be fully installed and operational.

4. Prior to the full operation of the bypass system, the CONTRACTOR shall demonstrate, to the satisfaction of the ENGINEER and INSPECTOR, that both the primary and backup bypass systems are fully functional and adequate, and shall certify the same, in writing, to the ENGINEER in a manner acceptable to the ENGINEER.

5. The CONTRACTOR shall provide one dedicated fuel tank for every single pump/generator, if fuel/generator driven pumps are used. The CONTRACTOR shall provide a fuel level indictor outside each fuel tank. The CONTRACTOR shall continuously (while in use) monitor the fuel level in the tanks and ensure that the fuel level does not drop below a level equivalent to two (2) hours of continuous bypass system operation. The CONTRACTOR shall take the necessary measures to ensure the fuel supply is protected against contamination. This includes, but is not limited to, fuel line water traps, fuel line filters, and protecting fuel stores from precipitation.

6. The CONTRACTOR shall provide an emergency standby power generator, if electric power driven pumps are used.

7. The CONTRACTOR shall continuously (while in use) monitor the operation of the bypass system and all impacted facilities. The CONTRACTOR shall submit, as part of their bypass plan, their monitoring procedure and frequency. The CONTRACTOR shall maintain a log of the monitoring in a manner acceptable to the ENGINEER and INSPECTOR.

8. The CONTRACTOR shall continuously monitor the flow levels downstream and upstream of the bypass to detect any possible failure that may cause a sewage backup and/or spill. The CONTRACTOR shall include the means and methods of monitoring the flow in their Spill Response Plan.

9. The CONTRACTOR shall routinely inspect and maintain the bypass system, including the backup system. The CONTRACTOR shall submit as part of their by pass plans their maintenance procedures and frequency. The CONTRACTOR shall maintain a log of all pertinent inspection, maintenance and repair records in a manner acceptable to the ENGINEER and INSPECTOR.

10. All costs associated with sewer bypass requirements listed above (Section B-1 through 9) shall be included in the Bid Item "Sewer bypass system".

C. Additional Insurance Requirements: The CONTRACTOR shall obtain and maintain an additional insurance coverage for Pollution Liability with limits and requirements set forth in EXHIBIT "A" of the General Instruction and Information for Bidders, Part IV of the Proposal. The limits and requirements for Pollution Liability shall be in an amount sufficient to cover potential losses from sudden and accidental pollution. All costs associated with the requirements for "Sewage Spill Prevention and Response Requirements", including additional insurance, shall be included in the prices bid for other related bid items. However, CONTRACTORS will be required to submit, with their bid, a cost breakdown for the items required by the "Sewage Spill Prevention and Response Requirements".

******

SECTION 01571
STORMWATER POLLUTION CONTROL
MEASURES FOR CONSTRUCTION ACTIVITIES

1.1 GENERAL:

A. The Contractor shall exercise every reasonable precaution to protect channels, storm drains, and bodies of water from pollution.

B. Conduct and schedule operations to minimize or avoid muddying and silting channels, drains, and waters.

C. As required, obtain permits for erosion and water pollution control from the appropriate jurisdictional agency before starting Work.

D. Provide any necessary water pollution control devices to prevent, control, and abate water pollution, and implement good housekeeping pollution control measures to reduce the discharge of pollutants from work sites to the maximum extent practicable. These water pollution control devices include drains, gutters, slope protection blankets and retention basins and shall be constructed concurrently with other Work at the earliest practicable time.

E. Exercise care in preserving vegetation and protecting property, to avoid disturbing areas beyond the limits of the Work. Promptly repair any damage caused by Contractor operations.

F. Comply with the specific requirements based on acreage of disturbed soil.

G. Penalties: Failure to comply with this Section may result in significant fines and possible imprisonment. The RWQCB or other prosecuting authority may assess fines of up to $32,500 per day for each violation. Should the City be fined or penalized as a result of the Contractor failing to comply with this Section, the Contractor shall reimburse the City for any and all fines, penalties and related costs.

H. Notification and Report: If pollution occurs in the work area for any reason or when the Contractor becomes aware of any violation of this Section, correct the problem and immediately notify the Inspector. In addition, submit a written report to the Engineer within seven (7) calendar days describing the incident and the corrective actions taken. If either the Inspector or Engineer is first to observe pollution or a violation, the Contractor shall also explain in the written report why the Work was inadequately monitored.

I. The provisions of this Section describe minimum compliance and do not preclude other more stringent stormwater pollution control measures that may be required in the Contract.

1.2 DEFINITIONS

A. “Construction activity": Operations such as clearing, grading, disturbances to the ground such as stockpiling, or excavation that results in soil disturbances. If construction activity is part of a larger common plan of development, the amount of disturbed soil is the total land area of disturbed soil that results under the common plan.

1.3 PAYMENT

A. All costs for work required for compliance with this section shall be included within the bid prices.

1.4 CONSTRUCTION ACTIVITY - LESS THAN ONE ACRE OF DISTURBED SOIL

A. Comply With The Following Minimum Water Quality Protection Requirements:

1. Retain eroded sediments and other pollutants on-site and do not allow transportation from the site by sheet flow, swales, area drains, natural drainage, or wind. Control slope and channel erosion by implementing an effective combination of best management practices (BMPs). Such BMPs include scheduling grading during non-rainy seasons, planting and maintaining vegetation on slopes and covering erosion-susceptible slopes.

2. Protect stockpiles of earth and other construction-related materials from being transported from the site by wind or water.

3. Properly store and handle fuels, oils, solvents, and other toxic materials to not contaminate the soil or surface waters, enter the groundwater, or be placed where they may enter a live stream, channel, drain, or other water conveyance facility. Protect all approved toxic storage containers from weather. Clean spills immediately and properly dispose of cleanup materials. Spills shall not be washed into live streams, channels, drains, or other water conveyance facilities.

4. Do not wash excess or waste concrete into the public way or any drainage system. Retain concrete wastes on-site until they can be appropriately disposed of or recycled.

5. Deposit trash and construction-related solid wastes in covered receptacles to prevent contamination of rainwater and dispersal by wind.

6. Do not allow sediments and other materials to be tracked from the site by vehicle traffic. Stabilize construction entrance roadways to inhibit sediments from being deposited onto public ways. Immediately sweep up accidental depositions. Do not allow depositions to be washed away by rain or by any other means.

7. Contain non-stormwater runoff from equipment or vehicle washing and any other activity at the work site.

8. At completion of the Work, clear the worksite of debris and restore to a condition at least equal to or better than prior to construction.

9. When construction activity with grading is likely to occur during the rainy season (October 1 through April 15), prepare a Wet Weather Erosion Control Plan (WWECP) per LAMC Section 61.02. The WWECP must be submitted to the Engineer for approval within thirty (30) calendar days after execution of the Contract.

10. Guidance on preparing the WWECP can be found in " Development Best Management Practices Handbook - Part A, Construction Activities", adopted by the Board and as authorized by LAMC Section 64.72. The handbook can be viewed at or obtained at cost at Bureau of Engineering public counters.

11. When working in live streams, these are additional water pollution control requirements.

    a. Erect barriers sufficient to prevent muddying or polluting streams.

    b. Prior to removing materials from a flowing stream, use a stream by pass or other equivalent means to keep the flow in the stream free of the mud or silt from the removal operations.

c. Avoid transporting materials across live streams. If not possible, the transportation operation must be designed to prevent materials from falling into the stream and cannot muddy the stream.

d. Equipment may not be operated in a live stream or channel unless the Contractor can demonstrate to the Engineer's satisfaction that no other practical alternatives exist. The equipment must be designed to prevent materials from falling into the stream and cannot muddy the stream.

e. Do not allow fresh portland cement or fresh portland cement concrete to enter the water flowing in streams, channels or drains.

f. Do not allow material derived from the Work to be deposited in a live stream, channel or drain.

1.5 CONSTRUCTION ACTIVITY - ONE ACRE OR MORE OF DISTURBED SOIL

A. In addition to the requirements for Section 1.4 - "Construction Activity - Less Than One Acre of Disturbed Soil", file a Notice of Intent (NOI) with the State Water Resources Control Board and apply for coverage under the State General Construction Activity Stormwater Permit (GCASP) (NPDES no. CAS000002. Comply with all of the requirements of the GCASP, including preparing and implementing a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must describe the erosion control practices to be implemented during construction and the selection and implementation of appropriate BMPs to account for site-specific and seasonal conditions. This supercedes the section 1.4 (9) WWECP requirement for describing erosion control practices.

B. The Waste Discharge Identification Number (WDID) is evidence of NOI submittal. Provide the WDID to the Engineer and other agencies that issued permits for the project (such as the Department of Building & Safety). Guidance with the GCASP, NOI and SWPPP is available in the "Construction Handbook" published by the California Stormwater Quality Association and downloadable from their web site at http://www.cabmphandbooks.com/Construction.asp.

C. Compliance with the GCASP requires:

1. Submitting a NOI to the SWRCB and paying fees prior to start of construction;

2. Preparing the SWPPP before start of construction;

3. Keeping the SWPPP on site, implementing it during construction, and revising it as needed; and

4. Submitting a Notice of Termination with the SWRCB when construction is complete.

D. Implementing the SWPPP Requires:

1. Certifying by July 1 of each year that construction activities are in compliance with the GCASP and SWPPP,

2. If there were instances of non-compliance, the Contractor shall submit notifications of non-compliance to the Los Angeles Regional Water Quality Control Board (RWQCB) within 30 calendar days from the time the non-compliance was first identified.

3. If the Contractor, SWRCB, or RWQCB determines that stormwater discharges and/or authorized non-stormwater discharges are causing or contributing to an exceedance of an applicable water quality standard, the Contractor shall:

a. Implement corrective measures immediately and notify the RWQCB as soon as possible but no later than 48 hours after discovering the discharges. Unless otherwise directed by the RWQCB, follow up the notification with a report within 14 calendar days to the

RWQCB. The report must describe: (1) the nature and cause of the water quality standard exceedance; (2) the BMPs currently being implemented; (3) any additional BMPs which will be implemented to prevent or reduce pollutants that are causing or contributing to the exceedance of water quality standards; (4) any maintenance or repair of BMPs; (5) an implementation schedule for corrective actions; and, (6) a description of actions taken to reduce the pollutants causing or contributing to the exceedance.

b. Immediately revise the SWPPP and monitoring program to incorporate the additional BMPs that have been and will be implemented, the implementation schedule, and any additional monitoring needed.

c. The Contractor is advised that none of the foregoing prevent the RWQCB from enforcing any provisions of the GCASP while the Contractor prepares and implements the above report.

4. Amending the SWPPP as needed. Sign and date all amendments, attach them directly to the SWPPP and promptly provide copies of all amendments to the Engineer.

5. Ensuring that persons responsible for preparing, implementing, and amending the SWPPP and responsible for permit compliance are appropriately trained. This includes personnel responsible for installing, inspecting, maintaining, and repairing BMPs. Include documentation of their training in the SWPPP.

6. Inspect BMPs before and after each storm and once each 24-hour period during extended storm events to assess BMP effectiveness. Implement BMP repairs or changes as soon as feasible. Document each inspection with a checklist kept with the SWPPP, using forms provided by the SWRCB, RWQCB or equivalent.

7. Develop and implement a sampling and analysis program for pollutants which are not visually detectable in storm water discharges, which are or should be known to occur on the construction site, and which could cause or contribute to an exceedance of water quality objectives in the receiving water.

8. In addition to plans or permits required by local, state, or federal agencies, maintain copies of the GCASP, SWPPP their amendments and their reference documents available for review at the construction site.

9. Retain records/copies of: data used to complete the NOI; the SWPPP and all attachments and amendments; compliance certifications; notifications of non-compliance; training; incidents such as spills or other releases, including photographs as available; sampling and analysis of discharges discovered through visual monitoring; all reports required by the GCASP; BMP inspections and checklists, and maintenance and repair activities; and activity-based BMPs, such as good housekeeping, that have been implemented.

10. After the Work is complete and final acceptance by the City, submit to the Engineer, all records/copies of documents required by the GCASP, including, but not limited to, the records/copies of the documents noted above.

* * * * * *

SECTION 01572
CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

1.1 THE REQUIREMENT

A. The Construction and Demolition Waste Management (CMDW) Specification includes procedures for ensuring optimal diversion of construction and demolition waste generated by the project, and documentation procedures for tracking waste generation and diversion.

B. Each construction and/or demolition project shall reuse or recycle a minimum of 75% of the inert debris and 50% of the remaining construction and demolition debris generated by the project.

C. The project shall promote the City's sustainable building efforts by creating a resource-efficient and environmentally sensitive project and maintaining optimum control of the construction and demolition waste generated during the project.

D. The project shall use products with post-consumer recycled content to the greatest extent feasible. Refer to the California Integrated Waste Management Board's website for information about recycled content construction products.

1.2 ABBREVIATIONS

A. CalMAX: California Materials Exchange

B. C&D: Construction and Demolition

C. CCR: California Code of Regulations

D. CDRG: Construction and Demolition Recycling Guide

E. CIWMB: California Integrated Waste Management Board

F. LEA: Local Enforcement Agency

G. SWDD: Solid Waste Diversion and Disposal

H. WMP: Waste Management Plan

1.3 DEFINITIONS

A. Certified Mixed Debris Processing Facility: A solid waste processing facility that accepts loads of mixed debris for the purpose of recovering re-usable and recyclable materials and disposing of the non-recyclable residual material. A Certified Mixed Debris Processing Facility has been certified by the City of Los Angeles to have a facility specific recycling rate for C&D waste and/or another facility specific recycling rate for municipal solid waste. See CDRG Section VII G for information on the current list of certified processors.

B. Class III Landfill: A landfill that accepts non-hazardous solid waste such as household, commercial, and industrial solid waste. A Class III landfill must have a CIWMB solid waste facilities permit and is regulated by the LEA.

C. Construction and Demolition Recycling Guide: a publication by the Bureau of Sanitation's Solid Resources Citywide Recycling Division available at http://www.lacity.org/san/solid_resources/recycling/publications/index.htm, or Solid Resources Citywide Recycling Division,1149 S. Broadway, 10th Floor, Los Angeles, CA 90015, (213) 485-2260; FAX (213) 485-3671.

D. C&D Debris: Solid waste and recyclable materials that result directly from construction, remodeling, repair, demolition, or deconstruction of buildings and other structures, do not contain hazardous waste (as defined in CCR Title 22, Section 66621.3, *et seq*.), and contain no more than one percent (1%) putrescible wastes by volume, calculated on a monthly basis. C&D debris includes, but is not limited to: asphalt, concrete, Portland cement, brick, lumber, wallboard, roofing material, ceramic tile, pipe, glass, carpet and associated packaging.

E. Deconstruction: The process of taking apart a structure with the primary goal of preserving the value of all useful building materials, so that they may be reused or recycled.

F. Disposal: Acceptance of solid waste at a legally operating facility for the purpose of landfilling.

G. Diversion: Activities that result in reducing the amount of waste disposed at a landfill. This can include source reduction activities, composting, recycling, and reuse.

H. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert waste is taken for the purpose of filling an excavation, shoring, or another soils engineering operation.

I. Inert Fill: A facility that can legally accept inert waste such as asphalt and concrete exclusively for the purpose of disposal.

J. Inert Debris/Inert Waste: Solid waste and recyclable materials that are source separated or separated for reuse, do not contain hazardous waste (as defined in CCR, Title 22, section 66261.3 et. seq.) or soluble pollutants at concentrations in excess of applicable water quality objectives, and do not contain significant quantities of decomposable waste. Inert debris may not contain more than 1% putrescible wastes by volume calculated on a monthly basis. Gravel, rock, soil, sand and similar materials, whether processed or not, that have never been used in connection with any structure, development, or other human purpose are not inert debris.

K. Mixed Debris: Material that includes commingled recyclable and non-recyclable construction and demolition debris.

L. Mixed Debris Processing Facility: A solid waste processing facility that accepts loads of mixed debris for the purpose of recovering re-usable and recyclable materials and disposing of the non-recyclable residual materials. See also Certified Mixed Debris Processing Facility.

M. Permitted Waste Hauler: A company that possesses a valid and current permit from the City of Los Angeles to collect and transport solid waste from individuals or businesses in the City of Los Angeles.

N. Recycling: The process of sorting, cleaning, treating and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating, or thermally destroying solid waste.

1. On-site Recycling Materials that are sorted and processed for use in an altered form in the project, (e.g. concrete is crushed for use as base for a parking lot on the site)

2. Off-site Recycling Source-separated materials hauled to another location and used in an altered form in the manufacture of a new product.

O. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of a new product. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a Solid Waste Facilities permit from the CIWMB or be regulated by the LEA.

P. ReuseMaterials that are recovered for use in the same form. This includes materials that are reused on-site or off-site.

Q. Salvage: Materials recovered for reuse or sale or donation to a third party.

R. Source Reduction: Any action causing a net reduction in the generation of solid waste. Source reduction includes, but is not limited to, reducing the use of nonrecyclable materials, replacing disposable materials and products with reusable materials and products, reducing packaging, and reducing the amount of yard waste generated.

S. Source-Separated Materials (Construction and Demolition Debris): Material that is sorted at the site of generation by individual material type for the purpose of reuse or recycling, i.e., loads of concrete that are source-separated for delivery to a base course recycling facility to be crushed into road base material. Note: The Contractor may be able to save money on collection fees for source-separated material. Source-separated material is not subject to the City's 10% AB939 fee.

T. Solid Waste: shall mean waste that the CIWMB has deemed acceptable for disposal at a Class III Landfill and shall not include source-separated material.

U. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for reuse or recycling. Transfer stations must be permitted by the CIWMB and regulated by the LEA.

1.4 DIVERSION REQUIREMENTS

A. The construction and demolition project shall reuse or recycle a minimum of 75% of the inert debris and 50% of the remaining construction and demolition debris generated by the project.

1.5 SUBMITTALS

A. Waste Management Plan (WMP):

1. The Contractor shall conduct a site assessment and estimate the types and quantities of materials, under the project, that are anticipated for on-site or off-site processing, recycling, reuse, or disposal. See CDRG Section VII G, for a partial list of facilities that accept these materials for recycling.

2. After the contract is awarded and prior to the commencement of the project, the City project manager will schedule and attend a meeting with the Contractor to discuss the Contractor's proposed WMP. This plan shall be submitted to allow the City and the Contractor an opportunity to develop a mutual understanding regarding the recycling and reuse requirements and programs.

3. Not more than 20 working days after the meeting, and before the commencement of the project, the Contractor shall prepare and submit to the City project manager a written WMP, Attachment A. The plan shall show a minimum 75% recycling for inert debris expected from the project and 50% recycling for the remaining C&D debris expected from the project. The Contractor shall submit the plan in the format provided herein as Attachment A, Parts I and II. Instructions for filling out the form are in Attachment A, 'Instruction Sheet'. Work shall not begin until the project Engineer approves the WMP for the project.

4. If the Contractor expects a circumstance that the Contractor believes make it infeasible to comply with the Diversion Requirement, the Contractor may submit a written request for an exemption at the time the WMP is submitted. If the exemption request is not approved by the Engineer, the Contractor shall revise and resubmit a WMP.

5. If the City determines that it is infeasible for the Contractor to meet the Diversion Requirement due to unique circumstances, the City shall determine the maximum feasible diversion rate for each material and shall indicate this rate on the WMP submitted by the Contractor. The City shall return a copy of the WMP to the Contractor marked "Approved for Infeasible Exemption". The Contractor will be required to meet the maximum feasible diversion rates as approved by the City. If the Contractor fails to meet the revised rates the Contractor will be subject to the stipulated penalties. Exempt projects are required to keep and submit all documentation for the project. This includes receipts, the WMP, SWDDReports, and all supporting documentation as required herein.

6. The City's approval of the Contractor's WMP will not otherwise relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures.

B. Solid Waste Diversion and Disposal Report (SWDDReport): With each submittal of the Contractor's application for progress payment, the Contractor shall prepare and submit to the inspector a written SWDD Report quantifying all material generated in the project which was either disposed, or diverted from disposal through reuse or recycling during the time period covered by the SWDD Report and progress payment. Part III of each SWDD Report is a cumulative history of the diversion and disposal for the project. The Contractor shall submit the report in the format provided herein as shown in Attachment B. Failure to submit the report and the supporting documentation shall render the application for progress payment incomplete and delay payment until the proper documentation is submitted. The supporting documentation includes manifests, weight tickets, receipts, reports, invoices, and other supporting documents specifically identifying the projects, the recyclables and solid waste generated by the project, and where the material was sent. Instructions for filling out the forms are in Attachment B, 'Instruction Sheet'. The final SWDD Report shall cover the complete time period of the project and shall contain, in Part III, a list of the total waste disposed and/or diverted for each reporting period. The final SWDD and supporting documentation must be submitted within 30 days of the end of the project.

C. Substitutions: Should the Contractor desire to use materials, equipment, or products that meet the requirements of these specifications but are more environmentally responsive, the Contractor shall submit these substitutions in accordance with "Substitutions and "Or Equal" Submittals" of the General Requirements.

1.6 PENALTY

A. If the diversion requirement has not been met, a per ton penalty will be applied to the disposed material over that allowed in the approved WMP.

B. The penalty will be calculated as follows: Tons over that allowed in the approved WMP times the per-ton penalty in effect at the time the contract was awarded. The penalty may not exceed the total payment retention for the project.

C. The penalty is $100 per ton.

D. The recommended penalty will be determined by the Bureau of Contract Administration and shall be considered by the Board of Public Works at the time of the project closeout.

E. The Contractor who has been assessed a penalty may submit a written request for a hearing. Upon receipt of the written request the awarding authority shall set the matter for hearing and notify the Contractor.

1.7 REUSE, SALVAGE, AND RECYCLING OPTIONS

A. Construction projects shall make use of as many reuse and salvage options as is feasible. One option is the California Materials Exchange (CalMAX), a free program sponsored by the CIWMB. The most recent issues of CDRG Section VII G, contains contact information for non-profit organizations, salvage facilities and other reuse organizations.

B. Recycling shall include both on-site and off-site recycling of source-separated materials, as well as mixed debris recycling efforts.

C. On-site recycling program shall produce a quality product to meet the specifications identified in the contract documents, subject to approval. The Contractor shall estimate the amount of material to be used in the project and include a program for off-site recycling of any excess material that cannot be used in the project.

D. The Contractor shall develop and implement a program to include source separation of solid waste, to the greatest extent feasible, of the following types:

1. Asphalt

2. Concrete, concrete block, slump stone (decorative concrete block)

3. Rock

4. Wood (lumber)

5. Green material (i.e. tree trimmings)

6. Other materials, as appropriate, such as red clay brick, building fixtures, architectural details, dry wall, carpet, carpet padding, and corrugated cardboard

E. Mixed Debris Recycling: The Contractor should develop and implement a program to transport loads of commingled construction and demolition materials that cannot be feasibly source separated to a mixed debris recycling facility. A list of these facilities and their recycling rates is in the most recent issue of CDRG Section VII G.

F. Certified Processors: These facilities have facility recycling rates, established by the City of Los Angeles for each mixed debris waste stream. Mixed construction and demolition debris taken to these facilities are considered to have been recycled at the rate of the certified processing facility. For example, 100 tons of material taken to a facility with a recycling rate of 60% gives the project credit for 60 tons of recycling. A list of these facilities and their recycling rates is in the most recent issue of CDRG Section VII G.

G. Recycling, Reuse, Mixed Waste Processing and Salvage Facilities: The CDRG is incorporated herein by reference and contains information about processing, recycling, reuse and salvage facilities.

H. Revenue: Revenue or savings obtained from recycled, reused, or salvaged materials shall accrue to the Contractor unless otherwise noted in the Contract Documents. Note: The Contractor may be able to save money on collection fees for source-separated material. Source-separated material is not subject to the City's 10% AB939 fee. Permitted waste haulers that take mixed C&D debris to certified processors may be eligible for a rebate on part of the AB 939 fee.

I. AB 939 Fee: The AB 939 fee is assessed on all solid waste hauled within the City of Los Angeles in accordance with Section 66.32 of the Los Angeles Municipal Code.

1. All solid waste haulers hauling material from City of Los Angeles locations must be permitted in accordance with Section 66.32 of the Los Angeles Municipal Code.

2. Source-separated material is not assessed this fee.

3. Permitted solid waste haulers may apply for a rebate for the recycled portion of the mixed waste taken to certified mixed debris processing facilities.

1.8 HAULING AND DISPOSAL OPERATIONS

A. Hauling: The Contractor is responsible for arranging the collection and hauling of C&D debris by a waste hauler that is permitted by the City of Los Angeles in accordance with Section 66.32 of the Los Angeles Municipal Code.

B. Recycling And Processing Facilities: The Contractor shall be responsible for transporting C&D debris to recycling or processing facilities. The Contractor shall be familiar with the requirements for acceptance of C&D materials at the recycling and processing facilities before the material is delivered. The most recent issue of CDRG Section VII G, includes a partial list of these facilities. Always call facilities in advance.

C. Disposal Facilities: The Contractor shall be responsible for transporting C&D debris that cannot be delivered to a recycling or processing facility, to a transfer station or disposal facility that can legally accept the materials for the purpose of disposal.

D. Site Disposal: The Contractor may not burn, bury, or otherwise dispose of solid waste on the project job-site.

* * * * *

(SEE ATTACHMENTS)

Attachment A

WASTE MANAGEMENT PLAN (Part I-Inert Materials)

Project Title:	W. O. Number:	Date Submitted:
Name & Title of Responsible Person:	Signature:	

Methods

1) Hand-wrecking to recover salvageable materials to be used on - site
2) Hand-wrecking to recover salvageable materials to be taken off - site
3) Other (please describe)
4) Hauling inerts to an engineered fill
5) On-site concrete and asphalt crushing for use on - site
6) On-site concrete and asphalt crushing for use off - site
7) Source separating materials and hauling to recyclers

Material	Facility and Location	Method	Tons Diverted	Tons Disposed
RECYCLING/REUSE				
Asphalt				
Concrete				
Brick				
Other (Describe)				
Other (Describe)				
DISPOSAL				
Mixed inerts				
Other (Describe)				
Other (Describe)				
Other (Describe)				
CERTIFIED PROCESSING**				
Mixed inerts				
Mixed inerts				
Mixed inerts				
Mixed inerts				
DIVERSION AND DISPOSAL TOTALS =				

$$\text{Percent Recycling} = \frac{\text{Total diversion}}{\text{Total diversion + Total disposed}} \times 100 =$$

$$\text{Percent Recycling} = \frac{\quad}{+} \times 100 =$$

**Recycling tonnages for debris taken to a certified processor = total tonnage taken to facility X recycling rate. Remaining tonnage counts as disposal. Example: 200 tons taken to a certified processor with a recycling rate of 0.63 (63%) yields 126 tons of diversion and 74 tons of disposal.

Attachment A

WASTE MANAGEMENT PLAN (Part II-All Other Materials)

W. O. No.:	Index No.:	Date Submitted:

Contractors Name:

Street address:

City, State, Zip:

Phone: Fax: Email:

Methods

1) Hand - wrecking to recover salvageable materials to be used on - site
2) Other (please describe)
3) Hand - wrecking to recover salvageable materials to be taken off - site
4) Source separating materials and hauling to recyclers

Material	Facility and Location	Method	Tons Diverted	Tons Disposed
RECYCLING/REUSE				
Glass				
Wood / Greenwaste				
Metal				
Cardboard				
Other (Describe)				
Other (Describe)				
DISPOSAL				
Mixed Waste				
Other (Describe)				
Other (Describe)				
CERTIFIED PROCESSING**				
Mixed Waste				
Mixed Waste				
Mixed Waste				
Mixed Waste				
DIVERSION AND DISPOSAL TOTALS =				

$$\text{Percent Recycling} = \frac{\text{Total diverted}}{\text{Total diverted} + \text{Total disposed}} \times 100$$

$$\text{Percent Recycling} = \frac{\qquad}{+} \times 100 =$$

**Recycling tonnages for debris taken to a certified processor = total tonnage taken to facility X recycling rate. Remaining tonnage counts as disposal. Example: 200 tons taken to a certified processor with a recycling rate of 0.63 (63%) yields 126 tons of diversion and 74 tons of disposal.

Attachment A - INSTRUCTION SHEET

1. **Please print very clearly or type.**
2. Attachment A includes: **Part I-**Inert Materials and **Part II**-Metal, Wood, and Other Material
3. The information required includes but is not limited to, the following:
   a. Contractor and project identification information
   b. Methods to be used for recycling, reusing, salvaging and disposing of materials. The method number should be chosen from the list at the top of Part I and Part II.
   c. Estimated quantities of **all** materials listed, in tons;
4. **Calculating recycling and disposal for mixed material taken to a certified processor: the total tons to be taken to certified processor times the recycling rate = amount to be recycled. Total to be taken to facility minus amount to be recycled = amount for disposal.
5. **Sample**

Project Title: Big St. Overcrossing	W. O. Number: 12341-0230709	Date Submitted: 09/09/99

Contractors Name: Acme Construction
Street address: 33333 Some St.
City, State, Zip: Anytown Ca. 90000
Phone: 213-555-5555 Fax: 213-555-1111 Email:

Methods

1) Hand - wrecking to recover salvageable materials to be used on - site
2) Hand - wrecking to recover salvageable materials to be taken off - site
3) Other (please describe)
4) Source separating materials and hauling to recyclers
5) Hauling inerts to an engineered fill

Material	Facility and Location	Method	Tons Diverted	Tons Disposed
	RECYCLING/REUSE			
Asphalt	BBB Crushing	4	200	
Concrete	BBB Crushing	4	55	
Brick	Joe's Salvage	2	6	
Other(Describe) Clean Gravel	The Best Landscaping	4	600	
	DISPOSAL			
Mixed waste	Joe's Landfill			1000
Other				
	CERTIFIED PROCESSING**			
Mixed Waste	Ben's Processing (Recycling Rate .81 or 81%)		8100	1900
Mixed Waste				
	DIVERSION AND DISPOSAL TOTALS =		8961	2900

$$\text{Percent Recycling} = \frac{\text{Total diverted}}{\text{Total diverted} + \text{Total disposed}} \times 100 =$$

$$\text{Percent Recycling} = \frac{8961}{8961 + 2900} \times 100 = 75.5\ \%$$

Attachment B

CITY OF LOS ANGELES/DEPARTMENT OF PUBLIC WORKS

SOLID WASTE DIVERSION AND DISPOSAL REPORT
PART I OF III - INERT WASTE MATERIAL

Project Title:	W. O. Number:	Date Submitted:	Progress Payment #

Company Name: Daytime Phone Number:

Index Number: Department:

Period Covered In This Report:

From: To:

Material	Facility and Location	Tons diverted	Tons Disposed
RECYCLING/REUSE			
Asphalt			
Concrete			
Brick			
Other (Describe)			
Other (Describe)			
DISPOSAL			
Mixed inerts			
Other (Describe)			
Other (Describe)			
Other (Describe)			
CERTIFIED PROCESSING**			
Mixed inerts			
Mixed inerts			
Mixed inerts			
Mixed inerts			
=	**DIVERSION AND DISPOSAL TOTALS ***		

*Copy the Diversion and Disposal Totals to Part III Cumulative Project Recycling Report. Each Report needs to have the totals from every previous Disposal And Diversion Report listed on it, as well as the totals from this report.

**Recycling tonnages for debris taken to a certified processor = total tonnage taken to facility X recycling rate. Remaining tonnage counts as disposal. Example: 200 tons taken to a certified processor with a recycling rate of 0.63 (63%) yields 126 tons of diversion and 74 tons of disposal.

Attachment B

SOLID WASTE DIVERSION AND DISPOSAL REPORT
PART II OF III - ALL OTHER WASTE MATERIAL

W. O. Number:	Date Submitted:

Material	Facility and Location	Tons Recycled	Tons Disposed
RECYCLING/REUSE			
Metal			
Wood / Lumber			
Greenwaste / Landscaping			
Glass			
Cardboard			
Other (Describe)			
Other (Describe)			
DISPOSAL			
Mixed waste			
Other (Describe)			
Other (Describe)			
Other (Describe)			
CERTIFIED PROCESSING**			
Mixed waste			
Mixed waste			
Mixed waste			
Mixed waste			
DIVERSION AND DISPOSAL TOTALS*			
=			

*Copy the Diversion and Disposal Totals to Part III Cumulative Project Recycling Report. Each Report needs to have the totals from every previous Disposal And Diversion Report listed on it, as well as the totals from this report.

**Recycling tonnages for debris taken to a certified processor = total tonnage taken to facility X recycling rate. Remaining tonnage counts as disposal. Example: 200 tons taken to a certified processor with a recycling rate of 0.63 (63%) yields 126 tons of diversion and 74 tons of disposal.

Attachment B

INERT SOLID WASTE DIVERSION AND DISPOSAL REPORT
PART III OF III - PROJECT CUMULATIVE TOTAL

W. O. Number:	Date Submitted:

Period Beginning	Period Ending	*Period Disposal	Cumulative Project Disposal	*Period Diversion	Cumulative Project Diversion, R	Cumulative Waste Generated D + R	Cumulative Recycling % (R/G)100
INERT WASTE MATERIAL CUMULATIVE PROJECT HISTORY							
ALL OTHER WASTE MATERIAL CUMULATIVE PROJECT HISTORY							

Name & title of person responsible for the information in this form:	Signature:

*From appropriate Part I or II during each period.
Each Attachment B Part III Report needs to have the Diversion and Disposal Totals from every previous Disposal And Diversion Report listed in it, as well as the totals from this report.
Attach another Part III form and continue information if more rows are needed

ATTACHMENT B - INSTRUCTION SHEET

Contractor may contact the Solid Resources Citywide Recycling Division of the Bureau of Sanitation at (213) 473-8228 for information about recycling construction and demolition materials.

Reporting Disposal and Diversion of Solid Waste. With each submittal of Contractor's application for progress payment, the Contractor shall prepare and submit to the inspector a written Solid Waste Diversion and Disposal Report quantifying all material generated in the project that was either disposed in landfills or diverted from disposal through recycling or reuse. Submit the report in the format provided as Attachment B. The report contains three sections. All three sections must be submitted each time. As indicated on the Solid Waste Diversion and Disposal Report:

PART I

1. Report disposal, reuse, or recycling in tons. Indicate zero (0) if there is no quantity to report for a type of material.

2. Indicate all locations to which materials are delivered for reuse, recycling, or disposal. These locations can include:

    a. Source Separated Recycling Facilities
    b. Mixed Debris Recycling Facilities
    c. Class III Landfills
    d. Inert Backfill Sites
    e. Salvage yards
    f. Transfer Stations

3. The Solid Waste Diversion and Disposal Report must be accompanied by: legible copies of weigh tickets, receipts, or invoices that specifically identify the project generating the material. Said documents must be from recyclers and/or disposal site operators that can legally accept the materials.

4. Indicate the Project title; City Work Order Number; Progress Payment Number; Item Number, the City Department for which the work in being done; the name of the company completing the 'Solid Waste Diversion and Disposal Report' and compiling supporting documentation; the printed name, title signature, and daytime phone number of the person responsible for the information on the form; the beginning and ending dates of the period covered; and the date that the 'Solid Waste Diversion and Disposal Report' is completed.

5. If materials are taken to a facility for which weigh tickets, receipts, or invoices are not available, Contractor shall provide documentation *on company letterhead* identifying the address to which materials were taken, name of owner/operator, type of materials, tons disposed, and the specific project generating the materials.

6. If materials are used on site, Contractor shall provide documentation *on company letterhead* identifying the type and tons of materials being reused or recycled on site and the specific project generating the materials.

SECTION 01581
PROJECT SIGNS

1.1 THE REQUIREMENT

A. The names, addresses and specialties of CONTRACTORS, Subcontractors, architects, or engineers may be displayed on removable signs. The size and location shall be subject to the ENGINEER'S approval. Commercial advertising matter shall not be attached to or painted on the surfaces of buildings, fences, canopies, or barricades.

B. TIME and INFORMATION type construction notice signs 1 each per Standard Plan S-791-1 are required at each of the 3 sewer replacement locations shown in the plans. The Inspector will determine appropriate locations. The time for the TIME sign and the telephone number for the INFORMATION sign will be furnished by the ENGINEER at the time of construction.

C. 2 each TYPE III CREDIT signs per Standard Plan S-792-0 are required. The INSPECTOR will determine the appropriate locations. The information for the sign will be furnished by the ENGINEER at the time of construction.

* * * * * *

SECTION 01611
GUARANTY / WARRANTY

1.1 THE REQUIREMENT

A. The CONTRACTOR shall and does hereby warrant and guaranty that all work executed under this Contract will be free from defects of materials and workmanship for a period of one (1) year from the date of Final Field Acceptance of the project as evidenced by the issuance of a "Statement of Completion" by the Inspector, except certain specific items of Work, materials and equipment requiring a guaranty or warranty for a greater period of time as hereinafter specified. In the event, however, that portions of the Work are sufficiently complete to allow use or occupancy by the CITY in the manner and for the purposes intended prior to final completion and acceptance of the project, the guarantee period will commence on the date shown on the Statement of Partial Completion.

B. The CONTRACTOR hereby agrees to indemnify and save harmless the CITY, and their officers, agents and employees against and from all claims and liability arising from damage and injury due to said defects. The CONTRACTOR shall repair or replace, at no cost to the CITY, any and all such defective Work and all other Work damaged thereby, which becomes defective during the term of the above-mentioned guaranties and warranties.

C. Within thirty (30) calendar days prior to completion of all Work the CONTRACTOR shall submit to the CITY original copies of all manufacturers guaranties covering all supplied and installed equipment and, where applicable, systems.

D. In addition to the requirements of INSURANCE, Contract Bonds, of the GENERAL CONDITIONS, it shall be understood that the Surety for the faithful performance bond, submitted in conformance with the terms of the Contract for this project, is liable on its bond for all obligations of the CONTRACTOR including guaranty provisions.

E. The CONTRACTOR shall, within twenty-four (24) hours of notice from the ENGINEER of any Work not in accordance with the requirements of the Contract, or any defects in the Work, commence and prosecute with due diligence all work necessary to fulfill the terms of this Section and to complete the Work within a period of time as approved by the ENGINEER. The CONTRATOR shall notify the ENGINEER of the repair schedule before commencing the repairs and notify the ENGIENER to arrange for inspection. The CONTRACOR shall submit a written report of the defect and methods of correction. In the event of failure by the CONTRACTOR and/or its surety to respond to the notice or to complete the Work required by this Section within the time specified, the CITY shall proceed to have such Work done at the CONTRACTOR's expense. The CONTRACTOR or its Surety shall promptly reimburse the CITY all direct and indirect cost associated with performing this Work.

*** * * * * ***

SECTION 01630
SUBSTITUTIONS AND "OR EQUAL" SUBMITTAL

1.1 THE REQUIREMENT

A. The CONTRACTOR may supply any of the materials specified or offer an equivalent. The ENGINEER shall determine whether the material offered is equivalent to that specified. The CONTRACTOR shall make all "Or Equal" submittals within thirty (30) calendar days after issuance of Notice to Proceed. Any request or submittal received after the specified period will be considered as NOT EQUAL to that so specified and will be processed as a substitution described hereinafter.

B. Whenever any particular material, process, or equipment is indicated by patent, proprietary or brand name, or by name of manufacturer, such wording is used for the purpose of facilitating its description and shall be deemed to be followed by the words 'or equal.' A listing of materials is not intended to be comprehensive, or in order of preference. The CONTRACTOR may offer any material, process, or equipment considered to be equivalent to that indicated. The substantiation of offers shall be submitted as provided in the Contract Documents.

C. The CONTRACTOR shall, at its expense, furnish data concerning items offered by it as equivalent to those specified. The CONTRACTOR shall have the material tested as required by the ENGINEER to determine that the quality, strength, physical, chemical, or other characteristics, including durability, finish, efficiency, dimensions, service, and suitability are such that the items will fulfill its intended function.

D. Test methods shall be subject to the approval of the ENGINEER. Test results shall be reported promptly to the ENGINEER, who will evaluate the results and determine if the substitutes items is equivalent. The ENGINEER'S findings shall be final. Installation and use of a substitute items shall not be made until approved by the ENGINEER.

E. All manufacturers' data submitted to the ENGINEER for review and acceptance shall clearly identify each proposed substitute with the corresponding Contract Drawing detail and Specification Section. If the ENGINEER decides to accept for use in the Project a material, process or article which is not the equal of that specified, substitution shall be made in the manner described in CHANGES AND EXTRA WORK of the GENERAL CONDITIONS, with a credit to the CITY for the difference in value.

F. The ENGINEER shall determine whether the material offered is equivalent to that specified. Any revision to structures, piping, mechanical, electrical, instrumentation, or any other work made necessary by such substitution must be approved by the ENGINEER, and the entire cost both direct and indirect of these revisions shall be borne by the CONTRACTOR.

G. Any materials, process, or article may be requested as a substitution by the CONTRACTOR, in lieu of that specified, under the following conditions:

1. Requests must be submitted in writing and in the manner described in SHOP DRAWINGS / SUBMITTALS of these GENERAL REQUIREMENTS.

2. Requests must be submitted thirty (30) calendar days prior to starting the work, as established by the ENGINEER, so as not to cause any delay in completion of the Project. No other request will be considered after expiration of the period specified, except that in exceptional cases where it is determined to be in the best interest of the CITY, as approved by the ENGINEER.

3. The CONTRACTOR agrees to pay for all Engineering and design services, if required, to make all changes and adjustments in material and work of all trades directly or indirectly affected by the substitute, to the satisfaction of the ENGINEER, at no cost to the CITY.

4. All requests for substitution shall be made through the CONTRACTOR. Submissions by the CONTRACTOR shall imply the CONTRACTOR'S approval of such substitution.

5. No requests for substitutions will be considered during the bidding period.

6. The CONTRACTOR shall furnish adequate data with each request for approval of a substitute to enable the ENGINEER to evaluate the proposed substitution.

7. If a substitute offered by the CONTRACTOR is not found to be equal to the specified material, then CONTRACTOR shall furnish and install the specified material.

8. The specified Contract completion time shall not be affected by any circumstance developing from the provisions of this Section.

*** * * * * ***

SECTION 01711
SITE INVESTIGATION

1.1 THE REQUIREMENT

A. CONTRACTOR shall investigate the Jobsite prior to Bid and during construction to ascertain all conditions affecting necessary procedures and sequencing of the Work operations in the execution of the Contracted Work.

1. CONTRACTOR shall report to the ENGINEER, prior to the Bid, any adverse condition(s), which would affect the proper execution of the Contracted Work and shall not proceed until instructed by the ENGINEER. Except as provided in GENERAL REQUIREMENTS Section – DIFFERING SITE CONDITION, failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the CONTRACTOR at its sole cost and expense.

2. Start of Contracted Work at the Jobsite shall imply CONTRACTOR'S acceptance of job conditions.

B. Work Determination: CONTRACTOR shall satisfy itself regarding job/site conditions, the nature and types of work to be performed and shall be responsible for the determination of all classes of work to be accomplished at the Jobsite or at the manufacturer's plant.

C. Allotted Working Space: CONTRACTOR shall limit work operations to the "working site" or "Jobsite" or "Worksite," and areas immediately adjacent thereto, as shown on the Contract Drawings, specified or authorized by the CITY ENGINEER.

1.2 UTILITY LOCATION

A. Unless specified otherwise, prior to commencing any excavation or other work, it is the CONTRACTOR'S responsibilities to verify and/ or determine the location and the depth of underground main distribution conduits, such as, but not limited to, water, gas, sewer, storm water, electric power, oil, telephone or cable television, in the area which is known, or reasonably should be known, to contain such subsurface installations. The CONTRACTOR shall call Underground Service Alert and obtain a reference number at least 48 hours before commencing excavation activities.

B. Coordination:

1. The CONTRACTOR is advised that the Drawings usually depict the location of substructures as they existed when the project was designed. Present-day information may indicate that new facilities may have been added, or are going to be added, or that some of those substructures are now, or will be, relocated, abandoned, removed, lowered, raised, blanketed, encased enlarged, protected, or altered in some other way. The CONTRACTOR shall carefully examine the proposed construction site prior to Bid and during construction for any evidence of recent surfacing of excavations, or the possible conflict with surface or aerial installations, and the latest substructure maps, and bid accordingly. If further information or clarification is desired, CONTRACTOR is urged to immediately contact the following:

a. The appropriate utility companies;

b. The appropriate District Office of the Bureau of Engineering; and/or

c. City of Los Angeles
Utility Coordination Section of the Project Award and Control Division
1149 S. Broadway, Suite 140
Los Angeles, CA 90015
(213) 847-0546

2. Review and verify with the information indicated on the Contract Drawings and the information provided in the GENERAL REQUIREMENTS Section 01112 - DESCRIPTION OF WORK.

1.3 UTILITY PROTECTION

A. The CONTRACTOR shall not interrupt the service function or disturb the support of any utility without authority from the owner or order from the CITY. All valves, switches, vaults, and meters shall be maintained readily accessible for emergency shutoff.

B. Where protection is required to ensure support of utilities located as shown on the Plans or in accordance with Subsection 1.2 – Utility Location, above, the CONTRACTOR shall, unless otherwise provided, furnish and place the necessary protection at its expense.

C. Upon learning of the existence and location of any utility omitted from or shown incorrectly on the Plans, the CONTRACTOR shall immediately notify the ENGINEER in writing. When authorized by the ENGINEER, support or protection of the utility will be paid for as provided in PAYMENT FOR CHANGES AND EXTRA WORK of the GENERAL REQUIREMENTS.

D. The CONTRACTOR shall immediately notify the ENGINEER and the utility owner if any utility is disturbed or damaged. The CONTRACTOR shall bear the costs of repair or replacement of any utility damaged if located as noted above, in Subsection 1.2 – Utility Location.

E. When placing concrete around or contiguous to any non-metallic utility installation, the CONTRACTOR shall, at its expense:

1. Furnish and install a 50 mm (2 inch) cushion of expansion joint material or other similar resilient material; or

2. Provide a sleeve or other opening which will result in a 50mm (2 inch) minimum-clear annular space between the concrete and the utility; or

3. Provide other acceptable means to prevent embedment in or bonding to the concrete.

1.4 UTILITY REMOVAL

A. Unless otherwise specified, the CONTRACTOR shall remove all interfering portions of utilities shown on the Plans or indicated in the Bid documents as “abandoned” or “to be abandoned in place”. Before starting removal operations, the CONTRACTOR shall ascertain from the CITY whether the abandonment is complete, and the costs involved in the removal and disposal shall be included in the Bid for the items of work necessitating such removals.

1.5 UTILITY RELOCATION

A. When feasible, the owners responsible for utilities within the area affected by the Work will complete their necessary installations, relocations, repairs, or replacements before commencement of work by the CONTRACTOR. When the Plans or Specifications indicate that a utility installation is to be relocated, altered, or constructed by others, the CITY will conduct all negotiations with the owners and work will be done at no cost to the CONTRACTOR, except as

provided in SSPWC Section 301-1.6. Utilities which are relocated in order to avoid interference shall be protected in their position and the cost of such protection shall be included in the Bid for the items of Work necessitating such relocation.

B. After award of the Contract, portions of utilities which are found to interfere with the Work will be relocated, altered or reconstructed by the owners, or the ENGINEER may order changes to the Work to avoid interference. Such changes will be paid for in accordance with PAYMENT FOR CHANGES AND EXTRA WORK of the GENERAL REQUIREMENTS.

C. When the Plans or Specifications provide for the CONTRACTOR to alter, relocate, or reconstruct a utility, all costs for such work shall be included in the Bid for the items of work necessitating such work. Temporary or permanent relocation or alteration of utilities requested by the CONTRACTOR for its convenience shall be its responsibility and it shall make all arrangements and bear all costs.

D. The utility owner will relocate service connections as necessary within the limits of the Work or within temporary construction or slope easements. When directed by the ENGINEER, the CONTRACTOR shall arrange for the relocation of service connections as necessary between the meter and property line, or between a meter and the limits of temporary construction or slope easements. The relocation of such service connections will be paid for in accordance with the provisions of PAYMENT FOR CHANGES AND EXTRA WORK of the GENERAL REQUIREMENTS. Payment will include the restoration of all existing improvements which may be affected thereby. The CONTRACTOR may agree with the owner of any utility to disconnect and reconnect interfering service connections. The CITY will not be involved in any such agreement.

1.6 UTILITY DELAYS

A. The CONTRACTOR shall notify the ENGINER of its construction schedule insofar as it affects the protection, removal, or relocation of utilities. Said notification shall be included as part of the construction schedule required in CONTRACTOR'S CONSTRCTION SCHEDULE AND REPORTS OF THE GENERAL REQUIREMENTS. The CONTRACTOR shall notify ENGINEER in writing of any subsequent changes in the construction schedule which will affect the time available for protection, removal, or relocation of utilities.

B. The CONTRACTOR will not be entitled to damages or additional payment for delays attributable to the utility relocations or alterations if correctly located, noted, and completed in accordance with 1.2 Utility Location, above.

C. The CONTRACTOR may be given an extension of time for unforeseen delays attributable to the unreasonably protracted interference by utilities in performing Work correctly shown on the Plans

D. The CITY will assume responsibility for the timely removal, relation, or protection of existing main or trunkline utility facilities within the area affected by the Work if such utilities are not identified in the Contract Documents. The CONTRACTOR will not be assessed liquidated damages for any delay caused by failure of CITY to provide for the timely removal, relocation, or protection of such existing facilities.

E. If the CONTRACTOR sustains loss due to delays attributable to interferes, relocations, or alterations not covered by Subsection 1.2 - Utility Location, above, which could not have been avoided by the judicious handling of forces, equipment, or plant, there shall be paid to the CONTRACTOR such amounts as the ENGINEER may find to be fair and reasonable compensation for such part of the CONTRACTOR'S actual loss as was unavoidable and the CONTRACTOR may be granted an extension of time.

F. Payment to the CONTRACTOR for actual loss due to a protracted utility delay shall be calculated based on wage increases, price increases of material and equipment, additional insurance costs and actual direct costs of maintaining the Worksite incurred because of the utility delay.

1.7 UTILITY COOPERATION

A. When necessary, the CONTRACTOR shall so conduct its operations as to permit access to the Worksite and provide time for utility work to be accomplished during the progress of the Work.

* * * * *

(SEE ATTACHMENT)

ATTACHMENT TO SECTION 01711

Attachment to General Requirements Section 01711 consists of one (1) document, as follows:

ATTACHMENT NUMBER	TITLE OF ATTACHMENT	NUMBER OF PAGES IN THIS ATTACHMENT
01711-A1	Summary of First Notice	(as required for each project)

Eng.8.463 (Rev.10-06)

Date: April 27, 2009

CITY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE CITY ENGINEER

SUMMARY OF FIRST - NOTICE REPLIES

Work Order No.:	Job ID No.:	
EW40019F	**1037**	**PENMAR WATER QUALITY IMPROVEMENT PROJECT - PHASE I**

Bidders are advised that project plans usually depict the location of substructures as they existed when the project was designed. Present-day information may indicate that new facilities may have been added or are going to be added. Some of those substructures may now be or will be relocated, abandoned, removed, lowered, raised, blanketed, encased, enlarged, protected, or altered in some other way. Bidders are urged to carefully examine the proposed construction site for any evidence of recent surfacing of excavations, or the possible conflict with surface or aerial installations. Contractor should use the latest substructure maps and prepare their bid accordingly. If further information or clarification is desired, bidders are urged to immediately contact the appropriate utility company or the appropriate District Office of the Bureau of Engineering. Contractors may also contact the Utility Coordinating Section, 1149 S. Broadway Street, Suite 140, Los Angeles, CA 90015, Telephone (213) 847-0552. The contractor will need to coordinate work with utility companies during construction if necessary.

Based on the confirmation from the following utility companies, they have facilities within the improvement area that will definitely be affected.

SOUTHERN CALIFORNIA GAS COMPANY (THE GAS COMPANY)

	Gale Etherly	(310) 687-2020
DISTRIBUTION (PACIFIC REGION)	Christopher Avila	(310) 687-2090

Three (3) Atlas Sheets: **{ LA 2269-3, LA 2269-4, LA 2270-1 }** furnished to the Bureau of Engineering identiy the approximate locations of the existing gas mains.
The Gas Company believes their facilities are not in direct conflict with the proposed construction. However, The Gas Company does have some steel and plastic gas mains that are adjacent to/or will be crossed during the proposed construction. These gas mains and services must be protected in place. Any damage to facilities must be reported immediately to the Gas Co. Call Center (800) 427-2200.
It is extremely important that the Gas Company receives **signed final plans** before construction, including profiles and subsequent plan revisions when available. A minimum of **twelve (12)** weeks is needed to analyze plans and to design alterations for any conflicting facilities. Depending on the magnitude of the work involved, additional time may be required to clear any conflicts.
The precise locations and depths of these facilities vary and can only be determined by pot holing, or some other acceptable method of taking elevations. For further information / assistance, contact Dave McKibben (310) 687-2032, refer to Plan File No. **09-026**.

LOS ANGELES DEPARTMENT OF WATER AND POWER (DWP)

	Mark Patterson	(213) 367 - 1219
WATER SYSTEMS (CENTRAL DISTRICT)	Mike Downs	(213) 367 - 1218

Three (3) Water Service Maps: { **108-147, 112-144, 110-147** } furnished to the Bureau of Engineering identify the approximate locations of the existing water mains. Water System work will require at least 15 working days of coordinated work.

xx xx xx xx xx

Specific conditions of requirements applicable to this improvement include (but not limited to):

Proposed work on Frederick St. N. of Rose Ave. is in close proximity to the existing 6" water main in Frederick St.. Relocate approximately 100' of 6" water main in Frederick St. N. of Rose Ave. Contact Business Arrangements Office (213) 367-2130.

x x

Proposed work on Oakwood Ave. between Milwood Ct. and Rialto Ave. is is close proximity to the existing 8" water main in Oakwood Ave. and crosses the 6" water main in Palms Blvd.. Relocate approximately 250' of 8" water main in Oakwood Ave. and support per Standard Drawing A3615-A the 6" water main crossing at Palms Blvd.. Contact business Arrangements Office (213) 367-2130

x x

Proposed work on Crescent Pl. at Palms Blvd. crosses the existing 6" water main in Palms Blvd.. Support per Standard Drawing A3615-A. Protect in place.

x x

Proposed work on abbot Kinney Blvd. E. of Palms Blvd. crosses existing 8" water main in Abbot Kinney Blvd.. Support per Standard Drawing A3615-A.

xx xx xx xx xx

Contact the Water Distribution Services - Business Arrangements Office at (213) 367-2130 to request temporary water service or for information on required financial arrangements. Support or replacement of existing water mains across trenches shall be in accordance with Water Services Organization Standard Drawing Nos. A-3615A, B-1453-1A, A-3716, and A-9219.

To coordinate field or request paving clearance, contact Shahram Fadakar, (213) 367-5659.

Based on the confirmation from the following utility companies, they have facilities within the improvement area that may not require relocation but will mark them upon request. Notify Underground Service Alert at 1-800-227-2600 two working days prior to excavation to have facilities marked:

LOS ANGELES DEPARTMENT OF WATER AND POWER (DWP)

POWER SYSTEMS	Ridwan Hardy	(213) 367 - 2755
	Kit Dallarte	(310) 458 - 8731
CITY OF SANTA MONICA	Antonio Shaibani	(310) 458 - 8926

The response from the City of Santa Monica includes a PLAN AND PROFILE drawing of a sanitary sewer in Frederick Street **[TRACT No. 22079]** signed by the Santa Monica City Engineer in 1955. The sewer extends from a point about 170 feet south of Marine Street to a point about 450 feet south of Marine Street along the Frederick Street centerline. This section of sewer appears to be totally within the City of Santa Monica.

This proposed project should not interfere with this existing sanitary sewer. No conflict is expected.

BUREAU OF STREET LIGHTING Dwight Garcia (213) 847 - 1492

The response from Bureau of Street Lighting referenced two (2) City of Los Angeles projects signed by the Los Angeles City Engineer in 1963.

x x

ROSE AVENUE BETWEEN WALGROVE AVENUE AND FREDERICK STREET
W. O. 81304 Plan: P -21957

This plan identifies and locates the traffic signal system facilities in Rose Avenue at Walgrove Ave.. This plan also identifies and locates the underground conduit system in Rose Avenue between Walgrove Avenue and Frederick Street. This plan also identifies and locates the sanitary sewer in Rose Avenue between Walgrove Avenue and Glenavon Avenue.

x x

PENMAR AVENUE, MORNINGSIDE WAY TO ROSE AVENUE STORM DRAIN
W. O. 51529 Plan: D -17984

This plan identifies and locates the underground conduit system in Penmar Avenue between Rose Avenue and Lake Street. This plan also identifies and locates the storm drain system in Penmar Avenue between Rose Avenue and Morningside Way.

x x

For paving clearance, contact Dharam Singhal at (213) 847 - 1504

Based on the confirmation from the following utility companies, there are no facilities within the improvement area that will be affected:

TIME WARNER CABLE	Benita Hall	(310) 647 - 5138
VERIZON BUSINESS	John Batchelder	(972) 729 - 6016
AT & T CALIFORNIA	Ronald Lozano	(626) 308 - 4102
SOUTHERN CALIFORNIA EDISON - TRANSMISSION DEPARTMENT	David Baker	(310) 608 - 5221
SOUTHERN CALIFORNIA EDISON - DISTRIBUTION DEPARTMENT	Heather Wingo	(310) 315 - 3235
CRIMSON PIPELINE, L. P.	Alex Morales	(562) 595 - 9044
INFORMATION TECHNOLOGY AGENCY	Todd Tran	(213) 847 - 2381
SOUTHERN CALIFORNIA GAS CO.	Rosalyn Squires	(818) 701 - 4546

A T & T LONG DISTANCE	Walter Werstiuk	(714) 963 - 7964
LACMTA	Woody Yee	(213) 922 - 5063
LOS ANGELES COUNTY - DEPARTMENT OF PUBLIC WORKS	Jomarie Garong	(626) 300 - 4694
VERIZON	Austin Armenta	(310) 264 - 5123
A T & T LOCAL (TCG)	Maria Guzman	(213) 787 - 9996

The following utility companies have not responded to the First Utility Notice, but they may have facilities within the improvement area.

All utility companies who were sent First Notices have responded.

Ted Allen, Acting Division Engineer
Department of Public Works
Bureau of Engineering
Project Award and Control Division

SECTION 01712
SUBSURFACE DATA

1.1 THE REQUIREMENT

A. All soil and test hole data, water table elevation, and soil analyses shown on the Drawings or included in the Specifications / Project Manual apply only at the location of the test holes and to the depth indicated. Test reports for test holes, which have been drilled, are available for inspection at the office of the ENGINEER, or contained in the Geotechnical Report for the project. Any additional subsurface exploration shall be done by the CONTRACTOR at their own expense. The indicated elevation of the water table is that level at the date the test hole data was obtained. It is the CONTRACTOR'S responsibility to determine and allow for the elevation of groundwater at the date of Project construction. A difference in elevation between the ground water shown in soil boring logs and groundwater actually encountered during construction will not be considered as a basis for extra work.

*** * * * * ***

SECTION 01721
MOBILIZATION

1.1 THE REQUIREMENT

A. General:

1. Whether Mobilization is included as a Contract Bid Item in the Bid Proposal Form or specified as part of the lump sum in the Contract Documents, the cost of labor, equipment, materials and incidentals for doing all the work in mobilization (in advance of construction operations and not directly attributable to any specific bid item) shall be included in the Contract Price Breakdown and progress payment estimate. If there is no mobilization bid item the CONTRACTOR shall submit to the INSPECTOR for approval the Contract Price Breakdown with the amount established for mobilization.

2. Mobilization shall include, but not be limited to, the following items, all as required for the proper performance and completion of the Work:

   a. Obtaining all permits, licenses, insurance, and bonds. Providing copies to the ENGINEER.

   b. Moving onto the Jobsite all of CONTRACTOR'S plant and equipment as required.

   c. Erecting temporary buildings and other construction facilities.

   d. Installing temporary construction power and wiring.

   e. Establishing fire protection system for its temporary facilities.

   f. Developing construction water supply.

   g. Providing field office trailers for the CONTRACTOR, complete with all specified equipment, furnishings and utility services.

   h. Providing sanitary facilities or connecting to onsite sanitary facilities as specified.

   i. Providing for potable water facilities as specified. This includes a means by which all on site CONTRACTOR, Subcontractor or supplier personnel can wash their hands with soap.

   j. Arranging for, and erection of, CONTRACTOR'S work and storage yards and sheds.

   k. Submitting all required Subcontractor insurance certificates and bonds.

   l. Posting all CAL/OSHA required notices and establishment of safety programs.

   m. Having the CONTRACTOR'S representative at the Jobsite full time.

   n. Furnishing of Construction Schedule, Contract Price Breakdown and Submittal Schedules.

   o. Erecting all temporary fencing, including relocation of existing K-rail and fencing as required to utilize the designated staging area.

p. Erecting CONTRACTOR signs. The names, addresses, and specialties of CONTRACTORS, subcontractors, engineers or architects may be displayed on removable signs. The size and location shall be subject to the ENGINEER'S approval. Commercial advertising matter shall not be attached to or painted on the surfaces of buildings, fences, canopies or barricades.

q. Installing Building Credit signs and Advance Construction Notice signs. The Building Credit sign shall be submitted to the ENGINEER for approval prior to installation. Refer to GR Section 01581 – Project Signs, for additional requirements.

r. Furnishing and set up of field office(s) for the ENGINEER and INSPECTOR. If it is necessary to relocate the INSPECTOR'S job office to a new facility or relocation during the course of the Contract provide the required labor and equipment. The new facility shall be properly equipped and conform to the requirements shown in Subsection B.2, Field Offices herein. The CONTRACTOR shall obtain the ENGINEER'S approval of the new location thirty (30) days in advance.

B. Field Offices for the Inspector and the Engineer:

1. Unless specified otherwise, the CONTRACTOR shall, at no cost to the CITY, furnish, install, maintain, and remove all temporary light, telephone, power and water (including piping, wiring, lamps and other equipment necessary for the field offices).

2. The CONTRACTOR shall furnish the ENGINEER and the INSPECTOR, for the duration of the contract, and through the STARTUP ASSISTANCE period, at no additional cost to the CITY a furnished field office with janitorial services and maintenance agreements for all equipment provided under this Section. This office shall have a minimum floor space of 480 square feet, at least 2 doors, and window area of not less than 50 square feet. All exterior doors and windows shall be provided with screens. All exterior doors shall be provided with door handles with double dead bolt locks and the CONTRACTOR shall provide the INSPECTOR 4 keys. Interior space shall have two separate lockable offices with a common area in between. This field office shall be furnished as follows:

a. Three (3) plan table(s), 4 standard 5-foot double pedestal desks with a drawer suitable for holding files, 4 chairs, 1 drafting stool, 2 plan racks, 4 - 4 drawer filing cabinets suitable to hold legal or letter size hanging file folders, 3 storage cabinets with a minimum of 4 adjustable shelves.

b. Heating and air conditioning of sufficient capacity shall be provided at no expense to the CITY to adequately control the temperature at all times.

c. Bottled drinking water shall be provided within the office. Sanitary facilities shall be provided directly adjoining the office for the sole use of the ENGINEER and the INSPECTOR. Sanitary facilities shall include a toilet and wash basin with hot and cold running water.

d. Extended area, non-coin operated telephone service shall be provided within the office area. The installation shall include 2 individual telephone lines, 2 cordless telephones, 2 answering machines (one for each staff line), 1 facsimile machine for each Section.

e. One (1) console type, dry, indirect electrophotographic process network-capable copier/printer/scanner capable of 60 letter size copies per minute. Copier shall be able to copy 11" X 17" ledger size paper and be able to reduce to 65% and enlarge to 154%. Copier shall have a sorter/finisher with a staple cartridge and have additional cassettes for letter, legal, ledger-size paper. The copier's primary paper supply shall be 8.5" X 11" size. The copier shall be installed new or like new in good working order and the CONTRACTOR shall maintain the unit in operating condition throughout the life of the Project.

f. One (1) Color inkjet all-in-one machine capable of printing, copying, and scanning up to 11" X 17". Printing shall be a minimum of 35 pages per minute in black and 28 pages per minute in color. Resolution shall be a minimum of 6000 x 1200 dpi. A 50-sheet document feeder shall be included. All toner cartridges shall be provided by the contractor for the duration of the project.

g. Eight (8) Duplex convenience outlets for electrical power [a minimum of four per staff person].

h. One (1) Outdoor lighting fixture with 300 Watt bulb to effectively light the area around the office facility.

i. Maintenance and service agreements for all office equipment shall be provided for the entire contract period.

j. The CONTRACTOR shall provide janitorial services twice per week for the field offices for the duration of the Contract Work.

k. The CONTRACTOR shall furnish the field office as follows:

(1) A laptop computer with that complies with the following requirements:

(a) Processor: Intel® Core™ 2 Duo SU9400 (1.4GHz, 800 MHz, 3 MB) or faster

(b) Memory: Minimum 2GB Shared Dual Channel DDR3 at 1066MHz

(c) Hard Drive: Minimum 250GB

(d) Display: Minimum 15.6" High Definition TL WLED

(e) Optical Drive: Minimum 8X CD/DVD Burner (Dual Layer DVD+/-R Drive)

(f) Network Card : Integrated 10/100 Network Card

(g) Wireless Card : Intel Wireless 5100n (802.11 n)

(h) Caring Case

(i) External Optical Mouse

(j) 2 Years Advance Service Plan

(k) Manufacturers : Dell Inspiron 15Z, HP Pavillion dv6t series or equal

(l) The computer shall be pre-loaded with the latest windows operating system (Windows 7 Professional). And the following application software:

(m) Microsoft Office Professional 2007

(n) Adobe Acrobat 9 Pro.

(o) Anti-virus protection software – ESET NOD32 Antivirus 4 with a two year maintenance package

l. Any computer equipment or software furnished under this section or under an Allowance for City Field Offices shall be the property of the City at the end of the project.

m. The CONTRACTOR shall provide a high speed internet connection for the duration of the Contract and through the start up assistance period.

C. Temporary Construction Utilities:

1. Construction Water: Potable water will be made available for the CONTRACTOR'S use from the existing fire hydrant system, as located on the Plans, or as directed by the ENGINEER. The CONTRACTOR shall meter water usage and pay for the cost of water consumption. The

CONTRACTOR shall make arrangements with the servicing water utility company. A backflow preventer shall be provided as per the Plumbing Code.

2. Construction Power: The CONTRACTOR shall provide all electrical power required in performance of the Work and shall pay all installation charges and monthly bills in connection therewith. The CONTRACTOR shall provide and maintain all temporary and permanent power. The CONTRACTOR shall pay for all permits. All temporary connections for electricity shall be subject to approval of the ENGINEER and the power company representative, and shall be removed in like manner at the CONTRACTOR'S expense prior to final acceptance of the Work.

3. Telephones: The CONTRACTOR shall provide and maintain at all times during the progress of the Work, at its own expense, not less than three (3) telephones in good working order, at its own field construction office. Each such telephone shall be connected to an established exchange for toll service and with all other telephones utilized by the CONTRACTOR.

4. Temporary Ventilation: The CONTRACTOR shall provide adequate means to furnish temporary ventilation within Work areas at CONTRACTOR'S own expense and conforming to applicable requirements and standards of Federal, State, County and the 2008 Los Angeles CITY Building Codes and Amendments.

D. Contractor's Temporary Storage Facilities: The CONTRACTOR shall provide an adequate temporary shed on the site in a location designated by the ENGINEER for the safe storage of material and equipment. The shed shall be weathertight with a wood floor above grade. The shed shall be removed upon completion of the Work, or when so ordered by the ENGINEER.

E. Sanitary Facilities: The CONTRACTOR shall provide adequate sanitary conveniences of an approved type for the use of persons employed on the Work, and properly secluded from public observation, shall be provided and maintained by the CONTRACTOR in such a manner and at such points as shall be required or approved by the INSPECTOR. These conveniences shall be maintained at all times without nuisances and their use shall be strictly enforced. Upon completion of the Contracted Work, they shall be removed from the premises, leaving the premises clean and free from a nuisance.

F. Job Bulletin Board: The CONTRACTOR shall provide and mount on the CONTRACTOR'S Field Office, where it can be readily seen by the CONTRACTOR'S employees, a substantially built 3-feet high x 4-feet wide bulletin board, with a framed glass door protected on the outside with a 2-inch x 2-inch galvanized mesh and lock.

G. Protection Enclosures:

1. Precautions shall be exercised by the CONTRACTOR at all times for the protection of persons and property.

2. CONTRACTOR shall furnish (or cause to be furnished) and maintain for the duration of Contracted Work, all scaffolds, covers, tarpaulins, canopies, warning signs, steps, bridges and other temporary construction and other protective devices as required by the INSPECTOR and the Local and State Rules, Ordinances and/or Regulations necessary for protection of public and private property and public safety.

3. Such enclosures shall be of reasonably good appearance and shall be maintained free of signs, posters, writing, markings and any other thing which would detract from a reasonably good appearance.

H. Temporary Fencing and Gates:

1. Provide and maintain for the duration of the Contracted Work temporary plywood or chain link fencing of design and type needed to prevent entry onto the Jobsite and exterior Work area by the public.

2. Construction shall conform to Section 3303 of the 2008 Los Angeles City Building Codes and Amendments where adjacent to any public way.

3. Plywood Fence and Canopy Along the Property Line where Adjacent to Public Way:

   a. Required by the 2008 Los Angeles CITY Building Codes and Amendments along the property lines where adjacent to a public way, apply two coats of an exterior semi-gloss enamel.

   b. Plywood fences shall be constructed on concrete foundation and subject to the wind force or other loading.

   c. Paint color shall be as directed by the ENGINEER.

   d. Any company logo or other posting is prohibited.

   e. Remove graffiti (if any) once a week during the Contract time.

4. Chain Link Fence with an Opening Along Property Lines:

   a. Provide an approved 6-foot high chain link fence and gate with metal supports along the property lines and/or at openings to prevent access to the Jobsite.

5. Chain Link Fence Outside Of Property Lines: CONTRACTOR shall obtain all necessary written approvals from the ENGINEER and the local authorities having jurisdiction prior to erecting and temporary chain link fencing. CONTRACTOR shall remove all chain link fencing and repair all sidewalks or existing improvements after completion of Contract.

I. Construction Sign:

1. Design: Refer to plan sheets and Section 01581.

2. Materials:

   a. Posts: 4-inch x 6-inch redwood, C.R.A. Foundation grade.

   b. Frame: Douglas fir solid stock, W.C.L.B., and Better, V.G. Finish.

   c. Metal Panel: No. 22 gauge sheet steel.

   d. CITY Seal: Provided by ENGINEER.

3. Fabrication:

   a. Securely attach frame to posts with adequate fasteners.

   b. Miter and nail frames, conceal fastenings and set nails.

   c. Secure a sheet metal panel to frame with wood stops.

4. Painting:

   a. By sign painters.

   b. On all surfaces of posts, panel and frame, 1 coat of primer and 2 coats of finish paint on exposed surfaces, and anti-graffiti coating.

   c. With exterior wood primer and exterior oil paint as specified in Section 09800.

d. White finish on all surfaces; black letters and black frames reveal.

5. Installation: Set posts into natural ground; location as directed by the ENGINEER.

6. Removal: Upon completion of Contracted Work or when directed by the ENGINEER.

7. Modifications:

a. During the course of the Contract, the CONTRACTOR may be required to make changes to lettering, as directed by the ENGINEER, up to forty (40) letters regardless of the letter size, without additional cost to the CITY.

b. Repair and recoat the modified area in a manner that will eliminate the evidence of the changes.

J. Permits:

1. The CONTRACTOR shall be responsible for obtaining and paying for all permits, licenses and fees in a timely manner, in accordance with Section 00217 of the General Conditions. The CONTRACTOR shall be aware of the expiration date of all building permits, plan checks and/or extensions when the ENGINEER turns over such documents to the CONTRACTOR for construction use. If the CONTRACTOR does not obtain the permits in a timely manner, the CONTRACTOR shall be responsible for the delay, and the additional cost incurred as a result of the delay, in obtaining and paying for the permits or licenses (such as costs to re-plan check, plan modification due to code changes, etc).

2. The CONTRACTOR shall be familiar with all aspects of the Project. For the Project which requires a haul route hearing and haul route bonding as part of the Grading Permit approval process, CONTRACTOR shall prepare and secure the Grading Permit as soon as the construction contract is awarded in order to mitigate any possible delays due to the haul route hearing, The haul route map preparations shall be as required by the Los Angeles CITY Department of Building and Safety, Grading Division, and [Section 02220 – EARTHWORK of the Project Manual.

3. The CONTRACTOR shall obtain and pay for the following:

a. Building Permit for each structure

b. Permits to Use Street Space and Deposit Building Materials from the Bureau of Street Services.

c. Grading Permit

d. Plumbing Permit

e. Demolition Permit

f. Electrical Permit

g. Los Angeles County Flood Control District

h. Shoring Permit

i. California General Construction Activity Stormwater Permit and Wet Weather Erosion Control Plan (WWECP) and Stormwater Pollution Prevention Plan (SWPPP) for stormwater pollution control measures for construction activities

j. S.C.A.Q.M.D. Underground Fuel Storage Tank Installation Permit

k. Department of Transportation Permits (CITY will submit for plan check and pay for owner's permit. CONTRACTOR shall submit and pay for work permit). CONTRACTOR will be responsible for preparing any additional traffic control plans required to complete the project, including plan check and permit fees.

K. Utility Services Connections:

1. Within five (5) days after the Notice-to-Proceed, notify the serving utilities that the Project is under construction and furnish the dates on which the services will be required. Furnish the ENGINEER a duplicate copy of all service requests.

2. Should any major changes to the Work indicated be necessary to complete the utility installation, notify the ENGINEER in writing at once and cease all the Work affected until approval for the required modifications has been obtained from the ENGINEER.

3. Water Service Connections: Make all arrangements with the Department of Water and Power for the domestic water service and the removal of existing water service, as required. If the CONTRACTOR uses an existing water supply for construction the billing shall be transferred to the CONTRACTOR prior to the start of construction. A duplicate of the transfer documentation shall be provided to the ENGINEER.

4. Power Service Connections: Make all arrangements with the Department of Water and Power for the new power service connections and testing of electrical equipment and control and removal of existing power service connections as part of the contract. The CONTRACTOR will pay for all fees and charges. Power for construction and testing equipment to be separately arranged and paid for by the CONTRACTOR.

5. After all utility services are completed, all street improvements shall be repaired.

6. If the CONTRACTOR is delayed during the inspections by local authorized agencies or work by utility companies, not the fault of the CONTRACTOR and a critical path is impacted, the CONTRACTOR shall be entitled to a non-compensable time extension and shall have no claim for any other compensation for such delay.

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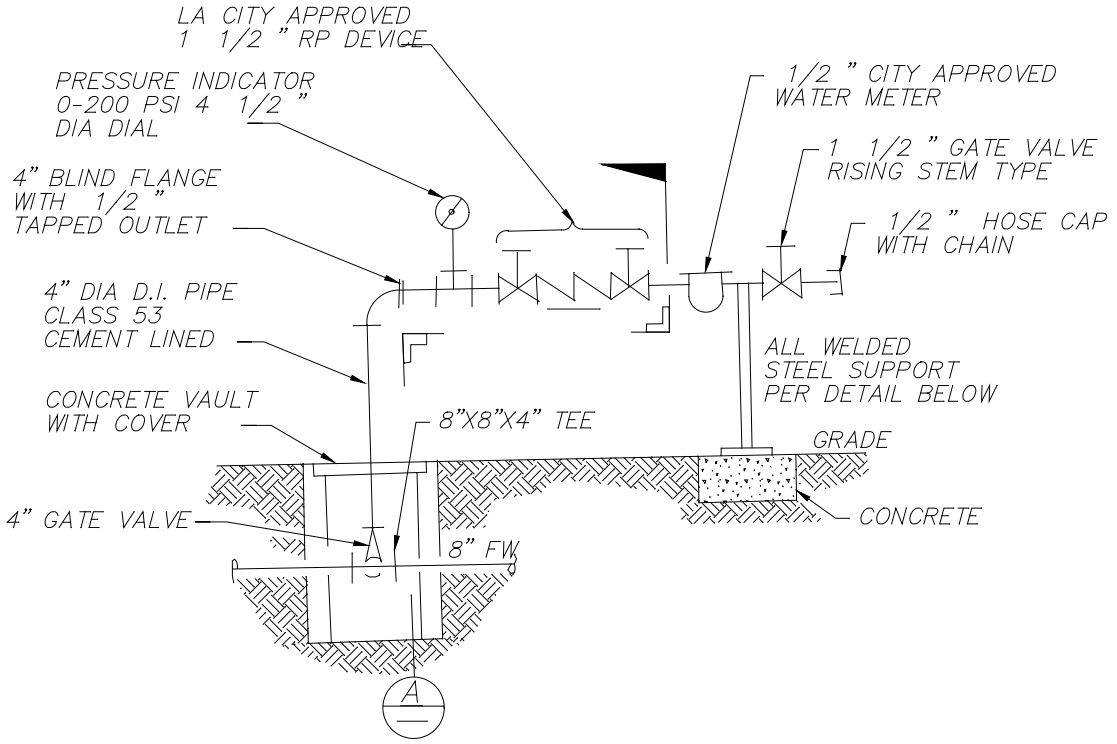
(SEE ATTACHMENT)

ATTACHMENTS TO SECTION 01721

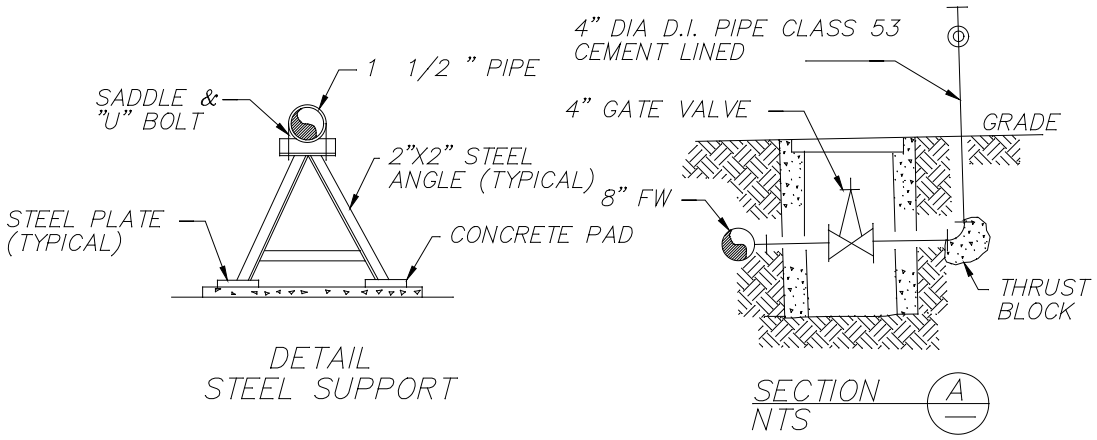
Attachments to General Requirements Section 01721 consists of one (1) document, as follows:

ATTACHMENT NUMBER	TITLE OF ATTACHMENT	NUMBER OF PAGES IN THIS ATTACHMENT
01721-A1	Construction Water Supply Schematic	1



CONSTRUCTION WATER SUPPLY DETAIL

NTS



CONSTRUCTION WATER SUPPLY SCHEMATICS

NTS

SECTION 01722
SURVEYING

1.1 THE REQUIREMENT

A. Contractor Provided Survey:

1. The CONTRACTOR shall notify the ENGINEER at least seven (7) working days before starting any Work in order that the ENGINEER may take necessary measures to ensure the preservation of survey monuments and bench marks.

2. The ENGINEER will be responsible for providing the initial vertical benchmarks and horizontal control points. The CONTRACTOR shall notify the ENGINEER in writing at least seven (7) working days before the initial survey control points are required.

3. The CONTRACTOR shall be responsible for all surveys required to layout the Work and for the accuracy of all survey work for construction. The CONTRACTOR shall include the cost of all such survey work in their Bid. The CONTRACTOR shall have all construction surveying performed by a `Licensed Land Surveyor' or a `Civil Engineer' registered by the State of California to perform such work. The ENGINEER reserves the right to verify all survey work done by the CONTRACTOR.

4. The CONTRACTOR shall preserve the initial survey control points for the duration of their usefulness. Monumentation that is subject to disturbance or destruction shall be located and referenced prior to construction and relocated and referenced if necessary after construction, in accordance with the Standard Technical Specifications and the Standard Plans.

B. Construction Surveys:

1. Construction Surveys shall conform to Chapter J 600 of the Bureau of Engineering Survey Manual, Part J. This manual may be purchased through the Bureau of Engineering Public Reference Center.

2. The CONTRACTOR shall provide all reference stakes and form checks necessary for construction and inspection of improvements. All construction staking shall be documented in survey field notes. This staking may include but is not limited to: removals, joins, rough grade, slope, utilities, storm drains, sewers, curbs, walks, paving, wall and building stakes; and any other staking necessary for construction and inspection.

C. Reference Or Grade Stakes: A reference or grade stake shall be set for each grade change or angle point shown on the plan, standard plan, and shop drawing, in addition to the normal staking interval.

D. Form Checks: Forms shall be checked when durable points may be disturbed, removed, or are impractical to be used to verify the design location. The measured location shall be recorded in the survey field notes. All variations from the plan location shall be brought to the attention of the ENGINEER.

E. Staking Intervals And Offset Stake Lines: All staking intervals shall be in accordance with the Survey Manual, Figure J 626.224A. Stake lines shall be set at an offset distance from the improvement to ensure proper grade, station, and alignment.

F. Utility Stakes: The CONTRACTOR shall provide stakes for all utilities, public or private, that require location or relocation, unless otherwise stated.

G. Additional Survey Work: The CONTRACTOR may be required to furnish additional survey work, such as profiles, restakes, Change Orders, etc., at the request of the ENGINEER or the INSPECTOR.

H. Accuracy:

1. The CONTRACTOR shall use appropriate surveying methods to obtain the following standards: For fixed works (i.e. cast-in-place concrete; asphalt pavement, pipes and drains; and other items determined by the ENGINEER) the following survey standards shall be used. The absolute horizontal accuracy, in relationship to the Engineer's control, shall be such that the semimajor axis of its 95% error ellipse is ± 0.015 foot or less. The absolute vertical accuracy, in relationship to the Engineer's control, shall be such that its standard deviation is ±0.015 foot or less. The relative horizontal accuracy of survey points within the Project shall be such that the semimajor axis of its 95% error ellipse is ±0.015 foot or less. The relative vertical accuracy of survey points within the Project shall be such that its standard deviation is ±0.015 foot or less.

2. For excavation purposes, the following survey standards shall be used. The absolute horizontal accuracy, in relationship to the Engineer's control, shall be such that the semimajor axis of its 95% error ellipse is ±0.1 foot or less. The absolute vertical accuracy, in relationship to the Engineer's control, shall be such that its standard deviation is ±0.1 foot or less. The relative horizontal accuracy of survey points within the Project shall be such that semimajor axis of the 95% error ellipse is ±0.1 foot or less. The relative vertical accuracy of survey points within the Project shall be such that its standard deviation is ±0.1 foot or less.

I. Survey/Inspector: The CONTRACTOR shall provide to the INSPECTOR those measurements and control points necessary to determine the location and conformance to the plan, line, and grade of the improvements necessary for inspection purposes.

J. Survey/Engineer: The CONTRACTOR shall provide to the ENGINEER those measurements necessary for the expedient completion of the Project.

K. Survey Plan Of Operations: Prior to construction, the CONTRACTOR shall submit to the ENGINEER for approval a survey plan describing methods and instrumentation to be used on the Project. The survey plan must be approved prior to any construction.

L. Survey Notes: The CONTRACTOR shall supply and keep notes on CITY standard format note sheets. The ENGINEER may request copies of, and otherwise review, survey notes at any time during the construction phase of the Project. Upon completion of the Project, the original survey notes shall become the property of the CITY and shall be delivered to the ENGINEER

M. Permanent Survey Markers: The CONTRACTOR shall be responsible for the preservation of survey monuments and bench marks except as noted herein. At least two (2) working days before the start of construction, the CONTRACTOR shall submit acceptable preconstruction survey tie notes to the ENGINEER'S office. These survey tie notes will be for all survey markers or bench marks that may be lost or disturbed due to construction. Lost or disturbed monuments shall be replaced at the CONTRACTOR'S expense by a California licensed land surveyor or registered civil ENGINEER authorized to practice land surveying. Post construction survey monument ties acceptable to the ENGINEER shall be submitted to the ENGINEER'S office before the completion of the Work (see "Monuments," Section 8771, Land Surveyors Act, Division 3, Chapter 15 of the Business and Professions Code). The ENGINEER will reestablish the monuments and bench marks where survey services are provided by the ENGINEER, providing the CONTRACTOR protects the preconstruction reference points. In this case, where the monuments are to be removed or damaged by the CONTRACTOR, the CONTRACTOR shall notify the ENGINEER in writing seven (7) calendar days before starting the Work.

N. Lot Stakes: The CONTRACTOR shall preserve property line and corner survey markers, except where their destruction is unavoidable, and the CONTRACTOR is proceeding in accordance with accepted practice. Markers that otherwise are lost or disturbed by its operations shall be replaced at the CONTRACTOR'S expense by the ENGINEER.

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SECTION 01723
RIGHT OF WAY

1.1 THE REQUIREMENT

A. The CONTRACTOR shall not allow its employees to use private property for any reason, or to use water or electricity from such property without written permission from the owner. The CONTRACTOR shall provide evidence of such permission, in writing, to the ENGINEER, before entering upon such lands.

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SECTION 01732
ADDITIONAL POTHOLING

1.1 THE REQUIREMENT

A. The CONTRACTOR shall conduct exploratory excavations by potholing to verify or to discover the actual locations and the size of existing underground utilities and improvements. The CONTRACTOR shall take care not to damage existing facilities during potholing operations. Any utility or existing facility (including those located by Underground Service Alert - USA) within 3 feet of any trench or excavation shall be potholed prior to starting the contract work in the vicinity. Potholing shall be done in each given area where excavation work is to occur at least fourteen (14) calendar days in advance of any excavation or construction in that area, to avoid possible delay in the progress of the Work.

B. Potholing shall consist of excavations at the locations of utilities or other underground facilities indicated on the Drawings, located by USA, or as directed by the ENGINEER. All costs of potholing operations for the utilities indicated on the Drawings shall be included in the CONTRACTOR'S Bid.

C. If an allowance for Additional Potholing has been established and included in the SCHEDULE OF WORK AND PRICES, this allowance shall only be used to reimburse the CONTRACTOR for potholing utilities not shown or otherwise referenced on the drawings, or as directed by the ENGINEER. If the total cost of the Work directed under the Additional Potholing allowance differ from the amount set forth in the SCHEDULE OF WORK AND PRICES, the Contract Price shall be adjusted by a Change Order. The adjustment shall be the difference between the total actual costs and the amount included in the Bid, as an additional amount due to the CONTRACTOR or a credit to the CITY, as appropriate.

D. In addition to the potholes indicated on the Drawings, or directed by the ENGINEER, the CONTRACTOR may opt to do further potholing deemed necessary at no additional cost to the CITY.

E. Potholing operations shall conform to all applicable requirements of INJURY AND ILLNESS PREVENTION - SAFETY MEASURES of the GENERAL CONDITIONS, as to sidewall slopes, sheeting and shoring, and all other excavation and trenching provisions specified herein.

F. Potholing operations shall be conducted in accordance with the requirements of PROTECTION OF PERSONS AND PROPERTY AND RESTORATION OF EXISTING IMPROVEMENTS of the GENERAL CONDITIONS, in order to ensure that the existing facilities will remain in operation with minimum interruptions. Attention is specifically directed to the limitations on street closures, altering of vehicular and pedestrian access in accordance with INTERFACE / COORDINATION REQUIREMENTS of these GENERAL REQUIREMENTS. Potholes shall be identified and protected in accordance with the City of LA Brown Book, the California Manual on Uniform Traffic Control Devices (MUTCD) and Work Area Traffic Control Handbook (WATCH) Standards.

G. The CONTRACTOR'S proposed method of potholing and schedule for potholing shall be submitted to the ENGINEER for approval, at least thirty (30) days prior to the commencement of operation. Any utilities damaged during potholing shall be immediately reported to the ENGINEER and INSPECTOR and repairs made immediately in accordance with the requirements of PROTECTION OF PERSONS AND PROPERTY AND RESTORATION OF EXISTING IMPROVEMENTS of the GENERAL CONDITIONS.

H. A complete log of all potholes shall be kept by the CONTRACTOR, showing specific locations and dimensions of trenches. The log shall be verified by the INSPECTOR prior to the backfilling of the potholes. The verified log will be submitted to the ENGINEER and the INSPECTOR within two (2) working days after completion of potholing in each area. Payment for potholing utilities not shown or otherwise referenced on the drawings, or as directed by the ENGINEER will not be made unless these potholes are listed on the verified log.

I. The CONTRACTOR shall record the coordinates, elevations and dimensions of all utilities and improvements verified or discovered by pot holing. The records shall be submitted to the ENGINEER within two (2) working days after the completion of pot holing in each area. The records shall also include dates of the pot holing operations and any additional discovered information or pertinent data.

J. Upon completion of potholing in each area, and after verification of the logs by the INSPECTOR, potholes shall be immediately backfilled and compacted in accordance with the specifications, or restored as directed by the ENGINEER.

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SECTION 01740
REMOVAL, CLEANUP, AND DEMOBILIZATION

1.1 THE REQUIREMENT

A. Upon completion of the Contracted Work, the CONTRACTOR shall remove all of its tools, materials and other articles from the property of the CITY. Should the CONTRACTOR fail to take prompt action to this end, the CITY, at its option and without waiver of such other rights as it may have, upon thirty (30) calendar days notice, may treat such items as abandoned property. The CONTRACTOR shall also sweep all floors broom clean, clean all exterior and interior surfaces and windows and remove all rubbish and debris resulting from the Contracted Work and shall maintain the Jobsite in a clean, orderly and safe condition at all times until completion of the physical Work and written Notice of Partial Acceptance. Failure to comply with this requirement shall be grounds for the CITY to assess clean-up costs in the amount of five percent (5%) of the mobilization cost.

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SECTION 01750
STARTUP ASSISTANCE

1.1 THE REQUIREMENT

A. To satisfy the requirements of the ENGINEER during the startup of the facility, the CONTRACTOR may be required to provide STARTUP ASSISTANCE. Startup assistance shall commence immediately after a Statement Of Partial Completion or a Statement Of Completion is issued as specified in PARTIAL ACCEPTANCE and FINAL ACCEPTANCE of the GENERAL CONDITIONS and shall continue for a period of two (2) months. Such services shall include the services of craft personnel supplied by the CONTRACTOR to satisfy the requirements of the ENGINEER during Startup. Such services shall be available for at least one (1) eight (8) hour shift per day until startup activities are concluded, and may also include the availability of said craft personnel on a twenty-four (24) hour on-call basis.

B. Such startup assistance shall include such modifications to the Work as deemed necessary by the ENGINEER to provide a complete and functional facility. Startup assistance is different from, and is in addition to, the work by the CONTRACTOR specified in Section 01810.

C. Commencing on the first day of startup assistance, and upon written notice by the ENGINEER, the CONTRACTOR shall provide the INSPECTOR with daily labor timesheets, material invoices, and rented equipment invoices required for startup assistance activities.

D. Direct costs of startup assistance activities shall be in strict accordance with the Cost Reimbursement (Time and Materials) portions of the GENERAL REQUIREMENTS Section PAYMENTS FOR CHANGES AND EXTRA WORK. However, D, GENERAL, through H, PROFIT, shall not be applicable to the direct costs of startup assistance. Instead, provisions for overhead and profit applied to the direct costs of startup assistance are included below:

DIRECT COST PERFORMED IN ONE MONTH	% OVERHEAD[2] AND PROFIT WHEN PRIME CONTRACTOR PERFORMS WORK	% OVERHEAD[2] & PROFIT PAID TO PRIME CONTRACTOR FOR WORK DONE BY ITS SUBCONTRACTORS[1]
Under $20,000	24%	11%
$20,000 - $50,000	22%	9%
$50,000 - $100,000	20%	7%
Over $100,000	18%	5%

[1] Subcontractors will mark up[2] their direct costs for startup assistance in accordance with the SSPWC available at the time of the Bid. Subcontractors at all tiers shall not be paid overhead and profit on their Subcontractor's work.

[2] Overhead for CONTRACTOR or Subcontractor shall consist of the following, but is not limited to:

1. Home office overhead expenses

2. All insurance requirements

3. Other needed insurance

4. Field office overhead including, but not limited to:

    a. Bookkeeping, accounting, estimating (whether done at the field or home office);

    b. Photocopying and/or office automation (whether done at the field or home office);

    c. Salaried superintendent or any other person with superintendent duties during the course of the Work;

    d. Any salaried staff and/or temporary office services;

    e. Trailers, electricity, water, telephone, etc.;

    f. Vehicles assigned to any salaried staff and/or temporary office services;

    g. Small tools and consumables. Small tools are defined as any equipment or tool, which has a replacement value of $1,000 or less;

    h. Travel of home office or field office staff, including transportation and expenses.

E. All items included in overhead shall not be billed as direct costs. The derivation of an extended overhead (field and/or office) rate and its application to contract time extensions shall not be applicable to startup assistance activities for this Contract. The duration of startup assistance will not be considered in the determination of the completion date for liquidated damages. That date will be determined by the completion of other work. Likewise, the duration of startup assistance will not be the basis in whole or in part for any claims for delay or extended overhead.

F. Each month the amount billed by the CONTRACTOR for startup assistance will be deducted from the amount stipulated in the SCHEDULE OF WORK AND PRICES of Bid Proposal. In the event that the stipulated amount is exhausted, the CITY will continue to approve payment via Change Orders. The cost of these Change Orders will be calculated in the manner described hereinbefore in this Article. In the event that the stipulated amount is not exhausted when the startup activities are concluded, the balance of the stipulated amount will not be due the CONTRACTOR and a deductive Change Order will be issued for the remaining balance.

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SECTION 01770
PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. Closeout Timetable: The CONTRACTOR shall establish dates for equipment testing and acceptance periods (as required under the Contract). Such dates shall be established not less than seven (7) calendar days prior to beginning any of the foregoing items, to allow the CITY, the ENGINEER, and their authorized representatives sufficient time to schedule attendance at such activities.

B. Final Submittals: The CONTRACTOR, prior to requesting Final Payment, shall obtain and submit the following items to the ENGINEER.

1. Written guarantees, where required.

2. Technical manuals and instructions.

3. Keying schedule.

4. Maintenance stock items; spare parts; special tools.

5. Completed record drawings.

6. Certificates of inspection and acceptance by local governing agencies having jurisdiction.

7. Releases from all parties who are entitled to claims against the subject Project, property, or improvement pursuant to the provisions of law.

C. Final Cleanup: The CONTRACTOR shall perform all tasks specified in REMOVAL, CLEANUP, AND DEMOBILIZATION of the GENERAL REQUIREMENTS.

D. Maintenance And Guarantee

1. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order from the ENGINEER. If the CONTRACTOR fails to make such repairs or replacements promptly, the ENGINEER reserves the right to do the work and the CONTRACTOR and his surety shall be liable to the CITY for the cost thereof.

2. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the CONTRACTOR which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work.

E. Bond: The CONTRACTOR shall provide a bond to guarantee performance of the provisions contained in NON-CONFORMING WORK and INSURANCE (Paragraph K) of the GENERAL CONDITIONS, GUARANTY / WARRANTY of these GENERAL REQUIREMENTS, and Paragraph 1.1 D of this Section.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operation and Maintenance Instructions: Unless specified otherwise, in addition to the maintenance manuals described hereinabove, arrange for each installer of equipment that requires regular maintenance to meet with the CITY'S personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance Manuals.
2. Permit and Record Documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. As Part of Instruction for Operating Equipment, Demonstrate the Following Procedures:

1. Start-up.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.2 FINAL CLEANING

A. General: General cleaning during construction is required by the GENERAL CONDITIONS and GENERAL REQUIREMENTS.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection prior to CITY'S acceptance of Contracted Work.

a. Remove labels that are not permanent labels.

b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials at no added cost to the CITY.

c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

e. Clean the site, including landscape development areas of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textures surface.

f. Remove all temporary detour stripping by the wet sandblasting method.

C. Pest Control: Engage an experienced exterminator to make a final inspection, and rid the Project of rodents, insects and other pests.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Contracted Work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the CITY'S property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completions of associated Work have become the CITY'S property, arrange for disposition of these materials as directed.

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SECTION 01782
TECHNICAL MANUALS

1.1 THE REQUIREMENT

A. Definitions:

1. CLAMMS: CLAMMS is an acronym for the City of Los Angeles Maintenance Management System. This is the system used for the identification and maintenance management of all [treatment plant or pumping plant] equipment. This CLAMMS number is typically the equipment identification number used in the Contract Documents.

2. Connective Wiring Diagrams: Connective Wiring Diagrams are electrical diagrams that show how an equipment or instrumentation item is to be connected to the Plant or equipment system electrical power system or instrumentation system.

3. Internal Wiring Diagrams: Internal Wiring Diagrams are electrical diagrams that show how an equipment or instrumentation item is internally electrically connected.

4. Maintenance Summary Forms: The Maintenance Summary Forms are a series of forms including the Equipment Maintenance Summary Form (MSF), Mechanical Component MSF, Electrical Component MSF, Instrumentation Component MSF, and Valve Gate Component MSF. These forms are used to summarize the identification, nameplate data, maintenance requirements, recommended lubricants, and recommended spare parts for the various equipment and instrumentation. (See Attachments 01782-A1 through 01782-A4.)

B. Technical Manuals:

1. Unless otherwise specified, Technical Manuals shall, as a minimum, include the following:

a. Table of Contents.

b. Itemized list of all data provided.

c. Consistent tabulation or indexing method within each technical manual and when compiling technical manual into the final O&M Manual.

d. Manufacturer, supplier, spare parts and servicing location information including name, address, phone number of the manufacturer and local representative.

e. Approved Shop Drawing Submittal information applicable to O&M, including operating curves, manufacturer's recommended tolerances and clearances, and approved fabrication drawings.

f. Recommended installation, adjustment, start-up, calibration and troubleshooting procedures.

g. Lubrication recommendation and yearly quantity requirements.

h. Recommended step-by-step procedures for all modes of operation including start-up, operation, shutdown, load changes, and emergency shutdown. Manufacturer's literature shall be included.

i. Complete internal and connection wiring diagrams. Circuit diagrams and schematics shall be down to component level.

j. Recommended preventive maintenance and maintenance procedures, including lubrication and calibration schedules.

k. Complete parts list, by generic title and identification number, with exploded views and schematics of each assembly.

l. Complete programming procedures and ladder logic documentation for all computer controlled, programmable logic controllers and automated equipment.

m. Electrical, instrumentation, control system and piping schematics.

n. Recommended spare parts list and list of special tools and equipment required for O&M.

o. Disassembly, overhaul, reassembly, realignment and testing instructions.

p. Complete equipment O&M Manuals.

q. All contents of the technical manual shall be suitable for compilation into a standard size, three-ring binder.

r. Approved isometric drawings of piping systems

C. Additional requirements are contained in individual Divisions of the Technical Specifications**.** The CONTRACTOR shall be responsible for reviewing all said reference requirements and including them in his Bid price. In the event of a conflict, the requirements of the individual Technical Specifications shall prevail. Repetition of requirements in two or more specification references shall not be cause for CONTRACTOR claim of conflict.

D. The CONTRACTOR shall submit two (2) copies of all Technical Manuals to the ENGINEER for review prior to sixty percent (60%) completion of Contract Amount as measured by Monthly Progress Payments. The ENGINEER will review and return one copy of each submittal within thirty (30) calendar days following their receipt by the ENGINEER. The CONTRACTOR shall make all revisions and additions and resubmit to the ENGINEER ten (10) copies of the corrected Technical Manuals prior to seventy-five percent (75%) completion of the Contract Amount.

E. The ENGINEER will review the corrected Technical Manuals within twenty-one (21) calendar days following their receipt by the ENGINEER. The CONTRACTOR shall then compile all of the corrected Technical Manuals into a single O&M Manual, which shall be arranged according to a Table of Contents, provided by the ENGINEER.

F. The CONTRACTOR shall furnish to the ENGINEER ten (10) copies of the final O&M Manual. Each manual shall consist of one or more volumes, each of which shall be bound, in a standard size, three-ring, loose-leaf, vinyl plastic hard cover binder, suitable for bookshelf storage. Binder ring size shall not exceed two-and-one-half inches (2.5 inches). All reprints shall be done on margin-reinforced papers. All submittal materials shall be in English. The final O&M Manual shall be submitted to the ENGINEER prior to eighty-five percent (85%) completion of the Contract Amount as measured by Monthly Progress Payments. Submittal of the Technical Manuals, the Corrected Technical Manuals and/or the O&M Manuals within the specified time frame, as detailed above, shall be a condition precedent to the making of the monthly payments.

G. With the final submittal of the TECHNICAL MANUALS, the CONTRACTOR shall submit one (1) copy of all CADD drawings, text and any other electronic files which are incorporated into the O&M Manual. The files are to be submitted on diskette or other media approved by the ENGINEER together with an index listing file names, originating computer program, and format.

H. If TECHNICAL MANUALS have been stipulated as a separate bid item in the SCHEDULE OF WORK AND PRICES in the Bid Proposal, the CONTRACTOR shall be entitled to receive Progress Payments upon submittal and approval of the TECHNICAL MANUALS. This bid item is not an allowance but is a fixed amount and the CONTRACTOR is not entitled to receive additional compensation for technical manuals. The CONTRACTOR shall be entitled to receive fifty percent (50%) of the bid breakdown amount upon approval of all required draft Technical Manuals to the ENGINEER. Partial submittal of the required Technical Manuals shall not entitle the CONTRACTOR to any payment of this amount. The CONTRACTOR is entitled to receive one-hundred percent (100%) of the bid breakdown amount at the time the ENGINEER gives full approval to all Technical Manuals. Partial approval, or approval of some of the Technical Manuals, shall not entitle the CONTRACTOR to any payment. Failure to list TECHNICAL MANUALS as a separate bid item in the SCHEDULE OF WORK AND PRICES does not relieve the CONTRACTOR from preparing the Technical Manuals and including all associated costs in the bid.

* * * * *

(SEE ATTACHMENTS)

ATTACHMENTS TO SECTION 01782

Attachments to General Requirements Section 01782 consists of four (4) documents, as follows:

ATTACHMENT NUMBER	TITLE OF ATTACHMENT	NUMBER OF PAGES IN THIS ATTACHMENT
01782-A1	Equipment Summary Data Forms Information Sheet	1
01782-A2	Equipment Summary Data Form	1
01782-A3	Information S heet f or E quipment M aintenance S ummary Form	1
01782-A2	Typical Maintenance Summary Form	1

EQUIPMENT SUMMARY DATA FORMS
INFORMATION SHEET

Equipment Summary Data Forms are intended to provide the Maintenance Department with sufficient information to catalogue newly purchased equipment items installed at the facility. This information is used for inventory purposes as well as for equipment performance tracking purposes. Each item of equipment installed at the facility must be documented on one of three Forms; electrical Summary Data Form, Equipment (mechanical, HVAC, etc.) Summary Data Form, and/or Pump Summary Data Form. Examples of each form are attached. Additional requirements regarding submittal format, quantities, etc, are found elsewhere in this Specification.

1. Equipment item (included industry-accepted nomenclature).

2. CITY Equipment Identification Number (CHAMPS)

3. Manufacturer
Address **Phone/Fax Numbers**

4. Supplier (if different than (3)
Address **Phone/Fax Numbers**

5. Equipment Serial Number(s)

6. Equipment Model Number

7. Size

8. capacity

9. Rated Output

10. Drive Motor Data (as appropriate).

In addition, information specific to the item described shall be provided as indicated on the example Forms.

EQUIPMENT SUMMARY
DATA FORM

EQUIPMENT ITEM: _____

EQUIPMENT COST: _____

EQUIPMENT SUPPLIER: _____

_____

COMPONENT INFORMATION: **NAMEPLATE DATE:** **MANUFACTURER:**	
CITY IDENTIFICAITON NUMBER:	**EQUIPMENT SERIAL NUMBER:**
EQUIPMENT MODEL DESIGNAITON:	**TYPE:**
SIZE:	**RATED OUTPUT:**
CAPACITY:	**SERVICE:**
COMPONENT INFORMATION: DRIVE MOTOR DATA **MANUFACTURER:**	
SERIAL NO.:	**HORSEPOWER:**
MODEL:	**FRAME:**
TYPE:	**VOLTAGE:**
ENCLOSURE:	**AMPERAGE:**
PHASE: **HERTZ:**	**SERVICE FACTOR:**
LUBRICATION REQUIREMENTS: MOTOR	
COMMENTS:	

INFORMATION SHEET FOR
EQUIPMENT MAINTENANCE SUMMARY FORMS

Equipment Maintenance Summary forms are intended to provide the Maintenance Division with information sufficient to properly diagnose (troubleshoot, repair, check-out, and return an item of equipment to service. Standard information contained in each Form shall be as follows:

In addition, Maintenance information required to troubleshoot, repair, and return electrical/electronic equipment to service (including set point, derivatives, etc.) Shall be included as required. The Maintenance Summary Form attached in intended to serve as a (minimum) guide to the information required per item of equipment. Additional requirements regarding submittal format, quantities, etc. are found elsewhere in this Specification.

1. **Equipment Item (include industry-accepted nomenclature)**

2. **CITY Equipment Identification Number (CHAMPS)**

3. **Manufacturer**
   Address Phone/Fax Numbers

4. **Equipment Serial Number(s)**

5. **Weight of Individual Components (over 100 pounds)**

6. **Nameplate Date (including voltage, horsepower, lubrication requirements, speed, etc.)**

7. **Manufacturer's Local Representative**
   Address Phone/Fax Numbers

8. **Maintenance Operation(s) Required. Listing shall include (1) Maintenance Operation to be performed. (2) frequency of said Maintenance Operation based on actual service conditions of installed equipment (i.e., type of duty, environmental factors). Reference shall be made to the appropriate section of the manufacturer's technical literature.**

9. **Lubricant List. List shall include a primary and two secondary manufacturer-approved lubricants.**

10. **Spare Parts required for a minimum of one (1) year of equipment operation based on anticipated actual service conditions. Also to be included in the name, address, and phone number of the recommended source of spare parts if different than (7) above.**

ATTACHMENT ____
Typical Maintenance Summary Form

NOTE: SUPPLEMENTARY INFORMATION, AS APPROPRIATE, SHALL BE INCLUDED

1. EQUIPMENT ITEM: _____

2. CITY EQUIPMENT IDENTIFICATION NUMBER (CHAMPS): _____

3. MANUFACTURER:_____
   ADDRESS:_____
   TELEPHONE NO.:_____ FAX NO.:_____

4. EQUIPMENT SERIAL/IDENTIFICATION NUMBERS: _____

5. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS):_____

6. NAMEPLATE DATA:_____

7. MANUFACTURER'S LOCAL REPRESENTATIVE:_____
   ADDRESS:_____
   TELEPHONE NO.: _____
   FAX NO.: _____

8. MAINTENANCE OPERATION(S) REQUIRED: (attach separate sheet if required).

OPERATION	FREQUENCY	COMMENTS

9. LUBRICANT LIST. Provide Reference symbol used in items recommended.

SHELL	STANDARD OIL	GULF	ARCO	EQUAL

10. RECOMMENDED SPARE PARTS LISTS FOR MINIMUM OF ONE (1) YEAR UNINTERRUPTED SERVICE. (Attach separate sheet if required).

ITEM	PART NO.	QUANTITY REQUIRED (per unit)	UNIT COST	COMMENTS

SECTION 01783
RECORD DRAWINGS AND RECORD PROJECT MANUAL

1.1 THE REQUIREMENT

A. Record Drawings are full size drawings (Plans) and Record Project Manual which are marked up during construction to delineate the actual in-place constructed conditions. Record Drawings shall be provided by the CONTRACTOR for this Project. Requirements for Record Drawings as specified elsewhere shall supplement the requirements specified herein.

B. Record Drawings and Record Project Manual shall include all changes in the Plans including those issued as Change Orders, Plan Clarifications, Addenda, Notice to Bidders, responses to Requests for Information, Jobsite Memos, and any additional details needed for the construction of the Project but not shown on the Plans. Any substructures encountered while excavating that are left in place shall be located by survey, to the satisfaction of the ENGINEER, shown, and identified on the Record Drawings. All substructures including, but not limited to, concrete structures, electrical conduit and duct banks, drains and sanitary sewer pipelines, process piping, water lines, etc, whose installed location differs from that shown on the original Plans shall be precisely located by survey to the satisfaction of the ENGINEER and recorded on the As-Built Drawings before backfilling.

C. Record Drawings and Record Project Manual shall be marked with red ink or chemical fluid on one (1) set of full size prints to produce a record of the complete installation. Any additional drawings that may be required to indicate record conditions shall be prepared on 24" x 36" paper. All additions to Contract Drawings shall employ and use drafting standards which are consistent with the drafting standards used in the Contract Drawings.

D. The Record Drawings and Record Project Manual, including those of all Subcontractors, shall be kept by the CONTRACTOR in the CONTRACTOR'S Jobsite office, shall be updated during construction, and shall be available for the ENGINEER'S inspection and copying at all times. The ENGINEER will review the Record Drawings prior to submittal of all Monthly Payment Requests. If, in the opinion of the ENGINEER, the Record Drawings are not current, approval of the Monthly Payment may be withheld until the drawings are made current. In addition, the CONTRACTOR shall submit a signed certification with each Monthly Payment Request stating that all Record Drawings are complete and accurate as of the date of the payment request.

E. Where the Plans are diagrammatic or lacking precise details, the CONTRACTOR shall produce dimensioned full size sheets as the Record Drawings. For installations outside of structures, the locations shall be given by coordinates and elevations. Where substructures are encased in concrete, the outside dimensions of the encasement shall also be given.

F. In the case of those Drawings which depict the detail requirements for equipment to be assembled and wired in the factory, the Record Drawings shall be updated by indicating those portions which are superseded by final Shop Drawings, and by including appropriate reference information describing the Shop Drawings by manufacturer, drawing and revision numbers.

G. At the Completion of the Work and after Final Inspection, the CONTRACTOR shall copy its Record Drawing (as installed) data, using red ink, onto a new set of high quality blueline prints provided by the CITY. The CONTRACTOR shall certify to the completeness and accuracy of the "as installed" information indicated on the blueline prints with its signature. The CONTRACTOR shall then deliver as a submittal to the ENGINEER, for review and approval, both the field developed blueline prints and the final signed blueline prints as a condition precedent to the CITY'S release of any retained funds.

H. An approved set of Drawings stamped by the City of Los Angeles Department of Building and Safety Plan Check Division must be kept on site for inspection by the City of Los Angeles Building and Safety Inspector. This set of stamped drawings is a part of the Contract Documents and is to be protected as such. The stamped set is not to be marked on or used as filed construction Drawings or As-Built Record Drawings.

* * * * * * *

SECTION 01810
EQUIPMENT AND SYSTEM
PERFORMANCE AND OPERATIONAL TESTING

PART 1--GENERAL

1.01 DESCRIPTION

A. This section contains requirements for the CONTRACTOR'S performance in documenting testing work required under this contract. In addition, this section contains requirements the for the CONTRACTOR'S performance during installed performance testing of all mechanical, electrical, and instrumentation. This section supplements but does not supersede specific testing requirements found elsewhere in this project manual.

1.02 QUALITY ASSURANCE

A. CONTRACTOR's Quality Assurance Manager:

1. The CONTRACTOR shall appoint an operations engineer or equally qualified operations specialist as Quality Assurance Manager to manage, coordinate, and supervise the CONTRACTOR'S quality assurance program. The Quality Assurance Manager shall have at least 5 years of total experience, or experience on at least five separate projects, in managing the startup commissioning of mechanical, electrical, instrumentation, HVAC, and piping systems. Operations specialists shall have equivalent experience in plant operation and maintenance. The quality assurance program shall include:

   a. A testing plan setting forth the sequence in which all testing work required under this project manual will be implemented.

   b. A documentation program to record the results of all equipment and system tests.

   c. An installed performance testing program for all mechanical, electrical, instrumentation, and HVAC equipment and systems installed under this contract.

   d. A calibration program for all instruments, meters, monitors, gages, and thermometers installed under this contract.

   e. A calibration program for all instruments, gages, meters, and thermometers used for determining the performance of equipment and systems installed under this contract.

   f. A testing schedule conforming to the requirements specified in paragraph 01810-2.02 C.

2. For the purposes of this section, a system shall include all items of equipment, devices and appurtenances connected in such a fashion as their operation or function complements, protects or controls the operation or function of the others. The Quality Assurance Manager shall coordinate the activities of all SUBCONTRACTORs and suppliers to implement the requirements of this section.

B. Calibration:

1. All test equipment (gages, meters, analysis instruments, and other equipment) used for calibrating or verifying the performance of equipment installed under this contract shall be

calibrated to within plus or minus 2 percent of actual value at full scale. Test equipment employed for individual test runs shall be selected so that expected values as indicated by the detailed performance specifications will fall between 60 and 85 percent of full scale. Pressure gages shall be calibrated in accordance with ANSI/ASME B40.1. Thermometers shall be calibrated in accordance with ASTM E77 and shall be furnished with a certified calibration curve.

C. References:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ANSI/ASME B40.1	Gauges Pressure Indicating Dial Type—Elastic Element
ASTM E77	Method for Verification and Calibration of Liquid-in-Glass Thermometers
ASHRAE 41.8	Standard Methods of Measurement of Flow of Gas
Dye Dilution Calibration Method	Flow Measurements in Sanitary Sewers By Dye Dilution, Turner Designs Mountain View, California,
	Flow Measurement in Sewer Lines by the Dye Dilution Method, Journal of the Water Pollution Control Federation, Vol. 55, Number 5, May, 1983, pg. 531
	Flow Measurement in Open Channels and Closed Conduits, Vol 1, U.S. Department of Commerce, National Bureau of Standards, pg. 361
	Techniques of Water-Resources Investigations of the United States Geological Survey, Chapter 16, Measurement of Discharge Using Tracers

1.03 SUBMITTALS

A. Submittal material, to be submitted in accordance with Section 01330, shall consist of the following:

1. A complete description of the CONTRACTOR'S plan for documenting the results from the test program in conformance with the requirements of paragraph 01810-2.02 A, including:

a. Proposed plan for documenting the calibration of all test instruments.

b. Proposed plan for calibration of all instrument systems, including flow meters and all temperature, pressure, and analysis systems.

c. Sample forms for documenting the results of field pressure and performance tests.

2. The credentials and certification of the testing laboratory proposed by the CONTRACTOR for calibration of all test equipment.

3. Preoperational check-out procedures, reviewed and approved by the respective equipment manufacturers.

4. Detailed testing plans, setting forth step-by-step descriptions of the procedures proposed by the CONTRACTOR for the systematic testing of all equipment and systems installed under this contract.

5. A schedule and subsequent updates, presenting the CONTRACTOR'S plan for testing the equipment and systems installed under this contract.

6. A schedules tablishing the expected time period (calendar dates) when the CONTRACTOR plans to commence operational testing of the completed systems, along with a description of the temporary systems and installations planned to allow operational testing to take place.

7. A summary of the Quality Assurance Manager's qualifications, showing conformance to paragraph 01810-1.02 A requirements.

PART 2--PRODUCTS

2.01 GENERAL

A. The CONTRACTOR shall prepare test plans and documentation plans as specified in the following paragraphs. The ENGINEER will not witness any test work for the purpose of acceptance until all test documentation and calibration plans and the specified system or equipment test plans have been submitted and accepted.

2.02 DOCUMENTATION

A. Documentation Plans:

1. The CONTRACTOR shall develop a records keeping system to document compliance with the requirements of this Section. Calibration documentation shall include identification (by make, manufacturer, model, and serial number) of all test equipment, date of original calibration, subsequent calibrations, calibration method, and test laboratory.

2. Equipment and system documentation shall include date of test, equipment number or system name, nature of test, test objectives, test results, test instruments employed for the test and signature spaces for the ENGINEER's witness and the CONTRACTOR'S quality assurance manager. A separate file shall be established for each system and item of equipment. These files shall include the following information as a minimum:

a. Factory performance tests
b. Field calibration tests[1]
c. Field pressure tests[1]

[1]Each of these tests is required even though not specifically noted in detailed specification section.

d. Field performance tests[1]
e. Field operational tests[1]

3. The CONTRACTOR shall develop test documentation forms specific to each item of equipment and system installed under this contract. Acceptable documentation forms for all systems and items of equipment shall be produced for review by the ENGINEER as a condition precedent to the CONTRACTOR'S receipt of progress payments in excess of 50 percent of the contract amount. Once the ENGINEER has reviewed and taken no exception to the forms proposed by the CONTRACTOR, the CONTRACTOR shall produce sufficient forms, at his expense, to provide documentation of all testing work to be conducted as a part of this contract.

B. Test Plans:

1. The CONTRACTOR shall develop test plans detailing the coordinated, sequential testing of each item of equipment and system installed under this contract. Each test plan shall be specific to the item of equipment or system to be tested. Test plans shall identify by specific equipment or tag number each device or control station to be manipulated or observed during the test procedure and the specific results to be observed or obtained. Test plans shall also be specific as to support systems required to complete the test work, temporary systems required during the test work, SUBCONTRACTORs' and manufacturers' representatives to be present and expected test duration. As a minimum, the test plans shall include the following features:

a. Step-by-step proving procedure for all control and electrical circuits by imposing low voltage currents and using appropriate indicators to affirm that the circuit is properly identified and connected to the proper device.

b. Calibration of all analysis instruments and control sensors.

c. Performance testing of each individual item of mechanical, electrical, and instrumentation equipment. Performance tests shall be selected to duplicate the operating conditions described in the project manual.

d. System tests designed to duplicate, as closely as possible, operating conditions described in the project manual.

2. Test plans shall contain a complete description of the procedures to be employed to achieve the desired test environment.

3. As a condition precedent to receiving progress payments in excess of 75 per cent of the contract amount, or in any event, progress payments due to the CONTRACTOR eight weeks in advance of the date the CONTRACTOR wishes to begin any testing work (whichever occurs earliest in the project schedule), the CONTRACTOR shall have submitted all test plans required for the systematic field performance and operational tests for all equipment and systems installed under this contract. Once the ENGINEER has reviewed and taken no exception to the CONTRACTOR'S test plans, the CONTRACTOR shall reproduce the plans in sufficient number for the CONTRACTOR'S purposes and an additional ten copies for delivery to the ENGINEER. No test work shall begin until the CONTRACTOR has delivered the specified number of final test plans to the ENGINEER.

C. Testing Schedule: The CONTRACTOR shall produce a testing schedule setting forth the sequence contemplated for performing the test work. The schedule shall be in bar chart form, plotted against calendar time, shall detail the equipment and systems to be tested, and shall be coordinated with the CONTRACTOR'S construction schedule specified in Section 01321. The schedule shall show the contemplated start date, duration of the test and completion of each test. The test schedule shall be submitted no later than 4 weeks in advance of the date testing is to begin. The ENGINEER will not witness any testing work for the purpose of acceptance until the CONTRACTOR has submitted a schedule to which the ENGINEER takes no exception. The test schedule shall be updated weekly,

showing actual dates of test work, indicating systems and equipment testing completed satisfactorily and meeting the requirements of this project manual.

2.03 SYSTEM AND EQUIPMENT PERFORMANCE TESTS

A. Each item of mechanical, electrical, and instrumentation equipment installed under this contract shall be tested to demonstrate compliance with the performance requirements of this project manual. Each electrical, instrumentation, mechanical, and piping system installed or modified under this contract shall be tested in accordance with the requirements of this project manual.

2.04 OPERATIONAL TESTS

A. Once all equipment and systems have been tested individually, the CONTRACTOR shall fill all systems with the intended process fluids. Storm water process systems shall be filled with water. After filling operations have been completed, the CONTRACTOR shall operate all systems for a continuous period of not less than 2 days, simulating actual operating conditions to the greatest extent possible. The CONTRACTOR shall install temporary connections, bulkheads and make other provisions to recirculate process fluids or otherwise simulate anticipated operating conditions. During the operational testing period, the CONTRACTOR'S Quality Assurance Manager and testing team shall monitor the characteristics of each machine and system and report any unusual conditions to the ENGINEER.

2.05 PRODUCT DATA

A. Product data, to be provided in accordance with Section 01330, shall be the original and three copies of all records produced during the testing program.

PART 3--EXECUTION

3.01 GENERAL

A. The objective of the testing program shall be to demonstrate, to the ENGINEER's complete satisfaction, that the structures, systems, and equipment constructed and installed under this contract meet all performance requirements and the facility is ready for the commissioning process to commence. In addition, the testing program shall produce baseline operating conditions for the Owner to use in a preventive maintenance program.

3.02 CALIBRATION OF FIXED INSTRUMENTS

A. Calibration of analysis instruments, sensors, gages, and meters installed under this contract shall proceed on a system-by-system basis. No equipment or system performance acceptance tests shall be performed until instruments, gages, and meters to be installed in that particular system have been calibrated and the calibration work has been witnessed by the ENGINEER.

B. All analysis instruments, sensors, gages, and meters used for performance testing shall be subject to recalibration to confirm accuracy after completion, but prior to acceptance of each performance test. All analysis instruments, sensors, gages, and meters installed under this contract shall be subject to recalibration as a condition precedent to commissioning under the provisions of Section 01455.

3.03 PERFORMANCE TESTS

A. General:

1. Performance tests shall consist of the following:

a. Pressure and/or leakage tests.

b. Electrical testing as specified in Division 16.

c. Wiring and piping, individual component, loop, loop commissioning and tuning testing as described in Division 17.

d. Preoperational checkout for all mechanical equipment. Preoperational check-out procedures shall be reviewed and approved by the respective equipment manufacturers.

e. Initial operation tests of all mechanical, electrical, and instrumentation equipment and systems to demonstrate compliance with the performance requirements of this project manual.

2. In general, performance tests for any individual system shall be performed in the order listed above. The order may be altered only on the specific written authorization of the ENGINEER after receipt of a written request, complete with justification of the need for the change in sequence.

B. Pressure and Leakage Tests: Pressure and leakage tests shall be conducted in accordance with applicable portions of Divisions 3 and 15. All acceptance tests shall be witnessed by the ENGINEER. Evidence of successful completion of the pressure and leakage tests shall be the ENGINEER's signature on the test forms prepared by the CONTRACTOR.

C. Functional Checkout: Prior to energization (in the case of electrical systems and equipment), all circuits shall be rung out and tested for continuity and shielding in accordance with the procedures required in Division 16.

D. Component Calibration and Loop Testing: Prior to energization (in the case of instrumentation system and equipment), all loops and associated instruments shall be calibrated and tested in accordance with the procedures required in Division 17.

E. Electrical Resistance: Electrical resistance testing shall be in accordance with Division 16.

F. Preoperational Tests: Preoperational tests shall include the following:

1. Alignment of equipment using reverse dial indicator method.

2. Preoperation lubrication.

3. Tests per the manufacturers' recommendations for prestart preparation and preoperational check-out procedures.

G. Functional Tests:

1. General:

a. Once all affected equipment has been subjected to the required preoperational check-out procedures and the ENGINEER has witnessed and has not found deficiencies in that portion of the work, individual items of equipment and systems may be started and operated under simulated operating conditions to determine as nearly as possible

whether the equipment and systems meet the requirements of these specifications. City water shall be employed as the test medium at the expense of the CONTRACTOR. The equipment shall be operated a sufficient period of time to determine machine operating characteristics, including noise, temperatures and vibration; to observe performance characteristics; and to permit initial adjustment of operating controls. When testing requires the availability of auxiliary systems such as looped piping, electrical power, compressed air, control air, or instrumentation which have not yet been placed in service, the CONTRACTOR shall provide acceptable substitute sources, capable of meeting the requirements of the machine, device, or system at no additional cost to the Owner. Disposal methods for test media shall be subject to review by the ENGINEER. During the functional test period, the CONTRACTOR shall obtain baseline operating data on all equipment with motors greater than 1 horsepower to include amperage, bearing temperatures, and vibration. The baseline data shall be collected for the Owner to enter in a preventive maintenance system.

b. Test results shall be within the tolerances set forth in the detailed specification sections of this project manual. If no tolerances have been specified, test results shall conform to tolerances established by recognized industry practice. Where, in the case of an otherwise satisfactory functional test, any doubt, dispute, or difference should arise between the ENGINEER and the CONTRACTOR regarding the test results or the methods or equipment used in the performance of such test, then the ENGINEER may order the test to be repeated. If the repeat test, using such modified methods or equipment as the ENGINEER may require, confirms the previous test, then all costs in connection with the repeat test will be paid by the Owner. Otherwise, the costs shall be borne by the CONTRACTOR. Where the results of any functional test fail to comply with the contract requirements for such test, then such repeat tests as may be necessary to achieve the contract requirements shall be made by the CONTRACTOR at his expense.

c. The CONTRACTOR shall provide, at no expense to the Owner, all power, fuel, compressed air supplies, water, and chemicals, all labor, temporary piping, heating, ventilating, and air conditioning for any areas where permanent facilities are not complete and operable at the time of functional tests, and all other items and work required to complete the functional tests. Temporary facilities shall be maintained until permanent systems are in service.

2. Retesting: If under test, any portion of the work should fail to fulfill the contract requirements and is adjusted, altered, renewed, or replaced, tests on that portion when so adjusted, altered, removed, or replaced, together with all other portions of the work as are affected thereby, shall, unless otherwise directed by the ENGINEER, be repeated within reasonable time and in accordance with the specified conditions. The CONTRACTOR shall pay to the Owner all reasonable expenses incurred by the Owner, including the costs of the ENGINEER, as a result of repeating such tests.

3. Posttest Inspection: Once functional testing has been completed, all machines shall be rechecked for proper alignment and realigned, as required. All equipment shall be checked for loose connections, unusual movement, or other indications of improper operating characteristics. Any deficiencies shall be corrected to the satisfaction of the ENGINEER. All machines or devices which exhibit unusual or unacceptable operating characteristics shall be disassembled and inspected. Any defects found during the course of the inspection shall be repaired or the specific part or entire equipment item shall be replaced to the complete satisfaction of the ENGINEER at no cost to the Owner.

3.04 OPERATIONAL TESTS

A. The CONTRACTOR shall provide system operation testing. After completion of all performance testing and certification by the ENGINEER that all equipment complies with the requirements of the specifications, the CONTRACTOR shall fill all process units and process systems, except those employing domestic water, oil, air, or chemicals, with City water.

B. Upon completion of the filling operations, the CONTRACTOR shall circulate water through the completed facility for a period of not less than 48 hours, during which all parts of the system shall be operated as a complete facility at various loading conditions, as directed by the ENGINEER. The operational testing period shall commence after this initial period of variable operation. Should the operational testing period be halted for any reason related to the facilities constructed or the equipment furnished under this contract, or the CONTRACTOR'S temporary testing systems, the operational testing program shall be repeated until the specified continuous period has been accomplished without interruption. All process units shall be brought to full operating conditions, including temperature, pressure, and flow.

* * * * *

SECTION 01820
OPERATIONS AND MAINTENANCE TRAINING

1.1 THE REQUIREMENT

A. General:

1. This section covers the development and implementation of a training program that will identify skills and knowledge necessary to safely and efficiently operate and maintain the facilities and equipment.

2. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies, and shall perform all functions and services required to complete the Work as specified herein. With the exception of Process Overview, Operations and Safety Training, training shall be divided into separate categories for operations training and maintenance training with maintenance training further broken down to specific crafts.

3. The training requirements specified in other Sections of the Specifications shall be in addition to those specified in this Section.

4. No actual operations training of a piece of equipment will be permitted until the equipment is properly installed and is operational.

5. Operations and maintenance training shall be a prerequisite to the beneficial use of the facility or any portion thereof and be completed a minimum of one week prior to the beneficial use of the facilities and equipment.

B. Related Work Specified Elsewhere:

1. LIQUIDATED DAMAGES of the GENERAL CONDITIONS.

2. SUBMITTALS of the GENERAL REQUIREMENTS.

3. CONTRACTOR'S CONSTRUCTION SCHEDULE AND REPORTS of the GENERAL REQUIREMENTS.

4. DIVISIONS 11, 16, and 17 as applicable.

C. Training Scope:

1. Manufacturer/Vendor Training:

a. Manufacturer supplied (VENDOR) equipment training for all major plant equipment and subsystems shall be provided for the Operations and Maintenance groups as outlined in this section. The VENDOR training shall be provided by qualified instructors of the equipment manufacturers, i.e.: equipment field startup technician or their representative, as approved by the ENGINEER and may include both on and off-site training venues. Generally, manufacturer sales representatives will not be acceptable.

b. Field training shall be hands-on, performance based training during which equipment shall be started and relevant systems and components shall be demonstrated.

c. Off-site training, primarily for the technical crafts including Electricians, Instrument Technicians and Mechanics, shall focus on specialized, technical training and shall be provided by the manufacturer at their factory or training facility. In the event, the CITY

requests specialized factory training on a particular piece of plant equipment, the contractor shall make arrangements with the applicable equipment manufacturer to provide such training.

2. Process Overview, Operations and Safety Training: Process overview and safety training for the Operations group, if deemed necessary, will be prepared and conducted by the CITY utilizing approved materials supplied by the equipment vendors. In the event the CITY is unable to provide the process training, the CONTRACTOR shall enter into an agreement with a training specialist approved by the ENGINEER. Any and all work performed by the training specialist will be paid as stated in Paragraph I, "Fixed Cash Allowance," herein. The CONTRACTOR shall submit invoices for payment from the training specialist, which have been previously approved by the ENGINEER and paid by the CONTRACTOR.

3. General:

   a. Training Material: Sections of the manufacturers O&M manuals, selected by the CITY for the installed equipment, shall be used as training material. The CONTRACTOR shall then reproduce the selected text for each piece of plant equipment and compile the training material to be used by the manufacturer's field technician.

   b. Training schedule: The CONTRACTOR shall provide an operation and maintenance training schedule to be conducted immediately following vendor equipment startup of the equipment. All training shall be scheduled for Tuesday through Thursday only.

D. Training Requirements:

1. The technical position titles of trainees for the Operational and Maintenance groups are listed below:

   a. Operations Group

   b. Maintenance Group

      (1) Mechanics/Plumbers

      (2) Electricians

      (3) Instrument Technicians

      (4) Other Crafts (HVAC)

2. Major equipment and plant subsystems for the various crafts which require training include, but are not limited to the following:

   a. Instrumentation and Controls (I&C):

      (1) Distributed Control Systems (DCS)

      (2) Programmable Logic Controllers (PLC)

      (3) Local Control Panels (LCP)

      (4) Loop Descriptions and Drawings

      (5) Instrument Installation and Calibration

   b. Electrical Systems:

      (1) Transformers and Substations

(2) Motor Control Centers (MCC)

(3) High and Low Voltage Systems

(4) Wiring Diagrams/Schematics

(5) Lighting and Power Panels

(6) Starters and Controllers

(7) Fire Detection and Alarm Systems

c. Operating Systems:

(1) Odor Control Systems

(2) Pumps

(3) Blowers and Fans

(4) Chemical Injection Systems

(5) Centrifuges

(6) Local and Remote Control Devices

d. MechanicalL

(1) Pumps, Couplings & Drives

(2) Blowers and Fans

(3) Lubrication

(4) All Other Rotating Equipment (HVAC)

E. Operation Training:

1. The VENDOR shall conduct training as described herein for the General Operations Group.

2. The training shall consist of instruction and include, but not be limited to, the following subjects. This training shall be conducted by qualified representatives of the equipment manufacturers as follows:

a. Safety precautions and procedures

b. Equipment description and function

c. Operating procedure

d. Operational Maintenance

e. Emergency procedures

F. Maintenance Training:

1. The maintenance training shall include the function, adjustment, repair, and replacement of all components related to the trainee's trade. Emphasis shall be placed on those areas listed in item number 3, below. Safety aspects shall also be stressed.

2. The field training shall stress hands-on instruction.

3. The training shall include, but not be limited to, the following:

   a. Preventive and corrective maintenance procedures, including replacement of parts; lubrication quantities, types, frequencies, and application points; and an estimate of time to perform such procedures.

   b. Special tools, techniques, or procedures required for either preventive or corrective maintenance of equipment, or its auxiliary or support systems.

   c. Procedures to perform adjustments required for alignment, wear and calibration for all preventive and corrective maintenance, and an estimate of time required to perform such procedures.

   d. Assembly and disassembly procedures, including parts lists required for appropriate preventive and/or corrective maintenance. Models, "exploded" views, and/or audiovisual materials shall be used for this training. These materials shall be turned over to the ENGINEER upon completion of training. Hands-on field training shall be provided, subject to the approval of the ENGINEER.

   e. Maintenance, overhauls, troubleshooting of equipment, and auxiliary or support systems.

4. Maintenance training shall be conducted as described in the following subsections.

   a. Mechanic Training:

      (1) Conduct field training for the Mechanics Group.

      (2) The training shall consist of instruction, including but not limited to, the following topics for each major equipment system:

         (a) Equipment Description and Function

         (b) Corrective and Preventive Maintenance Procedures

         (c) Disassembly and Assembly

         (d) Spare Parts

         (e) Troubleshooting

      (3) The field training shall consist of hands-on instruction.

   b. Electrician Training:

      (1) Conduct field training for the Electrician Group.

      (2) The training shall consist of instruction, including but not limited to, the following:

         (a) Transformers and Unit Substations

         (b) High and Low voltage Systems

(c) Motor Control Centers

(d) Control Panel Wiring Diagrams/Schematics

(3) The field training shall consist of hands-on instruction.

c. Instrument Technician Training:

(1) Conduct field training for the Instrument Technicians Group.

(2) The training shall consist of instruction, including but not limited to, the following subjects:

(a) PLC and/or DCS

(b) Loop and PID Drawings, Schematics

(c) Programming

(d) Variable Frequency Drives (VFD)

(e) Operator Interface

(3) The field training shall consist of hands-on instruction.

G. Execution:

1. The training specified herein shall be provided in the field at the project site.

2. The training specified herein shall be provided in a training program.

3. Training shall be conducted so that home study will not be required. The training shall be structured and scheduled to facilitate trainee comprehension of the subject material.

4. The CITY reserves the right to videotape any and all training materials and presentations, except for proprietary material, and retain all rights for usage of such recorded material to train CITY personnel.

H. Evaluation:

1. All training sessions will be monitored and approved by the ENGINEER. Any session or portion thereof deemed unsatisfactory, based on evaluation of the training, shall be repeated by the manufacturer or manufacturer's representative at no additional cost to the CITY.

2. When deemed appropriate by the ENGINEER, field instruction to CITY personnel designated to receive training may be acceptable as a training session. The instruction shall be provided by a field service technician qualified to perform corrective or preventive maintenance, troubleshooting, or related field services.

I. Fixed Cash Allowance:

1. A fixed cash allowance has been allocated for the Facility Overview and Operations/Safety training and is included as an item of the bid breakdown. Overhead and profit shall be as per Section 01212 – FIXED CASH ALLOWANCE ITESM of the GENERAL REQUIREMENTS.

2. However, if Facility Overview and Operations/Safety training are not executed or partially executed or partially expended, or over expended (with the ENGINEER'S prior approval), then an appropriate change order shall be executed in accordance with the provisions the GENERAL REQUIREMENTS Section 01254 -- PAYMENT FOR CHANGES AND EXTRA WORK.

J. Submittals:

1. The CONTRACTOR shall submit training packages for the ENGINEER'S review and approval. The training submittal shall be tied into the CONTRACTOR'S overall submittal process.

2. The CONTRACTOR shall provide the training submittals in the following order for review and approval by the ENGINEER:

   a. First draft sixty (60) days prior to proposed instruction date.

   b. Final draft thirty (30) days prior to proposed instruction date.

3. The "first draft" of the training material shall, as a minimum, contain the following:

   a. Instructional text that details the specific topics of training for the system. These topics are detailed previously in the training submittal. All text must be complete. Incomplete sections, paragraphs, etc., shall not be acceptable.

   b. Clean legible photocopies of all overhead transparencies to be used in the delivery of the lesson plan.

   c. Slides, videos (VHS), and any other type of visual training aid that will be used in conjunction with the training plan.

   d. Reference materials as detailed in the lesson plan (e.g. handout, manufacturer catalogues, brochures, and pamphlets). All material shall be reviewed by the ENGINEER to determine applicability and functionality. Reference materials that do not pass this review shall be modified and resubmitted within two weeks for approval.

   e. No training shall be scheduled unless this material is approved.

   f. The CONTRACTOR shall not proceed to the "final draft" stage of training material until the ENGINEER has approved the "first draft".

4. With the final draft of the training material, the CONTRACTOR shall submit a Training Agenda that provides the following information:

   a. Company name, address, and telephone number(s) for the vendor.

   b. Name and telephone number(s) of the vendor training representative.

   c. Duration of class (total hours).

   d. Breakdown of class and duration in hours of each training activity.

   e. Target audience (e.g. operators, maintenance personnel etc).

   f. Audiovisual requirements (i.e. slide projector, television, VCR, overhead projector, etc.).

5. After the CONTRACTOR has received approval of the "final draft" of the training material and the training agenda from the ENGINEER, only then can the actual training be scheduled. CONTRACTOR shall submit his proposed training schedule to the ENGINEER for approval. The proposed training schedule shall be submitted a minimum of sixty (60) calendar days prior to the start of the training. If the proposed training schedule is approved, then it becomes the final training schedule.

6. Any compensation that is paid to CITY personnel as a result of class cancellations of classes that begin more than thirty (30) minutes after the scheduled start time shall be reimbursed to the CITY by the CONTRACTOR. An exception is when a class is canceled or delayed due to actions by the CITY. The ENGINEER, or his/her representative, will monitor the starting times of scheduled classes.

7. The review of the training material does not constitute its approval unless specifically stated so. The training material submittal shall contain, but not be limited to, the following:

   a. Sufficient background information on each instructor for various sessions shall be provided to allow evaluation of the proposed instructor's qualifications and his capability of training the specific discipline.

   b. At the completion of the training, the CONTRACTOR shall forward to the ENGINEER three (3) complete sets of training materials and support material for each defined training category. This forwarding of materials is to take place at a closeout meeting between the CONTRACTOR and the ENGINEER.

8. Failure to submit training schedule or changes made to the final training schedule, that are not due to actions by the CITY, shall subject the CONTRACTOR to liquidated damages. Liquidated damages shall be assessed at the rate of $500 per day should the CONTRACTOR fail to meet the schedule's submittal requirements.

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Division 02 — Site Work

SECTION 02050
DEMOLITION AND SALVAGE

PART 1 - GENERAL

1.1 SCOPE.

A. This section covers the demolition of existing structures, piping, equipment, sitework and the salvage of existing materials and equipment as indicated on the drawings and as specified herein.

1.2 GENERAL.

A. CONTRACTOR shall be responsible for all work under this section.

B. Demolition and salvage work shall create minimum interference with CITY's operations and minimum inconvenience to CITY.

C. Blasting will not be permitted.

D. Construction Drawings of the existing structures to be demolished or salvaged are available at The City of Los Angeles, Bureau of Engineering, Department of Public Works, 1149 S. Broadway Street, Suite 630 Los Angeles, CA 90015-2213 for inspection and reference. There is, however, no expressed or implied guarantee by either the CITY or the Engineer as to the accuracy or completeness of these Drawings. The Contractor will be held to have visited the site and to have carefully and thoroughly inspected the existing facilities and to have taken into account in the preparation of his bid, all conditions affecting the work required by the Drawings and Specifications. Failure to do so will in no way relieve the Contractor of the responsibility for furnishing all labor and equipment required to perform demolition work.

E. The Contractor shall provide barricades, signs, lights, etc., to warn of possible dangers on the site until the demolition work is completed.

F. The Contractor shall protect from damage all existing construction and utilities that are to remain in service and all equipment that is required to be salvaged and remain property of the CITY.

G. The CONTRACTOR shall submit a complete coordination schedule for demolition work, including shut-off and continuation of utility services, with the ENGINEER's approval prior to start of the work. The schedule shall indicate proposed methods and operations of facility demolition, and provide a detailed sequence of demolition and removal work to ensure uninterrupted operation of occupied areas. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

1.3 RELATED SECTIONS

A. Documents affecting work of this Section include, but are not necessarily limited to the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, DIVISION 1 - GENERAL REQUIREMENTS and other applicable Sections of the Project Manual.

B. Section 02110 Site Clearing and Grubbing.

C. Section 02232 Preparation of Pavement Subgrade

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 DEMOLITION.

A. Structure Demolition:

1. The following structures shall be demolished, and the debris shall be removed from the jobsite.

   a. None.

2. Below grade areas and voids resulting from demolition shall be completely filled in accordance with Section 002200 EARTHWORK. Surfaces shall be graded to meet adjacent contours and to provide flow to surface drainage structures.

B. Piping and Equipment Demolition:

1. The following piping and equipment shall be removed and shall become the property of CONTRACTOR with the exceptions of the items listed. All such items shall be promptly removed from the jobsite.

2. Existing Irrigation System: Demolish existing irrigation system with the exception of the valves and sprinkler heads as indicated on the drawings.

3. Frederick Street Existing Utilities: The existing utilities within Frederick Street to be demolished include:

   a. 51" RCP storm drain
   b. 8" sewer
   c. Storm drain catch basin
   d. 27" RCP storm drain

4. Rose Avenue existing utilities: The existing utilities within Rose Avenue to be demolished include:

   a. Double 9'x12' RCB storm drain
   b. 18" RCP storm drain

5. Oakwood Avenue existing sewer: Demolish approximately 250 lineal feet of existing 16-inch VCP sewer with the associated maintenance hole as indicated on the drawings.

6. Rialto Court existing sewer: Demolish approximately 145 lineal feet of existing 16-inch VCP sewer with the associated maintenance hole as indicated on the drawings.

7. Crescent Place existing sewer: Demolish approximately 180 lineal feet of existing 16-inch VCP sewer with the associated maintenance hole as indicated on the drawings.

8. Abbot Kinney Boulevard existing sewer: Demolish approximately 75 lineal feet of existing 18-inch VCP sewer with the associated maintenance hole as indicated on the drawings.

C. Sitework Demolition:Sitework demolition shall include the following:

1. Removal of reinforced, nonreinforced, concrete drives, pavement, sidewalks, curb, and slabs on grade within the limits indicated on the drawings.

2. Removal of asphaltic concrete pavement and gravel pavement within the limits indicated on the drawings.

3. Removal of existing fencing within the limits indicated on the drawings.

3.2 SALVAGE.

A. Items To Be Salvaged by CITY: CITY may perform some salvage work. CONTRACTOR shall coordinate its operations with CITY to facilitate the work and to avoid damage to items to be salvaged by CITY.

B. Items To Be Salvaged by CONTRACTOR:

1. Removed and salvaged equipment or facilities shall include removal and salvage of all accessories, piping, manholes, supports, park features, baseplates and frames, and all other appurtenances, unless otherwise directed. The CONTRACTOR shall tag all salvaged items. The tag shall identify the item, the location and equipment the item was removed from, and the date of removal.

2. The sprinkler heads and valves from irrigation system shall remain the CITY's property and shall be delivered to CITY's Department of Recreation and Parks by CONTRACTOR in good condition to a location identified by the ENGINEER upon his/her approval.

3. The following existing materials and equipment shall be removed by CONTRACTOR, shall be reused as a part of the work, and shall remain the property of CITY: None.

4. CONTRACTOR shall carefully remove, in a manner to prevent damage, all materials and equipment specified herein or indicated to be salvaged and to remain the property of CITY. CONTRACTOR shall store and protect salvaged items specified or indicated to be reused in the work. Any items damaged in removal, storage, or handling through carelessness or improper procedures shall be replaced by CONTRACTOR in kind or with new items.

5. CONTRACTOR may, at his option, furnish and install new items instead of those specified or indicated to be salvaged and reused, in which case such removed items will become CONTRACTOR's property.

3.3 OCCUPANCY AND POLLUTION CONTROL

A. Water sprinkling, temporary enclosures, chutes, and other suitable methods shall be used to limit dust and dirt rising and scattering in the air. Comply with government regulations pertaining to environmental protection.

B. Water shall not be used when it creates hazardous or objectionable conditions such as ice, flooding, or pollution.

C. Water contaminated with sediment or hazardous or toxic materials shall not be allowed to run off into the public storm drain system (including street gutters). Such runoff shall be intercepted, collected and disposed of according to existing environmental regulations.

3.4 PROTECTION

A. Safe passage of persons around area of demolition shall be ensured. Operations shall be conducted to prevent damage to adjacent buildings, structures, other facilities, and people.

B. Interior and exterior shoring, bracing, or supports shall be provided to prevent movement, settlement or collapse of structures to be demolished, and to adjacent facilities to remain.

C. Existing landscaping materials, structures, and appurtenances, which are not to be demolished shall be protected and maintained as necessary and in accordance with the GENERAL CONDITIONS.

D. The CONTRACTOR shall protect and maintain conduits, drains, sewers, pipes, and wires that are to remain on the property.

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SECTION 02110
SITE CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers all site clearing and grubbing on the job-site indicated on the Contract Drawings and in the Project Manual.

B. Site clearing shall consist of removing all vegetable growth such as trees, roots, stumps, shrubs, brush, limbs; and stone, boulders, clods, wood and other vegetative growth from the growth surface. Clearing shall also include the removal and disposal of trash piles, rubbish, etc.

C. Grubbing shall consist of the removal and disposal of wood roots, stumps, shrubs, brush, stone, boulders, clods, vegetable growth, etc. below the ground or subgrade surface.

D. CONTRACTOR shall furnish all tools, equipment materials and supplies and shall perform all labor to complete the work associated with removal of all natural and artificial objectionable material from the designated areas of work as indicated in the Contract Documents.

E. This work shall also include the protection from injury and preservation of existing improvements, adjacent property, utility vegetation and existing objects designated to remain.

F. Prior to commencing the work, obtain acceptance from the ENGINEER regarding methods to be used and disposal of removed materials.

1.2 RELATED SECTIONS

A. Documents affecting work of this Section included, but are not necessarily limited to the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, DIVISION 1 - GENERAL REQUIREMENTS and other Sections of the Project Manual.

B. Section 02050 Demolition and Salvage

C. Section 02200 Earthwork

D. Section 02232 Preparation of Pavement Subgrade

E. Section 02810 Irrigation System

F. Section 02950 Landscaping

G. Section 03300 Concrete Work

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable reference specifications of the GENERAL REQUIREMENTS.

1.4 CONTRACTOR SUBMITTALS

A. Submit schedule of clearing, grubbing, and erosion control measures to be put in place for all work scheduled during the rainy season (October - April).

1.5 QUALITY ASSURANCE

A. Labor: Use adequate numbers of skilled laborers thoroughly trained in site-clearing operations and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

B. Codes and Regulations: Perform all work of this Section in strict accordance with applicable Government Codes and Regulations especially meeting all safety standards and requirements of CAL/OSHA, County and 2006 California Building Code and applicable Amendments. Conform to all storm water pollution control measures as required and provided in Section 02200 - EARTHWORK of the Project Manual. Provide additional measures, added materials and devices as may be needed as directed by the ENGINEER at no added cost to the CITY.

C. Miscellaneous Requirements:

1. Erection and maintenance of protections

2. Dust Control

3. Repair of Damages

4. Cleaning and Removal of Rubbish

D. Permits and Licenses: Procure all City, County and State Permits and Licenses, including Municipal Business License and pay all charges and fees for the same.

PART 2 - PRODUCTS

2.1 PRESERVATION OF TREES, SHRUBS, AND OTHER VEGETATION

A. Protect trees, shrubbery, and other vegetation not designated for removal from damage resulting from the work. Cut and remove tree branches only where, in the opinion of the ENGINEER, such cutting is necessary to effect construction. Scars resulting from the removal of branches shall be treated with an approved tree sealant. The ENGINEER shall identify all trees for preservation.

2.2 CLEARING AND GRUBBING FOR TRENCHING

A. The CONTRACTOR shall obtain ENGINEER's approval before beginning excavation. The CONTRACTOR shall complete clearing and grubbing prior to the start of trenching. The CONTRACTOR shall not permit excavated materials to cover vegetation prior to disposal.

2.3 REMOVAL AND DISPOSAL OF CLEARING AND GRUBBING DEBRIS

A. General: All materials removed shall be disposed of outside of the right-of-way. No accumulation of flammable material shall remain on or adjacent to the right-of-way. The roadway and adjacent areas shall be left with a neat and finished appearance.

B. Bituminous Pavement: Bituminous pavement removal shall be in conformance with SSPWC Section 300-1.3.2.

C. Concrete Pavement: Concrete pavement removal shall be in conformance with SSPWC Section 300-1.3.2.

D. Concrete Curb, Walk, Gutters, Cross Gutters, Driveways, and Alley Intersections: Concrete removal shall be in conformance with SSPWC Section 300-1.3.2.

2.4 STRIPPING

A. Stripping shall include the removal and disposal of all organic sod, topsoil, grass and grass roots, and other objectionable material remaining after clearing and grubbing from the areas designated to be stripped. The depth of stripping shall be as shown on the Drawings and specified herein.

B. Topsoil from the strippings shall be stockpiled and used for the finished site grading.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Examine the job-site and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper site-clearing operations, as directed by the ENGINEER. Do not proceed until such detrimental conditions have been corrected.

3.2 PROTECTION

A. Protect Existing Structures and Site Improvements from damage by approved methods and/or as authorized by the ENGINEER. Removal of all protections shall be when work of this Section is completed or when so authorized by the ENGINEER. Apply protections to adjacent properties as required and directed by the ENGINEER.

B. Protect Existing Utilities, not designated for removal, traversing the job-site and serving existing adjacent facilities.

C. Protect Existing Trees and Shrubs, not designated for removal, by providing temporary surrounding fencing so located a sufficient distance away so that trees and shrubs will not be damaged by site-clearing operations.

D. Protection of Persons and Property (existing structures and site improvements).

1. Provide barricades, warning signs at open depressions and holes on adjacent property and public accesses.

2. Provide operating warning lights during hours from dusk to dawn each day or as otherwise required.

3. Protect existing remaining structures, utilities, sidewalks, pavements other facilities from damage as caused by settlement, undermining, washout or other hazards created by site-clearing operations of this Section.

4. Provide and maintain pedestrian and vehicular access in accordance with Work Area Traffic Control Handbook (WATCH), latest edition.

E. Use means necessary to prevent air pollution or dust from becoming a nuisance to the public, to neighbors and to others performing work on or near the job-site. Comply with governing regulations.

F. Maintain access to the job-site, other neighboring property, street and alley at all times.

G. The project site shall be maintained in conformance with Section 7-8 - PROJECT SITE MAINTENANCE of the Standard Specifications for Public Works Construction (SSPWC) and the requirements of this Project Manual.

3.3 CLEARING AND GRUBBING

A. Clearing and grubbing shall be in conformance with the SSPWC Section 300-1, except 300-1.4.

B. To a depth of at least 2 feet below existing ground surfaces. Clean out all vegetable growth, roots, stumps, clods and other objective materials.

C. Treat roots remaining in the soil with a weed killer approved and as directed by the ENGINEER.

D. Remove all concrete and masonry debris. Remove stones, boulders, clods which are one (1) inch or larger. Remove stones, boulders, clods which are one (1) inch or larger from all utility trenches.

E. Remove all existing rubbish and debris or those resulting from work operations of this Section as soon as possible, do not allow to pile up. Do not burn rubbish and debris on the job-site.

F. Where active utility lines need to be capped or plugged, perform such work in accordance with requirements of the Utility Company or government agency having jurisdiction and conform to provisions of Section 01015 – CONTRACTOR'S USE OF THE PREMISES,

G. Existing Services to remaining structures are to be maintained at all times.

3.4 STRIPPING

A. Prior to beginning any excavation or fill, strip the topsoil to a depth of 6 inches. In general, topsoil shall be removed where structures are to be built, trenches dug, and roads, parking lots, walks, and similar improvements constructed within the areas presently covered with topsoil. Topsoil shall be stored clear of the construction area. Take reasonable care to prevent the topsoil from becoming mixed with subsoil. Use imported topsoil as required for final grading.

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SECTION 02150
SHORING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide shoring at open excavations and elsewhere where greater than 5-feet in depth. Shoring shall be furnished, placed, maintained and when applicable removed by the Contractor, as needed to protect workers, materials, other properties and the public. All wood sections or components of the shoring system shall be pressure treated.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, DIVISION 1-GENERAL REQUIREMENTS and other Sections of the Project Manual.

2. As established in the GENERAL CONDITIONS of the Contract, the Contractor is solely responsible for means and methods of construction and for the sequences and procedures to be used.

3. Excavation and Backfilling as applicable, but not limited to the following:

a. Section 02200 - Earthwork
b. Section 02810 – Irrigation System
c. Section 03300 – Cast-In Place Concrete
d. Section 05120 - Structural Steel

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Employ a qualified Engineer having a previously established reputation for at least five (5) years to design the shoring system and to inspect and report on the quality of its construction.

C. Comply with pertinent requirements of governmental agencies having jurisdiction.

D. Coordinate the shoring design and construction with:

1. Structural system established for the Work, including location of columns, walls, and other features.

2. Utilities established in the site.

E. Regulatory Requirements:

1. Conform to provisions of Section 01060 - REGULATORY REQUIREMENTS in the GENERAL REQUIREMENTS.

2. Comply with applicable requirements, but not necessarily limited to, shown on the contract Drawings; the latest Los Angeles City Building Code, Section 1802 – QUALITY AND DESIGN and Section 3301 – EXCAVATION AND FILLS; State of California, Code of Regulations, Title 8 – INDUSTRIAL RELATIONS, Division 1-DEPARTMENT OF INDUSTRIAL RELATIONS, Chapter 4 – DIVISION OF INDUSTRIAL SAFETY, Subchapter 4 – CONSTRUCTION SAFETY ORDERS, Section 1539, 1540 and 1541.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01340 - SUBMITTALS of DIVISION 1 - GENERAL REQUIREMENTS.

B. Design and Calculations: The Contractor shall design and prepare shoring drawings and make calculations of materials used structurally in excavations, footings and foundation in accordance with the code requirements. The pressures given in the Ninyo & Moore Report dated 8-11-09 shall be the minimum (Maximun for Passive Lateral Earth Pressure Pp) design loads for shoring on this project.

C. Shop Drawings: After submitting drawings for shoring to the ENGINEER for review, the CONTRACTOR shall incorporate all comments or corrections in the drawings, and submit to the authorized governing agencies for approval, at least 30 days prior to commencement of work. After the approval is obtained, the CONTRACTOR shall submit seven (7) duplicated copies of the approved drawings to the ENGINEER. No excavations shall be started until all the reviews and approval of the shoring design which includes the following minimum items have been obtained from the authorized agencies, the CITY or the ENGINEER:

1. Design assumptions, analysis calculations, and information on CONTRACTOR'S proposed method of installation and removal of all shoring.

2. The maximum design load to be carried by the various members of the support system.

3. Detailed excavation support drawings, showing all pertinent dimensions, spacings, and relationships among the components of the shoring, as well as construction sequence and scheduling.

4. The method of bracing and preloading, if any.

5. Detailed utility and structure support drawings, where necessary.

6. The full excavation depth and depth(s) below the main excavation to which the support system will be installed.

7. Detailed sequence of construction and loads for various stages of bracing removal.

8. Detailed drawings and descriptions of the method to be used by the Contractor to monitor shoring movements.

9. Types of construction equipment intended to be used in this Project.

10. Method of removing the soil from the trench or shoring.

11. Backfill Materials and Method of Backfill and Compaction.

12. Dewatering Plans.

D. Quality Control Submittals: Design Data: All the design and calculations and shop drawings shall be sealed and signed by a professional engineer licensed in the State of California and experienced in the design of earth retaining structures. The professional engineer shall be obtained and paid for by the CONTRACTOR.

E. Permits:

1. Submit in accordance with provisions in Section 01010 - SUMMARY OF THE WORK in DIVISION 1 - GENERAL REQUIREMENTS and other Sections of the Project Manual.

2. The CONTRACTOR shall submit shoring drawings and calculations to the City of Los Angeles, Department of Building and Safety and obtain and pay for the required permit for work under the jurisdiction of the City of Los Angeles Department of Building and Safety.

3. Obtain permit(s) as required by Title 8, Division 1-DEPT. OF INDUSTRIAL RELATIONS, Chapter 4 –DIVISION OF INDUSTRIAL SAFETY of the Calif Code Of Regulation, and pursuant to Subsection 7-10.4.1 - SAFETY ORDERS of SSPWC, prior to excavating to the depth of 5-feet or greater. A duplicate copy of the permit shall be submitted to the ENGINEER for review prior to a start of excavation.

F. Certification Form: As required by Los Angeles Bureau of Engineering Standard Plan S-610, latest edition, CONTRACTOR shall completely fill out a Competent Person Trench/Excavation Certification Form provided by Inspector of Bureau of Contract Administration prior to any worker access to trench or excavations and return it to the Inspector. The CONTRACTOR shall certify by this form; the name of the competent person administering the work, the soil classification, and the type of excavation protective system provided/installed.

G. Shoring Monitoring Data: As Specified herein.

1.4 REFERENCES

A. Reference Standards: Comply with the following, but not necessarily limited to:

1. State of California, Division of Occupational Safety and Health Administration (CAL/OSHA).

2. Standard Specification for Public Works Construction (SSPWC), published by Building News, Inc., Anaheim, California, latest edition. Section 306-1.1.6 - BRACING EXCAVATIONS.

3. Los Angeles City Bureau of Engineering Standard Plans.

B. Shoring Design References:

1. Appendix A: Geotechnical Evaluation for Penmar Water Quality Improvement Project dated 6-13-08.

2. Appendix A: Attachment 2 to Geotechnical Evaluation for Penmar Water Quality Improvement Project dated 8-11-09.

3. Appendix A: Recommendations for Shoring from City of Los Angeles Geotechnical Engineering Group.

1.5 PROTECTIONS

A. Protect adjacent existing improvements against damage by CONTRACTOR'S operations. Protect all excavation so that the soil of adjoining property will not cave in or settle. Repair or replace damaged items to the full satisfaction of the CITY at no extra cost to the CITY.

B. Shore, crib or lag excavations and earthbanks as necessary to prevent caving in, erosion or gullying of sides.

C. Divert or pump water out of all excavations and trenches until all installation work and backfilling are completed and inspected.

1.6 INSPECTIONS

A. Excavation of existing fills, reworking of natural soils and compaction of all required fills will be inspected and tested by the City Inspector with appropriate jurisdictional authority (City of Los Angeles, Department of Building and Safety or City of Los Angeles, Department of Public Works) and the ENGINEER.

B. Place all such backfill under the full supervision of the Inspector.

1.7 SYSTEM DESCRIPTION

A. Design Requirements:

1. Shoring: Design shoring in accordance with all applicable codes, and in accordance with the specific requirements shown on the Contract Drawings. All wood component of the shoring system shall be constructed of pressure treated wood in conformance with the code requirement.

2. Loading: Design and construct shoring to withstand all soil and hydrostatic loading that might occur during the various stages of construction and for any surcharging loading caused by equipment loads, loads from material or soil stockpiles, and earthquake-induced loads. The design values identified in the subsections of this paragraph shall be determined by the soils engineer, refer to the Geotechnical Evaluation Report prepared by Ninyo & Moore and dated June 13, 2008 in Appendix A.

   a. Determine the soil, surcharge, and hydrostatic loading, but in no case shall the loading be less than the earth and minimum equipment surcharge pressures.

   b. Determine the proper load distributions caused by such activities, and assure that those conditions are not exceeded in the field during construction.

   c. Design the shoring for lateral earth and water pressures and surcharge loads that could result from construction methods and dewatering activities.

   d. Consider sequence of excavation and placement as well as their removal of the lateral support elements in design of shoring.

3. Existing pipes or structures shall not be used to support any portion of the open excavation unless approved by the Engineer in writing.

4. The design of shoring shall conform to accepted engineering practice in this field. Approval of the Contractor's plans and methods of construction by the ENGINEER, the CITY or the authorized agencies does not relieve the CONTRACTOR of his responsibility for the adequacy of this support.

5. Support of vertical excavations that extend below the ground water table shall be provided by relatively water-tight, internally braced continuous interlocking sheet piles or secant piles. Sheeting shall be installed and extracted using vibration- and percussive-free methods. Secant piles shall be installed using temporary casing to prevent caving. The relatively watertight excavation support system shall extend a sufficient depth (minimum of 10 feet or refusal) below the bottom of the planned excavations to reduce the potential for heave and/or piping of excavation bottoms. Minimum embedment depths of 20 feet below the bottom of excavation are recommended for the tunneling shafts and the reservoir excavation, which is expected to be approximately 200 feet in diameter. Calculations supporting the design of the shoring cut-off depth shall be included in the shoring submittal. Perform excavations for other project components at depths of less than five feet below the existing ground surface using other approved methods of shoring or temporary excavation slopes as recommended in the

soils report. Shoring shall be installed prior to excavating more than 1-foot below the existing pavement surface.

6. For excavations that are not expected to be impacted by groundwater, other shoring methods, such as beam and plate, are acceptable.

B. Performance Criteria:

1. The CONTRACTOR shall be solely responsible for and bear the sole burden of cost for any and all damages resulting from improper shoring or failure to shore.

2. The safety of workmen, the protection of adjacent structures, property and utilities, and the installation of adequate supports for all excavations shall be the sole responsibility of the CONTRACTOR.

3. The design, planning, installation, and removal of all shoring shall be accomplished in such a manner as to maintain stability of the required excavation or trench section and to prevent any movement of soil that may cause damage to adjacent structures and utilities, damage or delay the work, or endanger life and health.

C. Requirements for dewatering systems are provided in Section 02200, “Earthwork,” 3.19 Dewatering.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until detrimental conditions are corrected.

B. Existing Utilities: Contract Drawings show major utilities, but all utilities may not be shown. Protect and provide utility trench support to any sewer, storm drains, water, gas, electric or other pipelines or conduits uncovered during work from damage whether shown on the drawing or not.

1. Excavate by hand or other excavation methods acceptable to the utility owner.

2. If existing utilities interfere with Contractor's proposed method of support, any required modification or relocation shall be performed at no additional cost to the CITY.

3. Contact Underground Service Alert, (800) 422-4133, and obtain underground service alert inquiry I.D. Number 48 hours prior to digging. Report the I.D. Number to the Bureau of Contract Administration when calling for inspection.

3.2 PREPARATION

A. Protection:

1. Protect or repair utilities damaged by operations of this Section.

2. Protect adjacent structures and property from damage and disfiguration.

B. Dewatering: Where applicable, no excavation shall commence until the CONTRACTOR has demonstrated to the satisfaction of the ENGINEER that the groundwater level has been lowered. Dewatering and that the soils inside the excavation are in the dewatered condition that was assumed in the CONTRACTOR'S shoring design and submittal.

3.3 INSTALLATION

A. All trench and excavation openings shall be lighted and fenced or barricaded during nights, weekends, and other times as necessary and meet CAL/OSHA safety requirements.

B. All shoring shall be installed to the lines and elevations shown on the CONTRACTOR'S review working drawings. No component of the shoring shall infringe on the minimum dimensions of any permanent structure shown in the Contract Drawings.

C. The excavation shall be staged as shown in the Construction Drawings or on required work documents and in such a manner as to provide a stable system of support at all times.

D. Should the shoring system utilize steel H-beams, piles, or other similar vertical supports, driving of said vertical supports will not be permitted in proximity of existing structures except for the last 4-feet. The vertical supports shall be placed in holes drilled to a depth of 4-feet above the proposed bottom of pile, except where this procedure is impracticable. The vertical support may then be driven to the required depth, not to exceed 4-feet. During the drilling and driving operations, the Contractor shall take care to avoid damage to utilities. At locations where the drilling of such holes is impracticable because of the existence of obstructions or rocks, running sand, or other adverse condition, alternative installation methods may be considered upon approval of the City Engineer. Such other means must be of a nature which will accomplish, as nearly as possible, the purpose of the drilling, namely, the prevention of damage to existing surface or subsurface improvements, both public and private.

3.4 MONITORING

A. Inspection: Comply with Section 01400 - QUALITY CONTROL SERVICES in the GENERAL REQUIREMENTS.

1. Monitor and record daily readings on the shoring during excavation to detect any vertical or horizontal movement. Submit a copy of all the daily readings to the ENGINEER at the end of each week. After excavation is completed, monitor the shoring weekly until the backfill is completed. Notify the Inspector and/or the ENGINEER immediately for any excessive movements or deflection.

    a. Measurements shall be referenced from an initial position of the shoring, as jointly established and agreed upon by the CONTRACTOR and the ENGINEER.

    b. Horizontal and lateral deflections into the excavation at any location on the shoring shall be limited to a maximum of 1-inch. If at any time this deflection exceeds 1-inch, immediate corrective measures shall be taken by the CONTRACTOR to prevent any further deflections.

    c. The CONTRACTOR shall stop the excavation work until corrective measures have been taken and the deflections have been reduced to acceptable limits as specified.

2. Monitor adjacent ground and structures on both sides of excavations to verify that no settlement is occurring or has occurred as a result of the CONTRACTOR'S construction activities.

3.5 REMOVAL OF SHORING

A. Shoring shall be designed to be gradually and completely removed as necessary to allow backfill to be placed and compacted. All shoring is to be completely removed by completion of work and any indication otherwise in the project's geotechnical report is to be disregarded. All voids existing behind the shoring shall be backfilled with structural concrete as specified in Section 02200 - EARTHWORK.

B. Shoring shall be removed as backfilling progresses. Removal shall be conducted in such a manner so as to avoid any damage to the reservoir, manholes, vault chambers, or to other members of the shoring system. Impact loading in members of the shoring system will not be allowed. All wood forms, loose or casual wood and debris shall be removed. Areas that cannot be accessed to achieve adequate compaction shall be backfilled with structural backfill without additional cost to the CITY as needed.

C. During backfilling, temporary support elements shall not be removed until alternative support is available, such as substituted struts, backfill, or ability of the support system to act as a cantilever without detrimental deflection. The type of backfill should be determined based on the requirements of Paragraph 2.2 of Section 02200.

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SECTION 02200
EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. The work of this Section includes all earthwork required for construction of the WORK. Such earthwork shall include, but not be limited to, the loosening, removing, loading, transporting, depositing, and compacting in its final location of all materials wet and dry, as required for the purposes of completing the work specified in the Contract Documents, which shall include, but not be limited to, the furnishing, placing, and removing of sheeting and bracing necessary to safely support the sides of all excavation; all pumping, ditching, draining, dewatering, and other required measures for the removal or exclusion of water from the excavation; the supporting of structures above and below the ground; all backfilling around structures and all backfilling of trenches and pits; the disposal of excess excavated materials; borrow of materials to make up deficiencies for fills; and all other incidental earthwork, all in accordance with the requirements of the Contract Documents.

B. Related Sections:

1. Documents affecting work of this Section include, but are not necessarily limited to the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, DIVISION 1 - GENERAL REQUIREMENTS and other applicable Sections of the Project Manual.

2. Section 02050 Demolition and Salvage.

3. Section 02110 Site Clearing and Grubbing.

4. Section 02150 Shoring.

5. Section 02341 Permeation Grouting

6. Section 02441 Small-Diameter Tunneling

7. Section 02513 Asphaltic Concrete Paving.

8. Section 02527 Concrete Cubs and Sidewalks.

9. Section 02810 Irrigation System.

10. Section 02950 Landscaping.

11. Section 03300 Concrete Work.

1.2 QUALITY ASSURANCE

A. Where soil material is required to be compacted to a percentage of maximum dry density, the maximum dry density at optimum moisture content will be determined in accordance with the latest version of ASTM D 1557. In-place field density tests will be performed in accordance with ASTM D 1556, (sand cone) and/or ASTM D 2922 and ASTM D 3017 (nuclear gauge). The number and location of field density tests will be determined by the ENGINEER. At least one sand-cone test (ASTM D 1556) will be taken for every five nuclear tests (ASTM D 2922

and 3017). The results of the sand cone test shall confirm the results of one of the nuclear gauge tests.

B. In case the tests of the fill or backfill show non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to insure compliance. Subsequent testing to show compliance shall be by a testing laboratory selected by the ENGINEER and shall be at the CONTRACTOR's expense. All imported fill material not specified in the contract shall be tested at the CONTRACTOR'S expense and approved by the ENGINEER.

C. Where imported fill material is required to possess certain gradation, strength, and settlement properties, the grain size distribution of soils will be determined using ASTM D 422, the gradation of concrete aggregate and base materials will be determined using ASTM C 136, the sand equivalent of soils will be determined using ASTM D 2419, the consolidation of soils will be determined using ASTM D 2435, the unconfined compressive strength of soils will be determined using ASTM D 2166, and the expansion index of soils will be determined using the latest IBC.

D. Labor: Use adequate numbers of skilled laborers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and the methods needed for proper performance of the Work of this Section.

E. Equipment: Use equipment adequate in size, capacity, and numbers to accomplish the work of this Section in a timely manner.

F. Codes and Standards:

1. Perform excavation work in compliance with applicable ordinance of governing authorities having jurisdiction including, but not limited to, the latest L. A. City Building Code and applicable Amendments; Division 1-DEPARTMENT OF INDUSTRIAL RELATIONS of Title 8 of the California Code of Regulations; Section 300 - EARTHWORK of SSPWC; and City of Los Angeles Brown Book, Latest Edition.

2. Comply with the current provisions of the following Codes and Standards:

a. Commercial Standards:

ASTM C 136	Test Method for Sieve Analysis of Fine and Coarse Aggregates.
ASTM D 422	Test Method for Particle-Size Analysis of Soils.
ASTM D 1556	Test Method for Density of Soil in Place by the Sand-Cone Method.
ASTM D 1557	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in (457-mm) Drop.
ASTM D 1633	Test Method for Compressive Strength of Molded Soil-Cement Cylinders.
ASTM D2166	Test Method for Unconfined Compressive Strength of Soils
ASTM D 2419	Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
ASTM D 2435	Test Method for One-Dimensional Consolidation Properties of Soils

ASTM D 2487	Classification of Soils for Engineering Purposes.
ASTM D 2901	Test Method for Cement Content of Freshly-Mixed Soil-Cement.
ASTM D 2922	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D 3017	Test Methods for Moisture Content of Soil & Rock in Place by Nuclear Methods. (Shallow Depth).

b. Standard Specifications:

SSPWC	Sections 203-1, 203-2, 203-3 - Bituminous Materials
SSPWC	Section 211 - Soil and Aggregate Tests
SSPWC	Section 300 - Earthwork
SSPWC	Section 306-1- Open Trench Operations

c. California Labor Code.

d. City of Los Angeles Building Code, for work under the jurisdiction of the City of Los Angeles Department of Building and Safety.

3. With reference to the terms and conditions of the construction standards for excavations set forth in OSHA "Safety and Health Regulations for Construction", Chapter XVII of Title 29, CFR, Part 1926, CONTRACTOR shall employ a competent person and, when necessary based on the regulations, a registered professional engineer, to act upon all pertinent matters of the work of this section.

4. The Contractor shall provide necessary measures for storm water pollution control and water quality protection. The Contractor shall meet the standards of good house keeping at all time.

G. Survey: The Contractor shall employ the services of a California licensed surveyor for the purposes of survey control, layout, grade and cross-sections required to control work.

H. Soil Testing: All soils testing will be done by a testing laboratory of the ENGINEER'S choice at the CITY's expense except as specified below. Unless specifically noted otherwise, all field testing shall be performed under the control of the Engineer.

1.3 SUBMITTALS

A. Submittals, including samples of materials, shall be in accordance with the GENERAL REQUIREMENTS.

B. Sources of imported materials.

C. Method of Back-Filling and Compaction.

D. Dewatering Plans.

E. The CONTRACTOR's attention is directed to the provisions for "Shoring and Bracing Drawings" in Section 6705 of the California Labor Code, the Los Angeles City Building Code, and SSPWC Section 306-1.1. The CONTRACTOR, prior to beginning any trench or structure excavation 5 feet or more in depth shall submit to the ENGINEER and shall be in receipt of the ENGINEER and Department of Building and Safety's written acceptance of the CONTRACTOR's detailed plan

showing design of all shoring, bracing, sloping of the sides of excavation, and other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation. The plans shall be prepared by a qualified civil or structural engineer licensed in the State of California and employed by an independent engineering firm insured against errors and omissions to the extent required by the ENGINEER. The submittal(s) shall include a site location map referencing existing features; detailed plans; elevations, and various sections indicating all excavation slopes, shoring components and connections and showing all structures and utilities potentially influenced by the performance of shoring, trenching or structure excavation along with supporting calculations; notes including sequence of construction, materials, and other clarification as required by the California Labor Code, SSPWC, the Los Angeles City Building Code, and the contract documents.

F. Test Reports-Excavating: The Contractor shall submit the following reports directly to the agency with jurisdictional authority (City of Los Angeles, Bureau of Engineering or City of Los Angeles, Department of Building & Safety), prepared by a certified Geotechnical Engineer and the testing service, with a copy to the Engineer:

1. Test reports on borrow material.

2. Verification of each footing subgrade.

3. Field density test reports.

4. One optimum moisture-maximum density curve for each type of soil encountered.

5. Other test reports as required by the Soil Engineer and the local cognizant agency.

G. Filter Fabric Data:

1. Complete descriptive and engineering data for the fabric shall be submitted in accordance with the submittals section. Data submitted shall include:

   a. A 12 inch square sample of fabric.

   b. Manufacturer's descriptive product data.

   c. Installation instructions.

H. Tunneling Data.

1. The Contractor shall provide the following submittals:

   a. Contractor’s Engineer work experiences.

   b. Contractor’s Engineer tunnel-related experiences.

   c. Methods of groundwater and surface water control.

   d. Tunnel Support Design.

   e. Equipment Plan

   f. Tunneling Procedures.

   g. Liner plate/Casing Pipe product data

   h. Sequence of construction.

i. Methods of collecting, conveying and treating ground water.

j. Means of face support both during excavation and during periods when tunneling is not taking place.

k. Details of proposed spiling to be used ahead of tunnel excavation.

l. Contingency plans for:

1) High levels of water inflow.
2) Encountering obstructions.
3) Settlement exceeding the specified amounts.

m. Resumes of key personnel.

1.4 PERMITS

A. Required: In addition to the requirements specified herein, and in applicable Section 01010 - SUMMARY OF WORK of DIVISION 1 - GENERAL REQUIREMENTS of the Project Manual.

B. The Contractor shall perform all work in accordance with the permit requirements of the Los Angeles City Department of Building and Safety, including obtaining hauling permit and bond, and making the notification to the adjacent property owners; no additional compensation will be allowed therefore.

C. The Contractor shall furnish the Engineer with a duplicate copy of OSHA excavation permit, and all other required permits prior to the start of the excavation work.

D. The Contractor shall obtain and pay for the Bureau of Engineering's Shoring (Lateral Support) Permit.

E. The Contractor shall obtain and pay for the California State Regional Water Quality Control Board (LARWQCB) Construction Water Discharge Permit.

F. The Contractor shall obtain and pay for any LARWQCB permits for the discharges that occur as a result of dewatering activities.

G. The Contractor shall obtain and pay for California General Construction Activity Stormwater Permit. The Contractor shall obtain Waste Discharge Identification Number after submitting Stormwater Pollution Prevention Plan (SWPPP) pursuant to Section 91.106 of L.A.M.C. to the Los Angeles City Dept. Building and Safety for reviews.

1.5 JOB CONDITIONS

A. Required Work Coordination: The Contractor shall fully coordinate the work operations of this Section with that of other trades involved and with the Engineer to assure proper sequence of work, limitations, methods and time of work so as to minimize or avoid interference with the existing utilities as well as performance of work by the other Contractors. The Contractor shall coordinate and arrange for all the inspections with the local authorized agencies and the Bureau of Contract Administration.

B. Trench Safety: Attention is directed to the provisions of Section 6705 of the Labor Code concerning trench excavation safety plans.

C. Air Pollution Control: The Contractor shall comply with all air pollution control rules, regulations, ordinances and statutes which apply to work performed pursuant to the Contract, including any air pollution control rules, regulations, ordinances and statutes, specified in Section 1107 of the Government Code.

D. Use of Pesticides:

1. The Contractor shall comply with all rules and regulations of the Department of Food and Agriculture, the Department of Health, the Department of Industrial Relations and all other agencies which govern the use of pesticides required in the performance of the Work on the Contract.

2. Pesticides shall include, but shall not be limited to herbicides, insecticides, fungicides, rodenticides, germicides, nematocides, bactericides, inhibitors, fumigants, defoliants, soil sterilants, and repellents.

3. Any substance or mixture of substances intended for preventing, repelling, mitigating or destroying weeds, insects, diseases, rodents, or nematodes and any substance of mixture for substances intended for use as a plant regulator, defoliant shall be considered as a pesticide.

E. Sound Control Requirements:

1. The construction site is adjacent to residential areas. The Contractor shall comply with all local sound control and noise level rules, regulations and ordinances which apply to any work performed pursuant to the Contract.

2. Each combustion engine, used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without said muffler.

F. Use of Explosives: The use of explosives is not permitted.

1.6 PROTECTIONS

A. General: Comply with provisions of Section 25 - PROTECTION OF PERSONS AND PROPERTY AND RESTORATION OF EXISTING IMPROVEMENTS in GENERAL CONDITIONS. Protect and guard all excavations against damage to life, limb and property as prescribed by Los Angeles City Department of Building and Safety.

B. Protections of Persons and Property:

1. Provide and install signs, lights and barricades at danger points on and off the job-site to guard against accidents, etc.

2. Protection and restoration of existing improvements shall conform to Section 7-9 - PROTECTION AND RESTORATION OF EXISTING IMPROVEMENTS of SSPWC and other Section of the Project Manual.

3. Barricade open excavations occurring as part of this work and post with warning lights.

4. Operate and maintain warning lights as recommended by authorities having jurisdiction.

5. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

6. Perform excavation within drip-line of large trees to remain by hand, and protect the root system from drainage or dry out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

C. Existing Improvements (including trees and shrubs Indicated to Remain): Protect against damage resulting from Contractor's operations. Repair or replace damaged items to the full satisfactions of the City at no added cost to the City.

D. Shoring, Cribbing and Lagging:

1. Required of excavations and earthbanks as necessary to prevent caving in, erosion or gullying of sides. Conform to applicable provisions in Section 02150 – SHORING of the Project Manual.

2. Design and calculations of shoring, etc. shall be in accordance with requirements of with the latest Los Angeles City Building Code, Section 2811 and Safety Orders of State of California, Division of Industrial Safety, Title 8, Subchapter 4, Article 6, Sections 1540 and 1541.

3. Upon completion of project or when no longer needed or otherwise directed by the authority having jurisdiction, remove all such shoring from the job-site.

E. Water: Divert or pump out of all excavations until concrete and other items are placed therein, forms removed, post-tensioning performed and backfilling is completed. The Contractor shall provide a mean for distilling the water before discharging it.

F. Existing Utilities:

1. Utilities shown on the drawings are shown pursuant to a search of available records and are shown as a matter of information and not as a matter of fact. Conforming with Section 01010 - SUMMARY OF THE WORK, Section 01015 – CONTRACTOR'S USE OF THE PREMISES and other Sections of the Project Manual, the Contractor shall locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

2. Should uncharted, or incorrectly charted piping or other utilities be encountered during excavation, consult the CITY immediately for directions. Cooperate with the CITY and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility Company.

3. Do not interrupt existing utilities serving facilities occupied and used by the CITY and others, during occupied hours, except when permitted in writing by the CITY or the ENGINEER and then only after acceptable temporary utility services have been provided.

4. Provide a minimum of 48-hour notice to the CITY, and receive written notice to proceed before interrupting any utility. Obtain clearance and notify all utility companies in the area and call Underground Service Alert by calling (800) 422-4133. Deliver utility clearance ticket number to the CITY prior to the start of any work.

5. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of service if lines are active.

1.7 INSPECTION

A. Required:

1. All excavations and trenches shall be inspected by the Inspector, and the Geotechnical Engineer before filling, backfilling and/or other subsequent work is placed therein.

2. Earthwork backfill for structures shall comply with requirements of Section 300-3.5 - STRUCTURAL BACKFILL of SSPWC and/or requirements in the Project Manual.

1.8 GEOTECHNICAL EVALUATION REPORT

A. Geotechnical Evaluation Report prepared by Ninyo & Moore and dated June 13, 2008 is a part of the Project Manual. The Contractor shall comply with all Geotechnical Report recommendations specified and other instruction directed by the Engineer. In case of conflicts between other part of the Project Manual and the Geotechnical Evaluation Report the most restrictive condition shall govern unless otherwise approved by the Engineer.

B. Groundwater Quality Testing Report prepared by Ninyo & Moore and dated August 27, 2009 is a part of the Project Manual. This report contains analytical data for ground water quality to assist the Contractor in determining potential treatment for extracted ground water.

1.9 MATERIAL HANDLING

A. Delivery: All materials, tools, equipment, etc. to be delivered to the job-site, in such a manner coordinated with progress of work of this Section.

B. Material Storage:

1. Stockpile satisfactory excavated materials where directed, until required for backfill or dispose of in accordance with Section 300-2.6 - SURPLUS MATERIALS of SSPWC. Place, grade and shape stockpiles for proper drainage.

2. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

3. Dispose of excess soil material and waste materials as herein specified.

PART 2 - PRODUCTS

2.1 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENTS

A. General:

1. Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, and free from grass, roots, brush, or other vegetation; contamination; or deleterious material.

2. Suitable materials may be obtained from onsite excavations, may be processed on site materials, or may be imported provided these materials meet all the requirements in the contract documents. If imported materials are required to meet the requirements of this Section or to meet the quantity requirements of the project, the CONTRACTOR shall provide the imported fill materials and the required reports of test results at no additional expense to the CITY, unless a unit price item is included for imported materials in the bidding schedule. Testing of import material should be performed by the soils engineer. Import material shall be sampled by Geotechnical Engineering Group (GEO) at the borrow site and approved prior to import. Three days notice is required to facilitate testing of proposed import material.

3. Unclassified fill shall consist of all fill unless separately designated. Unclassified fill shall conform to the requirements of SSPWC Section 300-4 and the requirements stated in the recommendations of the Geotechnical Report.

4. All material placed in fills and embankments shall be free from rocks or stones larger than the required size in their greatest dimension, brush, stumps, logs, roots, debris, and other organic or deleterious materials. The maximum size of stone in fills and embankment shall be as recommended in the Geotechnical Report for the site. No rocks or stones shall be placed in the upper 18 inches of any fill or embankment. Rocks or stones within the allowable size limit may be incorporated in the remainder of fills and embankments, provided they are distributed so that they do not interfere with proper compaction.

5. The following types of suitable materials are designated and defined as follows:

   a. Crushed Miscellaneous Base (CMB) shall conform to the requirements of SSPWC Section 200-2.4.

   b. Disintegrated Granite (DG) shall conform to the requirements of SSPWC Section 200-2.7.

6. Drainrock shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the following gradation requirements:

Sieve Size	Percentage Passing
1-inch	100
3/4-inch	90 - 100
3/8-inch	40 - 100
No. 4	25 - 40
No. 8	18 - 33
No. 30	5 - 15
No. 50	0 - 7
No. 200	0 - 3

7. The drainrock shall have a sand equivalent value not less than 75. The finish graded surface of the drainrock immediately beneath hydraulic structures shall be stabilized to provide a firm, smooth surface upon which to construct reinforced concrete floor slabs. The CONTRACTOR shall use, at its option, one of the asphalt types listed below, conforming to SSPWC Section 203-2 or SSPWC Section 203-3.

	Type 1	Type 2	Type 3
Designation	SC-70	SC-250	RS-1
Spray Temperature (^{o}F)	135-175	165-200	70-120
Coverage (gal/sq yd)	0.50	0.50	0.50

8. If the surface remains tacky, sufficient sand shall be applied to absorb the excess asphalt.

9. Primary Structural Fill shall conform to the requirements stated in the recommendations of the Geotechnical Report.

10. Structure Backfill material shall conform to the requirements of SSPWC Section 300-3.5.1 and the requirements stated in the recommendations of the Geotechnical Report.

11. Pervious Backfill material shall conform to the requirements of SSPWC Section 300-3.5.2 and the requirements in the recommendations stated in the recommendations of the Geotechnical Report.

12. Type A Bedding material shall conform to the requirements for 3/4-inch Crushed Rock, ½-inch Crushed Rock, No. 3 Concrete Aggregate, No. 4 Concrete Aggregate, or Portland Cement Concrete Sand in SSPWC Section 200-1 for pipes larger than 24 inches in diameter. Type A Bedding material shall conform to the requirements for Type B Bedding material or the requirements for Portland Cement Concrete Sand in SSPWC Section 200-1 for pipes 24 inches or smaller in diameter.

13. Type B Bedding material shall conform to the requirements for ½-inch Crushed Rock or No. 4 Concrete Aggregate in SSPWC Section 200-1.

14. Concrete Pipe Bedding material shall conform to the requirements of SSPWC Section 201-1.

15. Sand-Cement Slurry material shall conform to the requirements of SSPWC Section 201-1 for Trench Backfill Slurry.

16. Soil Cement material shall conform to the requirements of SSPWC Section 301-3.1.

17. Topsoil material shall conform to the requirements of SSPWC Section 212-1.1.

B. Controlled Low Strength Material (CLSM):

1. CLSM shall consist of a mixture of Portland cement, fly ash, sand, and water and shall be placed at locations indicated on the drawings or as directed by ENGINEER. The class of CLSM shall be as recommended in the geotechnical report.

2. If CLSM is not specifically approved or recommended in the geotechnical report or supplemental report, then CLSM shall not be used at that site without specific approval by the Geotechnical Engineer of Record.

3. The type of cement in CLSM shall be as recommended in the geotechnical report for the site(s). The class of fly ash in CLSM shall be as recommended in the geotechnical report for the site(s), except loss on ignition shall not exceed 4 percent. Fine aggregate in CLSM shall be clean natural sand, ASTM C33, except that clay particles shall not exceed one percent. Water in CLSM shall be potable.

   a. Class A CLSM. The initial trial mixture for Class A CLSM shall consist of the following minimum proportions per cubic yard to provide minimum compressive strength listed below:

Cement	50 lbs
Fly Ash	250 lbs
Sand (SSD)	2860 lbs
Water	370 lbs
Air Entraining admixture	6 percent
Minimum compressive strength at 56 days	129 psi

b. Class B C LSM: The initial trial mixture for Class B CLSM shall consist of the following minimum proportions per cubic yard to provide minimum compressive strength listed below:

Cement	100 lbs
Fly Ash	100 lbs
Sand (SSD)	2760 lbs
Water	386 lbs
Air Entraining admixture	5 percent
Minimum compressive strength at 56 days	202 psi [1.4 MPa]

c. Class C CLSM: The initial trial mixture for Class C CLSM shall consist of the following minimum proportions per cubic yard to provide minimum compressive strength listed below:

Cement	80 lbs
Fly Ash	275 lbs
Sand (SSD)	2795 lbs
Water	370 lbs
Air Entraining Agent	4 percent
Minimum compressive strength at 56 days	370 psi

4. CONTRACTOR shall design and test the CLSM. CONTRACTOR shall submit the mix design and test results to ENGINEER for review and acceptance. Initial set time shall be 8 hours plus or minus one hour as determined by ASTM C403. CLSM shall have an efflux time of 10 to 26 seconds through a special flow cone with a 1/2 inch discharge tube.

5. The batch proportions accepted by ENGINEER apply only for materials from the same source and having the same characteristics as the materials used in the mix design. Materials from any other source shall be used only with the acceptance of ENGINEER.

6. If a change in sources of materials is proposed, a new mix design shall be developed by CONTRACTOR before the new material is used. When unsatisfactory results or other conditions make it necessary, CONTRACTOR shall develop a new mix design to get the desired results.

7. During the progress of the work, no change shall be made in the batch proportions of the ingredients without the acceptance of ENGINEER.

2.2 USE OF FILL, BACKFILL, AND EMBANKMENT MATERIAL TYPES:

A. The CONTRACTOR shall use the types of materials as designated herein for all required fill, backfill, and embankment construction hereunder.

B. Where these Specifications conflict with the requirements of any local agency having jurisdiction, or with the requirements of a material manufacturer, the ENGINEER shall be immediately notified. In case of conflict therewith, the CONTRACTOR shall use the most stringent requirement, as determined by the ENGINEER.

C. Fill and backfill types shall be used in accordance with the following provisions:

1. Embankment fills shall be constructed of material conforming to the requirements recommended in the Geotechnical Report.

2. Pipe zone backfill, as defined under "Pipe and Utility Trench Backfill" herein, shall consist of the following materials for each pipe material listed below.

   a. Mortar coated pipe, concrete pipe, and uncoated ductile iron pipe shall be provided Type A Bedding, Type B Bedding, or Concrete Pipe Bedding materials as defined herein for pipe zone backfill material.

   b. Coal tar enamel coated pipe, polyethylene encased pipe, tape wrapped pipe, and other non-mortar coated pipes shall be backfilled with Portland Cement Concrete sand conforming to SSPWC Section 200-1 or Concrete Pipe Bedding material as defined herein for pipe zone backfill material.

   c. Plastic pipe and vitrified clay pipe shall be backfilled with 3/4-inch Crushed Rock conforming to SSPWC Section 200-1 or Concrete Pipe Bedding material as defined herein for pipe zone backfill material.

3. Trench zone backfill for pipelines as defined under "Pipe and Utility Trench Backfill" shall be Unclassified Fill material as defined herein unless conditions require the use of a designated material as indicated in the Contract Documents.

4. Final backfill material for pipelines under paved areas, as defined under "Pipe and Utility Trench Backfill" shall be Crushed Miscellaneous Base (CMB) material as defined herein.

5. Trench backfill and final backfill for pipelines under structures shall be the same material as used in the pipe zone, except where concrete encasement is required by the Contract Documents.

6. Base materials under pavements shall be Crushed Miscellaneous Base (CMB) material constructed to the thicknesses shown or specified.

7. Backfill around or behind structures shall consist of Structure Backfill as defined herein unless indicated otherwise in the Contract Documents.

8. Fill materials beneath structures shall be as follows:

   a. Fill beneath hydraulic structures or other water retaining structures with underdrain systems shall be Drainrock material, as defined herein, constructed to the limits and thicknesses shown or specified.

   b. Fill beneath structures without underdrain systems shall be Primary Structural Fill as defined herein.

   c. Fill beneath structures where groundwater must be removed to allow placement of concrete shall be Primary Structural Fill as defined herein.

9. Backfill used to replace pipeline trench over-excavation shall consist of Type B Bedding material as defined herein.

10. The top 6 inches of fill on reservoir roofs, embankment fills around hydraulic structures, and all other embankment fills shall consist of Topsoil as defined herein.

2.3 FILTER FABRIC.

A. Filter fabric shall be provided in rolls wrapped with covering for protection from mud, dirt, dust, and debris.

B. Filter Fabric Type A. Filter fabric Type A shall be provided for installation at locations indicated on the drawings and as specified herein. Filter fabric Type A shall be a nonwoven fabric consisting of only continuous chains of polymeric filaments or yarns of polyester formed into a stable network by needle punching. The fabric shall be inert to commonly encountered chemicals; shall be resistant to mildew, rot, ultraviolet light, insects, and rodents; and shall have the indicated properties:

Property	Test Method	Unit	Min Roll Value *
Fabric Weight	ASTM D3776	oz/yd^2	5.7
Grab Strength	ASTM D4632	lb	155
Grab Elongation	ASTM D4632	percent	50
Mullen Burst Strength	ASTM D3786	psi	190
Apparent Opening Size	CW-02215	U.S. Standard Sieve Size	70

* Minimum average roll value in weakest principal direction.

C. Filter Fabric Type B. Filter fabric Type B shall be provided for installation at locations indicated on the drawings and as specified herein. Filter fabric Type B shall be a nonwoven fabric consisting of only continuous chains of polymeric filaments or yarns of polyester formed into a stable network by needle punching. The fabric shall be inert to commonly encountered chemicals; shall be resistant to mildew, rot, ultraviolet light, insects, and rodents, and shall have the indicated properties:

Property	Test Method	Unit	Min Roll Value *
Fabric Weight	ASTM D3776	oz/yd^2	8.0
Grab Strength	ASTM D4632	lb	215
Grab Elongation	ASTM D4632	percent	50
Mullen Burst Strength	ASTM D3786	psi	375
Apparent Opening Size	CW-02215	U.S. Standard Sieve Size	70

* Minimum average roll value in weakest principal direction.

D. Filter Fabric Type C. Filter fabric Type C shall be provided for installation at locations indicated on the drawings and as specified herein. Filter fabric Type C shall be a woven monofilament fabric consisting of polypropylene. Filter fabric Type C shall have the indicated properties:

Property	Test Method	Unit	Minimum Average* Roll Value
Fabric Weight	ASTM D3776	oz/yd^2	6.0
Grab Strength	ASTM D4632	Lb	300
Elongation at Break	ASTM D4632	percent	15
Mullen Burst Strength	ASTM D3786	Psi	600
Puncture Strength	ASTM D4835	ls	120
Trapezoidal Tear	ASTM D4533	lbs	115
Apparent Opening Size	ASTM D4757	U.S. Standard Sieve Size	70

* Minimum average roll value in weakest principal direction.

E. Polyethylene Film: Polyethylene film beneath concrete slabs or slab base course material shall be Product Standard PS17, thickness as shown on plan, 10 mil minimum.

2.4 WEED KILLER/SOIL STERILANT

A. Provide a dry, free-flowing, dust-free chemical compound, soluble in water, capable of inhibiting growth of vegetation, and approved for use on this Work by governmental agencies having jurisdiction.

B. Tinted for visual identification, shall be as follow:

1. United States Borax Corp. “Polyborchlorate” or equal.

2. Pacific Coast Borax Co. “Polyborchlorate”.

3. Amspray Corp. “Pavex”.

4. Elanco “Spike 801".

2.5 COVERINGS UNDER TANK FLOOR AND FOOTINGS

A. Provide 30 mil. thick membrane PVC liner under tank floor and footings. The PVC liner shall be manufactured from virgin polymers and other compounding materials. Regrind, reworked, or trim materials shall be from the same manufacturer and the same formulation as the liner. No more than 10 percent regrind, reworked, or trim materials shall be used to manufacture the liner. Recycled materials shall not be allowed.

B. The 30 mil PVC liner shall be Wascoseal Type 30 by York Manufacturing Inc., or Watersaver Geomembrane PVC liner by Watersaver or approved equal.

C. Prior to pouring the tank floor, the aggregate base shall be covered with 6 mil. polyethylene, building paper or approved equal.

2.6 TOPSOIL

A. Where required, provide topsoil consisting of friable, fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoil, roots, heavy or stiff clay, stones larger than 2 inches in greatest dimension, noxious weeds, sticks, brush, litter, and other deleterious matter.

B. Topsoil to be obtained from sources within the project limits, or imported from an approved source outside the project limits.

2.7 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the CITY.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until detrimental conditions are corrected.

3.2 CLEARING, GRUBBING, AND STRIPPING

A. Clearing and grubbing shall be performed in accordance with SSPWC Section 300-1.

B. Stripping shall include the removal and disposal of all organic sod, topsoil, grass and grass roots, and other objectionable material remaining after clearing and grubbing from the areas designated to be stripped. The depth of stripping shall be as shown on the Drawings and specified herein.

C. Topsoil from the strippings shall be stockpiled and may be used for the finished site grading, subject to the approval of the ENGINEER.

D. Prior to beginning any excavation or fill, strip the topsoil to a depth of 6-inches. In general, topsoil shall be removed where structures are to be built, trenches dug, and roads, parking lots, walks, and similar improvements constructed within the areas presently covered with topsoil. Topsoil shall be stored clear of the construction area. Take reasonable care to prevent the topsoil from becoming mixed with subsoil.

3.3 DUST CONTROL

A. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the job-site.

3.4 STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION

A. General: Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the work. The removal of said materials shall conform to the lines and grades shown or ordered. Unless otherwise provided, the

entire construction site shall be stripped of all vegetation, debris, and all deleterious materials, and such materials shall be removed from the site prior to performing any excavation or placing any fill. The CONTRACTOR shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching, or other measures for the removal or exclusion of water, including taking care of storm water, groundwater (dewatering if required), and wastewater reaching the site of the work from any source so as to prevent damage to the work or adjoining property. Excavations shall be sloped or otherwise supported in a safe manner in accordance with requirements of the Contract Drawings and the applicable code of agencies with jurisdictional authority such as, City of Los Angeles, Department of Building and Safety, State of California, or the OSHA Safety and Health Standards for Construction (29CFR1926).

B. Shoring of Excavations:

1. See Section 02150 Shoring.

C. Excavation Beneath Structures and Embankments: Except where otherwise specified for a particular structure or ordered by the ENGINEER, excavation shall be carried to the grade of the bottom of the footing or slab. Where shown or ordered, areas beneath structures or fills shall be over-excavated. The subgrade areas beneath embankments shall be excavated to remove not less than the top 8 inches of native material and where such subgrade is sloped, the native material shall be benched. When such over-excavation is shown, both over-excavation and subsequent backfill to the required grade shall be performed by the CONTRACTOR. When such over-excavation is not shown on the plan and not specified but is ordered by the ENGINEER, such over-excavation and any resulting backfill will be paid for under a separate unit price bid item if such bid item has been established and approved by the ENGINEER prior to commencing the work; otherwise payment will be made in accordance with a negotiated price. After the required excavation or over-excavation has been completed, the exposed surface shall be scarified to a depth of 8 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain the required relative compaction.

D. Excavation Beneath Concrete Reservoir: Excavation under the reservoir shall extend to the bottom of the drainrock layer. After such excavation has been completed, the exposed surface shall be rolled with heavy compaction equipment to 95 percent of maximum dry density and then graded to provide a reasonably smooth surface for placement of the drainrock. Areas under the reservoir upon which fill is to be placed shall be scarified to a depth of 12 inches, brought to optimum moisture content, and compacted to obtain 95 percent of maximum dry density.

E. Excavation Beneath Paved Areas: Excavation under areas to be paved shall extend to the bottom of the aggregate base, if such base is called for; otherwise it shall extend to the paving thickness. After the required excavation has been completed, the exposed surface shall be scarified to a depth of at least 12 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum dry density.

F. Excavation Subgrade and Below Subgrade:

1. Excavate and shape subgrade to line, grade, and cross-sections shown on Drawings. Following receipt of written acceptance for the subgrade by the ENGINEER and local building official, compact the subgrade with approved equipment until the top 12-inches is compacted to 95 percent of maximum dry density at optimum moisture content as determined by ASTM D 1557. Remove all soft, loose, or otherwise unsuitable material and replace with suitable sandy material. The finished subgrade shall be firm, hard and unyielding. The subgrade shall be considered to extend over the full width of the base course. Compaction shall extend 18 inches beyond the edge of paving, curb, or form.

2. Where the ENGINEER deems subgrade material to be unsatisfactory, excavation below subgrade will be required to such depths as necessary to remove the unsatisfactory material. Excavation below grade shall be of the same classification as that above it provided it is removed in the same operation as the normal excavation. Special equipment or hand excavation may be required because of the presence of shallow utilities or other unforeseen conditions.

G. Notification of ENGINEER: The CONTRACTOR shall notify the ENGINEER at least 2 working days in advance of completion of any structure excavation and shall allow the ENGINEER a review period of at least one day before the exposed foundation is scarified and compacted or is covered with backfill or with any construction materials.

3.5 PIPELINE AND UTILITY TRENCH EXCAVATION

A. General: Unless otherwise shown or ordered, excavation for pipelines and utilities shall be open-cut trenches conforming to SSPWC Section 306-1.1. Trench widths shall be kept as narrow as is practical for the method of pipe zone densification selected by the CONTRACTOR, but shall have a minimum width at the bottom of the trench equal to the outside diameter of the pipe plus 18 inches. The maximum width at the top of the pipe shall be in accordance with Table A of Standard Plan S-251. If the maximum trench width is exceeded, the Contractor shall provide substitute installation in accordance with Table B of Standard Plan S-251.

B. Trench Bottom: Except when pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe. The trench bottom shall be given a final trim, using a string line for establishing grade, such that each pipe section when first laid will be continually in contact with the ground along the extreme bottom of the pipe. Rounding out the trench to form a cradle for the pipe will not be allowed.

C. Open Trench: The maximum amount of open trench permitted in any one location shall be 500 feet, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 100 feet from any traveled roadway or occupied structure. In such cases, however, barricades and warning lights meeting OSHA requirements shall be provided and maintained.

D. Trench Over-Excavation: Where the Drawings indicate that trenches shall be over-excavated, they shall be excavated to the depth shown, and then backfilled to the grade of the bottom of the pipe.

E. Over-Excavation: When ordered by the ENGINEER, whether indicated on the Drawings or not, trenches shall be over-excavated beyond the depth shown. Such over-excavation shall be to the depth ordered. The trench shall then be backfilled to the grade of the bottom of the pipe. All work specified in this Section shall be performed by the CONTRACTOR when the over-excavation ordered by the ENGINEER is less than 6 inches below the limits shown. When the over-excavation ordered by the ENGINEER is over 6 inches below the limits shown, additional payment will be made to the CONTRACTOR for that portion of the work which is located below said 6 inch distance. Said additional payment will be made under separate unit price bid items for over-excavation and bedding if such bid items have been established; otherwise payment will be made in accordance with a negotiated price.

F. Where pipelines are to be installed in embankment or structure fills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

G. Obtain ENGINEER's approval before beginning excavation. Complete clearing and grubbing prior to the start of trenching. Do not permit excavated materials to cover brush or trees prior to disposal.

H. The portion of the force main under the existing storm drain in Rose Avenue shall be constructed using micro-tunneling methods, as detailed in Section 3.9

3.6 OVER-EXCAVATION NOT ORDERED, SPECIFIED, OR SHOWN

A. Any over-excavation carried below the grade ordered, specified, or shown, shall be backfilled to the required grade with the specified material and compaction. Such work shall be performed by the CONTRACTOR at its own expense.

3.7 EXCAVATION IN LAWN AREAS NOT TO BE OTHERWISE LANDSCAPED

A. Where excavation occurs in lawn areas, the sod shall be carefully removed and stockpiled to preserve it for replacement. Excavated material may be placed on the lawn; provided, that a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of backfilling and testing of the pipeline, the sod shall be replaced in a manner so as to restore the lawn as near as possible to its original condition and to the satisfaction of the ENGINEER. CONTRACTOR shall provide new sod if stockpiled sod has remained so for more than 72 hours within the scope of the contract.

3.8 EXCAVATION IN VICINITY OF TREES

A. Except where trees are shown to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the ENGINEER. Trees shall be supported during excavation by any means previously reviewed by the ENGINEER.

3.9 TUNNEL EXCAVATION

A. Pipelines shall be constructed in tunnels of the type designated on the Drawings, in conformity with the requirements, which follow. Before starting work on any tunnel, detailed Drawings, specifications, and other data covering the liner to be used shall be submitted.

B. No excavation shall be performed until the ground has been dewatered completely and to the levels as specified in Division 2 Section “Dewatering” and Division 2 Section “Earthwork”.

C. The clear inside diameter of initial support shall be within ± 4 inches of the nominal diameter indicated in the Drawings.

D. The tunnel face shall be supported during excavation as necessary to prevent ground loss. At the end of every work day, the end of every work week or during times where excavation will not proceed for a period of two hours or more, the tunnel face shall be completely supported with breast boards or equivalent materials.

E. If the ground conditions require, the tunnel crown shall be pre-supported with spiling at the tunnel face. Spiling shall consist of steel channel sufficiently robust to be driven through the soil conditions encountered.

1. Tunnel Liner Plates: Care shall be taken during installation to maintain alignment, grade and the circular shape of the tunnel. Longitudinal joints in adjacent rings shall be staggered and not in alignment more than every second ring.

2. The entire operation of tunneling and setting of liners shall be acceptable to the City and all other agencies having jurisdiction. Adequate means shall be provided to keep the work free from water. The tunnel face shall be braced during periods when the excavation is not proceeding.

3. Sufficient sections of tunnel liner plates shall be provided with 1-1/2 inch or larger grouting ports, located near the centers, so that when the plates are installed there will be one line of holes on each side of the tunnel and one at the crown; the lower line of ports on each side shall be not more than 18 inches above the invert. The ports in each line shall be not more than 9 feet apart and shall be staggered.

4. All space between the lining and the earth shall be filled with grout forced in under pressure. The grout shall be mixed in the volumetric proportions of two parts Portland cement, one part fly ash, and not to exceed six parts of sand. Enough water shall be used to produce, when well mixed, a grout having the consistency of thick cream. As the pumping through any port is stopped, it shall be plugged to prevent backflow of grout.

5. Grouting shall be preformed in a sequence, which will preclude deflections exceeding 5 percent of the tunnel diameter. Grout shall be installed after every 6 feet and at least once per shift.

6. After the grout has been given at least 8 hours of time to set, the grout ports shall be opened and the annular grout shall be drilled to verify that the annular space was filled.

F. The portion of the force main under the existing storm drain in Rose Avenue shall be constructed using micro-tunneling methods, as detailed in Section 02441, “Small Diameter Tunneling.” Shoring of the tunneling shafts is discussed in Section 02150, “Shoring,” Section 1.7. Dewatering is discussed in Section 3.19. A water-tight seal shall be provided at the tunnel entrance and exit to limit ground water seepage to the tunnel shafts to 50 gallons per minute (gpm) per shaft. Permeation grouting may be utilized at the tunnel entrance and exit for ground water control as detailed in Section 02341, “Permeation Grouting.”

3.10 SETTLEMENT MONITORING

A. CONTRACTOR shall be responsible for maintenance of settlement monitoring points. Exact locations of settlement monitoring points shall be field-determined and be approved by the Engineer prior to installation. The general spacing of settlement monitoring points (arrays) shall be every 20 feet along the tunnel alignment. Each array shall consist of a single point directly above the tunnel and three points to both the right and left at a five foot spacing perpendicular to the tunnel axis (total of seven points per array). The settlement monitoring points shall be PK nails in pavement or a 12 inch long # 5 rebar driven into the ground in unpaved areas.

B. Monitoring Schedule and Limits: CONTRACTOR shall monitor the surface settlement monitoring points and shall report as described below:

1. Measure and obtain reference readings for all instruments immediately after installation. Measure at least three times to obtain repeatable readings prior to construction. All initial readings and subsequent movements shall be accurate to 0.003 feet.

2. Readings from all instruments and survey points shall be submitted to the CITY within 24 hours of collecting data.

3. Access: CONTRACTOR shall provide access to the CITY for measuring the instruments at all times.

4. The CITY shall occasionally conduct quality assurance measurements of instruments. Measurements by the CITY shall take precedence over the CONTRACTOR's measurement. The CITY'S measurement may be made available to the CONTRACTOR upon request, however, the CONTRACTOR shall rely on the CONTRACTOR's own instrument readings for construction purposes.

5. Monitoring Frequency: The CONTRACTOR shall record readings prior to, during and after construction. These readings shall be submitted to the CITY daily on forms that are acceptable to the CITY. The readings shall be, at minimum, at the following frequency and intervals:

When	Duration	Frequency
Prior to Construction	Two Weeks	Every seven days
During Construction	- -	Daily
After Construction	One Month	Every seven days

6. All elevations shall be referenced to fixed points which are a minimum of two hundred (200) feet away from all excavations to assure that the reference points remain accurate.

7. Instrument Threshold Limits: The CONTRACTOR shall limit the effects of construction to those specified in the following table.

Instrument Type	Allowable Limit
Surface Settlement Points	0.5 inches

a. If the limits listed above are exceeded, the CONTRACTOR shall take the following actions:

(1) Cease all related operations.

(2) Develop corrective actions to be taken and submit to CITY for review.

(3) Implement corrective actions.

(4) Resume related operations.

(5) Verify success of corrective measures.

(6) If corrective actions are not successful, cease all related operations and repeat process listed above.

3.11 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. The CONTRACTOR shall remove and dispose of all excess excavated material at a site selected by the CONTRACTOR and reviewed by the ENGINEER. All incurred expenses shall be borne by the CONTRACTOR. CONTRACTOR shall obtain all NGCGSSAM permits.

3.12 PROTECTION OF SUBGRADE

A. After preparing the subgrade as specified, all traffic on the subgrade shall be avoided. Should it be necessary to haul over the prepared subgrade, the CONTRACTOR shall drag and roll the traveled way as frequently as may be necessary to remove ruts, cuts, and breaks in the surface. All cuts, ruts, and breaks in the surface of the subgrade that are not removed by the above

operations shall be raked and hand tamped. All equipment used for transporting materials over the prepared subgrade shall be equipped with pneumatic tires.

B. Continued use of sections of prepared subgrade for hauling, so as to cut up or deform it from the true cross-section, will not be permitted. The CONTRACTOR shall protect the prepared subgrade from all traffic.

C. The CONTRACTOR will be required to plank the subgrade before hauling materials or equipment over it.

D. The subgrade shall be maintained in the finished condition until the first succeeding course or steel or concrete is placed.

E. The ENGINEER has the right to test the reworked subgrade and approve or disapprove the subgrade depending on its condition.

3.13 BACKFILL - GENERAL

A. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained specified strength to withstand the loads imposed. Backfill around water retaining structures shall not be placed until the structures have been tested, and the structures shall be full of water while backfill is being placed.

B. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation.

3.14 PLACING AND SPREADING OF BACKFILL MATERIALS

A. Backfill materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment the layers shall be evenly spread in loose lifts not exceeding 8 inches in thickness so that when compacted each layer shall not exceed 6 inches in thickness.

B. During spreading each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so that when compacted the pipe zone backfill will provide uniform bearing and side support.

C. Where the backfill material moisture content is below the optimum moisture content water shall be added before or during spreading until the proper moisture content is achieved.

D. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory, at or slightly above optimum moisture content.

3.15 COMPACTION OF FILL, BACKFILL, AND EMBANKMENT MATERIALS

A. Each layer of fill shall be mechanically compacted using proper compaction equipment (not rubber tire or wheel rolling) to the specified percentage of maximum dry density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.

B. Fill on reservoir and structure roofs shall be deposited at least 30 days after the concrete roof slab has been placed. Equipment weighing more than 10,000 pounds when loaded shall not be used on a roof. A roller weighing not more than 8,000 pounds shall be used to compact fill on a roof.

C. Flooding, ponding, or jetting shall not be used to densify any materials.

D. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the depth of the fill at that time, but not less than 5 feet. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.

E. Compaction Requirements: The following compaction test requirements shall be in accordance with ASTM D 1557. Where agency or utility company requirements govern, the highest compaction standards shall apply.

Location or Use of Fill	Percentage of Maximum Density
Pipe zone backfill portion above bedding for flexible pipe.	95
Pipe zone backfill bedding and over-excavated zones under bedding/pipe for flexible pipe.	95
Pipe zone backfill portion above bedding for rigid pipe.	95
Pipe zone backfill bedding and over-excavated zones under bedding/pipe for rigid pipe.	95
Final backfill, beneath paved areas or structures.	95
Final backfill, not beneath paved areas or structures.	95
Trench zone backfill.	95
Embankments.	95
Embankments, beneath paved areas or structures.	95
Backfill beneath structures, hydraulic structures.	95
Backfill around structures, on reservoir or structure roof.	95
Topsoil	85
Base	95

F. Trench Backfill Requirements: The pipe has been structurally designed based upon the trench configuration specified herein.

G. The CONTRACTOR shall maintain the indicated trench cross section up to a horizontal plane lying 6 inches above the top of the pipe.

H. If, at any location under said horizontal plane, the CONTRACTOR slopes the trench walls or exceeds the maximum trench widths indicated in the Contract Documents, the pipe zone backfill shall be "improved" or the pipe class increased as specified herein, at no additional cost to the CITY. "Improved" backfill shall mean sand-cement backfill containing at least 188 pounds of cement per cubic yard or equal materials acceptable to the ENGINEER.

I. If the allowable vertical deflection specified for flexible pipe is exceeded, the CONTRACTOR shall expose and reround or replace the pipe, repair all damaged lining and coating, and reinstall the pipe zone material and trench backfill as specified at no additional expense to the CITY.

3.16 PIPE AND UTILITY TRENCH BACKFILL

A. Pipe Zone Backfill: The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches below the bottom surface of the pipe, i.e., the trench subgrade, and a plane at a point 6 inches above the top surface of the pipe. The bedding for flexible pipe is defined as that portion of pipe zone backfill material between the trench subgrade and the bottom of the pipe. The bedding for rigid pipe is defined as that portion of the pipe zone backfill material between the trench subgrade and a level line which varies from the bottom of the pipe to the spring line as shown.

B. Bedding shall be provided for all sewers, drainage pipelines, and other gravity flow pipelines. Unless otherwise specified or shown, for other pipelines the bedding may be omitted if all the following conditions exist.

1. The pipe bears on firm, undisturbed native soil which contains only particles that will pass a one-inch sieve.

2. The trench excavation is not through rock or stones.

3. The trench subgrade soils are classified as suitable fill and backfill materials.

4. The trench subgrade soils have, as a maximum, a moisture content that allows compaction.

C. Where bedding is required, after compacting the bedding the CONTRACTOR shall perform a final trim using a string line for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe.

D. The pipe zone shall be backfilled with the specified backfill material. The CONTRACTOR shall exercise care to prevent damage to the pipeline coating, cathodic bonds, or the pipe itself during the installation and backfill operations.

E. Trench Zone Backfill: After the pipe zone backfill has been placed as specified above, and after all excess water has completely drained from the trench, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches above the top surface of the pipe and a plane at a point 18 inches below the finished surface grade, or if the trench is under pavement, 18 inches below the roadway subgrade. If concrete or sand-cement slurry backfill are used, the pipe shall be filled with water to prevent flotation.

F. Final Backfill: Final backfill is all backfill in the trench cross-sectional area within 18 inches of finished grade, or if the trench is under pavement, all backfill within 18 inches of the roadway subgrade.

3.17 BACKFILLING OF TUNNEL ANNULAR SPACE

A. Backfill the annular space with low density cellular concrete (LDCC). The limits of each LDCC placement shall be predetermined by the size and capacity of the batching equipment and the initial set time of the LDCC. LDCC injection lines shall be located in accordance with the number of stages necessary to complete the backfilling process. A stage or lift cannot be installed on another lift until a proper set has been attained.

B. Limit LDCC pressure to prevent damage or distortion to the carrier pipe. Define the limiting and estimated required pressure range. Provide an open ended, high point tap or equivalent vent and monitor it at the bulkhead.

3.18 EMBANKMENT CONSTRUCTION

A. The area where an embankment is to be constructed shall be cleared of all vegetation, roots and deleterious materials. Following this, the surface shall be moistened, scarified to a depth of 6 inches, and rolled or otherwise mechanically compacted. Embankment fill material shall be placed and spread evenly in horizontal layers. Each layer shall be moistened or aerated, as necessary. Each layer shall not exceed 6 inches of compacted thickness. The embankment fill and the scarified layer of underlying ground shall be compacted to 95 percent of maximum dry density per the requirements of the recommendations in the Geotechnical Report.

B. When an embankment fill is to be made and compacted against hillsides or fill slopes steeper than 4:1, the slopes of hillsides or fills shall be horizontally benched to key the embankment fill to the underlying ground. A minimum of 12 inches normal to the slope of the hillside or fill shall be removed and recompacted as the embankment fill is brought up in layers. Material thus cut shall be recompacted along with the new fill material at the CONTRACTOR's expense. Hillside or fill slopes 4:1 or flatter shall be prepared in accordance with Paragraph A, above.

C. Where embankment or structure fills are constructed over pipelines, the first 4 feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe.

3.19 DEWATERING

A. Dewatering equipment shall be provided to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result. Dewatering systems shall be designed, constructed and operated in accordance with Bureau of Engineering Special Order 001-0204. Per Special Order 001-0204, efforts shall be taken to reduce the volume of water extracted and changes to the natural ground water table as a result of dewatering. Sumps and/or well points shall be used within trench excavations and tunneling shafts to reduce the volume of extracted water and impacts to the natural water table outside the construction area. Four observation wells shall be installed outside the reservoir excavation to monitor potential dewatering impacts to the natural groundwater table surrounding the construction area. Redundancy shall be incorporated into the dewatering system design to allow for routine maintenance and/or occasional failure of the dewatering equipment while maintaining the required drawdown.

B. All excavations for concrete structures or trenches which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level to the minimum depth, 36 inches, beneath such excavations. The specified dewatering depth shall be maintained below the prevailing bottom of excavation at all times.

C. Surface water shall be diverted or otherwise prevented from entering excavations or trenches to the greatest extent possible without causing damage to adjacent property.

D. CONTRACTOR shall be responsible for the condition of any pipe or conduit used for drainage purposes, and all such pipe or conduit shall be left clean and free of sediment.

E. CONTRACTOR shall obtain from the appropriate agencies and authorities, the dewatering and stormwater discharge permits required to remove and dispose of groundwater, surface water, and any other water used in CONTRACTOR's operations. The permits shall be obtained prior to start of construction.

F. CONTRACTOR is required to submit dewatering plan, including required filtration treatment prior to commencement of dewatering activities

G. Groundwater produced by dewatering excavations and/or any nuisance or leakage water from inside excavations shall be disposed of in the sanitary sewer or storm drain system. For discharging to the sanitary sewer, an Industrial Wastewater Permit shall be obtained from the City Los Angeles, Bureau of Sanitation for discharge water quantity and quality restrictions. Groundwater treatment for the removal of solids or other constituents will be required with a permit from the Industrial Waste Unit, Bureau of Sanitation.

H. For discharging to the storm drain system, the groundwater must meet NPDES Permit requirements. The CONTRACTOR shall be fully responsible for obtaining an NPDES Permit for wastewater to surface water discharge from the California Regional Water Quality Control Board, Los Angeles Region. See Attachment 1 for NPDES discharge limits. See the report titled "Groundwater Quality Testing" dated August 27, 2009 for analytical data for groundwater samples collected at the project site.

I. Filtration treatment of the groundwater shall be required prior to storm drain discharge. When the dewatering system is shut down the CONTRACTOR shall be required to pump grout into the bottom of each dewatering well.

J. Ground water seepage into each tunneling shaft for force main construction below the existing storm drain shall not exceed a flow rate of 50 gallons per minute (gpm). If groundwater seepage exceeds the 50 gpm limit per tunneling shaft, remedial measures will be required. Examples of potential remedial measures are additional permeation grouting of the tunnel entrance and exit, permeation grouting of the excavation bottom, tremie sealing of the excavation bottom, or deeper shoring. See Section 02150, "Shoring," for recommendations regarding the shoring of the tunneling shafts.

K. Reference Documents:

1. Appendix A: Groundwater Quality Testing for Penmar Water Quality Improvement Project dated 8-27-08

2. Appendix A: Dewatering Recommendations from City of Los Angeles Geotechnical Engineering Group.

3.20 WATER QUALITY PROTECTION

A. Eroded sediments and other pollutants must be retained on side and may not be transported from the site via sheetflow, swales, area drains, natural drainage, or wind.

B. Stockpiles of earth and other construction-related materials must be protected from being transported from the site by wind or water.

C. Fuels, oils, solvents, and other toxic materials must be stored in accordance with their listing and are not to contaminate the soil nor the surface waters. All approved toxic storage containers are to be protected from the weather. Spills must be cleaned up immediately and disposed of in a proper manner. Spills may not be washed into the drainage system.

D. Excess or waste concrete may not be washed into the public way or any drainage system. Provisions shall be made to retain concrete wastes on-site until they can be appropriately disposed of or recycled.

E. Trash and construction-related solid wastes must be deposited into a covered receptacle to prevent contamination of rainwater and dispersal by wind.

F. Sediments and other materials may not be tracked from the site by vehicle traffic. The construction entrance roadways must be stabilized so as to inhibit sediments from being deposited into the public ways. Accidental depositions must be swept up immediately and may not be washed down by rain or by any other means.

3.21 CONTROLLED LOW STRENGTH MATERIAL (CLSM) FILL.

A. CLSM shall not be placed on frozen ground. Batching, mixing, and placing of CLSM may be started when weather conditions are favorable and when the temperature is at least 34°F and rising. At time of placement of CLSM the temperature shall be at least 40°F. Mixing and placing shall stop when the temperature is 38°F and falling. Each filling stage shall be as continuous an operation as is practicable.

B. CLSM shall be discharged from the mixer by an acceptable procedure into the area to be filled. CLSM shall be placed to limits indicated on the drawings. Mixing CLSM with in-situ soil shall be avoided.

C. When CLSM is placed as backfill against structures, the fill shall be placed in lifts of 2 to 3 feet and the next lift shall not be placed until the previous lift has taken initial set and at least 16 hours have elapsed from the end of placement. Lift thickness shall be reduced as necessary to prevent floatation of the structure.

D. When CLSM is placed over culverts or pipelines, they shall be anchored to prevent flotation during the placement of CLSM. Unless otherwise required, CLSM shall be placed to one foot below subgrade elevation if the subgrade elevation is not more than 5 feet over the top of the culvert or pipe. If the subgrade is more than 5 feet over the top of the culvert or pipe fill, CLSM shall be placed to an elevation 2 feet over the top of the culvert or pipe, and the remainder shall be backfilled with soil designated by ENGINEER.

3.22 RESODDING IN AREAS NOT TO BE OTHERWISE LANDSCAPED

A. All established lawn areas cut by the line of trench, by excavation, or damaged during the work shall be resod, after completion of construction, to the complete satisfaction of the property CITY and CITY. All sod used shall be the same type as removed or damaged, shall be best quality, and, when placed, shall be live fresh growing grass with at least 1-1/2 inches of soil adhering to the roots.

B. All sod shall be procured from areas where soil is fertile and contains a high percentage of loamy topsoil and from areas that have been grazed or mowed sufficiently to form a dense turf.

D. Sod shall be transplanted within 24 hours from the time it is harvested, unless stacked at its destination in a suitable manner. All sod in stacks shall be kept moist and protected from exposure to the sun and from freezing. In no event shall more than 1 week elapse between cutting and planting.

E. Before placing sod, all shaping and dressing of the areas shall have been completed. After shaping and dressing, commercial fertilizer of a type acceptable to CITY shall be applied uniformly in the manner and amounts recommended by the manufacturer, and harrowed lightly. Sodding shall follow immediately.

F. All sodding shall be done during the period from March 15 to October 1, unless written permission is given by CITY to extend the planting season.

3.23 SETTLEMENT

A. CONTRACTOR shall be responsible for all settlement of backfill, fills, and embankments which may occur within the correction period stipulated in the General Conditions.

B. CONTRACTOR shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from ENGINEER or CITY.

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SECTION 02341

PERMEATION GROUTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies minimum requirements for designing, performing, and testing the adequacy of permeation grouting as pre-excavation ground treatment from the ground surface or inside the tunnel at:

1. Contract Required Locations:

a. Construction shaft breakout and break-in locations for tunneling.
b. Construction shafts excavation within un-weathered Puente Formation.
c. Utility underpinning areas as indicated.

2. Other locations proposed by the Contractor to:

a. Minimize groundwater inflows into tunnel, construction shafts or maintenance hole shafts to acceptable limits; or

b. Improve the stability of in-situ materials; or

c. Control ground settlement.

B. Definitions:

1. Cement Grout: A neat cement grout utilizing microfine or ultra-fine Portland cement, water, and admixtures to accelerate or retard set.

2. Chemical Grout: A combination of ingredients comprising matrix-forming base materials, reactants, and accelerators or retarders.

3. Closure Criterion: Criterion based on grout take to refusal at the maximum allowable pressure for the depth of hole grouted, and used for cement grouting in rock to determine if a volume of ground has been adequately grouted at the maximum hole spacing, or whether it is necessary to drill additional holes by the split-spacing approach and perform additional grouting. A closure criterion of less than 135 lbs of cement per linear foot of hole has been established for this project.

4. Permeation Grouting: A method of ground treatment to reduce the permeability of rock using cement grouts or to reduce permeability and improve strength and stability of soils or weathered rock using chemical grout to fill soil pore spaces without causing fracturing or excessive movement of the ground.

5. Syneresis: Loss of liquid component caused by shrinkage or rearrangement of the structure.

6. Refusal: Relates to chemical grouting only. When no more than 4 gallons of chemical grout is injected into a hole over a continuous three-minute period at the applicable maximum specified injection pressure.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02410, EPBM Tunnel Excavation.

B. Section 02444, Shaft Construction.

C. Section 02496, Geotechnical Instrumentation.

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. American Society For Testing and Materials (ASTM):

1. ASTM C109, Test Method for Compressive Strength of Hydraulic Cement Mortars.

2. ASTM C 117, T est M ethod f or M aterial F iner t han 75 m icron (No. 200) S ieve i n M ineral Aggregates by Washing.

3. ASTM C150, Specification for Portland Cement.

4. ASTM C 266, T est M ethod f or T ime of S etting of H ydraulic-Cement P aste by G ilmore Needles.

5. ASTM C494, Specification for Chemical Admixtures for Concrete.

6. ASTM D4219, Unconfined Compressive Strength Index of Chemically Grouted Soils.

7. ASTM D 4320, Labor atory P reparation o f C hemically G routed S oil S pecimens f or O btaining Design Strength Parameters.

1.04 SUBMITTALS

A General: Make in accordance with Section 01330.

B Product Data:

1. Materials specified in Part 2 herein.

2. Manufacturer's m ixing and han dling requirements, per sonal safety equi pment, f irst ai d measures, a nd m ethods f or pr oper storage an d di sposal of w aste m aterials, i nclude containers.

3. Material Safety Data Sheets.

C Working Drawings and Methods Statements:

1. Means and methods for performing permeation grouting in each application. Identify staging areas, patterns, orientations, sequences, depths, and types of grouting, grout pipes, packers, and methods for performing grouting.

2. Calculations with clearly stated design parameters and assumptions identifying basis of grout design i ncluding computations of g rout qua ntities with r espect t o po rosity, s trength of t he grouted mass, target volumes, reduction in permeability, and refusal and closure criteria.

3. Proposed time schedule and work hours for performing permeation grouting.

4. Traffic control pl ans, i ncluding sequencing and du ration of d etours an d l ane c losures, as specified elsewhere in these specifications.

5. Provisions to be included for performing permeation grouting at the tunnel heading or inside the tunnels.

D Grout Mix Designs.

E Quality Control:

1. Qualifications:

   a. Grouting subcontractor within 30 days of NTP.

   b. Design Engineer.

2. Certifications:

   a. Certified laboratory test results on three sets of three grouted samples at least 30 days before starting grouting operations documenting that the proposed grout mix meets specified requirements.

   b. Manufacturer's certificate of compliance with Part 2 requirements.

   c. Manufacturer's certificate of origin for sodium silicate.

   d. Permits from property owners or agencies for access to perform permeation grouting.

3. Quality Control Plans:

   a. Methods for assuring that the targeted area has been fully grouted and that the strength and/or permeability requirements have been achieved.

   b. Methods for assuring that permeation grouting do not damage utilities and installed geotechnical instrumentation.

   c. Detailed drawings for grouting to underpin near-surface utilities and structures where indicated, including preventive measures to protect the utilities and structures from damage.

   d. Methods for determining in-situ or sampling for testing of permeability and compressive strength.

4. Records:

   a. Logs of exploratory borings drilled at each grouting location.

   b. Fully dimensioned as-built location, depth, length and orientation of drilled holes and casings.

   c. Daily records of drilling and grouting operations including injection date, time, location, grout mix, gel time, pressure, rate, volume and packer locations.

   d. Water inflow measurements before and after permeation grouting operation.

   e. Result of the standard penetration tests (SPT) performed before and after permeation grouting operation.

   f. Testing results of cement grout samples per approved Contractor's mix design.

5. Notifications:

   a. With 10 days advance notice of performing permeation grouting within public rights-of-way.

b. Immediately of leakage or damage to structures or facilities during grouting operations.

1.05 QUALITY ASSURANCE

A Qualifications:

1. Design Engineer: California Registered Geotechnical or Civil Engineer with at least 5 years of related experience.

2. Grouting Subcontractor: No less than three projects completed within the last five years comprising the planning and execution of a permeation grouting program of the scope and type required for this project.

1.06 DESIGN CRITERIA

A The work required herein relies substantially on CONTRACTOR-responsible means and methods for performing permeation grouting. Augment and enhance the minimum design criteria specified herein as required to meet the design and performance criteria specified elsewhere in these specifications.

B Perform pre-excavation permeation grouting in the unweathered Puente Formation for construction shafts to limit potential groundwater inflow. The grout zone shall extend to one full excavated diameter beyond the proposed excavation.

C Perform pre-excavation permeation grouting for shaft break-in and break-out where tunnel horizon is located below the groundwater table and within alluvium, weathered Puente Formation or along the interface between alluvium and weathered or unweathered Puente Formation.

D The width and height of the break-in and break-out zone shall be measured at least 3 times the excavated diameter of the tunnel, to be located immediately outside the shaft support wall along the centerline of the tunnel. The length of the grout zone shall extend to at least two full excavated diameters beyond the TBM cutterhead when full EPB pressure is demonstrated.

E No permeation grouting will be required if impermeable entrance ring seals are constructed on the inside face of the shaft walls. Such seals shall be capable of resisting both external hydrostatic pressure and the full pressure exerted by the EPBM or MTBM.

F Confirm subsurface conditions where permeation grouting is indicated or specified by advancing and logging at least one borehole for every application. The Contractor may use information from the exploratory borings made per Section 024 96. The Contractor may design the grouting including information taken from confirmation borings.

G Perform permeation grouting:

1. To specified closure criteria in un-weathered Puente Formation or refusal criteria in soil (Fill, Alluvium or weathered Puente Formation) in contract required grouting areas:

a. Hole spacing: 5-ft.

b. Maximum stage length: 12-ft.

c. Maximum injection pressure: 50 percent of overburden pressure plus 100 percent of existing hydrostatic pressure.

d. Using a mix design comprising a minimum of 8 lbs of cement per gallon of water.

2. To specified strength and permeability criteria at other locations proposed by the Contractor from the ground surface or inside underground tunnel:

a. Chemical Grouting: Perform sodium silicate chemical grouting at tunnel break-out and break-in locations and at work shaft inverts in fill, Alluvium or weathered Puente Formation.

(1) Minimum design criteria based on injection into standard medium-dense Ottawa sand (Ottawa 20-30):

(a) Minimum unconfined compressive strength: 200 psi.

(b) Maximum permeability: $1x10^{-5}$ cm/sec.

(c) Gel time: Between 5 minutes and 40 minutes, with 90 percent of tests resulting in a gel time of between 10 minutes and 30 minutes.

b. Cement Grouting in un-weathered Puente Formation:

(1) Perform the work until a closure criterion is met.

(2) Drill and grout additional split-space holes on either side of a hole wherein the closure criterion is exceeded using specified criteria.

H Perform compressive strength testing of grout samples per mix design proposed by the CONTRACTOR. Comply with ASTM C109 testing requirements.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A Store cement, chemical grouts and other materials to be used for ground treatment according to manufacturer's recommendations and used in order received. Do not use materials beyond expiration date.

B Deliver sodium silicate in sealed containers or a certified tank truck, and accompanied by the supplier's certificate of origin. Deliver reactant materials in sealed containers accompanied by the supplier's certificate of origin.

C Store chemicals in metal tanks, suitably protected from accidental discharge.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Materials shall be non-toxic, non-corrosive, and non-flammable.

B. Chemical Grout:

1. Design mix comprising a liquid base, reactant, water, accelerator, and other approved admixtures as required.

2. Liquid Base: Sodium silicate with a specific gravity between 1.4 and 1.5, and a silicate-to-soda ratio between 3.20 and 3.35.

3. Reactant: Organic base type which, when properly mixed with other grout components, provides a permanent, irreversible gel with controllable gel times. The resulting gels shall exhibit less than 15 percent syneresis in 30 days when mixed with appropriate amounts of sodium silicate, water and accelerator, and not exhibit objectionable odors such as ammonia. Sodium bicarbonate, sodium aluminates and other reactants that produce a temporary grout are prohibited.

4. Water: Potable and free of impurities affecting grout gelling characteristics and strength development of the grouted soil.

5. Accelerator: Technical grade, water-soluble calcium chloride or other metal salt, containing a minimum amount of insoluble materials.

6. Grout – Nontoxic and nonflammable during and after grouting.

C. Cement Grout:

1. Portland Cement: Micro- or ultra- fine Cement: conforming to ASTM C150, Blaine fineness of at least 9,000cm^2/g, fifty percent grain size (D_{50}) = 4 microns, and maximum grain size (D_{100}) = 15 microns.

2. Water: Potable, clean, and free of impurities that will affect the strength or gel development of the grout.

3. Maximum allowable shrinkage = 1 percent.

4. Admixtures: Comprising dispersants, anti-bleed agents, anti-wash out agents, accelerators, and other admixtures recommended by the manufacturer and approved by the ENGINEER.

D. Grout Pipe

1. Chemical Grouting - Provide re-groutable sleeve-port type PVC grout pipes with grout ports at maximum 2 feet centers covered by expandable rubber sleeves.

2. Cement Grouting – Per approved Contractor's submittals.

2.02 EQUIPMENT

A. Chemical Grouting Equipment:

General: Continuous mixing type, capable of supplying, proportioning, mixing and pumping the grout of the type specified. Do not use batch-type systems.

1. Meters:

a. Equip plant with automatic, real-time display, positive displacement meters that accurately measure and record the volume of each component pumped. Locate meters at the injection point and in each material line ahead of mixer.

b. Meter accuracy shall be within 0.25 gpm, independent of fluid viscosity.

2. Storage Tanks:

a. Of such capacity as to supply sufficient grouting materials to maintain production for at least 1 day so as to not interrupt the work if chemical delivery delays occur.

b. Provide preventive measures against accidental spillage of the grout products into the environment.

3. Mixers and Pumps:

a. Capable of developing at least 300 psi at pumping rates not to exceed 15 gpm.

b. Capable of varying the pumping rate while maintaining constant component ratios.

c. Equip with piping or hoses of adequate capacity to carry the base grout and reactant solutions separately to the point of mixing. Combine base grout and reactant solutions using a 'Y' fitting equipped with a check valve and a baffling chamber. Provide a readily accessible sampling valve after the baffling chamber. Equip lines with a water flushing connection or valve placed behind the 'Y' to facilitate flushing the grout from the mixing line and baffle between grouting sessions.

d. Equip with an automatic pressure shutoff device to protect against overpressuring in the formation and in the equipment.

B. Cement Grouting Equipment:

1. General:

a. Capable of supplying, proportioning, mixing and pumping the grout of the type specified.

b. Hose size: Nominal 1.5 inches.

c. Provide stop valve at collar of hole for use in maintaining pressure until grout has set.

2. System:

a. Provide for continuous circulation of grout in the system and to permit accurate pressure control at the grout hole connection.

b. Equip with means for periodic flushing system with water. Accomplish with grout intake valves closed, with water supply valve open, and with grout pump running at full speed.

3. Mixer: High speed colloidal-type of equal or greater capacity than pumping equipment.

4. Agitator tanks: Mechanical type with twice the capacity of the mixer.

5. Meters:

a. At mixer for measuring amount of mixing water added to grout dry ingredients with accuracy to 0.25 gpm.

b. Totalizing-type at collar of hole with accuracy to nearest gallon.

6. Pressure Gauges:

a. Provide one gauge at grout pump, one gauge on manifold hookup at collar of hole being grouted, and one accurately calibrated master gauge for periodic verification of gauge accuracy.

b. Range shall be 150 percent of maximum specified injection pressure with accuracy of at least 0.5 psi.

7. Pump:

a. Capable of developing pressure at the grout hole connection in a continuous, uniform manner, up to the maximum pressure required.

b. Equipped with bypass valve to prevent sudden or excessive pressure from developing at the grout hole connection.

C. Quality Control Equipment:

1. Provide all equipment and materials required to perform quality control sampling and testing as specified herein.

2.03 SOURCE QUALITY CONTROL (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A Abandon grout holes that are lost or damaged due to mechanical failure of the equipment, inadequacy of grout supply, or improper injection procedure. Backfill such holes using approved methods and replace.

3.02 PREPARATION

A Exploratory Soil Borings: Perform in accordance with Section 02496.

3.03 DRILLING

A Orient grout pipes as required to obtain the specified grout coverage between adjacent grout pipes. Use angle grout hole when necessary.

B After installing grout pipe, encase the sleeve-port grout pipes in a continuous brittle mortar sheath. Use an internal double packer to inject grout at the required sleeve-port for both rock and soil grouting.

3.04 GROUTING

A Chemical Grouting:

1. Conduct surface pressure test of Sleeve Port Grout Tube (SPGT) from manifold to injection point to determine system pressure loss. The pressure measured shall be used to estimate appropriate grouting pressures for production grouting.

2. Using double packers, inject chemical grout into the selected zones through alternate ports in the sleeve pipes. Temporary high injection pressures not exceeding one minute in duration will be permitted to crack open sleeve-ports.

3. Continue to inject grout until the specified refusal criteria have been met.

4. Repeat step 2 and 3 for the remaining grout ports in the sleeve pipes.

B Cement Grouting:

1. Perform grouting using upstaging or downstaging method.

2. Inject grout through single or double tube expandable packer(s) that are expanded pneumatically, mechanically or hydraulically, at a stage length no more than the maximum specified.

3. If the closure criteria is met or exceeded in any hole or section of hole between packers, drill additional holes to depth, split-spaced between original holes and continue grouting until closure criteria is met.

C Permeation grouting from inside the tunnel

1. Perform per Contractor's approved shop drawings and submittals.

D Monitoring:

1. Closely monitor the rate of grout take during grout injection. Ascertain the cause of sudden drops in grout injection pressures following initial start-up pressure adjustments. Continuously monitor adjacent paved and unpaved areas, storm drains and other utilities for grout leakage. In the event that grout leaks are observed, temporarily terminate injection and plug leaks before resuming grouting.

2. If excessive grout take is experienced that is not attributable to leakage, change injection pressure, pumping rates, gel or setting times, or grout composition, subject to the acceptance of the ENGINEER, to reduce grout use to acceptable levels.

3.05 CLEANUP AND SITE RESTORATION

A Backfill grout holes immediately upon acceptable completion of grouting at that hole.

B Remove grout pipe installed on private property to a depth of 10 feet.

C Restore street pavement and sidewalks in accordance with SSPWC and Standard Drawings. Restore utilities to the existing conditions before the start of the Work under this Section.

3.06 FIELD QUALITY CONTROL

A The CONTRACTOR shall design a field quality control program to demonstrate acceptable improvements in the ground characteristics before and after grouting to determine its effectiveness. The program shall include field and laboratory testing to be performed to verify the strengths and/or permeability of the grouted soil masses.

B As a minimum, the program shall include the following items:

1. Equipment: Check plant meter(s) accuracy at least twice daily.

2. Laboratory tests:

   a. Prepare 3 Ottawa sand samples for each 250 gallons of chemical grout pumped and sample in accordance with ASTM D4219.

   b. Obtain samples of grout used for chemical grouting for gel time checks at the rate of one sample for every half-hour of pumping or for every 250 gallons of grout, whichever is more frequent. Label gel samples and store until the completion of the project.

   c. Prepare compressive strength testing per ASTM C109 on a minimum three grout samples for each 10 yd^3 of cement grout pumped. The minimum strength of the tested samples shall achieve at least 80 percent of the compressive strength of the approved design mix at 7 or 28 days.

3. Field Tests:

   a. Visual: Verify the presence of grout by chemical method. Apply Phenophalin to soil samples recovered by in-situ method at different locations of the grout zone.

   b. Strength: Advance boring/probing and to perform SPT (Standard Penetration Test) testing in the grouted zone at a frequency of one test every 500 ft^3 or at least three samples per application.

   c. Permeability: Perform permeability testing in-situ where a water leakage test can be performed in the grout holes. Isolate the permeability testing in the hole to the grouted zone only before water is injected.

4. If the result of the field testing is non-conclusive and at the direction of the ENGINEER, the CONTRACTOR shall supplement the testing above by performing additional laboratory testing, as follows:

    a. Recover undisturbed soil samples by coring or other approved methods for strengths or permeability testing in the laboratory. Take a minimum of three soil samples, equally spaced within the cross-section of the grouted areas at each application to verify that the unconfined compressive strength and permeability meets specified requirements

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SECTION 02441

SMALL DIAMETER TUNNELING

PART 1 - GENERAL

1.01 SCOPE

A Perform all Work to provide buried piping, specials, and appurtenances shown, specified, and required for the construction of complete and operable sanitary sewer pipelines to the alignments and grades indicated using microtunneling methods. When permitted and at the Contractor's option, the use of auger boring of a steel casing with a carrier pipe is acceptable when the application is above the groundwater table.

B The Contractor shall have sole responsibility for the means and methods utilized to install the sewer pipeline all within the ground heaving/settlement criteria and tolerances specified herein and subject to review by the Engineer.

C Provide all items required to complete the Work as specified including, but not limited to, the microtunneling/jacking system, slurry spoil transportation and separation system, hoisting, lifting, safety, and control equipment and/or auger boring/jacking system, spoil transportation system, hoisting, lifting, safety, and control system.

D Annular Space: The radial measure for the void created between the outside radiuses of the jacking pipe to the outermost excavation along the entire pipeline. The distance includes the overcut caused by gauge cutters.

1.02 DEFINITIONS

E Auger Boring: construction method where an oversized steel casing is jacked forward simultaneously while an internal flight auger excavates the face and removes spoils to the jacking shaft/pit. The auger boring system may have directional control to assist maintaining line and grade. The steel casing is oversized to accommodate the setting of the carrier pipe to operational line and grade requirements.

F Casing (pipe): A pipe, typically made of steel, used to support a tunnel in which the product or carrier pipe is later inserted.

G Compression Ring/Packer: An engineered material designed as a ring and fitted between the bell and spigot jacking pipe ends to help distribute the jacking forces more uniformly over the entire bearing surface. The packer compensates for steering, misalignment, and pipe end irregularities during the jacking process.

H Emergency Recovery Shaft: A vertical excavation required for the removal of an obstruction or the trenchless construction equipment is retrieved or repaired. The location of an emergency shaft is determined by construction necessity and typically will not have a manhole constructed in the shaft.

I Intermediate Jacking Station (IJS): A steel cylinder, fitted with hydraulic jacking cylinders, which is incorporated into a pipeline between two pipe segments. Its function is to distribute the jacking forces over the pipe string on long drives.

J Jacking Frame: A structural component, fitted with hydraulic cylinders, which is used to push the shield and pipe string into the ground. The jacking frame serves to distribute the thrust load to the pipe string and the reaction load to the shaft wall or thrust wall.

K Jacking Pipe: A specialty pipe that is engineered and manufactured with a smooth outer wall and watertight joints. The pipe is specifically designed to be jacked through the ground and may also serve as a carrier or product pipe.

L Lubricant (Lubrication): A fluid, normally bentonite and/or polymers, used to reduce frictional jacking loads on the jacking pipe and fill the annular space.

M Microtunneling: A remotely controlled, steerable, laser guided pipe-jacking process that provides continuous support to the excavation face and tunnel. The microtunneling process provides the ability to control excavation face stability by applying mechanical and fluid pressure to counterbalance the earth and naturally occurring hydrostatic pressure. Personnel entry is not required for the routine operation of the MTBM.

N Obstruction: An object with a principal dimension is greater than or equal to 8 inches and an unconfined compressive strength (UCS) of 30,000 psi, that lies either fully or partially in the direct path of the tunnel excavation and prevents its progress.

O Overcut: The radial distance between the excavated hole and the outside radius of the MTBM; may also be described as the radial distance beyond the shield that the gauge cutter, the cutter that creates the greatest outside diameter, excavates.

P Packer: High quality fiberboard, which may contain other cushioning materials and is used to protect adjacent jacking surfaces from coming in direct contact with each other, distributing jacking loads, and helping to prevent pipe damage from microscopic pipe end imperfections.

Q Pipe Jacking: Constructing a pipeline by hydraulically jacking consecutive sections of jacking pipe through the ground behind a shield or TBM.

R Principal Dimension: The largest of the three orthogonal dimensions of an object.

S Slurry: A fluid, normally water or a water/bentonite medium, used in a closed loop system for the removal of spoil and to balance the naturally occurring hydrostatic pressure during microtunneling.

T Slurry Chamber: Located behind the cutting head of a slurry microtunneling machine. Excavated material is mixed with slurry in the chamber for transport to the surface.

U Slurry Separation: A process that separates excavated material from the circulating slurry.

V Specials: The pipe sections adjacent to an IJS that accommodate the IJS design requirements. The Special “A” is the pipe leading an IJS and the Special ”B” is the pipe trailing an IJS during the jacking process.

W Water Jetting: Cleaning mechanism of the cutterhead where high-pressure water is sprayed from nozzles in the cutterhead to help remove cohesive soils. Not permitted without prior written approval by the Engineer.

1.03 QUALITY ASSURANCE: QUALIFICATIONS

A Contractor:

1. Microtunneling: Possess a valid California Contractor’s Class “A” license and a minimum of five years experience in the installation of pipelines using microtunneling as the method of

installation. Experience requirements are the construction and completion of a minimum of five pipeline projects, each with a minimum of 1,000 L.F. of installed pipe between 24 inches inside diameter and 48 inches outside diameter using microtunneling as the method of installation.

2. Auger Boring: Possess a valid California Contractor's Class "A" license and a minimum of five years experience in the installation of pipelines using auger boring as the method of installation. Experience requirements are the construction and completion of a minimum of five pipeline projects, each with a minimum of 500 L.F. of installed pipe between 30 inches inside diameter and 54 inches outside diameter using a uger boring as the method of installation.

3. All referenced projects must have been completed by the contractor and not by other subcontractors within the last five years, and shall have the following characteristics:

   a. One of the referenced projects shall have utilized piping material similar to the type used in this Work.

   b. One of the referenced projects shall have been in similar ground conditions to those anticipated in this Work, including, but not limited to, similarities in soil type, soil strength as measured by "N" values, and hydrostatic head.

   c. One of the referenced projects shall be a successfully completed microtunnel of a length at least 100% of the longest drive length required on this Work.

B Superintendent:

1. The project superintendent shall have at least five years of tunneling/pipe jacking experience and shall have managed at least three microtunneling projects, each with a minimum of 1,000 feet, with similar ground conditions with similar equipment, and with drive lengths exceeding 400 feet.

C Operator:

1. Microtunneling: The microtunneling MTBM operator(s) shall have at least five years experience in the installation of pipelines using microtunneling as the method of installation. The MTBM operator shall have successfully completed a minimum of three pipeline projects each with a minimum of 1,000 L.F. of installed pipe between 24 inches inside diameter and 48 inches outside diameter using microtunneling as the method of installation.

2. Auger Boring: The auger boring contractor's auger boring operator(s) shall have at least five years experience in the installation of pipelines using auger boring as the method of installation. The auger boring operator shall have successfully completed a minimum of three pipeline projects each with a minimum of 500 L.F. of installed pipe between 30 inches inside diameter and 54 inches outside diameter using auger boring as the method of installation.

3. The operator shall also have:

   a. Operated the equipment similar to the one proposed on this Work.

   b. Utilized the same type of pipe material as used in this Work.

   c. Successfully completed a project in similar ground conditions to those anticipated in this Work, including, but not limited to: soil type, soil strength as measured by "N" values, and hydrostatic head, if present.

   d. Successfully completed a microtunnel of a drive length at least 100% of the longest drive length required on this Work.

e. For microtunneling Operator Only - Used an IJS if an IJS is to be used for this work.

D Experience Record: The experience record shall include name of project, the agency that contracted for the project, name of contact, jacking pipe material, soil conditions, longest drive planned and completed, and total footage planned and completed. If the microtunneling work was performed as a subcontractor, the record shall include name of general contractor, name of contact and all contact information.

E Microtunneling/auger boring crew: The microtunneling/auger boring crew is required to have a current Hazmat certification maintained through end of project.

F Survey:

1. An experienced professional surveyor licensed by the State of California and employed by the Contractor shall conduct all contractor needed surveys. The City will provide location reference coordinates shown on the plans.

2 Contractor shall submit surveyor's experience record that demonstrates previous underground surveying and includes the transfer of line and grade for tunneling.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals:

1. Construction Method and Sequence of Operations: Provide a description of the proposed method of construction and the sequence of operations to be performed during construction. This submittal shall include the following:

a. A general description and schedule of the tunneling procedure, including set-up of tunneling equipment, method of spoil removal, spoil disposal, disposal location, methods of protection and maintenance of project site, and groundwater control methods.

b. Machine specifications or a letter from the microtunneling machine manufacturer demonstrating that the selected machines is capable of progressing through the subsurface conditions as described in the GBR.

B Working Drawings/Work Plan:

1. Layout of jacking and receiving shafts; including jacking equipment within the shaft and above ground equipment at each shaft location.

2. Shop drawings of tunnel machine, including configuration of cutter head and overcut tolerances. Cutterhead drawing shall obstruction size that the machine is capable of ingesting, as defined by its principal dimension.

3. Shaft ventilation system details.

4. Electrical system, lighting system, and onsite power generation.

5. Grade and alignment control system details.

6. Groundwater control provisions of tunneling machine.

C Calculations signed and sealed by a Civil Engineer registered in the State of California.

D Details of slurry system and soil separation methods, including proposed slurry formulations by soil type, and calculations of the system capacity to handle flows at all proposed distances and changes of elevations to and from the tunneling machine.

1. Material Safety Data Sheet (MSDS) for slurry additives.

2. Sample slurry log sheet including time, date, sampler, shaft location, pipe number, slurry additives type, quantity added, soil type, viscosity, specific gravity, and water added.

E Jacking system details, intermediate jacking stations and their proposed spacing, method of operation, thrust capacity, and sleeve details, plus method of control to prevent the maximum allowable jacking force from being exceeded.

F Description of lubrication mix equipment and procedure for lubricating the pipe during jacking operations, including estimated volume for the anticipated soils.

1. Materials to be used for lubrication.

2. Material Safety Data Sheet (MSDS) for lubricant additives.

3. Details of lubrication system that demonstrate the system is capable of delivering sufficient volume and pressure for lubrication to perform, as required.

4. Sample lubrication log sheet including time, date, sampler, shaft location, pipe number, slurry additives type, quantity added, soil type, viscosity, specific gravity, and water added.

G Description of annular space grout mix(es) equipment and procedure(s) for backfill grouting the annular space after jacking operations.

1. Material Safety Data Sheet (MSDS) for grout mix additives.

2. Grout mix(es).

3. Minimum pressure and volume to completely fill void.

H Stamped theoretical jacking force calculations and pipe material calculations.

1. Jacking force calculations. If the jacking force calculations are based upon the use of a lubricant, the lubricant shall be used at all times.

2. Maximum anticipated construction loads, including jacking forces, and ensure that the anticipated loads are implemented in the manufacturer's design of the pipe. The submittal shall include calculations showing maximum allowable jacking force including Factor of Safety. Submit drawing of jacking pipe with lubrication/grout ports shown.

3. Jacking pipe packer details.

4. Heat of hydration calculation. To demonstrate the heat of hydration from the backfilling operation will not cause any damage or deformation on the Contractor's proposed carrier pipe.

I Layout, details and stamped calculations for the design of the carrier pipe spacer. Design the spacer to withstand the dead load of the carrier pipe, dynamic jacking forces and frictional drag during installation, and the buoyancy force during construction backfill operation.

J Details of Intermediate Jacking Station, or affirmative statement that no IJS is required:

1. Number of stations, location, and jacking force.

2. Manufacturer's approved repair procedure.

K Pipe Lay Schedule for each drive.

L Procedures:

1. Complete launch procedure beginning with any modification to the approved shoring through installation of first pipe in ground.

2. Procedure to prevent machine from dropping upon entrance into ground.

3. Complete retrieval procedure beginning when the MTBM is approximately 10 feet outside of shaft or before the approved shoring is modified to receive the MTBM. The procedure is to continue through pipe in seal and with ground stabilized.

4. Procedure to prevent soil from entering shaft during launch and retrieval of the tunneling equipment.

M Contingency plan for potential situations that may occur during tunneling operations shall be provided for the following scenarios.

1. Spoils do not settle/separate with the equipment on site including at minimum slurry sampling frequency, sand content, and viscosity limits by soil type.

2. Upon encountering an obstruction.

3. More than 1.0 cubic yards of soil enters the shaft during launch and retrieval of the tunneling equipment.

4. The jacking pressures start to increase rapidly and reasonable concern exists for completing jacking operations to the receiving shaft.

5. The MTBM "freezes" within a typical pipe reach during jacking operations.

N Survey plans including, but not limited to, the following:

1. Verification of line and grade for tunneling operations.

2. Verification of line and grade of the finished pipes.

O Jacking Operations Log:

1. A sample of logging reports and daily reports.

2. Transcribe to paper and submit to the Engineer at the end of each shift the jacking operations log, which shall include the following:

a. Position of the tunneling machine in relation to design line and grade.

b. Number of each pipe installed and length of pipe.

c. Position of IJS in the installed pipeline including exerted jacking force.

d. Maximum jacking forces exerted on the pipe at each section.

e. Starting and finish times for each crew shift each day.

f. Position of steering jacks.

g. Inclination and torque of cutter head or auger.

h. Face pressure of slurry and hydraulic pressure.

i. Volume of pipe lubricant used, viscosity, and pumping pressure.

j. Volume of backfill grout pumped and pumping pressure.

k. Observations of settlement or heaving.

l. Any available information requested by Owner.

3. If an automated data recording system is available on the microtunneling system supplied it is to be operational and the contractor is to submit a sample of all information available for recording, variations in sampling frequency, and formats. All automated data is to be provided to Owner on a daily basis.

P. Permit – All documentation required by Caltrans for Line 'C' installation

1.05 PROJECT CONDITIONS

A. Anticipated ground and tunneling conditions along the proposed sewer tunnel is described in the Geotechnical Baseline report.

B. Tunnels and other underground openings are classified as "potentially gassy" as described in the Contract Document. Provisions of the Tunnel Safety Orders of the State of California and Code of Federal Regulations concerning potentially gassy underground work shall apply (29 CFR 1926 Safety and Health Regulation of Construction (OSHA)) together with other applicable local, state and federal laws and regulations.

C. All underground equipment, electrical and mechanical systems, regardless of tunnel classification, to have Class I, Division II designation. Smoking and smoking materials will not be allowed at any time underground.

D The plans show permanent maintenance hole locations. Changing their locations may be possible but all changes shall be submitted to the Engineer for approval. All work so performed for the Contractor's convenience shall be at no additional cost to the OWNER.

E Temporary jacking and receiving shafts shall be sited and sized by the Contractor considering overhead and underground utility conflicts, driveway access and traffic impacts.

F Performance Criteria: No ground settlement or heaving shall be allowed along Line "C." Ground settlement or heaving during and after construction shall not exceed 1/2 inch along Line "1" as measured above and along the centerline of the tunnel being installed. Unless otherwise noted, all surface improvements are to be restored to original condition at no additional cost to Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A Sewer pipe shall be a direct-jacked, non-pressure, carrier pipe, specifically designed for microtunneling, conforming to:

1. City approved pipe system as indicated on Drawing S-2.

2. Relevant sections of the SSPWC.

3. Type and design of pipe selected shall be capable to withstand high jacking load anticipated.

4. The pipe shall be round, smooth, and with flush-jointed outer surfaces.

5. The ends of the pipe shall be perpendicular to the longitudinal axis of the pipe with a maximum deviation of no more than 5 mm/m (1/16 inch per foot) of pipe diameter, with a maximum of 6 mm/m (1/4 inch), measured with a square and a straight edge across the end of the pipe.

6. Pipe ends shall be square and smooth so that jacking loads are evenly distributed against the pipe end faces without point loads when the pipe is jacked. Pipe shall be capable of withstanding the microtunneling jacking forces imposed by the process of installation, as well as the final in-place loading conditions.

7. Grout or lubricant ports, at a minimum, are to be located at the mid point of the jacking pipe and not less than one port every 20 feet.

8. The CONTRACTOR shall provide means of protecting the pipe's corrosion protection barrier from being damaged in any way when working or traveling within the pipe.

9. IJS outer sleeve and any other steel surface in contact with the soil and sewage once installed shall be constructed of stainless steel of the same quality as the joint collar bands and shall be capable of withstanding the jacking forces.

10. The Special A shall be marked with the sequential number followed by the letter "A" and the Special "B" shall be marked with the sequential number followed by the letter "B" (e.g., if the IJS is to be located between pipes 18 and 19, the Special "A" shall be numbered 18-A and the Special "B" 19-B.)

2.02 STEEL CASING

A. Steel casing shall be Permalok or welded steel pipe.

B. Inside surface of the steel casing shall be smooth. All foreign objection, welding burr and protrusion shall be removed.

C. Provide grout hole openings if backfill grouting is required by this specification to fill the annular gap between the casing pipe and the ground.

2.03 LUBRICATION

A Lubrication shall consist of bentonite and/or polymers and water. Contractor shall bear expense of obtaining water from a potable water source. Polymers shall be non-toxic.

B Use NSF 060 or equal, Clean Water-approved materials only.

2.04 ANNULAR SPACE GROUT

A Contact Grout: Use contact grout to fill the annular space between the steel casing and carrier pipe. Perform the work per requirements in SSPWC and Section 02432. Maximum compressive strength of the grout at 28-day shall be 1,000 psi.

C Backfill Grout: Use backfill grout to fill the space between the casing pipe and the ground. Grout shall consist of a cementitious mix containing sand and water. The Contractor shall also comply with backfill grout requirements as stated in Section 02431.

C Grouting equipment shall have pressure regulating devices to prevent damage to the pipe.

2.05 EQUIPMENT

A. The Contractor shall be responsible for compliance with the following requirements.

1. General: The tunneling system(s) selected shall be specifically designed for excavating, transporting, and separating the soil materials and subsurface conditions along the alignment as described in the Geotechnical Baseline Report.

2. Microtunnel Boring Machine (MTBM): Use MTBM equipment that is capable of handling the various anticipated ground conditions. Only slurry MTBMs meeting the following requirements are permitted to be used for Line "C" and any other reaches under the groundwater table. The requirements include:

   a. Be capable of maintaining the tunnel face under wet, dry, and adverse soil conditions and preventing loss of ground through the machine. The MTBM must provide satisfactory support of the excavated face at all time.

   b. Be articulated to allow steering.

   c. Incorporate a suitable seal between the MTBM and the leading pipe.

   d. Provide protection to the electric and hydraulic motors and operating controls against water damage.

   e. Use bi-directional drive on the cutter head wheel, and/or adjustable fins or other means, to control roll.

   f. Exert a controllable pressure against the face, during both excavation and shutdown periods, to support the excavation face, prevent groundwater inflows, and prevent loss or heave of ground. A closed-face cutterhead designed to minimize loss of ground shall be provided. Control the volume of excavated material removed at the tunnel face and the machine advance rate to avoid over-excavation.

   g. The excavated diameter of the tunneling equipment along Line 'C' shall be no more 1-½ inches larger than the external diameter of the primary steel casing

3. Automated Spoil Transportation: Provide a MTBM that includes an automated spoil transportation slurry system that balances the groundwater pressures by the use of a slurry pressure balance system. System shall be capable of adjustment required to maintain face stability for the particular soil condition encountered on the Work and shall monitor and continuously balance the face pressure to prevent loss of slurry or uncontrolled ground water inflow. The Contractor shall:

   a. Manage the pressure at the excavation face by use of the slurry pumps.

   b. Include a slurry bypass unit in the system to allow the direction of flow to be changed and isolated, as necessary.

   c. Have a spoil transportation system that has the capability for removal of soil in balance with excavation and advance.

4. Slurry Separation Equipment: Provide a slurry separation system that is capable of the following:

   a. Use NSF 060 or equal, Clean Water-approved materials only.

   b. Provide adequate separation of the spoil from the slurry so that slurry with sediment content anticipated during the tunneling operation can be returned to the cutting face for reuse. Use a mechanical separation plant, including scalping screens, shaker screens, de-sanding and de-silting cones, and centrifuge as deemed necessary by the project plan. Appropriately contain spoil at the site prior to disposal.

   c. Use the type of separation process suited to the size of the tunnel being constructed, the soil type being excavated, and the workspace available at each jacking shaft location for operating the plant.

   d. Carefully monitor the composition of the slurry to maintain the slurry weight, gel strength, and viscosity limits defined by the Contractor's Work Plan.

5. Pipe Jacking Equipment: Provide a pipe jacking system with the following features:

   a. Main hydraulic cylinders mounted in a jacking frame located in the jacking shaft used to push the MTBM and pipe through the ground.

   b. Sufficient jacking capacity to push the MTBM and the pipe string between the shaft locations as proposed or indicated. Main jacks shall exceed the anticipated jacking force by at least 20% or Intermediate jacking station(s) will be provided.

   c. Hydraulic cylinder extension rates which are synchronized with the excavation rate of the MTBM, as determined by the soil conditions.

   d. Uniform distribution of jacking forces on the end of the pipe by use of thrust ring and packers.

   e. A pipe lubrication system that at all times lowers the friction developed on the surface of the pipe during jacking.

   f. Furnish and operate annular space grout system suitable for any required grouting operations depending on the condition of the application. The grouting operation shall not damage adjacent utilities or other properties. Grout shall be injected at a pressure that will not distort or imperil any portion of the Work or existing installations or structures.

6. Remote Control System: Provide a MTBM remote control system with the following features:

   a. Allows for operation of the system without the need for personnel to enter the tunnel. Has a display available to the operator, showing the position of the shield in relation to a design reference together with other information such as roll, pitch, complete guidance system, valve positions, thrust force, cutter head torque, rate of advance and installed length.

   b. Integrates the system of excavation and removal of spoil and its simultaneous replacement by pipe. As each pipe section is jacked forward, the control system synchronizes all of the operational functions of the system.

7. Active Direction Control: Provide a MTBM that includes an active direction control system with the following features:

   a. Controls line and grade by a guidance system.

   b. Is capable of maintaining line and grade to the tolerances specified.

c. Provides active steering information that is monitored and transmitted to the operating console. As a minimum, this information shall include location of the laser beam on the target and location of the cutter head.

d. Provides positioning and operation information to the operator on the control console.

8. Auger Boring equipment: The Auger Boring method shall only be used in soils above the ground water table. Use Auger Boring equipment that is capable of handling the various anticipated ground conditions. Only Auger Boring equipment meeting the following requirements shall be permitted. The requirements include:

a. The auger cutting head shall not be capable of protruding beyond the leading edge of the steel casing.

b. The auger shall be removable.

c. Grade shall be monitored through the use of a Dutch water level or approved equal.

d. The carrier pipe shall be able to be installed within design line and grade tolerances.

e. Provide spacers for the installation of the final sewer pipe to provide the minimum annular space as indicated or required.

PART 3 - EXECUTION

3.01 JACKING AND RECEIVING SHAFTS

A The Contractor shall be responsible for designing and constructing jacking and receiving shafts for tunneling.

B The tunneling machine shall not be launched on any drive until the appropriate receiving shaft is completed for retrieval of the tunneling equipment.

3.02 WORK AREA PREPARATION AND MAINTENANCE

A The Contractor shall be responsible for the following conditions:

1. Clean working conditions inside the jacking operation area, including removal of spoil, debris, equipment, and other material not required for operations. Contractor shall not store pipe on any City streets unless the Engineer grants permission in writing.

2. Power generation equipment and any other equipment operating on or with fuel or lubrication oils shall be provided with suitable oil and gas containment basins made of plastic lining and sand bags to ensure no loss of oil to drains or water courses or to contaminate the ground.

3.03 INSTALLATION

A Alignment Establishment: The Contractor shall be responsible for adherence to the following requirements and conditions:

1. Retain a Professional Surveyor licensed in the state of California to survey the control points identified in the Contract Documents, exclusive of Owner provided control points indicated on the drawings. City surveyor will provide survey monuments on the ground surface to be used

on the project. The contractor's surveyor shall verify all survey monuments that are used, and check baseline and benchmarks at the beginning of the Work and report any errors or discrepancies to the Engineer.

2. Establish and be responsible for accuracy of control for the construction of the entire Work, including Access Shaft locations, structures, excavation, pipe alignment, and grade.

3. Establish control points sufficiently far from the tunnel operation not to be affected by ground movement.

4. Check the primary control for the microtunneling system against an above ground undisturbed reference at least once each week or not greater than 200-foot intervals of pipeline constructed.

B Tolerances: The Contractor shall adhere to the following requirement and conditions:

1. Sewer pipe installation shall not vary by more than 1-1/2 inches in horizontal alignment or 1 inch in vertical elevation from any design point between shafts.

2. Record the exact position of the tunneling equipment at 50-foot intervals or a minimum of once per shift to ensure the alignment is within the specified tolerances. Make the survey at the tunneling equipment to allow immediate correction of misalignment before allowable tolerances are exceeded. The tunnel guidance system may be used; however, select times to measure and record this information after the air temperatures have stabilized throughout the pipe to ensure accurate readings.

3. When the excavation is off line or grade, return to the design line and/or grade at the lesser of (a) over the remaining portion of the drive, (b) at a rate of not more than 1-inch per 25 feet, and (c) not to exceed 50% of the maximum amount of deflection in each joint.

4. If allowable tolerances are exceeded, Contractor shall pay all costs for correction including City's cost to redesign and re-inspection.

5. No negative slope shall be acceptable

C Launch and Retrieval: The contractor shall implement appropriate procedures when the inflow of soil approximates 1.0 cubic yard and before settlement reaches the surface.

D Tunneling and Jacking of Pipe: The Contractor shall adhere to the following requirements and conditions:

1. Keep tunnel excavation within the lines and grades designated on the Contract Drawings, and within the tolerances specified herein.

2. Synchronize the rate of MTBM advance with the rate of spoil removed to avoid over-excavation.

3. Maintain an envelope of lubricant around the exterior of the pipe during jacking and excavation operation to reduce the exterior friction and possibility of the pipe seizing in place.

4. Exert a controllable pressure against the face, during both excavation and shutdown periods, to support the excavation face, prevent groundwater inflows, and prevent loss or heave of ground.

   a. Minimum face pressure shall be 0.5 bar along Line "C"

   b. Minimum face pressure shall be 0.2 bar along Line "1"

5. Contractor shall not employ water jetting of the ground to advance the pipe without prior written approval of the Engineer.

6. If the pipe "freezes" and the MTBM and/or pipeline is unable to be moved, the Contractor shall

   a. Excavate a recovery access shaft with a location subject to review by the Engineer

   b. In areas where recovery access shaft shall not be permitted, as along Line "C", the Contractor shall be able to recover the MTBM from the launching shaft.

7. In the event a section of pipe should be damaged during the jacking operation or joint failure occurs, as evidenced by visible groundwater inflow or other observations, use one of the following procedures to correct the damage, as directed by the Engineer, and at no additional cost to the Owner:

   a. Slightly damaged pipe that passes leakage test and maintains pipe barrel and joint structural integrity, may, if access is possible, be repaired in place with a method approved by the pipe supplier and if the proposed technique is accepted by the Engineer.

   b. Severely damaged pipe, or pipe where joint failure is evident, shall be removed from the excavation by surface excavation, or by jacking it through the excavation and removing it at the receiving shaft. The removed pipe, after inspection is found to be without defect, may be jacked a second time by being placed into the same pipe string at the jacking shaft.

8. Perform grouting as required to fill annular space and/or to control settlement. The grouting pressure shall be the minimum required for completely filling the void and not damaging the pipe.

E Intermediate Jacking Station:

1. Intermediate Jacking Station (IJS) shall be installed per contractor's plan or when the main jacks attain 80% of the IJS's designed jacking force without exceeding the maximum allowable jacking force.

2. Pipe repairs to be made at the IJS shall be of the same or compatible materials as the pipe and shall not reduce the inside diameter of the pipe and shall not create a pipe length longer than the lesser of two times the length of manufacture or 20 feet long. The repair shall be of a quality that does not void the original manufacturer's warranty.

F Obstructions:

1. Remove, clear, or otherwise make it possible for the microtunneling/auger boring equipment and pipe to progress past or through objects in accordance with the Contractor's submitted contingency plan.

2. No additional compensation for removing, clearing, or otherwise making it possible for the microtunneling/auger boring equipment to progress past objects that are not obstructions will be paid.

3. Payment for emergency rescue shafts, which includes the removal of the obstruction, shall be paid if the object meets the definition of an obstruction, and subject to the following requirements:

   a. Notify the Engineer immediately upon encountering an object that stops the forward progress of the Work.

b. Upon written authorization by the Engineer, proceed with removal of the object by means of obstruction removal procedures in accordance w ith the Contractor's approved submittals.

c. The Emergency Rescue Shaft shall not be located in areas rejected by the Engineer. The Contractor's request shall include all necessary permits and approvals, minimize public inconvenience and minimize impacting existing facilities. Additional ground monitoring instrumentation will be required.

4. The proposal of alternative methods for removing, clearing or otherwise making it possible for the microtunneling/auger boring equipment to progress past objects that does not allow for the visual observation and measurement of the nature of the object to be made shall not be considered for additional payment.

G Steel Casing:

1. The use of primary steel casing will be required for the construction of Line 'C' underneath the freeway. The Contractor's means and methods of construction shall comply with the Caltrans' permit requirements.

2 Use spacers to position and install the final sewer pipe inside the steel casing to the tolerance specified. Provide blockings preventing movement or displacement of the sewer pi pe during contact g routing. Maintain a minimum 2 -inch annular radial clearance all around

H Backfill and Contact Grouting:

1. Backfill grout to fill the annular space between the steel casing or jacked pipe and the excavated ground upon completion of the drive along Line '1' if the radial annular gap is in excess of ¾ inch, unless otherwise specified by Contract DocumentsFill in the annular space between the sewer pipe and the steel casing using contact grout as indicated. Use of Cellular concrete for contact grouting is not permitted.

2. Perform the work in comply with requirements in Sections 02431 and 02432.

3.04 NOISE MONITORING AND ABATEMENT

A Implement measures necessary to mitigate noise impacts caused by the Work and to comply with requirements in Section 01561. The following noise monitoring and abatement requirements are specific to the microtunneling/auger boring equipment operation:

1. Provide equipment with enclosures or construct portable sound barriers to minimize noise impact.

2. Provide a generator with a "residential" silencer and acoustic enclosure. Provide a unit that meets the noise requirements of the City of Los Angeles.

3.05 DISPOSAL OF MUCK AND EXCESS MATERIAL

A Remove muck and excavated material from the project site in accordance with the conditions in the General Requirements.

B. Identify a site for the legal disposal of muck and excess excavated material and dispose of same in accordance with all applicable Laws and Regulations.

3.06 SITE CLEANUP

A Unless otherwise shown or specified, Contractor shall restore to their original condition all existing surface improvements damaged or removed as a result of microtunneling operations.

3.07 QUALITY CONTROL

A Perform a CCTV inspection of the completed pipeline. Provide two color copies in DVD format to the Engineer.

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SECTION 02513
ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION.

A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated in the Contract Documents and specified herein.

B. Contractor shall coordinate the construction of asphaltic concrete paving with the excavation, the construction of concrete curb and gutters and other construction.

C. This section covers the work necessary to construct the roadway, driveway and parking area as indicated on the drawings, complete, in place, in accordance with the requirements of the Contract Documents.

1.2 RELATED SECTIONS:

A. Section 02110 Site Clearing and Grubbing

B. Section 02200 Earthwork.

C. Section 02810 Irrigation System.

D. Section 02950 Landscaping.

E. Section 03300 Concrete Work.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable reference specifications as specified in the GENERAL REQUIREMENTS.

B. Work of this section shall be performed in accordance with the Standard Specifications for Public Works Construction (SSPWC), latest edition; Los Angeles City Bureau of Engineering Brown Book, latest edition; Los Angeles City Building Code and Amendments, unless otherwise specified herein.

1.4 QUALITY ASSURANCE

A. Quality assurance will be provided by the INSPECTOR. The CITY will provide inspection at the asphalt plant and laboratory services within 50 miles of the geographical limits of the CITY. The CONTRACTOR shall be responsible for quality control.

B. Employees: Use adequate number of skilled Contractor's employees who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for the proper performance of the work of this Section.

C. Asphaltic Concrete Producers Qualifications: Use only materials furnished by a bulk asphaltic concrete producer regularly engaged in production of hot-mix, hot laid bituminous concrete and approved by Los Angeles City Bureau of Engineering.

D. Permit: Submit inspection and material certificates to the governing authorities and pay for all required permits, plan check, inspection and fees. Arrange for and make required inspections and tests.

E. Survey: The Contractor shall furnish all surveying necessary for the works. All works shall conform to the lines, elevations and grades. The Contractor shall submit the grade sheets to the City Engineer for review.

1.5 SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS, and the requirements of this section.

B. Samples: Prior to the delivery of specified aggregate to the site, the CONTRACTOR shall submit samples of the material for the INSPECTOR's acceptance in accordance with SSPWC Section 4-1.4. Samples shall be typical of materials to be furnished from the proposed source and in conformance with the specified requirements.

C. The CONTRACTOR shall formulate a job-mix formula using the Marshall Method in accordance with SSPWC Section 203-6.3.2 and submit it to the ENGINEER for approval. The resultant mixture shall have Marshall properties conforming to SSPWC Section 203-6.3.2.

D. Certificates:

1. Twenty days prior to the delivery of aggregates, asphalt materials, and paving mixes to the project site, the CONTRACTOR shall submit to the ENGINEER certificates and test results of compliance of such materials with these Specifications signed by the materials producer and the asphalt paving subcontractor and stating that materials meet or exceed the specified requirements.

2. Where laboratory testing is specified herein, the CONTRACTOR shall employ an independent testing laboratory to conduct such tests and submit certificates of the test results.

3. Certificate of Weigh Masters or certified delivery tickets for each truckload of asphaltic material delivered to the job-site.

E. Equipment: List all equipments including the milling machine, spreader, roller, etc. intended to be used in this project.

F. Spreading Schedule: At least 5 working days prior to commencing work, Contractor shall submit its spreading schedule to the City for approval. The schedule shall contain minimum two (2) phases to allow residents on the street to be sealed or paved ample "on street" parking within a reasonable distance from their homes. The Contractor shall notify the residents and business of the work and post temporary "no parking" signs.

1.6 DELIVERY STORAGE AND HANDLING

A. Delivery: Deliver materials, products, and equipment to the job site allocated by the contract. Deliver asphaltic concrete to the job-site in canvas covered trucks if necessary to maintain the specified spreading temperature.

B. Storage: Store materials at locations where specified and/or not interfering with work operation of this project.

C. Handling: Handle materials, etc. safely and avoiding damage to such materials prior to installation.

1.7 ENVIRONMENTAL CONDITIONS

A. Do not apply bituminous materials when the base surface is wet or contains an excess of moisture which would prevent uniform distribution and the required penetration.

B. Construct asphaltic concrete surface course only when the ambient temperature is above 40 degrees F. when the underlying base is dry and when it is not raining.

1.8 PROTECTION

A. Furnish, erect and maintain fences, barrier lights and signs as necessary to adequately protect the public, existing work and work under this Contract as prescribed by the Los Angeles City Department of Building and Safety.

B. Unless noted otherwise, all existing utility structures beneath the pavement shall be protected from any operations. No impact tool shall be allowed in demolition of existing pavement. All sewerage and storm structures, utility vault, etc. extending 2 inches or more above the new subgrade shall be removed by the Contractor to the new subgrade before paving. Structures projecting less than 2 inches above the subgrade may be paved and later adjusted to grade.

C. Protect the asphaltic concrete paved areas from traffic at least 4 days until the sealer is set and cured and does not pick up under foot or wheeled traffic.

D. Maintain vehicular and pedestrian traffic in accordance with W.A.T.C.H. (Work Area Traffic Control Handbook), latest edition.

1.9 ALTERATIONS, REPAIRS AND REPLACEMENT

A. As required for complete construction of the project; materials and construction to match existing adjacent work in quality and appearance and to conform to applicable provisions of the Project Manual.

1.10 RECORD DRAWINGS

A. Required: Clearly mark changes, deletions and/or additions to the work of this Section conforming to provisions of Section 30 - RECORD DRAWINGS AND RECORD PROJECT MANUAL.

1.11 REMOVAL AND CLEAN-UP

A. Remove and recycle all surplus materials, debris and rubbish resulting from work of this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: The CONTRACTOR shall make all tests necessary to locate a source of materials that meet the Specifications. Final approval of the aggregate material will be based on tests of material taken by the CONTRACTOR from the compacted base course.

B. Base Course: rushed aggregate for the base course shall consist of crushed rock and rock dust and shall conform to the requirements of SSPWC Section 200-2 UNTREATED BASE MATERIALS. Crushed slag base will not be allowed.

C. Asphalt Cement: Asphalt cement for binder shall be PG 64-10 paving asphalt and shall conform to the requirements of SSPWC Section 203-1 PAVING ASPHALT and Section 302-5.3 Prime Coat

D. Prime Coat: Asphalt to be used for a prime coat shall be liquid asphalt SC-250 and shall conform to the requirements of SSPWC Section 203-2 LIQUID ASPHALT.

E. Tack Coat: Asphalt emulsion shall be CSS-1 or CSS-1h and shall conform to the requirements of SSPWC Section 203-3 EMULSIFIED ASPHALT and Section 302-5.4 - TACK COAT

F. Asphalt Concrete:

1. The SSPWC, Section 203-6 - ASPHALTIC CONCRETE for hot plant mixed aggregate and asphalt, produced by an approved commercial asphalt paving plant, except as modified hereinafter:

2. Asphalt Cement: The Caltrans Stanrdard Specifications Section 92-1.02(B), for steam refined paving asphalt, PG64-10-75 Blows Viscosity Grade, mixed with the aggregate at a rate specified in SSPWC Section 203-6.3 - ASPHALT CONCRETE MIXTURES.

3. Two course AC Paving: The base course (first course) shall be Class B - PG64-10-75 with 3/4 inch maximum size aggregates; top course (second course) shall be 2 inches thick weaving surface course, Class C2 – PG64-10-75 with ½-inch maximum size aggregates.

G. Seal Coat: A fog seal coat, slow setting type emulsified asphalt (Grade SS-1h) of Section 203.3 - EMULSIFIED ASPHALT of the SSPWC, diluted with equal parts of water.

H. Parking Lot Striping and Markings: Material shall be Fuller "Traffic Line Paint" or J.E. Bauer Co., "Zonelac Traffic Paint". Color shall be white except that handicapped emblem and adjacent parking stall lines shall be "blue" color". The coating shall be minimum 15 mil thick.

I. Headers and Stakes: Redwood, Construction Grade in conformance to the SSPWC, Section 302-5.5 DISTRIBUTION AND SPREADING. Headers to be 2-inches x 6-inches size (within 2 inch of the thickness of pavement) with 2-inches by 4-inches stakes.

J. Concrete Wheel Bumpers:

1. Units: Precast reinforced concrete bumpers manufactured by Consley and Montigney, El Monte, California, phone (626) 283-2771, or equal.

2. Size: Four feet long; 5 3/8 inches high x 7 5/8 inches wide with sides chamfered so that top side will be 2 1/8-inches wide.

3. Materials:

a. 3250 psi concrete at 28 days.

b. Steel drift pins (3/4-inch diameter by 24-inches long), two required for each unit.

c. 2-inches reinforcing bars by length of unit, 2 required.

4. Construction:

   a. Forms and reinforcement in conformance with requirements of Section 03300 - CAST-IN-PLACE-CONCRETE, including 28-day curing period prior to delivery.

   b. Holes formed for drift pins; located 9-inches from each end of unit; reinforcing to run full length of the unit.

   c. Finished to simulate poured-in place concrete; without rock pockets, broken corners and other defects.

5. Curing: Allow units to cure full 28 days before installation.

K. Grout To Fill Pin Holes: Non-shrink grout; Embecco by Master Builders inc., 8978 Haven Ave., #A, Rancho Cucamonga, CA 91730, (800) 228-3318] or equal.

L. Disable Parking Sign: Disabled Parking signage shall comply with ADA Accessibility Guidelines for Buildings and Facilities (ADAAG) section 4.30 Signage.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be perf ormed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until detrimental conditions are corrected.

3.2 EXCAVATION AND BACKFILL

A. Excavation and backfill are specified in Section 02200 EARTHWORK.

3.3 PREPARATION OF SUBGRADE

A. Shape subgrade to the grades shown on the Drawings and roll with a three-wheeled power roller weighing approximately 10 tons. Compression under the rear wheels shall be at least 325 pounds per inch of wheel width. Other rollers may be used subject to prior acceptance by the ENGINEER. As the rolling of the subgrade proceeds, dig out all soft or spongy areas and fill the resulting holes with suitable material satisfactory to the INSPECTOR. Dispose of excess materials resulting from the grading. Do not use rollers adjacent to structures where such use may cause damage. Where the base course abuts structures and compaction with a roller is not practicable, compact the area with pneumatic tampers or other approved equipment.

B. Use of the prepared subgrade for hauling will not be permitted. The CONTRACTOR shall protect the prepared subgrade from all traffic.

C. The subgrade shall be maintained in the finished condition until the first succeeding course is placed.

3.4 PLACEMENT OF BASE COURSES

A. In accordance with Section 301-2 - UNTREATED BASE of the SSPWC.

B. Base:

1. Spread the specified base material to a thickness providing the compacted thickness.

2. Compact over the full width until a density of 95 percent.

C. Smoothness Tolerance: Provide the lines and grades within a tolerance of 3/8" in ten feet.

D. Deviations: Correct by removing materials, replacing with new materials, and reworking or recompacting as required.

E. Moisture Content: Use only the amount of moisture needed to achieve the specified compaction.

3.5 APPLICATION OF PRIME COAT

A. A prime coat shall be applied in conformance with SSPWC Section 302-5.3.

3.6 CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

A. Lay asphalt concrete over the aggregate base in accordance with the SSPWC Section 302-5.5. The method of proportioning, mixing, transporting, laying, processing, rolling the material, and the standards of workmanship shall conform to the applicable requirements of SSPWC Section 302-5 ASPHALT CONCRETE PAVEMENT. At no time shall the coarse aggregate that has segregated from the mix be scattered across the paved mat.

B. A tack coat of emulsified asphalt shall be applied to the first lift of the pavement prior to placing the second lift. Application shall be in conformance with SSPWC Section 302-5.4.

C. The INSPECTOR will examine the base before the paving has begun. The CONTRACTOR will correct any deficiencies before the paving is started. Roll each lift of the asphalt concrete and compact to 95 percent of the density obtained with the California Kneading Compactor per California Test 304. The grade, line, and cross section of the finished surface shall conform to the Drawings.

3.7 PARKING AREA STRIPING AND MARKINGS

A. Materials: As hereinbefore specified.

B. Lines: 4-inches wide.

C. Arrows: 12-inches stroke, with proportionate head.

D. Letters: 24-inches high], 4-inches strokes.

E. Disabled Emblem: An international Symbol of Accessibility Symbol shall be stenciled at the rear parking space. Each accessible parking unloading zone shall also be marked.

F. Preparations: All surfaces to be free of dirt, grease or other foreign materials.

G. Application: Apply one heavy undiluted coat with traffic line painting equipment in locations indicated on the Contract Drawings in uniform coverage, free from light spots and with all edges clean-cut, straight line and true. Paint by spray can shall not be allowed. Minimum dry paint thickness shall be 15 mils.

3.8 DISABLE PARKING SIGN

A. Located as per the requirements of ADA Accessibility Guidelines for Buildings and Facilities (ADAAG).

B. Prepare subgrade for the concrete footing inaccordance with Section 02200 - EARTHWORK.

C. Install concrete footing, post and sign in accordance with the requirements of ADA Accessibility Guidelines for Buildings and Facilities (ADAAG).

3.9 CONCRETE WHEEL BUMPERS

A. Secure bumpers in place with steel drift pins, two per bumper, driven to at least 1/4-inch below the top surface of the unit; fill holes with specified nonshrink grout to top surface of the unit.

3.10 CLEANUP

A. Clean all debris and unused materials from the paving operation. Clean all surfaces that have been spattered or defaced as a result of the paving operation. Asphalt or asphalt stains which are noticeable upon surfaces of concrete or materials which will be exposed to view shall be promptly and completely removed. Cleaning shall be done in a manner that will not result in any discharge of contaminated materials into any catch basin.

3.11 PROTECTION

A. In addition to the requirements for protection stipulated in the governing standards, CONTRACTOR shall protect all adjacent concrete and masonry so that no damage will occur as the result of subsequent construction operations. All damage or discoloration shall be repaired to the satisfaction of ENGINEER before final acceptance.

B. Special care shall be taken to prevent bituminous materials from spraying or splashing. Adjacent construction shall be protected by covering with suitable fabric or paper.

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SECTION 02527
CONCRETE CURBS AND SIDEWALKS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated in the Contract Documents and specified herein.

B. This section covers the work necessary to construct the concrete curbs, gutters and sidewalks as indicated on the drawings, complete, in place in accordance with the requirements of the Contract Documents. In addition, this section covers the work necessary to reconstruct concrete sidewalks, curb, and gutter.

C. All existing sidewalks, and curb and gutters disturbed or damaged during construction of new work, or indicated on the drawings to be demolished and replaced shall be reconstructed to the lines, grades, and cross section indicated on the drawings or as directed by ENGINEER to restore them at their original locations unless indicated otherwise on the drawings. The width and thickness of reconstructed sidewalks are to be the same as the original sidewalks and shall be verified with ENGINEER prior to reconstruction. Replacement concrete curb and gutter shall match the existing curb and gutter.

D. The CONTRACTOR shall be responsible for removal, construction, reconstruction, and adjustment as necessary to all existing or new manholes tops, curb and gutter, and area drainage structures to match new grades as needed.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 Earthwork

B. Section 02232 Preparation of Subgrade

C. Section 03100 Concrete Formwork

D. Section 03290 Joints in Concrete

E. Section 03300 Cast-In-Place Concrete

F. Section 03370 Concrete Curing

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable reference specifications as specified in the GENERAL REQUIREMENTS.

B. Work of this section shall be performed in accordance with the Standard Specifications for Public Works Construction (SSPWC).

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

1.5 QUALITY ASSURANCE

A. Comply with the applicable Reference Specifications of the GENERAL REQUIREMENTS.

PART 2 - PRODUCTS

2.1 FORMS

A. Form material shall be in conformance with SSPWC Section 303-5.2.

2.2 CRUSHED MISCELLANEOUS BASE

A. Crushed Miscellaneous Base shall conform to 200-2.4 of the Standard Specification for Public Works Construction.

2.3 EXPANSION JOINT FILLER

A. Expansion joint filler shall be 1/4-inch thick, preformed asphalt-impregnated, expansion joint material conforming to ASTM D 994.

2.4 CONCRETE

A. Refer to Section 03300 Cast-In-Place Concrete.

2.5 CURING COMPOUND

A. Refer to Section 03370 Concrete Curing.

2.6 EXCAVATION AND BACKFILL

A. Refer to Section 02200 Earthwork.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL

A. Excavation and backfill shall be in conformance with Section 02200 Earthwork

3.2 PREPARATION OF SUBGRADE

A. Preparation of subgrade shall be in conformance with Section 02232 Preparation of Subgrade.

3.3 PLACING CRUSHED MISCELLANEOUS BASE

A. Crushed Miscellaneous Base shall be in conformance with the SSPWC Section 301-2.2.

B. Crushed Miscellaneous Base shall be compacted in conformance with SSPWC Section 301-2.3.

3.4 SETTING FORMS

A. Setting forms shall be in conformance with SSPWC Section 303-5.2.1.

3.5 SLIP FORMING

A. Slip-form equipment shall be in conformance with SSPWC Section 303-5.2.2.

3.6 EXPANSION JOINTS

A. Expansion joints shall be constructed in conformance with SSPWC Section 303-5.4.2.

3.7 WEAKENED PLANE JOINTS

A. Weakened plane joints shall be placed in conformance with SSPWC Section 303-5.4.3.

3.8 PLACING CONCRETE

A. Concrete shall be placed in conformance with SSPWC Section 303-5.3.

3.9 FINISHING

A. General: Finishing shall be completed as specified herein for the type work being performed.

B. Curb: The stripping of front forms and finishing of curb shall be in conformance with SSPWC Section 303-5.5.2.

C. Walk: The finished surface of the walk shall be in conformance with SSPWC Section 303-5.5.3.

D. Gutter: The gutter shall be finished in conformance with SSPWC Section 303-5.5.4.

E. Access Ramps and Driveways: The Access Ramps and Driveways shall be finished in conformance with SSPWC Section 303-5.5.5.

3.10 CURING

A. Refer to Section 03370 Concrete Curing.

3.11 PROTECTION

A. In addition to the requirements for protection set forth in the governing standards, CONTRACTOR shall protect all adjacent concrete and masonry so that no damage will occur as the result of subsequent construction operations. All damage or discoloration shall be repaired to the satisfaction of ENGINEER before final acceptance.

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SECTION 02720
PIPE REAMING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This specification covers the requirements for renewal and upsizing of an existing 16-inch VCP sanitary sewer using a pipe reaming system including removal and replacement of service lateral connections, renewal of connections to manholes, finishing renewed pipelines, and abandoning existing VCP in place.

1.2 DEFINITIONS

A. Pipe Reaming: A trenchless process of using a Horizontal Directional Drill (HDD) with appropriate reamer to grind and pulverize the existing pipe, flush the pulverized pipe material and drilling fluid through the existing pipe to a retrieval point, and simultaneously installing a new pipe of equal or larger diameter in place of the existing pipeline.

B. Host Sewer Main: Pipeline designed to convey sewerage subject to the pipe reaming system.

C. Replacement Pipe: Pipe inserted into the host sewer main by pipe reaming system.

D. Continuous Pipe: High Density Polyethylene (HDPE) pipe, with welded joints, assembled and inserted so as to form a continuous section between access pits.

E. Renew Lateral: Replace service lateral in public space or easement.

F. Abandonment in-place: Disconnect, fill with grout or concrete and cap any portions of the existing VCP that will not be removed through the pipe reaming process and left in place at the end of the work.

1.3 QUALITY ASSURANCE

A. The contractor shall have prior experience with this type of installation, demonstrate proof of instruction by the licensor, or provide on site services of the licensor until such time the contractor's competency to perform the work is satisfactory to the Owner and/or Engineer.

B. Personnel performing fusing of HDPE pipe and fittings:

1. Certified by manufacturer of fusing equipment having successfully completed training in:

    a. Handling replacement pipe materials.
    b. Butt fusion of pipe joints, saddle fusion of fittings for service laterals.
    c. Operation and maintenance of all equipment to be used.

C. Certificate of Training includes at a minimum: Installer’s name, date of issuance, and process or product the person is certified to install.

D. Make available for inspection all information regarding production, delivery, handling, and storage aspects of replacement pipe.

E. Certification that backup equipment is available and can be delivered to project sites within 24 hours.

F. Contractor: Internally inspect pre-reaming and post-reaming work.

1.4 SUBMITTALS

A. Contractor shall submit a work plan to include.

1. Pipe reaming plan including at a minimum:

a. Description of process to be used.
b. Replacement pipe and fitting selection and composition.
c. Design calculations for installations.
d. Soil impacts.
e. Live load and dead load impacts.
f. Recommended manufacturer's installation procedures.
g. ASTM references and third party test reports.
h. Storage and handling requirements.

2. Plan for locating, exposing and re-connecting service laterals and restoring manhole connections.

a. Manhole connection to include waterstop/pipe restraint.

3. Proposed point repair method.

4. Temporary bypass pumping plan to meet the requirements of Specifications Section 02999.

5. Emergency plan. Maintain a copy of emergency plan on site for duration of project.

6. Traffic control plan

B. The Contractor shall submit the following:

1. Certificates of Compliance for raw materials, pipe, joints, fittings, and service connections.

2. Certificates of Training for process to be used.

a. Include installer's name, date of issuance and process for which certified.

3. Certificates of training for joint fusion, if applicable.

4. Pre-reaming and post-reaming CCTV inspection reports. Complete post-reaming inspection after reaming process, reconnection of laterals and renewals are completed.

5. Pulling log to include Allowable Tensile Load (ATL) and duration of pull of the replacement pipe.

6. Field testing results.

1.5 DELIVERY AND STORAGE

A. Transport, handle, and store pipes and fittings as recommended by manufacturer.

B. Replace pipe or fittings damaged before or during installation at no additional cost to the Owner.

PART 2 - MATERIALS

2.1 MATERIALS

A. General:

1. Metal in saddles, clamps and appurtenances: 300 or 304 stainless steel following ASTM A240.

2. Elastomeric materials, gaskets, clamps, connectors: oil resistant and manufactured following ASTM F477.

3. Fittings:

a. Pressure rated and classified same as adjoining pipe.
b. Inside diameter to match inside diameter of adjoining pipe.
c. Designed for pipe reaming applications.

B. HDPE pipe, joints, and fittings:

1. Polyethylene: Minimum cell classification PE 345464E following ASTM D3350.

2. Material designation: PE 3608 following ASTM F714.

3. Hydrostatic Design Basis at 73.4 degrees F: 1,600 psi following ASTM D2837

4. Pipe:

a. Manufactured, and sized following ASTM F714.

b. Minimum wall thickness: SDR 17.

c. Measure length to provide continuous, homogeneous pipe from manhole to manhole with enough extra length to allow for relaxing and finishing off at manholes.

d. Interior Pipe color:

1) Use fully bonded light-colored interior liner meeting specifications above.

e. Pipe Markings:

1) Mark following ASTM F714.
2) Legibly marked in green to identify as sewer pipe.

f. Approved Pipe Manufacturers:

1) Performance Pipe, Division of Chevron Phillips Chemical Company, LP.
2) Rinker Materials Poly Pipe Division.
3) Or Approved Equal.

5. Molded fittings:

a. Manufactured, sized and marked following ASTM D3261.

6. Field fabricated fittings:

a. Stock manufactured, sized and marked following ASTM F714.

7. Joint connection minimum requirements:

    a. Continuous pipe: assemble pipe lengths in field with butt-fused joints following ASTM D2657 and approved submittals or with electrofused joints following approved submittals. In case of conflicts between ASTM D2657 and approved submittals or if the ASTM reference is nonspecific, follow approved submittals.

        1) Joint strength: equal to or greater than pipe strength.

    b. Excavations for pipe reaming insertion or depression removal made between manholes: join pipe ends using butt-fused joints or electrofusion coupling.

        1) With Engineer's approval, use full circle seal clamps specified herein or seal and restraint type mechanical couplings manufactured by Dresser Piping Specialties or Smith-Blair, Inc. or approved equal.

C. Manhole Connection Materials:

1. Concrete:

    a. High strength, non-shrink, chemical resistant.
    b. Cures in presence of water.

2. Approved Manufacturers of Flexible Gasket Connector:

    a. A-Lok.
    b. Kor-N-Seal.
    c. Fernco.
    d. Or Approved Equal.

3. Approved Manufacturers of Fused-on Waterstop:

    a. ISCO Industries Wall Anchor.
    b. Central Plastics Electrofusion Flex Restraint.
    c. Or Approved Equal.

4. Approved Manufacturers of Hydrophobic Grout for Oakum Collar:

    a. Avanti AV 202.
    b. DeNeef Hydro Active Sealfoam.
    c. Or Approved Equal.

D. Lateral Reconnections:

1. Heat fusion or electrofusion saddles:

    a. Nominal inside diameter of existing service.

    b. Heat fusion saddles and electrofusion saddles: made of polyethylene pipe compound following ASTM D3350 and suitable for fusion welding to polyethylene pipe.

        1) Branch saddle style or approved equal.

    c. Approved Manufacturers:

        1) Molded Branch Saddle, Performance Pipe, Division of Chevron Phillips Chemical Company, LP.

2) Rinker Materials Poly Pipe Division.

3) Electrofusion Branch Saddle, Central Plastics Company.

4) Or Approved Equal.

2. Insertion connections:

a. Nominal inside diameter of existing service.

b. Approved Manufacturers.

1) Inserta Fittings Co.
2) Or Approved Equal.

3. Strap-on saddles:

a. Utilized only when heat fusion, electrofusion, or insertion saddles are not possible.

1) Requires prior approval from Engineer.

b. Made of polyethylene pipe compound following ASTM D3350 with stainless steel bands and fasteners, 50 year polyurethane gasket, and backup plate.

1) Strap-on-saddle type, tee saddle, or approved equal.

c. Approved Manufacturers:

1) JCM Industries, Inc.
2) Romac Industries.
3) Or Approved Equal.

E. Connection Appurtenances:

1. Use Full Circle Elastomeric Seal Clamps for joining plain ends of pipe.

a. Rubber sleeve coupling with stainless steel shear ring.

b. Following ASTM C1173.

c. Approved Manufacturers:

1) Fernco.
2) Mission Rubber Company Flex-Seal.
3) DFW by NDS.
4) Or Approved Equal.

2. Joint lubricants:

a. Following manufacturer recommendations.
b. Apply with brush or hand-apply. Spray application not permitted.

F. Flowable Fill:

1. Flowable fill shall be made of cement, sand and fly ash. The mix design shall be 50 lbs of cement, 250 lbs of fly ash, 2,850 lbs of cement, and 500 lbs of water for one cubic yard of flowable fill.

PART 3 - EXECUTION

3.1 MAINLINE PREPARATION

A. Respond to project site within 2 hours of Engineer's notification of problem on site. All costs due to failure to respond within prescribed time will be borne by Contractor.

B. Bypass Pumping:

1. Bypass pumping and temporary handling of sewage flow shall be in accordance with Specifications Section 02999.

C. Pre-reaming Inspections:

1. Perform internal CCTV inspections per the latest SSPWC Section 500-1.1.5 and as amended by the City of Los Angeles Brown Book.

2. Confirm, locate, and identify by building address all existing connections and services attached to host sewer main. Provide log to Engineer.

3. Confirm that host pipe is ready for reaming. Demonstrate on CCTV recording that major sags (25% of existing pipe diameter or larger) were realigned and obstructions, offset joints, missing or collapsed pipe that could interfere with reaming process were removed.

4. Notify Engineer if reaming is not viable. Provide Engineer with pre-inspection CCTV recording to support assertion.

D. Locate and protect existing utilities.

E. External Point Repairs Prior to Reaming:

1. Prior to reaming, perform external point repair to remove sags, offset joints and reaming constrictions or obstructions that can not be removed internally, and that may impede process or prevent successful completion..

F. Maintaining Invert and Slope:

1. Ascertain elevations of upstream manhole invert and downstream manhole invert of host sewer main to be reamed as well as intermediate point on mainline for verification that line and grade is maintained.

1.8 MANHOLE PREPARATION

A. Manholes not scheduled to be removed and through which the reamer will pass, shall have the invert removed sufficiently to allow the reamer to pass without deflection and allow for a structurally sound repair/replacement of the invert

1.9 REAMING AND PIPE INSTALLATION

A. Disconnect laterals from host sewer main following approved submittals.

B. Provide access pits as required to facilitate pipe reaming insertion process.

1. Locate pits as shown on Contract Drawing C-25 to minimize interference to vehicular traffic and inconvenience to public. Pipe shall immediately follow the reamer through the bore

channel. The reamer overcut should not exceed the maximum diameter of the replacement product by more than 3 inches. No final cuts or connections to HDPE shall be made to the pipe less than four hours after the pipe has reached its' final position.

2. Use sewer house connection locations, changes in sewer line and grade, and sags as access pit locations, and provide access to the sewer from both directions.

3. Prevent damage to adjacent areas during reaming process.

C. Do not exceed approved submittal insertion rate or force at any time. Maintain logs verifying rate and force did not exceed submitted calculations.

D. Use approved lubricant to ease installation friction. Match lubricants to soil and insertion conditions.

E. Dispose of any slurry generated by the installation in accordance with all applicable local, state and federal regulations

F. Remove irregular internal bead projections that are not uniform and rolled-back from butt-fused joints.

G. Remove and replace improperly reamed sewer mains at no additional cost to the Owner.

H. Contractor is responsible for all costs related to inaccurately located or misidentified live/active sewer house connections.

1. Re-connect missed or active taps and abandon erroneously opened connections at no additional cost to the Owner.

1.10 RELAX PERIOD

A. Allow inserted HDPE pipes to rest for a period of 4 hours before cutting and trimming replacement pipe or making any manhole connections.

B. If replacement pipe exhibits retraction, at end of relax period and after flexible manhole connectors' grout has set, anchor HDPE pipe at manholes following approved submittals.

C. After relax period, cut and trim replacement pipe 3 inches inside upstream and downstream manholes.

1.11 MANHOLE CONSTRUCTION

A. Construction of new manholes and replacement manholes for existing manholes which are removed to facilitate access for reaming operation shall be in accordance with the applicable specification sections.

1.12 MANHOLE RECONNECTION

A. Reconnect to manhole following approved submittals.

1. Restrain pipe at manhole wall.

2. Use flexible gasket connector, fuse-on water stop or hydrophobic grout-soaked oakum collar embedded in concrete poured or parged across manhole wall opening.

B. Flexible gasket connector.

1. Center connector in manhole opening.

2. Grout flexible connector in place in manhole wall, filling all voids for full thickness of manhole wall.

3. If flexible connector is not water tight, embed a fuse-on water-stop collar in manhole wall if required by Engineer.

C. When flexible gasket connector or fused-on water stop is not used, use quick setting non shrink grout pipe to manhole connections and bentonite collar, or grout-soaked oakum collar embedded in concrete poured or parged across manhole wall opening.

1.13 FIELD TESTING

A. Air test pipe prior to reconnection of house sewer connections.

B. Stabilize test pressures for replacement pipe at 4.0 PSIG with a minimum holding time of two minutes and a maximum 0.5 PSIG pressure drop.

C. Repair or replace pipelines that fail air tests and re-test at no additional cost to the Owner.

D. Perform post-reaming inspection of mainline.

1.14 RECONNECTION OF LATERALS

A. Perform following approved submittals.

1.15 SEWER PIPE ABONDONMENT

A. Sections of existing sewer main shown on the Contract Drawing to be abandoned shall be isolated from both ends and filled with flowable fill.

* * * * *

SECTION 02726
MAINTENANCE HOLE AND PRECAST VAULT CONSTRUCTION

PART 1 - GENERAL

1.1 SCOPE.

A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B. This section covers the work necessary for the construction of maintenance holes and precast vaults complete. Maintenance hole and vault details are as shown on the Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 Earthwork.

B. Section 02730 Forcemains and Sanitary Sewer System Testing.

C. Section 03300 Cast-in-Place Concrete.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable reference specifications as specified in the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards.

1. Commercial Standards:

ASTM A 48	Specification for Gray Iron Castings.
ASTM C 150	Specification for Portland Cement.

2. Standard Specifications: SSPWC Section 206 -3 Gray Iron Casting

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. Shop Drawings: The CONTRACTOR shall furnish complete shop drawings for all precast vaults and maintenance hole sections, hatches, cast iron frames and covers, and appurtenances for review by the ENGINEER in accordance with SUBMITTALS of the GENERAL REQUIREMENTS.

1.5 QUALITY ASSURANCE

A. Inspection: After installation, the CONTRACTOR shall demonstrate that all maintenance holes have been properly installed, level, with tight joints, at the correct elevations and orientations, and that the backfilling has been carried out in accordance with the Contract Documents.

PART 2 - PRODUCTS

2.1 GRANULAR BASE

A. Granular base shall conform to Section 02200 Earthwork.

2.2 CONCRETE

A. Ready-mixed, conforming to ASTM C 94, Alternate B. The concrete class for maintenance hole bases shall be 560-C-3250. The concrete class for maintenance hole and precast vault walls and top shall be 560-C-3250. Maximum size of aggregate shall be 1.5 inches. Slump shall be between 2 and 5 inches.

2.3 FORMS

A. Exterior exposed surfaces shall be plywood. Others shall be matched boards, plywood, or other approved material. Provide Fforms on all vertical surfaces. Trench walls, large rock, or earth will not be approved as form material.

2.4 REINFORCING STEEL

A. Conform to ASTM A 615, Grade 40, deformed bars.

2.5 POURED-IN-PLACE MAINTENANCE HOLES

A. Poured-in-place type maintenance holes may be used provided all details of construction are accepted by the ENGINEER.

2.6 PRECAST MAINTENANCE HOLE SECTIONS

A. Precast maintenance hole sections shall be minimum 48 inches in diameter, conforming to Standard Plan S-142 and to ASTM C 478. Minimum wall thickness shall be 5 inches for reinforced sections and 51/2 inches for unreinforced sections. Provide eccentric cones for all maintenance holes. Cones shall have same wall thickness and reinforcement as maintenance hole section. Top and bottom of all sections shall be parallel. Joints shall be Keylock type with rubber gaskets conforming to ASTM C 443. The CONTRACTOR's attention is directed to specification for MORTAR hereinafter.

B. Prior to the delivery of any size of precast maintenance hole section on the jobsite, yard tests will be conducted at the point of manufacture. The precast sections to be tested will be selected at random from the stockpiled material which is to be supplied for the job. All test specimens will be mat tested, and shall meet the permeability test requirements of ASTM C 14.

2.7 PRECAST BASE SECTIONS AND BASES

A. At the option of the CONTRACTOR, precast base sections or maintenance hole bases may be used provided all details of construction are approved by the ENGINEER. Base sections shall have the base slab integral with sidewalls. Base slab shall be constructed in accordance with Standard Plan S-140. Tie reinforcing steel to wall steel.

2.8 MAINTENANCE HOLE EXTENSIONS

A. Concrete grade rings for extensions shall be a maximum of 6 inches high and shall be approved by The INSPECTOR before installation.

B. In general, maintenance hole extensions will be used on all maintenance holes in roads or streets or in other locations where a subsequent change in existing grade may be likely. Extensions will be limited to a maximum height of 12 inches. Finish grade for maintenance hole covers shall conform to finished ground or street surface level, unless otherwise directed by the ENGINEER.

2.9 MORTAR

A. Standard premixed mortar conforming to ASTM C 387 or proportion 1 part Portland cement to 2 parts clean, well-graded sand which will pass a 1/8-inch screen. Admixtures may be used not exceeding the following percentages of weight of cement: Hydrated lime, 10 percent; diatomaceous earth or other inert materials, 5 percent. Consistency of mortar shall be such that it will readily adhere to the pipe if when using the standard tongue-and-groove type joint. If the Keylock type joint is used, the consistency shall be such that excess mortar shall be forced out of the groove and support is not provided for the next precast manhole section to be placed. Mortar mixed for longer than 30 minutes shall not be used.

2.10 PREFORMED PLASTIC GASKETS

A. Preformed plastic gaskets may be used in lieu of mortar type joints and shall be Kent-Seal No. 2 manufactured by Hamilton Kent Manufacturing Company, Kent, OH; Ram-Nek, manufactured by K. T. Snyder Company, Inc., Houston, TX; or equal, meeting all requirements of Federal Specification SS-S-00210.

2.11 PIPE STUBOUTS FOR FUTURE SEWER CONNECTIONS

A. Pipe stubouts shall be the same type as approved for use in lateral, main, or trunk sewer construction. Strength classifications shall be the same class as in adjacent trenches. Where there are two different classes of pipe at a maintenance hole, the higher strength pipe will govern strength classification. Rubber gasketed watertight plugs shall be furnished with each stubout adequately braced against all hydrostatic or air test pressures.

2.12 PRECAST CONCRETE VAULT

A. The precast concrete vault shall be precast with a 28-day, 4000 psi minimum compressive strength concrete and designed for AASHTO H-20 loading. Minimum dimensions are shown on the Standard Drawings. Provide openings for pipes and grating as shown on the Drawings.

2.13 MAINTENANCE HOLE STEPS

A. Maintenance hole steps shall be made of minimum 3/4-inch galvanized steel bar conforming to ASTM A 36. Steps shall be 12-inch wide minimum, center-to-center of legs, and shall be drop pattern with a 2-inch drop. Bends shall be made around a 1-inch radius minimum, 2-inch radius maximum mandrel. There shall be 3-inch minimum embedment in precast concrete maintenance hole sections and 4-1/2-inch minimum projection from the face of concrete at point of embedment to the center of the step. There shall be a 2-inch hook on the embedment end. Galvanizing shall conform to ASTM A 123 and shall be done after bending.

B. The installed steps shall be located so as to provide a continuous ladder with steps equally spaced vertically in the assembled maintenance hole at 12 inches ± 3/4-inch. They shall be capable of withstanding a force of 350 pounds, applied at any place on the step and in any direction which projects from the point of application through a diameter of the step cross-section at that point, with no permanent deformation resulting. Steps shall be cast in manhole sections by the manufacturer.

2.14 MAINTENANCE HOLE FRAMES AND COVERS

A. Cast iron of size and shape detailed on the Drawings. Covers shall have the word "SEWER" in 2-inch raised letters. Castings shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and all defects, and shall conform to ASTM A 48, Class 30B. Plane or grind bearing surfaces to ensure flat, true surfaces. Covers shall be true and seat within ring at all points. Frames shall have a minimum opening of 30 inches.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL

A. Conform to applicable portions of Section 02200 Earthwork. Backfill around maintenance holes shall be of the highest quality of trench backfill immediately adjacent, as shown on the Drawings.

3.2 GRANULAR BASE

A. Remove water from the excavation. Place a minimum of 6 - inches of granular base and thoroughly compact with a mechanical or power vibrating tamper.

3.3 CONCRETE BASE

A. Construct concrete base in conformance with the details shown on the Drawings. Vibrate to densify the concrete and screed so that the first precast maintenance hole section to be placed has a level, uniform bearing for the full circumference.

B. Deposit sufficient mortar on base to assure watertight seal between base and maintenance hole wall or place the first precast section of maintenance hole in concrete base before concrete has set, if preferred. First section shall be properly located and plumb.

3.4 PLACING PRECAST MAINTENANCE HOLE SECTIONS

A. Clean ends of sections of foreign materials. Thoroughly wet joint with water prior to placing mortar. Place mortar on groove of lower section. Set next section in place. Fill joint completely with mortar of the proper consistency. Trowel interior and exterior surfaces smooth on standard tongue-and-groove joints. Wipe or otherwise clean the excess mortar from the inside of the Keylock joint.

B. When a Keylock joint is used, it is the intent that the void between the tongue-and-groove be completely filled with mortar, and that the interior and exterior end faces of the section to be placed seat fully on the previously placed section.

C. Prevent mortar from drying out and cure by applying an approved curing compound or comparable approved method. Chip out and replace all cracked or defective mortar. Completed maintenance holes shall be rigid and watertight.

3.5 PREFORMED PLASTIC GASKETS

A. Carefully inspect precast maintenance hole sections to be joined. Sections with chips or cracks in the tongue shall not be used. Preformed plastic gaskets shall be installed in strict conformance with the manufacturer's recommendations. Only pipe primer furnished by the gasket manufacturer will be approved.

3.6 MAINTENANCE HOLE INVERT

A. Construct maintenance hole inverts in conformance with details shown on the Drawings, and with smooth transitions to ensure an unobstructed flow through maintenance hole. Remove all sharp edges or rough sections which tend to obstruct flow. Where a full section of pipe is laid through a maintenance hole, break out the top section as indicated and cover exposed edge of pipe completely with mortar. Trowel all mortar surfaces smooth.

3.7 FLEXIBLE JOINTS

A. Provide joints in all pipe not more than 1.5 feet from maintenance hole walls. Lay pipes entering maintenance holes on firmly compacted granular base rock to undisturbed earth. Granular base shall be as specified hereinbefore.

B. Where the last joint of the line laid up to the maintenance hole is more than 1.5 feet from the maintenance hole base, a 6-inch concrete encasement shall be constructed around the entire pipe from the maintenance hole base to within 1.5 feet of the pipe joint. The pipe encasement shall be constructed monolithically with the maintenance hole base. Pipes laid out of the maintenance hole shall be shortened to ensure the first joint is no more than 1.5 feet from the maintenance hole base.

3.8 PIPE STUBOUTS FOR FUTURE SEWER CONNECTIONS

A. Install stubouts in maintenance holes for future sewer connections as shown or as required by the ENGINEER. Maximum length shall be 1.5 feet outside the maintenance hole wall. Grout pipes in precast walls or maintenance hole base to provide watertight seal around pipes. Construct invert channels in accordance with details shown on the Drawings. Provide compacted granular rock as specified hereinbefore to undisturbed earth under all stubouts.

B. Install semi-permanent plugs at the end of stubouts with gasket joints similar to sewer pipe being used. Plugs shall be capable of withstanding all internal or external pressures without leakage. All plugs to be braced to prevent blowoffs.

3.9 PERMANENT PLUGS

A. Clean interior contact surfaces of all pipes to be cut off or abandoned as shown. Construct concrete plugs at the end at of all pipes 18 inches or less in diameter. Minimum length of concrete plugs shall be 8 inches. For pipe 21 inches and larger, the plugs may be constructed of common brick or concrete block. Plaster the exposed face of block or brick plugs with mortar. All plugs shall be watertight and capable of withstanding all internal and external pressures without leakage.

3.10 MAINTENANCE HOLE EXTENSIONS

A. Install extensions in conformance with the details shown on the Drawings, and to height determined by the ENGINEER. Lay grade rings in mortar with sides plumb and tops level. Seal joints with mortar as specified for maintenance hole sections. Extensions shall be watertight.

3.11 MAINTENANCE HOLE FRAMES AND COVERS

A. Install frames and covers on top of maintenance holes to positively prevent all infiltration of surface or groundwater into maintenance holes. Frames shall be set in a bed of mortar with the mortar carried over the flange of the ring as shown in the Maintenance Hole Details on the Drawings. Set frames so that tops of covers are flush with surface of adjoining pavement or ground surface, unless otherwise shown or directed.

3.12 MAINTENANCE HOLES OVER EXISTING SEWERS

A. Construct maintenance holes over existing operating sewer lines at locations shown. Perform necessary excavation as specified above, break into existing line, and construct maintenance hole.

B. Maintain flow through existing sewer lines at all times, and protect new concrete and mortar work for a period of 7 days after concrete has been placed. Advise ENGINEER of plans for diverting sewage flow and obtain ENGINEER's approval before starting. ENGINEER's approval will not relieve CONTRACTOR of responsibility for maintaining adequate capacity for flow at all times and adequately protecting new and existing work.

C. Construct the new base under the existing sewer and the precast sections as specified herein.

D. Break out the existing pipe within the new maintenance hole, cover the edges with mortar, and trowel smooth.

3.13 PRECAST CONCRETE VAULT

A. Install precast concrete vault at the locations shown on the Drawings. Provide necessary excavation and backfill as specified herein.

3.14 HYDROSTATIC TESTING

A. When, in the ENGINEER's opinion, the groundwater table is too low to permit visual detection of leaks, project maintenance holes shall be hydrostatically tested. The test shall consist of plugging all inlets and outlets and filling the maintenance hole with water to a height determined by the ENGINEER. Leakage in each maintenance hole shall not exceed 0.1 gallon per hour per foot of head above the invert. A maintenance hole may be filled 24 hours prior to time of testing, if desired, to permit normal absorption into the pipe walls to take place. Repair all maintenance holes that do not meet the leakage test, or are unsatisfactory from visual inspection, to conform to the requirements herein.

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SECTION 02730
FORCEMAINS AND SANITARY SEWER PIPELINE TESTING

PART 1 - GENERAL

1.1 SCOPE.

A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B. This Section covers the performance of all pipeline flushing and testing, complete, for forcemains and sanitary sewer system piping as specified herein and in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02726 Maintenance Hole and Precast Vault Construction.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable reference specifications as specified in the GENERAL REQUIREMENTS.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. The CONTRACTOR shall submit in writing all proposed plans for testing, and for water conveyance, control and disposal. The CONTRACTOR shall also submit written notice 48 hours in advance of the proposed testing schedule for review and concurrence of the ENGINEER.

1.5 QUALITY ASSURANCE (NOT USED)

PART 2 - PRODUCTS

2.1 GENERAL

A. Temporary valves, plugs, bulkheads, and other air pressure testing and water control equipment and materials shall be provided by the CONTRACTOR subject to the ENGINEER's review. No materials shall be used which will be injurious to pipeline structure and future function. Air test gages shall be laboratory-calibrated annually test gages and shall be recalibrated by a certified laboratory at the CONTRACTOR's expense prior to the leakage test, only if required by the ENGINEER.

PART 3 - EXECUTION

3.1 GENERAL

A. Unless otherwise specified, water for testing will be furnished by the CITY; however, the CONTRACTOR shall make all necessary provisions for conveying the water from the CITY designated source to the points of use.

B. Release of water from pipelines, after testing has been completed, shall be performed as reviewed by the ENGINEER.

C. All testing operations shall be performed in the presence of the INSPECTOR.

3.2 TESTING OF PIPELINE

A. General: All forcemains, gravity sewer pipes and service laterals shall be tested for exfiltration and/or infiltration and deflection, as specified. All maintenance holes shall be tested for leakage, as specified. Maintenance holes shall be tested prior to backfill placement, whereas all pipe shall be backfilled prior to testing. All leakage tests of sanitary sewer systems shall be in conformance with SSPWC Section 306-1.4.1. For pressure sewers (force main) tests, the water pressure shall be measured at the lowest point of the pipeline section being tested.

B. Water Exfiltration Test shall be in conformance with SSPWC Section 306-1.4.2.

C. Water Infiltration Test shall be in conformance with SSPWC Section 306-1.4.3. Unless otherwise specified, infiltration will be measured by the CONTRACTOR using measuring devices approved by the ENGINEER.

D. Air Pressure Test shall be in conformance with SSPWC Section 306-1.4.4.

E. At the CONTRACTOR's option, joints may be air tested individually, joint by joint, with the use of specialized equipment. The CONTRACTOR shall submit its joint testing procedure for the ENGINEER's review and approval prior to testing. Prior to each test, the pipe at the joint shall be wetted with water. The maximum test pressure shall be 3.0 psi. The minimum allowable pressure drop shall be 1.0 psi over a 30-second test period.

F. Water Pressure Test shall be in conformance with SSPWC Section 306-1.4.5.

G. Deflection Test: All flexible and semi-rigid main line pipe shall be tested in accordance with SSPWC Sections 306-1.2.12 and 306-1.2.13 for deflection, joint displacement, or any other obstruction by passing a rigid mandrel through the pipe by hand, not less than 30 days after completion of the trench backfill, but prior to permanent resurfacing. The mandrel shall be a full circle, solid cylinder, or a rigid, non-adjustable, odd-numbered leg (9 leg minimum) steel cylinder, accepted by the ENGINEER as to design and manufacture. The circular cross section of the mandrel shall have a diameter of at least 95 percent of the specified average inside diameter of the pipe and the minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe. Obstructions encountered by the mandrel shall be corrected by the CONTRACTOR.

3.3 TESTING OF MAINTENANCE HOLES

A. All sewer maintenance holes shall be hydrostatically tested for leakage after installation, but prior to being backfilled. Prior to hydrostatic testing, all maintenance holes shall be visually inspected for leaks. All leaks or cracks shall be repaired by the CONTRACTOR, prior to hydrostatic testing, to the satisfaction of the ENGINEER and the INSPECTOR. All pipes entering the maintenance hole shall be sealed at a point outside the maintenance hole walls so as to include testing of the pipe/maintenance

hole joints. The maintenance hole shall be filled with water to a level 2 inches below the top of the frame. Safety lines shall be secured to all plugs utilized. After a period of at least one hour to allow the water level to stabilize, the maintenance hole shall be refilled and the water level shall be checked. The water level shall again be checked after a period of 4 hours. If the water level is reduced by more than 1/4-inch, the leakage shall be considered excessive, and the CONTRACTOR shall be required to make all necessary repairs and retest the maintenance hole. The exterior of the maintenance hole shall be inspected during this period for visible evidence of leakage. Visible moisture, sweating, or beads of water on the exterior of the maintenance hole shall not be considered leakage, but any water running across the surface will be considered leakage and shall be repaired to the satisfaction of the ENGINEER and the INSPECTOR regardless of the volume of water lost.

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SECTION 02810
IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. All labor, materials, equipment, appliances, fixtures and tests necessary for complete removal of existing irrigation system and a new operating irrigation system as indicated on the Contract Drawings or specified in the Project Manual.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS in DIVISION 1 - GENERAL REQUIREMENTS and other Sections of the Project Manual.

2. Earthwork in Section 02200.

3. Trees, Plants and Ground Cover in Section 02950.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340 - SUBMITTALS of DIVISION 1 - GENERAL REQUIREMENTS of the Project Manual.

B. Make all submittals within 30 calendar days from the issuance of the Notice-to-Proceed.

C. Submit a minimum of seven (7) complete lists of irrigation materials and equipment, including manufacturer's name and address, specific trade names, catalog numbers complete with illustrations, manufacturer's recommendation or printed installation instructions, and/or necessary descriptive literature and clearly mark or underline proposed items.

D. Shop Drawings: Required for any irrigation structure as may be specified hereinafter in accordance with provisions of Section 01340 - SUBMITTALS in DIVISION 1 - GENERAL REQUIREMENTS.

E. Disapprovals: Contractor is responsible to promptly resubmit, for approval, necessary data concerning a substitution for a previously disapproved item or piece of equipment that may be requested by the Owner's Authorized Representative.

F. Procurement List: Use the approved list of irrigation materials and equipment for procurement without deviation unless otherwise authorized in writing by the Owner's Authorized Representative.

G. Manufacturer's recommended installation procedure which, when approved by the Owner's Authorized Representative will become the basis for accepting or rejecting actual installation procedures used on the Work.

H. Manufacturer's specifications and other data needed to provide compliance with the specified requirements.

1.3 QUALITY ASSURANCE

A. Workers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

B. Codes and Regulations: All materials and workmanship in this Section shall comply with all applicable City, County and State Plumbing Ordinances, Codes and Regulations.

C. Permit: Obtain and pay for all required Plumbing and Street Repair A permits. Deliver all permits and certifications of inspection to the Owner's Authorized Representative.

1.4 GENERAL REQUIREMENTS

A. Approvals by the Owner's Authorized Representative:

1. All approvals on required submittals hereinafter specified.

2. Approval of all resubmittals requested by the Owner's Authorized Representative.

B. Inspection: Notify the City Inspector at least 72 hours prior to time of required inspection.

C. Existing Utilities and Plant Materials: Protect utilities and/or plant materials not designated for removal or modification in place against damage resulting from work of this Contract. Perform any removal and/or modifications only on approval or instruction from the Owner's Authorized Representative or in accordance with applicable provisions noted or specified. Replace damaged existing plant material with like type and size material. Determine the cost of irreplaceable plant material according to the "square inch" method as described by the Council of Tree and Landscape Appraisers "Manual for Plant Appraisers" Handbook current edition and " Guide for Establishing Values of Trees and Other Plants".

D. Verification of Dimensions and Quantities: Verify site conditions, contract drawings, all dimensions and quantities prior to the bid. Furnish the quantities as may be necessary to do the specific work. Notify the Owner's Authorized Representative of any discrepancies between the Contract Drawings and the Project Manual and/or execution of the irrigation work prior to the bid. Do not work in areas where such discrepancies occur until further instruction by the Owner's Authorized Representative.

E. Record Drawings: Comply with provisions of the RECORD DRAWINGS AND RECORD PROJECT MANUAL section of the General Conditions. Accurately dimension location including depths of all piping, valves, and control equipment as installed. Indicate with suitable ink on one set of prints of the Contract Drawings to produce a record of complete installations; to be kept on the job and up-to-date during construction. At the completion of the work and prior to final inspection, the Contractor shall copy his record "as installed" data, using red ink, onto a set of blue line prints. The Contractor shall certify to the completeness and accuracy of the "as installed" information indicated on the blue line prints with his signature. Deliver the signed blue line prints to the Owner's Authorized Representative for review prior to start of the plant establishment period.

F. Modification of Contract Drawings: In each case where proposed substitute materials or equipment will require, for proper installation, changes to the design of the project as indicated on the Contract Drawings, appropriate proposed Revision Drawings prepared by a licensed Owner's Authorized Representative or Engineer shall be furnished by the Contractor for proper installation of the proposed substitute materials or equipment and for construction by all interested trades of the proposed revisions to the project. The cost of the Drawings and of the proposed revised construction shall be borne by the Contractor. Drawings shall be submitted for the Owner's Authorized Representative's review within 30 days after the issuance of Notice-to-Proceed.

G. Guarantee: General, in accordance with provisions of Section 28 in GENERAL CONDITIONS. Guarantee the entire irrigation system against defects in materials and workmanship for a period of one (1) year from the date of final acceptance of the Project.

1. Should any deficiencies develop within the specified guarantee period due to inferior or faulty material and workmanship, correct such deficiencies to the satisfaction of the Owner's Authorized Representative without added expense to the City.

2. The City reserves the right to make temporary repairs as necessary to keep the irrigation system equipment in operating condition. The exercise of this right by the City will not relieve the Contractor of his responsibilities under the terms of the guarantee.

3. Repair any settlement of backfilled trenches which may occur during a 30-day period after final acceptance by the Owner's Authorized Representative, to the Owner's Authorized Representative's satisfaction, without expense to the City, including the complete restoration of all damaged planting, paving, or other improvements of any kind.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver products to the job-site in their manufacturer's original containers, with labels intact and legible.

B. Storage: Store piping, materials, fitting, etc. at the job-site where directed by the Owner's Authorized Representative until such time for installation.

C. Handling: Promptly remove damaged materials and unsuitable items from the job-site and promptly replace with materials meeting the specified requirements, at no added cost to the City.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide recently manufactured materials of the best grade of each respective kind.

B. Pipe and Fittings: The type of pipe material and fittings designated on the Contract Drawings, or as hereinafter specified.

1. Plastic Pipe: High impact rigid polyvinyl chloride PVC 1220 (Type I, Grade 2), conforming to ASTM D 1785 - SPECIFICATION FOR POLY (VINYL CHLORIDE) (PVC) PLASTIC PIPE, SCHEDULES 40, 80 AND 120, the minimum pressure rating to be not less than the working pressures indicated therein for the schedule and size listed. (PVC pipe marked with product standard PS-21-70 conforms to the ASTM requirements.)

2. All Pipes: To be homogeneous throughout and free from cracks, holes, foreign materials, blisters, deleterious wrinkles, and dents.

3. Use Schedule 40 PVC pipe for pipe sizes up to and including 1 ½" diameter on both the discharge and supply side of control valves. Class 315 PVC plastic pipe shall be used for pipe sizes from 2 inch up to and including 3-inch diameter.

4. Use Schedule 80 PVC plastic pipe only, when threaded joints are specified, or otherwise permitted by the Owner's Authorized Representative.

5. All domestic piping in conjunction with a reclaimed water system shall be solvent welded Schedule 40 PVC with a continuous 3" wide aluminum backed, blue tape installed at the top of the pipe. The tape shall be labeled "POTABLE WATER", WITH 1" high white letters. A 3" wide blue tape, not aluminum backed, may be used if the contractor provides a continuous #14 un-insulated copper tracer wire. Attach the tape and tracer wire to the pipe with adhesive tape at 5 feet on center.

6. Continuously and permanently mark all pipes with the following: Manufacturer's name or trademark, size, schedule, and type of pipe, working pressure at 73 degrees F. and National Sanitation Foundation (N.S.F.) approval.

7. Fittings and Couplings for Plastic Pipe: Threaded or slip-fitting tapered socket solvent weld type. Provide SCH 80 ONLY threaded adapters with socket pipe for connections to threaded pipe. Plastic pipe fittings and couplings shall be SCH 40 PVC I or PVC I/II material, supplied for 2" and smaller. Plastic pipe fittings and couplings shall be SCH 80 PVC I or PVC I/II material, supplied for 3" and larger. Fittings and couplings shall comply with the following specifications (LASCO Pipe, Dura, or equal.).

Socket Fittings	Threaded Fittings
Schedule 40 ASTM D-2466 - SPECIFICATION FOR POLY (VINYL CHLORIDE) (PVC) PLASTIC PIPE FITTINGS, SCHEDULE 40	Schedule 80 ASTM D-2464 - SPECIFICATION FOR THREADED POLY (CHLORIDE)(PVC) PLASTIC PIPE FITTINGS,
Schedule 80 ASTM D-2467 - SPECIFICATION FOR POLY (VINYL CHLORIDE) (PVC) PLASTIC PIPE FITTINGS, SCHEDULE 80;	SCHED 80
ASTM D-1785 - SPECIFICATION FOR POLY (VINYL CHLORIDE) (PVC) PLASTIC PIPE, SCHEDULES 40, 80 AND 120	

14. All Other Metal Pipe and Fitting: All metal pipings, pipe fittings and nipples consisting brass, copper, bronze, etc. shall comply with appropriate ASTM testing standards including mercurous nitrate test.

15. Steel pipeline joints and plastic male pipe thread joints shall be made with Teflon tape applied to the male threads only.

16. Tetrahydrofuran primer tinted purple shall be used to prepare all surfaces to be solvent welded prior to the application of PVC solvent cement, no exceptions.

C. Valves and Valve Boxes:

1. General: Provide valves of the type and capacity designated on the Contract Drawings and with the requirements specified herein. All valves shall be capable of satisfactory performance at a minimum working pressure of 200 psi. Valve design shall permit disassembly for replacement of seals without removal of the valve body from the pipeline.

2. Gate Valves: In sizes 3" or smaller shall be bronze, non-rising stem, solid wedge, double disc valves with hand wheel (Nibco, or equal). Sizes 4 inches and larger shall be non-rising stem, resilient wedge, parallel seat, double disc valve provided with an operating nut. Disc shall be coated with non-corrosive plastic coating. Contractor shall provide an operating nut wrench for each five gate valves installed (Clow, or equal).

3. Automatic Remote Control Valves: Electrically operated, of brass with accurately machined valve seat surface, equipped with flow control adjustment, with capability for manual operation and readily disassembled for servicing with brass or stainless steel manual bleed capability; slow opening and closing and self-cleaning (Rain bird "GB Series or equal).

4. Hose Bibbs: Brass, Bronze except for the handle, replaceable compression disc and be 1-inch full port bent nosed, loose key operated.

5. Quick-Coupling Valves and Assemblies: Two (2) piece, brass or bronze, self-closing valves equipped with a brass or vinyl cover, built-in flow control and supplied in 1-inch size, unless otherwise required. Quick-coupler assembly shall include the valve, quick-coupler connection, and hose swivel. Contractor shall provide two quick coupler key with hose swivel for the project. Quick coupler valves installed ball field infields/dugouts shall not be placed in a valve box and shall be equipped with a locking vinyl cover (Rain Bird #44RC, Nelson #7542 or equal).

6. Valve Boxes and Covers: Pre-cast Portland cement concrete (unless otherwise indicated) 10 1/2 inches x 17 ¼ inches x 12 inches or sized as required for easy access and field servicing of the valve Eisel Enterprises or equal). Valve boxes shall have cast-iron self-locking covers, permanently embossed with 2-inch high initial identifying valve box contents:

Shut-Off Valve	SOV
Remote Control Valve	RCV
Gate Valve	GV
Quick Coupler Valve	QC
Manual Control Valve	MCV
Electrical Pull Box	ELEC
Flow Meter	FM
Master Valve	MV

D. Sprinkler Equipment:

1. Sprinkler, Bubbler Heads, and Spray Nozzles: Types and sizes shown on the Contract Drawings, with plastic nozzles.

2. Provide equipment of one type and flow characteristic from the same manufacturer and bearing the manufacturer's name and identification code in a position where they can be identified in the installed position.

3. All sprinkler heads shall be installed ½" above final grade.

4. Any soil sinkage found to exist around sprinkler heads at end of maintenance period shall be filled in level with surrounding grade with sprinkler risers' adjusted perpendicular to grade.

4. Pop-up sprinklers shall be mounted on swing joints indicated in the details.

5. Spray Head: Adjustable type from full flow to shut-off.

6. Rotary Head: Shall be gear driven with stainless steel pop-up riser.

7. Bubbler Head to be pressure compensating type.

E. Automatic Controller Unit: Type as called for on the Contract Drawings in accordance with the Project Manual. (Weathermatic or equal.).

1. The automatic controllers shall be electrically timed devices for automatically opening and closing remote control valves, with provisions for manual operation. All controllers and remote control valves supplied under this contract shall be compatible and have similar operational and adjustment features.

2. Sized to accommodate the number of stations or control valves included in the system plus 2 vacant stations.

3. Each station shall be capable of 7 independent days of programming, selective repeatability and a water budgeting program.

4. Each controller shall be provided with 117-volt and 24-volt circuit breakers, a single receptacle outlet (ground fault interrupter type) and a separate disconnect switch to remove the controller from the power source. Each controller shall have a separate white 12 gauge common wire per 12 control wires.

6. Each controller shall have the capability of programming 1 minute - to 9 hour-55 minute watering periods for each station.

7. Each controller shall have the capability of programming using 4 programs with 8 start times per program.

8. Each controller shall have the capability of operating under in two different modes: Standard mode runs using user input zone run times; Auto Adjust mode requires a Weathermatic SLW Series On-Site Weather Station to calculate weather based run times.

9. The station index shall advance directly to stations programmed to water without delay and shall not repeat until the next scheduled starting time.

10. The controllers shall be contained in a louver vented; vandal proof and weatherproof, heavy steel, zinc-plated, acrylic-enameled housing with an integral lock and lock cover. (Strong Box, or equal) Provide a 10' long by 5/8" diameter copper U.L. approved grounding rod for each controller enclosure. Make ground rod/wire connection with the CadWeld "One-Shot" connection process only. The controller shall be wall mounted as indicated on contract Drawings. The contractor shall submit shop drawing for Owner's Authorized Representative's review.

11. For sites with more than 3 acres of turf grass, controllers specified shall be "Best Management Practices" certified by the Department of Water and Power.

F. Conductors:

1. Supply line voltage conductors with THW, 600-volt insulation rating, conforming to the applicable provisions of ASTM D-2219 and 2220.

2. Low voltage control conductors shall be U.L. approved direct burial Type U.F., No. 14 AWG solid copper, unless otherwise required, in accordance with the control equipment manufacturer's recommendation. (Paige, Regency Wire, Cablex, or equal.)

G. All rigid electrical conduit shall be one (1) inch, Schedule 40, galvanized steel, threaded and bushed with packing placed in the ends to protect the wiring. Sweep ends of conduit into pull boxes to make splices.

H. Wire Connectors:

1. Low voltage wire connectors shall be a splice kits consisting of a one piece malleable plastic bulb body with internal locking fingers, filled with re-enterable gel seal. Connector shall be a non-crimping system with a flame retardant PVC insulator having a steel spring and shell within. Tube material shall be clear see-through polypropylene. The gel material shall be thixotropic calcium organic complex (DBY or BDR splice kit as manufactured by 3M Corp with Scotchlok Electrical Spring Connector).

2. Wire sizes and numbers of wires shall be as follows:

Connector	Color	No. and Size of Wire
3M DBY	Yellow	Max. 4-12 gauge UF wires
3M DBR	Red	Max. 3-14 gauge UF wires

I. Concrete Thrust Blocks and Anchoring Rods: Provide concrete thrust blocks and anchoring rod where applicable for plastic pipes with 3" inch diameter or larger, and all backflow preventer assemblies. The Portland cement concrete used for concrete thrust blocks shall be 470-B-2000 concrete and the anchoring rod shall be galvanized steel with a minimum of ½" diameter (wrapped around the pipe).

J. Crushed Rock Sump: Install 2 cubic feet of 3/4" crushed rock in all control boxes or as indicated in details. Keep crushed rock 3" clear of mainline. Crush rock shall conform to Section 200-1.2-CRUSHED ROCK AND ROCK DUST of the Standard Specifications for Public Works Construction.

K. Accessories: Provide two each special head wrenches for installing, removing and adjusting each type and make of sprinkler equipment. Provide two keys each for quick coupler valve, and controller units. For valve boxes provide one valve box cover key for each five valve boxes installed, provide a minimum two cover keys.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until detrimental conditions are corrected.

3.2 IRRIGATION SYSTEM INSTALLATION:

A. General:

1. Perform all work on the irrigation system, including hydrostatic and coverage tests, preliminary operational test of the automatic control system, and the backfill and compaction of trenches and other excavations after topsoil work and before planting.

2. Specimen plants (24-inch or larger size box) will be planted before installing the irrigation system; reroute irrigation lines conflicting with specimen plant locations to clear the root ball, if possible by twenty-four (24) inches.

3. With the Owner's Authorized Representative's direction, make adjustments where necessary to conform to actual field conditions unless otherwise noted. Irrigation system layouts shown on the Contract Drawings shall be considered schematic.

4. Make the irrigation system operational with uniform and adequate coverage of the areas to be irrigated, prior to planting.

5. All piping on the Contract Drawings shown in paved areas but running parallel and adjacent to planted areas, are intended for design clarification only and are to be installed in the planted area whenever possible.

6. No irrigation trenching shall pass closer than eight feet of the base of any tree. No tree root larger than 11/2 inches diameter shall be cut without the approval of City's Authorized Representative or Owner's Authorized Representative.

B. Trench Excavating and Backfilling: Size trenches and other excavations to accommodate the irrigation system components, conduits, pipe bedding material and other required facilities. Provide additional space to assure proper installation and access for inspections. Minimum 2 inches side clearance on each side of the pipe or conduit shall be provided in all trenches unless otherwise specified.

1. Unless otherwise specified, the minimum depth of cover over pipelines and conduits shall be as follows:

   a. Electrical conduit - 24-inches (36-inches under roadways and parking lots).

   b. Other Control Wiring - Depth of waterline or sprinkler line or a minimum of 18 inches cover if without any waterline or sprinkler line. Place adjacent to mainline if present. Bundle and tape wires at 10‘ intervals. Do not attach or tape to mainline.

   c. Waterlines continuously pressurized - 24-inches for lines up to 3” diameter, 36-inches for lines 4” diameter and larger. (36-inches under roadways and parking lots).

   d. Lateral sprinkler lines - 12-inches.

2. Make the bottom of trenches true to grade and free of protruding stones, roots, or other matter which would prevent proper bedding of pipe or other facilities.

3. Backfill trenches so that the specified thickness of topsoil is restored to the upper part of the trench and compacted to 90% relative compaction.

4. Backfill in the planting area shall be flooded in accordance with Subsection 306-1.3.3 – JETTED BACKFILL of the Standard Specifications of Public Works Construction.

5. Compact trench backfill through paved areas with each layer, not to exceed the thickness specified in SSPWC Section 306-1-3.2, to 90 percent relative compaction up to designated grade elevations to receive yard or concrete paving and base material per 306-1.3.2.

6. Resurface trenches through paved areas to match existing pavement. Contractor shall repair and bring up to grade any trenches that settled after installation.

C. Irrigation Pipeline Installation - General: Execute trench excavating and backfilling, including the depth of cover over the pipeline, in accordance with requirements of Subsection 3.2(B) and SSPWC Section 306-1.2.13, whichever is more stringent.

1. Install pipe fittings in accordance with the manufacturer's recommendations or printed installation instructions before pipe installation. In all pipe trenches, provide minimum 2-inch side clearances.

2. Bed pipe in at least 2-inches of finely divided material or cleaned sand to provide a firm, uniform bearing. Surround the pipe with additional finely divided material or clean sand to at least 2-inches over the top of the pipe. Backfill balance of trench with clean earth material and applicable base material.

3. Deposit trench backfill sufficient to anchor the pipe before the pipeline pressure testing, except that joints shall remain exposed until satisfactory completion of testing.

4. When pipelines run parallel they shall be separated horizontally by a minimum distance of 12”. When pipelines cross each other they shall be separated vertically by a minimum distance of 4”.

5. When two or more pipelines are installed in the same trench, separate the pipelines by a minimum horizontal clear distance of 4-inches. Install them so that each pipeline, valve, or other pipeline component may be serviced or replaced without disturbing the other.

6. Assemble all assemblies as specified and in accordance with the manufacturer's directions.

7. During installation of pipe, fittings, valves, and other pipeline components, prevent foreign matter from entering the system. Temporarily cap or plug all open ends at cessation of installation operations.

8. Accomplish changes in pipelines size with reducer fittings. No close nipples or bushings shall be used.

9. Place all lines under roadway or driveway having a width of less than 25 feet in a Schedule 40 PVC sleeve which is a minimum of two pipe sizes larger that the piping to pass through it. The sleeve shall be jacked under the paving at a depth of 36 inches minimum. Where remote control wiring crosses under paving having a width of less than 25 feet, a 3-inch schedule 40 PVC sleeve shall be jacked under the paving at a depth of 36 inches minimum. All sleeves shall extend 12 inches minimum beyond the edges of the paving.

10. Dissimilar metals shall be separated by an approved "Dielectric" coupling.

11. Reclaimed water pipeline installation: To comply with County Health requirements the contractor shall paint all reclaimed water, gate valve, quick coupler, flushing hydrant, air release, and remote control valve boxes and vaults on the inside and on the top of the cover with purple (Pantone 512) paint an stencil in Minimum ¾" high white letters stating "CAUTION: RECLAIMED WATER – DO NOT DRINK". Paint all reclaimed water fire hydrants with a purple (Pantone 512) color paint and stencil in minimum ¾" high white letter stating "CAUTION: RECLAIMED WATER – DO NOT DRINK". Paint all reclaimed water fire hydrants with a purple (Pantone 512) color paint and stencil "CAUTION: RECLAIMED WATER – DO NOT DRINK", in ¾" white letters. Contractor shall comply with the following:

    a. The Contractor shall arrange for continuous inspection of piping by the Los Angeles County Health Department, Cross Connection Program.

    b. No excavation or open trench may be backfilled without first securing Los Angeles County Health Department approval.

    c. The Contractor shall expose all potable water lines where new irrigation pipe crosses old or new domestic lines.

    d. Unused or abandoned water lines (domestic or other) are to be severed as close to the water mains as practicable, capped and a 10-foot section of abandoned line removed and cemented under County Health Department Supervision.

    e. Minimum pipe standards: Class 150 PVC, and higher class pipe where necessary to comply with AWWA or equivalent standards.

    f. Parallel construction: A minimum of 10 feet separation shall be maintained between domestic and reclaimed water lines.

    g. Cross-over construction: Keep pipes as close to 90 degrees as possible, with one foot separation from the outside edges of the pipes, with potable pipe above reclaimed wherever possible. Center full pipe length over the crossing.

    h. Alternate cross-over construction: Either the potable or redaimed water lines may be sleeved with the same class pipe for one full pipe length, (minimum 10 feet) centered over the cross-over.

    i. Potable and reclaimed water lines may not be laid in a common trench.

    j. Pipe bedding and backfill requirements shall be the same as for installation of potable water lines.

k. Contractor shall obtain and pay for any plumbing permits required from the Los Angeles City Department of Building and Safety.

D. Steel Pipe:

1. Square cut and ream pipe ends to full size with a long taper reamer.

2. Cut threads with clean sharp dies.

3. Make joints with a non-toxic, non-hardening joint compound applied to the male threads only.

4. Wrap steel pipe embedded in the ground with seamless 10 mil F.D.S. Safe-T-clad tape.

a. Spiral wrap pipe with uniform laps. Apply the second layer of wrap in the reverse direction of the first layer of wrap.

5. Joints and any remaining unwrapped portion of the pipeline shall be similarly wrapped after pressure testing.

E. Plastic Pipeline:

1. Join plastic pipe with socket type solvent welded fittings, threaded fittings, rubber ring fittings or by other means specified. Install steel pipe first when plastic pipe is joined to steel pipe.

2. Cut square, externally chamfer approximately 10-15 degrees and remove all burrs and fins.

3. Make solvent welded joints in accordance with ASTM D2855 - PRACTICE FOR MAKING - SOLVENT - CEMENTED JOINTS WITH POLY (VINYL CHLORIDE) (PVC) PIPE AND FITTINGS. Use Tetrahydrofuran primer tinted purple to prepare all surfaces to be solvent welded prior to the application of PVC solvent cement, no exceptions.

4. Install plastic pipe in accordance with ASTM D 2774 - PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PRESSURE PIPING and the requirements herein.

5. Exercise care in assembling a pipeline with solvent welded joints so that stress on previously made joints is avoided. Handling of the pipe following jointing, such as lowering the assembled pipeline into the trench, shall not occur prior to the set times specified by the manufacturer.

6. Apply solvent to pipe ends in such a manner that no material is deposited on the interior surface of the pipe or extruded into the interior of the pipe during jointing. Wipe off excess cement on the exterior of the joint immediately after assembly.

7. Threads for plastic pipe shall be as specified in Subsection 2.1(B)7 above. Install a plug in the bore of the pipe to prevent distortion prior to the threading.

8. Make threaded pipe joints using Teflon tape or other approved jointing material. Do not use solvent with threaded joints.

9. Protect pipe from tool damage during assembly. Use vises with padded jaws and strap wrenches for installation of fittings and nipples.

10. Remove and replace plastic pipe which has been nicked, scarred, or otherwise damaged.

11. Snake plastic pipe from side to side in the trench to allow 1-foot of expansion and contraction per 100 feet of straight run.

12. Do not expose the pipeline to water for a minimum of 24 hours after the last solvent welded joint is made.

F. Installation of Valves, Valve Boxes, and Special Equipment:

1. General: Install all valves and other equipment in strict accordance with the details in a normal upright position, unless otherwise recommended by the manufacturer, and make readily accessible for operation, maintenance and replacement.

2. Install valves of the same size as the pipeline in which they are installed, unless otherwise indicated.

3. Install shut-off valves and sectional control valves below ground; house in a covered valve box that will permit access for field servicing.

4. Install quick couplers below grade in covered valve boxes with locking lid located landscaped area 12" away from edge of paving. Boxes shall be set square to one another and adjacent fixed objects. All valves shall be run off a manifold group as shown in the Contract Drawing Details.

5. Set valve boxes and valve markers to ½" above finish grade on a minimum 12-inch deep layer of ¾ inch size crushed rock (min. 2 cubic foot) and set valves at sufficient depth to provide clearance between the cover and valve handle or key when the valve is in the fully open position. Place crushed rock below valve. Do not cover valve with rock. Valve box shall be set plumb on two 2"x4"x24" recycled plastic supports under the long axis of the valve box.

6. No equipment shall be installed closer than 12 inches to any paved surface, unless separated from the paved surface by a wall, fence, curb, or similar barrier, or installed underground.

G. Irrigation Head Installation and Adjustment:

1. General: In accordance with the requirements of Subsection 3.3 of this Section, flush and pressure test all mains and laterals, including risers before installing irrigation heads, after which perform a water coverage test.

2. Location, Elevation and Spacing:

a. Do not exceed the maximum irrigation head spacing shown on the Contract Drawings. The Department of Recreation and Parks irrigation plans are designed, as a minimum standard for head-to-head coverage. Head locations shall be scaled from the center of the head symbol directly from the irrigation plan. Accuracy of placement shall be within plus or minus one foot for all rotary heads having a throw of 25 feet or greater; with plus or minus 12 inches for all head types with a throw of under 25 feet. Where heads are located adjacent to paving, the heads shall be placed within three inches of such paving.

b. Install sprinklers heads ½" above finish grade. Adjust all heads as necessary at the end of the project to that height.

c. Install lawn sprinklers 3-inches clear of adjacent walks, curbs, paving, headers, and similar improvements.

d. All plastic sprinkler heads shall be installed with swing joint assemblies as shown in the details.

3. Irrigation Head Adjustment:

a. When all irrigation heads are installed and the irrigation system is operating, adjust and balance each section or unit with all section control valves fully open to obtain uniform 100% head to head coverage.

b. Adjust irrigation heads having adjustable pin nozzles, screws or orifices to provide adequate distribution of water over the coverage pattern. Without additional cost to the City, substitute larger or smaller nozzle cores in sprinkler heads and/or add or omit sprinkler heads as

necessary to obtain water coverage which will support healthy plant growth. Any required modification shall not alter the total GPM to a degree to require a major revision of pipe sizing.

c. At no time is the irrigation system to spray water on roadways or cause any erosion to the site.

H. Automatic Control System Installation:

1. General:

a. Install a complete automatic irrigation control system, including the automatic controller, automatic control valves and wiring, and all necessary accessories and utility service connections.

b. Install the automatic controller outside of the coverage pattern of the irrigation system at the location designated on the Contract Drawings. Verify location with Owner's Authorized Representative prior to installation.

c. Wall mounted controllers may be installed in electrical panel enclosures or buildings as indicated on the Contract Drawings.

d. Install a separate disconnect switch between the source of power and the controller and a single receptacle outlet (ground fault Interrupter type) as specified herein before. Provide fuse control components in the controller and ground the chassis.

e. Install all service wiring at the minimum depth specified in Subsection 3.2(B) of this Section in Schedule 40 galvanized steel electrical conduit from the service point to the controller. The minimum service wire shall be No. 12 AWG copper 600 volt, Type THW or THWN or larger, as required by the Contract or controller manufacturer. Locate splices only in specified pull boxes and make splices with a waterproof packaged kit approved for underground use. Set pull boxes to finish grade on a 12-inch deep layer of one (1) inch crushed rock.

f. House control wiring in conduit between the controller and an electrical pull box at the base of the controller. House control wire under all yard or concrete paved areas in Schedule 80 PVC waterline pipe sleeve. All other wiring issuing from the electrical pull box shall be direct burial and installed in the main or lateral waterline trenches wherever practical.

g. Irrigation control wiring shall be bundled and taped at an interval of approximately 10' O.C. Lay wire bundle in main line trench. Do not tape wire bundles to main line. Control wires running in the same trench as laterals lines or dead headed, the wire dept shall be maintained at 24". See Construction Document details for installation.

2. Color Code:

a. Color code all common wire white with all control wire in the following colors: red, yellow, blue, green, orange, tan, purple, pink, brown and gray. Make splices in control wire in accordance with the requirements for service wire. Leave at least 2-feet of coiled slack at each splice and point of connection inside of valve boxes.

b. Wires shall be color coded as follows:

CONTROLLER WIRE COLOR	STATION	STATIONS	STATIONS	STATIONS
RED	1	11	21	31
YELLOW	2	12	22	32

CONTROLLER WIRE COLOR	STATION	STATIONS	STATIONS	STATIONS
BLUE	3	13	23	33
GREEN	4	14	24	34
ORANGE	5	15	25	35
TAN	6	16	26	36
PURPLE	7	17	27	37
PINK	8	18	28	38
BROWN	9	19	29	39
GRAY	10	20	30	40

CONTROLLER	TAPE BUNDLE COLOR
A	RED
B	YELLOW
C	BLUE
D	GREEN
E	WHITE
F	BLACK

c. Each controller shall have a separate 12 gauge, AWG-UF, 600 volt, WHITE common wire for each of 12 consecutive stations on each irrigation controller.

Common 1 - stations 1-10
Common 2 - stations 11-20
Common 3 - stations 21-30

d. The Contractor shall run two extra black control wires from the automatic controller to the farthest valve system, or to the farthest valve at each end of the controller area, if the farthest area extends in two directions from the controller.

3. Low Voltage Wire Connections: Control wires shall be stripped of ½ inch insulation, inserted into the electrical spring connector, and the connector twisted in a clockwise direction until the wires are tight. Insert the complete splice in the gel-filled tube, and check visually to confirm that the wire nut has been pushed past the fingers and is seated in the bottom of the tube. Position wires in wire channels and close insulator cover. Crimped wire will not be accepted.

4. Testing Electrical Components:

   a. Field tests shall be performed by the Contractor on all irrigation system conductors in accordance with the requirements specified herein prior to performing the functional tests. Where conductors are installed by trenching and backfilling, such tests shall be performed after at least six (6) inches of backfill material has been placed over the conductors and backfill material has been compacted. Refer to trenching details on the drawings.

   b. Prior to the start of the functional testing, the Contractor shall perform the following tests on all irrigation system electrical conductors in the presence of the City's representative.

   c. Each circuit shall be tested for continuity and open circuits.

   d. Each circuit shall be tested for grounds.

   e. An insulation resistance test at 500-volts DC shall be made on each circuit between the circuit and the ground. The insulation resistance shall not be less than 10-megaohms on all circuits.

   f. The functional test for all the electric automatic irrigation system(s) shall consists of a minimum of fifteen (15) working days of operation during which time the controller shall complete at least three (3) complete cycles automatically for each station. The lengths and frequencies of the cycles will be determined by the City's representative. If unsatisfactory performance of the system develops, the condition shall be corrected and the test repeated until fifteen (15) working days of continuous, satisfactory operation is obtained.

   g. The functional test shall be satisfactorily completed prior to the start of the plant establishment period.

   h. Repair to the irrigation system shall be made within five (5) working days of a malfunction or damage to any portion of the system. Contractor is responsible for maintaining the proper watering requirements for new or existing plant material affected by this malfunction during repair.

5. Leave the control system in operating condition with an operational chart mounted within the controller cabinet upon completion of the work.

3.3 FLUSHING AND TESTING

A. Flushing: After completion, and prior to the installation of any terminal fittings, thoroughly flush the entire pipeline system to remove dirt, scale, or other material. Flushing shall start with the valve closest to the point of connection and proceed with each consecutive valve toward the valve farthest form the point of connection. Each lateral system shall have each riser capped during the flushing commencing with the riser closest to the valve and proceeding to the farthest riser. After flushing, conduct the following tests in the sequence listed below. Provide all equipment, materials, and labor necessary to perform the tests. Conduct all tests in the presence of the City Inspector.

   1. Perform a water pressure test on the mainlines with all control valves in place and closed. During the test, the Contractor shall provide pressure gauges downstream from the backflow device and upstream from the farthest remote control valve in the system. Air pressure testing of the irrigation system is acceptable if approved by the Project Engineer. The constant test pressure and the duration of the test are as follows:

      a. Main Line: Constant pressure test for 24 hours at 124 psi.

2. Sprinkler Coverage Test: Perform the coverage test after sprinkler heads have been installed and demonstrated that each section or unit in the irrigation system is balanced to provide uniform and adequate coverage of the areas serviced. Correct deficiencies in the system in accordance with the requirements of Subsection 3.2.

3. Operational Test: Evaluate the performance of all components of the automatic control system for manual and automatic operation. During the maintenance period, and at least 15 days prior to final inspection, set the controller on automatic operation so that the system will operate satisfactorily during such period. Make all necessary repairs, replacements, and adjustments until all equipment, electrical work, controls, and instrumentation are functioning in accordance with the Contract Documents.

3.4 OPERATING MANUALS AND EQUIPMENT

A. Furnish the City with four bound copies of operating and maintenance manuals for all irrigation system equipment such as automatic controller.

B. Explain in detail all irrigation equipment operations, watering schedule and maintenance procedures to the City personnel directed by the Inspector and Owner's Authorized Representative before completion of the project.

C. Provide the City with two copies of a controller chart showing the irrigation system installed on a half size photographic reproduction of the irrigation plan that reflects the as-built data. Each station shall be shown in a different color and control wire locations shall be indicated. The completed plans shall be laminated on each side with a 20 mil acrylic plastic sheet (hermetically sealed). A ¾" brass grommet shall be placed in each top corner. The Contractor shall obtain approval of the controller chart from the Owner's Authorized Representative before proceeding with the plastic lamination.

3.5 EXISTING IRRIGATION SYSTEM REPAIR – GENERAL

A. The Contractor shall reconstruct any existing irrigation lines that are to remain in service, when they interfere or are damaged by construction.

B. The Contractor is responsible for maintaining proper water to all plant material existing and/or new affected by construction.

C. Reconstruction or repair of the irrigation lines shall conform to the application sections of the SSPWC using all new materials except existing irrigation heads, which may be reinstalled if in good working order.

D. When modifications to an existing irrigation system are part of the project, the contractor shall verify the operation of all existing irrigation controllers, remote control valves, quick coupling valves, and irrigation heads prior to the commencement of work. The Owner's Authorized Representative shall be notified, in writing of any inoperable equipment encountered.

E. Contractor shall maintain 12 inches of cover over all lateral lines and 24 inches of cover over mainlines 3" and smaller in diameter. Mainlines 4" and larger in diameter shall have 30" of cover over the top of the pipe. Reconnect existing remote control valves to controller with approved watertight connectors.

F. Contractor is responsible for repairing and bringing up to grade any settling in trenches dug for the purpose of installing, repairing or retrofitting the irrigation system.

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SECTION 02950
TREES, PLANTS AND GROUND COVER

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. All labor, materials, equipment, and appliances necessary to provide existing lawn removal; planting of new lawn and all required testings and inspections; maintenance of existing trees as indicated on the Contract Drawings, specified herein and as needed for complete and proper installation and maintenance.

B. Related Sections:

1. Documents affecting work of this Section include, but are not necessarily limited to the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, in DIVISION 1 - GENERAL REQUIREMENTS and other Sections of the Project Manual.

2. Rough Grading in Section 02200 - EARTHWORK.

3. Irrigation System in Section 02810.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340 - SUBMITTALS of DIVISION 1 - GENERAL REQUIREMENTS of the Project Manual.

B. Make all submittals within 30 calendar days after the Notice-To-Proceed.

C. Submit seven (7) copies of the following:

1. Complete lists of landscape materials and equipment including nursery's and manufacturer's names and address, specific trade names, catalog numbers and estimate quantity; complete with descriptive literature and clearly mark or underline proposed items; list sources of landscape soils, and provide an agronomic soil tests on any imported soil.

D. Disapprovals: Promptly resubmit for approval necessary data concerning a substitution for a disapproved item.

E. Procurement List: Use the approved list of landscape materials and equipment for procurement without deviation unless otherwise authorized in writing by the Owner's Authorized Representative.

F. Work Certification And Project Closure: Prior to job acceptance, written certifications accompanied with material invoices and following submittals, shall be submitted to the Owner's Authorized Representative. Each invoice shall list on the original, the job name and delivery address. The following submittals, but not necessarily limited to, shall be made:

1. Copy of soil analysis from certified soil laboratory as outlined under Section 01 340 - SUBMITTALS.

2. Quantity and type of commercial and organic fertilizers.

3. Quantity and type of all specified soil amendments.

4. Slurry mix of Hydraulic Method of Seed Lawn Planting.

5. Quantity and type of herbicides and pesticides and their application program and registered labels.

6. Record Drawings and Record Project Manual for the irrigation and planting works.

7. Controller charts.

8. Results of mainline pressure testing (see irrigation specifications).

9. Modified Watering Schedules (if applicable).

10. Maintenance Log and Maintenance Schedules.

1.3 QUALITY ASSURANCE

A. Workers: Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

B. Codes and Regulations: All materials and workmanship in this Section shall comply with the City of Los Angeles Building Code and Amendments, County, Federal and State Codes and Regulations. Contractor shall also comply with all referenced sections of the latest edition of the Standard Specifications for Public Works Construction (SSPWC) modified by Los Angeles City Bureau of Engineering Standard Plan S-610, and all applicable Standard Plans. All SSPWC and Los Angeles City Bureau of Engineering Standard Plans are published by and available through Building News (BNI) and online. Contractor to obtain and pay for all required permits. Deliver all permits and submit certifications of compliance to the Owner's Authorized Representative.

C. Quality and Size: Comply with current edition of the "Horticultural Standards" for number one nursery stock as adopted by the "American Association of Nurserymen".

D. All Plants:

1. Shall be true to name, size and growing specifications with the names, standards and practices in "American Association of Nurserymen".

2. In all cases, botanical names take precedence over common names.

1.4 GENERAL REQUIREMENTS

A. Approvals by the Owner's Authorized Representative:

1. All required agricultural suitability and fertility analysis or testing, and weed/pest control prior to placing top soil or soil amendments.

2. All work on sprinkler irrigation system prior to start of landscaping work.

3. All reviews on required submittals hereinafter specified.

4. All resubmittals requested by the Owner's Authorized Representative.

B. Inspection: Notify the City Inspector and/or other required local governing agency at least 72 hours prior to time of the following required inspections:

1. All subgrade and fill works.

2. All weed/pest control and soil fertilizing and conditioning.

3. All plant material at time of delivery to the job-site.

4. All landscaping construction items prior to start of maintenance or plant establishment period.

C. Existing Utilities and Plant Materials: Protect utilities and/or plant materials, not designated for removal or modification, in place against damage resulting from work of this Contract. Perform any removal and/or modifications only on approval or instructions from the Owner's Authorized Representative or in accordance with applicable provisions. Replace damaged existing plant material with like type and size material. Determine the cost of irreplaceable plant material according to the "square inch" method as described by the Council of Tree and Landscape Appraisers, Guide for Plant Appraisal, current edition.

D. Existing Tree Preservation: A Department of Recreation & Parks Arborist shall be invited to the project job start meeting. The tree preservation requirements must be adhered to by the Contractor. See Contract Drawings Sheet L1, Landscape Demolition Plan, for procedures and contact personnel.

E. If a tree that is designated to remain is removed or caused to be irreversibly damaged as determined by the Department of Recreation and Parks Arborist, a replacement tree matching in size, quality and variety shall be installed using an installer approved by the Arborist.

F. Verification of Dimensions and Quantities: Verify all dimensions and quantities prior to start of work. Furnish the quantities as may be necessary to do the specific work. Promptly notify the Owner's Authorized Representative of any discrepancies between the Drawings and the Project Manual and/or actual job-site conditions which would affect the proper execution of the landscaping work. Do not work in areas where such discrepancies occur until further instructed by the Owner's Authorized Representative.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Notify the Owner's Authorized Representative of the delivery a minimum of 48 hours in advance so the plant materials may be inspected upon arrival at the job-site. All plant material judged by the Owner's Authorized Representative as unacceptable shall be removed immediately from the job-site by the Contractor.

2. Deliver fertilizer to the job-site in the original and unopened containers bearing manufacturer's guarantee chemical analysis, name, trade mark or trade name in conformance with Federal and Local law. In lieu of containers, fertilizer may be furnished in bulk and a certificate indicating the above information shall accompany each delivery.

3. Hydroseed Delivery: The contractor shall supply a delivery receipt to the Owner's Authorized Representative or authorized representative certifying conformance with the specified hydroseed mix and indicating that the slurry has not been mixed for longer than two (2) hours. Slurry which has been mixed longer than two (2) hours shall be recharged with 50 percent more of the specified seed mix, at the Contractor's expense. Delivery tickets shall be forwarded to the Owner's Authorized Representative.

B. Storage:

1. Store plants at the job-site where directed by the Owner's Authorized Representative.

2. Keep fertilizer in dry storage away from contaminants. Loose fertilizers and soil amendments shall be kept covered with a tarp.

3. Store plants not installed on the day of arrival at the job-site as follows:

a. Outside storage to be protected from wind.

C. Handling: Transport and handle plants with care to ensure protection against injury.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: All landscaping materials for soil conditioning, weed or pest control, or planting shall be first grade, commercial quality and shall have certificates.

B. Topsoil: Designated as "Imported/Class A" or "Unclassified/Class C" as specified herein. The Owner's Authorized Representative or authorized representative shall determine the suitability of topsoil prior to use. Transport topsoil from the source to its final position unless stockpiling is specified.

1. "Imported/Class A" Topsoil:

a. From a source outside the limits of the project selected by the Contractor and in compliance with Inspection requirements specified in General Conditions. Within 90 days after Notice-To-Proceed submit the proposed source of topsoil to the Owner's Authorized Representative for approval. After the Owner's Authorized Representative or authorized representative makes an initial inspection at the site of the proposed imported material, the Contractor shall perform the required tests as deemed necessary to determine that the material meets the requirements. The Contractor shall submit to the Owner's Authorized Representative a written report of a soil testing laboratory registered by the State of California for agricultural soil evaluation which states that the proposed source complies with this Section, and proposed soil amendments. After the testing report and proposed soil amendments are reviewed by the Owner's Authorized Representative, the Contractor shall comply with all the recommendations of the soil testing laboratory and add any additional soil amendments necessary to achieve proper nutrient levels to support a healthy plant growth, at no additional cost to the City.

b. "Imported/Class A" topsoil shall be of a uniform composition and structure, fertile and friable sandy loam garden soil, and be free of roots, clods and stones larger than 1-inch in greatest dimension, pockets of coarse sand, noxious weeds, sticks, brush and other litter and not be infested with nematodes or other undesirable insects and plant disease organisms.

c. "Imported/Class A" topsoil shall meet the following additional requirements:

(1) Gradation Limits: Sand - 50-80 percent, clay - 20 percent maximum, and silt - 30 percent maximum. The sand, clay and silt gradation limits shall be as defined in ASTM D-422 – TEST METHOD FOR PARTICLE – SIZE ANALYSIS OF SOILS.

(2) Permeability Rate: Hydraulic conductivity rate shall be not less than one inch per hour nor more than 20 inches per hour when tested in accordance with the USDA Handbook Number 60, method 34b or other approved methods.

(3) Agricultural Suitability and Fertility Analysis Tests: The topsoil shall be fertile and friable garden soil suitable for sustaining and promoting the growth of the specified plants. The topsoil shall comply with maximum permissible element concentration.

2. "Unclassified/Class C" Topsoil: Prior to any excavation, grading or fill works; the Contractor shall take six (6) test samples of the on-site soils at the locations and depths as specified and directed by the Owner's Authorized Representative or authorized representative. The soil samples shall be analyzed for agricultural suitability and fertility. The Contractor shall submit a written report of a soil testing laboratory registered by the State of California for agricultural soil evaluation and proposed soil amendments to the Owner's Authorized Representative for approval. Soil Amendments shall be added in accordance to the soil testing laboratory recommendations. The Contractor shall include in the construction schedule sufficient time for the testing processes and the grading work.

C. Fertilizers and Conditioning Materials:

1. Comply with the applicable requirements of the State Agricultural Code. All fertilizing materials shall be packaged, first grade, commercial quality products identified as to source, type of material, weight and manufacturer's guaranteed analysis. Fertilizing material shall not contain toxic ingredients or fillers in quantities harmful to human, animal, or plant life.

2. The Contractor shall submit a certificate of compliance stating that the material substantially complies with the Project Manual, in accordance with provisions of Subsection 1.2(b) hereinbefore specified.

3. Organic Soil Amendment: Organic Soil Amendment shall be selected products as described herein.

a. Organic Soil Amendment shall be a ground of processed wood product derived from Redwood, Fir or Cedar sawdust, or from the bark of Fir or Pine treated with a non-toxic agent to absorb water quickly and shall comply with the following requirements.

GRADATION	
Sieve Size	Percent Passing
1/4-inch #8 #35	95% minimum 80% minimum 30% maximum
Nitrogen Content	%, Dry Weight
Redwood Fir Cedar Fir Bark Pine Bark	0.4 - 0.6% 0.56 - 0.84% 0.56 - 0.84% 0.8 - 1.2% 0.8 - 1.2%

(1) Salinity: Maximum saturation extract conductivity 2.5 millimhos/centimeter at 25 degrees Celsius.

(2) Wetability: When one teaspoon of tap water is applied to 4 cubic inches of the air-dried products, the material shall become completely damp in a period not exceeding 2 minutes.

b. All Organic Soil Amendment shall conform with the following criteria:

(1) Humus material shall have an ash content of no less than 8% and no more than 50%.

(2) The pH of the material shall be between 6 to 7.5.

(3) The salt content shall be less than 10 millimho/cm at 25o C. (ECe less than 10) on a saturated paste extract. If the ECe exceeds 10 millimho/cm, the maximum rate of use shall not exceed 15% by volume.

(4) Boron content of the saturated extract shall be less than 1.0 parts per million.

(5) Silicon content (acid-insoluble ash) shall be less than 20%.

(6) Calcium carbonate shall not be present if to be applied on alkaline soils.

(7) Sludge-based materials are not acceptable if the soil already has a high level (toxic level) of zinc, copper or other heavy metals based on soil analysis.

(8) Carbon: Nitrogen ratio is less than 25:1.

(9) All compost shall be aerobic without malodorous presence of decomposition products.

(10) Maximum total permissible pollutant concentrations in amendment in parts per million on a dry weight basis:

Arsenic	20	Copper	150	Selenium	50
Cadmium	15	Lead	200	Silver	10
Chromium	300	Mercury	10	Vanadium	50
Cobalt	50	Molybdenum	60	Zinc	300
Nickel	100				

(11) Higher amounts of salinity or boron may be present if the soils are to be preleached to reduce the excess or if the plant species will tolerate the salinity and/or boron.

c. Hydroseed Additives shall meet the following guidelines:

(1) Mulch Fiber shall consist of virgin wood fiber of Aspen or Alder. It shall not contain any waste paper, newsprint or straw material. The fiber shall contain a green dye (color additive) to facilitate application.

(2) Hydroseed stabilizer shall be a tackifier consisting of natural mucloid materials (finely ground outer seed coatings) for the purpose of binding seed and soil together until germination and growth begins.

(3) Soil activator shall be a finely screened, non-abrasive combination of peat moss, composted chicken fertilizer, phosphorus and potassium having a minimum N-P-K of 1.2—1.4-5.

D. Plant Materials:

1. General: The plant names shown or listed on the Contract Drawings shall conform to the "Sunset Western Garden Book", latest edition; unless otherwise specified.

a. Type and Size: Plant materials shall be as listed on the Contract Drawings, unless otherwise instructed by the Owner's Authorized Representative.

b. All plants shall be inspected and approved prior to planting as per provisions of Subsection 1.4(B) herein before specified.

c. Substitutions: When plants of a specified kind or size are not available, substitution may be made upon approval by the Owner's Authorized Representative, in accordance with Section 12 - REFERENCE TO TRADE NAMES of the General Conditions and Section 01340 - SUBMITTAL. Contractor shall provide information regarding his attempts to locate such material.

2. Plant Material:

a. Seed - Kikuyu Grass: Fresh, clean, new crop seed, mechanically premixed to specified proportions; delivered to the site in original unopened containers bearing the dealer's guaranteed analysis and germination percentage, and a certification or stamp of release by a County Agriculture Commissioner. All seed mix shall be in original unopened containers and be subject to inspection prior to mixing.

b. Seed Lawn Planting Mixtures: Mixture of seed, fertilizer fiber, and other materials in the slurry mixture shall be as specified in the EXECUTION section of TREES, PLANTS AND GROUNDCOVER specifications.

E. Pesticides/Herbicides:

1. Pre-Emergent Herbicides: Selected from the broad spectrum of commercial brands available subject to approval by the Owner's Authorized Representative and not in conflict with the fertilizing and conditioning materials and any regulations governing its use. (Balan Granular, or equal.)

2. Post-Emergent Herbicides: Comply to all governing regulations and subject to approval by the Owner's Authorized Representative. Contractor shall identify the location of each proposed usage of Post-Emergent Herbicide. Post-Emergent Herbicide shall be type recommended or suitable for each plant material. Roundup, or approved equal shall be used for non-selective weed control.

3. Unless prohibited by the County Agricultural Commissioner, pesticides may be used for planting work. Usage of pesticides and herbicides shall conform to the requirements of the California Food and Agricultural Code and requirements. Weed oil and granular or pellet forms of pesticides shall not be used.

4. The contractor shall abide by all laws and codes governing weed abatement operations including but not limited to CAL-OSHA requirements and the Sate of California Healthy Schools Act of 2000 (AB2260), herein called "Schools Act." The areas governed by the Schools Act include but are not limited to locations adjacent to school age children.

PART 3 - EXECUTION

3.1 GENERAL

A. The Landscape work shall not be performed at any time when it may be subject to damage by climatic conditions.

B. The Contractor shall verify all dimensions shown on the Contract Documents and at the site.

C. Delivery of material shall begin only when it is ready for the work and after the inspections are made and the required samples and tests have been reviewed by the Owner's Authorized Representative. All materials furnished for the work shall be not less than the reviewed sample.

D. The Contractor shall provide temporary fencing, barricades, covering, or other protection to preserve existing landscaping items indicated to remain and to protect the adjacent properties and other structures from damages by the landscape and other contract work.

E. The Contractor shall abide by the Tree Preservation Guidelines, contract drawings Sheet L1, Landscape Demolition Plan, for all trees indicated to be saved. The Contractor shall retain the services of a tree surgeon approved by the Owner's Authorized Representative and Department of Recreation and Parks Arborist to repair damage to existing trees. Existing trees that are to be saved and which cannot be restored to full growth, as determined by the Department of Recreation and Parks Arborist shall be replaced per the Tree Preservation Guidelines. If there are oak trees on the project site the Contractor shall abide by the City of Los Angeles Oak Tree Ordinance.

F. The Contractor shall remove and/or relocate landscape items such as trees, shrubs, grass, other vegetation, improvements, and obstructions as shown on Drawings or specified otherwise. Plant material to be removed shall be disposed of off the site in a legal and proper manner.

3.2 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until detrimental conditions are corrected.

3.3 AGRICULTURAL SUITABILITY AND FERTILITY ANALYSIS TESTS

A. General: Except noted otherwise Contractor shall submit the proposed Imported/Class A Topsoil for Agricultural Suitability and Fertility Analysis. Contractor shall after completion of all rough grading operations sample all remaining on-site soil proposed to be used for top soil. The Contractor shall obtain the number of soil samples as specified and submit them to a certified soil laboratory for required soil analysis. The location of the soil sample and intent of the soil analysis are to provide the following:

1. Accurate soil amendment and fertilizer recommendations with regards to type, quantity and procedure to create planting soil for plant material which includes trees, shrubs, ground covers and turf.

2. Identify any potential problems in the relationship between specified of plant materials and existing soil conditions that may ultimately affect plant growth.

B. Samples shall be taken by a technician from certified soil laboratory. Recommendations for appropriate location, quantity, and method of obtaining samples shall be submitted by a certified technician and reviewed by the Owner's Authorized Representative.

1. Sample Taken For On-Site Soil after Completion of Grading or Clearing Operations:

a. Stockpile: Unless specified otherwise, take representative samples at locations and desired depth as directed by Owner's Authorized Representative.

b. For New Planting: Sample shall be taken 6 inches below proposed topsoil for lawn.

2. For on-site soil, use a soil probe or soil auger to remove a core samples. Otherwise use a shovel to dig a hole to the desired depth. Sample the soil from the side of the hole by scraping it with a trowel. The tools need to be clean and not rusty. Avoid sampling when the soil is to wet.

C. Contractor shall provide the Owner's Authorized Representative with a copy of the completed report on laboratory letterhead for review, in accordance with Section 11 - SHOP DRAWINGS AND MANUFACTURER'S DATA of the General Conditions prior to planting commencement.

D. Submitted recommendations shall include soil amendments and fertilization for initial planting, as well as any measures to be taken during the plant establishment period. Submittal shall include a narrative explaining the criteria employed to determine the soil sampling sites.

E. Agricultural Suitability and Fertility Analysis:

1. Must include pH measurement in the Saturation Extract, Electrical Conductivity of the saturation extract and Sodium Adsorption Ratio of the saturation extract. The approved procedures are the following:

pH	Method 21
Saturation Extract	Method 2
Sodium Adsorption Ration	Method 20b

Methods of the United States Salinity Laboratory as published in the Agricultural Handbook Number 60 entitled "Diagnosis and Improvement of Saline and Alkali Soils".

2. The following nutrients and elements must be determined with an approved extraction method. Interpretation data must be given citing concentrations which are considered to be low, medium and high:

Boron, Calcium, Copper, Iron, Magnesium, Manganese, Molybdenum, Phosphorus, Potassium, Sodium, Sulfur, and Zinc

3. The approved methods are those cited by the Council on Soil Testing and Plant Analysis and those methods currently used by Soil Scientist and Agronomists and published in Communications in Soil Science and Plant Analysis, Soil Science and Soil Science Society of America Journal. Approved methods are Mehlich Number 3, Bray P1, Bray P2, Olsen P, DTPA, Ammonium Acetate, Ammonium Bicarbonate-DTPA, and Hot Water Extract for Boron.

4. The saturation extract must be analyzed for Calcium, Magnesium, Sodium, Boron, Chloride, Nitrate and Sulfate.

5. The following trace metals must be measured by the DTPA extract:

Aluminum, Arsenic, Cadmium, Chromium, Cobalt, Lead, Lithium, Nickel, Selenium, Silver, Strontium, Tin and Vanadium.

6. The presence of Calcium Carbonate and/or Magnesium Carbonate must be determined.

7. Soil Texture and Organic Matter content may be estimated or determined by commonly used methods.

8. Interpretation of nutritional deficiencies or excesses and potential toxicities must be given.

F. Acceptable Elements:

1. The range of the essential elemental concentration in soil shall be as follows:

a. Ammonium Bicarbonate/DTPA Extraction, parts per million (mg/kilogram):

	Dry weight basis
Phosphorus	2 - 40
Potassium	40 - 220

	Dry weight basis
Iron	2 - 35
Manganese	0.3 - 6
Zinc	0.6 - 8
Copper	0.1 - 5
Boron	0.2 - 1
Magnesium	50 - 150
Sodium	0 - 100
Sulfur	25 - 500
Molybdenum	0.1 - 30

(1) If the soil pH is between 6 and 7, the maximum permissible elemental concentration shall be reduced 50%. If the soil pH is less than 6.0, the maximum permissible elemental concentration shall be reduced 75%. No more than three metals shall be present at 50% or more of the above values.

3.4 GRADING AND SITE PREPARATION:

A. Rough Grading:

1. Unless specified otherwise, remove existing soil, debris, weeds, roots and foreign material under the landscape area; perform clearing and grubbing in accordance with Subsection 3.4 of Section 02200 – EARTHWORK.

2. Scarify and compact the existing subgrade to 6" prior to backfilling with topsoil and soil conditioning. Remove during grading operation all stones over 1-inch in greatest dimension and excess soil.

3. Earthwork and Topsoil Placement: Shall include excavation and backfilling for the irrigation system and the preparation for the spreading, densification, cultivation and raking of topsoil, including fertilization and conditioning.

B. Conservation of Topsoil:

1. For Unclassified/Class C topsoil acceptable by Owner's Authorized Representative as topsoil, maintain the topsoil stockpile in a manner in which will not obstruct the natural flow of drainage.

2. Maintain the stockpiled topsoil free from debris and trash, and contamination.

3. Keep the sampled or tested stockpiled top soil from other top soil. The Contractor shall re-test any mixed top soil at no additional cost to the City.

4. Keep the stockpiled topsoil damp to prevent dust and drying out.

C. Topsoil Preparation and Conditioning:

1. Type and Thickness: Place approved Imported/Class A topsoil over the entire rough graded site, in accordance with Subsection 2.1(A), to an approximate depth, as recommended by the Owner's Authorized Representative or as indicated on the Contract Drawings.

2. Do not work topsoil when it is so wet as to cause excessive compaction or forming of hard clods, or so dry as to cause dust.

3. Compact topsoil to 90% relative compaction prior to fertilizing conditioning. Add additional topsoil where required to achieve finish grades.

D. Fertilizing and Conditioning:

1. Bring planting areas to finish grade including construction of landscape contour/ mounds before the spreading of specified fertilizer or soil conditioning materials and planting.

2. After approximate finished grades have been established, the upper 6 inches of top soil shall be conditioned and fertilized by means of mechanical tiller to the rate as specified on the drawings and the recommendations of the agricultural suitability and fertility analysis.

3. The following organic, soil amendments and fertilizer rates, and quantities are to be used for bid basis only.

Nitrogen-Stabilized (Type 1 Organic Soil Amendment):	6 cu yds per 1000 sq ft.
Commercial Fertilizer (Ammonium Phosphate 6/20/20):	15 lbs per 1000 sq ft.
Agricultural Gypsum:	100 lbs. per 1000 sq. ft.
Soil Sulfur:	20 lbs. per 1000 sq. ft.

4. Final report shall provide amendment and fertilization recommendations for the specific plant materials list as shown on the contract drawings and reviewed the Owner's Authorized Representative. The Contractor shall comply with the reviewed recommendations without additional cost to the City.

5. The quantities of such materials required for planting areas shall be at the job-site. Furnish the City Inspector with delivery tickets before spreading to verify the source, kind and quantities delivered. Furnish Owner's Authorized Representative duplicate copies of the material invoices as required in Subsection 1.2 (G).

6. After spreading of fertilizer and/or soil conditioning materials, uniformly cultivate such materials into the upper 6 inches of top soil using suitable equipment operated in at least two directions approximately at the right angles. Make the resulting soil friable.

E. Finish Grading:

1. Contractor shall verify with all Contract Drawings all areas receiving mulching. Contractor shall verify the amount of fertilizer and soil conditioning, and specified thickness of mulching to determine the finish grade. Make finish grade smooth, uniform and free of abrupt grade changes and depressions to insure proper surface drainage.

2. Finish grade below adjacent paving, curbs or headers shall be 1-inch in shrub or ground cover areas and 1-inch in lawn areas.

3. Water soil after spreading of fertilizer and/or soil conditioning materials, and allow it to settle to provide a stable surface. After the soil has dried out to a workable condition, regrade, rake and smooth to the required grades and contours. Finished surfaces to be clean and suitable for planting.

4. Finish grading shall insure proper drainage of site.

5. Eliminate all erosion scars.

3.5 WEED/PEST CONTROL

A. Unless specified otherwise, weed abatement shall apply to all planting areas. The abatement operation shall commence before planting but only after removals, grading, hardscape construction, installation of irrigation system, soil preparation, and fine grading of planting areas have been completed.

B. All herbicides for weed control shall be applied with a photosensitive dye which will produce a contrasting color when sprayed upon the ground. The dye shall be applied in a manner so as not to leave any stain upon surfaces.

C. Pesticides, as required, shall be applied by a licensed pest control applicator in accordance with the requirements of the California Food and Agricultural Code and Section 02200 – EARTHWORK specified herein. Within 90 days after the Notice-To-Proceed, a copy of the proposed application program shall be submitted to the Owner's Authorized Representative for review. The submittal shall include, but not be limited to the pesticides to be used, rates of application, methods of application, and areas to which pesticides are to be applied. Prior to commencement of application, the licensed pest control adviser must receive the Owner's Authorized Representative's approval of the program. The Contractor shall abide by all laws and codes governing weed abatement operations including but not limited to CAL-OSHA requirements and the State of California Healthy Schools Act of 2000 (AB2260).

D. Contractor shall notify the Owner's Authorized Representative a minimum of 72 hours prior to each application of pesticide/herbicide and shall indicate the hours during which the application will occur. No applications shall be made on Saturdays, Sundays, or legal holidays, unless otherwise prior approval by the Owner's Authorized Representative in writing.

E. Contractor responsibility during weed abatement operation and herbicide application shall include but not be limited to the following:

1. Seventy-two (72) hour written notice to the recreation director-in-charge, park and childcare patrons.

2. Submittal of a "Pest Control Recommendation Form" to the Owner's Authorized Representative.

3. A completed and accurate MSDS (Material Safety Data Sheet) shall be posted on the site of application, and the area of application shall be posted as such.

4. The application area shall be barricaded for public safety and appropriate signage, labels and warnings posted,

5. For sites over ½-acre in area, the contractor shall utilize a Owner's Authorized Representative approved plan of phasing the application. The plan shall be pre-approved by the Owner's Authorized Representative.

F. Any Contractor who is obligated under contract with the Department of Recreation and Parks for the construction or refurbishment of a park facility that involves the intended use of herbicides or other pesticides, must first notify the Pest Management Supervisor of the Forestry Division prior to any approved pesticide applications at any recreation/child care center. All pest control work performed at any facility shall fall within the guidelines of the Departments of Recreation and Parks IPM programs. In addition, each individual project will require a written recommendation by a licensed Pest Control Advisor for any pesticide applications.

G. Any questions regarding pesticide application and procedures at Recreation and Parks facilities shall be directed to the Owner's Authorized Representative and the RAP Forestry Group, Vegetative Management (213) 485-4826.

H. The following precautions shall be observed in handling and applying herbicides:

1. Before applying, the Contractor shall read and understand all instructions provided by the manufacturer.

2. Herbicidal product shall not be used when winds are gusty or in excess of 8 miles per hour, or when any other conditions exist which would result in drift.

3. Avoid combinations of pressure and nozzle type or adjustment that result in mist.

4. Do not apply during rain, or if rain is forecast within twelve hours. If rain occurs within a twelve-hour period, material must be reapplied after plant growth has dried out.

5. Contractor shall observe extreme care not to allow spray to contact desirable plant material. Use cardboard, plywood, or other appropriate material to shield plant materials outside of the treatment area from overspray.

6. Do not apply to bare ground.

7. Do not add other products to any herbicide mix, including spreader, stickers, or surfactants, unless required by the label directions and pre-approved by the Department of Recreation & Parks Pest Control Advisor (PCA)

I. The Contractor shall adhere to the following "Grow and Kill" methods:

1. Step 1. Clear site of all dead or living vegetative growth by hand or mechanical means.

2. Step 2. Thoroughly water all turf and planting areas daily to keep soil evenly moist for a period of at least two weeks.

3. Step 3. At the conclusion of the growth period, treat all plants within the treatment area with Roundup at an application rate of four (4) quarts of Roundup mixed in 50 gallons of clean water per acre applied by spraying. Thoroughly moisten all plant material with herbicide. If nutsedge (nutgrass) is present in any of the planting areas, "Manage" is recommended for control at a rate of 0.9. per gallon of water. Furthermore, the use of "Manage" requires the addition of 2 teaspoons (1/3 fluid ounce) of nonionic surfactant (No Foam A) to the mix.

4. Step 4. Do not water or otherwise disturb treated areas for a period of two (2) weeks.

5. Step 5. After the two-week kill period, remove all dead plants. If any living plants are observed, the entire plant, including roots, shall be removed by hand. Minimize physical disturbance of the soil.

J. New and/or existing plants which in the opinion of the Owner's Authorized Representative have been damaged by the application of pesticide/herbicide shall be replaced by the Contractor at their expense.

K. At the end of each work week, a written report of that week's applications of all pesticides/herbicides shall be submitted to the Owner's Authorized Representative.

L. Weed Suppression (Non-Herbicide Weed Removal) shall apply to all turf and planting areas. The suppression operation shall be commenced only after removals, grading, hardscape construction, installation of irrigation system, soil preparation, and fine grading of turf and planting areas have been completed. The contractor shall thoroughly water all turf and planting areas for a minimum period of two weeks prior to commencing removal. Contractor shall clear the site of all dead vegetation and living weeds by hand or mechanical means. All removed vegetation shall be properly disposed of off site.

3.6 PLANTING

A. General: All plant materials, including plants previously approved at the nursery, shall be inspected prior to planting. The Contractor shall be responsible for the condition of all plants, planted or otherwise, until final acceptance by the City and termination of maintenance period. Contractor shall be obligated to honor all requirements of warranty as indicated herein.

1. Perform planting with materials and equipment according to procedures favorable to the optimum growth of the plant. Do not plant during windy conditions.

2. Except as noted for specimen planting, start all planting operations immediately following the completion and approval of the irrigation system.

B. Protection and Storage:

1. Keep all plant materials delivered to the job-site in a healthy condition for planting.

2. Do not allow plants to dry out.

C. Layout and Plant Locations: Plant locations indicated on the Contract Drawings are approximate.

D. Lawn Planting: Complete site preparation; apply weed and pest control and the fine grading before planting the lawn.

1. Seed Lawn Planting: Accomplished by Hydraulic Method. Do not plant the seed when the wind velocity exceeds five miles per hour or is detrimental to the uniform distribution of the seed.

a. Hydraulic Method: The seed, fertilizer, fiber and other materials in the slurry mixture shall be as specified herein. All material shall be of such character that they will disperse into a uniform slurry when mixed with water. The mixture shall be such that an absorbent porous mat will be formed.

b. All materials must be available for inspection prior to application. Clearly identify the weights and contents of the containers. Use a green coloring additive in the slurry for the visual inspection purposes during application. Apply the slurry under pressure at the specified rates specified herein. Moisten areas to be planted by this method to a depth of 6" inches, but not surface wet at the time of application. Keep the hydraulically seeded areas moist during the germination period, but avoid puddling.

c. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.

3.8 MAINTENANCE AND PLANT ESTABLISHMENT

A. General Maintenance: Maintain all areas on a continuous basis as they are completed during the progress of the work and during the establishment period. Continue to maintain the area of work until final acceptance of the Contract by the City. Maintenance shall include continuous operations of picking up trash and emptying trash cans daily, watering, weeding (including all broad leaf weeds in lawn areas), mowing, rolling, edging, cultivation, fertilization, spraying, control of pests, insects and rodents, reseeding, plant replacement (irrespective of cause) or any other operations necessary to assure normal plant growth. Any malfunctions of, or damage to the irrigation system caused by the Contractor in the execution of his work shall be repaired within 24 hours. The Contractor is responsible for keeping all plant material sufficiently watered during any irrigation failures.

B. Plant Establishment:

1. Request a final inspection to begin the plant establishment and maintenance period after all planting and related work have been completed in accordance with the Contract Documents.

2. After planting is completed and approved, a field notification will be issued to the Contractor to establish the effective beginning date of the plant establishment period.

3. The Owner's Authorized Representative may extend the plant establishment period if the planted areas are improperly maintained, or if appreciable plant replacement is required, or other corrective work becomes necessary. The plant establishment period for all plants shall be for the duration of 90 calendar days.

4. Plant Establishment is considered as part of the contract works and paid for in accordance with Section 37 - PAYMENTS of the General Conditions. The Plant Establishment consists of:

   a. Maintenance of planting, including watering, plant replacement, weed and pest control, fertilization and any other conservation tasks to assure the standard rate of healthy growth and project aesthetics.

   b. Maintenance of irrigation systems.

   c. Daily Site clean-up which includes, but is not limited to trash pick-up, clearing of catch basins, and sweeping of walks.

   d. Maintain safe conditions.

   e. Perform other work as determined necessary by the Owner's Authorized Representative as specified in these Specifications.

   f. Keep all seeded and planted areas moist during the establishment period. If irrigation system is not available provide whatever watering systems is necessary to provide adequate watering during the establishment period without causing erosion detrimental to the planting area. Water all plants immediately after planting.

5. Contractor shall submit the form entitled MONTHLY MAINTENANCE SCHEDULE. They shall provide unit cost for all tasks proposed. Form shall be standard type used in the industry and completed to meet the intent of the plant establishment. This form establishes a reasonable minimum of services for plant establishment and it shall remain the responsibility of the Contractor to provide the necessary services beyond that minimum for situations due to his performance or lack thereof, to establish the plant materials in situations prior to acceptance of the Contract by the Owner's Authorized Representative.

6. All replacement plants are subject to the same inspection requirements set forth in these specifications for original plant installation.

7. Not more than twenty (20) working days prior to completion of the plant establishment period, the Contractor shall apply one application of herbicide conforming to the provisions under "Weed/Pest Control" of this Section or elsewhere in the Project Manual.

8. During the plant establishment period, damage caused by erosion shall be repaired.

9. Reconditioning: The Contractor shall notify the Owner's Authorized Representative at least five (5) days prior to applying each application of commercial fertilizer. At five (5) weeks after lawn seeding the Contractor shall apply a slow release 38-0-0 granular fertilizer at a rate of 15 pounds per 1000 sq. ft. to all lawn areas.

10. Keep all planted areas free of weeds. Cultivate weekly at intervals not to exceed 10 days.

11. Plants shall be kept watered and unsuitable plants shall be replaced.

12. During the plant establishment period, the automatic irrigation system shall be operated in the automatic mode, unless otherwise permitted by the Owner's Authorized Representative. When any automatic irrigation component is operated manually on a working day, that day will not be credited as a plant establishment working day unless the manual operation has been permitted in writing by the Owner's Authorized Representative.

13. Prior to the beginning of the plant establishment period, the Contractor shall submit for approval of the Owner's Authorized Representative, a proposed watering schedule program for each irrigation during and after the plant establishment period. The schedules shall be based upon an annual cycle and precipitation indicated below and the watering schedule indicated on Contract Drawings. Contractor shall follow the watering schedule closely and shall not deviate from the schedule without the approval from the Owner's Authorized Representative. The submitted schedule shall provide the watering times for each valve or station for different time periods.

    Average Monthly Precipitation

March, April, May	1.47 inches
June, July, August	0.10 inches
Sept., Oct., Nov.	0.74 inches
Dec., Jan., Feb.	3.32 inches

    Actual monthly precipitation rates

January	3.25 inches
February	3.55 inches
March	2.63 inches
April	1.47 inches
May	0.32 inches
June	0.08 inches
July	0.07 inches
August	0.15 inches
September	0.25 inches
October	0.67 inches
November	1.27 inches
December	3.17 inches

14. Upon completion of the plant establishment, Contractor shall submit the Final Watering schedule encased in hermetically sealed plastic. It shall be permanently attached by a short chain to the inside of the controller.

15. A Contractors representative who is competent in operating the irrigation controller(s) shall be present at the job-site when watering is in progress.

16. As part of the plant establishment period, thirty (30) days prior to a completion of the plant establishment period, written instruction shall be submitted to the Owner's Authorized Representative by a qualified person from the Contractor's personnel on the use and adjustment of the irrigation controller installed.

17. The approved written instructions by the Owner's Authorized Representative on the use and adjustment of the installed automatic controllers shall be performed and the approved watering schedule program shall be implemented within the last ten (10) working days of the plant establishment period. Such programming shall not relieve the Contractor of his responsibility to apply sufficient water as conditions may require to keep the soil and plant roots moist.

18. Weeds in all areas of the plants shall be controlled as specified herein or as directed by the Owner's Authorized Representative.

19. Surplus earth, papers, trash, and debris, within planting areas shall be removed and disposed of off-site. Such disposal shall conform to governmental regulations of all agencies having jurisdiction at the disposal site.

20. During the plant establishment period, any plant material shall be pruned by the Contractor at his expense, when directed to do so by the Owner's Authorized Representative.

C. Lawn Maintenance:

1. Perform the first mowing of lawn areas when the grass is 2-1/2 inches high and repeat as often as is necessary to maintain the lawn at a height of 1-1/2" inches. In no case shall the lawn be cut lower than 1-1/2 inches in height or allowed to grow higher than 3" unless indicated otherwise. The lawn shall be mowed a minimum of 2 times during the maintenance period.

2. After each cutting, the edge of the grass shall be trimmed to a neat and uniform line. Where trees occur in lawn areas, the grass shall be removed and neatly edged 18 inches away from the trees.

3. All grass clippings shall be collected and removed from the job site and the entire project shall be so cared for that a neat and clear condition will be presented at all times.

4. All lawn areas shall have 95 percent coverage with bare areas not exceeding three square inches.

D. Damage:

1. Replace as soon as possible plants that show signs of failure to grow at any time during the Contract period or those plants so injured or damaged so as to render them unsuitable for the purpose intended, at no additional cost to the City.

2. Provide replacement plants of the same type and size to match adjacent plants. New plants shall be inspected at the source, prior to the delivery. Furnish plant and fertilizer as specified. New plantings shall be subject to a new 90 days establishment period and guarantee specified herein.

3. Damage to planting areas shall be repaired immediately.

4. Depressions caused by vehicles or foot traffic shall be filled with topsoil and leveled.

E. Final Inspection/Final Acceptance:

1. Upon completion of the plant establishment period, a final inspection for acceptance will be performed by the City Inspector and Owner's Authorized Representative or authorized representative. The Contractor shall request for inspection at least three (3) working days prior to the anticipated date. For this inspection, the site must be thoroughly cleared of all debris and excess material removed. If work fails to pass final inspection, any subsequent inspection must be rescheduled as per above, and will be charged to the Contractor.

2. If the plant establishment period is satisfactorily completed ahead of other work included in the Contract, the plants establishment shall be extended and shall be the responsibility of the Contractor until all other work has been completed and accepted by the City.

3.9 GUARANTEE

A. Deficiencies: Should any deficiencies develop within the specified guarantee period, correct such deficiencies to the full satisfaction of the Owner's Authorized Representative without added expense to the City. All replacement plants shall be subject to a new guarantee for a period as described herein above.

3.10 FINAL CLEAN-UP

A. Required: Comply with provisions of Section 01710 - CLEANING of the GENERAL REQUIREMENTS. Upon completion of all landscape work and before final acceptance, remove all tools, surplus materials, apparatus, debris, weeds and exterminate rodents from the job-site. Leave the job-site in a neat, clean condition, acceptable to the City Inspector. Wash, clean and leave all paved areas without stains.

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SECTION 02999
TEMPORARY HANDLING OF SEWAGE FLOW AND STORM DRAINAGE

PART 1 - GENERAL

1.1 WORK DESCRIPTION

A. This Section provides the specification for the CONTRACTOR'S responsibilities for the temporary handling of sewage flow throughout the construction of the project. This includes, but is not limited to; handle sewage flow while connecting piping to the sewer manhole near Rose Avenue and Sunset Avenue, and rerouting the sewer in Frederick St. ROW north of Rose Avenue, and the modifications to the storm drain culvert in Rose Avenue.

B. When referring to "sewage" it shall be understood to include both sanitary sewage as well as flow in storm drains as indicated on the drawings and as specified herein.

1.2 CONTRACTOR SUBMITTALS

A. Unless otherwise indicated, the following shall be submitted to the ENGINEER 15 days after receiving the Notice to Proceed, in compliance with the General Requirements, and as specified herein:

1. Sewage bypass pipe material and fittings.

2. Plans showing details of proposed method of temporary handling of sewage flow, routing of bypass lines, containment areas, equipment location, schematic of pump set-up and discharge, and proposed sequencing.

3. Pump characteristic curves, electrical, controls, and instrumentation.

4. Spill Prevention, control, and countermeasure plan as described in Part 3 of this specification.

1.3 PAYMENT

A. Unless otherwise provided in these specifications, full compensation for temporary handling of sewage and the spill prevention, control and countermeasure plan shall be included in the contract unit price for which such work is appurtenant thereto, and no additional allowance shall be made therefore. Said various contract unit priced shall include all labor, materials, tools, and equipment necessary or incidental to the temporary sewer service operations. The CITY forces will not assist the CONTRACTOR with flow handling during the work.

PART 2 - PRODUCTS

2.1 PUMPING EQUIPMENT

A. In the event the CONTRACTOR elects to use engines to drive pumps, the engines shall be muffled in such a manner that the maximum noise level will not exceed 80 dBA at a distance of five feet from the engine. Regardless of the noise level, soundproofing shields not less than eight feet high shall be provided around each engine by the CONTRACTOR to absorb noise. Standby

pumping equipment shall be at the site continuously during pumping to provide 100 percent standby pumping capacity. The CONTRACTOR shall provide manpower to continuously monitor the pumping equipment on a 24-hour basis while in operation and activate standby equipment, if necessary.

2.2 TEMPORARY PLUGGING OF SEWER

A. Plugs shall be a heavy-duty inflatable type with a steel rod through plug centerline, a retaining plate and an eye-lift on both ends. Plugs shall be new, made of natural rubber and shall show no cracks or signs of damage. The plugs shall have a flexible sealing design to compensate for any irregular interior surface of the influent sewer pipe or channel. The plug length shall be suitable for the specific application as shown in the drawings. Plugs shall be equipped with continuous pressure monitoring and an audible alarm when pressure drops below 25 psi. The plug pressure rating shall not be less than 30 psi. The eye-lifts shall be secured to a stainless steel pulling cable. The pulling cable shall be a minimum of 5/8-inch in diameter.

PART 3 - EXECUTION

3.1 TEMPORARY HANDLING OF SEWAGE

A. The CONTRACTOR shall construct, operate, maintain, and remove, without damage to existing structures, all temporary sewage handling facilities. The CITY's forces will not assist the CONTRACTOR with flow handling during work. The CONTRACTOR shall submit details of his proposed method of temporary handling of sewage flow for review and acceptance by the ENGINEER. The CONTRACTOR shall investigate and monitor the flow conditions in the existing sewers at the new manhole locations for flow depth and duration of low and high flow periods. Flow data on the existing CITY facilities is available from the Bureau of Sanitation. However, the CITY does not guarantee the depth of flow during the construction. Temporary means may require the construction of bypass lines and bulkheads, pumping, or a combination thereof.

B. Under no circumstances shall sewage or solids be deposited onto the ground surface, streets, or into ditches, catch basins or storm drains or natural drainage ways. Sewage shall be handled in a manner so as not to create a public nuisance or health hazard.

C. The CONTRACTOR shall be responsible for continuity of sanitary sewer service to all facilities and properties connected to the sewers during the execution of the work to be performed under this Contract. In the event that sewage backup occurs and enters dwellings or other structures, the CONTRACTOR shall be responsible for cleanup, repair, property damage costs, fines imposed by jurisdictional authorities, and all claims arising therefrom. All spills shall be contained and returned to the sewer system.

3.2 SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN

A. The CONTRACTOR shall prepare, submit and carry out a spill prevention, control and countermeasure plan that incorporates the following:

1. The CONTRACTOR shall include or reference in the plan, materials provided as submittals per 1.2 above.

2. The CONTRACTOR shall provide in the plan a description of all emergency equipment for bypassing flow, containment, cleanup, and repair of any damage. Specifics shall include as applicable, but are not limited to:

   a. Pipe patch kits

   b. Sand bags

   c. Rubber matting

   d. Bypass pipes, pumps, and other relevant equipment

   e. Extra pumps

   f. Secondary containment in trench or other surrounding land relief

3. The CONTRACTOR shall maintain equipment on site.

4. The CONTRACTOR shall provide at least three (3) people who can be contacted 24 hours per day by phone to address on site emergencies. The CONTRACTOR shall provide the daily schedule with names, phone numbers, and hourly working schedules of three persons that may be brought on site any time. CONTRACTOR shall provide notification of any substitution in writing at least two days in advance. When bypassing flows, CONTRACTOR shall have at least two people on site 24 hours per day to monitor and maintain the bypass and implement the emergency procedures in case of an emergency.

5. The CONTRACTOR shall describe the method used to protect storm drains during construction on the plan. The description shall include where the storm drains are located (simple map of sewer pipe, storm drains, waterways, and any relief features) that could assist in containing the spill. The plan shall describe how storm drains will be blocked in the event of a spill (what material, who will do it, how long will it take). Describe any other response-related plans (bypass pumping set ups, etc.).

   a. The CONTRACTOR shall coordinate the plan with the construction storm water management Best Management Practices (BMP) to protect water quality and respond to spills of sewage, groundwater, or fuels, ensuring there are no conflicts with implementing each of the respective programs. The CONTRACTOR shall describe all spill prevention measures (e.g. monitoring of upstream manholes, monitoring in the trench).

6. The following spill procedures shall be incorporated into the CONTRACTOR'S plan.

   a. If a spill is detected or a catastrophic pipe failure occurs, the immediate priority of the CONTRACTOR shall be to prevent any sewage from reaching surface waters and storm drains. The CONTRACTOR shall immediately protect all drains using rubber mats or sand bags (have sand bags on site).

   b. The CONTRACTOR shall anticipate the following failure mode in his plan and be prepared to act accordingly.

   c. As the CONTRACTOR is excavating for a new trench and comes across moderate leaks in the existing pipe, the CONTRACTOR shall make coupling/clamp repairs as soon as possible to minimize sewage flow into the trench. If the leak is too large to make fast coupling repair, the CONTRACTOR shall start by passing (see by passing sequence below), then make repair.

   d. In case of catastrophic leak, the CONTRACTOR shall immediately start the bypassing sequence:

      (1) Plug downstream side of the manhole upstream from the leak.

(2) Insert bypass pump. The pump shall be sized to handle peak flow of existing sewer. The CONTRACTOR shall contact the CITY for flow data before construction starts. The CONTRACTOR is to provide spare pump or set up standby pump availability with rental yard.

(3) Connect hose from pump to discharge point. NOTE: Hose shall already be in place and connected to a downstream discharge point at all times when working near or with live sewers.

e. In event of any spill, the CONTRACTOR shall immediately and in parallel with above activities, notify the City of Los Angeles, Bureau of Sanitation Wastewater Collection Systems Division at (323) 342-6006 or at (213) 485-7575 after hours and request the CITY staff to be dispatched. The CONTRACTOR should attempt to give the best indication of the approximate size of the spill (<1,000 gallons is small; 1,000 gallons to 10,000 gallons is medium; and > 10,000 gallons is large) along with the approximate amount, if any, of sewage reached a storm drain or channel to the Control Center staff so they can dispatch the appropriate response.

f. Collections staff will respond to monitor the CONTRACTOR'S clean-up related activities to ensure the spill is cleaned in accordance with City standards and permit. It is the CONTRACTOR'S responsibility to provide the primary means for pipe repair and spill recovery and clean-up including mobilizing any necessary equipment to be onsite within an hour of a spill. Clean up may require a sweeper truck, Vactor truck, and/or other equipment. All CITY time and material and special equipment for spill cleaning will be deducted from the CONTRACTOR'S progress payment

g. The CONTRACTOR shall attempt to pond the water in an area away from storm drains that can be easily and fully recovered for discharge to the CITY's collection system. This ponding activity should not impact any environmentally sensitive areas.

h. The CONTRACTOR and ENGINEER with the assistance of the City's Bureau of Sanitation staff shall coordinate the most efficient and appropriate response, repair, and cleanup as soon as possible. The CONTRACTOR will cooperate with the CITY staff to the fullest extent possible in order to minimize the impacts and volume of the spill in the most efficient manner possible.

i. NO form of disinfection is allowed (especially if the water is reaching State waters). All wash water and sewage-contaminated wash water must be contained and recovered in the same manner as the sewage.

j. In the event of a spill, the CONTACTOR shall be prepared to document the spill, its likely cause, and the coordinated response with a video camera and photographs. The CONTRACTOR is required to attend a debriefing immediately after the spill is contained and cleaned up.

7. The CONTRACTOR shall comply with the Regional Water Quality Control Board, Health Department, and the CITY Standards, permits, and regulations. The CONTRACTOR shall cooperate with DISTRICT staff and other regulators and environmental agencies. In the event the Regional Water Quality Control Board levies a fine on the City because of a sewage spill caused by the Contractor (directly or indirectly) due to his lack of attention to procedures or other negligence, the CONTRACTOR shall be held responsible and the City will withhold the entire amount of any fine imposed by the Regional Water Quality Control Board from the payment to the CONTRACTOR. The California Water Code gives the Regional Water Quality Control Board authority to fine up to $10 per gallon and $10,000 per day for an illicit discharge.

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Division 03 — Concrete

SECTION 03100
CONCRETE FORMWORK

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all materials for concrete formwork, bracing, shoring, and supports and shall design and construct all falsework and scaffolding, all in accordance with the provisions of the Contract Documents.

B. Definitions:

1. Exposed Concrete: All concrete that is visible in the finished work, including concrete to be painted.

2. Unexposed Concrete: All other concrete that is concealed in the finished work, including plastered surfaces and attic and utility spaces.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 Earthwork.

B. Section 03200 Reinforcement Steel.

C. Section 03230 Earthquake Cables.

D. Section 03255 Wall Base and Top Joint.

E. Section 03290 Joints in Concrete.

F. Section 03300 Cast-in-Place Concrete.

G. Section 03315 Grout.

H. Section 03370 Concrete Curing.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Comply with the reference standards and Standard Specifications as specified in the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards, as applicable:

1. Government Standards:

PS 1	U.S. Product Standard for Concrete Forms, Class I
PS 20	American Lumber Softwood Standard
CSS	Caltrans Standard Specifications

2. Commercial Standards:

ACI 347	Recommended Practice for Concrete Formwork
ACI 117	Standard Tolerances for Concrete Construction and Materials

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. The following submittals and specific information shall be provided.

1. Falsework Calculations and Drawings: The CONTRACTOR shall comply with all the latest applicable Sections of the Division of Industrial Safety, Construction Safety Orders. For all falsework or vertical shoring installations where the height of the falsework or vertical shoring, as measured from the top of the sills to the soffit of the superstructure, exceeds 14 feet, or where individual horizontal span lengths exceed 16 feet, or where provision for vehicular, pedestrian, or railroad traffic through falsework or vertical shoring is made, Plans and Calculations shall be prepared and signed by a Civil Engineer, registered in the State of California. A copy of the falsework plan or shoring layout shall be available on the job site at all times. The Engineer who designed the falsework or vertical shoring shall personally inspect such work and provide a written certification that the work conforms to the design.

2. Scaffolding Calculations and Drawings: Scaffolding shall be defined in accordance with and shall conform to the Construction Safety Orders of the Division of Industrial Safety. If scaffolding is constructed for this project over or adjacent to traffic, or suspended from the traveled way, the Contractor shall submit to the Engineer working drawings for scaffolding systems. The scaffolding manufacturer's name, address, and phone number shall be shown on the working drawings. The working drawings, details and calculations for the scaffolding shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California. In addition, prior to submitting the working drawings to the Engineer, the working drawings shall be stamped and signed by an independent reviewer who is registered as a Civil Engineer in the State of California. The independent reviewer shall not be employed by the same entity preparing the working drawings.

C The CONTRACTOR shall, in accordance with the requirements in GENERAL REQUIREMENTS file with the City detailed plans of the falsework and scaffolding proposed to be used. Such plans and calculations shall be in sufficient detail to indicate the general layout, pattern layout, dimensioned to precisely locate grooves, form panel jointing, and similar features. The submittal shall also include sizes of members, anticipated stresses, grade of materials to be used, and typical soil conditions.

1. Form Release Compound

2. Form Ties and Spreaders

3. Installation Instructions

1.5 QUALITY ASSURANCE

A. Tolerances: The variation from established grade or lines shall not exceed 1/4-inch in 10 feet and there shall be no offsets or visible waviness in the finished surface. All other tolerances shall be within the tolerances specified in ACI 117, unless noted otherwise.

B. Laborers: Use adequate number of skilled laborers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

C. Prior to construction of formwork for concrete beams and slabs above grade, Contractor shall conduct a meeting at the site to determine and define all cambers required for the project. ENGINEER, Contractor and Contractor's formwork installer shall be in attendance at this meeting.

D. Engage a licensed surveyor to verify that work is within specified tolerances. Surveyor shall report in writing to the ENGINEER, with copy to Contractor, certifying work as acceptable or indicating deviations from allowable tolerances.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials for forms in timely manner to ensure uninterrupted progress.

B. Store materials by methods that prevent damage and permit ready access for inspection and identification.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Except as otherwise expressly accepted by the ENGINEER, all lumber brought on the job site for use as forms, shoring, or bracing shall be new material. All forms shall be smooth surface forms and shall be of the following materials:

Walls	-	Steel or plywood panel
Columns	-	Steel, plywood or fiber glass
Roof, floor, deck and soffit	-	Plywood, Steel Panels
All other work	-	Steel panels, plywood or tongue and groove lumber

2.2 FORM AND FALSEWORK MATERIALS

A. Materials for concrete forms, formwork, and falsework shall conform to the following requirements:

1. Lumber shall be Douglas Fir or Southern Pine, construction grade or better, in conformance with U.S. Product Standard PS20.

2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Pine plywood manufactured especially for concrete formwork and shall conform to the requirements of PS 1 for Concrete Forms, Class I, and shall be edge sealed.

3. Form materials shall be metal, wood, plywood, or other material approved by the ENGINEER that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line, and grade shown. Metal forms shall be an approved type that will accomplish such results.

   a. Forms for exposed exterior concrete surfaces shall be American Plywood Association (APA) High Density Overlay (HDO) Plyform Class I Ext. 48" X 96" X 3/4" minimum thickness.

   b. Forms for other concrete surfaces shall be American Plywood Association (APA) Douglas Fir B-B Plyform Class I Exterior PS 1, 3/4-inch minimum thickness.

4. Coated Form Plywood: For exposed painted concrete, plastic overlaid plywood of grade specified above, factory coated with a form coating and release agent equal to “Noxcrete”.

5. Tube forms: Sonoco “Seamless Sonotubes”, Alton Building Products “Sleek Seamless Standard Wall”, or equal, type leaving no marks in concrete, 1-piece lengths for full required height.

B. Unless otherwise shown, exterior corners in exposed concrete members shall be provided with 3/4-inch chamfers. Re-entrant corners in concrete members shall not have fillets unless otherwise shown.

C. Forms and falsework to support the roof and elevated floor slabs shall be designed for the total dead load, and a minimum construction live load of 30 psf .

D. Forms proposed for use at bridges shall comply with Caltrans Standard Specification Section 51.

2.3 FORM TIES

A. Form ties with integral waterstops shall be provided with a plastic cone or other suitable means for forming a conical hole to insure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties, or of other removable form-tie fasteners having a circular cross-section, shall not exceed 1-1/2-inches; and all such fasteners shall be such as to leave holes of regular shape for reaming.

B. Form ties for water-retaining structures shall have integral waterstops. Removable taper ties may be used except for water bearing structures, when approved by the ENGINEER. A preformed neoprene or polyurethane tapered plug sized to seat at the center of the wall shall be inserted in the hole left by the removal of the taper tie.

2.4. FORM RELEASE COMPOUND

A. Form release compound shall be non-staining clear coating free from oil, silicone, wax, and not grain-raising and shall be NSF approved. Use “Nox-crete Form coating” by Nox Crete, “Formshield” by Euclid Chemical Company, “Burke Bio Release” by Edoco, or “Cast-Off” by Sonneborn, or an approved equal. Where form liners are used, provide form compound recommended by form liner manufacturer. However, regardless of product use, provide form compound that is VOC compliant for the area used.

2.5 EARTH FORMS

A. Unless otherwise indicated or required, concrete for footings and pile caps may be placed directly against vertical excavated surfaces, provided the material will stand without caving, that minimum reinforcing steel clearances are maintained, and suitable provisions are taken to prevent raveling of top edges or sloughing of loose material from walls of excavation. Sides of excavation shall be made with a neat cut and the width made as indicated. Concrete which is exposed to view on exterior shall be formed to maintained depth of 6 inches below finished grade.

PART 3 -- EXECUTION

3.1 GENERAL

A. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The CONTRACTOR shall assume full responsibility for the adequate design of all forms, and any forms which are unsafe or inadequate in any respect shall promptly be removed from the WORK and

replaced at the CONTRACTOR's expense. A sufficient number of forms of each kind shall be provided to permit the required rate of progress to be maintained. The design and inspection of concrete forms, falsework, and shoring shall comply with applicable local, state and Federal regulations. Plumb and string lines shall be properly installed before concrete placement and shall be maintained during placement. Such lines shall be used by CONTRACTOR's personnel and by the INSPECTOR and shall be in sufficient number and properly installed. During concrete placement, the CONTRACTOR shall continually monitor plumb and string line form positions and immediately correct deficiencies.

B. Concrete forms shall conform to the shape, lines, and dimensions of members as called for on the Drawings, and shall be substantial, free from surface defects, and sufficiently tight to prevent leakage. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly-placed concrete. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

C. Camber: Place suitable jacks, wedges, or similar means to induce camber and to correct settlement in forms before and during concrete placing. Camber shall be as determined in pre-installation meeting specified above. In general, formwork shall be capable of accommodating camber of 1/8" per 10' of span plus 1/4".

3.2 FORM DESIGN

A. All forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. Plywood, 3/4-inch and greater in thickness, may be fastened directly to studding if the studs are spaced close enough to prevent visible deflection marks in the concrete. The forms shall be tight so as to prevent the loss of water, cement and fines during placing and vibrating of the concrete. Specifically, the bottom of wall forms that rest on concrete footings or slabs shall be provided with a gasket to prevent loss of fines and paste during placement and vibration of concrete. Such gasket may be a 1- to 1-1/2-inch diameter polyethylene rod held in position to the underside of the wall form. Adequate clean-out holes shall be provided at the bottom of each lift of forms. The size, number, and location of such clean-outs shall be as acceptable to the INSPECTOR.

B. Actual form design shall conform to ACI 347.

C. For concrete mixes characterized as self-consolidating concrete, high performance concrete, or known to contain components that can potentially extend the plastic state of the concrete, the forms shall be designed to sustain the resulting hydrostatic pressure for the total pour height or pressure head for that day of pour, whichever is more. For such mixes, appropriate set-time tests shall be conducted in preparation of the mix design and this information made available to the form designer.

3.3 CONSTRUCTION

A. Vertical Surfaces: All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is shown. Not less than 1-inch of concrete shall be added to the thickness of the concrete member as shown where concrete is permitted to be placed against trimmed ground in lieu of forms. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.

B. Construction Joints: Concrete construction joints will not be permitted at locations other than those shown or specified, except as may be acceptable to the ENGINEER. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete. Pipe stubs and anchor bolts shall be set in the forms where required.

C. Provide for openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts and other features as required. Fill form joints to produce smooth surfaces, intersections, and arrises. Use polymer foam or equivalent fillers at joints and where forms abut or overlap existing concrete to prevent leakage of mortar.

D. Set embedded piping and rough hardware in forms to be embedded in concrete in a manner so that the required strength of the structure will not be reduced.

D. Apply form release compound on formwork in accordance with manufacturer's instructions prior to placing of reinforcing steel, anchorages, and embedded items.

E. Construct forms suitable for removal without hammering or prying against and damaging the concrete.

F. Openings in Forms: Provide as required to facilitate cleaning and inspection. Close such openings immediately after cleaning and before placement of concrete. Provide air relief holes in formed top surfaces of concrete elements as required.

H. Form Ties:

1. Embedded Ties: Holes left by the removal of form tie cones shall be clean and rough before being filled with mortar as specified for "Finish of Concrete Surfaces" in Section 03300, "Cast-in-Place Concrete". Wire ties for holding forms will not be permitted. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1-inch back from the formed face or faces of the concrete.

2. Removable Ties: Where taper ties are approved for use in non water bearing structures, the larger end of the taper tie shall be on the wet side of walls in water retaining structures. After the taper tie is removed, the hole shall be thoroughly cleaned and roughened for bond. A precast neoprene or polyurethane tapered plug shall be located at the wall centerline. The hole shall be completely filled with non-shrink grout for water bearing and below-grade walls. The hole shall be completely filled with non-shrink or regular cement grout for above-grade walls which are dry on both sides. Exposed faces of walls shall have the outer 2-inches of the exposed face filled with a cement grout which shall match the color and texture of the surrounding wall surface.

I. Coordination:

1. Provide slots, openings, chases, recesses, grounds, nailers and screeds required by other trades and subsequent work.

2. Ensure that conduit, pipes, sleeves, anchors, hangers and ties are secured in forms before concrete is placed.

3.4 REUSE OF FORMS

A. Forms may be reused only if in good condition and only if acceptable to the INSPECTOR. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces which are permanently exposed to view. In the case of forms for the inside wall surfaces of water retaining structures, unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the INSPECTOR.

3.5 REMOVAL OF FORMS

A. Careful procedures for the removal of forms shall be strictly followed, and this work shall be done with care so as to avoid damage the concrete. No heavy loading on green concrete will be permitted. The period of time for formwork removal shall be in accordance with ACI 318, Chapter 6 and Section 303-1.4 of Standard Specifications and as follows:

1. Do not remove formwork until concrete has attained sufficient strength to support its own weight and all superimposed loads including construction loads and to permit form and falsework removal with complete safety.

2. In the case of concrete members subject to bending stresses, where the member relies upon forms for vertical support, forms shall remain in place until test cylinders attain a minimum comprehensive strength of 75 percent of the 28-day strength specified in Section 03300, "Cast in-Place Concrete", provided, that no forms shall be disturbed or removed under individual panel or unit before the concrete in the adjacent panel or unit has attained 75 percent of the specified 28-day strength and has been in place for a minimum of 7 days.

3. Forms for roofs and elevated slabs shall remain in place a minimum of 10 days after concrete has been placed.

4. Forms for all vertical walls and columns shall remain in place at least 3 days after the concrete has been placed.

5. Formwork removal shall also be subject to the curing requirements of section 3370 of these specifications and as authorized by the ENGINEER.

6. Reshore structural members as specified below because of design requirements or construction conditions to permit successive construction.

B. The time required to establish said strength shall be determined by the ENGINEER based on test cylinders made for this purpose from the concrete placed and in accordance with ACI 318 and the curing requirements of section 3370. If the time so determined is more than the minimum time specified above, then that time shall be used as the minimum length of time. Forms for all parts of the WORK not specifically mentioned herein shall remain in place for periods of time as determined by the ENGINEER.

3.6 FORMWORK TOLERANCES

A. Deflection: Limit deflection of forming surfaces from concrete pressure to L/240.

B. The following construction tolerances are hereby established and apply to finished walls and slabs unless otherwise shown:

Item	Tolerance
Variation of the constructed linear outline from the established position in plan.	In 10 feet: 1/8-inch; In 20 feet or more: 1/4-inch
Variation from the level or from the grades shown.	In 10 feet: 1/8-inch; In 20 feet or more: 1/4-inch
Variation from the plumb	In 10 feet: 1/8-inch; In 20 feet or more: 1/4-inch
Variation in the thickness of slabs and walls.	Minus 1/8-inch; Plus 1/4-inch
Variation in the locations and sizes of slabs and wall openings	Plus or minus 1/8-inch

3.7 MAINTENANCE OF FORMS

A. Forms shall be maintained at all times in good condition, particularly as to size, shape, strength, rigidity, tightness, and smoothness of surface. Forms, when in place, shall conform to the established alignment and grades. Before concrete is placed, the forms shall be thoroughly cleaned. The form surfaces shall be treated with a nonstaining mineral oil or other lubricant acceptable to the ENGINEER. Any excess lubricant shall be satisfactorily removed before placing the concrete. Where field oiling of forms is required, the CONTRACTOR shall perform the oiling at least two weeks in advance of their use. Care shall be exercised to keep oil off the surfaces of steel reinforcement and other metal items to be embedded in concrete.

3.8 FALSEWORK

A. The CONTRACTOR shall be responsible for the design, engineering, construction, maintenance, and safety of all falsework, including staging, walkways, forms, ladders, and similar appurtenances, which shall equal or exceed the applicable requirements of the provisions of the OSHA Safety and Health Standards for Construction, the requirements of the Construction Safety Orders of the California Division of Industrial Safety, and the requirements specified herein.

B. All falsework shall be designed and constructed to provide the necessary rigidity and to support the loads. Falsework for the support of a superstructure shall be designed to support the loads that would be imposed if the entire superstructure were placed at one time.

C. Falsework shall be placed upon a solid footing, safe against undermining, and protected from softening. When the falsework is supported on timber piles, the maximum calculated pile loading shall not exceed 20 tons. When falsework is supported on any portion of the structure which is already constructed, the load imposed by the falsework shall be spread, distributed, and braced in such a way as to avoid any possibility of damage to the structure.

D. Reshoring:

1. Minimum reshoring with falsework shall consist of not less than half the full required falsework added under the last placed floor over which full falsework is to be placed for the next floor above. Leave reshoring in place for at least 10 days after the floor above is placed, but in no case remove falsework until the next concrete placing has attained a compressive strength equal to 75% of that required for the 28 days age as determined by controlled test cylinders.

2. Maintain a form and falsework removal record.

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SECTION 03200
REINFORCEMENT STEEL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish, fabricate, and place all concrete reinforcement steel, welded wire fabric, couplers, and concrete inserts for use in reinforced concrete and masonry construction and shall perform all appurtenant work, including all the wires, clips, supports, chairs, spacers, and other accessories, all in accordance with the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 Concrete Formwork.

B. Section 03230 Earthquake Cables..

C. Section 03290 Joints in Concrete.

D. Section 03300 Cast-in-Place Concrete.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Comply with the reference standards of the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards, as applicable:

1. Commercial Standards:

ACI 315	Details and Detailing of Concrete Reinforcement.
ACI 318	Building Code Requirements for Reinforced Concrete.
ACI 350	Code Requirements for Environmental Engineering Concrete Structures.
ACI 530	Building Code Requirements & Specifications for Masonry Structures
WRI	Manual of Standard Practice for Welded Wire Fabric.
AWS D1.4	Structural Welding Code - Reinforcing Steel.
ASTM A 82	Specification for Steel Wire, Plain, for Concrete Reinforcement.
ASTM A 185	Specification for Welded Steel Wire Fabric For Concrete Reinforcement.
ASTM A 497	Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
ASTM A 615	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
ASTM A 706	Low-alloy Deformed Steel Bars for Concrete Reinforcement

CRSI Manual of Standard Practice

CRSI Recommended Practice for Placing Bar Supports, Specifications and Nomenclature

CRSI Recommended Practice for Placing Reinforcing Bars

2. Government Standards:

CSS Caltrans Standard Specifications.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. The following submittals and specific information shall be provided.

1. The CONTRACTOR shall furnish shop bending diagrams, placing lists, splice lengths and location, and drawings of all reinforcement steel prior to fabrication in accordance with GENERAL REQUIREMENTS.

2. Details of the concrete reinforcement steel and concrete inserts shall be submitted by the CONTRACTOR at the earliest possible date after receipt by the CONTRACTOR of the Notice to Proceed. Said details of reinforcement steel for fabrication and erection shall conform to ACI 315 and the requirements specified and shown. The shop bending diagrams shall show the actual lengths of bars, to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross section) of the outside surface. The shop drawings shall include bar placement diagrams which clearly indicate the dimensions of each bar splice.

1.5 QUALITY ASSURANCE

A. The CONTRACTOR shall make provisions for sampling reinforcing steel delivered to the job site. Two sampling bars, cut from different bars and 3 feet in length for bar sizes # 3 through # 5 and 5 feet in length for bars sizes # 6 and larger, shall be taken from each 10 tons or fraction thereof, of each size and heat number delivered to the job site. When the name of the manufacturer, heat identification number, or chemical analysis is not known, the sampling interval shall be each 2.5 tons or fraction thereof, of each bar size and heat number. Tests shall consist of 2 bent tests and 2 tensile tests. Costs of initial tests will be paid by the CITY. Additional tests due to material failing initial tests shall be paid by the CONTRACTOR.

B. Not used.

C. Not used.

D. The CONTRACTOR shall provide to the INSPECTOR written identification of reinforcement steel by manufacturer's heat number and mil certification, and the fabricator's release number and type from the point of fabrication to the place of final incorporation of the rebar into the work.

1.6 MARKING AND SHIPPING

A. Tag bundled bars with identification, and transport and store so as not to damage any material. Use metal tags indicating size, length and other marking shown on placement drawings. Maintain tags after bundles are broken.

PART 2 -- PRODUCTS

2.1 REINFORCEMENT STEEL

A. All reinforcement steel for all cast-in-place reinforced concrete construction shall conform to the following requirements:

1. Bar reinforcement shall conform to the requirements of ASTM A615, Grade 60 Billet Steel Reinforcement with supplementary requirement S-1, and ASTM A706 for rebars subject to welding, or as otherwise shown.

1. Bar reinforcement for wall boundary elements, special moment frames, or when subject to welding, shall conform to ASTM A706, unless noted otherwise.

3. Welded wire fabric reinforcement shall conform to the requirements of ASTM A185 , or ASTM A497 and the details shown; provided, that welded wire fabric with longitudinal wire of W9.5 size wire shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches; and provided further, that welded wire fabric with longitudinal wires larger than W9.5 size shall be furnished in flat sheets only.

4. Spiral reinforcement may be cold-drawn steel wire conforming to the requirements of ASTM A82, when approved by the ENGINEER.

5. All reinforcements shall be shop fabricated. Bending of reinforcing in the field will not be allowed.

6. Not used.

7. Reinforcement with any of the following defects will not be acceptable and be immediately removed from the site:

a. Bar lengths, depths, and/or bends exceeding the specified fabrication tolerances.

b. Bends or kinks not shown on the Drawings

c. Bars with reduced cross-section due to excessive rusting or other cause.

B. Accessories:

1. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcement during concrete placement. Slab bolsters shall have gray plastic-coated legs.

2. Concrete blocks (dobies), used to support and position reinforcement steel, shall have the same or higher compressive strength as specified for the concrete in which it is located. Where the concrete blocks are used on concrete surfaces exposed to view, the color and texture of the concrete blocks shall match that required for the finished surface. Wire ties shall be embedded in concrete block bar supports.

3. Use bar supports complying with CRSI recommendations, unless otherwise shown on the Contract Drawings.

4. Do not use wood, brick, or other non-complying material.

5. For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

6. For exposed-to-view completed concrete surfaces, where legs of supports are in contact with forms, provide supports with either hot-dip galvanized or plastic-protected legs. CONTRACTOR's selection subject to the ENGINEER's approval.

2.2 MECHANICAL COUPLERS

A. Mechanical couplers shall not be used.

2.3 WELDED SPLICES

A. Welded splices shall be provided where shown and where approved by the ENGINEER. All welded splices of reinforcement steel shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcement bars which are connected. Provide two samples of each bar size for testing. When welding is to be done in the field, provide field prepared samples. Preparation shall be made by welder actually preparing the production run.

B. All materials required to conform the welded splices to the requirements of AWS D1.4 shall be provided.

C. All welding shall be performed by City of Los Angeles certified welders. All shop welding shall be performed at shops of a City of Los Angeles approved fabricator.

PART 3 -- EXECUTION

3.1 GENERAL

A. All reinforcement steel, welded wire fabric, and accessories shall be fabricated, and placed in accordance with the requirements of the City of Los Angeles Building Code, CRSI Recommended Practices and Manual, and WRI, and the supplementary requirements specified herein.

3.2 FABRICATION

A. General: Reinforcement steel shall be accurately formed to the dimensions and shapes shown, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318 or ACI 350 (as applicable), except as modified by the Drawings. Bars shall be bent cold.

B. The CONTRACTOR shall fabricate reinforcement bars for structures in accordance with bending diagrams, placing lists, and placing drawings. Said drawings, diagrams, and lists shall be prepared by the CONTRACTOR as specified under GENERAL REQUIREMENTS.

C. Fabricating Tolerances: Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:

1. Sheared length: ± 1 inch

2. Depth of truss bars: + 0, - 1/2 inch

3. Stirrups, ties, and spirals: ± 1/2 inch

4. All other bends: ± 1 inch

3.3 PLACING

A. Placing: Reinforcement steel shall be accurately positioned as shown, and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcement steel shall be supported using approved accessories and chairs which are strong and rigid enough to prevent any displacement of the reinforcement steel and shall comply with the applicable Department of Building and Safety's Research Report. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. All concrete blocks used to support reinforcement steel shall be tied to the steel with wire ties which are embedded in the blocks. Use care not to damage vapor barriers where they occur.

B. The portions of all accessories in contact with the formwork shall be made of concrete, plastic, or steel coated with a 1/8-inch minimum thickness of plastic which extends at least 1/2-inch from the concrete surface. Plastic shall be gray in color.

C. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.

D. Bars additional to those shown which may be found necessary or desirable by the CONTRACTOR for the purpose of securing reinforcement in position shall be provided by the CONTRACTOR at its own expense.

E. Placing Tolerances: Unless otherwise specified, reinforcement placing tolerances shall be within the limits specified in Section 7.5 of ACI 318 except where in conflict with the requirements of the City of Los Angeles Building Code.

F. Bars may be moved as necessary to avoid interference with other reinforcement steel, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be reviewed and accepted by the ENGINEER.

G. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters having gray, plastic-coated standard type legs as specified in Paragraph B herein. Slab bolsters shall be spaced not less than 30 inches on centers, shall extend continuously across the entire width of the reinforcement mat, and shall support the reinforcement mat in the plane shown.

H. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than 3 feet on centers in any direction. The construction practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.

3.4 SPACING OF BARS

A. Spacing of reinforcement shall comply with ACI 318 requirements.

3.5 SPLICING

A. General: Reinforcement bar splices shall only be used at locations shown. When it is necessary to splice reinforcement at points other than where shown, the character of the splice and location shall be as acceptable to the ENGINEER.

B. Splices of Reinforcement: The length of lap for reinforcement bars, unless otherwise shown shall be in accordance with ACI 318, Section 12.15.1 for a class B splice. Stagger splices in horizontal wall bars at least 48" longitudinal in alternate bars and opposite faces.

C. Laps of welded wire fabric shall be in accordance with the ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

D. Splices in column spiral reinforcement, when necessary, shall be made by welding or by a lap of 1-1/2 turns.

E. Field welding of bars: Rebar shall not be welded at splices.

F. Not used.

G. Bending or Straightening: Reinforcement shall not be straightened or rebent in a manner which will injure the material. Bars with kinks or bends not shown shall not be used. All bars shall be bent cold, unless otherwise permitted by the ENGINEER. No bars partially embedded in concrete shall be field-bent except as shown or specifically permitted by the ENGINEER.

H. Not used.

3.6 CLEANING AND PROTECTION

A. The surfaces of all reinforcement steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcement shall be reinspected and, if necessary recleaned. Bars with reduced cross-section due to excessive rusting or other cause will not be acceptable for use and shall be replaced by the CONTRACTOR at no additional cost to the CITY.

3.7 FIELD QUALITY CONTROL

A. Inspection: Secure inspection and acceptance from INSPECTOR before concrete is placed. Make arrangements in advance for geotechnical inspection of foundations, continuous inspection as required, and/or structural observation by the designated registered design professional prior to concrete placement.

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SECTION 03230
EARTHQUAKE CABLES

PART 1 -- GENERAL

1.1 SCOPE OF WORK

A. This section covers the work necessary for the prestressed tank earthquake cables.

1.2 REFERENCE STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM D1056 - Standard Specifications for Flexible Cellular Materials - Sponge or Expanded Rubber

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 Concrete Formwork.

B. Section 03200 Reinforcement Steel.

C. Section 03250 Concrete Accessories.

D. Section 03255 Wall Base and Top Joint.

E. Section 03290 Joints in Concrete.

F. Section 03300 Cast-in-Place Concrete.

G. Section 03314 Prestressed Concrete Tank.

H. Section 03315 Grout.

1.4 SUBMITTALS

A. Submit in accordance with Section 01300 – Record Drawings and Submittals, of the quantity, location and details for the Engineer's approval before the earthquake cables are fabricated.

PART 2 -- PRODUCTS

2.1 EARTHQUAKE CABLES

A. Earthquake cables shall consist of 7 wire galvanized strands meeting the requirements of Section 03314 – Prestressed Concrete Tanks, shall be installed to connect the core wall and wall footing. If no strength requirements are shown on the Drawings, the minimum ultimate strength for 3/8" and 1/2" strand shall be 21,400 lbs. and 38,200 lbs., respectively.

B. Galvanized strands for earthquake cables shall meet the quantity and spacing outlined on the Plans. Strands shall be hot-dipped galvanized before stranding with a minimum zinc coating of 0.85 oz./ft^2.

2.2 CLOSED CELL NEOPRENE SEISMIC CABLE SLEEVES

A. Neoprene sleeves for seismic cables, which encase the galvanized strands, shall conform to the minimum dimensions shown on the Plans to permit unrestrained flexing of the strands inside the sleeves under the maximum projected radial wall movements.

B. The material shall be medium grade closed cell neoprene conforming to 2A3 of ASTM D 1056 and as further specified as follows and on the Plans.

1.	Compression deflection (25% deflection limit):	9-13 PSI
2.	Shore 00 durometer:	60-80 PCF
3.	Density:	12-28 PCF
4.	Water absorption by weight:	5%
5.	Temperature range:	
	low (flex without cracking):	-30° F
	high continuous:	150° F
	high intermittent:	200° F
6.	Compression set (average)	
	2" sample compressed 50% for 22 hrs. @ 70 E F and 24 hrs. recovery:	15%-25%
7.	Heat aging (7 days @ 158E F) lineal shrinkage (max.):	5%
8.	Tensile strength:	115 PSI min.
9.	Elongation:	180% min.
10.	Resilience (bayshore-% rebound average 2" thickness @ 72E F):	20%-40%

C. RUBATEX R423N and R431N are acceptable materials.

2.3 MILD STEEL REINFORCING BARS

A. The mild steel reinforcing bars for the support of the earthquake cable anchors shall be provided under Section 03200 – Reinforcement Steel.

PART 3 – EXECUTION

3.1 EARTHQUAKE CABLES

A. The cables may be cut to length with a burning torch.

B. Where necessary, the strands shall be pre-bent before placing the units in wall and wall footings, as called for on the Plans.

C. The strands shall be tied to the lower horizontal circumferential tie-bar on the vertical prestress tendons as shown on the Plans.

D. In the footing, the strands shall be tied to the radial footing bars at the bottom of the footing.

E. The strands shall be fanned out to provide separation between adjacent strands.

F. The strands shall not be kinked when curved to avoid crossing vertical wall joints.

G. At vertical wall joints, the strands can continue through the joint if less than two feet of the strand from the end of the neoprene cable sleeve is on one side of the joint prior to crossing the joint. If more than two feet is in the first wall section, the strand shall be curved up to be contained entirely in the originating wall section.

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SECTION 03250
CONCRETE ACCESSORIES

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies to install all concrete accessories to complete the Work including cast-in-place anchor bolts (also known as anchor rods), epoxy grouted anchor bolts or dowels and, expansion or adhesive anchors, in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03300 Cast-in-Place Concrete.

B. Section 03315 Grout.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Comply with the reference standards and Standard Specifications of the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards, as applicable.

1. Commercial Standards:

AISC Code of Standard Practice for Steel Buildings and Bridges

AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings

ASTM A 36	Specifications for Carbon Structural Steel
ASTM A 153	Specifications for Zinc Coating (Hot Dip) on Iron and Steel Hardware
ASTM A 193	Specifications for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 194	Specifications for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM A 307	Specifications for Carbon Steel Bolts and Studs, 60, 000 PSI Tensile Strength
ASTM A 449	Specifications for Quenched and Tempered Steel Bolts and Studs
ASTM A 615	Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM B 633	Specifications for Electrodeposited Coatings of Zinc on Iron and Steel

ASTM B 695	Specifications for Coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM F 436	Specifications for Hardened Steel Washers
ASTM F 1554	Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. The following submittals and specific information shall be provided.

1. High Strength Anchor Bolts: The CONTRACTOR shall provide mill certificates and certified compliance with ASTM F 1554; A 449 with F 436.

2. The CONTRACTOR shall submit shop drawings for all welded or fabricated items for use as anchors.

3. The CONTRACTOR shall submit catalog cuts and manufacturer's recommendations, with applicable City of Los Angeles Research Reports, for all expansion and adhesive anchors, and anti-seize thread lubricants.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Anchor Size: Anchor size shall be as specified or shown on plans.

B. Anchor Material:

1. Water-containment or sanitary structures, immersion service, or exposed exterior locations: Stainless steel.

2. Other locations: Galvanized steel as permitted by the corresponding ASTM except as listed in the contract drawings.

C. Anchor Length: Sufficient to extend through the nut(s) and not more than 1/4 inch beyond the nut when exposed while meeting the required embedment as indicated on the contract drawings or as required by the associated Los Angeles Department of Building and Safety's Research Report.

2.2 ANCHOR GRADES

A. Anchor Bolts and Nuts:

1. High Strength: ASTM F 1554 Grade 105; A 449, galvanized. Provide with corresponding galvanized hardened washers.

2. Stainless steel: ASTM A 193 and A 194, Type 316N, Grade 8MN.

3. Unspecified: ASTM F 1554 Grade 36; A 36 or A 307, galvanized.

4. Galvanizing: Hot dipped as required per ASTM F 1554; 1.25 ounces per square foot per ASTM A 153 or B 633; When protected from the atmosphere, moisture and sewage gases, ASTM B 695 is also acceptable.

5. Other Coatings: None; As specified in the contract drawings.

B. Flat Washers: Same material and finish as nut and bolt. For high strength bolts, use ASTM F 1554; F 436.

C. Reinforcing Steel Dowels: ASTM A 615, Grade 60. Same diameter as spliced rebar, or #4 minimum.

D. Expansion and Adhesive Anchors: Use only anchor types and styles with Research Report approval by the Los Angeles Department of Building and Safety.

PART 3 -- EXECUTION

3.1 PROJECT CONDITIONS

A. Examine the areas and conditions under which the work will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until detrimental conditions are corrected.

3.2 CAST-IN-PLACE ANCHOR BOLTS

A. Provide templates or other means to ensure accurate placement. Provide sufficient threads to allow for a nut to be placed on the concrete side of the template.

B. Anchor bolts shall be clean and free of all coatings which may impair bonding with concrete.

C. Provide two nuts and a washer with each anchor bolt. Provide an additional locknut when indicated on the Drawings.

D. High Strength Bolts: Install such that ASTM Grade markings are visible after casting into concrete.

3.3 EPOXY-GROUTED ANCHOR BOLTS OR DOWELS

A. Provide templates or other means to ensure accurate placement.

B. Anchor bolts or dowels shall be clean and free of all coatings which may impair bonding with epoxy.

C. Provide two nuts and a washer with each anchor bolt. Provide an additional locknut when indicated on the Drawings.

D. High Strength Bolts: Install such that ASTM Grade markings are visible after casting into concrete.

E. Do not disturb bolt or dowel until epoxy grout has cured and reached full strength.

3.4 EXPANSION AND ADHESIVE ANCHORS

A. Install per Los Angeles Department of Building and Safety Approved Research Report and manufacturer's recommendations, whichever is more restrictive. Provide nuts and washers of same material and finish as anchor body.

3.5 STAINLESS STEEL ANCHORS

A. After installation of stainless steel anchor bolts or expansion anchors, lubricate threads before fastening.

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SECTION 03255
TANK WALL BASE AND TOP JOINT

PART 1 -- GENERAL

1.1 SCOPE OF WORK

A. This section covers the work necessary for the prestressed tank wall base and top joints.

1.2 REFERENCE STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM D1056 - Standard Specifications for Flexible Cellular Materials - Sponge or Expanded Rubber.

ASTM D2000 - Classification System for Rubber Products in Automotive Applications.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 Concrete Formwork.

B. Section 03200 Reinforcement Steel.

C. Section 03230 Earthquake Cables.

D. Section 03250 Concrete Accessories.

E. Section 03290 Joints in Concrete.

F. Section 03300 Cast-in-Place Concrete.

G. Section 03314 Prestressed Concrete Tank.

H. Section 03315 Grout.

1.4 SUBMITTALS

A. Section 01300 - Submittals: Procedures for Submittals.

B. Provide the Engineer a 5-foot minimum length of each of the closed cell Neoprene pads and the Neoprene bearing pads in order that the Engineer can test the pads for compliance with these Specifications.

C. Furnish certified mill certificates showing that the material meets all of the requirements specified herein. The Engineer, at his option, may take samples of any materials and have them tested by an independent testing laboratory to verify their compliance with these Specifications. All such costs shall be borne by the Contractor.

PART 2 -- PRODUCTS

2.1 PVC WATERSTOPS

A. PVC waterstops shall conform to requirements in Section 03290 – Joints in Concrete. The size and location of the waterstop shall be as shown on the plans.

2.2 NEOPRENE BEARING PAD

A. Neoprene pads shall be of dimensions and hardness shown on the Drawings and shall be made by an approved manufacturer.

B. The material for 40 durometer Neoprene pads shall conform to ASTM D-2000 M2BC410A14B14.

C. Unless otherwise specified on the Plans, Neoprene pads shall be of 40 durometer.

D. KIRKHILL ELASTOMERS, 300 E. Cypress St., Brea, CA 92821 (Phone 714-529-4901, Construction Products Dept.) is one of several suppliers who can furnish Neoprene pads meeting these requirements.

2.3 CLOSED CELL NEOPRENE PADS

A. Closed cell Neoprene pads, shall be used as a filler material in the flexible joints between the wall and wall-footing and between the wall and roof connection in the areas not taken up by the solid Neoprene bearing pads and waterstop.

B. The material shall be medium grade conforming to 2A3 of ASTM D 1056. RUBATEX R431N or R423N are acceptable products (Phone - 800/367-7289), unless otherwise noted.

2.4 SOFT MASTIC

A. Soft mastic shall be installed in all voids and cavities around bearing pads, waterstops and seismic cable sleeves. Such material shall be installed with a consistency that will not adversely affect the quality of PVC and Neoprene materials.

B. SIKAFLEX 1A, as manufactured by Sika Corporation or SELECT SEAL U-230, as manufactured by Select Products Company, or approved equal, are acceptable materials.

PART 3 -- EXECUTION

3.1 INSTALLATION OF PVC WATERSTOP

A. PVC waterstops shall be continuous and shall be installed where shown. The method of installation shall be as specified in Section 03290 – Joints in Concrete.

3.2 BEARING AND FILLER PADS

A. Bearing and filler pads shall be installed in widths and in areas as indicated on the Plans.

B. Bearing and filler pads shall be glued to the concrete with an approved rubber cement material to prevent uplift of the pads during concrete pouring.

C. Pads at the base of the wall shall be held down with approved plastic shim plates placed under the vertical reinforcing steel bars.

D. Nailing down pads will not be permitted.

E. All voids and cavities between bearing and filler pads, waterstop and seismic cable sleeves, irrespective of whether these voids are large or small, shall be filled with a soft mastic of a consistency that will not adversely affect the quality of plastic and Neoprene materials.

F. Closed-cell Neoprene shall be ordered at least 1/4-inch wider than theoretically required to facilitate placing and to reduce development of voids between filler pads, bearing pads and waterstops.

G. Contractor's workmanship shall be such that no cement grout or concrete seepage will occur through the bearing and filler pad area resulting in a restraint of radial wall-movements.

H. A continuous Neoprene pad and one or more sponge filler pads are required between the top of the wall and the underside of the roof. Any void areas between such pads shall be filled with soft mastic to prevent any concrete mortar from the roof pour to seep into voids at the top of the wall.

* * * * * *

SECTION 03290
JOINTS IN CONCRETE

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall construct all joints and bearing pads in concrete at the locations shown. Joints required in concrete structures are of various types and will be permitted only where shown, unless specifically accepted by the ENGINEER.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 Concrete Formwork.

B. Section 03200 Reinforcement Steel.

C. Section 03300 Cast-in-Place Concrete.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Comply with the reference standards of the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards, as applicable:

1. Federal Specifications:

TT-S-0227E(3)	Sealing Compound, elastomeric type, Multi-component for Caulking, Sealing, and Glazing Buildings and Other Structures).

2. U.S. Army Corps of Engineers Specifications:

CRD-C572

3. Other Government Standards:

CSS	Caltrans Standard Specifications.

4. Commercial Standards:

ASTM C 920	Specification for Elastomeric Joint Sealants.
ASTM D 624	Test Method for Rubber Property -- Tear Resistance.
ASTM D 638	Test Method for Tensile Properties of Plastics.
ASTM D 746	Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
ASTM D 747	Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam.

ASTM D 1751	Premolded Joint Filler
ASTM D 1752	Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
ASTM D 2240	Test Method for Rubber Property -- Durometer Hardness.

1.4 TYPES OF JOINTS

A. Construction Joints: When fresh concrete is placed against a hardened concrete surface, the joint between the two pours is called a construction joint. Unless otherwise specified, all joints in water bearing members shall be provided with a waterstop and sealant groove of the shape specified and as shown on the plans.

B. Contraction Joints: Contraction joints are similar to construction joints except that the fresh concrete shall not bond to the hardened surface of the first pour, which shall be coated with a bond breaker. The slab reinforcement shall be stopped 4-1/2 inches from the joint, unless noted otherwise; which is provided with a sleeve-type dowel, to allow shrinkage of the concrete of the second pour. Waterstop and sealant groove shall also be provided.

C. Expansion Joints: To allow the concrete to expand freely, a space is provided between the two pours, the joint shall be formed as shown on the plans. This space is obtained by placing a filler joint material against the first pour, which acts as a form for the second pour. Unless otherwise specified, all expansion joints in water bearing members shall be provided with an approved type waterstop.

Premolded expansion joint material shall be installed with the edge at the indicated distance below or back from finished concrete surface, and shall have a slightly tapered, dressed, and oiled wood strip secured to or placed at the edge thereof during concrete placement, which shall later be removed to form space for sealing material. The space so formed shall be filled with a joint sealant material as specified in the Paragraph in Part 2 entitled "Joint Sealant." In order to keep the two elements in line the joint shall be provided with a sleeve-type dowel as shown.

D. Control Joints (Weakened Plane): The function of the control joint is to provide a weaker plane in the concrete, where shrinkage cracks will probably occur. A groove, of the shape and dimensions as shown on the plans, is formed or saw-cut in the concrete and shall be filled with a joint sealant material as specified in the Paragraph in Part 2 entitled "Joint Sealant."

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with GENERAL REQUIREMENTS.

B. The following submittals and specific information shall be provided.

1. Waterstops: Prior to use of the material required under this contract, qualification samples shall be submitted. Such samples shall consist of extruded or molded sections of each size or shape to be used. The material sample shall be representative of the material to be furnished under this contract. The balance of the material to be used under this contract shall not be produced until after the ENGINEER has reviewed and approved the qualification samples.

2. Joint Sealant: Prior to ordering the sealant material, the CONTRACTOR shall submit to the ENGINEER for review and approval, data to show compliance with the requirements of the Contract Documents. Certified test reports from the sealant manufacturer on the actual batch of material being supplied indicating compliance with the above requirements shall be furnished the ENGINEER before the sealant is used on the job.

3. Shipping Certification: The CONTRACTOR shall provide written certification from the manufacturer as an integral part of the shipping form, to show that all of the material shipped to this project meets or exceeds the physical property requirements of the Contract Documents. Supplier certificates are not acceptable.

4. The CONTRACTOR shall submit placement shop drawings showing the location and type of all joints for each structure.

1.5 QUALITY ASSURANCE

A. Waterstop manufacturer shall demonstrate five years (minimum) continuous, successful experience in production of waterstops.

B. Waterstop Inspection: It is required that all waterstop field joints shall be subject to inspection, and no such work shall be scheduled or started without having made prior arrangements with the INSPECTOR to provide for the required inspections. Not less than 24 hours notice shall be provided to the INSPECTOR for scheduling such inspections.

C. All field joints in waterstops shall be free of misalignment, bubbles, inadequate bond, porosity, cracks, offsets, and other defects which would reduce the potential resistance of the material to water pressure at any point. All defective joints shall be replaced with material which shall pass said inspection, and all faulty material shall be removed from the site and disposed of by the CONTRACTOR at its own expense.

D. The following waterstop defects represent a partial list of defects which shall be grounds for rejection:

1. Offsets at joints greater than 1/16-inch or 15 percent of material thickness, at any point, whichever is less.

2. Exterior crack at joint, due to incomplete bond, which is deeper than 1/16-inch or 15 percent of material thickness, at any point, whichever is less.

3. Any combination of offset or exterior crack which will result in a net reduction in the cross section of the waterstop in excess of 1/16-inch or 15 percent of material thickness at any point, whichever is less.

4. Misalignment of joint which result in misalignment of the waterstop in excess of 1/2-inch in 10 feet.

5. Porosity in the welded joint as evidenced by visual inspection.

6. Bubbles or inadequate bonding.

E. Waterstop Samples: Prior to use of the waterstop material in the field, a sample of a fabricated mitered cross and a tee constructed of each size or shape of material to be used shall be submitted to the ENGINEER for approval. These samples shall be fabricated so that the material and workmanship represent in all respects the fittings to be furnished under this contract. Field samples of fabricated fittings (crosses, tees, etc.) will be selected at random by the INSPECTOR for testing. When tested, they shall have a tensile strength across the joints equal to at least 600 psi.

F. Construction Joint Sealant: The CONTRACTOR shall prepare adhesion and cohesion test specimens as specified herein, at intervals of 5 working days while sealants are being installed.

G. The sealant material shall show no signs of adhesive or cohesive failure when tested in accordance with the following procedure in laboratory and field tests:

1. Sealant specimen shall be prepared between 2 concrete blocks (1-inch by 2-inch by 3-inch). Spacing between the blocks shall be 1/2-inch. Coated spacers (2-inch by 1-1/2-inch by ½-inch) shall be used to insure sealant cross-sections of 1/2-inch by 2 inches with a width of ½-inch.

2. Sealant shall be cast and cured according to manufacturer's recommendations except that curing period shall not exceed 24 hours.

3. Following curing period, the gap between blocks shall be widened to one inch. Spacers shall be used to maintain this gap for 24 hours prior to inspection for failure.

H. Store waterstops under tarps to protect from oil, dirt, and sunlight.

1.6 GUARANTEE

A. The CONTRACTOR shall provide a 5-year written guarantee of the entire sealant installation against faulty and/or incompatible materials and workmanship, together with a statement that it agrees to repair or replace, to the satisfaction of the CITY, at no additional cost to the CITY, any such defective areas which become evident within said 5-year guarantee period.

PART 2 -- PRODUCTS

2.1 PVC WATERSTOPS

A. General: Waterstops shall be extruded from an elastomeric polyvinyl chloride compound containing the plasticizers, resins, stabilizers, and other materials necessary to meet the requirements of these Specifications. No reclaimed or scrap material shall be used. The CONTRACTOR shall obtain from the waterstop manufacturer and shall furnish to the ENGINEER for review, current test reports and a written certification of the manufacturer that the material to be shipped to the job meets the physical requirements as outlined in the U.S. Army Corps of Engineers Specification CRD-C572 and those listed herein.

B. Flatstrip and Center-Bulb Waterstops: Flatstrip and center-bulb waterstops shall be as detailed and as manufactured by: Kirkhill Rubber Co., Brea, California; Greenstreak, St. Louis, MO, Water Seals, Inc., Chicago, Illinois; Progress Unlimited, Inc., New York, New York; or an approved equal; provided, that at no place shall the thickness of flat strip waterstops, including the center bulb type, be less than 3/8-inch.

C. Multi-Rib Waterstops: Multi-rib waterstops, where required, shall be as detailed and as manufactured by Water Seals, Inc., Chicago, Illinois; Progress Unlimited, Inc., New York, New York; Greenstreak, St. Louis, MO, or an approved equal. Prefabricated joint fittings shall be used at all intersections of the ribbed-type waterstops.

D. Other Types of Waterstops: When other types of waterstops, not listed above are required and shown, they shall be subjected to the same requirements as those listed herein.

E. Waterstop Testing Requirements: When tested in accordance with the specified test standards, the waterstop material shall meet or exceed the following requirements:

Physical Property, Sheet Material	Value	ASTM Std.
Tensile Strength-min (psi)	1750	D 638, Type IV
Ultimate Elongation-min (percent)	350	D 638, Type IV
Low Temp Brittleness-max (degrees F)	-35	D 746
Stiffness in Flexure-min (psi)	400	D 747
Accelerated Extraction (CRD-C572)		
Tensile Strength-min (psi)	1500	D 638, Type IV
Ultimate Elongation-min (percent)	300	D 638, Type IV

Physical Property, Sheet Material	Value	ASTM Std.
Effect of Alkalies (CRD-C572)		
Change in Weight (percent)	+0.25/-0.10	------
Change in Durometer, Shore A	+5	D 2240
Finish Waterstop		
Tensile Strength-min (psi)	1400	D 638, Type IV
Ultimate Elongation-min (percent)	280	D 638, Type IV

F. Accessories:

1. Provide factory made waterstop fabrications for all changes of direction, intersections, and transitions leaving only straight butt joint splices for the field.

2. Provide hog rings or grommets spaced at 12 inches on center along length of waterstop.

3. Provide Teflon coated thermostatically controlled waterstop splicing irons for field butt splices.

2.2 JOINT SEALANT

A. Joint sealant shall be polyurethane polymer designed for bonding to concrete which is continuously submerged in water.

B. Joint sealant material shall meet the following requirements:

1. Work Life	45 - 90 minutes
2. Time to Reach 20 Shore "A" Hardness (at 77 degrees F, 200 gr quantity)	24 hours, maximum
3. Ultimate Hardness	30 - 40 Shore "A"
4. Tensile Strength	250 psi, minimum
5. Ultimate Elongation	400 percent, minimum
6. Tear Resistance (Die C ASTM D 624)	75 pounds per inch of thickness, minimum
7. Color	Light Gray

C. All polyurethane sealants for waterstop joints in concrete shall conform to the following requirements:

1. Sealant shall be 2-part polyurethane with the physical properties of the cured sealant conforming to or exceeding the requirements of ASTM C 920 or Federal Specification TT-S-00227 E(3) for 2-part material, as applicable.

2. For vertical joints and overhead horizontal joints, only "non-sag" compounds shall be used; all such compounds shall conform to the requirements of ASTM C 920 Class B, or Federal Specification TT-S-0027 E(3), Type II.

3. For plane horizontal joints, the self-leveling compounds which meet the requirements of ASTM C 920 Class A, or Federal Specification TT-S-0027 E(3), Type I shall be used. For joints subject to either pedestrian or vehicular traffic, a compound providing non-tracking characteristics, and having a Shore "A" hardness range of 25 to 35, shall be used.

4. Primer materials, if recommended by the sealant manufacturer, shall conform to the printed recommendations of the sealant manufacturer.

D. All sealants, wherever shown, or required hereunder shall be Rubbercalk 2101-I or 270 as manufactured by Products Research Company; GS 102 or GS 1102 as manufactured by General Sealants Corp; or an approved equal. For sanitary structures mastic/sealant material shall be Ram Nek Sealant by Henry Co.; Sika Flex 1A, Sikadur 51 NS by Sika Corp.

E. Sealants for non-waterstop joints in concrete shall conform to the requirements of Section 07900, "Joint Sealants". Mastic joint sealer shall be a material that does not contain evaporating solvents; that will tenaciously adhere to concrete surfaces; that will remain permanently resilient and pliable; that will not be affected by continuous presence of water and will not in any way contaminate potable water; and that will effectively seal the joints against moisture infiltration even when the joints are subject to movement due to expansion and contraction. The sealer shall be composed of special asphalts or similar materials blended with lubricating and plasticizing agents to form a tough, durable mastic substance containing no volatile oils or lubricants and shall be capable of meeting the test requirements set forth hereinafter, if testing is required by the ENGINEER.

2.3 PREFORMED JOINT FILLER

A. Preformed joint filler material shall be of the preformed non-extruding type joint filler constructed of cellular neoprene sponge rubber or polyurethane of firm texture. Bituminous fiber type will not be permitted. All non-extruding and resilient-type preformed expansion joint fillers shall conform to the requirements and tests set forth in ASTM D 1752 for Type I, except as otherwise specified herein.

B. Unless otherwise noted, preformed joint filler shall be a non-extruding, resilient, bituminous type conforming to the requirements of ASTM D 1751.

2.4 BACKING ROD

A. Backing rod shall be an extruded closed-cell, polyethylene foam rod. The material shall be compatible with the joint sealant material used and shall have a tensile strength of not less than 40 psi and a compression deflection of approximately 25 percent at 8 psi. The rod shall be 1/8-inch larger in diameter than the joint width except that a one-inch diameter rod shall be used for a 3/4-inch wide joint.

2.5 BOND BREAKER

A. Bond breaker shall be Super Bond Breaker as manufactured by Burke Company, San Mateo, California; Hunt Process 225-TU as manufactured by Hunt Process Co., Santa Fe Springs, California; Select Cure CRB as manufactured by Select Products Co., Upland, California; or an approved equal. It shall contain a fugitive dye so that areas of application will be readily distinguishable.

2.6 BEARING DEVICES AND ELASTOMERIC BEARING PADS

A. Bearing devices and elastomeric bearing pads shall comply with CSS Section 51.

PART 3 -- EXECUTION

3.1 GENERAL

A. Unless otherwise shown, waterstops of the type specified herein shall be embedded in the concrete across joints as shown. All waterstops shall be fully continuous for the extent of the joint. Splices necessary to provide such continuity shall be accomplished in conformance to printed instructions of manufacturer of the waterstops. The CONTRACTOR shall take suitable precautions and means to support and protect the waterstops during the progress of the work and shall repair or replace at its own expense any waterstops damaged during the progress of the work. All waterstops shall be stored so as to permit free circulation of air around the waterstop material.

B. When any waterstop is installed in the concrete on one side of a joint, while the other half or portion of the waterstop remains exposed to the atmosphere for more than 2 days, suitable precautions shall be taken to shade and protect the exposed waterstop from direct rays of the sun during the entire exposure and until the exposed portion of the waterstop is embedded in concrete.

3.2 SPLICES IN WATERSTOPS

A. Splices in waterstops shall be performed by heat sealing the adjacent waterstop sections in accordance with the manufacturer's printed recommendations and the following requirements:

1. The material not be damaged by heat sealing.

2. The splices have a tensile strength of not less than 60 percent of the unspliced materials tensile strength.

3. The continuity of the waterstop ribs and of its tubular center axis be maintained.

B. Butt joints of the ends of two identical waterstop sections may be made while the material is in the forms.

C. All joints with waterstops involving more than 2 ends to be jointed together, and all joints which involve an angle cut, alignment change, or the joining of 2 dissimilar waterstop sections shall be prefabricated by the CONTRACTOR prior to placement in the forms, allowing not less than 24-inch long strips of waterstop material beyond the joint. Upon being inspected and approved, such prefabricated waterstop joint assemblies shall be installed in the forms and the ends of the 24-inch strips shall be butt welded to the straight run portions of waterstop in place in the forms.

3.3 JOINT CONSTRUCTION

A. Setting Waterstops:

1. In order to eliminate faulty installation that may result in joint leakage, particular care shall be taken of the correct positioning of the waterstops during installation. Adequate provisions must be made to support the waterstops during the progress of the WORK and to insure the proper embedment in the concrete. The symmetrical halves of the waterstops shall be equally divided between the concrete pours at the joints. The center axis of the waterstops shall be coincident with the joint openings. Maximum density and imperviousness of the concrete shall be insured by thoroughly working it in the vicinity of all joints

2. In placing flat-strip waterstops in the forms, means shall be provided to prevent them from being folded over by the concrete as it is placed. Unless otherwise shown, all waterstops shall be held in place with light wire ties on 12-inch centers which shall be passed through the edge of the waterstop and tied to the curtain of reinforcing steel. Horizontal waterstops, with their flat

face in a vertical plane, shall be held in place with continuous supports to which the top edge of the waterstop shall be tacked. In placing concrete around horizontal waterstops, with their flat face in a horizontal plane, concrete shall be worked under the waterstops by hand so as to avoid the formation of air and rock pockets.

3. Adequate means shall be provided for anchoring the waterstop in concrete. Waterstops shall be positioned so that they are equally embedded in the concrete on each side of the joint.

B. Joint Location: Construction joints, and other types of joints, shall be provided where shown. When not shown, construction joints shall be provided at 25-foot maximum spacing for all concrete construction, subject to the approval of the ENGINEER, unless noted otherwise. Where joints are shown spaced greater than 25 feet apart, provide joint spacing as specified per plan. The location of all joints, of any type, shall be submitted for acceptance by the ENGINEER.

C. Joint Preparation: Special care shall be used in preparing concrete surfaces at joints where bonding between two sections of concrete is required. Unless otherwise shown, such bonding will be required at all horizontal joints in walls. Surfaces shall be prepared in accordance with the requirements of Section 03300, "Cast-in-Place Concrete."

D. Construction Joint Sealant:

1. Construction joints in water-bearing floor slabs, and elsewhere as shown, shall be provided with tapered grooves which will be filled with construction joint sealant. The material used for forming the tapered grooves shall be left in the grooves until just before the grooves are cleaned and filled with joint sealant. After removing the forms from the grooves, all laitance and fins shall be removed, and the grooves shall be sand-blasted. The grooves shall be allowed to become thoroughly dry, after which they shall be blown out; immediately thereafter, they shall be primed and filled with the construction joint sealant. The primer used shall be supplied by the same manufacturer supplying the sealant. No sealant will be permitted to be used without a primer. Care shall be used to completely fill the sealant grooves. Areas designated to receive a sealant filler shall be thoroughly cleaned, as outlined for the tapered grooves, prior to application of the sealant.

2. Sealant application shall be in accordance with the manufacturer's printed instructions. The surfaces of the groove for the sealant shall not be coated. Concrete next to waterstops shall be placed in accordance with the requirements of Section 03300, Cast-in-Place Concrete.

3. The primer and sealant shall be placed strictly in accordance with the printed recommendations of the manufacturer, taking special care to properly mix the sealant prior to application. All sealant shall cure at least 7 days before the structure is filled with water.

4. All sealant shall be installed by a competent waterproofing specialty contractor who has a successful record of performance in similar installations. Before work is commenced, the crew doing the WORK shall be instructed as to the proper method of application by a representative of the sealant manufacturer.

5. Thorough, uniform mixing of 2-part, catalyst-cured materials is essential; special care shall be taken to properly mix the sealer before its application. Before any sealer is placed, the CONTRACTOR shall arrange to have the crew doing the WORK carefully instructed as to the proper method of mixing and application by a representative of the sealant manufacturer.

6. Any joint sealant which after the manufacturer's recommended curing time for the job conditions of the WORK hereunder, fails to fully and properly cure shall be completely removed; the groove shall be thoroughly sandblasted to remove all traces of the uncured or partially cured sealant and primer, and shall be re-sealed with the specified joint sealant. All costs of such removal, joint treatment, re-sealing, and appurtenant work shall be at the expense of the CONTRACTOR.

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SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all materials for concrete in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished concrete, in accordance with the requirements of the Contract Documents.

B. The following types of concrete shall be covered in this Section:

1. Structural Concrete: Concrete to be used in all cases except where noted otherwise in the Contract Documents.

2. Sitework Concrete: Concrete to be used for curbs, gutters, sidewalks, pavements, fence and guard post embedment, and underground duct bank encasement unless otherwise shown.

3. Lean Concrete: Concrete to be used for thrust blocks, pipe trench cut-off blocks and cradles, where the preceding items are detailed on the Drawings as unreinforced. Concrete to be used as protective cover for dowels intended for future connection.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 Concrete Formwork.

B. Section 03200 Reinforcement Steel.

C. Section 03230 Earthquake Cables.

D. Section 03250 Concrete Accessories.

E. Section 03255 Wall Base and Top Joint.

F. Section 03290 Joints in Concrete.

G. Section 03314 Prestressed Concrete Tank.

H. Section 03315 Grout.

I. Section 03370 Concrete Curing.

J. Section 03741 Pressure Injection of Cracks.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Comply with the reference standards and the Standard Specifications of the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards, as applicable.

1. Commercial Standards:

ACI 117	Standard Tolerances for Concrete Construction and Materials
ACI 301	Specifications for Structural Concrete for Buildings
ACI 305R	Standard Specifications for Hot Weather Concreting
ACI 306.1	Standard Specifications for Cold Weather Concreting
ACI 318	Building Code Requirements for Reinforced Concrete
ACI 347	Recommended Practice for Concrete Formwork
ACI 350	Recommended Practice for Sanitary Structure
ASTM C 31	Practices for Making and Curing Concrete Test Specimens in the Field
ASTM C 33	Specification for Concrete Aggregates
ASTM C 39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 40	Test Method for Organic Impurities in Fine Aggregates for Concrete
ASTM C 42	Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 88	Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate
ASTM C 94	Specification for Ready-Mixed Concrete
ASTM C 117	Standard Test Method for Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing
ASTM C 131	Test Method for Resistance to Degradation of Small-Sized Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
ASTM C 136	Method for Sieve Analysis of Fine and Coarse Aggregate
ASTM C 143	Test Method for Slump of Portland Cement Concrete
ASTM C 157	Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete.
ASTM C 192	Method of Making and Curing Concrete Test Specimens in the Laboratory.
ASTM C 260	Specification for Air-Entraining Admixtures for Concrete.
ASTM C 289	Test Method for Potential Reactivity of Aggregates (Chemical Method)

ASTM C 311	Method for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C 494	Specification for Chemical Admixtures for Concrete
ASTM C 618	Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM D 2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate

2. Government Standards:

CSS	Caltrans Standard Specifications

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with GENERAL REQUIREMENTS.

B. The following submittals and specific information shall be provided.

1. Mix Designs: Prior to beginning the WORK, the CONTRACTOR shall submit to the ENGINEER, for review, and acceptance, preliminary concrete mix designs for each class and type of concrete specified herein. The mix designs shall be designed by an independent testing laboratory acceptable to the ENGINEER. All costs related to such mix design shall be borne by the CONTRACTOR.

2. Each concrete mix submittal shall contain the following information, as applicable:

a. Location and purpose of the mix.

b. Slump on which the design is based.

c. Total gallons of water per cubic yard, and the water/cement ratio.

d. Brand, type, composition and quantity of cement.

e. Specific Gravity, source and gradation of each aggregate.

f. Ratio of fine to total aggregate per cubic yard.

g. Weight (surface dry) of each aggregate per cubic yard.

h. Brand, type, and ASTM designation, active chemical ingredients and quantity of each admixture.

i. Copy of the Building and Safety Research Report Approval for each concrete admixture.

j. Air content.

k. Compressive strength based on 7 day and 28 day compression tests, including standard deviation calculations, corroborative data (if applicable), and required average comprehensive strength per ACI 318, Section 5.

l. Time of initial and final set.

m. Certification stamp and signature by a Civil or Structural engineer registered in the State of California, experienced in concrete mix design.

n. Certificate of Compliance for Cement.

o. Certified mill test reports, including fineness, for each shipment of cement.
p. Concrete pour sequence.

3. Certified Delivery Tickets: Where ready-mix concrete is used, the CONTRACTOR shall provide certified weighmaster delivery tickets at the time of delivery of each load of concrete. Each certificate shall show the public weighmaster's signature, and the total quantities, by weight of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate and added at the batching plant as well as the amount of water allowed to be added at the site for the specific design mix. Each certificate shall, in addition, state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to when the batch was dispatched, when it left the plant, when it arrived at the job, the time that unloading began, and the time that unloading was finished.

4. When a water reducing admixture is to be used, the CONTRACTOR shall furnish mix designs for concrete both with and without the admixture.

1.5 QUALITY ASSURANCE

A. Laborers: Use adequate number of skilled laborers who are thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

B. Compliance with Regulations: All materials shall comply with the current rules and regulations of the local air quality management district, with the rules regarding volatile organic compounds, and with FDA rules and regulations for dangerous substances in construction products.

C. Concrete Manufacturer: Furnish concrete from licensed commercial ready-mix concrete plants conforming to ASTM C94 and approved by City of Los Angeles Department of Building and Safety. Requirements herein govern when exceeding ASTM C94.

D. Continuous Inspection: Construct structural concrete exceeding 2,500 psi compressive strength under continuous inspection of DEPUTY INSPECTOR. Obtain inspection and approval of forms and reinforcing by CONTRACTOR's Independent Testing/Inspection Laboratory three (3) working days before placing structural concrete in order to be verified by ENGINEER.

E. Tests on component materials and for compressive strength and shrinkage of concrete will be performed as specified herein. Test for determining slump will be in accordance with the requirements of ASTM C 143.

F. The cost of all laboratory tests on cement, aggregates, and concrete compressive strength, will be borne by the CITY. However, the CONTRACTOR shall be responsible for all other required tests, and shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications.

G. Concrete for testing shall be supplied by the CONTRACTOR at no cost to the CITY, and the CONTRACTOR shall provide assistance and facilities to the INSPECTOR in obtaining samples, and disposal and cleanup of excess material. The CONTRACTOR shall provide the test cylinders, as described in item 1.5.H, to the INSPECTOR for the required testing.

H. Field Compression Tests:

1. Compression test specimens will be taken during construction from the first placement of each concrete mix used and at intervals thereafter as selected by the INSPECTOR to insure continued compliance with these specifications. Each set of test specimens will be a minimum of 4 cylinders.

2. Compression test specimens for concrete shall be made in accordance with ASTM C 31. Specimens shall be 6-inch diameter by 12-inch high cylinders.

3. Compression tests shall be performed in accordance with ASTM C 39. Two test cylinders will be tested at 7 days as necessary and two at 28 days. Any remaining cylinders will be held to verify test results, if needed.

I. Evaluation and acceptance of Compressive Strength Concrete shall be based on the following criteria:

1. Concrete shall be sampled and tested in accordance with the ASTM's stated in Subsection 1.3.B.1.

2. Acceptance of concrete placed shall be based on 28-day compressive strength test results. A 28-day compressive strength test shall consist of the average compressive strength of two concrete test cylinders fabricated from a single load of fresh concrete except that, if a cylinder should show evidence of improper handling, molding, or testing, said cylinder shall be discarded and the compressive strength test shall then consist of the remaining cylinder.

3. Concrete compressive strength tests representing concrete poured-in-place, shall attain the 28-day compressive strength specified in the specifications or as shown on the plans.

4. In-place concrete represented by a compressive cylinder strength test failing to meet the specified 28-day compressive strength shall be removed from the work at no cost to the CITY. Also, the CONTRACTOR shall at its own expense make any corrective changes in the mix deemed necessary by the ENGINEER. The changes in the mix proportions or placement procedures shall be approved by the ENGINEER prior to the placement of any additional concrete subsequent to a failing compressive strength test.

5. As an alternative to the removal of concrete represented by a failed cylinder compressive strength test and subject to the approval of the ENGINEER, the concrete represented by the failed compressive strength cylinder test or tests may be cored in place. The corings shall be completed no later than 10 days from notification of failure by the ENGINEER. The cores shall be taken by the CONTRACTOR in the presence of the INSPECTOR and tested at the CONTRACTOR's expense in accordance with ASTM C 42 by a certified laboratory acceptable to the INSPECTOR. The cores shall be 4 inch diameter (min.) unless otherwise directed by the ENGINEER. At least three cores shall be taken in each area represented by a failed 28-day concrete compressive strength cylinder test. Unless otherwise directed by the ENGINEER, the cores shall be tested wet following a 40-hour submergence. If each core tests at least 95 percent of the specified 28-day compressive strength or greater, the concrete represented may be accepted provided the CONTRACTOR accepts the payment provisions stated below. Concrete represented by failing core tests shall not be paid for and shall be removed by the CONTRACTOR from the work at no cost to the CITY.

6. Payment to the CONTRACTOR for concrete accepted by the ENGINEER based on core test results but represented by failing compressive cylinder test results shall be reduced as follows:

a. When the result of a single compressive cylinder strength test is less than the specified 28-day compressive strength but 95 percent or more of the 28-day compressive strength, the CONTRACTOR shall pay the CITY $15 per cubic yard for each in-place cubic yard of concrete represented by the deficient compressive strength cylinder test as determined by the actual sampling interval.

J. Shrinkage Tests:

1. Drying shrinkage tests shall be provided by the CONTRACTOR for the trial batch specified in the Paragraph in Part 2 entitled "Trial Batch and Laboratory Tests," and during construction to insure continued compliance with these Specifications.

2. Drying shrinkage specimens shall be 4-inch by 4-inch by 11-inch prisms with an effective gage length of 10 inches, fabricated, cured, dried and measured in accordance with ASTM C 157 modified as follows: specimens shall be removed from molds at an age of 23 ±1 hours after trial batching, shall be placed immediately in water at 70 degrees F ±3 degrees F for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine original length and then submerged in saturated lime water at 73 degrees F ±3 degrees F. Measurement to determine expansion expressed as a percentage of original length shall be made at age 7 days. This length at age 7 days shall be the base length for drying shrinkage calculations ("0" days drying age). Specimens then shall be stored immediately in a humidity control room maintained at 73 degrees F ±3 degrees F and 50 percent ±4 percent relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as percentage of base length shall be made and reported separately for 7, 14, 21, and 28 days of drying after 7 days of moist curing.

3. The drying shrinkage deformation of each specimen shall be computed as the difference between the base length (at "0" days drying age) and the length after drying at each test age. The average drying shrinkage deformation of the specimens shall be computed to the nearest 0.0001 at each test age. If the drying shrinkage of any specimen departs from the average of that test age by more than 0.0004-inch, the results obtained from that specimen shall be disregarded. Results of the shrinkage test shall be reported to the nearest 0.001 percent of shrinkage. Compression test specimens shall be taken in each case from the same concrete used for preparing drying shrinkage specimens. These tests shall be considered a part of the normal compression tests for the project. Allowable shrinkage limitations shall be as specified in Part 2, herein.

K. Construction Tolerances: The CONTRACTOR shall set and maintain concrete forms and perform finishing operations so as to ensure that the completed work is within the tolerances specified in Section 03100 “Concrete Formwork”. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances.

PART 2 -- PRODUCTS

2.1 CONCRETE MATERIALS

A. Materials shall be delivered, stored, and handled so as to prevent damage by water or breakage.

B. All materials furnished for the work shall comply with the requirements of ACI 301, as applicable. For bridge structures, materials for concrete shall conform to Section 90-2 to 90-4 of CSS.

C. Storage of materials shall conform to the requirements of ACI 301.

D. Materials for concrete shall conform to the Standard Specifications and the following requirements.

1. Concurrent with strength design criteria, concrete shall also be proportioned to provide the requisite durability to satisfy the exposure conditions imposed by either environment and/or service. Durability, in this context, refers to the ability of the concrete to resist deterioration from the environment or service in which it is placed. Concrete proportioned in accordance with ACI 318, or ACI 350 for sanitary structures, chapter 4, Durability Requirements, will meet this criteria.

2. Cement shall be standard brand Portland cement conforming to ASTM C 150 for Type V, including Table 1A optional requirements. A minimum of 85 percent of cement by weight shall pass a 325 screen. Only one brand of cement shall be used. The cement shall be suitably protected from exposure to moisture until used. Cement that has become lumpy shall not be used. Sacked cement shall be stored in such a manner so as to permit access for inspection

and sampling. Cement reclaimed from cleaning bags or leaking containers shall not be used. All cement shall be used in the sequence of receipt of shipments.

3. Water for mixing and curing shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts and other impurities. The water shall be considered potable, for the purposes of this Section only, if it meets the requirements of the local governmental agencies. Agricultural water with high total dissolved solids (over 1000 mg/l TDS) shall not be used.

4. Aggregates shall be obtained from pits acceptable to the INSPECTOR, shall be non-reactive, and shall conform to ASTM C 33. Lightweight sand for fine aggregate will not be permitted.

   a. When tested in accordance with ASTM C 289, the ratio of silica released to reduction in alkalinity shall not exceed 1.0.

   b. When tested in accordance with ASTM C 40, the fine aggregate shall produce a color in the supernatant liquid no darker than the reference standard color solution.

   c. When tested in accordance with ASTM C 131, the coarse aggregate shall show a loss not exceeding 42 percent after 500 revolutions, or 10.5 percent after 100 revolutions.

   d. When tested in accordance with ASTM C 88, the loss resulting after five cycles shall not exceed 10 percent for fine or coarse aggregate when using sodium sulfate.

   e. When tested in accordance with ASTM C 117, materials finer than No. 200 sieve shall not exceed 1% for gravel, and 1.5% for crushed aggregate.

   f. When tested in accordance with ASTM D 2419, the California sand equivalent values operating range shall not be below 71%.

5. Ready-mix concrete shall conform to the requirements of ASTM C 94.

6. Admixtures:

   a. The ENGINEER may require the use of admixtures or the CONTRACTOR may propose to use admixtures to control the set, effect water reduction, and increase workability. In either case, the addition of an admixture shall be at the CONTRACTOR's expense. The use and continued use of an admixture shall be approved by the ENGINEER. Admixtures specified herein, other than calcium chloride, shall conform to the requirements of ASTM C 494. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used. Admixtures shall contain no free chloride ions, be non-toxic after 30 days, and shall be compatible with and made by the same manufacturer as the air entraining admixture.

   b. These admixtures shall not be used in greater doses than those recommended by the manufacturer or permitted by the ENGINEER. The permitted dosage of the admixture shall not exceed that which will result in an increase in the drying shrinkage of the concrete in excess of 20 percent when used in precast or prestressed concrete, or 10 percent when used in any other structural concrete. The strength of concrete containing the admixture in the amount proposed shall, at the age of 48 hours and longer be not less than that of similar concrete without the admixture. The admixture shall not adversely affect the specified air content, unless permitted by the ENGINEER.

   c. Set controlling admixture shall be either with or without water-reducing properties. Where the air temperature at the time of placement is expected to be consistently over 80 degrees F, a set retarding admixture such as Sika Chemical Corporation's Plastiment, Master Builder's Pozzolith 300R, or an approved equal shall be used. Where the air temperature at the time of placement is expected to be consistently under 40 degrees F,

a set accelerating admixture such as Sika Chemical Corporation's Plastocrete 161FL, Master Builder's Pozzolith 50C, or an approved equal shall be used.

d. Low range water reducer shall conform to ASTM C 494, Type A where ambient temperature is 80 degrees F or lower, or Type D where ambient temperature is above 80 degrees F. It shall be either a hydroxylated carboxylic acid type or a hydroxylated polymer type. The quantity of admixture used and the method of mixing shall be in accordance with the manufacturer's instructions and recommendations.

e. High range water reducer shall be sulfonated polymer conforming to ASTM C 494, Type F or G.

(1) If the high range water reducing agent is added to the concrete at the batch plant, it shall be second generation type, Daracem 100, as manufactured by W.R. Grace & Co.; Pozzolith 430R, as manufactured by Masterbuilders; or an approved equal. High range water reducer shall be added to the concrete after all other ingredients have been mixed and initial slump has been verified.

(2) If the high range water reducer is added to the concrete at the job site, it shall be used in conjunction with a low range water reducer and shall be Pozzolith 400N and Pozzolith MBL82, as manufactured by Masterbuilders; WRDA 19 and WRDA 79, as manufactured by W.R. Grace & Co.; or an approved equal. Concrete shall have a slump of 3-inches ± 1/2-inch (at point of discharge) prior to adding the high range water reducing admixture at the job site. The high range water reducing admixture shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day's operation of the job site system.

(3) Concrete shall be mixed at mixing speed for a minimum of 30 mixer revolutions after the addition of the high range water reducer.

f. Concrete Waterproofing Admixure: Xypex Concentrate Admix C-1000 (standard set time) or C-2000 (extended set time), or approved equal that shall be of the cementitious crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete. Use of waterproofing admixture shall be at locations specified per the contract drawings and shall follow all manufacturer recommendations for quantity and preparation.

g. Air-entraining agent meeting the requirements of ASTM C 260, shall be used. Sufficient air-entraining agent shall be used to provide a total air content of 3 to 4 percent (at point of discharge); provided that, when the mean daily temperature in the vicinity of the worksite falls below 40 degrees F for more than one day, the total air content provided shall be 5 to 6 percent. The CITY reserves the right, at any time, to sample and test the air-entraining agent received on the job by the CONTRACTOR. The air-entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement.

7. Calcium Chloride: Except as otherwise provided herein, calcium chloride will not be permitted to be used in concrete.

2.2 CURING MATERIALS

A. Materials for curing concrete shall conform to Section 03370 “Curing Concrete, Part 2.

2.3 NON-WATERSTOP JOINT MATERIALS

A. Materials for non-waterstop joints in concrete shall conform to Section 03290 “Joints In Concrete”, Part 2.

2.4 MISCELLANEOUS MATERIALS

A. Floor sealer/hardener shall be a colorless, aqueous solution of zinc and/or magnesium fluosilicate or of sodium silicate, and shall be as manufactured by Masterbuilders Company, W.R. Grace Co., or an approved equal. The solution shall be delivered ready for use in the manufacturer's original sealed containers. Each gallon of the fluosilicate solution shall contain not less than 2 pounds of crystals.

B. Dampproofing agent shall be an asphalt emulsion, such as Sonneborn Hydrocide 660, Flintkote C-13-E Foundation Coating, or an approved equal.

C. Epoxy adhesives shall be per the following products for the applications specified:

1. For bonding freshly-mixed, plastic concrete to hardened concrete, Sikadur Hi-Mod Epoxy Adhesive, as manufactured by Sika Chemical Corporation; Concresive 1001-LPL, as manufactured by Adhesive Engineering Company; or an approved equal.

2. For bonding hardened concrete or masonry to steel, Colma-Dur Gel, Sikadur Hi-Mod Gel, or an approved equal.

D. Drypack: Field mixture of 1 part Portland cement to 2 parts fine aggregate mixed to a damp consistency such that a ball molded in the hands will stick together and hold its shape. At CONTRACTOR's option, the specified admixture may be added for increased workability at lower water/cement ratio. In lieu of field mixing, CONTRACTOR may use factory mixed drypack material, such as Master Builders "SetGrout" or Euclid "Euco Dry Pack Grout", or an approved equal.

E. Expansion Joint Filler: Asphalt impregnated fiber or non-extruding foam type, conforming to ASTM D994 and D1751, or D1752.

F. Construction Joint Materials: “Key-Kold”, “Kwik-Joint” of profiles indicated, or an approved equal.

G. Bonding Agent: “Weld-Crete”, manufactured by Larsen Products Co. or “Concresive", manufactured by Master Builders, or an approved equal

2.5 CONCRETE DESIGN REQUIREMENTS

A. General: Concrete shall be composed of cement, admixtures, aggregates and water. These materials shall be of the qualities specified. The exact proportions in which these materials are to be used for different parts of the work will be determined during the trial batch. In general, the mix shall be designed to produce a concrete capable of being deposited so as to obtain maximum density and minimum shrinkage and, where deposited in forms, to have good consolidation properties and maximum smoothness of surface. Mix designs with more than 41 percent of sand of the total weight of fine and coarse aggregate shall not be used. The aggregate gradations shall be formulated to provide fresh concrete that will not promote rock pockets around reinforcing steel or embedded items. The proportions shall be changed whenever necessary or desirable to meet the required results at no additional cost to the CITY. All changes shall be subject to review by the ENGINEER.

B. Water-Cement Ratio and Compressive Strength: The minimum compressive strength and cement content of concrete shall be not less than that specified in the following tabulation.

Type of Work	Min. 28-Day Compressive Strength (psi)	Max Aggregate Size (in)	Cement per cu yd (sacks)	Max W/C Ratio (by weight)
Structural Concrete *				
a. Tank Core Wall:	5,000	1	8.0	0.40
b. Columns:	4,500	1	7.0	0.42
c. Roof Slab:	4,500	1	7.0	0.42
d. Floor Slab:	4,500	1	7.0	0.42
e. Other Structures **:	4,500	3/4	7.0	0.42 **
Sitework concrete:	2,500	1	5.5	0.50
Lean concrete:	2,000	3/8	4.8	0.71

Shotcrete: see Section 03314

Note: One sack of cement equals 94 lb.
* Use “B” Aggregate gradation when placing conditions permit.
** For Slabs on grade, maximum W/C ratio shall be 0.45.

C Adjustments to Mix Design: The mixes used shall be changed whenever such change is necessary or desirable to secure the required strength, density, workability, and surface finish and the CONTRACTOR shall be entitled to no additional compensation because of such changes.

D. Fly ash/pozzolan shall not be used.

2.6 CONSISTENCY

A. The quantity of water entering into a batch of concrete shall be just sufficient, with a normal mixing period, to produce a concrete which can be worked properly into place without segregation, and which can be compacted by the vibratory methods herein specified to give the desired density, impermeability and smoothness of surface. Subject to the w/c ratio requirements of section 2.5, the quantity of water shall be changed as necessary, with variations in the nature or moisture content of the aggregates, to maintain uniform production of a desired consistency. The consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C 143. The slumps shall be as follows:

Part of Work	Slump (in)
With high range water reducer added	8-inches max
Other work	per Standard Specifications

2.7 TRIAL BATCH AND LABORATORY TESTS

A. Before placing any concrete, a Department of Building and Safety certified testing laboratory approved by the ENGINEER shall prepare, within 30 calendar days after the date of the Notice to Proceed, a trial batch of each concrete mix, based on the preliminary concrete mixes submitted by the CONTRACTOR. During the trial batch the aggregate proportions may be adjusted by the testing laboratory using the two coarse aggregate size ranges to obtain the required properties. If one size range produces an acceptable mix, a second size range need not be used. Such adjustments shall be considered refinements to the mix design and shall not be the basis for extra compensation to the CONTRACTOR. All concrete shall conform to the requirements of this Section, whether the aggregate proportions are from the CONTRACTOR's preliminary mix design, or whether the proportions have been adjusted during the trial batch process. The trial batch shall be prepared using the aggregates,

cement and admixture proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain 3 drying shrinkage, and 10 compression test specimens from each batch. The cost of not more than 3 laboratory trial batch tests for each specified concrete strength shall be borne by the CONTRACTOR. Any additional trial batch testing required shall be performed at the expense of the CONTRACTOR.

1. The trial batch procedure may be waived when test data of prior performance of the proposed mix design, performed by a Department of Building and Safety certified testing laboratory, is presented by the CONTRACTOR and approved by the ENGINEER.

2. The requirements of this section may be waived for concrete mixes specified by the Class per the Standard Specifications.

B. The determination of compressive strength will be made by testing 6-inch diameter by 12-inch high cylinders; made, cured and tested in accordance with ASTM C 192 and ASTM C 39. 5 compression test cylinders shall be tested at 7 days and 5 at 28 days. The average compressive strength for the 5 cylinders tested at 28 days for any given trial batch shall not be less than the appropriate sections of ACI 318 of the specified compressive strength.

C. A sieve analysis of the combined aggregate for each trial batch shall be performed according to the requirements of ASTM C 136. Values shall be given for percent passing each sieve.

2.8 SHRINKAGE LIMITATION

A. The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21-day drying age or at 28-day drying age shall be 0.036 percent or 0.042 percent, respectively. The CONTRACTOR shall only use a mix design for construction that has first met the trial batch shrinkage requirements.

B. The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage requirement by more than 25 percent.

C. If the required shrinkage limitation is not met during construction, the CONTRACTOR shall take any or all of the following actions, at no additional cost to the CITY, for securing the specified shrinkage requirements. These actions may include changing the source or aggregates, cement and/or admixtures; reducing water content; washing of aggregate to reduce fines; increasing the number of construction joints; modifying the curing requirements; or other actions designed to minimize shrinkage or the effects of shrinkage.

2.9 MEASUREMENT OF CEMENT AND AGGREGATE

A. The amount of cement and of each separate size of aggregate entering into each batch of concrete shall be determined by direct weighing equipment furnished by the CONTRACTOR and acceptable to the ENGINEER; provided that, where batches are so proportioned as to contain an integral number of conventional sacks of cement, and the cement is delivered at the mixer in the original unbroken sacks, the weight of the cement contained in each sack may be taken without weighing as 94 pounds.

2.10 MEASUREMENT OF WATER

A. The quantity of water entering the mixer shall be measured by a suitable water meter or other measuring device of a type acceptable to the ENGINEER and capable of measuring the water in variable amounts within a tolerance of one percent. The water feed control mechanism shall be capable of being locked in position so as to deliver constantly any specified amount of water to each batch of concrete, and the meter shall include a set-back register with a readily visible vertical face and double hands indicating in cubic feet and decimals thereof. A positive quick-acting valve shall be

used for a cut-off in the water line to the mixer. The operating mechanism must be such that leakage will not occur when the valves are closed

2.11 READY-MIXED CONCRETE

A. At the CONTRACTOR's option, ready-mixed concrete may be used meeting the requirements as to materials, batching, mixing, transporting, and placing as specified herein and in accordance with ASTM C 94, including the following supplementary requirements.

B. Ready-mixed concrete shall be delivered to the site of the work, and discharge shall be completed within 90 minutes after the addition of the cement to the aggregates or before the drum has been revolved 250 revolutions, whichever is first. In hot weather, or under conditions contributing to quick stiffening of the concrete, the ready-mixed concrete shall be discharged before the temperature of the concrete exceeds 90 degrees F.

C. Truck mixers shall be equipped with electrically-actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the re-settable, recording type, and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.

D. Each batch of concrete shall be mixed in a truck mixer for not less than 70 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolution of mixing.

E. Truck mixers and their operation shall be such that the concrete throughout the mixed batch as discharged is within acceptable limits of uniformity with respect to consistency, mix, and grading. If slump tests taken at approximately the 1/4 and 3/4 points of the load during discharge give slumps differing by more than 2-inches when the specified slump is more than 3-inches, the mixer shall not be used on the work unless the causing condition is corrected and satisfactory performance is verified by additional slump tests. All mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed of rotation, general mechanical condition of the unit, and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.

F. Each batch of ready-mixed concrete delivered at the job site shall be accompanied by a certified weighmaster delivery ticket furnished to the INSPECTOR in accordance with the Paragraph in Part 1 entitled "Certified Delivery Tickets".

G. The use of non-agitating equipment for transporting ready-mixed concrete will not be permitted. Combination truck and trailer equipment for transporting ready-mixed concrete will not be permitted. The quality and quantity of materials used in ready-mixed concrete and in batch aggregates shall be subject to continuous inspection at the batching plant by the INSPECTOR.

H Mixing and Transporting of concrete for bridge structures shall comply with Section 90-6 of CSS.

PART 3 -- EXECUTION

3.1 PROPORTIONING AND MIXING

A. Proportioning: Proportioning of the concrete mix shall conform to the requirements of Chapter 3 "Proportioning" of ACI 301; provided that the maximum slump for any concrete shall not exceed 4-inches except when the use of high range water reducer is permitted which increases the maximum slump to 8-inches. Proportioning for bridge structures shall comply with Section 90-5 of the CSS.

B. Mixing: Mixing of concrete shall conform to the requirements of Chapter 7 of said ACI 301 Specifications.

C. Slump: Maximum slumps shall be as specified herein in Section 2.6.

D. Retempering: Retempering of concrete or mortar which has partially hardened will not be permitted.

3.2 PREPARATION OF SURFACES FOR CONCRETING

A. General: Wet wood forms sufficiently to tighten up cracks. Wet other materials sufficiently to reduce adsorption and to help maintain concrete workability. Earth surfaces shall be thoroughly wetted by sprinkling, 24 hours prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

B. Vapor Barrier: Install under interior floor slabs on grade. Lap joints 6" in the direction of concrete spreading and tape seal. Seal the joints at walls and around penetrations with tape. Cover barrier with 2" layer of clean damp sand.

C. Screeds: Set screeds at walls and maximum 8’ centers between. Set to provide level floor. Check with an instrument level, transit, or laser during placing operation to maintain level floor.

D. Screeds Over Vapor Barrier: Use weighted pad or cradle type screeds and do not drive stakes through the vapor barrier. Check with an instrument level, transit, or laser.

E. Metal Floor Decking: Verify that decking joints are sealed and there are no openings or voids that will permit concrete leakage.

F. Expansion Joint Filler: Install where slabs abut buildings and elsewhere as indicated. Install full depth of concrete with top level with finished surface of concrete.

G. Joints in Concrete: Concrete surfaces upon or against which concrete is to be placed, where the placement of the old concrete has been stopped or interrupted so that, as determined by the ENGINEER, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bond. Except where the Drawings call for joint surfaces to be coated, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, and foreign material. Such cleaning shall be accomplished by sandblasting followed by thorough washing. All pools of water shall be removed from the surface of construction joints before the new concrete is placed.

H. After the surfaces have been prepared all approximately horizontal construction joints shall be covered with a layer of mortar approximately two-inch thick, or as shown on the plans. The mortar shall have the same proportions of cement and sand as the regular concrete mixture. The water-cement ratio of the mortar in place shall not exceed that of the concrete to be placed upon it, and the consistency of the mortar shall be suitable for placing and working in the manner hereinafter specified. The mortar shall be spread uniformly and shall be worked thoroughly into all irregularities of the surface. Wire brooms shall be used where possible to scrub the mortar into the surface. Concrete shall be placed immediately upon the fresh mortar. When casting deep walls (more than 6 feet high) over slabs or footings, in lieu of the two-inch thick mortar, a 6-inch lift of a rich pea gravel mix with the same water-cement ratio as the wall concrete shall be placed and spread uniformly. Wall concrete shall follow immediately and shall be placed upon the fresh pea gravel mix.

I. Embedded Items: No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and ACCEPTED by the INSPECTOR at least 24 hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from concrete previously placed shall be cleaned of all such grout before the surrounding or adjacent concrete is placed.

J. Conduits and Sleeves:

1. Locate so as not to reduce the strength of construction. Do not place pipes, except conduits in a slab of less than 3-1/2" thickness.

2. In supported concrete slabs, do not bury conduit having any outside diameter greater than 33% of the thickness of the slab. Increase slab thickness locally to meet this requirement.

3. Do not place conduit between the bottom of reinforcing steel and the bottom of supported slab.

4. In placing conduits at slabs on earth, place below the reinforcement, and encase in concrete by increasing thickness of the slab locally to at least 3" of concrete around the conduit on all sides.

K. All inserts or other embedded items shall conform to the requirements herein.

L. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms where shown or by shop drawings and shall be acceptable to the INSPECTOR before any concrete is placed. Accuracy of placement is the responsibility of the CONTRACTOR.

M. Where concrete is to be cast against old concrete, (greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by sand-blasting, exposing the aggregate. In concrete shear-walls, suspended slabs and roof slabs, the interface surface at construction joints shall be roughened to a full amplitude of one quarter inch. The hardened surface shall be cleaned of all latent foreign material and washed clean, prior to the application of an epoxy bonding agent.

N. Concrete shall not be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the work. Concrete shall not be deposited underwater nor shall the CONTRACTOR allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, will be subject to the review of the ENGINEER.

O. Corrosion Protection: Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2-inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.

P. Openings for pipes, inserts for pipe hangers and brackets, and the setting of anchors shall, where practicable, be provided for during the placing of concrete.

Q. Anchor bolts shall be accurately set, and shall be maintained in position by templates while being embedded in concrete.

R. Cleaning: The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

3.3 HANDLING, TRANSPORTING, AND PLACING

A. General: Do not place concrete during rain or adverse weather conditions without means to prevent all damage. Conform to requirements specified hereinafter whenever concrete placement is required during cold or hot weather. Placing of concrete shall conform to the applicable requirements of ACI 301 and the requirements of this Section.

B. Non-Conforming Work or Materials: Concrete which upon or before placing is found not to conform to the requirements specified herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these Specifications, or which is of inferior quality, shall be removed and replaced by and at the expense of the CONTRACTOR.

C. Concrete shall not be placed except in the presence of duly authorized representative of the INSPECTOR. The CONTRACTOR shall notify the INSPECTOR in writing at least 48 hours in advance of placement of any concrete.

D. Placement in Wall Forms: Concrete shall not be dropped through reinforcement steel or into any deep form, whether reinforcement is present or not, causing separation of the coarse aggregate from the mortar on account of repeatedly hitting rods or the sides of the form as it falls, nor shall concrete be placed in any form in such a manner as to leave accumulation of mortar on the form surfaces above the placed concrete. In such cases, some means such as the use of hoppers and, if necessary, vertical ducts of canvas, rubber, or metal shall be used for placing concrete in the forms in a manner that it may reach the place of final deposit without separation. In no case shall the free fall of concrete exceed 4 feet below the ends of ducts, chutes, or buggies. Concrete shall be uniformly distributed during the process of depositing and in no case after depositing shall any portion be displaced in the forms more than 6 feet in horizontal direction. Concrete in forms shall be deposited in uniform horizontal layers not deeper than 2 feet; and care shall be taken to avoid inclined layers or inclined construction joints except where such are required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in forms shall not exceed 5 feet of vertical rise per hour.

E. Casting New Concrete Against Old: An approved epoxy adhesive bonding agent shall be applied to the old surfaces according to the manufacturer's written recommendations. This provision shall not apply to joints where waterstop is installed, see Section 03290, "Joints in Concrete".

F. Conveyor Belts and Chutes: All ends of chutes, hopper gates, and all other points of concrete discharge throughout the CONTRACTOR'S conveying, hoisting and placing system shall be so designed and arranged that concrete passing from them will not fall separated into whatever receptacle immediately receives it. Conveyor belts, if used, shall be of a type acceptable to the ENGINEER. Chutes longer than 50 feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the specified consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will be wasted. All conveyor belts and chutes shall be covered. Sufficient illumination shall be provided in the interior of all forms so that the concrete at the places of deposit is visible from the deck or runway.

G. Placement in Slabs: Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the pour. As the work progresses, the concrete shall be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screeded in an up-slope direction.

H. Temperature of Concrete: The temperature of concrete when it is being placed shall be not more than 90 degrees F nor less than 40 degrees F in moderate weather, and not less than 50 degrees F in weather during which the mean daily temperature drops below 40 degrees F. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the specified minimum temperature. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, the CONTRACTOR shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The CONTRACTOR shall be entitled to no additional compensation on account of the foregoing requirements.

I. Cold Weather Placement:

1. Earth foundations shall be free from frost or ice when concrete is placed upon or against them.

2. Normal Concrete: When the temperature is below 40 degrees F, the temperature of the concrete placed in the forms shall be at least 60 degrees F. When the temperature is below 30 degrees F, the temperature of the concrete as mixed shall be 65°F. In all cases, when the daily average temperature is below 40 degrees F, the concrete shall be kept at 55 degrees F for the 72 hours, and then allowed to drop uniformly to the air temperature over the next 24 hours. Concrete temperature shall be measured by placing a thermometer 2" below the top of the concrete being placed.

3. Air-entrained concrete shall be kept at the above temperature for 27 hours and above freezing for an additional 72 hours.

4. No calcium chloride shall be used to accelerate hardening of concrete. CONTRACTOR to certify that any additive used does not contain calcium chloride.

5. If low temperature accelerating admixture is proposed, adjust concrete mix as required and obtain approval of the ENGINEER.

6. All concrete materials, reinforcement, forming materials and ground with which concrete is to come in contact shall be free of frost.

7. The covering or other protection used in connection with the curing shall remain in place and intact for at least 24 hours.

8. The work shall be protected from the elements, flowing water, and defacements of any nature during the construction operations.

9. Conform to the provisions of ACI 306.1, except as modified herein.

J. Hot Weather Placement: Conform to ACI 305R and the following requirements:

1. Take extra care to reduce the temperature of the concrete being placed, and to prevent rapid drying of newly placed concrete. When the outdoor ambient temperature is more than 90 degrees F, shade the fresh concrete as soon as possible after placing, and start curing as soon as the surface of the fresh concrete is sufficiently hard to permit it without damage.

2. Concrete placement temperatures shall be controlled by the CONTRACTOR and shall not be limited to:

   a. Shading and cooling the aggregate;

   b. Avoiding use of hot cement;

   c. Cooling mixing water by additions of ice;

   d. Insulating water supply lines and tanks; and

   e. Insulating mixer drums or cooling them with sprays or wet burlap.

K. Cast-in-place concrete shall be homogeneous throughout the structural element. The methods used to place shall prevent segregation. Placement of concrete for bridge structures shall conform to Section 51-1 of the CSS.

3.4 PUMPING OF CONCRETE

A. General: If the pumped concrete does not produce satisfactory end results, the CONTRACTOR shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

B. Pumping Equipment: The pumping equipment must have 2 cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the CONTRACTOR may have a standby pump on the site during pumping.

C. The minimum diameter of the hose (conduits) shall be 4-inches.

D. Pumping equipment and hoses (conduits) that are not functioning properly, shall be replaced.

E. Aluminum conduits for conveying the concrete will not be permitted.

F. Gradation of coarse aggregates shall conform to ASTM C 33 and shall be as close to the middle range as possible.

G. Gradation of fine aggregate shall conform to ASTM C 33, with 15 to 30 percent passing the number 50 screen and 5 to 10 percent passing the number 100 screen. The fineness modulus of sand used shall not be over 3.00.

H. Field Control: Concrete samples for slump per ASTM C 143 and test cylinders per ASTM C 31 and C 39.

3.5 ORDER OF PLACING CONCRETE

A. The order of placing concrete in all parts of the work shall be acceptable to the ENGINEER. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown. The placing of units shall be done by placing alternate units in a manner such that each unit placed shall have cured at least 7 days before the contiguous unit or units are placed, except that the corner sections of vertical walls shall not be placed until the 2 adjacent wall panels have cured at least 14 days.

B. The surface of the concrete shall be level whenever a run of concrete is stopped. To insure a level, straight joint on the exposed surface of walls, a wood strip at least 3/4-inch thick shall be tacked to the forms on these surfaces. The concrete shall be carried about 1/2-inch above the underside of the strip. About one hour after the concrete is placed, the strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel and all laitance shall be removed.

3.6 TAMPING AND VIBRATING

A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement. Vibrators shall be high speed power vibrators (8,000 to 10,000 rpm) of an immersion type in sufficient number and with (at least one) standby units as required.

B. Operation of Vibrators: Do not horizontally transport concrete in forms with vibrators nor allow vibrators to contact forms or reinforcing. Push vibrators vertically into the preceding layers that are still plastic and slowly withdraw, producing maximum obtainable density in concrete without creating voids or segregation. In no case disturb concrete that has partially set. Vibrate at intervals not exceeding two-thirds the effective visible vibration diameter of the submerged vibrator. Avoid excessive vibration that causes segregation. Use and type of vibrators shall conform to ACI 309 "Recommended Practice for Consolidation of Concrete".

C. Correction of Segregation: Before placing next layer of concrete, and at the top of last placement for vertical elements, remove concrete containing excess water or fine aggregate or showing deficiency of coarse aggregate and fill the space with compacted concrete of correct proportions.

D. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are placed horizontally, the concrete shall be worked under the waterstops by hand, making sure that all air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration, over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.

E. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and doses snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly as specified. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the results herein specified within 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.

3.7 FINISHING CONCRETE SURFACES

A. General: Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth, continuous hard surface. Allowable deviations from plumb or level and from the alignment, profiles, and dimensions shown are defined as tolerances and are specified in Part 1, herein. These tolerances are to be distinguished from irregularities in finish as described herein. Aluminum finishing tools shall not be used.

B. Formed Surfaces: Formed surfaces for all structures other than building structures and bridge decks, shall be finished per Section 303-1.9 of Standard Specifications. Concrete for bridge decks shall be finished per CSS Section 51-1.17. Concrete for building and retaining wall structures shall be finished per architectural finish as specified hereon, or as shown on Drawings.

C. Unformed Surfaces: After proper and adequate vibration and tamping, all unformed top surfaces of slabs, floors, walls, and curbs shall be brought to a uniform surface with suitable tools. The classes of finish specified for unformed concrete surfaces are designated and defined as follows:

1. Finish U1 - Sufficient leveling and screeding to produce an even, uniform surface with surface irregularities not to exceed 3/8-inch. No further special finish is required.

2. Finish U2 - After sufficient stiffening of the screeded concrete, surfaces shall be float finished with wood or metal floats or with a finishing machine using float blades. Excessive floating of surfaces while the concrete is plastic and dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floating shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Surface irregularities shall not exceed 1/4-inch. Joints and edges shall be tooled where shown or as determined by the ENGINEER.

3. Finish U3 - After the floated surface (as specified for Finish U2) has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense, uniform surface free from blemishes, ripples, and trowel marks. The finish shall be smooth and free of all irregularities.

4. Finish U4 - Steel trowel finish (as specified for Finish U3) without local depressions or high points. In addition, the surface shall be given a light hairbroom finish with brooming perpendicular to drainage unless otherwise shown. The resulting surface shall be rough enough to provide a nonskid finish.

D. Unformed surfaces shall be finished according to the following schedule:

UNFORMED SURFACE	Finish
Grade slabs and foundations to be covered with concrete or fill material	U1
Floors to be covered with grouted tile or topping grout	U2
Slabs which are water bearing with slopes 10 percent and less	U3
Sloping slabs which are water bearing with slopes greater than 10 percent	U4
Slabs not water bearing	U4
Slabs to be covered with built-up roofing	U2
Interior slabs and floors to receive architectural finish	U2

E. Floor Sealer Hardener (Surface Applied):

1. Floors to receive hardener shall be cured, cleaned, and dry with all work above them completed. Apply zinc and/or magnesium fluosilicate evenly, using 3 coats, allowing 24 hours between coats.

2. The first coat shall be 1/3 strength, second coat 1/2 strength, and third coat 2/3 strength. Each coat shall be applied so as to remain wet on the concrete surface for 15 minutes. If sodium silicate is used, it shall be applied evenly, using 3 coats, allowing 24 hours between coats, and the material shall be applied full strength at the rate of one gallon per 300 square feet. Approved proprietary hardeners shall be applied in conformance with the manufacturer's instruction. After the final coat is completed and dry, surplus hardener shall be removed from the surface by scrubbing and mopping with water.

3. Floor hardener shall be applied where shown.

3.8 CURING AND DAMPPROOFING

A. Curing and Dampproofing shall conform to Section 03370 “Curing Concrete”, Part 3.

3.9 PROTECTION

A. The CONTRACTOR shall protect all concrete against injury until final acceptance by the CITY. Fresh concrete shall be protected from damage due to rain, hail, sleet, or snow. The CONTRACTOR shall provide such protection while the concrete is still plastic and whenever such precipitation is imminent or occurring. Immediately following the first frost in the fall, the CONTRACTOR shall be prepared to protect all concrete against freezing. After the first frost, and until the mean daily temperature in the vicinity of the worksite falls below 40 degrees F for more than one day, the concrete shall be maintained at a temperature not lower than 50 degrees F for at least 72 hours after it is placed.

B. The CONTRACTOR shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the CITY. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the CONTRACTOR'S expense.

3.8 TREATMENT OF SURFACE DEFECTS

A. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the ENGINEER. In no case will extensive patching of honey combed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall be repaired as specified herein. Concrete containing extensive voids, holes, honeycombing, or similar depression defects, shall be completely removed and replaced. All repairs and replacements herein specified shall be promptly executed by the CONTRACTOR at its own expense.

B. Defective surfaces to be repaired shall be cut back from trueline a minimum depth of 1/2-inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material, and not less than 1/32-inch depth of the surface film from all hard portions, by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces under repair will remain moist, but not so wet as to overcome the suction upon which a good bond depends. The material used for repair purposes shall consist of a mixture of one sack of cement to 3 cubic feet of sand. For exposed walls, the cement shall contain such a proportion of Atlas white Portland cement as is required to make the color of the patch match the color of the surrounding concrete.

C. Holes left by tie-rod cones shall be reamed so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with non-shrink grout. Holes left by form-tying devices having a rectangular cross-section, and other imperfections having a depth greater than their least surface dimension, shall not be reamed but shall be repaired in an approved manner with non-shrink grout.

D. All repairs shall be built up and shaped in such a manner that the completed work will conform to the requirements of this Section, as applicable, using approved methods which will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of said repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.

E. Prior to filling any structure with water, all cracks that may have developed shall be repaired to the satisfaction of the ENGINEER. This repair method shall be done on the water bearing face of members. Prior to backfilling, faces of members in contact with fill, which are not covered with a waterproofing membrane, shall also have cracks repaired as specified herein.

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SECTION 03314
PRESTRESSED CONCRETE TANK

PART 1 -- GENERAL

1.1 SCOPE OF WORK

A. This section covers the complete furnishing and installation of seven-wire strand for circumferential and t hread bars f or v ertical p restressing, of c oncrete w alls, s pecial f orming requirements and the complete shotcrete application. This section also covers the qualifications for the Contractor, the Tank Contractor, the Prestressor and the Shotcreter. In addition, this section covers general requirements for the tank and construction materials used in the tank. In the event of a discrepancy between this section of the Specifications and any other section of the Specifications, this section shall gov ern. The words "stressing machine" may refer to either circumferential wrapping machinery or vertical tendon stressing equipment.

B. The Contractor shall furnish and construct the prestressed concrete reservoir of the capacity shown on the Plans, consisting of a concrete roof with concrete support columns, concrete floor and a poured-in-place concrete core wall, post-tensioned vertically with steel tendon rods and circumferentially with wrapped strand protected with several coats of shotcrete.

C. The tanks shall conform to the dimensions and be equipped with the appurtenances shown on the Plans and as specified herein.

D. Concrete work shall conform to the provisions of Section 03300 – Cast-in-Place Concrete, as supplemented and modified by this section.

1.2 REFERENCE STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM A416	-	Specification for Uncoated Seven-Wire Stress-Relieved Steel Strand for Prestressed Concrete.
ASTM A722	-	Specification for Uncoated High-Strength Steel Bar for Prestressing Concrete.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03200 Reinforcement Steel.

B. Section 03230 Earthquake Cables.

C. Section 03250 Concrete Accessories.

D. Section 03255 Wall Base and Top Joint.

E. Section 03315 Grout.

F. Section 03370 Concrete Curing.

G. Section 03741 Pressure Injection of Cracks.

H. Section 07100 Prefabricated Drainage Composites.

1.4 WORK BY SUB-CONTRACTOR AND SUPERINTENDENT

A. Due to the nature of the project, it is the intent of these Specifications to obtain a first class product with emphasis on overall safety, quality and quality control, both during and after the construction process. Only Sub-Contractors experienced in the construction of strand wrapped prestressed concrete tanks are qualified to bid on and construct this tank project. The Sub-Contractor shall have successfully completed at least three (3) circular cast in place prestressed concrete tanks of at least one-half of the diameter, height and capacity in the last five (5) years.

B. All tanks listed for the Subcontractor's experience requirements must have been built in the Subcontractor's own name. Experience of personnel associated with the Sub-Contractor or hired by the Subcontractor will not be considered unless the Subcontractor can demonstrate that the work was sub-contracted and performed directly by the listed Tank Subcontractor's business name.

C. The proposed Tank construction Supervisor-in-Charge of Field Operations (superintendent) shall be currently employed by the qualified Tank Subcontractor and shall have been the tank construction Supervisor-in-Charge of Field Operations (superintendent) on no less than two (2) circular prestressed concrete tanks of at least one-half of the diameter, height and capacity during the last five years. The qualified tank Supervisor-in-Charge of Field Operations (superintendent) shall have been in the direct employment of the qualified Tank Subcontractor for both of the tanks listed and will be required to be on the project site in responsible charge, full-time, during all tank concrete construction activities.

D. The City is desirous of obtaining a concrete tank that will not develop structural and aesthetic problems. Therefore, as evidenced by these Specifications and Drawings, a strong emphasis has been made on performance to assure desired details and proven construction methods are utilized to provide the highest quality structure available. For example, the stringent forming and pouring methods, the close-tolerance continuously recorded circumferential prestressing and the automated shotcrete specified are only three of many ways that will help prevent structurally deficient problems from occurring during the service life of the tank. It is imperative that the specified features of these Documents be strictly adhered to and that only Subcontractors that have a successful performance record in prestressed concrete tank construction be approved to perform the work.

E. A Subcontractor may not be approved to perform the work unless the Tank Subcontractor's, and associated Supervisor-in-Charge of Field Operations' (Superintendent), experience requirements are submitted and approved by the City's Project Engineer/ Construction Manager.

1.5 WORK BY PRESTRESSOR

A. No stressing system falling under any of the following requirements will be considered unless it has been successfully used on tanks of at least one-half of the diameter, height and capacity. The Contractor shall submit to the City's Construction Manager a list of project references, each project reference shall include, the project's name and location, owner's name, Owners Contact information including the owner's project manager or Construction manager names and phones. the completion dates of three (3) tanks on which the proposed qualifying "stressing machine" and automated shotcrete equipment has been used within the past five (5) years. All tanks listed for the Prestressor's experience requirements must have been Prestressed in the Prestressor's own name. Experience of personnel associated with the Prestressor or hired by the Prestressor will not be considered unless the Prestressor can demonstrate that the work was contracted and performed directly by the listed Prestressor in its business name.

B. Descriptive literature shall also be submitted to the Construction Manager showing the proposed machinery with the recorders and a typical copy of an actual recording of the applied forces taken from one of the jobs on which such machinery has been used. Any stressing system that will not provide the substantial equivalent of the above requirements will be rejected.

C. The Prestressor system and Prestressor Subcontractor will not be approved unless such data is submitted and proved by the Project Engineer/Construction Manager. This applies to the strand wrapping, tendon-stressing and automated shotcrete equipment.

D. Experience gained by the Prestressor in machine single wire wrapping, internal tendon systems or external tendon systems shall not be considered in meeting the required experience requirements.

E. If subcontracted, the prestressing firm or individual(s) will be responsible to the Tank Contractor for the following phases of work:

1. Furnish, stress and pressure grout the vertical prestressing thread bars with epoxy.
2. Abrasive blast the exterior concrete core wall and apply shotcrete scratch coat.
3. Furnish and install the horizontal prestressing strand.
4. Apply the shotcrete cover coat application over the strand.

1.6 SUBMITTALS REQUIRED BY CONTRACTOR

A. The following information is required to be submitted to the Construction Manager:

1. The name(s) of the proposed qualified superintendent who will be in direct charge of the tank construction for the full duration of the Contract.

2. A list of at least two reservoir jobs successfully completed by each of the superintendents listed by the Tank Contractor, which shall include a tank description, the name and location of the Project, Owner's contact Information, the Design Consultant, and the approximate completion date of each tank while directly employed by the Tank Sub-Contractor.

3. The name and address of the Tank Contractor, and a list of at least three concrete tanks, similar in design to the tank specified here-in, successfully completed by the Tank Contractor during the last five years in its own name.

4. The name and address of the Tank Prestressor, if different than the Tank Contractor and the name and location of the Project, Owner's contact Information and the completion dates of three structures on which the proposed qualifying strand wrapping prestressing system, meeting the substance of these Specifications requirements, has been used during the last five years.

5. Descriptive literature of the strand wrapping, the vertical prestressing and the automated shotcrete machinery meeting all of these Specification requirements. Include in such data photographs or prints of the means of recording of both the circumferential and vertical prestressing applications and copies of actual photographs, print-outs or other records of applied wrapping forces (as well as force-elongation diagrams if available) taken from jobs in which the machinery has been used.

6. Failure to submit any of the above documents for the review & approval by the Project Engineer / Construction Manager. Will be cause for the Rejections of the proposed system / equipment, Subcontractor and or Personnel.

7. In the event that the Tank Sub-contractor or Prestressor Sub-contractor submitted by the General contractor do not meet the qualifications listed above, the General contractor must, at no additional cost to the city and without delay, submit in accordance to the contract's General Conditions Section 00311 a Subcontractor Substitution request, and submit for the project's engineer approval a different subcontractor(s) that meet the required minimum qualifications listed in this section.

1.7 CONTRACT AWARD

A. The Contract will be awarded on the basis of the methods, material and equipment shown on the Drawings and specified in these Specifications. The Specifications and Drawings are based on proven construction techniques that result in successful low-maintenance tank storage performance. The following specific design criteria and salient characteristics are considered essential to the successful construction of the specified prestressed concrete tank.

1. Experience in constructing a large quantity of successful tanks, ease of construction, Contractor familiarity with this type of tank construction and reduced inspection costs associated therewith.

2. Adaptability of liners, as specified here-in, to be used under floor and subgrade to prevent water migration.

3. Capability of subgrade to be compacted with heavy equipment.

4. Capability of floor and footing to expand and contract.

5. Satisfactory response of tank under seismic conditions.

6. A "freed" condition between wall and wall-footing by use of neoprene bearing pads.

7. A PVC water stop between core wall and floor-footing.

8. Properly formed, poured and reinforced core walls.

9. Concrete floor, walls and roof of the thickness, strength and cement content specified here-in.

10. A reduced number of vertical wall joints.

11. A PVC water stop between each vertical wall joint.

12. Quantity of vertical prestressing and the type of positive anchoring system as specified here-in.

13. Vertical prestressing tendons consisting of individual galvanized thread bars encased in PVC tubing.

14. Epoxy pumping of all vertical prestressing tendons around thread bars.

15. External, continuously strand wrapped circumferential prestressing providing the desired bond with the shotcrete in addition to the final force specified. (No stressing system based on single strand wrapping, pulling strand through a die or jack-operated, circumferential tendon or cable systems, based on circumferential movement of the prestressing steel after it is placed in/around the wall, will be allowed.)

16. Positive anchoring system of circumferential prestressing to the core wall and spaced as shown on the Drawings.

17. Maximum allowable spacing of circumferential prestressing as specified.

18. Galvanized circumferential prestressing for long-life performance.

19. Continuous and instantaneous recording and correction of all applied prestressing forces.

20. A maximum acceptable stress tolerance of + 1.5% at any point along the prestressing steel.

21. No variation in prestressing forces due to friction losses.

22. Automated, wet-mix 10-sack shotcrete applied over a fully sandblasted concrete core wall.

23. External moisture protection as specified here-in.

24. Conventional two-way, flat slab reinforced concrete roof and slope as shown on the Drawings. (No post-tensioned, precast, waffle, dome or other types of roof systems will be allowed.)

25. Wall-roof connection as shown on the Drawings.

26. An acceptable tank leakage rate as specified here-in.

1.8 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for Submittals.

B. Contractor shall submit five (5) copies of the circumferential prestressing wrapping schedule and the intermediate lock-off elevations for the Engineer's review before the wall pour is made.

C. The Contractor shall submit mill certifications for the seven-wire strand, strand and high-strength threaded bars to verify conformance to these specifications.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Prestressing steel shall be adequately packaged against intrusion of chemical contaminants (from the atmosphere or otherwise) for the protection of the steel against physical damage and corrosion during (and subsequently as the result of) shipping and storage.

B. Prestressing steel that has sustained physical damage through rust or otherwise will be rejected.

C. All materials and prestressing material delivered to the job site shall be stored off the ground on planks, supported by 4" x 4" timber, which must be covered with polyethylene or sizalkraft paper to prevent any moisture from coming up from the bottom.

D. Reels of strand, prestressing tendons, anchorages, etc., shall be stacked neatly and as compact as possible.

E. All materials for tendons and all fabricated thread bars shall be covered with tarpaulins in such a manner that water, rain, moisture and dust are kept away.

PART 2 -- PRODUCTS

2.1 SEVEN-WIRE STRAND

A. Hot-dipped galvanized seven-wire strand used for circumferential strand wrapping prestressing or earthquake cables shall meet the following minimum requirements:

	Item	Specification	
1.	Nominal strand diameter	3/8"	1/2"
2.	Nominal area after galv.(in^2)	0.089	0.153
3.	Nominal weight (lbs/1000 LF)	303	541
4.	Pitch (strand dia.)	12-16	12-16
5.	Tensile strength (lbs) min.	21,400	38,200
6.	Yield strength @ 1% extension (lbs) min.	16,000	28,500
7.	Elongation in 24-inch at fracture min.	4.5%	4.5%
8.	Weight of zinc coating (oz/sq ft) min.	0.85	0.85

B. Hot-dipped galvanized seven-wire strand shall be manufactured in accordance with ASTM A-416 prior to galvanizing.

C. Single wire prestressing material shall not be utilized in lieu of seven-wire strand prestressing material.

2.2 HIGH-STRENGTH THREADBARS – GALVANIZED

A. Deformations of the thread bars shall form a screw-thread suitable for mechanically coupling lengths of thread bar and for positive attachment of anchor assemblies.

B. Deformations shall conform to ASTM A-722, Type II requirements and shall be uniform such that any length of bar may be cut at any point and the internal threads of a coupling designated for that size of bar can be freely screwed on the bar. The bars and their deformations shall be hot rolled.

C. Tensile and Physical Properties shall meet the following requirements with bars being manufactured in accordance with ASTM A-722, Type II:

	Item	Unit	Specifications	
1.	Nominal diameter	inches	1.25	1.375
2.	Min. tensile force	kips (min.)	187	237
3.	Yield force at 0.2% offset	kips (min.)	150	190
4.	Elong. in 20 bar diameters	% (min.)	4	4
5.	Nom. cross-sectional area	sq. in.	1.245	1.577
6.	Nominal bar weight	lbs./ft.	4.39	5.56
7.	Min. wt. of zinc coating	oz./sq. ft.	0.85	0.85

D. Thread bars with quenched or tempered steels will not be permitted and shall have a maximum carbon content of 0.55%. Only manufacturers with at least 5 years of experience (under their current name) in the manufacturing of post-tensioning material will be accepted.

2.3 ANCHORAGES FOR VERTICAL POST-TENSIONED THREAD BARS

A. All post-tensioned prestressing shall be secured at the ends by means of approved permanent anchoring devices, which shall hold the prestressing steel at a force not less than 95% of the guaranteed minimum tensile strength of the prestressing steel.

B. The load from the vertical prestressing anchoring device shall be distributed to the concrete through steel bearing plates of dimensions and details shown on the Drawings.

C. All vertical prestressing anchor plate dimensions, all dimensions relating to the conical hole in the top and bottom of the bearing plate (35° cone angle with the vertical), all steel tubing attached to the top bearing plate, and all tendon spacings shall strictly conform to the details shown on the Drawings.

D. Fully-threaded anchor connections shall be used at both ends of the vertical prestressing bar, which shall incorporate a spherical-shaped bearing surface to match the conical surface in the bearing plate.

E. The contact point of the spherical-shaped vertical prestressing bearing surface to conical hole shall be approximately 1/4" to 1/2" below the bearing plate surface.

F. Wedge anchors shall not be used for permanent anchor hardware.

2.4 TESTING OF PRESTRESSING MATERIAL

A. Prestressing Contractor shall furnish, at his own expense, Mill test certificates showing the dimensional and physical characteristics of each size, heat or reel of the prestressing steel he has furnished. Additional tests by a local testing laboratory and at Contractor's expense will be required for incomplete certificates and prestressing steel of foreign origin.

B. Prestressing Contractor shall furnish evidence, to the satisfaction of the Engineer, prior to the preparation of shop drawings and installation of vertical tendons, that the proposed thread bar anchorage system meets the requirements of these specifications. The Engineer may order additional tests to be taken. Should such additional tests not meet the specifications, such expenses shall be paid for by the Contractor.

C. Before any stressing operation may be started, Contractor shall calibrate all recording equipment at an approved testing laboratory to the satisfaction of the City.

D. All continuous force readings for either the vertical or the circumferential prestressing operations shall be developed with electronic (or the substantial equivalent) force (strain gauge method) sensing transducers, all having a maximum non-linearity error of $\pm$0.5% and a maximum hysteresis error of $\pm$0.25%.

2.5 ANCHOR POCKETS FOR VERTICAL TENDONS

A. Anchor pockets for vertical prestressing tendons shall consist of steel cans, hot-dipped galvanized after cutting (unless shown otherwise on the Plans) and subsequently welded to the top bearing plate.

B. Anchor pockets shall be adequately sealed from moisture and concrete intrusion by wooden lids and 2 inch wide plastic adhesive tape. Remove the lid prior to roof pour and grout void solid after prestressing.

C. Anchor pockets for vertical prestressing thread bars must have adequate provisions for flushing of ducts with water during concrete placement.

2.6 DUCTS FOR VERTICAL THREAD BARS

A. Duct enclosures for vertical prestressing steel shall be standard PVC pipe of size and class specified on the Plans.

B. All ducts shall be provided with expandable valves to facilitate the injection of epoxy after prestressing.

C. All connection details shall be as shown on the Plans.

2.7 EPOXY GROUT FOR VERTICAL THREAD BAR TENDONS

A. The vertical tendon system shall provide complete 2-part epoxy protection of the prestressing steel inside ducting and anchors.

B. Acceptable epoxy grout product is Select Injection Epoxy NC, distributed by SPG, Upland, CA (909) 985-5771. Approved equal material may be used.

C. Portland Cement grout will not be accepted.

2.8 PORTLAND CEMENT

A. Portland Cement for the tank construction and shotcrete shall meet the requirements set out in Section 03300 of these Specifications.

2.9 SHOTCRETE

A. Fine aggregates shall meet the requirements set out in Section 03300 – Cast-in-Place Concrete, of these Specifications.

B. Well-graded coarse sand shall be used for all shotcrete applications.

C. Coarse sand shall generally consist of the following gradation:

Sieve Size	% Passing by Weight
3/8 inch	100
No. 4	95 - 100
No. 8	80 - 100
No. 16	50 - 85
No. 30	25 - 60
No. 50	10 - 30
No. 100	2 - 10

1. The fineness modulus shall fall between 2.70 and 3.00.

D. Rebound materials shall not be reused in any form for shotcrete. Rebound is defined as aggregate mixed with cement, which ricochets off the surface during the application of shotcrete because of collision with a harder surface, reinforcement, or other aggregate particles.

E. Water shall meet the requirements set out in Section 03300 – Cast-in-Place Concrete, of these Specifications.

F. Air-entrainment and admixtures shall meet the requirements specified in Section 03300 – Cast-in-Place Concrete, of these Specifications.

G. All shotcrete, unless otherwise specified here-in, shall be fibrous reinforced. Such material shall consist of 100% virgin polypropylene fibrillated fibers specifically manufactured for use as concrete/shotcrete secondary reinforcement. The required volume of fibers to be added per cubic yard of shotcrete shall be as specified in these Specifications.

1. Polypropylene fibers will help to provide greater control of cracking from drying shrinkage and thermal expansion/contraction, a reduction of permeability, an increased impact capacity, an improved shatter/abrasion resistance and added toughness of the shotcrete.

2. The fibers shall be manufactured in accordance with applicable building codes and ASTM C-1116 Type III 4.1.3. and ASTM C-1116 (Ref. ASTM C-1018) Performance Level I_5 as outlined in Section 21, Note 17. Fibrous concrete reinforcement shall be as manufactured by the FIBERMESH COMPANY, Chattanooga, TN [phone: (615) 892-7243], or equal.

3. Acceptable polypropylene fibers shall have the following physical characteristics:

   a. Specific gravity = 0.91
   b. Tensile strength = 80-110 ksi
   c. Fiber length = graded per manufacturer

2.10 SHOTCRETE PROPORTIONING

A. Each cubic yard of mortar in the ready mix truck or mixer shall consist of 0.1% (1.5 lbs. per cubic yard) polypropylene fibers as specified here-in and a mix ratio of 3 lbs. of moist sand to 1 lb. of Portland cement. Up to 50 oz. of PRO- KRETE-R or POZZOLITH 300R may be added at the option of Contractor during warm weather conditions.

B. Whenever night temperatures are expected to drop below 35F, shotcrete proportioning shall follow the provisions of ACI 306R, “Cold Weather Concreting”.

C. If the batching procedure requires that smaller volumes of cement and sand be used, the required cement-to-sand ratio shall still be strictly followed.

D. Additives other than PRO-KRETE-R or POZZOLITH 300R (such as POZZOLITH 300N or others) shall not be used unless specifically approved by the Engineer, after careful consideration of its corrosive influence on prestressing steels.

E. If used by the shotcreter, the total volumetric air content of the shotcrete before placement shall not exceed 7 percent (plus or minus one percent) as determined by ASTM C-173 or ASTM C-231.

F. Unless otherwise specified on the Drawings, shotcrete cylinder strengths at 28 days shall be no less than 4,500 psi. Higher shotcrete cylinder strengths shall not permit a reduction in the above specified cement contents. The cement content in the above mix designs may be increased should the specified 28 day strength requirement not be met.

G. The polypropylene fibers and admixtures shall be added to the shotcrete at the time it is batched and in the amounts specified here-in. These additives shall be mixed in strict conformance to the manufacturer's instructions and recommendations for uniform and complete distribution. Each certificate of delivery supplied by the shotcrete supplier shall indicate the additive trade name, manufacturer's name and amount per cubic yard added to each batch of shotcrete.

2.11 WALL FORMS

A. Full Height Pours: The wall form design shall be such that wall sections can be poured full height without creating horizontal cold joints and without causing snapping of form ties which shall be of sufficient strength and number to prevent spreading of the forms during the placement of concrete and which shall permit ready removal of the forms without spalling or damaging the concrete. Formwork shall conform to the requirements of Section 03100 of these Specifications.

2.12 ROOF FORMS

A. Forms and falsework supports for the roof slab shall be sufficiently rigid and have the strength to support the wet concrete, the workers and equipment necessary for its placement within acceptable deflection limits. Formwork shall conform to the requirements of Section 03100 of these Specifications.

PART 3 – EXECUTION

3.1 BASIC SEQUENCE OF PRESTRESSING

A. The construction shall follow the basis orders as below, see AWWA D110-04 for more specific requirements of each step of construction.

1. When the core wall concrete reaches the specified strength vertically post-tension the wall. Pull each theadbar to develop 200 psi residual compression.

2. Epoxy inject each threadbar that has been post-tensioned.

3. Abrasive blast the exterior face of the corewall.

4. Apply an initial layer of shotcrete (3/8" thick).

5. Apply circumferential prestressing (3/8" diameter, 7-wire galvanized strand) to develop 200 psi residual compression.

6. Apply a 3/8" thick layer of shotcrete between each layer of circumferential prestressing.

7. Apply a 1-1/2" thick finish coat of shotcrete over the last layer of circumferential prestressing.

8. Wet the newly applied finish coat of shotcrete over the last layer of circumferential prestressing.

9. Cure shotcrete for 7 days.

10. Lid to be striped prior to circumferential stressing.

3.2 CIRCUMFERENTIAL PRESTRESSING EQUIPMENT

A. The circumferential stressing system shall produce a continuously, electronically (or substantial equivalent) monitored permanent stress or force recording along the full length of the strand as it is being applied. The stress variation in any strand at any point around the circumference should not be greater than ± 1.5 percent of the ultimate strength of the steel. In addition to this recording, any system which deflects the tensioned strand between the tensioning device and the wall, shall

provide a similar continuously monitored stress or force record along the full length of the strand as it is being applied to the wall. These recordings shall show that either before or after deflection, that the stress variation in any strand at any point around the circumference shall not be greater than ± 1.5 percent of the ultimate strength of the steel. Due to prior instances of force measurement inaccuracies and the inherent problems associated with hand-held stressometers, no manual recorded force readings will be accepted. This requirement shall be strictly followed.

B. Any wrapping that does not meet the stress tolerances specified and/or cannot meet the requirements of above will not be accepted and will be removed at Contractor's expense. Contractor is responsible for all costs associated with meeting the specified tolerances.

C. Since intermittent force applications can result in an unequal stress distribution around the wall (due to friction losses), the prestressing system shall be capable of applying a continuous wrapped force at any point around the circumference within the specified tolerances. Circumferential stressing systems based on jack-operated cable or rod-type tendons (such as those placed inside of ducts incorporated in the corewall or placed manually around the exterior of the corewall) will not be allowed.

D. Since wrapping systems which utilize single solid prestressing material will not provide the desired bond between the prestressing material and the shotcrete and since single solid prestressing material will not provide an adequate safety factor against failure, only machine wrapping systems which utilize seven-wire prestressing strandwrapping will be allowed.

3.3 CIRCUMFERENTIAL PRESTRESSING APPLICATION

A. All cracks, 0.02 inches and larger in the corewall and floor slab, shall be repaired per Section 03741 of these specifications following the circumferential prestressing of the tank walls.

B. Wrapped strand shall be anchored to the wall at least at the ends of every coil or reel. Submit anchoring method shop drawings to the Engineer for review.

C. Permanently anchoring one strand to a previously wrapped strand will not be permitted.

D. Wrapping strand ends shall be joined by suitable splicing methods that will develop 90% of the full strength of the strand. Submit splicing method shop drawings to the Engineer for review.

E. Use of different alloys in the splicing material shall not be permitted.

F. Because prestressing material exposed to excessive temperatures greatly increases the possibility of irrevocable damage, such as steel embrittlement, stress corrosion, or wire splitting, the temperature of the prestressed material during application shall not be allowed to increase by more than fifty degrees during such application. No system that relies on pulling the prestressing material through a die to create a force, will be allowed.

G. Wrapping may start when the concrete has reached a compressive strength noted on the Drawings; however, under no circumstance shall the compressive stress, exceed 55% of the compressive strength of the concrete attained at that time. The strength of the concrete shall be confirmed by the testing of concrete test cylinders taken from the concrete used for the wall sections.

H. An initial shotcrete layer of 3/8" thickness shall be applied to the core wall prior to wrapping.

I. The clear spacing between any two wrapped strands in the vertical direction shall be at least 1.5 strand diameters or 3/8 inch, whichever is larger. Any wrapped strands not meeting the spacing requirements shall be spread by approved methods or must otherwise be removed.

J. In the event that gaps between the core wall and the wrapped strand develop that exceed 3/8 inch, wrapping shall be discontinued and the wall shall be built up with shotcrete to provide the proper curvature.

K. Wrapping over intermediate shotcrete coats or built-up shotcrete areas may commence 12 hours after the shotcrete has been applied or when the shotcrete has reached a compressive strength of 400 psi, whichever is later.

3.4 VERTICAL PRESTRESSING EQUIPMENT

A. The Contractor shall provide a continuously, electronically (or substantial equivalent), monitored permanent force elongation record from zero to full force at the final lock-off for all vertical prestressing work.

B. The ordinate of the permanent recording shall show the elongation in inches and the abscissa shall show the force in pounds or kips.

C. Manually recorded force and elongation readings will not be accepted.

D. The vertical thread bar stressing machinery shall have automatic electronic tensioning cut-off devices or equivalent means to insure that the specified force and elongation is not exceeded at any time during the stressing operation.

E. The force readings at the stressed bar ends, immediately after lock-off, for any stressing operation, on any thread bar, shall not fluctuate more than $\pm$ 1.5% of the minimum ultimate strength of the steel from the desired average force setting.

F. The applied force, immediately after lock-off of the stressing operation on any thread bar, shall be no less than 72% of the minimum ultimate strength of the steel and the applied force before lock-off shall be no greater than 75%.

3.5 VERTICAL PRESTRESSING APPLICATION

A. All permanent anchor hardware shall have a ball-shaped threaded nut that can be screwed down on to a matching cone-shaped bearing surface in the bearing plate after the desired tension on the anchor hardware and/or prestressing steel has been applied.

B. The number and spacing of the thread bars shown on the Drawings, shall not be altered under any condition.

C. High-strength thread bars must be used for vertical prestressing.

D. Vertical thread bar components shall be assembled off the ground and as detailed on the Drawings. All vertical thread bars must be fully assembled before they are installed in the forms.

E. Particular attention shall be paid to sufficiently taping damaged joint connections and holes in the PVC thread bar ducts.

F. Anchor plates must be installed at right angles to the thread bar alignment near the anchor. Anchor plates must be installed with long sides, aligned parallel with the wall forms and secured to prevent their rotation while concrete is placed.

G. The maximum permissible misalignment of anchor plate to tendon alignment is plus or minus 2.5 degrees.

H. Vertical prestressing thread bars shall be accurately placed at the locations shown on the Drawings, or as approved by the Engineer, and shall be securely fastened in place to reinforcing steel and form ties to prevent movement during placement of concrete. Placing of vertical tendons shall be done to proper locations, elevations and alignments, with a maximum tolerance of plus or minus 1/4 inch.

I. Unless indicated otherwise on the Plans, the minimum concrete cover around steel anchor pockets and bearing plates shall be 1.5 inches.

J. The vertical clearance between bottom anchor plate and the waterstop at the base of the tank walls shall be no less than 2 inches nor more than 4 inches.

K. All vertical thread bars must be flushed with water from the top immediately upon completion of the concrete vibrating operation. Water shall be introduced through a taped-off hole in the wooden lids on the anchor pockets and be permitted to drain through the bottom grout tube. Flushing shall not be accomplished by introducing water through the bottom connection.

L. Flushing of ducts shall proceed after the pouring and vibrating of concrete around the thread bars ducts has been completed.

M. Upon completion of the water flushing operation of vertical thread bar ducts, the ducts shall be given a short burst of compressed air from the top only to remove any accumulations of water at the bottom of the ducts.

N. Cleaning of ducts with air only (not water), or removal of water with air from the bottom connection, will not be permitted.

O. After the concrete corewall has reached the required compressive strength for prestressing listed on the drawings, the vertical thread bars shall be stressed to the level indicated on the drawings. Every other thread bar shall be stressed until all thread bars have been stressed to the prescribed level. This will require the prestressor to travel around the tank twice.

P. After the stressed tendon has been locked-off the tendons shall be grouted as described below.

Q. All ducts shall be clean and free of water and deleterious materials that would impair bonding of the grout or interfere with grouting procedures.

R. Grout injection pipes shall be fitted with positive mechanical shutoff valves, which shall not be removed within the first 24 hours after grouting.

S. Grouting of thread bar duct shall be started at the lowest grout connection.

T. Each vertical thread bar duct shall be pumped until the entire nut at the top anchor has been covered. Pea gravel and/or silica sand may be placed (at Prestressor's option) around the top anchor nut prior to epoxy pumping.

U. In cold weather, and especially during frosts, special precautions must be taken to avoid the freezing of grout. In the event that the grouting procedure cannot be postponed, the wall temperature must be kept above the freezing point with hot blankets or by other approved means.

V. Upon completion of the vertical stressing and grouting operation, the inside surface of all the shear cans shall be coated with a 2-part epoxy adhesive. Immediately after the epoxy coating has become tacky, all anchor pocket areas above the anchor nuts shall be drypacked with a 1 cement to 2 sand mortar mix, or alternately, the metal can may filled with concrete aggregates and epoxy.

W. The drypack surface shall be finished flush with the adjoining concrete surface.

3.6 CIRCUMFERENTIAL AND VERTICAL PRESTRESSING OPERATIONS

A. The initial electronically (or substantial equivalent) recorded steel stress shall not exceed 75 percent of the guaranteed minimum ultimate strength (M.U.S.) of the steel at any time during or after stressing.

B. An automatic, continuously electronically (or substantial equivalent) monitored permanent recording of the applied force, at any point on the strand, at any point on and around the tank wall, must be made during the entire circumferential prestressing application. All such recordings must be based on a continuous sensing of the applied force on the strand between the tensioning drum and the wall when, and as, the strand is being wrapped and laid on the wall.

C. The force setting on wrapping and vertical thread bar stressing machinery shall be such that the applied forces fall within the specified minimum or maximum stress or force limitations; the force setting shall be corrected immediately when the applied force falls outside the required force tolerance limitations.

D. In the event that the stressing machinery is incapable of holding the applied forces within the specified stress or force limitations, the Engineer will order, at Contractor's expense, the removal and replacement of such machinery in favor of a different unit capable of maintaining such tolerance requirements.

E. The loss in stress in post-tensioned prestressing steel due to creep and shrinkage of concrete and sequence stressing has be assumed as 25,000 psi. The final stress is the average initial stress reduced by the stress loss of 25,000 psi.

F. The final force is the steel section multiplied by the final stress.

G. The final force for the vertical thread bars shall be no less than the required final force shown on the Plans.

H. The initial force for the circumferential wrapped strand shall be no less than the required initial force shown on the plans.

I. The continuous, electronically-produced force application chart during the wrapping application becomes the property of the City.

J. An automatic, continuously electronically (or substantial equivalent) monitored and simultaneously recorded force-elongation reading must be made for each vertical stressing application.

K. The force-elongation reading must represent the true relationship between the elongation at any given point of the vertical stressing operation and the applied force on the prestressing steel at that same point.

L. The force-elongation relationship must be constantly maintained from the beginning, starting with the removal of the slack to the point of lock-off and complete release of the force on the vertical prestressing steel after retraction of the stressing piston or equivalent stressing device.

M. All electronically produced force-elongation readings during the vertical thread bar stressing operations become the property of the City.

3.7 SAFETY PRECAUTIONS

A. Every precaution shall be taken to keep personnel and visitors outside the danger area of breaking strands or bars.

B. At no time shall anyone stand in the line of the stressed vertical thread bars or stressed strand.

C. No work shall be performed by anyone, other than the prestressing crew, within 100 feet of the wrapping operation or the application of the vertical tendon stressing operation.

D. Where access to the site by unauthorized persons is outside the Contractor's control, while prestressing work is in progress, Contractor shall erect protective fencing to prevent breaking strand from endangering such persons.

E. No welding to anchor plates is permitted after the tendons have been assembled. The prestressing steel shall not be used as a "ground" for welding operations.

3.8 ABRASIVE BLASTING

A. Exterior surfaces of concrete walls shall be prepared prior to any shotcreting or strand wrapping may be started, to remove all deteriorated concrete and bond-inhibiting contaminants. The surface preparation shall achieve a minimum profile of ICRI CSP5 over a minimum of 90 percent of the surface area required to be prepared.

B. The concrete surface shall have no traces of laitance, form-oil, original surface smoothness or surface color.

C. In order to mitigate environmental concerns, conform to environmental constraints, and achieve the desired profile, the Tank Prestressor shall utilize either a self-contained mechanical etching or shot blast system, combined with a vacuum recovery system, or a high pressure water jetting system with dust suppression equipment. Abrasive blasting systems which rely on sandblasting or steel shot without a vacuum recovery system or systems that have not been used successfully in the past to prepare surfaces for shotcreting and standwrapping will not be permitted.

3.9 SHOTCRETE EQUIPMENT

A. Shotcrete mixing shall be in conformance with the requirements of Section 03300 – Cast-in-Place Concrete, of these Specifications.

B. The delivery equipment shall be of an approved design and size which has given satisfactory results in similar previous work.

C. The equipment must be capable of discharging mixed materials into the hose under close control and it must be able to deliver a continuous smooth stream of uniformly mixed material at the proper velocity to the discharge nozzle, free from slugs of any kind.

D. The nozzle shall be of a design and size that will insure a smooth and uninterrupted flow of materials.

E. Delivery equipment shall be thoroughly cleaned at the end of each shift.

F. Equipment parts shall be regularly inspected and replaced as required.

G. The air capacity of the compressor shall be large enough that the minimum amount of air to be available at the nozzle shall be no less than 400 CFM, irrespective of whether or not air from the same air supply is used for other purposes.

3.10 SHOTCRETE APPLICATION PROCESS

A. Prior to application, testing lab shall verify all components, proportions of acceleration, nozzlemen certificate, equipment, and test panel fabrications.

B. Shotcrete shall be applied under the wet mix process only.

C. Nozzles shall be mounted on power driven machinery enabling the nozzle to travel parallel to the surface to be sprayed at a uniform linear or bi-directional speed.

D. The nozzle shall be kept at a uniform constant distance from the surface, always insuring a right angle spray of the material to the surface.

E. Hand operated nozzles and shotcreting operations dependent on the performance of the nozzleman will not be accepted except where additional shotcrete is needed to correct flat areas or for architectural surface treatments.

F. Grout materials shall be delivered to the jobsite in ready-mix trucks from approved batching plants. However, job mixing will be accepted provided automatic weigh batch plants are used.

G. The sand, cement and water shall be premixed before being pumped through a 2" minimum hose by specially designed mortar pumps.

H. The high velocity impact shall be developed pneumatically by injecting compressed air at the nozzle.

I. The minimum air capacity to be furnished to the nozzle shall be 400 CFM.

3.11 SHOTCRETE PLACING AND FINISHING

A. Shotcrete shall be applied in a steady, uninterrupted flow. Should the flow become intermittent for any cause, the machine operator shall direct the nozzle away from the work until it again becomes constant, or shut off the flow of materials.

B. The nozzle shall be held at approximately right angles to the surface and shall be kept at the proper and the same distance from the surface dictated by good practice standards for the type of application, type of nozzle and air pressure employed.

C. Sufficient time shall be allowed for each layer of shotcrete to set up so it may take the next layer without sagging.

D. The shotcrete shall be started at the bottom of the wall until all wrapped strand has been covered. Subsequent shotcrete layers may be applied from the top down or from the bottom up at the discretion of the Contractor.

E. While the nozzle travels around the wall, the nozzle shall be raised or lowered at a uniform rate in such a manner that an adequate overlapping of coatings and a uniform finish will develop.

F. The nozzle shall be spiraled up or down around the tank to either the top or the bottom of the wall or to the termination of the intermediate strand layer.

G. To insure proper penetration around the strand and proper conveyance of the material through the hose, a 5" to 7" slump of the mortar at the pump is recommended.

H. Prewetting of the wall prior to the shotcrete application shall not be done, even in arid areas. The moisture absorption by earlier applied layers is relied upon to improve the bond and strength of the material and to reduce drying shrinkage of the applied shotcrete.

I. The application of the shotcrete in the number and thickness of layers specified herein is mandatory for proper penetration of shotcrete behind prestressing material and to reduce shrinkage due to more uniform in-depth drying of the shotcrete.

J. Each layer of wrapped prestressing steel shall be covered with shotcrete until a minimum cover of 3/8" over the steel has been obtained.

K. The final covercoat, to make up for the full thickness of shotcrete over the final strand layer, shall be applied in at least 3 layers of equal thickness.

L. Each layer of shotcrete shall be completed for the full circumference of the tank and substantially the full height of that layer before the next layer of shotcrete may be applied.

M. All shotcrete coatings shall be built up in layers of approximately 3/8 inch in thickness until the final required thickness has been obtained. The Contractor shall demonstrate by a reliable means that the proper thickness of shotcrete has been obtained with each layer applied.

N. Unless otherwise specified on the Drawings, the minimum shotcrete cover over all wrapped steel shall be 1.5 inches.

O. After the minimum shotcrete cover specified over the wrapped prestressing strand has been completed by the automated shotcrete procedure, and only if such finish requirements are shown on the Drawings, the exterior surface shall be given an acceptable float finish true to line and curvature and to details shown on the Plans.

P. If a float finish is required on the Drawings, plaster or hand-applied shotcrete may be used to build up and level the surface and to obtain the desired surface finish and projections.

Q. The finish coat mix (if a smooth float finish is required on the Drawings), shall consist of a minimum of one sack of cement for each 3-1/2 cubic feet of moist plaster sand.

R. If no finish requirements are shown on the Drawings, it is intended to have a natural original gun finish of the shotcrete cover coat.

S. Contractor shall take every possible precaution to protect adjacent buildings, concrete surfaces, vehicles, equipment, etc., from being damaged by overshooting shotcrete and by materials carried away by the wind.

T. Overshot shotcrete and rebound materials deposited on the roof shall be removed before it adheres to the concrete surface.

U. Contractor shall pay for all damages caused by his operations under this contract.

3.12 SHOTCRETE TESTS

A. All shotcrete operations, testing, and prequalifying, shall conform to the entire Section 1913A of the 2007 CBC.

3.13 HAND PLACED SHOTCRETE FOR REPAIRS ONLY

A. To insure a high quality shotcrete, the Contractor shall satisfy the Engineer that the nozzleman has had sufficient and acceptable experience in the application of structural shotcrete.

B. Experience gained on shotcrete pool and ditch construction will not be considered as experience for qualifying the nozzleman, unless approved by the Engineer.

C. The nozzleman shall be capable of applying thin coats of even and uniform thickness.

D. The nozzleman's skill shall be tested and approved by the Engineer before he may start any work.

3.14 RESTRICTIONS ON SHOTCRETE OPERATION

A. Shotcrete shall not be applied under such strong wind conditions that a considerable amount of cement and moisture will be removed by the wind from the mortar spray between the nozzle and the surface on which the shotcrete is applied.

B. Shotcrete may be applied in cold weather provided the surfaces are not frozen.

C. The temperature during the day must be expected to rise to at least 40 °F and the night temperature of the first night after the shotcrete application must not be expected to drop below 27°F.

D. The use of Type 3 Portland cement is required (when readily available) in the event shotcrete is applied at temperatures below 40°F.

E. The Contractor may apply shotcrete under those conditions solely at his own risk.

F. Whenever rain or frost has damaged shotcrete which has not had a chance to set up, such shotcrete must be removed and replaced.

G. Contractor shall consult with the Engineer to determine whether or not he will accept the shotcrete damaged by rain or frost before applying any new layers of shotcrete.

3.15 SHOTCRETE WATERCURING

A. Intermediate layers of shotcrete shall be kept damp by hand curing or other means no sooner than 12 hours after the shotcrete has been applied.

B. This watercuring is not required should additional shotcrete be applied on the entire wall surface within the following 12 hours.

C. An indiscriminate use of continuous watercure for intermediate layers should be avoided.

D. Complete shotcrete surfaces, which do not receive any additional coatings, shall be membrane cured with plastic for a period of at least seven (7) days. Plastic membrane used shall contain and prevent loss of moisture from shotcrete as much as possible. Membrane curing methods utilizing curing compounds or wax-based residuals will not be permitted.

E. Wall coatings, specified in Section 09900 – Painting and Coating, shall be applied no later than five (5) days after completion of the curing. If conditions make it impossible to apply coatings within the five (5) day period, or if no coatings are required, shotcrete shall be membrane cured for a period of ten (10) days instead of the seven (7) days specified here-in.

3.16 CLEANING AND WATERPROOFING

A. After construction is completed, the interior of the tank shall be completely hosed out and cleaned of all dirt and loose material.

B. Filling:

1. The City will pay for filling the reservoirs the first time and shall be allowed beneficial use of the water used for conducting the leakage tests. Following the leakage tests, as described in this Section, the Contractor shall drain the reservoirs through the outlet pipeline. The Contractor shall refer to Section 01115 – Construction Sequence.

2. The tank shall be filled in approximately eight-foot increments with 8 normal working hours between each increment for observation of possible leaks through ring drains, wall, and wall-footing.

C. Roof, floor and wall-footing cracks, which may have developed from drying shrinkage, shall not be taped or chipped out and caulked. All cracks shall be repaired in accordance with Section 03741 prior to applying the interior coating (if specified).

3.17 TESTING AND REPAIRING LEAKS

A. The City will pay for filling the tank the first time. If the leakage test fails, the Contractor shall be responsible for the cost of filling the tank for subsequent tests. After filling the tank, the water level shall be held at the high water level for a period of 24 hours.

B. The tank and the drain lines from the ring drain shall then be examined for evidence of leaks.

C. All leaks shall be repaired to the satisfaction of the City.

D. Any areas that, in the opinion of the City, are exposed to contamination during the repair work shall be re-chlorinated to the City's satisfaction.

E. Leaks in floor construction joints may be detected with the aid of a diver.

F. Mud or cement deposits on the floor, when stirred up, would flow to the leak and may so indicate where the leaks are.

G. Honeycomb and cracks around waterstops may be detected through tapping with a hammer along the joint.

H. The City may be insisted upon any of these procedures when cement seeding has not stopped the leaks.

I. Leakage through joints, which is suspected to be a result of bent over waterstops or honeycomb under or around waterstops will require removal of concrete around the waterstops in suspected areas, if directed by the Engineer.

J. Chipped out concrete areas shall be properly drypacked with a mix of 1 cement to 2 coarse sand, after coating the existing concrete surface with an approved epoxy.

K. The leakage rate of the completed tank shall not exceed 0.05% of the tank capacity in any 24 hour period when tested in accordance with ACI 350 R-93. If, at the end of 5 days the average daily leakage does not exceed the maximum allowable, the test shall be considered satisfactory. All visible running leaks shall be repaired to the satisfaction of the City. Small damp spots (where visible in the case of above ground tanks) may be accepted during the first 6 months of operation;

should they not have healed by then, the City may order the immediate repair of such areas. Any cracks, voids, honey comb or cold joints showing or causing running leaks of water, shall be epoxy pumped by qualified operators until such cracks and voids have been completely sealed. If leakage continues and if allowed by the City, the floor shall be covered with a minimum of two inches of water and pure cement shall then be spread evenly over the entire floor area at the rate of one sack of cement to every 1000 square feet of floor area. The floor shall not be allowed to dry after the application of cement. Should repeated cement seeding fail to seal the cracks, each crack shall be pumped and sealed with a two-part water insensitive epoxy. If the Contractor elects to seal the tank floor, the Contractor shall be required to remove all cement residue from the tank and clean to the City's satisfaction.

L. The tank shall not be backfilled until and unless the City has accepted the tests. Once authorized to backfill, the tank shall be at least half full when the tank is backfilled. The backfill shall be placed equally around the tank as it is compacted, it shall not be piled against one portion of the perimeter unevenly. No track driven equipment shall be within 5 feet of the tank wall during backfilling operations without the approval of the City.

M. This section shall be applicable during the entire specified warranty period of the tank.

* * * * * *

SECTION 03315
GROUT

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all materials for grout in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished grout, in accordance with the requirements of the Contract Documents.

B. All grouts shall be City of Los Angeles approved product. The CONTRACTOR shall submit a copy of the Los Angeles Research Report with submittals.

C. The following types of grout shall be covered in this Section:

1. Non-Shrink Grout: This type of grout is to be used wherever grout is shown in the Contract Documents, unless another type is specifically referenced.

2. Cement Grout

3. Epoxy Grout

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03250 Concrete Accessories.

B. Section 03300 Cast-in-Place Concrete.

C. Section 03314 Prestressed Concrete Tank.

D. Section 03741 Pressure Injection of Cracks.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Comply with the reference standards of the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards, as applicable.

1. Commercial Standards:

CRD-C 621	Corps of Engineers Specification for Non-shrink Grout
ASTM C 109	Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or 50-mm Cube Specimens)
ASTM C 531	Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical- Resistant Mortars, Grouts, and Monolithic Surfacings
ASTM C 579	Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacings

ASTM C 827	Test Method for Early Volume Change of Cementitious Mixtures
ASTM C 1107	Standard Specification for Packaged dry hydraulic cement grout (non-shrink)
ASTM D 696	Test Method for Coefficient of Linear Thermal Expansion of Plastics

2. Other Government Standards:

CSS	Caltrans Standard Specifications.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with GENERAL REQUIREMENTS.

B. The following submittals and specific information shall be provided.

1. The CONTRACTOR shall submit certified test results verifying the compressive strength, shrinkage, and expansion requirements specified herein; and manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of non-shrink and epoxy grout used in the work.

1.5 QUALITY ASSURANCE

A. Field Tests:

1. Compression test specimens will be taken during construction from the first placement of each type of grout, and at intervals thereafter as selected by the ENGINEER to insure continued compliance with these specifications. The specimens will be made by the INSPECTOR

2. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C 109 at intervals during construction as selected by the ENGINEER. A set of three specimens will be made for testing at 7 days, 28 days, and each additional time period as appropriate.

3. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the ENGINEER. A set of three specimens will be made for testing at 7 days, and each earlier time period as appropriate.

4. All grout, already placed, which fails to meet the requirements of these specifications, is subject to removal and replacement at the cost of the CONTRACTOR.

5. The cost of all laboratory tests on grout will be borne by the CITY, but the CONTRACTOR shall assist the INSPECTOR in obtaining specimens for testing. However, the CONTRACTOR shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications. The CONTRACTOR shall supply all materials necessary for fabricating and containing the test specimens.

B. Construction Tolerances: Construction tolerances shall be as specified in the Section 03300 , "Cast-in-Place Concrete," except as modified herein and elsewhere in the Contract Documents.

PART 2 -- PRODUCTS

2.1 CEMENT GROUT

A. Cement Grout: Cement grout shall be composed of one part cement, three parts sand, and the minimum amount of water necessary for the mixture to flow under its own weight. Where needed to match the color of adjacent concrete, white Portland cement shall be blended with regular cement as needed. In addition, where needed, an approved admixture may be added to increase workability at a low water/cement ratio. The minimum compressive strength at 28 days shall be 4000 psi.

B. Cement grout materials shall be as specified in Section 03300, "Cast-in-Place Concrete".

2.2 PREPACKAGED GROUTS

A. Non-Shrink Grout:

1. Non-shrink grout shall be a prepackaged, inorganic, non-gas-liberating when tested in accordance with C1107, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout specified herein shall be that recommended by the manufacturer for the particular application.

2. Class A non-shrink grouts shall have a minimum 28 day compressive strength of 5,000 psi; shall have no shrinkage (0.0 percent) and a maximum 4.0 percent expansion in the plastic state when tested in accordance with ASTM C 827; and shall have no shrinkage (0.0 percent) and a maximum of 0.2 percent expansion in the hardened state when tested in accordance with CRD C 621.

3. Class B non-shrink grouts shall have a minimum 28 day compressive strength of 5,000 psi and shall meet the requirements of CRD C 621.

4. Application:

a. Class A non-shrink grout shall be used for the repair of all holes and defects in concrete members which are water bearing or in contact with soil or other fill material, grouting under all equipment base plates, and at all locations where grout is specified in the contract documents; except, for those applications for Class B non-shrink grout and epoxy grout specified herein. Class A non-shrink grout may be used in place of Class B non-shrink grout for all applications.

b. Class B non-shrink grout shall be used for the repair of all holes and defects in concrete members which are not water-bearing and not in contact with soil or other fill material, grouting under all base plates for structural steel members, and grouting railing posts in place.

B. Epoxy Grout:

1. Epoxy grout shall be a pourable, non-shrink, 100 percent solids system. The epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all premeasured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged.

2. The chemical formulation of the epoxy grout shall be that recommended by the manufacturer for the particular application.

3. The mixed epoxy grout system shall have a minimum working life of 45 minutes at 75 degrees F.

4. The epoxy grout shall develop a compressive strength of 5,000 psi in 24 hours and 10,000 psi in seven days when tested in accordance with ASTM C 579, Method B. There shall be no shrinkage (0.0 percent) and a maximum 4.0 percent expansion when tested in accordance with ASTM C 827.

5. The epoxy grout shall exhibit a minimum effective bearing area of 95 percent. This shall be determined by a test consisting of filling a 2-inch diameter by 4-inch high metal cylinder mold covered with a glass plate coated with a release agent. A weight shall be placed on the glass plate. At 24 hours after casting, the weight and plate shall be removed and the area in plan of all voids measured. The surface of the grout shall be probed with a sharp instrument to locate all voids.

6. The peak exotherm of a 2-inch diameter by 4-inch high cylinder shall not exceed 95 degrees F when tested with 75 degree F material at laboratory temperature. The epoxy grout shall exhibit a maximum thermal coefficient of 30 x 10^{-6} inches/inch/degree F when tested according to ASTM C 531 or ASTM D 696.

7. The CONTRACTOR shall demonstrate the ability of the epoxy grout system to completely fill the size and depth of the intended hole, blockout, or area before the system is submitted for consideration by the ENGINEER.

8. Application: Epoxy grout shall be used to embed all anchor bolts and reinforcing steel required to be set in grout, and for all other applications required in the Contract Documents.

2.3 CURING MATERIALS

A. Curing materials shall be as specified in Section 03300, "Cast-in-Place Concrete" for cement grout and as recommended by the manufacturer of prepackaged grouts.

2.4 CONSISTENCY

A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow. Where "dry pack" is called for in the Contract Documents, it shall mean a grout of that consistency; the type of grout to be used shall be as specified herein for the particular application.

2.5 MEASUREMENT OF INGREDIENTS

A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.

B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

PART 3 -- EXECUTION

3.1 GENERAL

A. All surface preparation, curing, and protection of cement grout shall be as specified in Section 03300, "Cast-in-Place Concrete". The finish of the grout surface shall match that of the adjacent concrete.

B. The manufacturer of Class A non-shrink grout and epoxy grout shall provide on-site technical assistance upon request. All costs related to this requirement shall be borne by the CONTRACTOR.

C. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

3.2 CONSOLIDATION

A. Grout shall be placed in such a manner, for the consistency necessary for each application, so as to assure that the space to be grouted is completely filled.

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SECTION 03370
CONCRETE CURING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B. This section covers the work necessary for the concrete curing requirements.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 Concrete Formwork.

B. Section 03300 Cast-In-Place Concrete.

C. Section 03314 Prestressed Concrete Tank.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the reference standards and Standard Specifications of the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards, as applicable.

1. Federal Specifications:

   UU-B-790A (Int.Amd. 1) Building Paper, Vegetable Fiber (Kraft, Waterproofed, Waterproofed, water Repellant and Fire Resistant)

2. Commercial Standards:

ACI 308	Standard Practice for Curing Concrete
ASTM C 156	Test Method for Water Retention by Concrete Curing Materials
ASTM C 171	Specifications for Sheet Materials for Concrete Curing
ASTM C 309	Specifications for Liquid Membrane-Forming Compounds for Curing Concrete

3. Government Standards:

CSS	Caltrans Standard Specifications

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

1.5 QUALITY ASSURANCE

A. Quality Control Data:

1. Curing Compound: Manufacturer's Certification of Compliance, to include statement that product meets ASTM C 309**,** additional permeability requirement, and coverage.

2. Retardant For Exposed Aggregate Finish on Formed Surface: Manufacturer's Certification of Compliance including statement that product is suitable for and will meet job requirements.

3. Curing method, procedures and method of application to be used shall be in compliance with the requirements as specified herein.

PART 2 -- PRODUCTS

2.1 CURING MATERIALS

A. Materials for curing concrete as specified herein shall conform to the Standard Specifications and the following requirements:

1. Polyethylene sheet for use as concrete curing blanket shall be white and conform to ASTM C 171. The loss of moisture when determined in accordance with the requirements of ASTM C 156 shall not exceed 0.055 grams per square centimeter of surface.

2. Polyethylene-coated waterproof paper sheeting for use as concrete curing blanket shall consist of white polyethylene sheeting free of visible defects, uniform in appearance, having a nominal thickness of 2 mils and permanently bonded to waterproof paper conforming to the requirements of Federal Specification UU-B-790A (Int. Amd. 1). The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 gram per square centimeter of surface.

3. Polyethylene-coated burlap for use as concrete curing blanket shall conform to ASTM C 171. The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 grams per square centimeter of surface.

4. Curing mats for use in Curing Method 6 as specified herein, shall be heavy shag rugs or carpets or cotton mats quilted at 4-inches on center. Curing mats shall weigh a minimum of 12 ounces per square yard when dry.

5. Evaporation retardant shall be a material such as Confilm as manufactured by Masterbuilders, Cleveland, OH; or an approved equal**.**

B. Curing Compound:

1. Curing compound shall consist of a liquid which, when applied to fresh concrete by means of a spray gun, will form an impervious membrane over the exposed surfaces of the concrete.

2. The membrane may be either asphaltic or paraffin derivatives to which other waterproofing materials may have been added. Concrete curing compounds shall be designated by type as follows:

a. Type 1 – Clear or translucent without dye

b. Type 1-D - Clear or translucent with red fugitive dye

c. Type 2 - White pigmented

d. Type 3 - Light gray pigmented

e. Type 4 - Black pigmented

3. Provide curing compound meeting requirements of ASTM C 309, with additional requirement that permeability not exceed 0.039 gm/square cm/72 hours, when tested in accordance with ASTM C 156 standards.

4. Provide evaporation retardant where required to prevent rapid evaporation of water from fresh exposed concrete.

5. When pigmented curing compounds are used, at the time of use, the compound shall be thoroughly mixed, with the pigment uniformly dispensed throughout the mixture.

6. Unless otherwise specified, Type 1-D curing compound shall be used, except that Type 2 shall be used for the top surface of bridge decks.

2.2 FLOOR HARDENER (SURFACE-APPLIED)

A. Floor hardener shall be a colorless, aqueous solution of zinc and/or magnesium fluosilicate.

B. Each gallon of fluosilicate solution shall contain minimum of 2 pounds of crystals.

C. All hardeners shall be furnished by the CONTRACTOR and shall be delivered ready mixed in sealed original containers bearing the manufacturer's name and product identification.

PART 3 -- EXECUTION

3.1 CURING AND DAMPPROOFING METHODS

A. General: All concrete shall be cured for not less than 10 days after placing, in accordance with the methods specified herein for the different parts of the work, and described in detail in the following paragraphs.

Surface to be Cured or Dampproofed (except bridge structures)	Method
Unstripped forms	1
Wall sections with forms removed	6
Construction joints between footings and walls, and between floor slab and columns	2
Encasement concrete and thrust blocks	3
All concrete surfaces not specifically provided for elsewhere in this Paragraph	4
Floor slabs on grade	5
Roof and slabs not on grade	6

Surface to be Cured or Dampproofed (except bridge structures)	Method
Floor slabs to be covered with resilient flooring	8
Exterior buried surfaces of roof slabs and basement walls	7
All liquid and water retaining structures	2

1. Method 1: Wooden forms shall be wetted immediately after concrete has been placed and shall be kept wet with water until removed. If steel forms are used the exposed concrete surfaces shall be kept continuously wet until the forms are removed. If forms are removed within 10 days of placing the concrete, curing shall be continued in accordance with Method 6, herein.

2. Method 2: The surface shall be covered with burlap mats which shall be kept wet with water for the duration of the curing period, until the concrete in the walls has been placed. No curing compound shall be applied to surfaces cured under Method 2.

3. Method 3: The surface shall be covered with moist earth not less than 4 hours, nor more than 24 hours, after the concrete is placed. Earthwork operations that may damage the concrete shall not begin until at least 7 days after placement of concrete.

4. Method 4: The surface shall be sprayed with a liquid curing compound.

    a. Curing compound shall be applied in 2 coats according to the manufacturer's printed instructions. The direction of application of the second coat shall be perpendicular to the first. The second coat shall be applied when the first coat is dry to touch, but not to exceed 4 hours. Each coat shall be applied at a rate not more than 200 square feet per gallon and in such a manner as to cover the surface with a uniform film which will seal thoroughly.

    b. Where the curing compound method is used, care shall be exercised to avoid damage to the seal during the curing period. The CONTRACTOR shall maintain and monitor the curing compound membrane for a minimum of 10 days. Should the seal be damaged or broken before the expiration of this curing period, the break shall be repaired immediately by the application of additional curing compound over the damaged portion.

    c. Wherever curing compound may have been applied by mistake to surfaces against which concrete subsequently is to be placed and to which it is to adhere, said compound shall be entirely removed by wet sandblasting just prior to the placing of new concrete.

    d. Application of the curing compound to the concrete shall commence as soon as the finished surface of the concrete reaches a uniformly damp appearance with no free water on the surface. Curing compound shall also be applied no later than 2 hours after removal of forms from contact with formed surfaces or after the placement of concrete on the subgrade. At any point, the application rate shall be within 50 square feet per gallon of the nominal rate and the average application rate shall be within 25 square feet per gallon of the nominal rate specified when tested in accordance with California Test 535.

    e. Repairs required to be made to formed surfaces shall be made within the said 2-hour period; provided, however, that any such repairs which cannot be made within the said 2-hour period shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area involved shall first be wet-sandblasted to remove the curing compound, following which repairs shall be made as specified herein.

f. At the time of use, pigmented curing compounds shall be maintained in a thoroughly mixed condition. Containers of curing compound shall remain air-tight when not in use.

g. The CONTRACTOR shall apply curing compound in the presence of the INSPECTOR. Curing compound shall be applied to form a continuous and uniform membrane.

5. Method 5: Immediately after the concrete has been screeded, it shall be treated with a liquid evaporation retardant. The retardant shall be used again after each work operation as necessary to prevent drying shrinkage cracks.

   a. Immediately after each square foot of the concrete has been finished, it shall be given a coat of curing compound in accordance with Method 4, herein. Not less than one hour nor more than 4 hours after the coat of curing compound has been applied, the surface shall be wetted with water delivered through a fog nozzle, and concrete-curing blankets shall be placed on the slabs. The curing blankets shall be polyethylene sheet, polyethylene-coated waterproof paper sheeting or polyethylene-coated burlap. The blankets shall be laid with the edges butted together and with the joints between strips sealed with 2-inch wide strips of sealing tape or with edges lapped not less than 3-inches and fastened together with a waterproof cement to form a continuous watertight joint.

   b. The curing blankets shall be left in place during the 10-day curing period and shall not be removed until after concrete for adjacent work has been placed. Should the curing blankets become torn or otherwise ineffective, the CONTRACTOR shall replace damaged sections. During the first 3 days of the curing period, no traffic of any nature and no depositing, temporary or otherwise, of any materials shall be permitted on the curing blankets. During the remainder of the curing period, foot traffic and temporary depositing of materials that impose light pressure will be permitted only on top of plywood sheets 5/8-inch minimum thickness, laid over the curing blanket. The CONTRACTOR shall add water under the curing blanket as often as necessary to maintain damp concrete surfaces at all times.

6. Method 6: Concrete slabs shall be treated with an evaporation retardant as specified in Method 5. The concrete shall be kept continuously wet by the application of water for a minimum period of at least 10 consecutive days beginning immediately after the concrete has been placed or forms removed. Heavy curing mats shall be used as a curing medium to retain the moisture during the curing period. The curing medium shall be weighted or otherwise held in place to prevent being dislodged by wind or any other causes. Until the concrete surface is covered with the curing medium the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed. The curing blankets and concrete shall be kept continuously wet by the use of sprinklers or other means both during and after normal working hours. Immediately after the application of water has terminated at the end of the curing period, the curing medium shall be removed and curing compound immediately applied in accordance with Method 4, herein. The CONTRACTOR shall dispose of excess water from the curing operation to avoid damage to the work.

7. Method 7:

   a. Method 6 shall be used for curing.

b. Immediately after completion of curing the surface shall be sprayed with a dampproofing agent consisting of an asphalt emulsion. Application shall be in 2 coats. The first coat shall be diluted to 1/2 strength by the addition of water and shall be sprayed on so as to provide a maximum coverage rate of 100 square feet per gallon of dilute solution. The second coat shall consist of an application of the specified material, undiluted, and shall be sprayed on so as to provide a maximum coverage rate of 100 square feet per gallon. Dampproofing material shall be as specified herein.

c. As soon as the asphalt emulsion, applied as specified herein, has taken an initial set, the entire area thus coated shall be coated with whitewash. Any formula for mixing the whitewash may be used which produces a uniformly coated white surface and which so remains until placing of the backfill. Should the whitewash fail to remain on the surface until the backfill is placed, the CONTRACTOR shall apply additional whitewash.

8. Method 8: Floor slabs to be covered with resilient flooring shall be coated with an asphaltic membrane curing compound such as Hunt's Process Black, or an approved equal.

3.2 EVAPORATION RETARDANT APPLICATION PROTECTION

A. Spray onto surface of fresh concrete immediately after screeding to react with surface moisture.

B. Reapply after smoothing surface with a bull float to ensure continuous, compacted monomolecular layer until final finishing is completed.

C. After finishing, apply water curing as specified.

3.3 CURING AND PROTECTION IN COLD WEATHER

A. Concrete shall not be placed during cold weather where conditions would require procedures as specified in ACI 306.

B. The Engineer, at his option, may allow cold weather placement of concrete if an extended period of cold weather is anticipated.

C. Water curing of concrete may be reduced to 6 days during periods when the mean daily temperature in the vicinity of the worksite is less than 40 degrees F; provided that, during the prescribed period of water curing, when temperatures are such that concrete surfaces may freeze, water curing shall be temporarily discontinued.

D. Concrete cured by application of curing compound will require no additional protection from freezing if the protection at 50 degrees F for 72 hours is obtained by means of approved insulation in contact with the forms or concrete surfaces; otherwise, the concrete shall be protected against freezing temperatures for 72 hours immediately following 72 hours protection at 50 degrees F. Concrete cured by water curing shall be protected against freezing temperatures for 3 days immediately following the 72 hours of protection at 50 degrees F.

E. Discontinuance of protection against freezing temperatures shall be such that the drop in temperature of any portion of the concrete will be gradual and will not exceed 40 degrees F in 24 hours. In the spring, when the mean daily temperature rises above 40 degrees F for more than 3 successive days, the specified 72-hour protection at a temperature not lower than 50 degrees F may be discontinued for as long as the mean daily temperature remains above 40 degrees F; provided, that the concrete shall be protected against freezing temperatures for not less than 48 hours after placement.

F. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying. Use of unvented heaters will be permitted only when unformed surfaces of concrete adjacent to the heaters are protected for the first 24 hours from an excessive carbon dioxide atmosphere by application of curing compound; provided, that the use of curing compound for such surfaces is otherwise permitted by these Specifications.

3.4 CLEAR HARDENER APPLICATION (SURFACE APPLIED)

A. Before application, thoroughly cure floors to receive hardener for minimum 28 days, keep clean, unpainted, free from membrane curing compounds, and dry with all work above them completed.

B. Do not use curing compounds where floor hardeners are specified. Use water curing only.

C. Apply hardener evenly, using three coats, allowing 24 hours between coats as follows:

1. First Coat: 1/3 strength, second coat 1/2 strength, and third coat 2/3 strength, mix with water.

2. Apply each coat so as to remain wet on surface for 15 minutes.

3. Apply approved hardeners in accordance with manufacturer's instructions.

4. After final coat is completed and dry, remove surplus hardener from surface by scrubbing and mopping with water.

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SECTION 03741
PRESSURE INJECTION OF CRACKS

PART 1 -- GENERAL

1.1 DESCRIPTION

A. This section covers the repair of cracks in concrete by the injection of an epoxy resin adhesive.

1.2 REFERENCE STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM D695 - Test method for Compressive Properties of Rigid Plastics

1.3 REPAIR CRITERIA

Cracks in concrete at least 0.02 inches in size shall be repaired.

1.4 QUALIFICATIONS

A. Epoxy injection shall be performed by a certified applicator.

B. Contractor's/Subcontractor's operator engaged in the epoxy injection process shall have satisfactory operator experience in the methods of restoring concrete structures utilizing the specific epoxy injection process indicated. Operator's experience shall include previous repairs of cracked or damaged concrete structures, the technical knowledge of correct material selection and use, and the operation, maintenance and trouble shooting of equipment.

PART 2 -- PRODUCTS

2.1 EPOXY RESIN ADHESIVE FOR INJECTION

A. Epoxy adhesive grout shall be a 100 percent solids 2-part water insensitive low-viscosity epoxy resin system. Epoxy shall be suitable for grouting both dry and damp cracks. Epoxy shall develop a minimum tensile strength (ASTM D 695) of 6,000 psi and a minimum compressive strength of 8,000 psi. Epoxy shall be SELECT BOND GP-4440, as manufactured by SPC, Upland, CA, or equivalent.

2.2 SURFACE SEAL

A. The surface seal material is that material used to confine the injection adhesive in the fissure during injection and cure.

B. The surface seal material shall have adequate strength to hold injection fittings firmly in place and to resist injection pressures adequately to prevent leakage during injection.

C. The material shall be from the same manufacturer of the epoxy resin adhesive and be of a compatible material.

2.3 EQUIPMENT FOR INJECTION

A. The equipment used to meter and mix the two injection adhesive components and inject the mixed adhesive into the crack shall be portable, positive displacement type pumps with interlock to provide positive ratio control of exact proportions of the two components at the nozzle. The pumps shall be electric or air powered and shall provide in-line metering and mixing.

B. The injection equipment shall have automatic pressure control capable of discharging the mixed adhesive at any pre-set pressure up to 200 psi plus or minus 5 psi and shall be equipped with a manual pressure control override.

C. The injection equipment shall have the capability of maintaining the volume ratio for the injection adhesive prescribed by the manufacturer of the adhesive within a tolerance of plus or minus 5 percent by volume at any discharge pressure up to 200 psi.

PART 3 -- EXECUTION

3.1 PREPARATION

A. Surface adjacent to cracks or other areas of application shall be cleaned of dirt, dust, grease, oil, efflorescence or other foreign matter which may be detrimental to the integrity of the bond between the epoxy and the injection surface. Acids and corrosives shall not be permitted.

B. Entry ports shall be provided along the crack at intervals of not more than the thickness of the concrete being repaired. Ports shall be compatible with pressure injection equipment.

C. Surface seal material shall be applied to the face of the crack between the entry ports. For through cracks, surface seal shall be applied to both faces.

D. Enough time for the surface seal material to gain adequate strength shall pass before proceeding with the injection.

3.2 EPOXY INJECTION

A. Injection of epoxy adhesive shall begin at lower entry port and continue until there is an appearance of epoxy adhesive at the next entry port adjacent to the entry port being pumped.

B. When epoxy adhesive travel is indicated by appearance at the next adjacent port, injection shall be discontinued on the entry port being pumped, and epoxy injection shall be transferred to the next adjacent port where epoxy adhesive has appeared.

C. Epoxy adhesive injection shall be performed continuously until cracks are completely filled.

D. If port to port travel of epoxy adhesive is not indicated, the work shall immediately be stopped and the Engineer of Record notified.

3.3 FINISHING

A. When cracks are completely filled, epoxy adhesive shall be cured to sufficient time to allow removal of surface seal without any draining or runback of epoxy material from cracks.

B. Surface seal material and injection adhesive runs or spills shall be removed from concrete surfaces.

C. The face of the crack shall be finished flush to the adjacent concrete showing no indentations or protrusions caused by the placement of entry ports.

3.4 PRESSURE TEST

A. The mixing head of the injection equipment shall be connected and the equipment run until clear uniformly mixed material flows into the purge pail. The operator shall engage the equipment shut-off nozzle valve and subsequently bump the on-off switch while monitoring pressure on psi gauge until the pressure reaches 200 psi. Pressure gauge shall be monitored for one minute. If pressure is maintained between 190-200 psi, check valves shall be considered to be functioning properly and the injection may proceed. If pressure drops below 190 psi, Contractor shall be required to have new seals installed on the check valves and the equipment shall be subsequently retested.

B. The pressure test shall be run for each injection unit at the beginning and after meal break of every shift that the unit is used in the work of crack repair.

C. The adequacy and accuracy of the equipment shall be solely the responsibility of the Contractor.

3.5 RATIO TEST

A. The epoxy mixture ratio shall be monitored continuously while injecting by placing a strip of masking tape on the sides of the A and B reservoirs full height. After filling reservoirs, the A and B levels shall be marked and monitored while running injection machine into purge pail for a period of one minute.

B. The ratio test shall be run for each injection unit at the beginning and after meal break of every shift that the unit is used in the work of crack repair.

3.6 PROOF OF RATIO AND PRESSURE TEST

A. At all times during the course of the work the Contractor shall keep complete and accurate records available to the Engineer of the pressure and ratio tests specified above.

B. In addition, the Engineer at any time without prior notification of the Contractor, may request the Contractor to conduct the tests specified above in the presence of the Engineer.

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SECTION 03936
WATER LEAKAGE TEST FOR CONCRETE STRUCTURES

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish labor, tools and equipment to perform specified leakage tests for concrete water holding structures.

1.2 SUBMITTALS

A. All submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. Shop Drawings: Submit leak repair methods.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 WATER LEAKAGE TEST

A. Test the Following Concrete Water Holding Structures for Leakage:

1. Underground Concrete Reservoir.

2. Pump Stations and all miscellaneous concrete structures containing liquid.

B. Before Testing Water Holding Structures for Leakage:

1. Backfill excavations to top of structure foundations.

2. Cure concrete and obtain specified concrete compressive strength.

3. Do not apply brick facing or other materials that will cover concrete surfaces until after testing water holding structures for leakage.

C. Isolate sections of water holding structures that can be isolated in actual operation. Test sections separately for leakage.

D. Close valves and gates to structures.

E. Fill water holding structures with water to maximum liquid level indicated on the Drawings.

F. Make other equipment such as stop gates, sluice gates, valves, and temporary bulkheads watertight, or measure leakage through other equipment by methods acceptable to ENGINEER. Do not base leakage upon manufacturer's estimates

G. Determine evaporation by floating evaporation pans in structures during testing.

H. Examine concrete surfaces for leaks and damp spots during first 24 hours after filling structures.

I. When Leaks or Damp Spots Appear on Exposed Surfaces:

1. Mark visible leaks and damp spots.

2. Drain structures of water after minimum 24 hours of being full.

3. Repair defects causing leaks and damp spots by epoxy injection on both interior and exterior of structures.

4. Refill water holding structures.

5. Repeat testing and repair process until no leaks or damp spots appear.

J. When no leaks or damp spots appear after 24 hours of being full, measure change in water volume during the next 24 hours.

K. When water volume loss exceeds 0.10 percent of water volume originally held with allowance for equipment leakage, evaporation, and precipitation:

1. Determine cause of volume loss.

2. Drain structures of water.

3. Repair defects causing loss of water volume.

4. Refill water holding structures.

5. Repeat testing and repair process until volume loss does not exceed 0.10 percent of water volume originally held in 24 hours.

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Division 05 — Metals

SECTION 05120
STRUCTURAL STEEL

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish, fabricate, and install, the structural steel framing and all appurtenant metal parts required for permanent connection of the structural steel, complete, all in accordance with the requirements of the Contract Documents and shall include the requirement that the CONTRACTOR design all temporary construction braces and sequences of erection.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The WORK of the following Sections or Divisions applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 02200 Earthwork

2. Section 03315 Grout

3. Section 05500 Miscellaneous Metalwork.

4. Section 09800 Protective Coating.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with reference specifications of the GENERAL REQUIREMENTS.

B. American Institute of Steel Construction:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges."

2. AISC "Manual of Steel Construction - Allowable Stress Design"

3. AISC "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design" and including the "Commentary"

4. AISC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts" approved by the Research Council on Structural Connections of the Engineering Foundation.

C. American Welding Society:

1. AWS D1.1 Structural Welding Code - Steel.

2. AWS B2.1 Welding Procedure and Performance Qualification

D. American Society for Testing and Materials:

1. ASTM A36 Structural Steel

2. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless, Grade B

3. ASTM A153 Zinc Coating (Hot Dip) on Iron and Steel Hardware

4. ASTM A193 Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service

5. ASTM A194 Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service

6. ASTM A307 Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

7. ASTM A325 High-Strength Bolts for Structural Steel Joints

8. ASTM A354 Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.

9. ASTM A449 Hex Cap Screws, Bolts and Studs, Steel, Heat Treated 120/105/90 ksi Minimum Tensile Strength, General Use

10. ASTM A500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes, Grade B

11. ASTM A501 Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

12. ASTM A563 Carbon and Alloy Steel Nuts

13. ASTM A572 High Strength Low-Alloy Columbium-Vanadium Structural Steel.

14. ASTM A671 Electric-Fusion-Welded Steel Pipe for Atmospheric and Lower Temperatures.

15. ASTM A992 Structural Steel Shapes.

16. ASTM F436 Hardened Steel Washers.

E. References herein to "Building Code" shall mean the California Building Code (CBC) and the City of Los Angeles Building Code.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. Certified copies of mill reports covering chemical and mechanical properties for each type of structural steel.

C. Certified copies of test reports for high-strength bolts shall be furnished in accordance with ASTM A325.

D. Shop drawings shall include all shop and erection details showing all members and their connections, anchor bolt layouts, schedules for fabrication procedures, and diagrams showing the sequence of erection. Members and connections for any portion of the structure not shown on the contract drawings shall be detailed by the fabricator and indicated on the shop drawings. All welds shall be indicated by standard welding symbols of the AWS. Shop drawings shall show reference marks and cross references to drawings. Fabricator shall be responsible for correct interpretation of design drawings and shall call to the ENGINEER's attention any discrepancies found on design drawings. No deviation shall be made from design drawings without prior

approval in writing. Shop drawings shall conform to AISC recommendations and specifications and shall show all holes, etc. required for other work.

E. Prior to erection, the CONTRACTOR shall submit an erection plan of the structural steel framing. This erection plan shall conform to the requirements of the AISC Code of Standard Practice for Steel Building and Bridges. The erection plan shall describe all necessary temporary supports, including the sequence of installation and removal.

F. Welding procedures and welder certifications for shop and field welders shall be submitted in triplicate, directly to the ENGINEER from a recognized testing laboratory, with copies to the CONTRACTOR and others as required.

G. Copies of reports of tests and inspection conducted on shop and field welded and bolted connections shall be submitted to the ENGINEER.

1.5 QUALITY ASSURANCE

A. Fabrication, Shop Inspection and Tests.

1. Shop Inspection shall be in accordance with **SAMPLING, TESTING AND FABRICATION INSPECTION** of the **GENERAL REQUIREMENTS**. The CONTRACTOR shall furnish all facilities for the inspection of materials and workmanship in the shop and the INSPECTOR shall be allowed free access to the necessary parts of the work. The INSPECTOR shall have the authority to reject any materials or work not meeting the requirements of these Specifications. Approval of the work by the INSPECTOR, however, shall not relieve the CONTRACTOR of the responsibility of providing a fabricated structure that is in accordance with the drawings and specifications.

2. The CONTRACTOR shall provide mill test reports, covering the chemical and physical properties of the steel used in the work.

3. High-strength bolts shall be inspected using one of the procedures set forth in the current AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts.

4. Liqualification tests, including those for weld repair, shall be submitted to and approved by the ENGINEER prior to their use in fabrication.

5. All welds and welded headed anchors shall be visually inspected by qualified personnel as per AWS D1.1.

6. Thirty percent of full penetration welds shall be fully ultrasonically or radiographically tested by qualified Inspectors as per AWS D1.1. However, when approved by the ENGINEER, the nondestructive testing rate for an individual welder or welding operator may be reduced to 10 percent, provided the reject rate is demonstrated to be 5 percent or less of the welds tested for the welds or welding operator. The fabricator quality controller shall perform all test at their own expense.

7. Ten percent of partial penetration, fillet, plug, and slot welds, shall be tested using magnetic particle or dye penetrant methods by qualified Inspectors as per AWS D1.1. Magnetic particle testing shall be in accordance with ASTM E709. If more than twenty percent of the tested welds fail the test, additional welds as determined by the ENGINEER, shall be tested. The fabricator quality controller shall perform all test at their own expense.

8. The CONTRACTOR shall notify the ENGINEER of any non-destructive testing failure result prior to repair.

9. The CONTRACTOR shall maintain records of non-destructive testing qualifications of testing personnel and submit them to the ENGINEER on request.

10. Welds that are required by the ENGINEER to be corrected or redone, shall be retested as directed, at the CONTRACTOR's expense and to the satisfaction of the ENGINEER and the INSPECTOR.

1.6 FIELD INSPECTION AND TESTING

A. The ENGINEER and the INSPECTOR reserve the right to inspect the work at all times. The CONTRACTOR shall provide temporary ladders, steps, scaffolding, planking, etc., necessary for safe access to the work to be inspected.

B. Field inspection may include, but not be limited to, the following:

1. Inspection of erection steel work for conformance with this specification and the drawings.

2. Inspection of high strength bolted connections in accordance with AISC specification for structural joints using ASTM A325 or A450 bolts.

3. Verification of welding procedures specification, welding procedures, and qualifications of welding operators, welders and tackers in accordance with AWS D1.1.

4. Visual inspection of field welds and field welded headed anchors in accordance with AWS D1.1.

C. Non-destructive testing of field welds shall include, but not be limited to, the following:

1. Thirty percent of full penetration welds shall be fully ultrasonically or radiographically tested by qualified personnel as per AWS D1.1. If more than ten percent of the tested welds fail the test, additional welds as determined by the ENGINEER, shall be tested.

2. Ten percent of partial penetration, fillet, plug, and slot welds, shall be tested using magnetic particle or dye penetrant methods by qualified personnel as per AWS D1.1. Magnetic particle testing shall be in accordance with ASTM E709. If more than twenty percent of the tested welds fail the test, additional welds as determined by the ENGINEER, shall be tested.

3. The CONTRACTOR shall notify the ENGINEER of any non-destructive testing failure result prior to repair.

4. The CONTRACTOR shall maintain records of non-destructive testing and qualifications of testing personnel and submit them to the ENGINEER on request.

5. The costs of all tests specified herein shall be borne by the CONTRACTOR.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rolled W-shapes: ASTM A992. T, M, and S-shapes and plates: ASTM A572 Grade 50, unless noted otherwise.

B. Rolled C and L-shapes: ASTM A36.

C. All stainless steel shapes and plates shall be ASTM A167, Type 316.

D. Structural steel pipe shall be ASTM A53 Type E or Type S, Grade B.

E. Rectangular and round hollow structural shapes (HSS): ASTM A500, Grade B.

F. E-70 - T4 weld metal shall not be used for any welds. All welds indicated in lateral braced frames shall be made with filler metal with a notch toughness of 20 ft-pounds minimum at zero degrees Fahrenheit.

G. Bolts for structural framing connections shall be ASTM A325 with heavy hexagonal nuts and load-indicator washers or tension set bolts unless otherwise indicated. Bolts used to connect dissimilar metals shall be ASTM A193 and A194, Type 316 stainless steel.

H. Machine bolts and anchor bolts together with nuts and washers shall conform to ASTM A 307 unless otherwise noted. They shall be hot-dip galvanized. Galvanizing shall be heavy-duty (not less than 1.25 ounces per square foot), and shall conform to ASTM A153. These bolts shall be installed with self-locking nuts or with lock washers and plain nuts.

I. Welded anchor studs shall be headed concrete anchor studs (HAS), deformed bar anchors (DBA), or threaded anchor studs (TAS) as indicated on the Drawings and as supplied by Nelson Stud Welding Company, Lorain, OH; Omark Industries, KSM Fastening Systems Division, Seattle, WA; or equal.

J. Adhesive concrete anchors shall be RE 500 (LARR 25514) as manufactured by Hilti Incorporated, Simpson Set Adhesive (LARR 25279) as manufactured by Simpson, or approved equal.

K. Structural steel shall be cleaned and coated with a shop paint primer; except, that primer shall be omitted for members to be galvanized coating or fire proofed with no further coating.

L. All structural members shall be furnished full length without splices unless otherwise noted or approved by the ENGINEER.

PART 3 - EXECUTION

3.1 MEASUREMENT

A. The CONTRACTOR shall verify all dimensions, grades, elevations, job conditions, and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of work. The CONTRACTOR shall review the Drawings and any discrepancies shall be reported to the ENGINEER for clarification prior to starting fabrication.

3.2 FABRICATION

A. Fabricate items of structural steel in accordance with the Drawings, AISC Specifications, and as indicated on the final reviewed shop drawings. Fabrication and assembly shall be done in the shop to the greatest extent possible.

B. Properly mark and matchmark materials for field assembly.

C. Where finishing is required, complete the assembly, including bolting and welding of units, before start of finishing operations.

3.3 CONNECTIONS

A. Unless otherwise indicated on the drawings, minimum beam framing connections shall be in accordance with AISC Manual of Steel Construction. All connections of beams, except handrails, ladders and girt connections, shall be bolted with high-strength bolts to provide slip critical type connections using direct tension load indicator washers or tension set bolts. Beam connections shall have a minimum of two 3/4-inch high-strength bolts unless otherwise indicated. All connections unless shown otherwise shall develop full strength of members joined and shall conform to AISC standard connections. Installation of bolts shall be in accordance with the manufacturer's recommendations and AISC Specification for Structural Joints using ASTM A 325.

B. Double-angle members shall be connected together in accordance with AISC specification, with a 3/4-inch diameter, high-strength bolt and a filler plate or welded filler plate.

C. Column ends shall be square and milled to have full bearing at splices and at end plates.

D. The CONTRACTOR shall notify the INSPECTOR to make arrangements to inspect high strength bolted connections and welded connections and to perform testing and prepare test reports. This inspection shall be in addition to the inspection specified in subsections 1.5A and 1.5B of this specification.

3.4 WELDED CONSTRUCTION:

A. Comply with AWS D1.1 Code for procedures, appearance, and quality of welds and welders, and methods used in correcting welding work.

B. Stainless steel welding shall conform to the details and standards of workmanship of this specification and AWS D1.6, except that the prequalified welds for carbon steel are not applicable to stainless steel. Welders and weld procedures for stainless steel shall be specifically qualified per AWS B2.1 for the type of stainless steel to be welded. Welders and weld procedures for welding of stainless steel to carbon steel shall be qualified per AWS B2.1.

C. Unless otherwise shown, all butt and bevel welds shall be complete penetration.

3.5 HOLES FOR OTHER WORK

A. Provide holes as necessary or as indicated for securing other work to structural steel framing, and for the passage of other work through steel framing members. Provide threaded nuts welded to framing, and other specialty items as shown to receive other work. No torch cut holes are permitted.

3.6 SHOP PAINT PRIMER

A. Apply shop paint primer in accordance with Section 09800, "Protective Coating". Omit shop applied primer in the following cases: at field weld locations, at contact surfaces of high strength bolted connections, where a portion of a member is to be embedded in concrete, and where galvanize coating or fire proofed with no further coating is required. Remove all slag from welds before painting.

3.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Load structural members in such a manner that they may be transported and unloaded without being excessively stressed, deformed, or otherwise damaged.

B. Protect structural steel members and packaged materials from corrosion and deterioration. Material shall be stored in a dry area and shall not be placed in direct contact with the ground. Do not place materials on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Repair or replace damaged materials or structures as directed.

3.8 ERECTION

A. The CONTRACTOR shall comply with the AISC Specifications and Code of Standard Practice, and with specified requirements.

B. High-strength bolts shall be installed in accordance with the AISC Specification for Structural Joints using ASTM A325 or ASTM A490. The connections shall be the "slip - critical type" class "A."

C. Anchor bolts and other connectors required for securing structural steel to in-place work, and templates and other devices for presetting bolts and other anchors to accurate locations shall be furnished.

3.9 SETTING BASES AND BEARING PLATES

A. Prior to the placement of non-shrink grout beneath base and bearing plates, the bottom surface of the plates shall be cleaned of all bond-reducing materials, and concrete and masonry bearing surfaces shall also be cleaned of all bond-reducing materials and roughened to improve bonding.

B. Set loose and attached baseplates and bearing plates for structural members on wedges, leveling nuts, or other adjustable devices.

C. Tighten the anchor bolts after the supported members have been positioned and plumbed.

D. Grouting of baseplates shall be done with non-shrink gout, of flowable consistency, as specified in Section 03315 "Grout". Grouting shall be completed prior to placing loads on the structure.

3.10 FIELD ASSEMBLY

A. Set structural frames accurately to the lines and elevations indicated. Align and adjust the various members to form a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

B. Level and plumb individual members of the structure within specified AISC tolerances. CONTRACTOR shall provide and install all temporary bracing necessary to carry construction loads until the structure has been completed.

C. Establish required leveling and plumbing measurements at the main operating temperature of the structure.

3.11 MISFITS AT BOLTED CONNECTIONS

A. Where misfits in erection bolting are encountered, the CONTRACTOR shall immediately notify the ENGINEER. The CONTRACTOR shall submit a method to remedy the misfit for review by the ENGINEER. The ENGINEER will determine whether the remedy is acceptable or if the members must be refabricated. Methods of remedy may include, but are not limited to, the following:

1. Ream holes that must be enlarged to admit bolts and use oversized bolts.

2. Plug-weld misaligned holes and redrill holes to admit standard size bolts.

3. Drill additional holes in the connection, conforming with AISC Standards for bolt spacing and end and edge distances, and add additional bolts.

4. Reject the improperly fabricated member and fabricate a new member to ensure proper fit.

B. Mis-sized or misaligned holes in members shall not be enlarged by burning or by the use of drift pins.

3.12 MISFITS AT ANCHOR BOLTS

A. Where misalignment between anchor bolts and bolt holes in steel members are encountered, the ENGINEER shall be immediately notified. The CONTRACTOR shall submit a method to remedy the misalignment for review by the ENGINEER.

3.13 GAS CUTTING

A. Do not use gas cutting torches in the field for correcting fabrication errors in the structural framing, except on secondary members which are not under stress and will be concealed in the finished structure and when approved by the ENGINEER. Finish gas-cut sections equal to a sheared appearance.

3.14 TOUCHUP PAINTING

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint primer. Apply touchup paint primer by brush or spray which is the same thickness and material as that used for the shop paint. Galvanized surfaces which have been field welded or damaged shall be repaired in accordance with Section 05500 "Miscellaneous Metalwork."

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SECTION 05500
METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide and install all miscellaneous metal and metal fabrications in place, as indicated on the Contract Drawings and hereafter specified or needed for complete and proper installation, includes but not limited to the following:

1. Pipe brackets
2. Pipe bumper posts
3. All formed and bent plate-14 gauge and heavier
4. Bolts, rods, dowels, nuts, washers, anchors, brackets and other miscellaneous iron.
5. Metal ladders
6. Steel guard rails
7. Angle thresholds
8. Downspouts
9. Frames and gates for trench drains.
10. Furnishing and installing factory horizontal aluminum access doors.

B. Related Work Sections:

1. Documents affecting work of this Section include, but are not necessarily limited to the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS and Sections in GENERAL REQUIREMENTS of DIVISION 1 of these Specifications.
2. Concrete Work in Division 3.
3.. Protective Coatings in Section 09800.
4.. Devices for support of mechanical and electrical materials in Divisions 15 and 16.

1.2 QUALITY ASSURANCE

A. Qualifications of Personnel: Use only adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and are completely familiar with the necessary crafts and with the specified requirements and methods needed for proper performance of the work of this Section.

B. Welder's Qualifications: Currently qualified according to AWS D1-1.

C. Design: Fabricate and erect work in accordance with A.I.S.C.

D. Welding Operations: Perform shop and/or field welding required in connection with work of this Section in strict accordance with pertinent recommendations of the American Welding Society (AWS).

E. Project Conditions: Do not fabricate components which require fitting to structural elements or into finished spaces until dimensions are verified at the job-site. Verify that other trades with related work are complete before installing vault access door(s). Access door mounting surfaces shall be straight and secure; substrates shall be of proper width. Refer to the access door construction documents, shop drawings, and manufacturer's installation instructions. Observe all appropriate OSHA safety guidelines for this work.

F. Regulations: Comply with 2006 International Building Code with the Los Angeles City 2008 Amendments.

G. Shop Inspections: Required

H. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this project with sufficient production capacity to produce work units without causing delay in the Contracted Work.

1.3 SUBMITTALS

A. General: Comply with pertinent provisions in the SUBMITTALS SECTION 01340 in DIVISION 1 - GENERAL REQUIREMENTS of these Specifications.

B. Materials List: Submit list of proposed items to be provided under this Section.

C. Shop Drawings:

1. Submit for all items proposed to be fabricated and installed under this Section. Identify each proposed item with corresponding Contract Drawing detail and Specification references.

2. Shop drawings for the aluminum access doors shall provide the following information:

a. Product Data: Provide manufacturer's product data for all materials in this specification.

b. Show profiles, accessories, location, and dimensions.

c. Samples: Manufacturer to provide upon request; sized to represent material adequately.

d. Contract Closeout: Vault access door manufacturer shall provide the manufacturer's Warranty prior to the contract closeout.

D. Samples: Submit physical samples of specified materials for color or texture selection by the Consultant, when so requested.

E. Templates: Provide for anchor and bolt installation by other trades.

F. Manufacturers Specifications and Other Data: Provide as-needed to prove compliance with the specified requirements.

G. Manufacturer's Recommended Installation Procedures: When approved by the Consultant, will become the basis for accepting or rejecting actual installation procedures used on the Work.

H. Certificates: Submit certification that specified surface preparation and primer or galvanized coatings as specified have been applied to steel items and are in accordance with the Specifications.

I. Welder's certificates signed by the Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

J. Horizontal Aluminum Access Door Warranty: Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of (25) twenty-five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

1.4 PRODUCT HANDLING

A. General:

1. Fabricated metal items shall not be fabricated or delivered to the job-site before required review of the Shop Drawings by the City Engineer or the Consultant and returned to the Contractor.

2. Store fabricated metal items above ground on platforms, skids or other approved supports in a weathertight and dry location until ready for installation.

B. Protection: Use all means necessary to protect the materials and manufactured items of this Section before, during and after installation and to protect the work and materials of all other trades.

C. Replacements: In the event of damage to work of this Section, immediately make all repairs and replacements necessary to the approval of the City Engineer or the Consultant and at no added cost to the City.

D. Materials to be Installed by Others:

1. Deliver anchor bolts and other anchorage devices to be embedded in concrete to the job-site in time before start of concrete work operations.

2. Provide setting drawings, templates and other directions necessary for installation of anchor bolts and devices.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. General:

1. All material shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.

2. All metal surfaces shall be free from any defects which would impair the strength, durability, appearance, and shall be of the best commercial quality, for the purposes intended and adequate to withstand the strains and stresses to which they will be subject. Metals shall be protected from injury at the job, in transit, and until erected in place, inspected, and approved.

B. Miscellaneous Metals: (As Applicable)

1. Iron and Steel (General): 2006 International Building Code with the Los Angeles City 2008 Amendments, Section 27.

2. Structural Steel: ASTM A36.

3. Steel Plates, Shapes and Bars: Mild or structural grade conforming to applicable ASTM A36 Specifications.

4. Steel Plates (Bent or Cold Formed): ASTM A283 Grade "C", ASTM A992 for W shapes.

5. Gray Cast Iron: ASTM A48, Class 10 or as specified.

6. Malleable Iron Castings: ASTM A47.

7. Steel Tubing: AISI MT1010, electric welded, minimum 14-gage, shapes and size as indicated on the Contract Drawings.

8. Steel Pipe: ASTM A53, Grade A, Schedule 40 black finish or ASTM A120, galvanized when used on building exterior.

9. Steel Bars and Bar-size Shapes: ASTM A306 Grade 65 or ASTM A36.
10. Cold Finished Steel Bars: ASTM A108.

11. Galvanized Carbon Steel Sheets: ASTM A526 with G90 zinc coating in accordance with ASTM A525.

12. Aluminum Castings: 214 aluminum alloy.

13. Aluminum Extrusions: 6061-T6 aluminum alloy.

14. Stainless Steel: Type 316, except as otherwise specified.

15. Diamond or checker Pattern Plate: U.S. multigrip floor plate; U.S. Steel Corp. or equal.

C. Miscellaneous Related Materials: (As Applicable)

1. Welding Electrodes: Conform to AISC and ASTM A233 and the Code for Arc and Gas Welding in Building Construction, A.W.S. Publication D1.1 use E-70XX Series Electrodes.

2. Paint Primer (for uncoated ferrous metal): Rust-Oleum Corp. "X-60 Bare Metal Red Primer".

3. Hot-Dip Galvanizing: ASTM A-123 or as applicable after fabrication. See Section 210-3 of the "Standard Specifications".

4. Galvanizing Repair Material: "Galvalloy" by Metalloy Products Co., 1341 Sussex Lane, Newport Beach, California or equal 90% zinc rich cold process repair material.

5. Non-Shrink Grout: "Por-Rok" by Hallemite Mfg. Co. Cleveland, Ohio (Los Angeles, Phone (213) 583-4184).

6. Fasteners: Same material and finish of work to be fastened together; screws to be countersunk oval head type, unless otherwise indicated on the Drawings.

7. Mechanical Anchors: For securing miscellaneous metal items to concrete to be self-drilling concrete anchors, not less than 3/8-inch size, Phillips Redhead, or as otherwise indicated on the Drawings.

8. Bolts and Nuts: Low-carbon hexagon-head type, ASTM A-307, Grade "A" or "B". Lag bolts shall be square-head Type FS FF-B-561.

9. Miscellaneous: All items of miscellaneous metal indicated on drawings, including clip angles, ties, straps, anchors, bolts, angles, rods, and other appurtenances required by details or necessary for proper installations.

10. Dry Pack: A cement-sand mix of 1 part Portland cement to 2-1/2 parts sand by volume with necessary water added to provide for solid compaction.

11. Chains: 3/16-inch size, galvanized proof chain complete with suitable size harness snaps and two eyebolts, length to suit job conditions.

12. Gasket Material: Soft compressible neoprene rubber strip, thickness and width as indicated on the drawings.

13. Filler Material for Welding Aluminum: Type 53.

14. Concrete inserts:

    a. Threaded or wedge type galvanized ferrous castings of malleable iron complying with ASTM A27;

    b. Provide required bolts, shims, and washers, hot-dip galvanized in accordance with ASTM A153.

15. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

16. Welding Rods and Bare Electrodes: Select in accordance with AWS Specifications for the metal alloy to be welded.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Consultant.

2.3 SHOP PAINT

A. Primer: Use "10-99 Tnemec Primer" or "Rustoleum Number 5769 Primer.

B. For Repair of Galvanizing: Use a high zinc-dust content paint complying with MIL-P-21035.

2.4 FABRICATION

A. Field Measurements: Secure all field measurements required for proper and adequate fabrication and installation of all work of this Section. Exact measurements are the responsibility of the Contractor.

B. Workmanship: (As Applicable)

1. Except as otherwise shown on the Contract Drawings or the approved Shop Drawings use materials of size, thickness, and type required to produce reasonable strength and durability in the work of this Section.

2. Fabricate with accurate angles and surfaces which are true to the required lines and levels, grinding exposed welds smooth and flush, forming exposed connections with hairline joints, and using concealed fasteners wherever possible. Do not fabricate components which require fitting to structural elements or into finished spaces until dimensions are verified at the job-site.

3. Prior to shop painting or priming, properly clean metal surfaces as required for the applied finish and for the proposed use of the item.

4. On surfaces inaccessible after assembly or erection, apply two coats of the specified primer. Change color of second coat to distinguish it from the first.

5. Work to dimensions shown or accepted on the Shop Drawings, using proven details of fabrication and support.

6. Conform to applicable provisions of the Uniform Building Code with the Los Angeles City 1992 Amendments, Chapter 27.

7. Form exposed work true to line and level, with accurate angles and surfaces and with straight sharp edges.

8. Ease the exposed edges to a radius of approximately 1/32-inch unless otherwise shown.

9. Form bent-metal corners to smallest radius possible without impairing the work.

10. Welding: Electric arc welding, Uniform Building Code with the Los Angeles City 1992 Amendments, Chapter 27.

11. Bolting: Bolts to be drawn tight and threads set to secure nuts.

12. Assembly: Assemble all items with parts in true alignment and accurately fitted, joints well made, adequately fastened with butts and sharp edges ground smooth.

13. Conceal all fastenings where practicable and make exposed joints hairline.

14. Nonferrous metal items shall comply with best practice of the trade. Form all sections true to detail and free from defects impairing appearance, strength, and durability.

15. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

16. On surfaces inaccessible after assembly or erection, apply two (2) coats of the specified primer. Change color of second coat to distinguish it from the first coat.

C. Galvanizing: Provide a zinc coating for those items shown or specified to be galvanized as follows and as applicable:

1. ASTM A153 for galvanized iron or steel hardware.

2. ASTM A123 for galvanized rolled, pressed or forged steel shapes, plates, bars and strip 1/8-inch thick and heavier.

D. Field Galvanizing:

1. Required: For repair of protective coating of damaged galvanized surfaces resulting from welding or other construction operations in the shop or at the job-site at no added cost to the City.

2. Method: By "galvalloy" methods, in accordance with manufacturer's directions.

E. Shop Painting:

1. Required: On all uncoated ferrous metals; galvanized ferrous metal not to be shop coated.

2. Paint: Specified paint primer.

3. Painting: Full prime coating, completely covering the metal surfaces; at least 1 coat on all surfaces which will be accessible after fabrication and erection; at least 2 coats on all surfaces which will be inaccessible after fabrication and erection.

4. Remove scale, rust and other deleterious materials before application of Shop Coating.

5. Clean off heavy rust and loose mill scale in accordance with SSPC-SP-2 or SSPC-SP-3 before coating.

6. Remove oil, grease and similar contaminants in accordance with SSPC-SP-1.

F. Carpenter's Iron Work: Furnish all bent or otherwise fabricated bolts, plates, anchors, hangers and other miscellaneous steel items not readily obtainable "OFF-THE-SHELF" and required for anchoring work to concrete, masonry and interior partitions. Fasteners shall be of the same material as the item being fastened. Items to be built into masonry or cast into concrete shall be delivered to the job-site in time to avoid any delay of other trade operations. Anchor, for mechanical anchoring of items to concrete shall be self-drilling type and minimum 3/8-inch size.

G. Rough Hardware:

1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.

2. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.5 HORIZONTAL ALUMINUM ACCESS DOORS

A. Manufacturer: The BILCO Company, P.O. Box 1203, New Haven, CT 06505; 1-203-934-6363, Nystrom Building Products, 9300 73rd Avenue North Brooklyn Park, MN 55428 1-763-488-9200, or approved equal.

B. Access Door: Furnish and install where indicated on plans vault access door Type J-AL H20, size as shown in the contract drawings. The vault access door shall be pre-assembled from the manufacturer.

C. Performance Characteristics:

1. Cover: Shall be reinforced to support AASHTO H-20 wheel load with a maximum deflection of 1/150th of the span. Manufacturer to provide structural calculations stamped by a registered professional engineer in the sate of California upon request. (Note: For installation in an off-street location where not subject to high density, fast moving traffic.)

2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.

3. Operation of the cover shall not be affected by temperature.

4. Entire door, including all hardware components, shall be highly corrosion resistant. Please consult the manufacturer when doors are to be installed in unusually harsh environments or extremely corrosive conditions.

C. Cover: Shall be 1/4" (6.3 mm) aluminum diamond pattern.

D. Frame: Channel frame shall be 1/4" (6.3mm) extruded aluminum with bend down anchor tabs around the perimeter. A continuous EPDM gasket shall be mechanically attached to the aluminum frame to create a barrier around the entire perimeter of the cover and significantly reduce the amount of dirt and debris that may enter the channel frame.

E. Hinges: Shall be specifically designed for horizontal installation and shall be through bolted to the cover with tamperproof Type 316 stainless steel lock bolts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts.

F. Drain Coupling: Provide a 1-1/2" (38mm) drain coupling located in the right front corner of the channel frame [note: can be placed at a different location if specified].

G. Lifting mechanisms: Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" gusset support plate.

H. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug].

I. Hardware:

1. Hinges: Heavy forged aluminum hinges, each having a minimum 1/4" (6.3 mm) diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame.

2. Cover shall be equipped with a hold open arm which automatically locks the cover in the open position.

3. Cover shall be fitted with the required number and size of compression spring operators. Springs shall have an electrocoated acrylic finish. Spring tubes shall be constructed of a reinforced nylon 6/6 based engineered composite material].

4. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover. Locking device shall be recessed so that it is not a tripping hazard.

5. Hardware: Shall be Type 316 stainless steel hardware.

J. Finishes: Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until such detrimental conditions are corrected.

3.2 COORDINATION

A. Coordinate work of this Section as required with other trades to assure proper and adequate provisions in the work of those trades for interface with the work of this Section.

3.3 INSTALLATION

A. General: (As Applicable)

1. Set work accurately into position, plumb, level, true, and free from rack.

2. Anchor firmly into position.

3. Where field welding is required, comply with AWS recommended procedures of manual-shielded metal-arc welding for appearance and quality of weld and for methods to be used in correcting welding work.

4. Grind exposed welds smooth, and touchup shop prime coats.

5. Do not cut, weld, or abrade surfaces which have been hot-dip galvanized after fabrication and which are intended for bolted or screwed field connections.

6. Dissimilar Materials: Where metals are in contact with plaster, concrete or other type metals, paint contact faces of the metal before installation, with a heavy bituminous coating:

B. Immediately After Erection: Clean the field welds, bolted connections, and abraded areas of shop priming. Paint the exposed areas with same material used for shop priming.

3.4 PIPE BUMPER POSTS (BOLLARDS)

A. Required: At locations indicated on the Contract Drawings.

B. Materials: Galvanized steel pipe, size and length as indicated on the Drawings.

C. Installation: Set plumb in concrete footings of size indicated on the Drawings, to indicated height; pipe post to be filled with concrete to top and top to be tooled to shed water. Top of exposed portion of footing to be tooled to shed water.

3.5 METAL LADDER

A. Materials: Steel bar stringers, steel angle clips, steel plate frame, steel bar rungs, steel pipe enclosure with anchor plates and anchor bolts.

B. Fabrication:

1. In accordance with drawing details, weld rungs and supports to stringers.

2. Grind smooth all sharp edges and welds.

3. Hot-dip galvanized exterior ladder and the enclosure after fabrication.

4. Top surface of each ladder ring shall be made non-slip, subject to approval of the City Engineer.

C. Installation: As indicated on the Contract Drawings, securely bolt in accurate location, plumb, square and true.

3.6 HORIZONTAL ALUMINUM ACCESS DOORS

A. Inspection: Verify that the vault access door installation will not disrupt other trades. Verify that the substrate is dry, clean, and free of foreign matter. Report and correct defects prior to any installation.

B. Installation:

1. Submit product design drawings for review and approval to the engineer before fabrication.

2. The installer shall check as-built conditions and verify the manufacturer's vault access door details for accuracy to fit the application prior to fabrication. The installer shall comply with the vault access door manufacturer's installation instructions.

3. The installer shall furnish mechanical fasteners consistent with the vault access door manufacturer's instructions.

3.7 CLEAN-UP AND ADJUSTMENT

A. Clean-up:

1. During the progress of the work, conform to provisions of Section 01710 of the GENERAL REQUIREMENTS, keep the premises free from debris and waste resulting from work of this Section. Upon completion of this Section remove all surplus materials and debris from the job-site.

2. Immediately after erection, clean the field welds, bolted connections and abraded areas of shop priming. Paint the exposed areas with the same material used for the shop priming.

B. Adjustments: Adjust all operating parts and/or assemblies as may be required to provide the necessary function and smooth operation.

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SECTION 05520
HANDRAILS AND RAILINGS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B. This section covers the work necessary to furnish and install handrails and railings, complete.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03300 Cast-in-Place Concrete

B. Section 05500 Miscellaneous Metalwork

C. Section 09800 Protective Coating

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the reference specifications of the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards.

1. Government Standards: California OSHACalifornia Occupational Safety and Health Standards.

2. Trade Standards: Aluminum Association (AA) publications, as referenced herein.

3. Manufacturer's Standards: In addition to the standards listed above, the railings and their installation shall be in accordance with the manufacturer's published recommendations and specifications.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. The following submittals and specific information shall be provided:

1. Shop Drawings: Railing supplier's shop drawings on the railing system.

2. Calculations: Engineering calculations shall be submitted for review. Engineering calculations shall include (but not be limited to) railings, handrail brackets, brackets, support flanges, and fasteners or anchors.

1.5 QUALITY ASSURANCE (Not Used)

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken packages, containers, or bundles bearing the label of the manufacturer.

B. Storage: All materials shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

PART 2 -- PRODUCTS

2.1 ALUMINUM HANDRAIL SYSTEMS

A. General: Aluminum handrail systems or components shall be fabricated as shown or shall be an ENGINEER-accepted prefabricated/pre-engineered system or component by one fabricator/manufacturer that meet the submittal requirements as stated in SUBMITTALS of the General Requirements. Manufacturers who may meet these specified requirements are: Alumaguard, a division of Bettinger West, Inc., Denver, CO; or Thompson Fabricating Co., Birmingham, AL; or approved equal. These systems shall meet the allowable load and deflection criteria.

B. Pipe:

1. All rails, posts, and formed elbows shall be fabricated from extruded Alloy 6105-T5 with a minimum tensile strength of 38,000 psi and a minimum yield strength of 35,000 psi, and with special close tolerance for tight fit and excellent appearance. All other aluminum parts shall be fabricated from 6063-T6 or 6061-T6 extruded aluminum of adequate strength for all loads.

2. Round tube and round picket railings shall be side mounted unless otherwise shown. Posts shall be not less than 1-1/2-inch diameter, Schedule 40 pipe or 1-1/2-inch x 2-inches oval section. The posts shall be evenly spaced at not less than 4-feet nor more than 6-feet on centers. Field conditions may require some adjustment of spacing. Pickets shall be not less than 5/8-inch OD pickets, spaced at 4-1/2-inches on center; or 3/4-inch OD pickets, spaced at 6 inches on centers. Top rails and railings shall be not less than 1-1/2-inch OD pipe or 2-inch oval section. Rails may be type with bottom enclosures. Bottom rails shall be not less than 1-1/2-inch OD pipe or 1-7/8-inch diameter extrusion with bottom enclosures. The top railings shall be as long as possible and the post shall not project through the top rails. Toeboard of picket rails shall be a specially extruded, snap-in bottom rail enclosure with toeboard or special extruded centered toeboard that is screw applied to bottom of the bottom rail.

C. Fittings:

1. All fittings shall be as shown or shall be one of the following types: A one-piece aluminum extrusion machined to final shape and attached to the handrail post with either concealed welds or a stainless steel fastener. A one-piece connector of aluminum or stainless steel, either welded or attached to the handrail post with stainless steel fasteners and designed to be completely covered when the handrail is connected. All fitting surfaces designed to be exposed to view after installation is complete will match the handrail metal alloy, surface, shape, and anodized finish and shall be the continuous diameter type for smooth appearance and to permit continuous sliding of the hands.

2. The handrail post bolted baseplate connector shall be fabricated as shown on the Drawings or equivalent molded or extruded meeting all of the appearance and strength requirements. The baseplate shown shall conform to ASTM A 167, Type 304 stainless steel with a minimum yield strength of 30,000 psi. The insert shown shall be fabricated from stainless steel pipe with a minimum wall thickness of 0.145-inch and with a minimum yield strength of 50,000 psi. The insert dimensions shall meet the required tolerances shown on the Drawings. Furnish test data to show that the yield strength of the material in the as-delivered pipe equals or exceeds 50,000 psi. Inserts using stainless steel with minimum yield strengths less than 50,000 psi shall have thicker walls to develop equal strength.

3. The handrail wall brackets, aluminum, round top, similar to R & B Wagner No. 1767; Julius Blum No. 384A; or equal; clear anodized and meeting all the dimensional wall/railing clearance requirements of national, state, and local standards, regulations, and codes, including OSHA.

D. Additional Specific Fabrications:

1. The handrail gate shall meet all the safety requirements of the national, state, and local standards, regulations, and code requirements that specifically apply to this project, including OSHA. The gate shall be fabricated using 6063-T6 extruded aluminum, and as otherwise shown on the Drawings. Gate hardware shall meet all specified requirements. Manufacturers who may provide hardware meeting these Specifications are: Craneveyor Corp., South El Monte, CA Julius Blum & Co., Inc. Carlstadt, NJ; Thompson Fabricating Co., Birmingham, AL; or approved equal. Provide test reports to show that all gate hardware meets minimum safety strength requirements for handrails and guard rails.

2. The handrail picket panels and clamps shall be fabricated using solid bar 6063, 6105, or 6061 extruded aluminum as shown on the Drawings with finishes specified. All fasteners shall be stainless steel.

3. Toeboards and accessories shall be fabricated as shown on the Drawings, or shall be molded or extruded by a handrail manufacturer providing equivalent appearance, strength, and safety properties to that shown, using 6063 or 6061 aluminum with finishes as specified, meeting all applicable state, federal, and Los Angeles Building Code requirements. All fasteners shall be stainless steel. Provide expansion and contraction connections between each post as shown or equivalent.

E. Embedded Items: All metal anchorages to be embedded in concrete shall be furnished and installed under this section and shall be as shown on the Drawings or as specified herein.

F. Finishes:

1. All exposed aluminum shall be clear anodized in accordance with the Aluminum Association AA-M32-C22-A41. All exposed prefabricated handrail and toeboard handrail, picket panel, and toeboard components, except stainless steel fasteners, shall be anodized after fabrication.

2. All complete rails, modules, and components shall be cushion wrapped to prevent them from being scratched and dented during shipment, storage, and installation. Wrapping shall be left intact, insofar as possible, until the railing is completely installed.

2.2 ANCHOR BOLTS, FASTENERS, CONCRETE ANCHORS

A. Miscellaneous Fasteners:

1. Type 316 stainless steel elastic locknuts; Type 316 stainless steel flat washers; molded nylon flat washers; round head machine screws ((RHMS); Type 316 stainless steel, all as supplied by McMaster-Carr Supply Company, Los Angeles, CA; or equal.

2. Stainless steel bolts and nuts for bolting handrail to metal beams, unless otherwise shown, shall be ASTM A 193 and A 194, Type 316 with a minimum yield strength for bolts of 95,000 psi.

3. Anchor bolts, Type 316 stainless steel anchor bolt with a minimum yield strength of 30,000 psi, 5/8-inch minimum diameter with hex nuts, or size as shown.

4. Wedge anchors for exterior use and for interior use shall be 304 or 316 stainless steel, 3/4-inch diameter by 5-inch HILTI Kwik-Bolt TZ, stud type, manufactured by HILTI, Inc., Stamford, CT; stainless steel bolts, 3/4-inch by 5-inch, completely assembled, manufactured by Wej-It Corporation, Broomfield, CO; or equal.

5. Wedge anchors have been limited to 5-inch lengths for use in 6-inch slab and wall thicknesses. Where anchors are to be used in thicker section, larger anchor lengths may be used. Load values for tension pullout with special inspection shall be 3, 900 pounds minimum. Special inspection is required.

6. Concrete anchors in other sizes and quantity when used shall be based upon approved test reports with special inspection where required. Submit calculations and test data for review prior to use. Satisfy all applicable codes.

PART 3 -- EXECUTION

3.1 FABRICATION OF ALUMINUM HANDRAIL SYSTEMS

A. The work shall be performed according to approved shop drawings by workmen experienced in the fabrication and erection of aluminum railing systems of the type and quality specified. See the Drawings for other requirements.

B. Handrail post to be bolted to metal or concrete shall be furnished longer than needed and field cut to exact dimensions required to satisfy any vertical variations on the actual structure, or in lieu of field cutting provide an approved fitting containing provisions for vertical adjustment. The Detail Drawings require field fit-up. Shims or grout under baseplates shall not be used. Misfits shall be rejected.

C. The aluminum handrail system shall be completely free of all burrs, nicks, and sharp edges when the installation is complete. Welding shall not be permitted.

D. Coat ends of aluminum posts to be set in grout or concrete as specified in Section 09800, "Protective Coating".

E. The railing shall be erected in the field without cutting, drilling, welding, or tapping unless specifically approved by the ENGINEER.

F. No exposed welds, rivets, or screws shall be permitted unless specifically detailed on the plans.

G. Field welding of aluminum connections shall not be permitted. Welded connections shall be permitted only where indicated on the Contract drawing and on the approved shop drawings.

H. Welding shall conform to the SSPWC Section 304-2.1.2.

I. Railing panels shall be in conformance with SSPWC Section 304-2.1.2

J. For structures on curves, either horizontal or vertical, the railing shall conform to the SSPWC Section 304-2.1.2.

K. Completed aluminum railing units shall be anodized after fabrication and in conformance with the SSPWC Section 304-2.1.2.

3.2 INSTALLATION

A. Assembly/installation of handrail system shall be performed in strict accordance with manufacturer's written recommendations for installation and the details shown.

B. The railing shall be erected in conformance with the SSPWC Section 304-2.1.3.

C. The railing installation shall be in conformance with the SSPWC Section 304-2.1.3.

D. After erecting the railing, any abrasions or exposed steel shall be repaired as specified.

E. Protection from Entrapped Water: All exterior installations and interior installations subject to high humidity shall have provisions made to drain water from the railing system. When posts are mounted in concrete or when bends or elbows occur at low points, weep holes of 1/4-inch diameter shall be drilled at the lowest possible elevations, one hole per post or rail. Hole shall be drilled in the plane of the rail.

F. Expansion Joints:

1. Provide at intervals of not more than 24-feet on centers and at structural joints as hereinafter specified.

2. Provide slip joint with internal sleeve extending 2-inches beyond each side of joint. Provide slip joint gap of 0.2-inch to allow for expansion.

3. Fasten to one side using either adhesive or two blind rivets, set at 120 degrees and 240 degrees interval from top of pipe.

4. Locate joints within 12-inches of posts. Locate expansion joints in rails to also coincide with expansion joints in the structural walls and floors that support the railings.

G. Setting Posts:

1. Embedded:

a. Clean dust and foreign matter from sleeves or blockouts.

b. Moisten interior of hole and surrounding surface with clean water. Install Category II-B non-metallic grout as specified in Section 03315, "Grout".

c. Brace railing until grout sets.

2. Surface Mounted:

   a. The post bolted baseplate connectors shall sit solidly on concrete, stair stringer, or other material as shown on the Drawings. The use of shims, wedges, grout, etc. for handrail post alignment or any other reason will not be permitted.

   b. The handrail posts shall be furnished longer than needed and then accurately measured in the field for correct length, cut and secured to the post baseplate connector as shown on the Drawings.

H. Posts and Rails:

   1. Set posts plumb and aligned to within 1/8-inch in 12-feet.

   2. Set rails horizontal or parallel to rake of steps to within 1/8-inch in 12-feet.

   3. Posts and rails shall be all in the same plane. There shall be no projections or irregularities to present a hazard or prevent a user from sliding his hand continuously along the top rail.

I. Handrail Wall Brackets: Support wall rails on brackets, spaced not more than 6-feet on centers. Provide in-wall anchor backplates on solid blocking on stud walls.

J. Toeboard: Toeboards shall be accurately measured in the field for correct length (after handrail post installation), cut and secured to posts as shown on the Drawings. Provide toeboards at all handrails except where concrete curbs are furnished.

K. Handrail Gate: The handrail gate shall be installed to meet safety requirements.

L. Cleaning:

   1. Wash thoroughly using clean water and soap. Rinse with clean water.

   2. Do not use acid solution, steel wool, or other harsh abrasive.

   3. If stain remains after washing, restore in accordance with recommendations of manufacturer, or replace handrails with an acceptable finish.

3.3 CLEANUP

A. Upon completion of installing the handrails and railings, clean up all waste materials and debris resulting from this operation and dispose of such waste materials and debris off the site.

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Division 07 — Thermal and Moisture Protection

SECTION 07900
JOINT SEALANTS

PART 1 - GENERAL

1.1. THE REQUIREMENT

A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B. This section covers all joint sealant as specified herein and shown on Drawings.

1.2. RELATED WORK SPECIFIED ELSEWHERE

A. Section 03300 Concrete Work

1.3. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the reference specifications of the GENERAL REQUIREMENTS.

B. Federal Specifications:

TT-S-001543A	Sealing Compound, Silicone Rubber Base, (Calking,Sealing and Glazing in Buildingfs and Other Structures).
TT-S-00230C(2)	Sealing Compound, Elastomeric Type, Single Component, (For Calking, Sealing, and Glazing in Buildings and Other Structures).

1.4. CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. The following submittals and specific information shall be provided.

1. Product Data: Surface preparation and installation instructions.

2. Samples: Material proposed for use showing color range available, and marked with the manufacturer's name and product identification.

3. Quality Control Submittals:

a. Applicator Qualification: Documentation showing minimum of 5 years experience installing sealants in projects of similar scope.

b. Certificates of Compliance: Proposed materials meet Specification requirements.

4. Contract Closeout Submittals: Guarantee.

1.5. QUALITY ASSURANCE (NOT USED)

1.6. PRODUCT HANDLING

A. Deliver sealants to the jobsite in sealed containers, each bearing manufacturer's name and product designation.

B. Store and protect sealant products from damage, deterioration, and contamination in accordance with manufacturer's written recommendations.

1.7. ENVIRONMENTAL CONDITIONS

A. Ambient Temperature: Between 40 and 80 degrees F (4 and 27 degrees C) when sealant is applied.

1.8. GUARANTEE

A. Sealed Joints: Against adhesive and cohesive failure of sealant and for watertightness of sealed joints for a period of 5 years after date of final completion of sealants.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Like Items of Materials: End products of one manufacturer to achieve standardization for appearance, maintenance, and replacement.

B. CONTRACTOR Option: Immersible sealant may be substituted for nonimmersible sealant of the same material.

C. Characteristics:

1. Uniform, homogeneous.
2. Free from lumps, skins, and coarse particles when mixed.
3. Nonstaining, nonbleeding.
4. Hardness of 15 minimum and 50 maximum, measured by Method ASTM C 661.

2.2. SEALANT MATERIALS

A. Type 1 - Silicone, Nonsag, Not Immersible:

1. Silicone base, single-component, chemical curing; ASTM C 920, Type S, Grade NS, Class 50; Federal Specification TT-S-001543A, nonsag type, Class A;

2. Capable of withstanding movement up to 50 percent of joint width.

3. Manufacturer: Dow Corning Corp. No. 790; General Electric Silpruf; Sonneborn Sonolastic Omniseal; or equal.

B. Type 2 - Multi-Part Polyurethane, Self-Leveling, Immersible:

1. Polyurethane base, multi-component, chemical curing; ASTM C 920, Type M, Grade P, Class 25 and Federal Specification TT-S-00227, self-leveling Type I, Class A.

2. Capable of being continuously immersed in water.

3. Manufacturer: Sonneborn Sonolastic SC 2 Paving Joint Sealant; Pecora Corp. Urexspan NR-200; H. S. Peterson Co. Iso-Flex 880GB; Mameco International Vulkem 245; or equal.

C. Type 3 - Multi-Part Polyurethane, Nonsag, Immersible:

1. Polyurethane base, multi-component, chemical curing; ASTM C 920, Type M, Grade NS, Class 25 and Federal Specification TT-S-00227E, nonsag Type II, Class A.

2. Capable of being continuously immersed in water.

3. Manufacturer: H. S. Peterson Co. Iso-Flex 881; Mameco International Vulkem 922; Product Research Corp. PRC 270; Sonneborn Sonolastic NP-II; or equal.

D. Type 4 - Multi-Part Polyurethane, Nonsag, Not Immersible:

1. Polyurethane base, multi-component, chemical curing; ASTM C 920, Type M, Grade NS, Class 25 and Federal Specification TT-S-00227, nonsag Type II, Class A.

2. Manufacturer: Sonneborn Sonolastic NP-II; Pecora Corp. Dynatrol II; Tremco Dymeric; H. S. Peterson Co. Isoflex 2000; Mameco International Vulkem 227; or equal.

E. Type 5 - One-Part Polyurethane, Immersible:

1. Polyurethane base, single-component, chemical curing; Federal Specification TT-S-00230, Type I or II, Class A.

2. Capable of being continuously immersed in water, withstand movement of up to 25 percent of joint width.

3. Manufacturer for Nonsag: Sonneborn Sonolastic NP-I; Sika Chemical Corp., Sikaflex-1a No. 430; Mameco International Vulkem 116; or equal.

4. Manufacturer for Self-Leveling: Sonneborn Sonolastic SL-1; Mameco International Vulkem 45; Sika Chemical Corp. Sikaflex 12SL; or equal.

F. Type 6 - One-Part Polyurethane, Not Immersible:

1. Polyurethane base, single-component, chemical curing; ASTM C 920, Type S, Grade NS, Class 25 and Federal Specification TT-S-00230, nonsag Type II, Class A.

2. Manufacturer: Pecora Corp. Dynatrol I; Tremco Dymonic; Sonneborn Sonolastic NP-I; or equal.

G. Type 7 - Multi-Part Polysulfide, Immersible:

1. Polysulfide base, two-component, chemical curing; ASTM C 920, Type M, Grade P or NS, Class 25 and Federal Specification TT-S-00227, Type I self-leveling, Type II nonsagging, Class A, uniform, homogeneous and free from lumps, skins, and coarse particles when mixed.

2. Capable of being continuously immersed in water.

3. Manufacturer: W. R. Meadows CM-60, two-part; Sonneborn Sonolastic Two; or equal.

H. Type 8 - One-Part Polysulfide, Nonsag, Not Immersible:

1. Polysulfide base, single-component, chemical curing; ASTM C 920, Type S, Grade NS, Class 12 1/2; Federal Specification TT-S-00230, Type II nonsag, Class A;

2. Capable of withstanding movement up to 20 percent of joint width.

3. Manufacturer: W. R. Meadows CM-60, one-part; Sika Chemical Corp. Sikaflex 440; Product Research Corp. PRC 7000; or equal.

I. Type 9 - One-Part Acrylic Terpolymer, Nonsag, Not Immersible:

1. Acrylic base, single-component, solvent curing; Federal Specification TT-S-00230, Type I nonsag, Class B.

2. Capable of withstanding movement up to 7.5 percent of joint width; Shore "A" hardness of 55 maximum.

3. Manufacturer: Pecora Chemical Corp. 60 + Unicrylic; Tremco Mono; or equal.

2.3. BACKUP MATERIAL

A. Nongassing, extruded, closed-cell round polyethylene foam rod, compatible with sealant used, and as recommended by sealant manufacturer.

B. Size: As shown or as recommended by sealant material manufacturer. Provide for joints greater than 3/16-inch wide.

C. Manufacturer: Haveg Industries Minicel; Dow Corning Ethafoam SB; Sonneborn Sonofoam; Hercules, Inc., HBR; or equal.

2.4. BOND BREAKER

A. Pressure Sensitive Tape: Recommended by sealant manufacturer to suit application.

2.5. JOINT CLEANER

A. Noncorrosive and nonstaining type, recommended by sealant manufacturer; compatible with joint forming materials.

2.6. PRIMER

A. Nonstaining type recommended by sealant manufacturer to suit application.

2.7. SEALANT COLOR

A. Unless specifically noted, match the color of the principal wall material adjoining the area of application.

2.8. TAPE SEALANT

A. Closed cell polyvinyl chloride (PVC) foam coated on both sides with a modified acrylic pressure-sensitive adhesive.

B. Color: Black.

C. Size: 3/4-inch width by length as required by thickness as recommended by manufacturer, for particular application.

D. Properties:

1. Tensile Strength (ASTM D 412, Die C): 80 psi.
2. Elongation (ASTM D 412, Die C): 125 percent.
3. Compression Set (ASTM D 1056): 30 percent max.
4. Compression Deflection (ASTM D 1056) at 25 Percent Deflection: 2.5 psi.
5. Low Temperature Flexibility, 5 Hours at -40 Degrees F: No cracking.
6. Heat Rsistance/Maximum Shrinkage, 70 Hours at 212 Degrees F: 1.5 percent.
7. Staining (ASTM D 925) on Most Substrates: None.
8. Water Absorption by Weight at 30 Percent Compression: 24 percent.
9. Density per Cubic Foot (ASTM D 3574): 10 pounds.
10. Thermal Conductivity (k factor): 0.24.

2.9. PREFORMED SEALS

A. Preformed Compressible Joint Seals:

1. Widths Up to 5-Inches: [Acme Highway Products Corp., Buffalo, NY, Acmaseal J-Series; Watson-Bowman Associates, Inc., Buffalo, NY, WA-Series; H. S. Peterson Co. Isoflex Neoprene Seal, LS-Series, Pontiac, MI]; or equal.

2. Other Widths: Series or model recommended by seal manufacturer.

PART 3 - - EXECUTION

3.1. GENERAL

A. Use of more than one material for the same joint is not allowed unless approved by the sealant manufacturer.

B. Install joint sealants in accordance with ASTM C 962.

C. Horizontal and Sloping Joints of 1 Percent Maximum Slope: Use self-leveling (Grade P) joint sealant.

D. Steeper Sloped Joints, Vertical Joints, and Overhead Joints: Use nonsag (Grade NS) joint sealant.

E. Use joint sealant as required for the appropriate application and as follows:

Joint Size	Sealant Type
Less than 1-inch	1,2,3,4,5,6,7,8, or 9
Less than 2-inch	1,2,3,4, or 7
Over 2-inch	As per manufacturer's recommendation

3.2. PREPARATION

A. Verify that joint dimensions and physical and environmental conditions are acceptable to receive sealant.

B. All surfaces to be sealed shall be dry, sound, and free of dust, loose mortar, and other foreign materials.

1. Mask adjacent surfaces where necessary to maintain neat edge.
2. Starting of work will be construed as acceptance of all subsurfaces.

C. Verify that joint shaping materials and release tapes are compatible with sealant.

D. Examine joint dimensions and size materials to achieve required width/depth ratios.

3.3. INSTALLATION

A. Use joint filler to achieve required joint depths, to allow sealants to perform intended function.

1. Install backup material as recommended by sealant manufacturer.
2. Where possible, provide full length sections without splices; minimize number of splices.

B. Use bond breaker where recommended by sealant manufacturer.

C. Apply sealant within environmental conditions stated above.

1. Consult manufacturer when sealant cannot be applied within these temperature ranges.

D. Seal all joints around door and louver frames, expansion joints, and elsewhere as indicated.

E. Joint Sealant M aterials: F ollow m anufacturer's r ecommendation and i nstructions, f illing j oint completely from bottom to top, without voids.

F. Joints: Tool slightly concave after sealant is installed.

1. When tooling white or light color sealant, use a water wet tool.
2. Finish joints free of air pockets, foreign embedded matter, ridges, and sags.

G. Tape Sealant: Locate where indicated and install in accordance with manufacturer's instructions.

3.4. PREFORMED SEALS

A. Prepare joint surfaces clean and dry, free from oil, rust, laitance, and other foreign material.

B. Construct joints straight and parallel to each other and at the proper width and depth.

C. Install within environmental conditions stated above.

D. Apply joint sealant manufacturer's approved primer and adhesive in accordance with manufacturer's instructions.

E. Install seal in accordance with manufacturer's instructions.

3.5. CLEANING

A. Clean surfaces next to the sealed joints of smears or other soiling resultant of sealing application.

B. Replace any damaged surfaces resulting from joint sealing or cleaning activities.

C. Clean up and dispose of all waste materials and debris resulting from this operation off the site.

3.6. JOINT SEALANT SCHEDULE

A. This s chedule l ists the s ealant t ypes ac ceptable f or eac h j oint l ocation. U se as few different sealant types as possible to meet the requirements of this project.

Joint Location	Sealant Type(s)
1. Expansion/Contraction and Control Joints at:	
Concrete Walls	1,3,4,5,6,7
Concrete Floor Slabs	2,5

Joint Location	Sealant Type(s)
Masonry Walls	1,3,4,5,6,7
2. Material Joints at:	
Metal Door & Louver Frames (Exterior)	1,5,6,8
Metal Door & Louver Frames (Interior)	1,5,6,8,9
Wall Penetrations (Exterior)	1,5,6,8
Wall Penetrations (Interior)	1,5,6,8
Floor Penetrations	5,6,7
Ceiling/Roof Penetrations	1,3,4,5,6,7
Sheet Metal Flashings	1,3,5,7
3. Other Joints:	
Threshold Sealant Bed	5
Immersed Concrete (Vertical and Sloped)	3,5
Immersed Concrete (Horizontal)	2,5
4. Openings Around Pipes, Conduits, and Ducts Through:	
Fire-Rated Construction	11
Concrete Form Snap-Tie Holes	1,4,6

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Division 09 — Coating

SECTION 09800
PROTECTIVE COATING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the protective coating of all specified surfaces not specifically included under the requirements of Section 09905 "Architectural Paint Finishes," including all surface preparation, pretreatment, coating application, touch-up of factory-coated surfaces, protection of surfaces not to be coated, cleanup, and appurtenant work, all in accordance with the requirements of the Contract Documents.

B. The following surfaces shall not be protective coated hereunder unless shown or specified herein, or elsewhere in the Contract Documents.

1. Concrete.
2. Stainless steel.
3. Machined surfaces.
4. Grease fittings.
5. Glass.
6. Equipment nameplates.
7. Maintenance hole frames and covers.
8. Platform gratings, stair treads, door thresholds, and other walk surfaces.

C. The coating system schedules summarize the surfaces to be coated, the required surface preparation, and the coating systems to be applied. Coating notes on the drawings are used to show exceptions to the schedules, to show or extend the limits of coating systems, or to clarify or show details for application of the coating systems.

1.2 RELATED WORK SPECIFIED ELSEWHERE (Not Used)

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. References herein to "SSPC Specifications" or "SSPC" shall mean the published standards of the Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburgh, PA 15213.

B. References herein to "NACE" shall mean the published standards of the National Association of Corrosion Engineers, P.O. Box 986, Katy, TX 77450.

C. Comply with the reference specifications of the GENERAL REQUIREMENTS.

D. Comply with the current provisions of the following Codes and Standards.

1. Commercial Standards:

ANSI A13.	Scheme for Identification of Piping Systems.
ANSI/AWWA C105	Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
ANSI/AWWA C203	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape-Hot-Applied.
ANSI/AWWA D102	Painting Steel Water-Storage Tanks

2. Federal Specifications:

TT-P-28F	Paint, Aluminum, Heat Resisting (1200F)

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. Samples: The Contractor shall submit samples of all paint, finishes, and other coating materials specified herein, in accordance with the GENERAL REQUIREMENTS. Paint or coating samples shall be submitted on 8-1/2-inch by 11-inch sheet metal. Each sample shall be completely coated over its entire surface with one protective coating material, type, and color.

C. Coating Materials List: The Contractor shall provide 8 copies of a coating materials list which indicates the manufacturer and the coating number, keyed to the coating systems herein, prior to or at the time of submittal of samples.

D. Paint Manufacturer's Information: For each paint system to be used the Contractor shall submit the following listed data at least 30 days prior to painting.

1. Paint manufacturer's data sheet for each product used, including statements on the suitability of the material for the intended use.

2. Paint manufacturer's instructions and recommendations on surface preparation and application.

3. Colors available for each product (where applicable).

4. Compatibility of shop and field applied coatings (where applicable).

5. Material safety data sheet for each product used.

6. Two sets of color samples to match each color selected by the Engineer from the manufacturer's standard color sheets. If custom mixed colors are required by this Section, the color samples shall be made using color formulations prepared to match the color samples furnished by the Engineer. The color formula shall be shown on the back of each color sample.

1.5 QUALITY ASSURANCE

A. General: The Contractor shall give the Engineer a minimum of 3 days advance notice of the start of any field surface preparation work of coating application work, and a minimum of 7 days advance notice of the start of any shop surface preparation work.

B. All such work shall be performed only in the presence of the Engineer, unless the Engineer has granted prior approval to perform such work in its absence.

C. Inspection by the Engineer, or the waiver of inspection of any particular portion of the work, shall not relieve the Contractor of its responsibility to perform the work in accordance with these Specifications.

D. Where protective coatings are to be performed by a subcontractor, said subcontractor must possess a valid state license as required for performance of the painting and coating work called for in this specification and must provide 5 references which show that the painting subcontractor has previous successful experience with the specified or comparable coating systems. Include the name, address, and the telephone number for the owner of each installation for which the painting subcontractor provided the protective coating.

E. Scaffolding shall be erected and moved to locations where requested by the Engineer to facilitate inspection. Additional illumination shall be provided to cover all areas to be inspected.

F. Inspection Devices: The Contractor shall furnish, until final acceptance of such coatings, inspection devices in good working condition for the detection of holidays and measurement of dry-film thicknesses of protective coatings. Dry-film thickness gages shall be made available for the Engineer's use at all times while coating is being done, until final acceptance of such coatings. The Contractor shall provide the services of a trained operator of the holiday detection devices until the final acceptance of such coatings. Holiday detection devices shall be operated only in the presence of the Engineer.

G. Holiday Testing: The Contractor shall holiday test all coated ferrous surfaces inside a steel reservoir, or other surfaces which will be submerged in water or other liquids, or surfaces which are enclosed in a vapor space in such structures and surfaces coated with any of the submerged and severe service coating systems. Areas which contain holidays shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then retested.

1. Coatings With Thickness Exceeding 20 Mils: For surfaces having a total dry film coating thickness exceeding 20 mils: pulse-type holiday detector such as Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20, or equal shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the specified coating thickness.

2. Coatings With Thickness of 20 Mils or Less: For surfaces having a total dry film coating thickness of 20 mils or less: Tinker & Rasor Model M1 non-destructive type holiday detector, K-D Bird Dog, or equal shall be used. The unit shall operate at less than 75 volts. For thicknesses between 10 and 20 mils, a non-sudsing type wetting agent, such as Kodak Photo-Flo, or equal, shall be added to the water prior to wetting the detector sponge.

H. Film Thickness Testing: On ferrous metals, the dry film coating thickness shall be measured in accordance with the SSPC "Paint Application Specification No. 2" using a magnetic-type dry film thickness gage such as Mikrotest model FM, Elcometer model 111/1EZ, or equal. Each coat shall be tested for the correct thickness. No measurements shall be made until at least 8 hours after application of the coating. On non-ferrous metals and other substrates, the coating thicknesses shall be measured at the time of application using a wet film gage.

I. Surface Preparation: Evaluation of blast cleaned surface preparation work will be based upon comparison of the blasted surfaces with the standard samples available from the NACE, using NACE standard TM-01-70.

1.6 MANUFACTURER REPRESENTATIVE

A. The Contractor shall require the protective coating manufacturer to furnish a qualified technical representative to visit the project site for technical support as specified in the paragraph entitled "Manufacturer's Certification", herein, and as may be necessary to resolve field problems attributable

or associated with the manufacturer's products furnished under this Contract or the application thereof.

1.7 MAINTENANCE

A. Warranty Inspection: A warranty inspection may be conducted during the eleventh month following completion of all coating and painting work. The Contractor and a representative of the coating material manufacturer shall attend this inspection. All defective work shall be repaired in accordance with these specifications and to the satisfaction of the City. The City may, by written notice to the Contractor, reschedule the warranty inspection, or may cancel the warranty inspection altogether. If a warranty inspection is not held the Contractor is not relieved of its responsibilities under the Contract Documents.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Definitions: The term " paint", " coatings", or " finishes" as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, and all other protective coatings, excepting galvanizing or anodizing, whether used as a pretreatment, primer, intermediate coat, or finish coat. The term "DFT" means minimum dry film thickness.

B. General: Coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use.

C. The Contractor shall use coating materials suitable for the intended use and recommended by their manufacturer for the intended service.

D. Compatibility: In any coating system only compatible materials from a single manufacturer shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, subject to the approval of the Engineer, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.

E. Colors: All colors and shades of colors of all coats of paint shall be as selected or specified by the Engineer. Each coat shall be of a slightly different shade, to facilitate inspection of surface coverage of each coat. Finish colors shall be as selected from the manufacturer's standard color samples by the Engineer. Finish colors shall be custom mixed to match color samples furnished by the Engineer.

F. Protective Coating Materials: Products shall be standard products produced by recognized manufacturers who are regularly engaged in production of such materials for essentially identical service conditions. Where requested, the Contractor shall provide the Engineer with the names of not less than 10 successful applications of the proposed manufacturer's products demonstrating compliance with this specification requirement.

G. Substitute or "Or-Equal" Submittals: Unless otherwise specified, materials are from the catalogs of the companies listed herein. Materials by other manufacturers are acceptable provided that they are established as being compatible with and of equal quality to the coatings of the companies listed. The Contractor shall provide satisfactory documentation from the firm manufacturing the proposed substitute or "or-equal" material that said material meets the specified requirements and is equivalent or better than the listed materials in the following properties:

1. Quality

2. Durability

3. Resistance to abrasion and physical damage

4. Life expectancy

5. Ability to recoat in future

6. Solids content by volume

7. Dry film thickness per coat

8. Compatibility with other coatings

9. Suitability for the intended service

10. Resistance to chemical attack

11. Temperature limitations in service and during application

12. Type and quality of recommended undercoats and topcoats

13. Ease of application

14. Ease of repairing damaged areas

15. Stability of colors

H. The cost of all testing and analyzing of the proposed substitute materials that may be required by the Engineer shall be paid by the Contractor. If the proposed substitution requires changes in the contract work, the Contractor shall bear all such costs involved and the costs of allied trades affected by the substitution.

2.2 INDUSTRIAL COATING SYSTEMS

A. Material Sources: Each of the following manufacturers is capable of supplying many of the industrial coating materials specified herein. Where manufacturers and paint numbers are listed, it is to show the type and quality of coatings that are required. Proposed substitute materials must be shown to satisfy the material descriptions and to equal or exceed the properties of the listed materials as required in the paragraph entitled "Substitute or `Or-Equal' Submittals" herein.

1. Ameron

2. Carboline Coatings Company

3. Engard Coatings Corporation

4. Pittsburgh Paints

5. Tnemec Company

B. System 1 – Not Used

C. System 2 - Not Used

D. System 3 - Aluminum Silicone Resin: Aluminum silicone resin material shall be suitable for a service temperature of up to 1,000 degrees F, and shall comply with Federal Specification TT-P-28.

1. Prime coat and finish coat (2 or more, DFT = 3 mils), Rust-Oleum 4315, or equal.

2. Total system DFT = 3 mils.

E. System 4 - Aliphatic Polyurethane: Two component aliphatic acrylic or polyester polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, resistance to chemical fumes and severe weathering and with a minimum solids content of 58 percent by volume. Primer shall be a rust inhibitive two component epoxy coating with a minimum solids content of 70 percent by volume.
If this coating system is to be used on Galvanized Ferrous Metal; provide surface treatment (or approved equal) for the prime coat as per the Coating Manufacturers product data sheet.

1. Prime coat (DFT = 4 mils), Amerlock 400 VOC, Carboguard 890 VOC, Engard 460 HS or 428HS, Tnemec L69 Epoxoline, or equal.

2. Finish coat (one or more, DFT = 3 mils), Amershield VOC, Carboline 133 MC, Engard 428 HS, Tnemec 740 EverThane, or equal.

3. Total system DFT = 7 mils.

4. More than one finish coat shall be applied as necessary to produce a finish with uniform color and texture.

F. System 5 - Inorganic Zinc/Polyurethane: The inorganic zinc primer shall be a water or solvent based, self-curing, zinc silicate 2-component inorganic coating which contains at least 85 percent of metallic zinc by weight in the dried film, and is recommended by the coating manufacturer as a primer for this system. The intermediate coat shall be a high-build two component epoxy with a solids content of at least 70 percent by volume. Finish coats shall be a 2-component aliphatic acrylic or polyester polyurethane coating material that provides superior color and gloss retention, resistance to chemical fumes and severe weathering, and a minimum solids content of 58 percent by volume.

1. Prime coat (DFT = 2 mil), Dimetcote 21-5/4A, Carbo Zinc 11 WB, Engard 428HS or 460 HS, Tnemec 94H2O Hydro- Zinc, or equal.

2. Intermediate coat (DFT = 4 mils), Amerlock 400 VOC, Carboline 890 VOC, Engard 428HS, Tnemec L69 Epoxoline, or equal.

3. Finish coats (one or more, DFT = 3 mils), Amershield VOC, Carboline 133 MC, Engard 428 HS, Tnemec 740 EverThane, or equal.

4. Total system DFT = 9 mils.

5. Intermediate coat shall be applied in excess of 4 mils DFT or in more than one coat as necessary to completely cover the inorganic zinc primer and prevent application bubbling of the polyurethane finish coat.

6. More than one finish coat shall be applied as necessary to produce a finish with uniform color and texture.

G. System 6 - Inorganic Zinc, Water Based: Water based, self curing, ethyl silicate shall be a two component inorganic coating material that contains at least 85 percent of metallic zinc by weight in the dried film.

1. Prime coat and finish coat (one, DFT = 3 mils), Dimetcote 21- 5/4 A, Carbozinc 11 WB, or equal.

2. Total system DFT = 3 mils.

H. System 7 - Acrylic Latex: Single component, water based acrylic latex with a fungicide additive shall have a minimum solids content of 35 percent by volume. Prime coat shall be as recommended by manufacturer. The coating material shall be available in the ANSI safety colors.

1. Prime coat (DFT = 2 mils), as recommended by manufacturer.

a. Metal Carbocrylic 3358 MW
b. Non-Ferrous Metals, Wood, PVC, Drywall, Concrete Sanitile 120 (DFT= 2 mils)

2. Finish coats (2 or more, DFT = 6 mils), Amercoat 2104, Carboline 3359 MC, Tnemec 1028 Enduratone, or equal.

3. Total system DFT = 8 mils.

I. System 8 - Not Used

J. System 9 - Not Used

K. System 10 - Acrylic, Concrete: High molecular weight acrylic coating material shall have a minimum solids content of 35 percent by volume. Prime coat shall be an acrylic filler and sealer for concrete surfaces.

1. Prime coat (Filler/sealer), Tnemec 180 Tneme-Crete,Sanitile 100, or equal.

2. Finish coats (2 or more, DFT = 3 mils), Tnemec 180 Tneme- Crete, Carbocrylic 3359 MC (DFT = 6 mils) or equal.

L. System 11 - Aliphatic Polyurethane, Concrete: Two component aliphatic polyester polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, and resistance to chemical fumes and severe weathering, and with a minimum solids content of 58 percent by volume. Filler-sealer compound shall be a two component epoxy material used to provide a smooth surface for the epoxy intermediate coat. The filler-surfacer is applied to the entire concrete surface and worked into the concrete surface with a wide blade putty knife or squeegee. The intermediate coat shall be a high-build polyamide epoxy coating with a minimum solids content of 70 percent by volume.

1. Prime coat (Filler-sealer), NU-Klad 114A, Engard 428HS,Sanitile 100, Tnemec 215 Surfacing Epoxy, or equal.

2. Intermediate coat (DFT = 4 mils), Amerlock 400 VOC, Engard 428HS, Sanitile 100 (DFT= 2mils), Tnemec L69 Epoxoline, or equal.

3. Finish coats (2 or more, DFT = 3 mils), Amershield VOC, Engard 428 HS,Carbothane 133 MC (DFT= 3 mils), Tnemec 740 Everthane, or equal.

M. System 12 - Aliphatic Polyurethane, Fiberglass: Two-component aliphatic polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, and resistance to chemical fumes and severe weathering. A primer, tie coat, or mist coat shall be used as recommended by the manufacturer.

1. Prime coat (Tie coat), Engard 428HS, Sanitile 120 (DFT= 2 mils), Tnemec P69 Epoxoline, or oequal.

2. Finish coats (2 or more, DFT = 3 mils), Amershield VOC (one, 3 mils), Engard 428 HS, Carbothane 133 MC (DFT = 3 mils), Tnemec 740 Everthane, or equal.

2.3 SUBMERGED AND SEVERE SERVICE COATING SYSTEMS

A. Materials Sources: The manufacturers' products listed in this paragraph are materials which satisfy the material descriptions of this paragraph and have a documented successful record for long term submerged or severe service conditions. If proposed materials are not listed below, the requirements of the paragraph entitled "Substitute or `Or-Equal' Submittals" apply. In addition, the Contractor shall submit for consideration a list of at least 10 installations with similar service conditions for which the proposed substitute or "or-equal" products have shown satisfactory performance for at least several years including the name, address, and phone number of the owner of each installation.

B. System 100 - Amine Cured Epoxy: High build, amine cured, straight epoxy resin shall have a solids content of at least 80 percent by volume, and shall be suitable for long-term immersion service in potable water. The material shall conform to Food and Drug Administration regulations for food additives.

1. Prime coat and finish coats (3 or more, DFT = 16 mils), Phenoline 341 (1 coat) 16 mil, Amercoat 133, Tnemec 22 Pota-Pox, or equal.

C. System 101 – Amine cured Epoxy: High-build, amine cured, epoxy resin shall have a solids content of at least 70 percent by volume, comply with local VOC regulations, and shall be suitable for long-term immersion service in potable water. The material shall be certified in accordance with NSF standard 61 for contact with potable water. Total thickness 8- 12 mills DFT.

1. Prime Coat (DFT= 4-6 mils) Tnemec L140F Pota-Pox, or equal.

2. Topcoat (DFT = 4-6 mils) Tnemec l140F Pota-Pox, or equal.

D. System 102 – Epoxy Mortar: High-build, 3-componet amine cured epoxy mortar, shall have a solids content of 100 percent by volume, suitable for long-term immersion and atmospheric exposure to wastewater. Filler-resurfacer compound shall be a 3-component epoxy cementitious thin overlay material used to fill voids and rough areas and must feather-edge capable. Epoxy Glaze (finish) coat shall bea 100 percent solids epoxy suitable for long-term immersion and atmospheric exposure to wastewater.

1. Filler/Resurfacre thin Overlay (Thickness = minimum 1/16”), Tnemec 218 MortarClad, or equal.

2. Epoxy Mortar (DFT = 125 mils) Tnemec 434 Perma-Shield, or equal.

3. Finish coat (DFT = 15-20 mils), Tnemec 435 Perma-Glaze, or equal.

E. System 103 - Coal Tar Epoxy: High build, 2-component amine cured coal tar epoxy shall have a solids content of at least 68 percent by volume, suitable for long term immersion in wastewater and for coating of buried surfaces, and conforming to DOD-P-23236, Class 2, or to SSPC Paint 16. Prime coats are for use as a shop primer only. Prime coat shall be omitted when both surface preparation and coating are to be performed in the field.

1. Prime coat (DFT = 1.5 mils).

2. Finish coats (2 or more, DFT = 16 mils), Carboguard 888, or equal.

3. Total system DFT = 17.5 mils.

4. Bitumastic 300M (2 or more DFT =16 mils) can only be used in shop conditions.

F. System 104 - Coal Tar Epoxy, Concrete: High build, 2-component amine cured coal tar epoxy, shall have a solids content of at least 74 percent by volume, suitable for long term immersion in wastewater and for coating of buried surfaces and conforming to DOD-P-23236, Class 2, or to SSPC Paint 16. Filler-surfacer compound shall be a 2-component epoxy material used to fill voids and rough areas. The seal coat provides a smooth surface for the application of the coal tar epoxy. The seal coat is a two-component epoxy material with 100 percent solids and is applied to the entire concrete surface and worked into the concrete surface with a wide blade putty knife or a squeegee.

1. Seal coat, Carboguard 501, or equal.

2. Intermediate coat (DFT = 4 mils), Carboguard 501 or equal.

3. Finish coats (2 or more, DFT = 16 mils) Phenoline 341 (1 coat, DFT= 20 mils), or equal.

4. Use Amercoat 133 as shown in System 100 as alternative.

G. System 105 - Inorganic Zinc/Epoxy:

1. Inorganic Zinc Primer: Water or solvent based, self-curing 2-component inorganic coating shall contain a minimum of 85 percent metallic zinc by weight in the dried film and is recommended by the coating manufacturer as a primer for the epoxy material.

2. Polyamide Cured Epoxy: High build polyamide cured epoxy coating shall have a solids content of at least 70 percent by volume and a finish coat color of white. The material shall be capable of achieving at least 4 mils dry film thickness per coat.

3. Amine Cured Epoxy: High build amine cured epoxy coating shall have a solids content of at least 80 percent by volume and with a finish coat color of white or ivory. The material shall be capable of achieving at least 5 mils dry film thickness per coat.

4. The epoxy coating material shall be a straight epoxy resin and shall be either a polyamide-cured epoxy or an amine-cured epoxy suitable for long-term immersion service in potable water. The material shall conform to Food and Drug Administration regulations for food additives and state and local health regulations and policies for service in potable water reservoirs. The Contractor shall submit a written certification that the proposed materials meet the above regulatory agency standards and policies. The material shall be applied with a primer if recommended by the coating manufacturer.

5. Part A: Products shall be as listed, or equal:

a. Pre-coating, prior to erection. See Note (1) under Paragraph f.	(DFT = 3 mils)	Dimetcote 9, Carboline Zinc D11-VOC, Tnemec 94-H2O Hydro-Zinc
b. Touch up, following erection. See Note (2) under Paragraph f.	(DFT = 3 mils)	Tnemec 94-H2O Hydro-Zinc
c. Difficult-to-coat areas, following erection. See Note (3) underline Paragraph f.		Amercoat 395, Carbo-859 VOC, Tnemec L140F Pota-Pox.
d. Finish Coats (2 or more)	(DFT = 8 mils)	Amercoat 395, Phenoline 341, Tnemec L140F Pota-Pox.

e. Total system DFT = 7 mils

f. Notes:

(1) All lap roof plate edges are to be pre-coated. If necessary, zinc primer exposed on exterior of roof may be removed prior to welding.

(2) Touch-up coating shall be done for areas damaged during erection, or areas not pre-coated. The Contractor shall spot sandblast to SSPC-SP-5 before application of coating. Material used for touch-up shall be a compatible solvent based inorganic or organic zinc primer recommended by the manufacturer.

(3) All edges, nuts, bolts, lap joints, weld seams and the roof rim angle shall receive one brush-applied coat prior to the application of the complete spray coat.

6. Part B: Products shall be as listed, or equal:

a. Difficult-to-coat areas. See Note (1) under Paragraph d.		Amercoat 395, Phenoline 341, Tnemec L140F Pota-Pox.
b. Finish coats (2 or more). See Note (1) under Paragraph d.	(DFT = 12 mils)	Amercoat 395, Phenoline 341, Tnemec L140F Pota-Pox.

c. Total system DFT = 12 mils

d. Notes:

(1) All edges, nuts, bolts, lap joints, and weld seams shall receive one brush-applied coat prior to the application of the first complete spray coat.

7. Curing Period: Prior to immersion, the completed system shall be subjected to at least 240 hours of curing time with the metal temperature at a minimum of 70 degrees F, or 480 hours at a minimum of 60 degrees F, both conditions at a maximum relative humidity of 50 percent and under the forced ventilation conditions required by the paragraph entitled "Curing of Coatings, herein. More curing time or a higher temperature shall be provided if recommended by the epoxy coating manufacturer. If the environmental conditions do not provide the necessary minimum temperature, use heated air to provide the necessary heat for curing. Other combinations of curing time and temperature may be used if the coating manufacturer presents satisfactory documentation and test results to substantiate that the degree of curing is equal or greater than curing for 240 hours at 70 degrees F.

8. Volatile Organic Compound Testing: The completed interior reservoir coating system shall be tested for volatile organic compounds as specified herein.

H. System 106 - Fusion Bonded Epoxy: The coating material shall be a 100 percent powder epoxy applied in accordance with the ANSI/AWWA C213 "AWWA Standard for Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines", except that the surface preparation shall be as specified in the coating system schedule of this Section. The coating shall be applied using the fluidized bed process.

1. Liquid Epoxy: For field repairs or where, as confirmed by the Engineer, it would be impossible to use the powder epoxy method without causing damage to the item, the use of a liquid epoxy will be permitted, applied in not less than 3 coats to provide a DFT of 15 mils. The liquid epoxy shall be a 100 percent solids epoxy recommended by the powder epoxy manufacturer.

1. Coating (DFT = 16 mils), Scotchkote 206N, or equal.

2. Total system DFT = 16 mils.

I. System 107 - Not Used

J. System 108 – Not Used

K. System 109 - Epoxy - Phenolic: Epoxy-phenolic amine cured resin with a solids content of at least 55 percent by volume, and suitable for long-term immersion in wastewater and exposure to the effects of hydrogen sulfide gas where there is the probability of sulfuric acid formation on the surfaces.

1. Prime coat and finish coats (3 or more, DFT = 12 mils), Amercoat 346, or equal.
2. Prime/ Finish coat (One coat , 20 mils DFT) Plasite 4500-S

L. System 109 – Epoxy – Amine: Epoxy-amine cured resin with a solids content of at least 100 percent by volume, and suitable for long-term immersion in wastewater and exposure to the effects of hydrogen sulfide gas where there is the probability of sulfuric acid formation on the surfaces.

1. Prime coat and finish coats (DFT = 20-30 mils), Tnemec 435 Perma-Glaze, or equal.

M. System 110 - Epoxy - Amine, Concrete: Epoxy- amine cured resin with a solids content of at least 55 percent by volume, and suitable for long-term immersion in wastewater and exposure to the effects of hydrogen sulfide gas where there is the probability of sulfuric acid formation on the surfaces. The filler-sealer shall be a 100 percent solids amine cured epoxy material with silica and inert fillers. A 100 percent solids epoxy surfacer shall be used to fill holes and patch the concrete surfaces after abrasive blasting.

1. Prime coat (filler-sealer), applied in two coats to the entire surface using a squeegee to achieve a smooth, void-free surface, Carboguard 501, Amerlock Sealer followed by Nu-Klad 114A, Tnemec 218 MortarClad (in one coat), or equal.

2. Finish coats (2 or more, DFT = 12 mils), Plasite 4500-S (one coat, 20 mils), Sigma Novoguard 840, or equal. On stairways and in walking and working areas use Tnemec 435 PermaGlaze, Plasite 4500-S, or use Sigma Novoguard 840 with Amercoat 886 non-skid additive in the final coat.

N. System 111 – Not Used

O. System 112 - Vinyl Ester-Concrete: Vinyl ester resin coating material with an inert flake pigment suitable for immersion service in hydrochloric acid and sulfuric acid solutions. The filler-sealer shall be a 100 percent solids amine-cured epoxy or vinyl ester material with silica and inert fillers. The filler-sealer is applied to the entire concrete surface. A 100 percent solids epoxy or vinyl ester surfacer shall be used to fill holes and patch the concrete surface after abrasive blasting.

1. Prime coat (filler-sealer), applied in two coats using a squeegee to achieve a smooth void-free surface.

2. Finish coats (two or more, DFT = 40 mils), Tnemec 120 Vinester, or equal.

2.4 SPECIAL COATING SYSTEMS

A. System 200 - PVC Tape: Prior to wrapping the pipe with PVC tape, the pipe and fittings first shall be primed using a primer recommended by the PVC tape manufacturer. After being primed, the pipe shall be wrapped with a 20-mil adhesive PVC tape, half-lapped, to a total thickness of 40 mils.

B. System 201 - Rich Portland Cement Mortar: Rich portland cement mortar coating shall have a minimum thickness of 1/8-inch, followed by enclosure in an 8-mil thick polyethylene sheet with all joints and edges lapped and sealed with tape.

C. System 203 - Epoxy Surfacing: Two-component epoxy floor surfacing shall be formulated to resist many acids, alkalies, and solvents. Material shall be resistant to liquid alum, sodium hydroxide, and 50 percent sulphuric acid. Products shall be as follows, or equal:

1. Ameron Alternative: Prime coat Amerlock Sealer; finish coat Nu-Klad 110A, (1/4-inch thick).

2. Engard Alternative: Prime coat Engard 491; finish coat Engard 481 (1/4-inch thick).

3. Carboline Alternative: Prime coat Carboguard 501, finish coat Semstone 140 (¼ inch thick, 250 mils DFT).

4. Tnemec Alternative: Prime coat Tnemec 237 Power- Tread; finish Tnemec 282 Tneme- Glaze (1/4-inch thick).

D. System 204 - Waterproofing: Two coats of a clear, non-staining, silane-modified-siloxane masonry waterproofing material. The waterproofing system 204 after application shall be provided with not less than a five-year warranty on the performance of the product.

1. Where EPA Allows Solvents: Chemstop, "WB Heavy Duty "; Rainguard, "XS", Chemprobe / Prime a Pell H2O; or equal.

2. Where EPA Prohibits Solvents: Chemstop, "WB Regular / Heavy Duty"; Rainguard's "Blok-Lok"; Rainproof's "Chem-Trete #45", Chemprobe / Prime A Pell H2O; or equal.

3. Surfaces shall be cleaned with a chemical (approved by waterproofing manufacturer) cleaner and power wash. Surfaces shall be clean and dry before application of waterproofing. Method and rate of application shall be in accordance with manufacturer's published instructions. A manufacturer's representative shall be present during applications if necessary for warranty.

E. System 205 - Polyethylene Encasement: Application of polyethylene encasement shall be in accordance with ANSI/AWWA C105 using Method C.

F. System 206 - Cement Mortar Coating: A 1-1/2-inch minimum thickness mortar coating reinforced with 3/4-inch galvanized welded wire fabric shall be provided. The cement mortar shall contain no less than one part Type V cement to 3 part s s and. The cement mortar shall be cured by a curing compound meeting the requirements of "Liquid Membrane-Forming Compounds for Curing Concrete" ASTM C 309-81, Type II, white pigmented, or by enclosure in an 8-mil thick polyethylene sheet with all joints and edges lapped by at least 6-inches.

G. System 207 - Non-Slip Surfacing: Coating shall have one coat of Semstone 140 W/ aluminum oxide additive, AS 150 as manufactured by Amstep Products or one coat of Ameron Nu-Klad 100A with Amercoat 886 additive, or one coat Tnemec 280 Tneme-Glaze with Series 211 additive or equal. The coating shall be gray in color. Application shall be by means of a roller and not more than 60 sq ft per gallon of non-slip coating shall be applied. Primer shall be as recommended by the coating manufacturer.

H. System 208 - Aluminum Metal Isolation: A wash primer (0.5 mils) shall be applied, followed by one coat of heavy bodied bituminous paint, such as Tnemec L69 Epoxoline, or equal (8 mils). Total thickness of system (8.5 mils).

PART 3 -- EXECUTION

3.1 STORAGE, MIXING, AND THINNING OF MATERIALS

A. Manufacturer's Recommendations: Unless otherwise specified herein, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating, and for all other procedures relative to coating shall be strictly observed. The Contractor shall supply the Engineer with copies of each manufacturer's instructions in accordance with the GENERAL REQUIREMENTS.

B. All protective coating materials shall be used within the manufacturer's recommended shelf life.

C. Storage and Mixing: Coating materials shall be protected from exposure to cold weather, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings of different manufacturers shall not be mixed together.

3.2 PREPARATION FOR COATING

A. General: All surfaces to receive protective coatings shall be cleaned as specified herein prior to application of said coatings. The Contractor shall examine all surfaces to be coated, and shall correct all surface defects before application of any coating material. All marred or abraded spots on shop-primed and on factory-finished surfaces shall receive touch-up restoration prior to any coating application.

B. Protection of Surfaces Not to be Coated: Surfaces which are not to receive protective coatings shall be protected during surface preparation, cleaning, and coating operations.

C. All hardware, lighting fixtures, switch plates, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not to be painted shall be removed, masked or otherwise protected. Drop cloths shall be provided to prevent coating materials from falling on or marring adjacent surfaces. The working parts of all mechanical and electrical equipment shall be protected from damage during surface preparation and coating operations. Openings in motors shall be masked to prevent entry of coating or other materials.

D. Care shall be exercised not to damage adjacent work during blast cleaning operations. Spray painting shall be conducted under carefully controlled conditions. The Contractor shall be fully responsible for and shall promptly repair any and all damage to adjacent work or adjoining property occurring from blast cleaning or coating operations.

E. Protection of Painted Surfaces: Cleaning and coating shall be so programmed that dust and other contaminants from the cleaning process will not fall on wet, newly-coated surfaces.

3.3 SURFACE PREPARATION STANDARDS

A. The following referenced surface preparation specifications of the Steel Structures Painting Council shall form a part of this specification:

1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, dirt, soil, salts, and contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.

2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mill scale, and loose paint to degree specified, by hand chipping, scraping, sanding, and wire brushing.

3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mill scale, and loose paint to degree specified by power tool chipping, descaling, sanding, wire brushing, and grinding.

4. White Metal Blast Cleaning (SSPC-SP5/NACE1): Removal of all visible rust, mill scale, paint, and foreign matter by blast cleaning by wheel or nozzle (dry or wet) using sand, grit, or shot.

5. Commercial Blast Cleaning (SSPC-SP6/NACE3): Blast cleaning until at least two-thirds of each element of surface area is free of all visible residues.

6. Brush-Off Blast Cleaning (SSPC-SP7/NACE4): Blast cleaning of all except tightly adhering residues of mill scale, rust, and coatings, exposing numerous evenly distributed flecks of underlying metal.

B. The other surface preparation standards shall be the most recent versions published by the SSPC and NACE.

3.4 METAL SURFACE PREPARATION (UNGALVANIZED)

A. The minimum abrasive blasting surface preparation shall be as specified in the coating system schedules included at the end of this Section. Where there is a conflict between these specifications and the coating manufacturer's printed recommendations for the intended service, the higher degree of cleaning shall apply.

B. Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this Section. Blast cleaned surfaces shall match the standard samples available from the National Association of Corrosion Engineers, NACE Standard TM-01-70.

C. All oil, grease, welding fluxes and other surface contaminants shall be removed by solvent cleaning per SSPC-SP1 prior to blast cleaning.

D. All sharp edges shall be rounded or chamfered and all burrs, and surface defects and weld splatter shall be ground smooth prior to blast cleaning.

E. The type and size of abrasive shall be selected to produce a surface profile that meets the coating manufacturer's recommendation for the particular coating and service conditions.

F. The abrasive shall not be reused unless otherwise approved by the Engineer. For automated shop blasting systems, clean oil-free abrasives shall be maintained.

G. The Contractor shall comply with the applicable federal, state, and local air pollution control regulations for blast cleaning.

H. Compressed air for air blast cleaning shall be supplied at adequate pressure from well maintained compressors equipped with oil/moisture separators which remove at least 95 percent of the contaminants.

I. Surfaces shall be cleaned of all dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming or another approved method prior to painting.

J. Enclosed areas and other areas where dust settling is a problem shall be vacuum cleaned and wiped with a tack cloth.

K. Damaged or defective coating shall be removed by the specified blast cleaning to meet the clean surface requirements before recoating.

L. If the specified abrasive blast cleaning will damage adjacent work, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC-SP2, hand tool cleaning or SSPC-SP3, power tool cleaning, may be used.

M. Shop applied coatings of unknown composition shall be completely removed before the specified coatings are applied. Valves, castings, ductile or cast iron pipe, and fabricated pipe or equipment shall be examined for the presence of shop-applied temporary coatings. Temporary coatings shall be completely removed by solvent cleaning per SSPC-SP1 before the abrasive blast cleaning work has been started.

N. Shop primed equipment shall be solvent cleaned in the field before finish coats are applied.

3.5 SURFACE PREPARATION FOR GALVANIZED FERROUS METAL

A. Galvanized ferrous metal shall be alkaline cleaned per SSPC-SP1 to remove oil, grease, and other contaminants detrimental to adhesion of the protective coating system to be used.

B. Pretreatment coatings of surfaces shall be in accordance with the printed recommendations of the coating manufacturer.

3.6 SURFACE PREPARATION OF FERROUS SURFACES WITH EXISTING COATINGS

A. General: All grease, oil, heavy chalk, dirt, or other contaminants shall be removed by solvent or detergent cleaning prior to abrasive blast cleaning. The generic type of the existing coatings shall be determined by laboratory testing.

B. Abrasive Blast Cleaning: The Contractor shall provide the degree of cleaning specified in the coating system schedule for the entire surface to be coated. If the degree of cleaning is not specified in the schedule, deteriorated coatings shall be removed by abrasive blast cleaning to SSPC-SP6, Commercial Blast Cleaning. Areas of tightly adhering coatings shall be deaned to SSPC-SP7, Brush-off Blast Cleaning, with the remaining thickness of existing coating not to exceed 3 mils.

C. Incompatible Coatings: If coatings to be applied are not compatible with existing coatings the Contractor shall apply intermediate coatings per the paint manufacturer's recommendation for the specified coating system or shall completely remove the existing coating prior to abrasive blast cleaning. A small trial application shall be conducted for compatibility prior to painting large areas.

D. Unknown Coatings: Coatings of unknown composition shall be completely removed prior to application of new coatings.

E. Water Abrasive or Wet Abrasive Blast Cleaning: Where specified or where job site conditions do not permit dry abrasive blasting for industrial coating systems due to dust or air pollution considerations, water abrasive blasting or wet abrasive blasting may be used. In both methods, paint-compatible corrosion inhibitors shall be used, and coating application shall begin as soon as the surfaces are dry. Water abrasive blasting shall be done using high pressure water with sand injection. In both methods, the equipment used shall be commercially produced equipment with a successful service record. Wet blasting methods shall not be used for submerged and severe service coating systems unless specified.

3.7 CONCRETE AND CONCRETE BLOCK MASONRY SURFACE PREPARATION

A. Surface preparation shall not begin until at least 30 days after the concrete or masonry has been placed.

B. All oil, grease, and form release and curing compounds shall be removed by detergent cleaning per SSPC-SP1 before abrasive blast cleaning.

C. Concrete, concrete block masonry surfaces and deteriorated concrete surfaces to be coated shall be abrasive blast cleaned to remove existing coatings, laitance, deteriorated concrete, and to roughen the surface equivalent to the surface of the No. 80 grit flint sandpaper.

D. If acid etching is required by the coating application instructions the treatment shall be made after abrasive blasting. After etching, rinse surfaces with water and test the pH. The pH shall be between neutral and 8.

E. Surfaces shall be clean and as recommended by the coating manufacturer before coating is started.

F. Unless required for proper adhesion, surfaces shall be dry prior to coating. The presence of moisture shall be determined with a moisture detection device such as Delmhorst Model DB, or equal.

3.8 PLASTIC, FIBERGLASS AND NONFERROUS METALS SURFACE PREPARATION

A. Plastic and fiberglass surfaces shall be sanded or brush off blast cleaned prior to solvent cleaning with a chemical compatible with the coating system primer.

B. Non-ferrous metal surfaces shall be solvent-cleaned SSPC-SP1 followed by sanding or brush-off blast cleaning SSPC-SP7/NACE4.

C. All surfaces shall be clean and dry prior to coating application.

3.9 ARCHITECTURAL CONCRETE BLOCK MASONRY SURFACE PREPARATION

A. The mortar surfaces shall be cured at least 14 days before surface preparation work is started.

B. Dust, dirt, grease, and other foreign matter shall be removed prior to abrasive blasting.

C. The masonry surfaces shall be prepared in accordance with the material manufacturer's printed instructions.

3.10 WORKMANSHIP

A. Skilled craftsmen and experienced supervision shall be used on all work.

B. Clean drop cloths shall be used. All damage to surfaces resulting from the work hereunder shall be cleaned, repaired, and refinished to their original condition.

C. All coatings shall be applied under dry and dust-free conditions. Coating shall be done in a workmanlike manner so as to produce an even film of uniform thickness. Edges, corners, crevices, and joints shall receive special attention to insure that they have been thoroughly cleaned and that they receive an adequate thickness of coating material. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat would not increase the hiding. Special attention shall be given to insure that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other approved precautionary measures.

3.11 SHOP COATING REQUIREMENTS

A. All items of equipment, or parts of equipment which are not submerged in service, shall be shop primed and then finish coated in the field after installation with the specified or approved color. The methods, materials, application equipment and all other details of shop painting shall comply with this section. If the shop primer requires topcoating within a specified period of time, the equipment shall be finish coated in the shop and then touch-up painted after installation.

B. All items of equipment, or parts and surfaces of equipment which are submerged or inside an enclosed hydraulic structure when in service, with the exception of pumps and valves, shall have all surface preparation and coating work performed in the field.

C. The interior surfaces of steel reservoirs shall have all surface preparation and coating work performed in the field.

D. For certain pieces of equipment it may be undesirable or impractical to apply finish coatings in the field. Such equipment may include engine generator sets, equipment such as electrical control panels, switchgear or main control boards, submerged parts of pumps, ferrous metal passages in valves, or other items where it is not possible to obtain the specified quality in the field. Such equipment shall be shop primed and finish coated and touched up in the field with the identical material after installation. The Contractor shall require the manufacturer of each such piece of equipment to certify as part of its shop drawings that the surface preparation is in accordance with these specifications. The coating material data sheet shall be submitted with the shop drawings for the equipment.

E. For certain small pieces of equipment the manufacturer may have a standard coating system which is suitable for the intended service conditions. In such cases, the final determination of suitability will be made during review of the shop drawing submittals. Equipment of this type generally includes only indoor equipment such as instruments, small compressors, and chemical metering pumps.

F. Shop painted surfaces shall be protected during shipment and handling by suitable provisions including padding, blocking, and the use of canvas or nylon slings. Primed surfaces shall not be exposed to the weather for more than 6 months before topcoated, or less time if recommended by the coating manufacturer.

G. Damage to shop-applied coatings shall be repaired in accordance with this Section and the coating manufacturers printed instructions.

H. The Contractor shall make certain that the shop primers and field topcoats are compatible and meet the requirements of this Section. Copies of applicable coating manufacturer's data sheets shall be submitted with equipment shop drawings.

3.12 APPLICATION OF COATINGS

A. The application of protective coatings to steel substrates shall be in accordance with "Paint Specification No. 1, (SSPC-A-1)", Steel Structures Painting Council.

B. Cleaned surfaces and all coats shall be inspected prior to each succeeding coat. The Contractor shall schedule such inspection with the Engineer in advance.

C. Blast cleaned ferrous metal surfaces shall be painted before any rusting or other deterioration of the surface occurs. Blast cleaning shall be limited to only those surfaces that can be coated in the same working day.

D. Coatings shall be applied in accordance with the manufacturer's instructions and recommendations, and this Section, whichever has the most stringent requirements.

E. Special attention shall be given to edges, angles, weld seams, flanges, nuts and bolts, and other places where insufficient film thicknesses are likely to be present. Use stripe painting for these areas.

F. Special attention shall be given to materials which will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.

G. Finish coats, including touch-up and damage repair coats shall be applied in a manner which will present a uniform texture and color matched appearance.

H. Coatings shall not be applied under the following conditions:

1. Temperature exceeding the manufacturer's recommended maximum and minimum allowable.

2. Dust or smoke laden atmosphere.

3. Damp or humid weather.

4. When the substrate or air temperature is less than 5 degrees F above dewpoint.

5. When air temperature is expected to drop below 40 degrees F or less than 5 degrees F above the dewpoint within 8 hours after application of coating.

I. Dewpoint shall be determined by use of a sling psychrometer in conjunction with U.S. Dept. of Commerce, Weather Bureau psychrometric tables.

J. Steel piping shall be abrasive blast cleaned and primed before installation.

K. The finish coat on all work shall be applied after all concrete, masonry, and equipment installation is complete and the work areas are clean and dust free.

3.13 CURING OF COATINGS

A. The Contractor shall provide curing conditions in accordance with the conditions recommended by the coating material manufacturer or by this Section, whichever is the highest requirement, prior to placing the completed coating system into service.

B. In the case of enclosed areas, forced air ventilation, using heated air if necessary, may be required until the coatings have fully cured.

C. Forced Air Ventilation of Steel Reservoirs and Enclosed Hydraulic Structures: Forced air ventilation is required for the application and curing of coatings on the interior surfaces of steel reservoirs and enclosed hydraulic structures. During curing periods continuously exhaust air from a maintenance hole in the lowest shell ring, or in the case of an endosed hydraulic structure, from the lowest level of the structure using portable ducting. After all interior coating operations have been completed provide a final curing period for a minimum of 10 days, during which the forced ventilation system shall operate continuously. For additional requirements, refer to the specific coating system being used in the paragraph entitled "Submerged and Severe Service Coating Systems" herein.

3.14 NOT USED

3.15 IDENTIFICATION OF PIPING

A. Identification of piping shall be in accordance with Section 15780 "Treatment Plant Piping Identification Systems."

B. Every valve or connection, where it may be possible for a worker to be exposed to a hazardous substance, shall be labeled per General Industry Safety Orders, Article 112 OSHA Occupational Safety and Health Standards 29CFR1910.

C. All unburied pipe in structures and in chemical pipe trenches shall be color-code painted. Colors shall be as specified in Section 15780 "Piping Identification Systems," as selected by the Engineer, or as shown.

3.16 COATING SYSTEM SCHEDULES - FERROUS METALS

A. Coating System Schedule, Ferrous Metal - Not Galvanized:

	Item	Surface Prep.	System No.
FM-1	All exposed surfaces indoors and outdoors, except those included below.	Commercial blast cleaning SSPC-SP6/NACE3	(4) Aliphatic polyurethane
FM-3	Surfaces of equipment and ferrous surfaces submerged or intermittently submerged in potable water or utility water, including all surfaces lower than 2-feet above high water level and all surfaces inside enclosed hydraulic structures and vents (excluding shop-coated valves, couplings, pumps).	White metal blast cleaning SSPC-SP5/NACE1	(100 or 101) amine-cured epoxy
FM-4	Surfaces of equipment and ferrous surfaces submerged or intermittently submerged in wastewater, including all surfaces lower than 2-feet above high water level and all surfaces inside enclosed hydraulic structures (excluding shop-coated valves, couplings, pumps).	White metal blast cleaning SSPC-SP5/NACE1	(102) Epoxy mortar / Epoxy glaze
FM-5	Surfaces exposed to high temperature (between 150 and 600 degrees F).	White metal blast cleaning SSPC-SP10/NACE1	(6) inorganic zinc,water-based
FM-7	Buried small steel pipe.	Removal of dirt, grease, oil	(200) PVC tape
FM-8	Buried pipe couplings, valves, and flanged joints (where piping is plastic).	Removal of dirt, grease, oil	(201) rich portland cement mortar
FM-9	Buried pipe couplings, valves, and flanged joints (where piping is not plastic, or tape-coated, or mortar-coated steel), including epoxy-coated surfaces.	As specified by reference specification	(205) polyethylene encasement
FM-10	Buried pipe couplings, valves, and flanged joints (where piping is mortar-coated steel or reinforced concrete), including epoxy-coated surfaces.	Removal of dirt, grease, oil	(206) cement-mortar coating

FM-11	Ferrous surfaces in water passagaes of all valves 4-inch size and l arger, exterior surfaces of s ubmerged valves.	White metal blast cleaning SSPC-SP5/NACE1	(100 or 101) amine-cured epoxy
FM-12	Where shown or s pecified, ferrous s urfaces i n water passages and s ubmerged surfaces of al l pumps w hich have di scharge s ize of 4-inches or larger.	White metal blast cleaning SSPC-SP5/NACE1	(100 OR 101) amine-cured epoxy
FM-12	Where s hown or s pecified, ferrous s urfaces i n water passages and s ubmerged surfaces of al l pumps w hich have di scharge s ize of 4-inches or larger.	White metal blast cleaning SSPC-SP5/NACE1	(106) fusion-bonded epoxy
FM-13	Ferrous surfaces of sleeve-couplings	White metal blast cleaning SSPC-SP5/NACE1	(100 or 101) amine-cured epoxy
FM-14	All f errous s urfaces of s luice gates, flap gat es, and s hear gates, including wall thimbles.	White metal blast cleaning SSPC-SP5/NACE1	(106) fusion-bonded epoxy
FM-15	Buried surfaces that are not specified to be coated	White metal blast cleaning SSPC-SP5/NACE1	(103) coal tar epoxy
FM-16	Indoor sheet metal, flashings, exposed ducts.	Commercial blast c leaning SSPC-SP6/NACE3	(4) aliphatic polyurethane

B. Coating System Schedule, Ferrous Metal - Galvanized: Pretreatment coatings, barrier coatings, or washes shall be applied as recommended by the coating manufacturer. All galvanized surfaces shall be coated All galvanized surfaces except for the following items shall be coated unless coating is required by other Sections: (1) Floor gratings and frames, (2) Handrails, (3) Stair treads, (4) Chain link fencing and appurtenances, (5) Specifier selected items.

Item		Surface Prep.	System No.
FMG-1	All exposed surfaces indoors and outdoors, except those below.	Alkaline cleaning SSPC-SP1	(4) aliphatic polyurethane
FMG-3	Buried small steel pipe.	Removal of dirt, grease, oil	(200) PVC tape
FMG-4	Surfaces buried or submerged in wastewater.	Alkaline cleaning SSPC-SP1 followed by brus h-off grade blast cleaning SSPC-SP7/NACE4	(102) Epoxy Mortar / Epoxy Glaze
FMG-5	Buried mi scellaneous surfaces, c ouplings, v alves, and flanged joints.	Removal of dirt, grease, oil	(201) rich portland cement mortar
FMG-6	Indoor sheet metal flashings, exposed ducts.	Alkaline cleaning SSPC-SP1	(4) aliphatic polyurethane

3.17 COATING SYSTEM SCHEDULE, NON-FERROUS METAL, PLASTIC, FIBERGLASS

A. Where isolated non-ferrous parts are associated with equipment or piping, the Contractor shall use the coating system for the adjacent connected surfaces. Do not coat handrails, gratings, frames or hatches. Only primers recommended by the coating manufacturer shall be used.

	Item	Surface Prep.	System No.
NFM-1	All exposed surfaces, indoors and outdoors, except those included below.	Solvent cleaned SSPC-P1	(4) aliphatic polyurethane
NFM-3	Aluminum surfaces in contact with c oncrete, or w ith any other metal except galvanized ferrous metal.	Solvent cleaned SSPC-SP1	(208) aluminum metal isolation
NFM-4	Polyvinyl chloride plastic piping, indoors and outdoors, or i n s tructures, not submerged.	Solvent cleaned SSPC-SP1	(7) acrylic latex
NFM-5	Fiber glass surfaces.	Per Paragraph 3.8	(12) aliphatic polyurethane fiberglass
NFM-6	Buried non-ferrous metal pipe.	Removal of dirt, grease, oil	(200) PVC tape

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Division 11 — Equipment

SECTION 11000
EQUIPMENT GENERAL PROVISIONS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all tools, supplies, materials, equipment, and all labor necessary for the furnishing, construction, installation, testing, and operation of all equipment and appurtenant work, complete and operable, all in accordance with the requirements of the Contract Documents.

B. The provisions of this Section shall apply, in general, to all equipment specified and where referred to, and they supplement the detailed equipment specifications. The detailed equipment specifications shall govern where this section conflicts with detailed sections.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Divisions 2 and 15 Piping, Fittings, and Valves as applicable.

B. Section 05500 Miscellaneous Metalwork.

C. Section 09800 Protective Coating.

D. Section 11300 Pumps, General.

E. Division 17, Instrumentation and Control.

F. Section 15610 Piping, General.

G. Section 15770 Pipe Supports and Mechanical Joint Restraints.

H. Section 16800 Electric Motors.

I. Section 16010 Electrical General Provisions.

J. Section 16480 Low Voltage Motor Control.

K. Section 16482 Medium Voltage Motor Control.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable reference specifications as specified in the GENERAL REQUIREMENTS.

B. Commercial Standards: All equipment, products, and their installation shall be in accordance with the following standards, as applicable, and as specified in each Section of these specifications:

1. American Society for Testing and Materials (ASTM).

2. American Public Health Association (APHA).

3. American National Standards Institute (ANSI).

4. American Society of Mechanical Engineers (ASME).

5. American Water Works Association (AWWA).

6. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).

7. American Welding Society (AWS).

8. National Fire Protection Association (NFPA).

9. Federal Specifications (FS).

10. National Electrical Manufacturers Association (NEMA).

11. Rubber Manufacturers of America (RMA).

12. Manufacturer's published recommendations and specifications.

13. General Industry Safety Orders (OSHA).

C. The following standards in particular are referred to in this Section of the Specifications:

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800.
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel, Nickel Alloy, and Other Special Alloys.
ANSI B46.1	Surface Texture.
ANSI S12.6	Method for the Measurement of the Real-Ear Attenuation of Hearing Protections.
ANSI/ASME B1.20.1	General Purpose Pipe Threads (inch)
ANSI/ASME B31.1	Power Piping.
ANSI/AWWA D100	Welded Steel Tanks for Water Storage.
AWWA C206	Field Welding of Steel Water Pipe.
ASTM A 48	Specification for Gray Iron Castings.
ASTM A 108	Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. Shop Drawings: The CONTRACTOR shall furnish complete shop drawings for all equipment specified in the various Sections, together with all piping, valves, and controls for review by the ENGINEER in accordance with **SUBMITTALS** of the GENERAL REQUIREMENTS.

C. Tools: Where the equipment is manufactured to require special tools for maintenance other than those normally available commercially, the CONTRACTOR shall supply one complete set of special wrenches or other special tools necessary for the assembly, adjustment, and dismantling of the equipment. All tools shall be of best quality hardened steel forgings with bright, finished heads and

with work faces dressed to fit nuts. The set of tools shall be neatly mounted in a labeled tool box of suitable design provided with a hinged cover.

D. Spare Parts:

1. The CONTRACTOR shall obtain and submit from the manufacturer a list of suggested spare parts for each piece of equipment according to the provisions of **SPARE PARTS** of the GENERAL REQUIREMENTS. After approval, CONTRACTOR shall furnish such spare parts suitably packaged, identified with the equipment number, and labeled. CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment. All spare parts are intended for use by the CITY, only, after expiration of the guaranty period. Any spare parts which the ENGINEER permits the CONTRACTOR to use for startup activities shall be replaced by the CONTRACTOR prior to the CITY's acceptance of beneficial use of the equipment.

2. During the term of this Contract the CONTRACTOR shall notify the ENGINEER in writing about any manufacturer's modification of the approved spare parts, such as part number, interchangeability, model change or others. If the ENGINEER determines that the modified parts are no longer applicable to the supplied equipment, the CONTRACTOR at its expense shall provide applicable spare parts.

E. Torsional Anlysis: The CONTRACTOR shall submit to the ENGINEER a torsional and lateral vibration analysis of the following equipment, in accordance with the GENERAL REQUIREMENTS. The analysis shall be performed by a specialist experienced in this type of work and approved by the ENGINEER.

1. All engine drives.

2. All blowers and compressors with drives of 100 horespower and over.

3. All vertical pumps with universal joints and extended shafts.

4. All other equipment where specified.

The torsional natural frequency of the drive train must be avoided by $\pm$25 percent by any exciting frequency of the equipment, throughout the entire operating range.

F. Vibration Analysis: In the bid price the CONTRACTOR shall include at least two site visits of the above mentioned specialist for each type and size of equipment, during construction and testing of the equipment, to analyze and measure the amount of equipment vibration and make a written recommendation for keeping the vibration at a safe limit. The CONTRACTOR shall implement those recommendations to meet provisions of the specifications.

1.5 QUALITY ASSURANCE

A. Inspection, Startup, and Field Adjustment: The CONTRACTOR shall demonstrate that all equipment meets the specified performance requirements. CONTRACTOR shall provide the services of an experienced, competent, and authorized service representative of the manufacturer of each item of major equipment and shall visit the site of work to perform the following tasks.

1. Assist the CONTRACTOR in the installation of the equipment.

2. Inspect, check, adjust if necessary and approve the equipment installation.

3. Start-up and field-test the equipment for proper operation, efficiency, and capacity.

4. Perform necessary field adjustments during the test period until the equipment installation and operation are satisfactory to the ENGINEER.

5. Instruct the CITY's personnel in the operation and maintenance of the equipment. Instruction prior to system testing of the equipment shall include step-by-step troubleshooting procedures with all necessary equipment testing.

6. The vendors rep shall provide a letter certifying the installation with approved test results attached.

B. Costs: The costs of all inspection, startup, testing, adjustment, and instruction work performed by factory-trained representatives shall be borne by the CONTRACTOR. The CITY will pay for costs of power and water. When available, the CITY's operating personnel will provide assistance in the field testing.

C. Public Inspection: It shall be the responsibility of the CONTRACTOR to inform the local authorities, such as building and plumbing inspectors, fire marshall, OSHA inspectors, and others, to witness all required permits and issue certificates, and pay all fees.

D. Tolerance: Tolerances and clearances shall be as shown on the shop drawings and shall be closely adhered to. Machine work shall in all cases be of high-grade workmanship and finish, with due consideration to the special nature or function of the parts. Members without milled ends and which are to be framed to other steel parts of the structure may have a variation in the detailed length of not greater than 1/16-inch for members 30 feet or less in length, and not greater than 1/8-inch for members over 30 feet in length.

E. Machine Finish: The type of finish shall be the most suitable for the application and shall be shown in micro-inches in accordance with ANSI B46.1. The following finishes shall be used:

1. Surface roughness not greater than 63 micro-inches shall be required for all surfaces in sliding contact.

2. Surface roughness not greater than 250 micro-inches shall be required for surfaces in contact where a tight joint is not required.

3. Rough finish not greater than 500 micro-inches shall be required for other machined surfaces.

4. Contact surfaces of shafts and stems which pass through stuffing boxes and contact surfaces of bearings shall be finished to not greater than 32 micro-inches.

F. All equipment and material furnished for the project shall be brand new and free of material and manufacturing defects.

G. Manufacturer's Experience: Unless otherwise directed by the ENGINEER, all equipment furnished shall have a record of at least 5 years of successful, troublefree operation in similar applications, from the same manufacture.

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Noise Level: When the equipment is in operation, no single piece of equipment shall exceed the OSHA noise level requirements for a one hour exposure, and the City of Los Angeles Building and Safety requirements.

B. Personal Hearing Protection: Where specified, the CONTRACTOR shall supply, in their original unopened packaging, three pairs of high attenuation hearing protectors. The ear protectors shall be capable of meeting the requirements of ANSI S12.6 and shall produce a noise level reduction of 25 dBA at a frequency of 500 Hz. The hearing protectors shall have fluid filled ear cushions and an

adjustable, padded headband. The protectors shall be stored in a weatherproof, labeled, steel cabinet, furnished by the CONTRACTOR and mounted in an approved location near the noise producing equipment.

C. Service Factors: Service factors shall be applied in the selection or design of mechanical power transmission components. Unless otherwise specified, the following load classifications shall apply in determining service factors:

Type of Equipment	Load Classification
Blower:	
Centrifugal or vane	Uniform
Lobe	Moderate Shock
Reciprocating Air Compressor:	
Multi-Cylinder	Moderate Shock
Single-Cylinder	Heavy Shock
Pump:	
Centrifugal or Rotary	Uniform
Reciprocating	Moderate Shock
Mixer:	
Constant Density	Uniform
Variable Density	Moderate Shock
Flocculator or Clarifier	Uniform
Sludge Thickener	Moderate Shock
Grit Handling Equipment	Moderate Shock
Trash Rack Rake	Moderate Shock
Crane or Hoist	Moderate Shock

D. For service factors of electric motors, see Section 16800, "Electric Motors." Where load classifications are not specified, best modern practice shall be used.

E. Welding: Unless otherwise specified or shown, all welding shall conform to the following:

1. Latest version of ANSI/AWWA D100.

2. Latest revision of AWWA C206.

3. All composite fabricated steel assemblies which are to be erected or installed inside a hydraulic structure, including any fixed or movable structural components of mechanical equipments, shall have continuous seal welds to prevent entrance of air or moisture.

4. All welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards governing same.

5. All welders shall be City of Los Angeles certified.

6. In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be specified by the AWS code. Upon completion of the welding, all weld splatter, flux, slag, and

burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. All sharp corners of material which are to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

F. Protective Coating: All equipment shall be painted or coated in accordance with Section 09800, "Protective Coating," or Section 09905 "Architectural Paint Finishes" unless otherwise approved by the ENGINEER. Non-ferrous metal and corrosion-resisting surfaces shall be coated with grease or lubricating oil. Coated surfaces shall be protected from abrasion or other damage during handling, testing, storing, assembly, and shipping.

G. Protection of Equipment: All equipment shall be boxed, crated, or otherwise protected from damage and moisture during shipment, handling, and storage. All equipment shall be protected from exposure to corrosive fumes and shall be kept thoroughly dry at all times. Pumps, motors, drives, electrical equipment, and other equipment having anti-friction or sleeve bearings shall be stored in weathertight storage facilities prior to installation. For extended storage periods, plastic equipment wrappers should be avoided, to prevent accumulation of condensate in gears and bearings.

H. Identification of Equipment Items: Each item of equipment shipped shall have a legible identifying mark corresponding to the equipment number shown or specified for the particular item.

I. Vibration Level: All equipment subject to vibration shall be provided with restrained spring-type vibration isolators or pads per manufacturer's written recommendation.

J. Shop Fabrication: Shop fabrication shall be preformed in accordance with the Contract Documents and the CONTRACTOR approved shop drawings.

2.2 EQUIPMENT SUPPORTS AND FOUNDATIONS

A. Equipment Supports: Unless otherwise shown, all equipment supports, anchors, and restrainers shall be adequately designed for static, dynamic, wind, and seismic loads. The design horizontal seismic force shall be greater of that noted in the general structural notes or as required by the governing building code, or 10 percent of gravity, whichever is greater.

B. Equipment Foundations: Equipment foundations shall be as per manufacturer's written recommendations. All mechanical equipment, tanks, control cabinets, etc., shall be mounted on minimum 3.5-inch high concrete bases, unless otherwise shown or specified.

C. Shop Drawings: Shop drawings shall be submitted to the ENGINEER for review in accordance with the requirements of the GENERAL REQUIREMENTS. Shop Drawings will be considered incomplete unless clear, concise calculations are presented showing equipment anchorage forces and the capacitates of the anchorage elements provided by the CONTRACTOR.

2.3 PIPE HANGERS, SUPPORTS, AND GUIDES

A. All pipe connections to equipment shall be supported, anchored, and guided to avoid stresses and load on equipment flanges and equipment. Supports and hangers shall be accordance with the requirements of Section **15770**, Pipe Supports and Mechanical Joint Restraints.

2.4 FLANGES AND PIPE THREADS

A. All flanges on equipment and appurtenances provided under this Section shall conform to ANSI B16.1, Class 125; or B16.5, Class 150, unless otherwise shown. All pipe threads shall be in accordance with ASNI/ASME B1.20.1, and the requirements of Section **15610**, "Piping, General."

2.5 COUPLINGS

A. Flexible couplings shall be provided between the driver and the driven equipment to accommodate slight angular misalignment, parallel misalignment, end load, and to cushion shock loads. Where required for vertical shafts, 3-piece spacer couplings or universal type couplings for extended shafts shall be installed. Selection of flexible coupling shall include service factor of driven equipment.

B. The CONTRACTOR shall have the equipment manufacturer select or recommend the size and type of coupling required to suit each specific application.

C. Taper-lock bushings may be used to provide for easy installation and removal on shafts of various diameters.

D. Where universal type couplings are shown, they shall be of the needle bearing type construction, equipped with commercial type grease fittings.

2.6 SHAFTING

A. General: All shafting shall be continuous between bearings and shall be sized to transmit the power required. Keyways shall be accurately cut parallel with shaft centerline. Unless otherwise specified and justified by calculation, shafting shall not be turned down at the ends to accommodate bearings or sprockets whose bore is less than the diameter of the shaft. All shafts shall rotate in the end bearings and shall be turned and polished, straight and true.

B. Materials: Shafting materials shall be appropriate for the type of service and torque transmitted. Environmental elements such as corrosive gases, moisture, and fluids shall be taken into consideration. Materials shall be shown or specified unless furnished as part of an assembly.

1. Low carbon cold-rolled steel shafting shall conform to ASTM A 108, Grade 1018.

2. Medium carbon cold-rolled shafting shall conform to ASTM A 108, Grade 1045.

3. Corrosion-resistant shafting shall be stainless steel or Monel, whichever is most suitable for the intended service.

C. Differential Settlement: Where differential settlement between the driver and the driven equipment may be expected, a shaft of sufficient length with 2 sets of universal type couplings shall be provided.

2.7 BEARINGS

A. General: Bearings shall conform to the standards of the Anti-Friction Bearing Manufacturers Association, Inc. (AFBMA).

B. To assure satisfactory bearing application, fitting practice, mounting, lubrication, sealing, static rating, housing strength, and other important factors shall be considered in bearing selection.

C. All lubricated-for-life bearings shall be factory-lubricated with the manufacturer's recommended grease to insure maximum bearing life and best performance.

D. Bearing Life: Except where otherwise specified or shown, all bearings shall have a minimum B-10 life expectancy of 5 years or 20,000 hours, whichever occurs first. Where so specified, bearings shall have a minimum rated B-10 life expectancy corresponding to the type of service, as follows:

Type of Service	Design Life (years)	B-10 Design Life (hours)
1. 8-hour shift	10	20,000
2. 16-hour shift	10	40,000
3. continuous	10	60,000

E. Bearing housing shall be of cast iron or steel and bearing mounting arrangement shall be as specified or shown, or as recommended in the published standards of the manufacturer. Split-type housings may be used to facilitate installation, inspection, and disassembly.

F. Sleeve-type bearings shall have a Babbitt or bronze liner.

2.8 GEARS AND GEAR DRIVES

A. Unless otherwise specified, gears shall be of the helical or spiral-bevel type, designed and manufactured in accordance with AGMA Standards, with a gear teeth minimum service factor of 1.7, a minimum B-10 bearing life of 60,000 hours and a minimum efficiency of 94 percent. Worm gears shall not be used, unless specifically approved by the ENGINEER.

B. All gear speed reducers or increases shall be of the enclosed type, oil-or grease-lubricated and fully sealed, with a breather to allow air to escape but keep dust and dirt out. The casing shall be of cast iron or heavy duty steel construction with lifting lugs and an inspection cover for each train. An oil level glass and an oil flow indicator shall be provided, arranged for easy reading.

C. Gears and gear drives as part of an equipment assembly shall be shipped fully assembled for field installation.

D. Gear design, manufacture and material selections shall be left to the discretion of the manufacturer, provided the above AGMA level of quality suitable for the application are met. Input and output shafts shall be adequately designed for the service and load requirements. Gears shall be computer-matched for minimum tolerance variation. The output shaft shall have 2 position seals to prevent oil leakage.

E. Oil level and drain location relative to the mounting arrangement shall be easily accessible. Oil coolers or heat exchangers with all required appurtenances shall be furnished when necessary.

2.9 DRIVE CHAINS

A. Power drive chains shall be commercial type roller chains and meet ANSI Standard.

B. A chain take-up or tightener shall be provided in every chain drive arrangement to provide easy adjustment.

C. A minimum of one connecting or coupler link shall be provided with each length of roller chain.

D. Sludge collector chain and attachments shall be of the manufacturer's best standard material and suitable for the process fluid.

2.10 SPROCKETS

A. General: Matching sprockets shall be furnished with all chain drives and chain-type material handling equipment.

B. Materials: Unless otherwise specified, materials shall be as follows:

1. Sprockets with 25 teeth or less, normally used as a drive, shall be made of medium carbon steel in the 0.40 to 0.45 percent carbon range.

2. Type A and B sprockets with 26 teeth or more, normally used as driven sprockets, shall be made of minimum 0.20 percent carbon steel.

3. Large diameter sprockets with Type C hub shall be made of cast iron conforming to ASTM A 48, Class 30.

C. All sprockets shall be accurately machined to ANSI Standards. Sprockets shall have deep hardness penetration in tooth sections.

D. Finish bored sprockets shall be furnished complete with keyseat and set screws.

E. To facilitate installation and disassembly, sprockets shall be of the split type or shall be furnished with taper-lock bushings as required.

F. Idler sprockets shall be furnished with brass or Babbitt bushings, complete with oil hole and axial or circumferential grooving. Steel collars with set screws may be provided in both sides of the hub.

2.11 V-BELT DRIVES

A. V-belts and sheaves shall be of the best commercial grade and shall conform to ANSI and RMA Standards.

B. Unless otherwise specified, sheaves shall be machined from the finest quality gray cast iron.

C. All sheaves shall be statically balanced. For high speed application, where vibration is a problem, sheaves shall be dynamically balanced. Sheaves operating at belt speeds exceeding 6,5000 fpm may be required to be constructed of special materials.

D. To facilitate installation and disassembly, sheaves shall be furnished complete with **Taper lock** bushings as required.

E. Finish bored sheaves shall be furnished complete with keyseat and set screws.

F. Sliding motor bases shall be provided to adjust the tension of V-belts.

2.12 DRIVE GUARDS

A. All power transmission, prime movers, machines, shaft extensions, and moving machine parts shall be guarded to conform with the Division of Industrial Safety General Industrial Safety Orders latest edition and the OSHA Safety and Health Standards (29CFR1910). The guards shall be constructed of minimum 10 gage expanded, flattened steel with smooth edges and corners, galvanzied after fabrication and securely fastened. Where required for lubrication or maintenance, guards shall have hinged latched access doors.

2.13 FLEXIBLE CONNECTORS

A. General: Flexible connectors shall be installed in all piping connections to engines, blowers, compressors, and other vibrating equipment and in piping systems in accordance with the requirements of the Section **15610**, "Piping, General."

2.14 INSULATING CONNECTIONS

A. General: Where dissimilar materials are connected, insulating bushings, unions, couplings, or flanges, as appropriate, shall be used in accordance with the requirements of the Section **15610**, "Piping, General."

2.15 GASKETS AND PACKINGS

A. Gaskets shall be in accordance with the requirements of Section **15610**, "Piping, General."

B. Packing around valve stems and reciprocating shaft shall be compressible material, compatible with the fluid being used. Chevron-type "V" packing shall be **Garlock No. 432, John Crane "Everseal," or equal**. Pump seals shall be as specified in Section **11300**, "Pumps, General".

C. Packing around rotating shafts (other than valve stems) shall be "O"-rings, stuffing boxes, or mechanical seals, as recommended by the manufacturer and approved by the ENGINEER, in accordance with Section **11300**, "Pumps, General."

2.16 NAMEPLATES

A. Equipment nameplates of stainless steel shall be engraved or stamped and fastened to the equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins. Nameplates shall contain the manufacturer's name, model, serial number, size, characteristics, and appropriate data describing the machine performance ratings.

2.17 SAFETY REQUIREMENTS

A. Where work construction areas are located within a flammable or toxic gas environment, suitable gas detection, ventilating, and oxygen deficiency equipment shall be provided. Workers shall be equipped with approved breathing apparatus.

2.18 OVERLOAD PROTECTION

A. General: Unless otherwise specified in individual equipment Sections, all sludge collectors, clarifier raking mechanism, conveyors and bar screen equipment drives shall be provided with an overload protection device as follows:

1. Mechanical System: The overload protection shall be a mechanical device to provide for reliable protection in the event of excessive overload. It shall be a ball detent type designed for long term repeatability and life. It shall be infinitely adjustable by a single adjusting nut. Once set it shall be tamperproof, and incorporate a torque monitoring and control system. It shall activate an alarm set for 85 percent, and a motor cutout switch set for 100 percent of maximum continuous running torque. A visual torque indication shall be provided and oriented so that it may be read form the walkway. The dial shall be calibrated from 0 to 100 percent of maximum continuous running torque. The design of the torque limiter should initiate the mechanical disengagement of the drive upon overload. Each unit shall be suitable for outdoor/corrosive environments with a protective finish, corrosion inhibiting lubricants and a stainless steel cover.

2. Electronic System: As an alternative to the mechanical system, the overload protection may be an Electronic Torque Monitoring Control System capable of displaying torque, rpm's, one level of overload, and two levels of overload of the drive system. It shall incorporate a time-delay for start-up and a voltage monitoring and compensation circuit for up to ± 15 percent variation.

   a. The overload device shall have an enclosure suitable for outdoor installation at temperatures of 0-70 degrees C, and relative humidity up to 95 percent. A visual torque dial shall be provided and oriented so that it can be easily read from the walkway.

   b. The torque monitoring system shall be calibrated to: alarm and shut down the system in the event the torque drops to 50 percent of normal running; alarm at 85 percent of maximum continuous running torque and shut down the motor at maximum continuous running torque of the equipment. The system shall be calibrated at the factory of the equipment manufacturer and it shall be capable of monitoring twice the maximum continuous running torque of the equipment.

B. Manufacturers, or Equal:

1. American Autogard Corporation

2. Ferguson Machine Company.

2.19 ANCHOR BOLTS

A. Equipment suppliers shall furnish suitable anchor bolts for each item of equipment. Anchor bolts together with templates or setting drawings, shall be delivered to permit setting the anchor bolts when the structural concrete is placed. Two leveling nuts shall be furnished for each bolt. The anchor for design calculations must be stamped by a Cal registered civil or structural engineer.

B. Unless otherwise shown on the Drawings or specified, anchor bolts for items of equipment mounted on baseplates shall be long enough to permit 1-1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete. Bolts shall extend with at least two threads over the nut after final alignment.

C. Unless otherwise specified or approved by the Engineer, anchor bolts, nuts, and washers shall be stainless steel.

2.20 LIFTING LUGS

A. Lifting Lugs: Equipment weighing over 80 pounds shall be provided with lifting lugs.

PART 3 -- EXECUTION

3.1 COUPLINGS

A. The CONTRACTOR shall have the equipment manufacturer select or recommend the size and type of coupling required to suit each specific application; installation shall be per equipment manufacturer's printed recommendations.

3.2 INSULATING CONNECTIONS

A. All insulating connections shall be installed in accordance with the manufacturer's printed instructions.

3.3 PIPE HANGERS, SUPPORTS, AND GUIDES

A. Hangers, supports, and guides shall be spaced in accordance with ANSI/ASME B.31.1 standard, and with tables in Section 15770, Pipe Supports and Mechanical Joints.

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SECTION 11300
PUMPS, GENERAL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install all tools, equipment, materials, and supplies and shall perform all labor necessary for the installation, testing, and placing into operation of all pumps and pumping appurtenances, complete and operable, in accordance with the requirements of the Contact Documents.

B. The provisions of this Section shall apply to all pumps and pumping equipment specified, except where otherwise specified in the Contract Documents.

C. The CONTRACTOR shall assign to a single manufacturer full responsibility for the furnishing and functional operation of the complete pump system including the pumps, drives, drive motors, speed control equipment (where variable speed drives are required) and accessories. The designated single manufacturer, however, need not manufacture more than one part of the unit (pump, or motor and drive), but shall coordinate the design, assembly, testing, and erection of the unit(s) as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. SUBMITTALS of the General Requirements.

B. Divisions 2 and 15 as applicable Piping.

C. Section 05500 Miscellaneous Metalwork.

D. Section 09800 Protective Coating.

E. Section 11000 Equipment General Provisions.

F. Section 11310 Variable Speed Drives, General.

G. Section 11510 Submersible Constant Speed Chopper Pumps

H. Section 11520 Submersible Variable Speed Chopper Pumps

I. Section 16010 Electrical General Provisions.

J. Section 16480 Low Voltage Motor Control.

K. Section 16482 Medium Voltage Motor Control.

L. Section 16800 Electric Motors.

M. Section 17034 Gages.

N. Section 17405 Process Instrumentation and Control.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable Reference Specifications as specified in the General Requirements.

B. Commercial Standards:

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
ANSI/ASME B31.1	Power Piping.
ANSI/ASME B73.1M	Specifications for Horizontal End Suction Centrifugal Pumps for Chemical Process.
ANSI/ASME B73.2M	Specifications for Vertical In-Line Centrifugal Pumps for Chemical Process.
ANSI/AWWA E101	Deep Well Vertical Turbine Pumps - Line Shaft and Submersible Types.
ANSI/IEEE 112	Test Procedure for Polyphase Induction Motors and Generators.
ANSI/IEEE 115	Test Procedure for Synchronous Machines.
ASTM A 48	Specification for Gray Iron Castings.
ASTM A 470	Specification for Vacuum-Treated Carbon and Alloy Forgings for Turbine Rotors and Shafts.
ASTM A 536	Specification for Ductile Iron Castings.
ASTM E 448	Recommended Practice for Scleroscope Hardness Testing of Metallic Materials.
ASTM B 62	Specification for Composition Bronze or Ounce Metal Castings.
Latest Edition	Hydraulic Institute Standards for Centrifugal, Rotary, and Reciprocating Pumps.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. The following submittals and specific information shall be provided.

1. Pump name, identification number and specification number.

2. Performance curve and pump data showing capacity vs. head, NPSH required, efficiency, and BHP.

3. The CONTRACTOR shall require the manufacturer to indicate points on the H/Q curves, and the limits recommended for stable operation between which the pumps may be operated without surge, cavitation and vibration. The stable operating range shall be as wide as possible based on the pumps actual hydraulic and mechanical tests.

4. Pump detailed description and specification.

5. Electrical data including control and wiring diagrams.

6. Assembly and installation drawings including shaft size, seal, coupling, anchor bolt plan, part nomenclature, material list, outline dimensions and shipping weights. Vendor shall also be required to supply calculations, signed by a registered California Professional Engineer, to establish the number, type size, length, embedment, etc. of anchor bolts needed to meet the Seismic requirements of the individual project location.

7. Pump drive and motor in accordance with Section **16800** "Electrical Motors".

8. Bearing life calculations.

9. Shaft deflection calculations.

C. Certification: The CONTRACTOR shall obtain written certification from the pump manufacturer, addressed to the CITY, stating that the equipment will efficiently and thoroughly perform the required functions in accordance with these Specifications and as shown, and that the pump manufacturer accepts joint responsibility with the CONTRACTOR for coordination of all equipment, including motors, variable speed drives, controls, and services required for proper installation and operation of the completely assembled and installed pumps. The CONTRACTOR shall submit all such certificates to the ENGINEER.

D. Technical Manuals: Prior to startup the CONTRACTOR shall furnish the CITY complete operations and maintenance manuals in accordance with TECHNICAL MANUALS of the GENERAL REQUIREMENTS.

E. Tools: Special tools necessary for maintenance and repair of the pumps and one pressure grease gun for each type of grease required for pumps and motors shall be furnished as a part of the work hereunder; such tools shall be suitably stored in metal tool boxes, and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.

F. Spare Parts: The CONTRACTOR shall obtain and submit from the manufacturer a list of recommended spare parts for each piece of equipment according to the provisions of SPARE PARTS of the General Requirements. After approval, CONTRACTOR shall furnish such spare parts suitably packaged, identified with the equipment number, and labeled. CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment. All spare parts are intended for use by the CITY, only, after expiration of the guaranty period. Any spare parts which the ENGINEER permits the CONTRACTOR to use for startup activities shall be replaced by the CONTRACTOR prior to the CITY's acceptance of beneficial use of the equipment.

1. During the term of this Contract the CONTRACTOR shall notify the ENGINEER in writing about any manufacturer's modification of the approved spare parts, such as part number, interchangeability, model change or others. If the ENGINEER determines that the modified parts are no longer applicable to the supplied equipment, the CONTRACTOR at its expense shall provide applicable spare parts.

G. Field Procedures: Instructions for field procedures for erection, adjustments, inspection, and testing shall be provided prior to installation of the pumps.

1.5 QUALITY ASSURANCE

A. Performance Curves: All centrifugal pumps shall have a continuously rising curve. In no case shall the required horsepower at any point on the performance curve exceed the rated horsepower of the motor or engine.

B. Shaft Load and Deflection: Pump shafts on volute type pumps shall be designed to provide sufficient stiffness to operate without distortion or damaging vibration throughout the range of service specified. Shaft deflection at the face (impeller side) of the shaft seal shall be limited to no more [illegible] 1.5 mils at any operating condition within the zone described by the specified continuous duty operating conditions. Deflection at the shaft seal shall be calculated using the relationship set forth below:

1. Overhung Shaft Pumps: Shaft radial loads and deflection for overhung shaft pumps operating in single volute casings shall be calculated using the following relationship:

$$\Delta_{max} = \frac{R}{3 \times E} \times \left\{ \frac{a^2 \times c - (a \times b \times c)}{I_c} + \frac{1}{I_a} \times \left[a^3 + \frac{b^3 - (3 \times a^2 \times b)}{2} \right] \right\}$$

where:

Δ_{max} = deflection, inches, at the outboard (impeller side) face of the shaft seal

E = modulus of elasticity, psi
30 x 10^6 for carbon steel
28 x 10^6 for 316 stainless steel
Alternate materials: as accepted by Construction Manager

a = shaft length, inches, from the centroid of the impeller profile (from inlet to discharge nozzle) to the centerline of the radial bearing

b = shaft length, inches, from the centroid of the impeller profile (from inlet to discharge nozzle) to outboard (impeller side) face of shaft seal

c = shaft length between centerline of bearings, inches

Ia = moment of inertia of the shaft at section a, in4

Ic = moment of inertia of the shaft at section c, in4

R = radial load, pounds, at any specified operating condition or any operating condition within the envelope of specified operating conditions resulting in peak loads imposed on the shaft:

$$R = (K)\ (H)\ (D)\ (Y) + W$$

where:

K = Radial thrust factor. K for single volute pumps shall vary with flow and specific speed in accordance with the following:

Q/Q_{BEP}	*K*, N_S = 2000	*K*, N_S = 3500
0.0	0.31	0.38
0.1	0.30	0.375
0.2	0.28	0.36

Q/Q_{BEP}	*K*, N_S = 2000	*K*, N_S = 3500
0.3	0.26	0.345
0.4	0.24	0.325
0.5	0.22	0.3
0.6	0.18	0.27
0.7	0.15	0.23
0.8	0.12	0.185
0.9	0.08	0.14
1.0	0.05	0.09
1.1	0.06	0.12
1.2	0.11	0.17
1.3	0.20	0.25

Notes:

1. Q/Q_{BEP} in the table is the ratio of flow at the operating condition to flow developed by the pump at best efficiency

2. N_S in the table is specific speed, as defined in ANSI/HI 1.1 - 1.6.

3. *K* for pumps with specific speeds between 2000 and 3500 shall be established by a straight line interpolation from the above values.

4. *K* for pumps with specific speeds greater than 3500 shall be established by a straight line extrapolation from the above values.

5. K for double volute pumps shall be not less than half the values in the above table, as determined by the application of the rules in notes 3 and 4.

6. The manufacturer is at liberty to use differing values of K from that stipulated above so long as they are greater than those listed in the table. Under no circumstances will lesser values of K be acceptable.

H = Head (psi) developed by the pump at any specified duty point, including operating conditions within the envelope of conditions specified.

D = Mean impeller diameter, inches

Y = Impeller width, inches, at discharge, including shrouds

W = Impeller weight with wearing ring, pounds (*W* = 0 if vertical pump)

2. Radial loads calculated in accordance with the above procedure shall be used for bearing life calculations as required under paragraph 11050-1.04 E. 5. Flexural stress calculations shall be based upon the loading criteria specified above and shall be incorporated into the combined stress calculations specified under paragraph 11050-1.04 E. 3.

3. Impeller Between Bearings Pumps: Shaft deflection for single volute pumps with the impeller mounted between bearings such as for split case centrifugal pumps shall be calculated in accordance with the following formula:

$$\Delta_{max} = \frac{(R \times x) \times (3 \times L^2 - 4 \times x^2)}{48 \times E \times I}$$

where:

Δ_{max}	=	deflection, inches, at the face (impeller side) of the shaft seal
R	=	radial force, as defined above
L	=	distance between bearings, inches
E	=	modulus of elasticity for the shaft material, as defined above
I	=	shaft moment of inertia at the bearings, inches^4
x	=	distance between bearing and seal face (impeller side), inches

C. Equipment Testing: The CONTRACTOR shall be responsible for the coordination of the following tests of each pump, drive, and motor:

1. General: Tests shall be performed in accordance with the Test Code for Centrifugal Pumps of the Standards of the Hydraulic Institute, Inc. Tests shall be performed on the actual assembled unit from shut-off head condition to 125 percent of the required maximum design capacity. Prototype model tests will not be acceptable. Pumps and motors shall be factory-tested, as defined herein.

2. Factory Tests of Pumps: All pumps and motors of sizes 10 to 125 hp (inclusive) shall be factory-tested in accordance with the above specifications. Seven sets of Certified test data shall be submitted to the ENGINEER. This data shall include, but not be limited to the following:

   a. Hydrostatic test with data recorded.

   b. Hydraulic test with a minimum of 5 readings between shutoff head and 125 percent of the maximum design capacity, recorded on data sheets as defined by the Hydraulic Institute, signed, dated, and certified.

   c. Certified pump curves showing head/flow, bhp, efficiency and NPSH required curves**. NPSH required shall be at least 5 feet of water absolute less than NPSH available.**

   d. Certification that the pump hp demand will not exceed the rated motor hp beyond the 1.0 service rating at any point on the curve.

3. Factory Tests of Motors: All motors of sizes 10 hp and larger, shall be assembled, tested, and certified at the factory and the working clearances checked to insure that all parts are properly fitted. The tests shall be in accordance with ANSI/IEEE 112 and ANSI/IEEE 115 standards, including heat run and efficiency tests. All computations shall be recorded and 7 certified and dated copies of the test results shall be furnished to the ENGINEER.

4. Factory Witnessed Tests: All pumps, variable speed drives, and motors, 150 hp and larger, shall be factory-tested as complete, assembled units, as specified above, and witnessed by the ENGINEER and the INSPECTOR. The manufacturer shall give the Engineer a minimum of 2 weeks notification prior to the test. All costs for INSPECTOR and ENGINEER shall be borne by the CONTRACTOR and included in the bid price. Such costs shall include travel and subsistence for 2 people but shall exclude any salaries. Test results in triplicate shall be

submitted to the ENGINEER and no equipment shall be shipped until the test data have been approved by the ENGINEER and the INSPECTOR.

5. Acceptance: In the event of failure of any pump to meet any of the above requirements or efficiencies, the CONTRACTOR shall make all necessary modifications, repairs, or replacements to conform to the requirements of the Contract Documents and the pump shall be re-tested at no additional compensation, until found satisfactory.

D. Field Tests: All pumping units shall be field tested after installation, in accordance with the Contract Documents, to demonstrate satisfactory operation, without causing excessive noise, vibration, cavitation, and overheating of the bearings. The field testing shall be performed in the presence of an experienced field representative of the manufacturer of each major item of equipment, who shall supervise the following tasks and shall certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation:

1. Start-up, check, and operate the equipment over the entire speed range. Any vibration shall be within the amplitude limits recommended in the Hydraulic Institute Standards and it shall be recorded at a minimum of 4 pumping conditions defined by the ENGINEER.

2. Pump performance shall be documented by obtaining concurrent readings, showing motor voltage, amperage, pump suction head, and pump discharge head, for at least 4 pumping conditions at each pump rpm. Each power lead to the motor shall be checked for proper current balance.

3. Bearing temperatures shall be determined by a contact-type thermometer. A running time of at least 20 minutes shall be maintained for this test, unless liquid volume available is insufficient for a complete test.

4. Electrical and instrumentation testing shall conform to applicable sections of these Specifications.

5. The field testing shall be witnessed by the ENGINEER and the INSPECTOR. In the event any of the pumping equipment fails to meet the above test requirements, it shall be modified and retested in accordance with the requirements of these Specifications. The CONTRACTOR shall then certify in writing that the equipment has been satisfactorily tested, and that all final adjustments thereto have been made. Certification shall include date of final acceptance test, as well as a listing of all persons present during tests, and resulting test data. The costs of all work performed in this Paragraph by factory-trained representatives shall be borne by the CONTRACTOR. The CITY will pay for costs of power and water. When available, the CITY's operating personnel will provide assistance in the field testing.

1.6 MANUFACTURER'S SERVICE REPRESENTATIVE

A. Erection and Startup Assistance: Service and instruction assistance by the manufacturer's engineering representative for each pump 10 hp and larger shall be provided by the CONTRACTOR during the following periods:

1. During erection.

2. During startup.

B. Instruction of CITY's Personnel: The CONTRACTOR shall provide for the services of a factory service representative to instruct the CITY's personnel in the operation and maintenance of the equipment. This service shall consist of both hands-on training and field training for both the maintenance and operations personnel. It will consist of at least **one** day's visit to the plant for each type of similar pumps to be coordinated with the CITY. Instruction shall adhere to the following requirements as a minimum:

1. As a minimum classroom equipment training for operations personnel will include:

    a. Using slides and drawings, discuss the equipment's specific location in the plant and an operational overview.

    b. Purpose and plant function of the equipment.

    c. A working knowledge of the operating theory of the equipment.

    d. Start-up, shutdown, normal operation, and emergency operating procedures, including a discussion on system integration and electrical interlocks, if any.

    e. Identify and discuss safety items and procedures.

    f. Routine preventative maintenance, including specific details on lubrication and maintenance of corrosion protection of the equipment and ancillary components.

    g. Operator detection, without test instruments, of specific equipment trouble symptoms.

    h. Required equipment exercise procedures and intervals.

    i. Routine disassembly and assembly of equipment if applicable (as judged by the City on a case-by-case basis) for purposes such as operator inspection of equipment.

2. As a minimum, hands-on equipment training for operations personnel will include:

    a. Identify location of equipment and review the purpose.

    b. Identifying piping and flow options.

    c. Identifying valves and their purpose.

    d. Identifying instrumentation:

        (1) Location of primary element.

        (2) Location of instrument readout.

        (3) Discuss purpose, basic operation, and information interpretation.

    e. Discuss, demonstrate, and perform standard operating procedures and round checks.

    f. Discuss and perform the preventative maintenance activities.

    g. Discuss and perform start-up and shutdown procedures.

    h. Perform the required equipment exercise procedures.

    i. Perform routine disassembly and assembly of equipment if applicable.

    j. Identify and review safety items and perform safety procedures, if feasible.

3. Classroom equipment training for the maintenance and repair personnel will include:

    a. Theory of operation.

    b. Description and function of equipment.

    c. Start-up and shutdown procedures.

d. Normal and major repair procedures.

e. Equipment inspection and troubleshooting procedures including the use of applicable test instruments and the "pass" and "no pass" test instrument readings.

f. Routine and long-term calibration procedures.

g. Safety procedures.

h. Preventative maintenance such as lubrication; normal maintenance such as belt, seal, and bearing replacement; and up to major repairs such as replacement of major equipment part(s) with the use of special tools, bridge cranes, welding jigs, etc.

4. Hands-on equipment training for maintenance and repair personnel shall include:

a. Locate and identify equipment components.

b. Review the equipment function and theory of operation.

c. Review normal repair procedures.

d. Perform start-up and shutdown procedures.

e. Review and perform the safety procedures.

f. Perform City approved practice maintenance and repair job(s), including mechanical and electrical adjustments and calibration and troubleshooting equipment problems.

1.7 GUARANTEES, WARRANTIES

A. After completion, the CONTRACTOR shall furnish to the CITY the manufacturer's written guarantees, that the pumping equipment will operate with the published efficiencies, heads, and flow ranges and meet these specifications. The CONTRACTOR shall also furnish the manufacturer's warranties as published in its literature and as specified.

PART 2 -- PRODUCTS

2.1 GENERAL

A. The CONTRACTOR shall furnish and install only such pumping equipment as the designated single manufacturer certifies is suitable for use with its equipment and the service conditions.

B. All manufactured items provided under this Section shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products; such manufacturers shall have had previous experience in such manufacture and shall, upon request of the ENGINEER, furnish the names of not less than 5 successful installations of its equipment of comparable nature to that offered under this contract.

C. All combinations of manufactured equipment which are provided under these specifications shall be entirely compatible, and the CONTRACTOR and the designated single manufacturer shall be responsible for the compatible and successful operation of the various components of the units conforming to specified requirements. Each unit of pumping equipment shall incorporate all basic mechanisms, coupling, electric motor or engine drive and unit mounting. All necessary mountings and appurtenances shall be included.

D. Where 2 or more units of the same type and/or size of pumping equipment are required, such units shall all be produced by the same manufacturer.

2.2 MATERIALS

A. All materials furnished as part of the pumping equipment shall be suitable for its intended use and service. Materials not specifically called for shall be high-grade, standard commercial quality, free from all defects and imperfection that might affect the serviceability of the product for the purpose for which it is intended, and shall conform to the following requirements:

1. Cast iron pump casings and bowls shall be of close-grained gray cast iron, conforming to ASTM A 48, or equal.

2. Bronze pump impellers shall conform to ASTM B 62.

3. Stainless steel pump shafts shall be of Type 400, Series. Miscellaneous stainless steel parts shall be of Type 316 except in septic environment.

4. All anchor bolts, nuts and washers shall be Type 316 stainless steel, unless otherwise specified in individual pumping equipment specifications. Buried or submerged bolts, nuts and washers shall be of Type 316 stainless steel, unless otherwise specified by the Engineer.

2.3 PUMP APPURTENANCES

A. Nameplates: Each pump shall be equipped with a stainless steel nameplate indicating rated head and flow, impeller size, pump speed, and manufacturer's name and model number.

B. Solenoid Valves: The pump manufacturer shall furnish and install solenoid valves on the water or oil lubrication lines and on all cooling water lines. Solenoid valve electrical rating shall be compatible with the motor control voltage and shall be furnished complete with all necessary conduit and wiring installation from control panel to solenoid.

C. Pressure Gages: All pumps (except sample pumps, sump pumps, and hot water circulating pumps) shall be equipped with pressure gages installed at pump suction and discharge lines. Pressure gages shall be located in a representative location, where not subject to shock or vibrations, in order to achieve true and accurate readings. Pressure gages shall be furnished in conformance with Section **17034**, "Gages".

D. Pump suctions shall be equipped with compound gages. Where subject to shock or vibrations, the pressure gages shall be provided with snubber and wall-mounted or attached to galvanized channel floor stands and connected by means of flexible connectors.

E. Variable Speed Drives: Variable speed drives, drive motors, speed control equipment, and accessories shall be furnished in accordance with applicable Division **11** sections.

2.4 PUMP REQUIREMENTS - GENERAL

A. Flanges: Suction and discharge flanges shall conform to ANSI standard B16.1 or B16.5 dimensions.

B. Lubrication: Vertical pump shafts shall be product water-lubricated, unless otherwise specified. Deep-well pumps and pumps with dry barrels shall have water- or oil-lubricated bearings and seals.

C. Handholes: Handholes on pump casings shall be shaped to follow the contours of the casing to avoid any obstructions in the water passage.

D. Vortex Suppressors: Vertical pumps with insufficient submergence shall be furnished with vortex suppressors.

E. Drains: All gland seals, air valves, and cooling water drains, and drains from variable speed drive equipment shall be piped to the nearest floor sink, or drain, with galvanized steel pipe or copper tube, properly supported with brackets.

F. Grease Lubrication: For all vertical propeller, mixed-flow, and turbine pumps, other than deep well pumps, of bowl sizes 10-inch and larger, the CONTRACTOR shall provide a stainless steel tube attached to the column for grease lubrication of bottom bearing.

G. Stuffing Boxes: Where stuffing boxes are specified for the pump seal, they shall be of the best quality, using the manufacturer's suggested materials best suited for the specific application. For sewage, sludge, drainage, and liquids containing sediments, the seals shall be fresh-water flushed, using lantern rings. If fresh water is not available, the seal shall be flushed with product water cleaned by means of a solids separator as specified in the individual pump specifications. Unless otherwise specified, the packing material shall be interlaced Teflon braiding, containing 50 percent ultrafine graphite impregnation to satisfy the following specification:

Shaft speeds	-	up to 2500 fpm
Temperature	-	up to 500 degrees F
pH range	-	0-14

H. Mechanical Seals:

1. Unless otherwise specified mechanical seal designs shall be selected for highest reliability and for rugged service. Mechanical seals shall be provided where called out, and they shall be water-flushed, unless otherwise specified. Water flushing shall be as described above. Unless otherwise specified, mechanical seals for pumping equipment shall be self-aligning, self-centering, single, Chesterton 442 seals, or equal, provided with Chesterton/SpiralTrac solids removal restriction bushings as follows. Mechanical seals for all pumps (except line shaft pumps where the seal barrier fluid is used for line shaft bearing lubrication) shall be fitted with SpiralTrac Version N or D, as recommended by EnviroSeal Engineering Products, Ltd, Nova Scotia, Canada.

2. Boxes for mechanical seals on pumps for contaminated water service (sludge, grit, wastewater, scum, reclaimed water, etc.) shall be drilled and tapped for connection of a clean water purge supply. Seals that are required to have automatic seal venting shall be provided with a second flush connection.

I. For all seal arrangements, a buffer fluid must be circulated a minimum 20 psi above suction pressure, or as required by manufacturer, in order to maintain reliable seal performance.

J. Preferred seals for all services other than chemicals and corrosives should be equipped with non-clogging, single coil springs and non-sliding, internal, secondary elastomers. Metal parts are to be of 300 series, corrosion-resistant materials.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. General: Pumping equipment shall be installed in accordance with approved procedures submitted with the shop drawings and as shown, unless otherwise approved by the ENGINEER.

B. Alignment: Equipment shall be field tested to verify proper alignment, operation as specified, and freedom from binding, scraping, vibration, shaft runout, or other defects. Pump drive shafts shall be measured just prior to assembly to ensure correct alignment. Equipment shall be secured in position and fixed neatly in appearance.

C. Lubricants: The installation work shall include furnishing the necessary oil and grease for initial operation.

3.2 PROTECTIVE COATING

A. All exposed materials, except corrosion-resistant metals which have not been shop painted, shall be field coated as specified in Section **09800**, "Protective Coating". Shop painted items which suffered damage to the shop coating shall be touched up as specified in Section **09800** "Protective Coating."

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SECTION 11310
VARIABLE SPEED DRIVES, GENERAL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install all variable speed drive equipment complete with drive motor, speed control unit, accessories, connections, supports, control housing, and appurtenances as shown and as specified in each variable speed drive Section, to provide a complete and workable installation in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 11000 Equipment General Provisions.

B. Division 16, Section: Adjustable Frequency Drives.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable reference specifications as specified in the GENERAL REQUIREMENTS.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. The CONTRACTOR shall provide and submit complete, detailed shop drawings of all the equipment, controls, enclosures, weather protection, tools, and manufacturer's recommended spare parts as referenced above.

1.5 QUALITY ASSURANCE (Not Used)

PART 2 -- PRODUCTS

2.1 GENERAL

A. Equipment Compatibility: Each variable speed drive shall be compatible with the equipment it serves and the CONTRACTOR shall assign to the manufacturer of the driven equipment the unit responsibility for the entire package, including wiring, cooling, and weather protection. The manufacturer of the variable speed drive equipment shall have a record of at least ten years experience for the proposed system, successfully used in similar applications.

B. Enclosures: Where outdoor enclosures are provided for the control equipment:

1. Enclosures shall be of sufficient size to afford access to all parts, and clearance for passage in front of the enclosure to satisfy all code requirements.

2. There shall be sufficient lighting in the cabinet for maintenance work.

3. The enclosures shall be made of enameled steel, fiber glass, or similar durable material, with locking device and all necessary safety devices, and corrosion protection.

4. Where exposed to the weather, drive housing shall be weather-protected, ventilated, or air conditioned, as required for trouble-free operation, with air filters to eliminate dust problems.

5. Control cabinets shall be mounted on concrete bases, extending not less than 4 inches above highest portion of surrounding ground.

2.2 DESIGN AND CONSTRUCTION

A. Design: The drives shall be of the horizontal or vertical type, as shown, and meet the following additional requirements:

1. They shall be capable of converting a fixed input speed from a standard motor to a variable output speed, as specified for the driven equipment.

2. There shall be, either, no slip allowed when the drive is operating at top rated speed; or, for models with slippage there shall be sufficient allowance made in sizing the driven equipment to obtain the specified capacity.

3. The drives shall be able to vary speed on demand with smooth acceleration or deceleration, without any vibration or shock loading, to meet the operating conditions of the equipment specifications, without overloading or overheating the drive or the motor.

B. Construction: All rotating parts shall be of top grade steel or ductile iron, encased in a cast iron or steel housing. Input and output shafts and members shall be carefully aligned and carried in sleeve or antifriction bearings. The bearings design and bearing life shall be as specified in Section 11000, Paragraph 2.7, Bearings.

C. Lubrication: All transmission parts and bearings shall be continuously lubricated and cooled by oil or grease, as required for trouble-free operation.

D. Cooling: Each drive shall be furnished with any necessary cooling equipment, complete with heat exchangers, fans, air conditioning, temperature probes, controls, safety shut-down, alarm, and accessories, fully integrated as a complete system. All cooling devices shall be constructed to enable regular maintenance or removal without dismantling of the drive.

E. Controls: The control systems shall be capable of accepting the specified signals corresponding to liquid level, flow, pressure, or temperature of the process as shown, and automatically vary the output speed in proportion to the signal. The control unit shall be provided with local speed indicator.

2.3 SPARE PARTS

A. Each variable speed drive assembly shall be furnished with all necessary spare parts as recommended by the Manufacturer. All parts shall be properly labeled and identified with the name and number of the equipment to which they belong.

B. A list of spare parts shall be submitted according to the provisions of Section 11000 "Equipment General Provisions."

PART 3-- EXECUTION

3.1 INSTALLATION

A. All variable speed drives shall be installed in strict accordance with the Manufacturer's printed instructions. The CONTRACTOR shall provide the services of a factory-trained Manufacturer's representative, who shall assist during installation and testing of the equipment, and training of the CITY's operating personnel.

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SECTION 11510
SUBMERSIBLE CONSTANT SPEED NON-CLOG PUMPS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B. The requirements of this Section will govern over related Sections if discrepancies arise. This Section covers guide rail-mounted submersible, constant speed, chopper type centrifugal pumping units and controls. Each pumping unit shall be complete with a closed-coupled, submersible, electric motor; a wall-mounted discharge fitting; guide rails; quick connect/disconnect coupling; inlet nozzle; and all other appurtenances specified or otherwise required for proper operation.

C. The pumps will be installed in a trench-type wet well downstream of a bar screen with 1 ½" openings for use in pumping stormwater on a continuous basis. Materials shall be macerated and conditioned by the pump as an integral part of the pumping action. The pump must have demonstrated the ability to chop through and pump high concentrations of solids such as plastics, heavy rags, grease and hair balls, wood, paper products and stringy materials without plugging, both in tests and field applications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03315 Grout.

B. Section 09800 Protective Coating.

C. Section 11300 Pumps, General.

D. Section 11000 Equipment General Provisions.

E. Section 16800 Electric Motors

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable current provisions of the Codes and Standards as specified in Section 11300, "Pumps, General" and as specified herein.

1. National Fire Protection Agency (NFPA 820).

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. The submittal shall include complete fabrication, assembly, foundation, and installation drawings, together with detailed specifications, and data covering materials used, parts, devices, and other accessories forming a part of the equipment furnished, including the following information:

1. Pumps:

a. Name of Manufacturer;

b. Type and Model;

c. Rotative speed;

d. Size of suction nozzle;

e. Size of discharge nozzle;

f. Type of bearings;

g. Net weight of pump motor only;

h. Complete performance curve showing capacity vs. head, NPSH required, efficiency, and kW input; and

i. Data on shop painting.

j. Dimensions, mounting, of guide rails.

2. Motors:

a. Name of Manufacturer;

b. Type and Model;

c. Type of bearings and lubrication;

d. Rated size of motor, hp;

e. Temperature rating;

f. Full load rotative speed;

g. Net weight;

h. Service factor;

i. Efficiency at full load and pump design point;

j. Full load current; and

k. Locked rotor current.

3. Control Panel and Components:

a. Name of Manufacturer;

b. Type and Model;

c. Dimensions and net weight of complete panel; and

d. Overcurrent characteristics and details of motor control.

1.5 QUALITY ASSURANCE

A. General: Unless otherwise specified herein, quality assurance of all submersible pumps and motors shall be as specified in Section 11300, "Pumps, General."

B. The Contractor shall assign unit responsibility to the manufacturer of the pumps provided under this section. All mechanical equipment components, at least, of this entire equipment assembly shall be furnished by the pump manufacturer. This manufacturer is the unit responsibility manufacturer and has unit responsibility for the equipment assembly specified in this section. A completed, signed, and notarized Certificate of Unit Responsibility (Form 18) shall be provided. Unit responsibility for related components in a mechanical equipment assembly does not require or obligate the unit responsibility manufacturer to warranty the workmanship or quality of component products not manufactured by them.

C. Factory Tests: All submersible pumps and motors shall be factory tested as specified in Section 11300 "Pumps, General" and as specified herein.

1. Hydrostatic Testing: All pumps shall be hydrostatically tested to a minimum pressure of 1.5 times the shut off head of the pump. Each pump and motor shall be tested as one assembled unit and shall show zero leakage.

2. Submersible Motor Leakage Test: The motor shall be leak tested pressure equivalent to 65 feet of water and shall show zero leakage. Test procedures shall be submitted to the ENGINEER for review.

D. Field Tests:

1. General: After installation of the pumping equipment, electrical, instrumentation and control, the CONTRACTOR shall be responsible to make sure that all the works have been checked, and all equipment has been tested in conformance with the drawings and specifications. Field tests shall be conducted in the presence of the ENGINEER, plant operation personnel in three stages.

2. Test No. 1: The CONTRACTOR shall notify the ENGINEER at least two weeks prior to the scheduled test. Each pump shall be operated for a minimum period of 24 hours in air (unsubmerged). In the case of wet pit submersible pump, the wet well level shall be held below the flange of the motor.

3. Test No. 2: Each pump shall be operated for a minimum period of 24 hours with the motor submerged and fully loaded. In the case of the dry pit pump where submerging the motor is not possible, Test No. 2 shall be conducted during the factory test.

4. Test No. 3: The final test shall be conducted for a period of 7 continuous days, 24 hours a day in automatic operation. The pumping plant shall be operated throughout the range of operation simulating the daily variation of flow. In the event that the incoming flow will not be enough to simulate operation of the pumping plant, the CONTRACTOR shall provide a signal generator or other equivalent equipment to simulate the rise and fall of wet well level, and all shutoff and alarm safety devices to demonstrate that the control system was installed to satisfy the design conditions as shown and specified in the Contract Document.

5. Upon proper determination by the ENGINEER that the pumping system has operated satisfactorily without major failure, the pumping system shall be recommended for acceptance by the ENGINEER and the INSPECTOR.

E. Noise Level: Unless otherwise specified, the maximum permissible noise level for a complete piece of mechanical equipment located within or outside a structure shall not exceed 85 dbA at 3 feet. A complete piece of equipment includes the driver and driven equipment plus any intermediate couplings, gears and auxiliaries.

1.6 SPARE PARTS

A. The pumps shall be furnished with the following spare parts:

1. One (1) set of mechanical shaft seals for each pump.

2. One (1) set of wearing rings for each pump.

3. One (1) set of bearings for each pump and motor.

4. Three (3) sets of O-rings for each pump.

5. One (1) neoprene submersible cable of required length for the submersible pumps complete with termination kit.

B. All spare parts shall be packed in containers which are dearly identified with indelible markings on the containers.

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Power Supply: Power supply to equipment will be 480 volts, 60-Hz, 3-phase.

B. Anchor Bolts: All anchor bolts, nuts, and washers shall be Type 316 stainless steel and shall comply with the anchor bolts and expansion anchors section. Anchor bolts shall be accurately located and centered in pipe sleeves having an inside diameter approximately 2-1/2 times the bolt diameter and with a length approximately 8 times the bolt diameter.

C. Painting:

1. All iron and steel parts which will be in contact with pumped liquid or submerged after installation, including the inside of the impeller casing, the impeller, and the discharge elbow, shall be shop cleaned in accordance with the coating manufacturer's recommendations and painted with an epoxy coating system. The coating shall have a dry film thickness of at least 10 mils and shall consist of a prime (first) coat and one or more finish coats. At least one quart of the finish coat shall be furnished with each pump for field touchup painting.

2. All other iron and steel surfaces, except stainless steel and machined surfaces, shall be shop painted as specified in Section 09800 "Protective Coating."

D. The Owner and Construction Manager believe the following manufacturers are capable of producing equipment and products, which will satisfy the requirements of this Section. This statement, however, shall not be construed as an endorsement of a particular manufacturer’s product, nor shall it be construed that a named manufacturer’s standard product will comply with the requirements of this Section. Candidate Manufacturers include:

1. ITT Flygt;

2. Fairbanks Morse;

3. ABS;

4. Or equal.

E. It is the express intent of these specifications to accurately describe equipment that is a regular production item of the specified manufacturer, and that has a proven record of performance in similar applications. The chopper pump manufacturer shall have a minimum of ten (10) years of documented experience in the design and production of chopper pumps of all types, and not less than five (5) years of experience in the production of the equipment as specified herein.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

A. Pumping units shall be designed for the following operating conditions and requirements:

1.	Unit designation	Storm Pumps 1-4
2.	Location	Diversion Wet Well Pumping Station
3.	Number of pumping units	4
4.	Service	Range from 1 to 4 Duty, 1 to 4 Standby
5.	Operation (hours per day)	Continuous during storm events
6.	Flow (gpm)	
	See 2.2C Condition B (Min Operating Head)	2,775
	See 2.2B Design point	2,250
	See 2.2D Condition C (Max Operating Head)	1,510
7.	NPSH available at suction (ft)	31
8.	Pump head (TDH-ft)	
	See 2.2C Condition B (Min Operating Head)	22
	See 2.2B Design point	25.5
	See 2.2D Condition C (Max Operating Head)	28.3
9.	Minimum pump efficiency at best efficiency point at speed required for design point, min (percent)	73
10.	Liquid to be pumped	Screened storm water downstream of 1 1/8” bar screen
11.	Specific gravity of liquid	~1.0
12.	Liquid temperature (degrees C)	15 - 25
13.	Max pump speed (rpm)	1170
14.	Max motor size (hp)	30
15.	Depth of wet well (ft)	23.51
16.	Water depth in the wet well (ft)	
	Min	0
	During Normal Operation	8
	Max	20
17.	Min discharge outlet size (inches)	8

18. See 2.4-I Min suction inlet nozzle size (inches) 16

19. Min rigid sphere diameter (inches) capable of passing through the pump from inlet to discharge 3

20. Min hydrostatic test pressure (psi) .5 x shutoff head plus suction pressure

B. "Design Point" pump head (TDH-ft) and capacity (gpm) shall be taken as the rated operating condition. Performance at the rated condition shall be guaranteed. Design point has been selected to obtain the rated pumping capacity for the installation. Design point shall be used for pump selection. Design point shall be located within the Preferred Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and listed in the manufacturer's published application data for the specific model proposed for this application.

C. Condition B is presented to indicate operating conditions when the pump is operating against minimum anticipated system head, assuming a hypothetical head-capacity curve. Pumps with steeper head-capacity curves will produce less flow at this head. The reverse will occur with pumps having a shallower head-capacity curve.

D. Condition C is presented to indicate operating conditions when the pump is operating against maximum anticipated system head, assuming a hypothetical head-capacity curve. Pumps with head-capacity curves steeper than that assumed will produce slightly greater flow at slightly greater head. The reverse will occur with pumps having a shallower head-capacity curve.

E. Pump performance shall be stable and free from cavitation and noise throughout the specified operating head range at minimum suction submergences. The design running clearance between the impeller inlet and the casing wearing ring (if provided) shall be not less than 0.006-inch or one-half mil per inch of casing wearing ring diameter, whichever is greater.

F. Each pumping unit shall be designed so that reverse rotation at rated head will not cause damage to any component.

G. Periodically, operating staff with manipulate station wet well level controls to lower wet well level to clean the wet well of accumulated solids. Solids will be removed from the wet well by operating the pumps until they break suction. Equipment furnished under this section shall be specifically certified by the manufacturer as suitable for operation in confined wet wells where the wet well will be cleaned using the pumping equipment. Pump anchorage systems, including the discharge piping, shall be restrained against the short-term buffeting caused by the cleaning process, where velocities in the wet well trench are expected to reach 15 feet per second with the liquid level at or below the top of the motor housing.

2.3 MATERIALS

A. Stator Housing, Oil Chamber Housing, Impeller Casing, and Sliding Bracket: Cast iron, ASTM A48.

B. Impeller: Cast Iron, ASTM A48

C. Casing Wearing Ring: Nitrile or stainless steel, ASTM A276 Series 400.

D. Motor and Pump Shaft: Stainless steel, ASTM A276, Series 400

E. Bearings: Bearings shall be heavy-duty permanently lubricated ball type. Bearings for pumps shall be designed for an L-10 life of 18,000 hours heavy-duty service without requiring additional lubrication.

F. All Wetted Assembly Fasteners: ASTM A276 Type 316 stainless steel.

G. Mechanical Seals: See Paragraph 2.4-E of this Section for material requirements.

H. Discharge Elbow: Cast iron, ASTM A48 or Ductile iron, ASTM A 536, Class 65-45-12.

I. Guide Rails/ Guide Bar Brackets: ASTM A276 Type 316 stainless steel.

J. Protective Coating: All iron and steel parts which will be in contact with pumped liquid or submerged after installation, including the inside of the impeller casing, the impeller, and the discharge elbow, shall be shop cleaned and painted in accordance with ENGINEER approved Manufacturer's standards or with Section 9800, Protective Coating.

2.4 PUMP CONSTRUCTION

A. Impeller Casing: The volute casing shall be a one-piece casting with a tangential or center discharge nozzle. The volute shall be designed for efficient conversion of kinetic to potential energy and shall have clear passageways designed to pass the solid sphere specified under paragraph 2.2-A of this Section. The cutwater shall be specifically designed for use in fluids with stringy solids, small rocks and rags. The volute casting shall be specifically designed to bear the loads associated with removal and placement of the pump and to withstand the loads imposed by the operations specified under paragraphs 2.2-A of this Section. The discharge nozzle shall be not less that the diameter specified under paragraph 2.2-A and shall be reinforced for the loads imposed by the specified conditions of service. The nozzle flange face shall be designed to mate with the discharge fitting specified in paragraph 2.4-J of this Section. The volute casing shall be drilled and tapped or otherwise fitted with an inlet nozzle conforming to the requirements specified in paragraph 2.4-I of this Section.

B. Impeller: The impeller shall be dynamically balanced, nonclogging design capable of passing solids, fibrous materials, small rocks, and other matter found in normal stormwater applications through to the discharge nozzle. Impellers for pumps with discharge 4 inches in diameter and greater shall be not less than two-vane design. Fit between the impeller and the shaft shall be a sliding fit with a taper-lock bushing pressed by a screw, which is threaded into the end of the shaft, or a slip fit onto the shaft and drive key and fastened to the shaft by an impeller nut having cover for protection from pumped fluid. A wearing ring system designed for abrasion resistance shall provide efficient sealing between the volute and impeller.

C. Wearing Rings: Renewable wearing rings shall be securely fastened to the impeller casing front cover to provide either an axial or radial running clearance.

D. Oil Chamber Housing: The oil chamber shall contain a moisture sensor, inspection plug, drain plug, and vent plug.

E. Mechanical Seals:

1. The pump shall be provided with a tandem double mechanical seal running in an oil reservoir, composed of two separate lapped face seals. The lower seal unit, between the pump and oil chamber, shall consist of one stationary and one positively driven, rotating tungsten-carbide or silicon-carbide ring, with each pair of rings held in contact by a separate spring. The upper seal unit, between the oil sump and the motor housing, shall consist of one stationary tungsten-carbide or silicon-carbide ring and one positively driven silicon-carbide or rotating carbon ring. Ceramic seals will not be acceptable. The seals shall require neither maintenance nor adjustment and shall be easily replaceable. Conventional double mechanical seals with a single or a double spring between the rotating faces, or that require constant differential pressure to effect sealing and are subject to opening and penetration by pumping forces, will not be acceptable. The pump shall be capable of continuous submergence without loss of watertight integrity to a depth of 65 feet.

2. Each pump shall be provided with a seal lubricant chamber for the shaft sealing system. The seal lubricant chamber shall be designed to assure that an air pocket is provided in the seal lubricant chamber, to absorb the expansion of the seal lubricant due to temperature variations. The drain and inspection plug with positive anti-leak seal shall be easily accessible from the outside.

F. Bearings: Bearings shall be heavy-duty, oil lubricated or permanently greased lubricated, anti-friction type, double shielded and factory sealed. Bearings shall be designed for an L-10 rating life of at least 50,000 hours at any operating condition specified under paragraph 11510-2.2-A.

G. Cable Seal: The cable entry water seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall be comprised of a single cylindrical elastomer grommet having a dose tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland, potting chamber or terminal board, which shall isolate the motor interior from foreign material gaining access through the pump top. If a potting chamber is used, the potting procedure shall employ an epoxy potting compound combined with a procedure which insures penetration of the compound into the individual cable conductor strands to prevent development of wicking pathways for entrance of water into the motor.

H. Sealing of Mating Surfaces: All mating surfaces of major components shall be machined and fitted with O-rings where watertight sealing is required. Sealing shall be accomplished by O-ring contact of four surfaces and O-ring compression in two plans without reliance on a specific fastener torque or tension to obtain a watertight joint. The use of elliptical O-rings, gaskets, or seals requiring a specific fastener torque value to obtain and maintain gasket or seal compression and watertightness will not be acceptable. The use of secondary sealing compounds, gasket cement, grease, or other devices to obtain watertight joints will not be acceptable.

I. Inlet Nozzle: The final configuration of the inlet shall be selected to efficiently convey the pumped fluid into the impeller eye. The inlet suction nozzle shall be sized and installed as shown on Contract Plans and specified in this section to meet submergence and dearance requirements required by pumping station design standards. Diameter of suction nozzle shall result in an inlet velocity of less than or equal to 4 ft/sec as specified in paragraph 11510-2.2-A.18. The pump inlet nozzle shall be of sufficient length to extend down towards the sump floor as shown on the Contract Plans to achieve the floor separation required by the Hydraulic Institute Intake Standard (ANSI/HI 9.8).

J. Pump Anchorage and Guide System:

1. The discharge connection fitting shall be bolted to the structure as indicated and shall serve as a lower attachment for the guide rails. The discharge connection fitting shall be elbow discharge type, as indicated. The anchorage system shall be designed to transmit the forces imposed by the design conditions specified under paragraph 2.2 of this Section safely to the structure. Calculations and supporting documentation justifying the support design shall be provided with the pump submittal as required under Section 11300. The face of the discharge elbow inlet flange shall be perpendicular to the floor and make contact with the face of the pump discharge nozzle flange. The diameter and drilling of the elbow outlet flange shall conform to ANSI B16.1, Class 125.

2. The pump, inlet nozzle and motor assembly shall be automatically connected to and supported by the discharge base and guide rails such that the unit can be removed from the wet well and replaced without the need for operating personnel to enter the wet well. Sealing of the pumping unit to the discharge connection shall be accomplished by a simple linear downward motion of the pump with the entire weight of the pumping unit guided to and pressing tightly against the discharge connections. No portion of the pump shall bear directly on the floor of the sump and no rotary motion of the pump shall be required for sealing. Guide bars provided for directing the pump into position or for removing the pump for maintenance shall steer the pump into proper contact with the discharge connection fitting. Once the pump has been positioned on its support fitting at the discharge fitting, the guide bar system shall not be required for pump support.

K. Sliding Bracket: Each pumping unit shall be provided with an integral, self-aligning guide rail sliding bracket. The bracket shall be designed to obtain a wedging action between flange faces as final alignment of the pump occurs in the connected position. The bracket shall maintain proper contact and a suitably sealed connection between flange faces under all operating conditions.

L. Guide Rails: Each pumping unit shall be equipped with no less than two guide rails constructed of Type 316 stainless steel. Guide rails shall be sized to fit the discharge base and the sliding bracket and shall extend upward from the discharge bases to the access hatch cover at the top of the wet well. An upper guide rail bracket shall be provided and shall be Type 316 stainless steel. Guide bars provided for directing the pump into position or for removing the pump for maintenance shall steer the pump into proper contact with the discharge connection fitting. Once the pump has been positioned on its support fitting at the discharge fitting, the guide bar system shall not be required for pump support. Calculations supporting the adequacy of the guide rail and anchorage system shall be included in the pump submittal.

M. Lifting Chain: A chain suitable for removing and installing each pump should be selected and provided by the pump manufacturer. The chain shall be Type 316 stainless steel. A suitable chain hook shall be provided at the top of the wet well.

2.5 BALANCE

A. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case, the vibration displacement (peak-to-peak) as measured at any point on the machine shall not exceed 4.0 mils.

B. At any operating speed, the ratio of rotative speed to the critical speed of a unit or components thereof shall be less than 0.8 or more than 1.3.

C. Shaft Deflection: Pump shafts on volute type pumps shall be designed to provide sufficient stiffness to operate without distortion or damaging vibration throughout the range of service specified. Shaft deflection at the face (impeller side) of the shaft seal shall be limited to no more than 1.5 mils at any operating condition within the zone described by the specified continuous duty operating conditions. Deflection at the shaft seal shall be calculated using the relationship set forth in paragraph 11300-1.5-B.

2.6 ELECTRIC MOTORS

A. Each pump shall be driven by an air-cooled, totally submersible, electric motor furnished by the pump manufacturer. Each motor shall be rated 460-volt, 60-Hz, 3-phase with HP as indicated on the drawings and shall have a nameplate rating which exceeds the maximum horsepower required by the pump. The stator housing shall be an air-filled, watertight casing. Motor insulation shall be moisture-resistant, Class F, with temperature rise (based on maximum ambient temperature of 40 degrees C) of 80 degrees C measured by the resistance method. Each motor shall be NEMA Design B with 1.15 service factor for continuous duty.

B. The motor bearings shall be antifriction, permanently lubricated type. The lower bearing shall be fixed to carry the pump thrust and the upper bearing free to move axially. The bearings shall have a calculated AFBMA L_{10} Life Rating of 40,000 hours when operating at maximum operating head.

C. The motor shall be designed for continuous (24 hours per day) duty and shall be capable of sustaining a minimum of 12 start/stop cycles per hour. Each motor shall be capable of continuous operation in air (unsubmerged) for at least 15 minutes under pump full load conditions without exceeding the temperature rise limitations for the motor insulation system.

D. Each motor starting current at full voltage shall not exceed 650 percent of the motor full load circuit.

E. Each pump motor shall be provided with a special cable UL-approved and suitable for submersible pump applications; this shall be indicated by a code or legend permanently embossed on the cable. The cable length shall be coordinated with design requirements. Power cable shall be sized per the design, copper with 600-volt insulation in accordance with NEC requirements.

F. The cable entry water seal design shall be such that a specific fastener torque is not required to ensure a watertight and submersible seal. The use of epoxies, silicones, or other secondary sealing systems will not be acceptable. The cable entry junction box and motor shall be separated by a stator lead sealing gland or terminal board. The junction box shall isolate the motor interior from moisture gaining access through the top of the stator housing or a separate moisture-sensing device shall be provided in the stator housing.

G. Refer to Section 16800, Electric Motors for additional applicable requirements.

PART 3 -- EXECUTION

3.1 GENERAL

A. Each discharge base shall be leveled, plumbed, aligned, and wedged into position to fit connecting piping. Installation procedures shall be as recommended by the pump manufacturer and the Hydraulic Institute Standards. Grouting shall be as specified in Section 03315 "Grout."

3.2 WARRANTY

A. In addition to the guarantee requirements specified in Section 01611, the Contractor shall cause the pump manufacturer to warrant the units against defects in materials and workmanship for a period of 5 years or 10,000 hours under the specified uses and with normal operation and service. This warranty shall be delivered, in writing, to the Owner and shall include, as a minimum, 100 percent full payment coverage for parts and labor during the first 60 months or 10,000 hours of operation, whichever occurs first.

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SECTION 11520
SUBMERSIBLE VARIABLE SPEED NON-CLOG PUMPS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B. The requirements of this Section will govern over related Sections if discrepancies arise. This Section covers guide rail-mounted submersible, variable speed, chopper type centrifugal pumping units and controls. Each pumping unit shall be complete with a closed-coupled, submersible, electric motor; a wall-mounted discharge fitting; guide rails; quick connect/disconnect coupling; inlet nozzle; and all other appurtenances specified or otherwise required for proper operation.

C. The Discharge Pumps will be installed in a trench-type wet well downstream of a bar screen with 1 ½" openings for use in pumping stormwater on a continuous basis. The Reservoir Pumps will be installed in a circular wet well for use in pumping stormwater from a storage reservoir on a continuous basis. Materials shall be macerated and conditioned by the pump as an integral part of the pumping action. The pump must have demonstrated the ability to chop through and pump high concentrations of solids such as plastics, heavy rags, grease and hair balls, wood, paper products and stringy materials without plugging, both in tests and field applications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03315 Grout.

B. Section 9800 Protective Coating.

C. Section 11300 Pumps, General.

D. Section 11000 Equipment General Provisions.

E. Section 16800 Electric Motors

F. Section 11310 Variable Frequency Drive

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable current provisions of the Codes and Standards as specified in Section 11300, "Pumps, General" and as specified herein.

1. National Fire Protection Agency (NFPA 820).

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. The submittal shall include complete fabrication, assembly, foundation, and installation drawings, together with detailed specifications, and data covering materials used, parts, devices, and other accessories forming a part of the equipment furnished, including the following information:

1. Pumps:

    a. Name of Manufacturer;

    b. Type and Model;

    c. Rotative speed;

    d. Size of suction nozzle;

    e. Size of discharge nozzle;

    f. Type of bearings;

    g. Net weight of pump motor only;

    h. Complete performance curve showing capacity vs. head, NPSH required, efficiency, and kW input; and

    i. Data on shop painting.

    j. Dimensions, mounting, of guide rails.

2. Motors:

    a. Name of Manufacturer;

    b. Type and Model;

    c. Type of bearings and lubrication;

    d. Rated size of motor, hp;

    e. Temperature rating;

    f. Full load rotative speed;

    g. Net weight;

    h. Service factor;

    i. Efficiency at full load and pump design point;

    j. Full load current; and

    k. Locked rotor current.

3. Control Panel and Components:

    a. Name of Manufacturer;

    b. Type and Model;

    c. Dimensions and net weight of complete panel; and

d. Overcurrent characteristics and details of motor control.

1.5 QUALITY ASSURANCE

A. General: Unless otherwise specified herein, quality assurance of all submersible pumps and motors shall be as specified in Section 11300, "Pumps, General."

B. The Contractor shall assign unit responsibility to the manufacturer of the pumps provided under this section. All mechanical equipment components, at least, of this entire equipment assembly shall be furnished by the pump manufacturer. This manufacturer is the unit responsibility manufacturer and has unit responsibility for the equipment assembly specified in this section and for reviewing the associated variable frequency drive equipment specified in Section 11310 and certifying its compatibility with the equipment assembly specified in this section. A completed, signed, and notarized Certificate of Unit Responsibility (Form 18) and a certification of variable speed drive compatibility shall be provided. Unit responsibility for related components in a mechanical equipment assembly does not require or obligate the unit responsibility manufacturer to warranty the workmanship or quality of component products not manufactured by them.

C. Factory Tests: All submersible pumps and motors shall be factory tested as specified in Section 11300 "Pumps, General" and as specified herein.

1. Hydrostatic Testing: All pumps shall be hydrostatically tested to a minimum pressure of 1.5 times the shut off head of the pump. Each pump and motor shall be tested as one assembled unit and shall show zero leakage.

2. Submersible Motor Leakage Test: The motor shall be leak tested pressure equivalent to 65 feet of water and shall show zero leakage. Test procedures shall be submitted to the ENGINEER for review.

D. Field Tests:

1. General: After installation of the pumping equipment, electrical, instrumentation and control, the CONTRACTOR shall be responsible to make sure that all the works have been checked, and all equipment has been tested in conformance with the drawings and specifications. Field tests shall be conducted in the presence of the ENGINEER, plant operation personnel in three stages.

2. Test No. 1: The CONTRACTOR shall notify the ENGINEER at least two weeks prior to the scheduled test. Each pump shall be operated for a minimum period of 24 hours in air (unsubmerged). In the case of wet pit submersible pump, the wet well level shall be held below the flange of the motor.

3. Test No. 2: Each pump shall be operated for a minimum period of 24 hours with the motor submerged and fully loaded. In the case of the dry pit pump where submerging the motor is not possible, Test No. 2 shall be conducted during the factory test.

4. Test No. 3:

a. The final test shall be conducted for a period of 7 continuous days, 24 hours a day in automatic operation. The pumping plant shall be operated throughout the range of operation simulating the daily variation of flow. In the event that the incoming flow will not be enough to simulate operation of the pumping plant, the CONTRACTOR shall provide a signal generator or other equivalent equipment to simulate the rise and fall of wet well level, and all shutoff and alarm safety devices to demonstrate that the control system was installed to satisfy the design conditions as shown and specified in the Contract Document.

b. Upon proper determination by the ENGINEER that the pumping system has operated satisfactorily without major failure, the pumping system shall be recommended for acceptance by the ENGINEER and the INSPECTOR.

E. Noise Level: Unless otherwise specified, the maximum permissible noise level for a complete piece of mechanical equipment located within or outside a structure shall not exceed 85 dbA at 3 feet. A complete piece of equipment includes the driver and driven equipment plus any intermediate couplings, gears and auxiliaries.

1.6 SPARE PARTS

A. The pumps shall be furnished with the following spare parts:

1. One (1) set of mechanical shaft seals for each pump.

2. One (1) set of wearing rings for each pump.

3. One (1) set of bearings for each pump and motor.

4. Three (3) sets of O-rings for each pump.

5. One (1) neoprene submersible cable of required length for the submersible pumps complete with termination kit.

B. All spare parts shall be packed in containers which are clearly identified with indelible markings on the containers.

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Power Supply: Power supply to equipment will be 480 volts, 60-Hz, 3-phase.

B. Anchor Bolts: All anchor bolts, nuts, and washers shall be Type 316 stainless steel and shall comply with the anchor bolts and expansion anchors section. Anchor bolts shall be accurately located and centered in pipe sleeves having an inside diameter approximately 2-1/2 times the bolt diameter and with a length approximately 8 times the bolt diameter.

C. Painting:

1. All iron and steel parts which will be in contact with pumped liquid or submerged after installation, including the inside of the impeller casing, the impeller, and the discharge elbow, shall be shop cleaned in accordance with the coating manufacturer's recommendations and painted with an epoxy coating system. The coating shall have a dry film thickness of at least 10 mils and shall consist of a prime (first) coat and one or more finish coats. At least one quart of the finish coat shall be furnished with each pump for field touchup painting.

2. All other iron and steel surfaces, except stainless steel and machined surfaces, shall be shop painted as specified in Section 09800 "Protective Coating."

D. The Owner and Construction Manager believe the following manufacturers are capable of producing equipment and products, which will satisfy the requirements of this Section. This statement, however, shall not be construed as an endorsement of a particular manufacturer’s product, nor shall it be construed that a named manufacturer’s standard product will comply with the requirements of this Section. Candidate Manufacturers include:

1. ITT Flygt;

2. Fairbanks Morse;

3. ABS;

4. Or equal.

E. It is the express intent of these specifications to accurately describe equipment that is a regular production item of the specified manufacturer, and that has a proven record of performance in similar applications. The chopper pump manufacturer shall have a minimum of ten (10) years of documented experience in the design and production of chopper pumps of all types, and not less than five (5) years of experience in the production of the equipment as specified herein.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

A. Pumping units shall be designed for the following operating conditions and requirements:

1.	Unit designation	Discharge Pumps 1&2
2.	Location	Diversion Wet Well Pumping Station
3.	Number of pumping units	2
4.	Service	1 duty, 1 standby
5.	Operation (hours per day)	Periodically to continuous during dry and low-flow weather

6. Flow (gpm)

See 2.2D Max Capacity	800
See 2.2C Design point #1 Normal Operation	450
See 2.2E Design point #1 Wet well Cleanout	450
See 2.2C Design point #2 Normal Operation	675
See 2.2E Design point #2 Wet well Cleanout	675

7. NPSH available at suction (ft) 31.5

8. Pump head (TDH-ft)

See 2.2D Max Capacity	46
See 2.2C Design Point #1 Normal Operation	23
See 2.2E Design Point #1 Wet well Cleanout	31.5
See 2.2C Design Point #2 Normal Operation	30.5
See 2.2E Design Point #2 Wet well Cleanout	40

9. Minimum pump efficiency at best efficiency point at speeds required for Design Points #1 and #2 Normal Operation, min (percent) 72

10.	Liquid to be pumped	Screened storm water downstream of 1 1/8” bar screen
11.	Specific gravity of liquid	~1.0
12.	Liquid temperature (degrees C)	15 - 25
13.	Max pump speed (rpm)	1800
14.	Max motor size (hp)	15
15.	Depth of wet well (ft)	23.51

16. Water depth in the wet well (ft)

Min	0
During Normal Operation	8
Max	20

17. Min discharge outlet size (inches) 4

18. See 2.4-I Min suction inlet nozzle size (inches) 10

19. Min rigid sphere diameter (inches) capable of passing through the pump from inlet to discharge 3

20. Min hydrostatic test pressure (psi) 1.5 x shutoff head plus suction pressure

B. Pumping units shall be designed for the following operating conditions and requirements:

1. Unit designation Reservoir Pumps 1& 2

2. Location Reservoir Wet Well Pumping Station

3. Number of pumping units 2

4. Service 1 duty, 1 standby

5. Operation (hours per day) continuous during reservoir discharge period

6. Flow (gpm)

See 2.2D Max Capacity	800
See 2.2C Design point #1 Normal Operation	450
See 2.2E Design point #1 Wet well Cleanout	450
See 2.2C Design point #2 Normal Operation	675
See 2.2E Design point #2 Wet well Cleanout	675

7. NPSH available at suction (ft) - 31

8. Pump head (TDH-ft)

See 2.2D Max Capacity	37
See 2.2C Design Point #1 Normal Operation	23.5
See 2.2E Design Point #1 Wet well Cleanout	29
See 2.2C Design Point #2 Normal Operation	27.5
See 2.2E Design Point #2 Wet well Cleanout	34

9. Minimum pump efficiency at best efficiency point at speed required for design points #1 and #2 (normal operation), (percent) 70

10. Liquid to be pumped Screened storm water downstream of 1 1/8” Bar Screen

11. Specific gravity of liquid ~1.0

12. Liquid temperature (degrees C) 15 - 25

13. Max pump speed (rpm) 1800

14.	Max motor size (hp)	20
15.	Depth of wet well (ft)	27.5
16.	Water depth in the wet well (ft)	
	min	5.75
	max	20.5
17.	Min discharge outlet size (inches)	4
18.	See 2.4-I Min suction inlet nozzle size (inches)	10
19.	Min rigid sphere diameter (inches) capable of passing through the pump from inlet to discharge	3
20.	Min hydrostatic test pressure (psi)	1.5 x shutoff head plus suction pressure

C. "Design Points #1 and #2 Normal Operation" pump head (TDH-ft) and capacity (gpm) shall be used for pump selection. Design point shall be located within the Preferred Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and listed in the manufacturer's published application data for the specific model proposed for this application.

D. "Max Capacity" pump head (TDH-ft) and flow (gpm) shall be taken as the rated operating condition. Performance at the rated condition shall be guaranteed. Design point has been selected to obtain the rated pumping capacity for the installation. It is not intended that the pumps be selected for maximum efficiency at this operating point. Max Capacity shall be located in the Allowable Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and listed in the manufacturer's published application data for the specific model proposed for this application.

E. Pump performance shall be stable and free from cavitation and noise throughout the specified operating head range at minimum suction submergences. "Design Points #1 and #2 Wet well Cleanout" shall be located in the Allowable Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and listed in the manufacturer's published application data for the specific model proposed for this application. The design running clearance between the impeller inlet and the casing wearing ring (if provided) shall be not less than 0.006-inch or one-half mil per inch of casing wearing ring diameter, whichever is greater.

F. Each pumping unit shall be designed so that reverse rotation at rated head will not cause damage to any component.

G. The pumps will be operated at variable speed in response to the control system specified in Section 17900. Periodically, operating staff with manipulate station wet well level controls to lower wet well level to clean the wet well of accumulated solids. Solids will be removed from the wet well by operating the pumps until they break suction. Equipment furnished under this section shall be specifically certified by the manufacturer as suitable for operation in confined wet wells where the wet well will be cleaned using the pumping equipment. Pump anchorage systems, including the discharge piping, shall be restrained against the short-term buffeting caused by the cleaning process, where velocities in the wet well trench are expected to reach 15 feet per second with the liquid level at or below the top of the motor housing.

2.3 MATERIALS

A. Stator Housing, Oil Chamber Housing, Impeller Casing, and Sliding Bracket: Cast iron, ASTM A48.

B. Impeller: TBD

C. Casing Wearing Ring: Nitrile or stainless steel, ASTM A276 Series 400.

D. Bottom Wearing Plate: Cast iron, ASTM A48.

E. Motor and Pump Shaft: Stainless steel, ASTM A276, Series 400

F. Bearings: Bearings shall be heavy-duty permanently lubricated ball type. Bearings for pumps shall be designed for an L-10 life of 18,000 hours heavy-duty service without requiring additional lubrication.

G. All Wetted Assembly Fasteners: Type 316 stainless steel.

H. Mechanical Seals: See Paragraph 2.4-E of this Section for material requirements.

I. Discharge Base: Cast iron, ASTM A48.

J. Guide Rails/ Guide Bar Brackets: Type 316 stainless steel.

K. Protective Coating: All iron and steel parts which will be in contact with pumped liquid or submerged after installation, including the inside of the impeller casing, the impeller, and the discharge elbow, shall be shop cleaned and painted in accordance with ENGINEER approved Manufacturer's standards or with Section 9800, Protective Coating.

2.4 PUMP CONSTRUCTION

A. Impeller Casing: The volute casing shall be a one-piece casting with a tangential or center discharge nozzle. The volute shall be designed for efficient conversion of kinetic to potential energy and shall have clear passageways designed to pass the solid sphere specified under paragraph 2.2-A and 2.2-B of this Section. The cutwater shall be specifically designed for use in fluids with stringy solids, small rocks and rags. The volute casting shall be specifically designed to bear the loads associated with removal and placement of the pump and to withstand the loads imposed by the operations specified under paragraphs 2.2-A of this Section. The discharge nozzle shall be not less that the diameter specified under paragraph 2.2-A and shall be reinforced for the loads imposed by the specified conditions of service. The nozzle flange face shall be designed to mate with the discharge fitting specified in paragraph 2.4-J of this Section. The volute casing shall be drilled and tapped or otherwise fitted with an inlet nozzle conforming to the requirements specified in paragraph 2.4-I of this Section.

B. Impeller: The impeller shall be dynamically balanced, nonclogging design capable of passing solids, fibrous materials, small rocks, and other matter found in normal stormwater applications through to the discharge nozzle. Impellers for pumps with discharge 4 inches in diameter and greater shall be not less than two-vane design. Fit between the impeller and the shaft shall be a sliding fit with a taper-lock bushing pressed by a screw, which is threaded into the end of the shaft, or a slip fit onto the shaft and drive key and fastened to the shaft by an impeller nut having cover for protection from pumped fluid. A wearing ring system designed for abrasion resistance shall provide efficient sealing between the volute and impeller.

C. Wearing Rings: Renewable wearing rings shall be securely fastened to the impeller casing front cover to provide either an axial or radial running clearance. As an alternative, the use of an axially adjustable wearing plate arranged to permit adjustment of the axial running clearance between the impeller and plate will also be acceptable. The wearing plate shall have an outward spiraling groove designed to force stringy solids outward and away from the impeller.

D. Oil Chamber Housing: The oil chamber shall contain a moisture sensor, inspection plug, drain plug, and vent plug.

E. Mechanical Seals:

1. The pump shall be provided with a tandem double mechanical seal running in an oil reservoir, composed of two separate lapped face seals. The lower seal unit, between the pump and oil chamber, shall consist of one stationary and one positively driven, rotating tungsten-carbide or silicon-carbide ring, with each pair of rings held in contact by a separate spring. The upper seal

unit, between the oil sump and the motor housing, shall consist of one stationary tungsten-carbide or silicon-carbide ring and one positively driven silicon-carbide or rotating carbon ring. Ceramic seals will not be acceptable. The seals shall require neither maintenance nor adjustment and shall be easily replaceable. Conventional double mechanical seals with a single or a double spring between the rotating faces, or that require constant differential pressure to effect sealing and are subject to opening and penetration by pumping forces, will not be acceptable. The pump shall be capable of continuous submergence without loss of watertight integrity to a depth of 65 feet.

2. Each pump shall be provided with a seal lubricant chamber for the shaft sealing system. The seal lubricant chamber shall be designed to assure that an air pocket is provided in the seal lubricant chamber, to absorb the expansion of the seal lubricant due to temperature variations. The drain and inspection plug with positive anti-leak seal shall be easily accessible from the outside.

F. Bearings: Bearings shall be heavy-duty, oil lubricated or permanently greased lubricated, anti-friction type, double shielded and factory sealed. Bearings shall be designed for an L-10 rating life of at least 50,000 hours at any operating condition specified under paragraph 11520-2.2-A & 2.2-B.

G. Cable Seal: The cable entry water seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall be comprised of a single cylindrical elastomer grommet having a dose tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland, potting chamber or terminal board, which shall isolate the motor interior from foreign material gaining access through the pump top. If a potting chamber is used, the potting procedure shall employ an epoxy potting compound combined with a procedure which insures penetration of the compound into the individual cable conductor strands to prevent development of wicking pathways for entrance of water into the motor.

H. Sealing of Mating Surfaces: All mating surfaces of major components shall be machined and fitted with O-rings where watertight sealing is required. Sealing shall be accomplished by O-ring contact of four surfaces and O-ring compression in two plans without reliance on a specific fastener torque or tension to obtain a watertight joint. The use of elliptical O-rings, gaskets, or seals requiring a specific fastener torque value to obtain and maintain gasket or seal compression and watertightness will not be acceptable. The use of secondary sealing compounds, gasket cement, grease, or other devices to obtain watertight joints will not be acceptable.

I. Inlet Nozzle: The final configuration of the inlet shall be selected to efficiently convey the pumped fluid into the impeller eye. The inlet suction nozzle shall be sized and installed as shown on Contract Plans and specified in this section to meet submergence and clearance requirements required by pumping station design standards. Diameter of suction nozzle shall result in an inlet velocity of less than or equal to 4 ft/sec as specified in paragraph 11520-2.2-A.18 and B.18. The pump inlet nozzle on the Discharge Pumps shall be of sufficient length to extend down towards the sump floor as shown on the Contract Plans to achieve the floor separation required by the Hydraulic Institute Intake Standard (ANSI/HI 9.8). The pump inlet nozzle on the Reservoir Pumps shall be positioned in the sump to achieve the floor separation required by the Hydraulic Institute Intake Standard (ANSI/HI 9.8).

J. Pump Anchorage and Guide System:

1. The discharge connection fitting shall be bolted to the structure as indicated and shall serve as a lower attachment for the guide rails. The discharge connection fitting shall be elbow discharge type, as indicated. The anchorage system shall be designed to transmit the forces imposed by the design conditions specified under paragraph 2.2 of this Section safely to the structure. Calculations and supporting documentation justifying the support design shall be provided with the pump submittal as required under Section 11300. The face of the discharge elbow inlet flange shall be perpendicular to the floor and make contact with the face of the pump discharge nozzle flange. The diameter and drilling of the elbow outlet flange shall conform to ANSI B16.1, Class 125.

2. The pump, inlet nozzle and motor assembly shall be automatically connected to and supported by the discharge base and guide rails such that the unit can be removed from the wet well and replaced without the need for operating personnel to enter the wet well. Sealing of the pumping unit to the discharge connection shall be accomplished by a simple linear downward motion of the pump with the entire weight of the pumping unit guided to and pressing tightly against the discharge connections. No portion of the pump shall bear directly on the floor of the sump and no rotary motion of the pump shall be required for sealing. Guide bars provided for directing the pump into position or for removing the pump for maintenance shall steer the pump into proper contact with the discharge connection fitting. Once the pump has been positioned on its support fitting at the discharge fitting, the guide bar system shall not be required for pump support.

K. Sliding Bracket: Each pumping unit shall be provided with an integral, self-aligning guide rail sliding bracket. The bracket shall be designed to obtain a wedging action between flange faces as final alignment of the pump occurs in the connected position. The bracket shall maintain proper contact and a suitably sealed connection between flange faces under all operating conditions.

L. Guide Rails: Each pumping unit shall be equipped with no less than two guide rails constructed of Type 316 stainless steel. Guide rails shall be sized to fit the discharge base and the sliding bracket and shall extend upward from the discharge bases to the access hatch cover at the top of the wet well. An upper guide rail bracket shall be provided and shall be Type 316 stainless steel. Guide bars provided for directing the pump into position or for removing the pump for maintenance shall steer the pump into proper contact with the discharge connection fitting. Once the pump has been positioned on its support fitting at the discharge fitting, the guide bar system shall not be required for pump support.

M. Lifting Chain: A chain suitable for removing and installing each pump should be selected and provided by the pump manufacturer. The chain shall be Type 316 stainless steel. A suitable chain hook shall be provided at the top of the wet well.

2.5 BALANCE

A. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case, the vibration displacement (peak-to-peak) as measured at any point on the machine shall not exceed 4.0 mils.

B. At any operating speed, the ratio of rotative speed to the critical speed of a unit or components thereof shall be less than 0.8 or more than 1.3.

C. Shaft Deflection: Pump shafts on volute type pumps shall be designed to provide sufficient stiffness to operate without distortion or damaging vibration throughout the range of service specified. Shaft deflection at the face (impeller side) of the shaft seal shall be limited to no more than 1.5 mils at any operating condition within the zone described by the specified continuous duty operating conditions. Deflection at the shaft seal shall be calculated using the relationship set forth in paragraph 11300-.5-B.

2.6 ELECTRIC MOTORS

A. Each pump shall be driven by an air-cooled, totally submersible, electric motor furnished by the pump manufacturer. Each motor shall be rated 460-volt, 60-Hz, 3-phase with HP as indicated on the Drawings and shall have a nameplate rating which exceeds the maximum horsepower required by the pump. The stator housing shall be an air-filled, watertight casing. Motor insulation shall be moisture-resistant, Class F, with temperature rise (based on maximum ambient temperature of 40 degrees C) of 80 degrees C measured by the resistance method. Each motor shall be NEMA Design B with 1.15 service factor for continuous duty.

B. The motor bearings shall be antifriction, permanently lubricated type. The lower bearing shall be fixed to carry the pump thrust and the upper bearing free to move axially. The bearings shall have a calculated AFBMA L_{10} Life Rating of 40,000 hours when operating at maximum operating head.

C. The motor shall be designed for continuous (24 hours per day) duty and shall be capable of sustaining a minimum of 12 start/stop cycles per hour. Each motor shall be capable of continuous operation in air (unsubmerged) for at least 15 minutes under pump full load conditions without exceeding the temperature rise limitations for the motor insulation system.

D. Each motor starting current at full voltage shall not exceed 650 percent of the motor full load circuit.

E. Each pump motor shall be provided with a special cable UL-approved and suitable for submersible pump applications; this shall be indicated by a code or legend permanently embossed on the cable. The cable shall be coordinated with design requirements.. Power cable shall be sized per the design,

F. The cable entry water seal design shall be such that a specific fastener torque is not required to ensure a watertight and submersible seal. The use of epoxies, silicones, or other secondary sealing systems will not be acceptable. The cable entry junction box and motor shall be separated by a stator lead sealing gland or terminal board. The junction box shall isolate the motor interior from moisture gaining access through the top of the stator housing or a separate moisture-sensing device shall be provided in the stator housing.

G. The variable-frequency drive is provided under Section 11310 as part of the electrical motor control center. The pump motor manufacturer shall certify that the adjustable-frequency drive provided will operate the motor without detrimental effects.

H. Refer to Section 16800, Electric Motors for additional applicable requirements.

PART 3 -- EXECUTION

3.1 GENERAL

A. Each discharge base shall be leveled, plumbed, aligned, and wedged into position to fit connecting piping. Installation procedures shall be as recommended by the pump manufacturer and the Hydraulic Institute Standards. Grouting shall be as specified in Section 03315 "Grout."

3.2 WARRANTY

A. In addition to the guarantee requirements specified in Section 01611, the Contractor shall cause the pump manufacturer to warrant the units against defects in materials and workmanship for a period of 5 years or 10, 000 hours under the specified uses and with normal operation and service. This warranty shall be delivered, in writing, to the Owner and shall include, as a minimum, 100 percent full payment coverage for parts and labor during the first 60 months or 10, 000 hours of operation, whichever occurs first.

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SECTION 11815
STAINLESS STEEL SLIDE GATES

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install slide gates in the sizes and locations shown, complete and operable, including manual operating nut pinned to extension stem end, bracing, frame, mountings, etc., as specified herein, in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 09800 Protective Coatings.

B. Section 11000 Equipment General Provisions.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable reference specifications as specified in the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards.

ASTM A193A	Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
ASTM A194A	Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure and High-Temperature Service.
ASTM A240	Chromium and Chromium-Nickel Stainless Steel.
ASTM A283	Low and Intermediate Tensile Strength Carbon Steel Plates.
ASTM A380	Standard Practice for Cleaning, De-scaling and Passivation of Stainless Steel Parts, Equipment and Systems.
ASTM D638	Test Method for Tensile Properties of Plastics.
ASTM D790	Test Met hods f or F lexural P roperties of U nreinforced and Reinforced Plastics and Electrical Insulating Materials.
ASTM D2240	Test Method for Rubber Property-Durometer Hardness.
ASTM E 84-91A	Surface Burning Characteristics
ASTM D3982-92	Standard Specifications for Contact Molded “Fiberglass” Glass Fiber Reinforced Thermosetting Resin Duct and Hoods.
ASTM C582	Standard S pecifications f or C ontact Mol ded R einforced Thermosetting Plastic (RTP).

ASTM D5241-93	Standard Specifications for Contact Molded Glass-Fiber-Reinforced Thermosetting Resin Flanges.
ASTH D4024-00	Standard Specifications for Reinforced Thermosetting Resin (RTR) Flanges.
NBS PS 15-69	Custom Contact-Molded Reinforced-Polyester Chemical-Resistant Process Equipment.
UL 181	Standard for Factory Made Air Ducts and Air Connectors.

* When two or more of the above regulations are applicable, the more stringent requirement shall be met.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS and include the following information:

1. The CONTRACTOR shall submit complete shop drawings of all gates, frames, slides, and operators including full dimensions.

2. Design load calculations for deflection at the maximum expected head, and calculations for the lifting force required to lift the gate.

3. Anchorage: Anchor bolt design calculations and details. Anchorage shall meet the seismic design requirements specified in Section 03250. Seismic calculations shall be stamped and signed by a Professional Structural Engineer licensed in the State of California and shall be provided as part of the anchorage submittal requirements.

4. Parts list with materials of construction.

5. Plan, cross section, and details showing proposed mounting for the gate, frame, stem and operator in the specific structure the gate is to be installed.

6. Manufacturer’s recommended installation instructions.

1.5 QUALITY ASSURANCE

A. Comply with Section 11000 "Equipment General Provisions."

B. The leakage allowance for slide gates shall not exceed 0.1 gpm/ft of seating perimeter under 20 ft of seating head, and 0.2 gpm/ft under 20 ft of unseating head, to meet ANSI/AWWA C-501.

1.6 GATE SCHEDULE

Equipment No.	Design Seating Head (ft)	Design Unseating Head (ft)	Size (in)
Slide Gate-1	18	18	48x48
Slide Gate-2	14	14	54x24

PART 2 -- PRODUCTS

2.1 EQUIPMENT FEATURES:

A. Design: All gates shall be new and of current manufacture, and adequately braced to prevent warpage and bending under the intended use. Stainless steel slide gates shall be self-contained type. Manufacturer's welders shall be certified per ASME, Section 1X or American Welding Society. Fasteners and anchor bolts shall be ASTM A276, Type 316 Stainless Steel.

B. Manual Operators: Gates submitted under this section shall have T-wrench/floor box type operators which includes floor box, thrust bearings, and lift nut. Floor box shall be of fabricated steel, with galvanized steel hinged cover and embedded in the roof of the stormwater lift station as specified on the Contract Drawings. Floor box depth shall be such that the gate stem and operating nut does not protrude above the floor. Wall brackets shall be stainless steel. Thrust bearings shall be roller or ball bearing type, replaceable and protected by seals. Accessible pressure type grease fittings shall be provided for bearing lubrication. Operating nuts shall be ANSI/AWWA C501standard 2-inch square head nuts. The square operating nut shall be installed to facilitate the use of a portable power operator.

C. Stems: Stems shall be ASTM A276, Stainless Steel, Type 304, 303 MX, or 316. Stems shall be manufactured of solid bar. The stem diameter shall be capable of withstanding twice the rated output of the operator at 40 pounds pull for manual operators. Stem guides shall be ASTM A276, Stainless Steel, Type 304L or 316L, with bronze or UHMW Polyethylene bushing. Stems shall be supported such that 1/r ratio for the unsupported part of the stem shall not exceed 200. Stem threads shall be of cut ACME type. Non-rising stems shall be provided on gates with T-wrench/floor box type operators.

D. Frames and Guides:

1. Frames, rails, and yokes shall be ASTM A276 or ASTM A240, Type 316L Stainless Steel. The gate frame shall be a rigid, welded unit, composed of the guide rails, cross bars, and deadrails, with a clear opening the same size as the waterway, unless otherwise specified. They shall be integral flange back or embedded type. The guides will be of sufficient length to support two-thirds (2/3) the height of the slide, when the gate is fully open. On wall-mounted gates, compressible gaskets or grout shall be provided between frame and wall as needed to ensure full mating of surfaces and no leakage.

2. On self-contained gates, where the guides extend above the operating floor, they shall be sufficiently strong so that no further reinforcing will be required. The yoke to support the operating device shall be formed by members welded or bolted at the top of the guides. The arrangement of the yoke shall be such that the slide and stem can be removed without disconnecting the yoke. When the slide is too long to allow this, the yoke shall be bolted for easy removal.

3. The yoke shall be sufficiently strong to support the lift forces when subjected to a load of 100 pounds pull on the operator. The yoke shall be designed so that its deflection under full operating load will not exceed 1/360 of the gate width.

E. Slides: Slides shall be ASTM A276 or ASTM A240, Type 316L Stainless Steel. The slide shall be plate reinforced with structural shapes welded to the plate. The slide shall not deflect more than 1/1000 of the span of the gate, or 1/16 inch whichever is greater, under maximum design head. The stem connection shall be either the Clevis type, with structural members welded to the slide and a bolt to act as pivot pin, or a threaded and bolted (or keyed) thrust nut supported in welded nut pocket. The pocket and yoke of the gate shall withstand at least 2.5 times the rated thrust output of the operator at 40 pounds pull.

F. Sealing System:

1. Seals shall be ASTM D2000, Grade AA625, Buna-N or neoprene rubber, or ASTM D4020 UHMW Polyethylene. Flush bottom seal shall be of compressible neoprene and may be located in either the slide or the frame. With the slide open, the invert of the gate shall be flush with the channel or opening, with no pockets or cavities for the accumulation of solids.

2. Top and side seals shall be able to be replaced without removing the gate frame from the concrete or wall thimble.

3. Gates shall use a sealing system of neoprene and/or polyethylene to achieve the leakage rates specified and to provide a durable sealing system. Sealing surfaces shall have a finish smoother than 125 micro-inch rms. Possible methods may include:

   a. A minimum of two independent and adjustable ultra-high molecular weight polyethylene pressure pads with a maximum spacing of 12 inches in each guide to control the seal compressions. These shall provide point-to-point adjustment of the double hollow bulb seal located on the sides and top of the slide. Each bulb shall have a 1-inch outside diameter and a concentric hollow center, and shall be attached to the gate with UHMW polyethylene grommets and stainless steel fasteners. The invert shall be a stainless steel angle welded to the bottom of the guides to form the seating surface for the seals attached to the slide.

   b. The slide shall fit into an extruded polyethylene guide. Side and top seals shall be self-adjusting. A continuous compression cord within the side and top guide (frame side) shall ensure contact between the guide and the slide.

G. Coating:

1. Each gate and all accessories shall be epoxy-coated as specified in Section 09800 Protective Coating. Care shall be exercised to protect all machined surfaces during sandblasting and coating.

2. Cleaning and Finishing stainless steel welded fabrication:

   a. Cleaning of weld joints and weld joint areas both before and after welding, shall conform to ASTM A380. Use only stainless steel brushes or stainless steel wool.

   b. Finishing: All weld areas following fabrication shall be pickled to remove all mill scale, weld inclusions, and color, and passivated in conformance to ASTM A380.

   c. Contractor shall submit the cleaning and passivation procedure in compliance with the above requirements for ENGINEER's review and approval.

2.2 MANUFACTURERS:

A. Rodney Hunt;

B. Waterman;

C. Fontaine;

D. Or equal.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Slide gates shall be installed in strict accordance with the manufacturer's printed recommendations and the requirements herein. Square operating nut shall be located in floor boxes on the finished surface of the pump station as shown on Contract Drawings. Square operating nut shall be installed such that maintenance personnel can use a portable electric operator to lift slide gates.

B. All damage to surface coatings incurred during shipment and/or installation shall be repaired to the satisfaction of the ENGINEER prior to installation.

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Division 15 — Mechanical

SECTION 15010
BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Basic Mechanical Requirements specifically applicable to Division 15 Sections, in addition to Division 1 - General Requirements.

1.2 DESCRIPTION

A. Furnish all materials and perform all labor required to execute the work as indicated on the project contract documents and specifications and as required to complete the work of Division 15 sections, except as otherwise herein specifically excluded.

1.3 WORK INCLUDED

A. The scope of work for Divisions 15 shall include everything necessary and incidental to completing the Heating, Ventilating, and Air Conditioning (HVAC), and Plumbing work indicated on the Project Contract Documents, including but not limited to the following:

1. The installation of roof mounted, Packaged Gas Heat / Electric Cool Air Conditioning Units complete with factory furnished field installed equipment roof curbs.

2. The installation of all required air filters for all HVAC systems included in the scope of this Project.

3. The installation of roof mounted, in-line, ceiling, and utility set Exhaust Fans for general or special system exhaust requirements.

4. The installation of HVAC system Ceiling Diffusers and Ceiling Registers including volume dampers and mounting frames to match the ceiling types on the Project.

5. The installation of all supply, return, exhaust and fresh air ductwork for the entire Project including manual volume dampers, fire dampers, combination fire / smoke dampers, duct hangers and supports, seismic restraints, sleeves, inserts and anchors, and all other required appurtenances for all new HVAC systems installed under the scope of work for this Division.

6. The installation of all duct lining, duct and pipe insulation including all rigid inserts, weather covers and water sealing.

7. The installation of condensate drain piping as detailed herein including valves, fittings, and piping specialties.

8. The preparation and submission of complete Shop Drawings for all equipment and materials installed under the scope of work for all disciplines specified under Division 15.

9. The installation of all Equipment Identification as specified herein.

10. The complete Air Test and Balancing for all HVAC systems installed in the scope of the Project by an Independent Test and Balance Contractor.

11. The complete air pressure and soap testing of all natural gas piping installed in the scope of this project.

12. The preparation and submission of complete Written Operating and Maintenance Instructions for all equipment and accessories installed in the scope of this Project for each discipline under Division 15.

13. The preparation and submission of complete Record Drawings for all work installed under Division 15.

14. The preparation and submission of One (1) Year Written Guarantee in a form as stipulated in Division 1 – General Requirements.

15. The Scope of Work for Division 15 shall be coordinated with the scope of work with all other Divisions included in the Project Contract Documents and Specifications.

16. All existing conditions and dimensions shall be verified in the field prior to the fabrication and installation of any new work for Division 15.

1.4 WORK SPECIFIED ELSEWHERE

A. Concrete, Architectural Sheet Metal, Doors and Exterior Wall Louvers, Painting and Patching, Sawcut and Coring, and Electrical.

1.5 SITE INSPECTION

A. The Contractor shall visit the project site prior to submitting a bid and thoroughly familiarize himself with the existing conditions that impact the new work. By the act of submitting a bid, the successful contractor accepts all existing conditions under which he will be required to perform the scope of work indicated on the Contract Documents and specifications of Division 15.

B. No change order allowance will be made due to the bidding Contractor failing to comply with Paragraph “A” above.

1.6 ORDINANCES, REGULATIONS AND CODES

A. References to Technical Societies, Trade Organizations, Governmental Agencies is made in Division 15 in accordance with the following abbreviations:

AFI - Air Filter Institute
AMCA - Air Moving & Conditioning Association
ARI - Air Conditioning & Refrigeration Institute
ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME - American Society of Mechanical Engineers
ASTM - American Society of Testing Materials
AWSC - American Welding Society Code
ANSI - American National Standards Institute B31.1, “Code for Pressure Piping”
CBC - California Building Code, latest approval edition
CCR - California Code of Regulations, latest approval edition
CEC - California Electrical Code, latest approval edition
CFC - California Fire Codes, latest approval edition
CMC - California Mechanical Code, latest approval edition
CPC - California Plumbing Code, latest approval edition
DSA - Division of the State Architect
FIA - Factory Insurance Association
NAFM - National Association of Fan Manufacturers

NEMA - National Electrical Manufacturer's Association
NFPA - National Fire Protection Association, latest approval edition
ORS - Office of Regulatory Services
SCAQMD - South Coast Air Quality Management District
SMACNA - Sheet Metal and Air Conditioning Contractors National Association
UFC - Uniform Fire Code, latest approval edition
UL - Underwriter's Laboratories, Inc. Publications
UPC - Uniform Plumbing Code

B. Requirements of Regulatory Agencies: Materials and installation shall comply with applicable local, state, and national codes and ordinances. Rulings and interpretations of the enforcing agencies shall be considered as part of the local codes. No change orders shall be permitted for furnishing items required by the local codes but not specified or shown on the drawings.

C. Codes and Standards:

1. CBC and Los Angeles Amendments (California Building Code - Part 2, Title 24, CCR).

2. CMC and Los Angeles Amendments (California Mechanical Code - Part 4, Title 24 CCR).

3. CPC and Los Angeles Amendments (California Plumbing Code - Part 5, Title 24 CCR).

4. Uniform Fire Code with State and Los Angeles Amendments (California Fire Code - Part 9, Title 24 CCR).

5. National Fire Protection Association's - National Fire Code.

D. Nothing in these drawings and specifications is to be construed to permit work in violation thereof. Ordinances, regulations and codes are to be construed as minimum requirements.

E. The responsibility of the Mechanical Engineer shall be to provide Construction Observation to determine the Contractor’s performance relative to the obligations of the Contract Documents and specifications for Division 15. The responsibility of the Mechanical Engineer does not include determining the adequacy of the Contractor’s safety measures in, on, or near the Project Construction Site. The installing contractor assumes full and total responsibility for all safety measures required for the project construction for the duration of the project.

F. Ventilating, refrigeration and electrical equipment and appliances are required to be approved by the Underwriters' Laboratories, Inc., or other nationally recognized testing agency and installed per the testing agency's specifications.

1.7 PERMITS, FEES AND INSPECTIONS

A. Obtain and pay for all necessary permits, fees, assessments, complimentary drawings, required by any legally constituted public authorities having jurisdiction.

1.8 DRAWINGS AND SPECIFICATIONS

A. The Mechanical Engineer’s decision will be final on interpretation of the Drawings and Specifications.

B. The Drawings and Specifications are complimentary. Any work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both.

C. Where codes, standards, drawings or specifications are in conflict, the most stringent requirement shall prevail.

D. Alternate support or seismic restraint details shall have prior approval in writing by the Mechanical Engineer. The Contractor shall be responsible for obtaining all agency approvals without any additional cost or time compensation to the Contract and without any time penalty on the work schedule.

1.9 SUBMITTALS

A. Comply with pertinent provisions of SUBMITTALS Section 01330 of DIVISION 1 - GENERAL REQUIREMENTS of these Specifications.

B. Within thirty (30) days after the award of Contract and prior to executing any fabrication or installation, the Contractor shall prepare and submit to the Mechanical Engineer for review and approval, complete Division 15 Shop Drawings and Submittals for the Project. This shall include HVAC and Plumbing disciplines under the scope of Division 15.

C. All submittals shall be bound in a neat ring type binder form and shall contain a complete list, in index form for all equipment and materials proposed for use on the Project. All submittals shall be complete as one package and submitted at one time. Partial or incomplete submittals will not be reviewed and will be returned to the Contractor rejected for re-submittal.

D. All information contained in the Submittals and Shop Drawings shall be properly identified by reference number to the item number of paragraphs in the Contract Specifications and Drawing Equipment Schedules. Any deviation or substitution shall be clearly identified on the submittal page and noted as such.

E. All Equipment or materials fabricated or installed prior to obtaining the Mechanical Engineers Shop Drawing and Submittal review and approval are at the Contractors own risk. The Contractor, at his own expense, shall be responsible for correcting and / or removing all work installed or fabricated prior to obtaining Shop Drawing and Submittal approvals.

F. The Contract Documents and Specifications specify and detail equipment and materials deemed the most suitable for the service anticipated. This is not to preclude other products are equally as good and efficient. The Contractor shall prepare the Project Division Bid on the basis of the equipment and materials specified for the purpose of determining the Project Division low Bid. The awarding of the Contract shall constitute a contractual obligation to furnish the specified basis of design equipment and materials or listed equals.

G. After the execution of the Contract, should the Contractor desire to substitute equipment other than that specified in the Contract, such a substitution shall be considered for one reason only – the equipment proposed for substitution is superior in construction and efficiency to that specified herein.

H. In the event the Contractor obtains the Mechanical Engineer’s approval for equipment other than that described herein, the Contractor shall, at his own expense, make all required changes in the supporting structures, buildings, related trade costs, and piping necessary to accommodate the substituted equipment. Complete Record Drawings shall be furnished to the Mechanical Engineer indicated all details of the installation.

I. The following list is the minimum Shop Drawing and Submittal package that the Contractor shall prepare and submit to the Mechanical Engineer for review and approval. The Project Shop Drawings and Submittals shall be complete in every aspect as described in the paragraphs above. Partial or incomplete submittals will not be reviewed and will be returned to the Contractor rejected for re-submittal.

1. The installing Contractor shall prepare and submit for approval the following Shop Drawing and Submittal package as part of the Scope of Work for Division 15, HVAC, Plumbing, and Fire Protection:

a. Prepare prior to fabrication and installation, complete field coordinated installation Shop Drawings for each discipline included in Division 15 Scope of Work in this Project.

b. All Shop Drawings shall be prepared using the manual drafting method or using AutoCAD Release 14. Contractor submitted hand sketches are not acceptable and will be returned to the installing Contractor rejected.

c. All Shop Drawings prepared by the Contractor shall be prepared in ¼ -inch or ½ -inch scale. No exceptions.

d. One (1) original tracing and two (2) blueprints of the Contractor prepared Shop Drawings shall be submitted to the Mechanical Engineer for review and approval. At the completion of the Mechanical Engineer's review the original tracing will be returned to the Contractor with review comments noted.

e. The Contractors Shop Drawings shall detail all equipment and piping systems including installed dimensions and elevations. All Shop Drawings shall be complete in every respect prior to submittal to the Mechanical Engineer.

f. The re-use of the Mechanical Engineer's construction drawings for the preparation of the installing Contractors Field Shop Drawing Submittal is not acceptable.

g. It shall be the responsibility of the installing Contractor to submit copies of the final approved and coordinated Field Shop Drawings to all other trades for coordination with their work so that grouped pipes, ducts, and conduit will not interfere with each other.

2. Submit complete HVAC equipment and accessory submittals for each and every piece of equipment installed on the Project including:

   a. Packaged Gas Heat / Electric Cool Air Conditioning Units – supply fan data, economizer data, dimensioned arrangement drawings, air aide performance data, gas heating performance data, refrigeration system tonnage and performance data, motor horsepower(s), voltage, and factory supplied accessories.

   b. Exhaust Fans Systems – complete manufacturer computer selections, dimensioned arrangement drawings, fan curves and motor horsepower, voltage, and factory supplied accessories.

3. Submit complete HVAC ductwork and accessory submittals for all systems installed on the Project including:

   a. Supply, return, exhaust, and fresh air ductwork including rectangular duct gauges and joint methods, round duct type, duct gauge, and joint methods, duct fittings – rectangular and round, duct joint sealing method, supports and seismic bracing details.
   b. Duct system appurtenances including fire damper assemblies, fire / smoke damper assemblies, manual volume dampers – round and rectangular ducts, flexible ductwork, register boxes, turning vanes, housings and plenums, roof flashing, and duct instrument test ports.
   c. Air distribution products including supply diffusers, return / exhaust registers, mounting frames, and manual dampers.

   d. Duct insulation and duct liner including proposed thickness, RValue for each type, manufacturer & model and installation methods.

   e. Ductwork vibration isolation including fabric connections at each unit or where passing through building seismic separations where specified herein.

4. Submit complete HVAC, Plumbing and accessory submittals for all systems installed on the Project including:

    a. Complete piping submittals including piping material – schedule & type and ASTM grade, pipe fittings - type and ASTM grade, joint methods, supports and seismic bracing details.

    b. Piping system appurtenances and accessories including each type of valve(s), – grade, rating, catalog number and manufacturer.

    c. Piping system specialties including thermometers with separable wells, pressure gauges, automatic air vents, Pete's Plugs, circuit balancing valves, strainers, check valves, plug cocks, and butterfly valves.

    d. Piping system expansion loops including joint type – manufacturer, material & duty, pipe guides and anchors – manufacturer & model number, material, duty and expansion calculations.

    e. Piping system flow or temperature measuring taps – quantity and type, coordinated with Division 13800.

    f. Pipe insulation including proposed thickness, R-Value for each type, rigid inserts, manufacturer & model and installation methods.

    g. Piping vibration isolation including flex connections at each unit or where passing through building seismic separations where specified herein.

    h. Piping installation appurtenances including sleeves, fireproofing, caulking, waterproofing, roof flashing and escutcheons.

5. Submit complete Plumbing and accessory submittals for all systems installed on the Project including:

    a. Complete fixture submittal including manufacturer & model number, fixture carrier manufacturer & model number, fixture faucets set(s), trim & supplies.

    b. Complete Plumbing system specialties including backflow preventer, clean-outs – floor and wall, hose bibbs, pipe isolators, water hammer arrestor(s), and access panel(s).

    c. Provide complete domestic piping submittals as detailed in item #4 – a thru h above.

1.10 RECORD DRAWINGS AND MANUALS

A. Comply with pertinent provisions of SUBMITTALS Section 01783 of DIVISION 1 - GENERAL REQUIREMENTS of these Specifications.

B. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Mechanical Engineer and City.

C. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.

D. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.

E. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.

F. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required for each piece of equipment installed under Division 15.

G. Contents: Each manual shall have an index listing the contents. Information in the manuals shall include not less than:

1. General introductions and overall equipment description, purpose, functions and simplified theory of operation.

2. Specifications

3. Installation instructions, procedures, sequences, and precautions, including tolerances for level, horizontal and vertical alignment.

4. Grouting requirements.

5. List showing lubricants for each item of mechanical equipment and recommended lubrication intervals.

6. Start-up and beginning operation procedures.

7. Operational procedures.

8. Shutdown procedures.

9. Maintenance and calibration procedures

10. Parts lists

11. Name, address and telephone number of each manufacturer's local representative.

H. Manual Submittals: Unless otherwise specified, each submittal shall include two (2) copies of each manual, one of which will be returned to the Contractor, marked to show the required review. When approved, deliver four copies to Architect unless otherwise specified. Manuals shall be bound in ring type binder. Refer to 1.9 for specific requirements.

1.11 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP

A. Unless otherwise specified, equipment and materials used in the installation shall be new and in perfect condition when installed. Articles provided for the same general purpose or use shall be of the same make. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. Furnish the services of an experienced superintendent, who shall be constantly in charge of the work, and who will remain on the project through completion together with all necessary journeymen, helpers and laborers required.

1.12 SEISMIC DESIGN

A. Contractor shall be responsible for anchors and connections of mechanical work to the building structure including calculations for approval by the Mechanical Engineer for items or work, where alternate support or anchorage detail is proposed to prevent damage as a result of an earthquake, including manufactured equipment, the connection and integrity of shop fabricated and field fabricated materials and equipment. The anchorage of all pipes, ducts, conduits, fixtures, equipment, etc. shall withstand the lateral forces and shall accommodate calculated building displacement as required by the California Building Code, and local city/county codes.

Building equipment and connections therefore shall be designed to resist lateral seismic forces equal to 1.0 of equipment weight to working allowable stress. Cantilever posts supporting equipment shall be designed to resist lateral seismic forces equal to 0.5 of equipment weight to allowable working stress. Conform to the following:

1. All mechanical equipment seismic anchorage shall conform to C.C.R. Title 24, 1998 CBC Section 1632A and Table 16A-0. Anchorage details for roof/floor mounted equipment shall be as shown on plans.

1.13 SUBSTITUTIONS AND CHANGES

A. Comply with pertinent provisions of Section 01630 SUBSTITUTIONS AND "OR EQUAL SUBMITTAL of DIVISION 1 - GENERAL REQUIREMENTS of these Specifications.

B. The provisions of this clause shall override those contained in 01630 SUBSTITUTIONS AND "OR EQUAL SUBMITTAL.

C. The Mechanical Engineer will consider formal written requests for the substitution of products in place of those products specified only if these are submitted with the Bid for evaluation and in accordance with all conditions specified hereafter.

D. Requests for substitutions after the award of Contract shall be considered only in the case of product unavailability. Product unavailability shall be verified in writing by the manufacturer. Verbal requests are not acceptable.

E. Submit separate request for each substitution at the time of Bid in the event of non-availability of the item included in the Bid. Each substitution request shall include:

1. Complete data substantiating compliance of the proposed substitution with all requirements stated in the project Contract Documents.

2. Submit complete data for the proposed substitution as it relates to changes in the project construction schedule.

3. Submit complete data for any effect of the proposed substitution on other Work in Division 15 and other Divisions, any other related Contracts, and any changes required in other work or products.

F. The Contractor shall be responsible at no extra cost to the City for any and all changes resulting from the proposed substitutions which affect the work of other Sections, Divisions, or related Contracts.

G. Claims for additional costs caused by the substitution which may subsequently become apparent shall be met by the Contractor.

H. Substitutions will not be considered for acceptance when the acceptance will require substantial revision of the Contract Documents, unless the Contractor bears the cost of the redesign.

I. Where any redesign of the Work of division 15 or other Work is required due to the substitution, arrangement or equipment layout other than herein specified or shown, the Contractor shall:

1. Arrange for the required redesign by the Architect and Mechanical Engineer.

2. Pay all costs associated with the redesign.

J. Substitute products shall not be ordered or installed without prior written approval / acceptance by the Mechanical Engineer through the Architect.

K. The Mechanical Engineer shall have sole discretion to determine the acceptability of the proposed substitutions and reserves the right to reject any such substitution.

L. Approval of any substitutions shall not relieve the Contractor from full compliance with the requirements of the Contract Documents.

1.14 APPROVALS

A. The Mechanical Engineer will have the right to accept or reject equipment, materials, workmanship, tests and determine when the Contractor has complied with the requirements herein specified.

1.15 SELECTION AND ORDERING OF EQUIPMENT AND MATERIALS

A. Immediately after award of the Contract and after the approval of submittals by the Mechanical Engineer, the Contractor shall arrange for the purchase and delivery of equipment and materials required, in ample quantities and at a time coordinated with the project management schedule. He shall deliver to the City a complete list of equipment and materials ordered, giving descriptions, plate numbers, brochures, name of the wholesalers, date of the orders and approximate delivery dates.

1.16 LOCATIONS AND ACCESSIBILITY

A. Drawings show pipe and ductwork diagrammatically. Conform to Drawings as closely as possible in layout work. Vary run of piping, run and shape of ductwork and make offsets during progress of work as required to meet structural and other interferences as approved by the Mechanical Engineer. Install piping and ductwork to best suit field conditions after coordinating with other trades. Run all piping and ductwork parallel to, or at right angle to, building walls. Keep horizontal lines as close to bottom of structures as possible. Conform to ceiling heights established on Drawings.

B. Install equipment in such a manner as to be readily accessible for maintenance and repairs. Install piping, ducts and conduit in such a manner as to preserve headroom, avoid obstructions and keep openings and passageways clear.

C. Installation of valves, thermometers, gauges, cleanouts, dampers, controls, water specialties, duct access doors or any other indicating equipment or specialties requiring reading, adjustment, inspection, maintenance shall be conveniently and accessibly located with reference to the finished building.

D. Where wall and ceiling access doors are required but not shown, such doors shall be furnished under other sections and as directed by the Architect. Coordinate this requirement with appropriate trade.

E. If changes in the indicated locations or arrangements are required, they shall be made without additional charges.

F. In an existing area, where required, remove, reinstall, reconnect or replace, etc., any existing work to accommodate new work without any additional cost to the City. Material shall match existing, unless otherwise specified or approved in writing by the Architect.

1.17 COORDINATION OF TRADES

A. Contractor shall coordinate with all trades in the interest of obtaining the most practical overall arrangement of equipment, piping, conduit, and ducts and to maintain maximum headroom and accessibility.

B. No extras will be allowed for changes made necessary by interference between trades.

C. Submit Composite Drawings; include dimensioned plans, elevations, sections and details and give complete information particularly as to the kinds and types of materials and equipment, size and location of sleeves, inserts, attachments, chases, openings, conduits, ducts, boxes, lighting, structural interferences. Coordinate these Composite Drawings and field layouts in the field for proper relationship to work of applicable trades based on field conditions. Contractor shall have competent personnel readily available for coordinating, checking, and supervision of field layouts. The procedures for submittals and resubmittals, and final distribution shall be as specified in Section 01300. Do not start installation of work involved under Composite Drawings until applicable submittal is reviewed by the Architect. Discrepancies between the Drawings and Composite Drawings shall be specifically noted and identified on the Composite Drawings. Drawings for the various trades involved shall be submitted as required and reviewed prior to preparation of Composite Drawings.

1. Equipment Foundations and Bases: Furnish certified details and drawings for approval before fabrication. Furnish parts necessary for each foundation sub base and support.

2. Pipe Sleeves and Inserts: Furnish and install pipe sleeves and pipe support inserts before concrete is poured.

3. Roof, Wall and Floor Openings: Furnish Shop Drawings showing exact locations and sizes of openings through roofs, walls and floors.

4. Concrete: Conform to Concrete Section of the Specifications.

1.18 GUARANTEES

A. Contractor shall guarantee workmanship, equipment and materials installed under this contract for a period of not less than one (1) year from the date of Final Field Acceptance of the project as evidenced by the issuance of a “Statement of Completion” by the Contract Administration Inspector . Should any defects occur during this period, the Contractor shall promptly repair or replace the defective item and any other damage caused to the building free of charge to the City, including cost of labor and materials.

B. Guarantee included in this section to cover:

1. Faulty or inadequate design.

2. Improper assembly or erection.

3. Defective workmanship or material.

4. Incorrect or inadequate operation or other failure.

C. Contractor shall guarantee the complete and perfect operation of the entire system and that equipment will be supported in such a way as to be free of objectionable vibration and noise.

D. Furnish the parts and labor to replace any items found to be defective in the refrigeration equipment within the guarantee period.

E. In addition to other guarantees, furnish maintenance for all the refrigeration equipment, including replacement of refrigerant and oil, for a period of one (1) year. This shall include regular monthly maintenance and "On Call" service. Identify this cost as a separate line item in the project bid.

F. For equipment bearing a manufacturer's warranty in excess of one (1) year, furnish a copy of the warranty to the City of Los Angeles, who shall be named as beneficiary.

1.19 PROTECTION OF EQUIPMENT AND MATERIALS

A. Provide adequate storage facilities at a location designated by the Construction Manager for all equipment and materials on the site and make provisions to protect such materials and equipment from damage.

1.20 CLOSING-IN OF UNINSPECTED WORK

A. Contractor shall not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Project Inspector. Should any of work be covered up or enclosed before such inspection and test, the Contractor shall at no cost to the City, uncover the work and after it has been inspected, tested, and approved, make repairs with such materials as may be necessary to restore work to its original and proper condition.

1.21 BUILDING FOOTING CLEARANCES

A. Under no circumstances shall pipes, ducts, or conduits penetrate footings. They shall cross below footings or through sleeves above footings. As approved by the Structural Engineer those running parallel to footings shall have the minimum clearance from the cone of influence indicated on the Structural Drawings or as required by Code.

1.22 DAMAGE BY LEAKS

A. Contractor shall be responsible for all damage to any part of the premises caused by rain leaks through or around ducts or pipes, leaks or breaks in piping, equipment or fixtures furnished or installed by him for a period of one (1) year from the date of Substantial Completion.

1.23 EQUIPMENT LABELS

A. Equipment provided under this Section shall be provided with the manufacturer's metal identification labels attached to each individual piece of equipment showing complete performance characteristics, size, model and serial number.

1.24 EXCAVATION, TRENCHING AND BACKFILLING

A. Excavating, trenching and backfilling for utilities within the building area shall be done in conformity with Division 2. Piping shall be installed promptly after excavation in order to keep the trenches open as short a time as possible.

B. Excavating, trenching and backfilling for utilities outside the building area shall be done in conformity with Division 2.

C. Any existing underground piping and conduit that is encountered shall be properly shored and protected from damage. Active piping shall be left intact and undamaged.

1.25 PRELIMINARY OPERATION

A. Should the City request that any portion of the plant, apparatus, or equipment be operated for the City's beneficial use prior to the final completion and acceptance of the work, the Contractor shall conform to the requirements of the General Conditions. Such operation shall be under the supervision and direction of the Contractor. Such preliminary operation shall not be construed as an acceptance of any of the work.

1.26 ELECTRICAL WORK

A. Coordinate with Division 16 in making the line and low voltage electrical connections and be responsible for the operation of the equipment furnished under this section.

B. Voltage for electrical work will be included in Division 16. However, any control wiring which is required that is not shown on the control diagram shall be as described under this Section. In the event that the Contractor chooses to provide equipment which requires extra expense in the power or control wiring, he shall pay additional electrical costs.

C. Safety switches, starters, circuit breakers, and the electrical connections of mechanical equipment to the electrical power service shall be provided under Division 16.

D. Interconnecting wiring, safety switches, relays, controllers and motor starters which are integral components of packaged equipment shall be provided as an integral part of that equipment.

E. All interconnecting power wiring and conduits shall be provided by Division 16.

F. Control wiring shall be provided by Division 15, unless otherwise indicated on the drawings.

G. Conduit for control wiring shall be provided by Division 16.

1.27 YEAR 2000 COMPLIANCE, WARRANTY, IDEMNIFICATION

A. All equipment, hardware, software and firmware product delivered under this Contract shall be able to accurately process date/time data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-fist centuries, and the years 1999 and 2000, and leap year calculation to the extent that other information technology, used in combination with the information being acquired, properly exchanges date/time date with it.

B. The Contractor represents and warrants that all equipment, hardware, software, and firmware product delivered under this Contract shall be able to accurately process date/time data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-fist centuries, and the years 1999 and 2000, and leap year calculation to the extent that other information technology, used in combination with the information being acquired, properly exchanges date/time date with it.

C. If the Contract requires that specific listed products must perform, as a system in accordance with the foregoing warranty then the warranty shall apply to those listed products as a system.

D. The duration of this warranty and the remedies available to the City for breach of this warranty shall be defined in, and subject to, the terms and limitations of the Contractor's standard commercial warranty or warranties contained in this Contract, provided that notwithstanding any provision to the contrary in such commercial warranty or warranties, the remedies available to the City under this warranty shall include the repair or replacement of any product whose non-compliance is discovered and made known to the Contractor in writing within one (1) year after acceptance.

E. Nothing in this warranty shall be construed to limit any rights of remedies the City may otherwise have under this Contract with respect to defects other than Year 2000 performance.

F. In addition to the remedies available in this Section, and elsewhere in the Contract, the Contractor shall indemnify, defend and hold the City harmless from and against any and all liability, losses, claims, damages, costs and expenses, including legal fees sustained or incurred by reason or failure of any of the equipment, hardware, software or firmware product to be delivered under this Contract to be Year 2000 compliant.

PART 2 - MATERIALS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

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SECTION 15020
NOISE, VIBRATION AND SEISMIC CONTROL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. This section includes the minimum control requirements for noise, vibration and seismic forces for piping, ductwork, and equipment.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 11000 Equipment General Provisions.

2. Section 15770 Pipe Supports and Mechanical Joint Restraints.

1.3 REFERENCED PUBLICATIONS

A. The following publications form a part of this specification to the extent indicated by the references thereto:

1. Acoustical Society of America publication ASA 47, Sound Level Meters.

2. American Society of Mechanical Engineers publication PTC 36, Measurement of Industrial Sound.

3. ANSI S1.2, Physical measurement of Sound.

1.4 SUBMITTALS

A. Submittals shall conform to Section 11000, Equipment General Provisions, and shall also contain the following:

1. Complete itemized listing of the ductwork, piping and equipment to be isolated, the isolator type, manufacturer and model numbers selected, isolator loading and deflection, wire diameter and number of coils in springs and a reference to the specific drawings indicating items to be isolated and isolator details.

2. Shop drawings of each type of isolation detail required, including catalog cuts and data sheets for each type of isolator and isolation material.

3. Torsional and lateral vibration analysis shall be provided for each item of the following listed equipment. The analysis shall be performed, stamped, and signed by a mechanical engineer registered in the state of California and experienced in this type of work. The submittal shall be approved by the ENGINEER prior to fabrication of equipment.

a. Blowers and compressors with drives of 100 horsepower and over.

b. Steam turbine generator units.

c. Vertical pumps with universal joints and extended shafts.

d. Other equipment where specified.

4. The torsional natural frequency of the drive train must be avoided by 25 percent by any exciting frequency of the equipment, throughout the entire operating range. Provide documentation to support this requirement. Such documentation shall be based on calculations or shop tests.

5. Detailed description of equipment vibration field test procedures and equipment.

6. CONTRACTOR's certification of compliance to noise requirements for each item of equipment to be furnished on the project except equipment for which a factory noise test is performed.

7. Certified copies of factory noise tests on the Equipment Noise Data Sheets attached hereto.

8. Certified test reports for field noise tests and field vibration tests including detailed procedures and equipment used, test results, and required corrective action.

1.5 PROJECT REQUIREMENTS

A. Noise Restrictions and Control

1. Unless otherwise specified, the maximum permissible noise level for a complete piece of equipment located either within or outside a structure shall not exceed 85 dBA at 3 feet at any point. A complete piece of equipment includes the driver, driven equipment and all other attachments that may produce noise.

2. The CONTRACTOR shall certify that all equipment furnished under this contract shall not exceed 85 dBA at 3 feet under the conditions specified herein.

3. An “Equipment Noise Data Sheet“ (see Appendix “B” attached to this Section) shall be submitted to the ENGINEER for all equipment.

4. Certain items of equipment determined to be critical for noise control shall meet more stringent noise levels as specified in the individual equipment specification and shall be subject to factory and field tests as specified herein. These critical items of equipment include the following:

a. Fans/Blowers

b. Compressors

c. Other equipment where specified

B. Mechanical Vibration: Mechanical equipment, unless otherwise specified, shall operate at, or below, a peak amplitude vibration level of 0.0392 inches per second, defined as "GOOD" or better on the “General Machinery Vibration Severity Chart”, Appendix “A” of this Section. In no case shall peak amplitude vibration exceed the maximum allowable level recommended by the manufacturer, and approved by the ENGINEER.

C. Seismic Control:

1. Equipment Supports

Except where otherwise specified, all equipment supports, anchors and restrainers shall be suitable for a minimum seismic force of 0.3 of gravity in addition to static and dynamic loads and shall conform to UBC Seismic Zone 4 requirements.

2. Piping Supports

Where the piping system is subject to shock loads, such as seismic disturbances or thrusts imposed by the actuation of safety valves, hanger design shall include hydraulic shock suppressors, Grinnell Fig. 200, Basic Engineers Model BE4-10, or equal.

1.6 EQUIPMENT NOISE TESTS

A. Equipment Noise Levels: Noise level measurements shall be taken on complete pieces of equipment including the driver, driven equipment and all other attachments that may produce noise. The manufacturer's noise report shall clearly indicate the test conditions including equipment technical data and acoustic measurement procedures while conducting the test. These conditions shall also be the same when the equipment is installed at the jobsite. The A-weighted and octave band spectrum levels shall be required in these measurements. The measurements shall be performed at a 3 foot distance on an imaginary bounding surface around the equipment. The dimensions of these bounding surfaces and measurement locations must be clearly identified. Sufficient measurements shall be taken on all points around the equipment such that all directional radiation characteristics are identified. The tests shall be performed in an open space, or if not possible, then the test environment shall be clearly described.

B. Factory Test and Shipment of Equipment:

1. A noise test shall be performed at the factory on the items of equipment identified as critical for noise control. Where identical items of equipment are being furnished, one test will be satisfactory unless otherwise specified. The ENGINEER may be present to witness the test. The CONTRACTOR shall inform the ENGINEER at least two weeks in advance of the date and time of the noise test. The equipment shall not be shipped until the noise test is performed and the equipment meets the specified noise levels. If the tests show that the equipment exceeds the specified maximum permissible noise limits, the CONTRACTOR shall modify the equipment at no additional cost to the CITY until noise limits are met. The modifications to the equipment shall not interfere with routine operations and maintenance, and shall be acceptable to the ENGINEER. Additional tests shall be performed at the CONTRACTOR's expense until the specified noise levels are met.

2. The CITY shall be reimbursed by the CONTRACTOR for all costs of any required additional visits by the ENGINEER to witness subsequent tests.

C. Field Noise Test: A field noise test, as specified herein, shall be performed by the CONTRACTOR for all equipment furnished under this contract, or equipment furnished by the CITY for installation under this contract. After delivery and installation of the equipment, the CONTRACTOR, at his own expense, shall perform a field noise test in the presence of the ENGINEER, to demonstrate that the equipment meets the specified noise levels in the plant environment, including equipment furnished by the CITY. If the equipment furnished by the CONTRACTOR fails to meet the specified noise limits, the CONTRACTOR shall take the necessary steps to reduce the noise to the specified levels. All mitigation methods, design and procedures shall be acceptable to the ENGINEER. All costs of required mitigation for critical equipment will be paid by the CITY provided the equipment met the specified noise levels during the factory test. For noncritical equipment, where factory tests were not required, the costs of required mitigation to meet the specified noise levels shall be the responsibility of the CONTRACTOR.

D. Reporting of Equipment Noise Level Factory Tests:

1. All noise measurements shall be made in relation to a reference pressure level of 0.0002 microbar. The measurements shall be made with a Type I sound level meter per ASA 47.

2. All noise levels shall be reported on a copy of the “Equipment Noise Data Sheet” attached as Appendix “B” to this section. If the data sheet is not complete, including the manufacturer's guarantee clause, or if the noise level reported exceeds the maximum allowable noise level specified, it will be cause for rejection of the equipment.

PART 2 -- PRODUCTS

2.1 ISOLATORS FOR FLOOR MOUNTED EQUIPMENT

A. Type A: Double deflection neoprene mountings shall have a minimum static deflection of 0.35 inches. All metal surfaces shall be neoprene covered to avoid corrosion and have friction pads on both top and bottoms so they need not be bolted to the floor. Mountings shall be Type ND or rails Type DNR.

B. Type B: Spring type isolators shall be free standing and laterally stable without any housing and include 1/4-inch neoprene acoustical friction pads between the baseplate and the support. All mounting shall have valves leveling bolts rigidly bolted to the equipment. Spring diameters shall be not less than 80 percent of spring height at rated load. Springs shall have a minimum additional travel to solid equal to 50 percent of the rated deflection. Mounting shall be Type SLF.

C. Type C: Equipment with operating weight different from the installed weight shall be mounted on spring mountings with a housing that includes vertical limit stops to prevent spring extension when weight is removed. A minimum clearance of 1/2-inch shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operations. Mountings shall be Type SLR.

D. Type Y: Curb mounted rooftop equipment shall be mounted on vibration isolation bases that fit over the roof curb and under the isolated equipment. The aluminum top member shall overlap the bottom member a minimum of 2" inches to provide water runoff independent of the seal. The aluminum members shall house cadmium plated springs having a one-inch minimum deflection. Springs shall have a minimum additional travel to solid equal to 50 percent of deflection. Spring diameters shall be no less than 0.8 of the spring height at rated load. Wind resistance shall be provided by means of resilient snubbers in the corners with a minimum clearance of 1/4-inch. Bases shall consist of continuous closed cell sponge materials both above and below the base and a waterproof flexible neoprene connection joining the outside perimeter of the aluminum members.

E. Type Z: Requirements shall be similar to Type Y with the additional requirement that 80 percent of the weight of the equipment shall be taken by 4 springs having a minimum deflection of 3-1/2 inches that are sealed on steel bridging members passing over the top of the unit. These springs shall be cadmium plated. Springs shall be attached by means of one-inch threaded rods with clevises.

2.2 ISOLATORS FOR SUSPENDED EQUIPMENT

A. Type D: Vibration hangers shall contain a steel spring and a 0.3-inch deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 degree arc before contacting the hole. Hangers shall

be Type 30N. Springs shall have a minimum additional travel equal to 50 percent of the rated deflection.

B. Type E: Vibration hangers shall be similar to Type D but shall be precompressed to the rated deflection and be designed with a release mechanism to free the spring. Hangers shall be Type PC30N.

C. Type F: Hangers shall be similar to Type D except that the steel spring shall be located in a neoprene cup manufactured with a grommet and having a steel washer which will evenly distribute the load on the neoprene. Hangers shall be Type W30.

2.3 THRUST RESTRAINTS

A. Type X: Thrust restraints shall be provided for air handling equipment as specified. Each restraint shall include a spring element in series with a neoprene pad. The spring element shall allow for maximum 1/4-inch movement at start and stop. Horizontal restraints shall be symmetrical on either side of the equipment and shall be Type WB.

B. For earthquake protection, the spring mounts shall be furnished with rubber snubbers, or all restraints shall be designed based on the acceleration levels of 0.5g in any horizontal direction and 0.4g in any vertical direction as applied at the center of gravity, and shall conform to UBC Seismic Zone 4 requirements.

2.4 MANUFACTURERS:

A. Mason Industries, Inc.

B. Korfund Dynamics Corporation

C. Consolidated Kinetics Corporation;

D. Or Equal.

Note: The isolator types referred to in the previous paragraphs refer to Mason Industries designations.

PART 3 -- EXECUTION

3.1 PENETRATION ISOLATION

A. For piping and ductwork isolation, penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork, and maintain a minimum of 3/4-inch and maximum of 1-1/4-inch clearance around the outside surfaces. This clearance space shall be tightly packed with glass fiber, and caulked airtight. All penetrations through fire rated walls, soffits, or floors shall be fitted with an approved firestop assembly.

3.2 INSTALLATION OF ISOLATORS AND APPURTENANCES

A. Isolators and appurtenances shall be installed in accordance with the approved shop drawings and the manufacturer's recommended installation instructions.

3.3 EQUIPMENT VIBRATION TESTS

A. Field vibration tests shall be conducted at no additional cost to the CITY on specified items of equipment, or for which a torsional and lateral vibration analysis are required. Field vibration tests shall be performed under the direction of the ENGINEER who prepared the torsional and lateral vibration analysis. Tests should conform to the approved procedures based on applicable ANSI, ASA and ASME standards. If the vibration exceeds the specified requirements, corrective measures and retesting shall be provided at no additional cost to the CITY until the specified requirements are achieved.

B. The ENGINEER may direct vibration tests on certain items of equipment in addition to those specified above. Such tests shall be performed by the CONTRACTOR at the CITY's expense unless the equipment fails to meet the specified requirements, in which case the costs for said test and any retests shall be borne by the CONTRACTOR.

* * * * *

(SEE ATTACHMENTS)

APPENDIX "A"
GENERAL MACHINERY
VIBRATION SEVERITY CHART

APPENDIX "B"
EQUIPMENT NOISE DATA SHEET

APPENDIX B
Equipment Noise Data Sheet
Pg 1 of 2
[Environmental Engineering Division, Bureau of Engineering]

A. EQUIPMENT DESCRIPTION:

General Description of Equipment:_____
_____
Manufacturer:_____ Model No.:_____
Is equipment connected to other equipment?: ___Yes ___No
If Yes, explain:_____
Overall Dimensions (LxWxH): _____ Weight:_____

Attach technical specifications of this equipment. Include where applicable: power and heat consumption, power output, speed, efficiency, duty cycle, other relevant information, and catalog cuts.

Materials of Construction: _____
Comments regarding operation:

B. NOISE DATA:

Complete the following table with sound pressure levels (SPL) based on measurements made at three feet from bounding surfaces according to ANSI S1.2, Physical Measurement of Sound.

List SPL from equipment only. If data includes noise from other equipment, clearly state and complete an additional table for the other equipment.

NOISE DATA TABLE: SPL in dB re 20.0 Micro Pascal

Octave Band Center Freq. in Hertz	Standard Equipment	Special Design	Acoustic Treatment	Maximum Allowable Noise Per System
63	_____	_____	_____	_____
125	_____	_____	_____	_____
250	_____	_____	_____	_____
500	_____	_____	_____	_____
1000	_____	_____	_____	_____
2000	_____	_____	_____	_____
4000	_____	_____	_____	_____
8000	_____	_____	_____	_____
A-Weighted				85

Noise measurements were taken in: ___open area; ___reverberant space; ___ semi-reverberant space; ___other
(explain):_____
_____

Describe Special
Design:_____
_____
_____

Describe Acoustic
Treatment:_____
_____
_____

State loading condition (speed, output, etc.) during test: _____
_____

Test Performed By:_____ _____ _____ Date:_____
Printed Name Signature

Test Witnessed By:_____ _____Date:_____
Printed Name Signature

C. MANUFACTURER'S GUARANTEE:

The manufacturer guarantees that the noise levels provided above under the stated conditions, shall not be exceeded when the equipment is installed and commissioned at the operating site.

Guaranteed By: _____ _____ Date:_____
Printed Name Title

_____ _____Date:_____
Signature

SECTION 15050
BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Division 15 Sections.

1. Piping materials and installation instructions common to most piping systems.

2. Concrete equipment base construction requirements.

3. Equipment nameplate data requirements.

4. Field-fabricated metal and wood equipment supports.

5. Installation requirements common to equipment specification sections.

6. Cutting and patching.

7. Touch-up painting and finishing.

B. Pipe and pipe fitting materials are specified in piping system Sections.

1.3 DEFINITIONS

A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.

B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

F. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

B. Product data for following piping specialties:

1. Mechanical sleeve seals.

2. Identification materials and devices.

C. Samples of color, lettering style, and other graphic representation required for each identification material and device.

D. Shop drawings detailing fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

E. Coordination drawings for access panel and door locations.

F. Prepare coordination drawings according to Division 1 Section Submittals" to a 1/4 inch equals 1 foot scale or larger. Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Show where sequence and coordination of installations are important to the efficient flow of the Work. Include the following:

1. Proposed locations of piping, ductwork, equipment, and materials. Include the following:

a. Planned piping layout, including valve and specialty locations and valve stem movement.

b. Planned duct systems layout, including elbows radius and duct accessories.

c. Clearances for installing and maintaining insulation.

d. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.

e. Equipment service connections and support details.

f. Exterior wall and foundation penetrations.

g. Fire-rated wall and floor penetrations.

h. Sizes and location of required concrete pads and bases.

2. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

3. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

4. Reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.

G. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" Article of this Section.

1.5 QUALITY ASSURANCE

A. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

B. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

C. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces.

G. Coordinate installation of identifying devices after completion of covering and painting, where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual piping system specification Sections in Division 15 for special joining materials not listed below.

B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, except where thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125 cast-iron and cast-bronze flanges.

b. Narrow-Face Type: For raised-face, Class 250 cast-iron and steel flanges.

2. ASME B16.20 for grooved, ring-joint, steel flanges.

3. AWWA C110, rubber, flat face, 1/8-inch thick, except where other thickness is indicated; and full-face or ring type, except where type is indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is indicated.

D. Solder Filler Metal: ASTM B 32.

E. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon steel bolts and nuts.

F. Couplings: Iron body sleeve assembly, fabricated to match outside diameters of plain-end, pressure pipes.

1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47, Grade 32510 or ASTM A 536 ductile iron.

3. Gaskets: Rubber.

4. Bolts and Nuts: AWWA C111.

5. Finish: Enamel paint.

G. Copper tubing:

1. Joining for copper pipes 4 - inch and smaller; no lead, City of Los Angeles (approved type) for all copper pipe above ground under.

2. Sil-Fos silver alloy for pipe underground and for piping above ground having a continuous street main pressure of 100-lbs or more.

3. Wire solder only; paste mixed solder not permitted.

H. Flux: As recommended by manufacturer of solder.

2.3 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type, where required to conceal protruding fittings and sleeves.

1. Inside Diameter: Closely fit around pipe, tube, and insulation of insulated piping.

2. Outside Diameter: Completely cover opening.

3. Cast Brass: One-piece, with set-screw.

a. Finish: Rough brass.
b. Finish: Polished chrome plate.

4. Cast Brass: Split casting, with concealed hinge and set-screw.

a. Finish: Rough brass.
b. Finish: Polished chrome plate.

B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.

2. Insulating Material: Suitable for system fluid, pressure, and temperature.

3. Dielectric Unions: Factory-fabricated, union assembly, for 250 psig minimum working pressure at 180 deg F temperature.

4. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300 psig minimum pressure to suit system pressures.

5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.

6. Dielectric Couplings: Galvanized-steel coupling, having inert and non-corrosive, thermoplastic lining, with threaded ends and 300 psig minimum working pressure at 225 deg F temperature.

7. Dielectric Nipples: Electroplated steel nipple, having inert and non-corrosive, thermoplastic lining, with combination of plain, threaded, or grooved end types and 300 psig working pressure at 225 deg F temperature.

C. Mechanical Sleeve Seals: Modular, watertight, mechanical type. Components include interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve. Connecting bolts and pressure plates cause rubber sealing elements to expand when tightened.

D. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet-Metal: 24 gage or heavier, galvanized sheet metal, round tube closed with welded longitudinal joint.

2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.

3. Cast-Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, having plain ends and integral water stop, except where other features are specified.

4. Wall Penetration Systems: Wall sleeve assembly, consisting of housing, gaskets, and pipe sleeve, with 1 mechanical-joint end conforming to AWWA C110 and 1 plain pipe-sleeve end.

a. Penetrating Pipe Deflection: 5 percent without leakage.

b. Housing: Ductile-iron casting having waterstop and anchor ring, with ductile-iron gland, steel studs and nuts, and rubber gasket conforming to AWWA C111, of housing and gasket size as required to fit penetrating pipe.

c. Pipe Sleeve: AWWA C151, ductile-iron pipe.

d. Housing-to-Sleeve Gasket: Rubber or neoprene, push-on type, of manufacturer's design.

5. Cast-Iron Sleeve Fittings: Commercially-made, sleeve having integral clamping flange, with clamping ring, bolts, and nuts for membrane flashing.

a. Underdeck Clamp: Clamping ring with set-screws.

2.4 IDENTIFYING DEVICES AND LABELS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 15 Sections. Where more than single type is specified for listed application, selection is Installer's option, but provide single selection for each product category.

B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.

2. Location: An accessible and visible location.

C. Stencils: Standard stencils, prepared for required applications with letter sizes conforming to recommendations of ASME A13.1 for piping and similar applications, but not less than 1-1/4-inches-high letters for ductwork and not less than 3/4-inch-high letters for access door signs and similar operational instructions.

1. Material: Fiberboard.

2. Material: Brass.

3. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.

4. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ASME A13.1 for colors.

D. Plastic Duct Markers: Manufacturer's standard laminated plastic, color coded duct markers. Conform to following color code:

1. Green: Cold air.

2. Yellow: Hot air.

3. Yellow/Green: Supply air.

4. Blue: Exhaust, outside, return, and mixed air.

5. For hazardous exhausts, use colors and designs recommended by ASME A13.1.

6. Nomenclature: Include following:

a. Direction of air flow.

b. Duct service (supply, return, exhaust, etc.).

E. Plastic Equipment Markers: Laminated-plastic, color-coded equipment markers. Conform to following color code:

1. Green: Cooling equipment and components.

2. Yellow: Heating equipment and components.

3. Yellow/Green: Combination cooling and heating equipment and components.

4. Brown: Energy reclamation equipment and components.

5. Blue: Equipment and components that do not meet any of above criteria.

6. For hazardous equipment, use colors and designs recommended by ASME A13.1.

7. Nomenclature: Include following, matching terminology on schedules as closely as possible:

a. Name and plan number.

b. Equipment service.

c. Design capacity.

d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.

8. Size: Approximate 2-1/2 by 4 inches for control devices, dampers, and valves; and 4-1/2 by 6 inches for equipment.

I. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

1. Multiple Systems: Where multiple systems of same generic name are indicated, provide identification that indicates individual system number as well as service such as "Boiler No. 3" and "Air Supply No. 1H."

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 15 specify piping installation requirements unique to the piping system.

B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

C. Install piping at indicated slope.

D. Install components having pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's printed instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast-brass, one-piece, with set-screw, and polished chrome-plated finish. Use split-casting escutcheons where required, for existing piping.

2. Uninsulated Piping Wall Escutcheons: Cast-brass or stamped-steel, with set-screw.

3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.

4. Insulated Piping: Cast-brass or stamped-steel, with concealed hinge, spring clips, and chrome-plated finish.

5. Piping in Utility Areas: Cast-brass or stamped-steel, with set-screw or spring clips.

N. Sleeves are not required for core drilled holes.

O. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs, and where indicated.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, concrete floor and roof slabs, and where indicated.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified.

2. Build sleeves into new walls and slabs as work progresses.

3. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than 6 inches.

b. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger, penetrating gypsum-board partitions.

c. Cast-Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Flashing is specified in Division 7 Section "Flashing and Sheet Metal."

1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.

4. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants specified in Division 7 Section "Joint Sealants."

Q. Above Grade, Exterior Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.

1. Install steel pipe for sleeves smaller than 6 inches.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger.
3. Assemble and install mechanical seals according to manufacturer's printed instructions.

R. Below Grade, Exterior Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.

S. Below Grade, Exterior Wall, Pipe Penetrations: Install ductile-iron wall penetration system sleeves according to manufacturer's printed installation instructions.

T. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping sealant material. Firestopping materials are specified in Division 7.

U. Verify final equipment locations for roughing-in.

V. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

W. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system specification Sections.

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3. Soldered Joints: Construct joints according to AWS "Soldering Manual," Chapter 22 "The Soldering of Pipe and Tube."

4. Brazed Joints: Construct joints according to AWS "Brazing Manual," Chapter 28 "Pipe and Tube."

5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves as follows:

   a. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

   b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).

   c. Align threads at point of assembly.

   d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.

   e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

6. Welded Joints: Construct joints according to AWS D10.12 "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe" using qualified processes and welding operators according to "Quality Assurance" Article.

7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

X. Piping Connections: Except as otherwise indicated make piping connections as specified below.

1. Install unions, in piping 2 inches and smaller, adjacent to each valve and at final connection to each piece of equipment having 2-inches or smaller threaded pipe connection.

2. Install flanges, in piping 2-1/2-inches and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

3. Dry Piping Systems (Gas, Compressed Air, and Vacuum): Install dielectric unions and flanges to connect piping materials of dissimilar metals.

4. Wet Piping Systems (Water and Steam): Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom, where mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.3 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow and as indicated in other Division 15 sections.

1. Stenciled Markers: Complying with ASME A13.1.

2. Plastic markers, with application systems. Install on pipe insulation segment where required for hot non-insulated pipes.

3. Locate pipe markers as follows wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.

a. Near each valve and control device.

b. Near each branch, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.

c. Near locations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.

d. At access doors, manholes, and similar access points that permit view of concealed piping.

e. Near major equipment items and other points of origination and termination.

f. Spaced at a maximum of 50 feet intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.

g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

B. Equipment: Install engraved plastic laminate sign or equipment marker on or near each major item of mechanical equipment.

1. Lettering Size: Minimum 1/4-inch-high lettering for name of unit where viewing distance is less than 2 feet, 1/2-inch-high for distances up to 6 feet, and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.

2. Text of Signs: Provide text to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to name of identified unit.

C. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers; or provide stenciled signs and arrows, showing duct system service and direction of flow.

1. Location: In each space where ducts are exposed or concealed by removable ceiling system, locate signs near points where ducts enter into space and at maximum intervals of 50 feet.

D. Adjusting: Relocate identifying devices which become visually blocked by work of this Division or other Divisions.

3.4 PAINTING AND FINISHING

A. Refer to Division 9 Section "Painting" for field painting requirements.

B. Damage and Touch-Up: Repair marred and damaged factory painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

A. Construct concrete equipment bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000 psi, 28-day compressive strength concrete and reinforcement as specified in Division 3 Section "Cast-In-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1 "Structural Welding Code - Steel."

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.8 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting and patching as specified in other section.

B. Repair cut surfaces to match adjacent surfaces.

3.9 TEST AND TESTING

A. General: Tests shall be as required by the various Sections under Division 15, as well as by this Section.

B. Forcemains shall be tested in accordance with the requirements for pressure sanitary sewers per SSPWC 306-1.4 using the water pressure test method per Section 02730.

C. Tests may be required in the case of materials and equipment submittals and substitutions:

1. For items submitted which are altered, substituted, or which cannot readily be determined by the City Engineer as exactly conforming to the Specifications, Contractor may be required to submit certified test results to prove that the items in question meet Specification requirements.

2. Tests may also be required on certain items which are as specified, including fan and pump performance. Should such tests be required of specified items and tests prove that items do meet Specification requirements, the City will pay for applicable portions of tests.

D. Piping Tests:

1. Perform engineering tests required to demonstrate that operation of mechanical systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be made in presence of the City Engineer, the Architect or the Field Inspector, and the representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required approvals are obtained.

2. Should Contractor refuse or neglect to perform any test required by Specifications, the City Engineer may perform such tests and Contractor shall pay charges in connection therewith.

3. Pressure gages used in testing shall have one pound graduations; vacuum gages shall have one-inch mercury graduations. Air shall be bled from lines requiring hydrostatic or water tests.

4. Systems shall be pressure tested in accordance with Pipe Test Schedule below. Pipe test shall show no loss in pressure after a minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for Fire Sprinkler Systems, local codes shall govern.

5. Flue gas lines shall be tested twice: First with piping exposed, before backfilling trenches or lathing; second with pipe in finished arrangement, ground backfilled (paved where required) and walls finished.

6. Refrigerant piping may be tested using a halide detector or calibrated electronic testing equipment.

7. Piping systems may be tested as a unit or in sections as directed by the City Engineer, but entire system shall successfully meet requirements specified herein, before acceptance by the City Engineer.

8. Repair of damage to pipes and their appurtenances, or to any other structures resulting from or caused by these tests, shall be performed by Contractor.

E. Pipe Testing Schedule:

System Tested	**Test Pressure (psig)**	**Test With:**
Vent and roof drain (except pipes running under a slab or under-ground)	Fill with water to top of highest vent, allow to stand two hours, or longer, as directed by Inspector. Minimum head required for any joint shall be 10-feet in building.	Water

System Tested	Test Pressure (psig)	Test With:
Cast-iron soil, waste and interior downspout, condensate drain from air conditioning equipment	10-feet of water vertically	
Storm water disposal lines	Running water test	Water
Hot water heating system piping	150	Water
Domestic water piping (metallic)	200	Water
Fire Sprinkler piping	200	Water
Gas piping (steel threaded or plastic)	60 (both tests)	Air
Gas piping (steel welded)	100 (both tests)	Air
Refrigeration Suction Freon R407C	150	Nitrogen & Freon
Puron R410A	250	
Refrigeration Liquid & Hot Gas Piping Freon R407C	150	Nitrogen & Freon
Puron R410A	300	

F. Operational Tests:

1. Before operating any equipment or systems, a through check shall be made to determine that all systems have been flushed and cleaned as required and that all equipment has been properly installed, aligned, lubricated, and serviced.

    a. Factory instructions shall be checked to see that installations have been made accordingly and that recommended lubricants have been used in all bearings, gearboxes, crankcases, and similar equipment. Particular care shall be used in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for any damage that may have occurred during shipment, after delivery, or during installation. In event of any damage, equipment shall be replaced, renewed, or repaired at Contractor's expense.

2. Contractor shall provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for all tests hereinafter specified.

3. Contractor shall pay for electric energy and fuel required for tests.

4. Any final adjustment to equipment or systems shall meet specified performances requirements.

5. Any equipment, system, or work found deficient during any test shall be replaced or corrected. Retest and obtain approval from the City Engineer.

G. Project Completion Tests:

1. Upon completion of Mechanical work, or such a time prior to completion as may be determined by the City Engineer, all mechanical equipment and systems shall be operated and tested for a period of at least 5 consecutive 8-hour days to demonstrate satisfactory over-all operation of building or project as a completed unit. Tests shall include operation of heating, ventilating, and air conditioning equipment and systems for a period of not less than 2, 8-hour, days at not less than 90% of full, specified heating and cooling capacities.

2. Tests shall commence after preliminary balancing and adjustments to equipment and systems have been completed, and all running equipment has been checked and thoroughly lubricated.

3. Immediately before starting tests all air filter media shall be cleaned or renewed. Roll type filters shall be advanced to provide new clean media. Cleanable type media shall be thoroughly cleaned and shall be re-oiled with new clean oil as recommended by manufacturer if they are of viscous impingement type. Disposable type filters shall be replaced with new filters. Replaceable media shall be replaced with new media.

4. An accurate means of measuring air flow and temperatures shall be used to balance air supply, return, and exhaust systems, so that uniform temperatures occur in every room and design air flow is obtained through registers, diffusers and grilles.

5. Systems shall be adjusted to provide air flows indicated including maximum fresh air and maximum return air. Dampers shall be checked for proper settings and operation. Air and water inlet and leaving temperatures at coils shall be checked. Complete operational data including air flows, room temperatures, fan speeds, motor currents, plenum and duct static pressures shall be tabulated.

6. Welding done on this project may be subject to radiographic inspections at random.

H. Post Contract Tests: If required full load operating conditions cannot be obtained at time of project completion test, due to unfavorable outdoor temperatures or conditions, Contractor shall return to job site when requested by the City Engineer and operate and test equipment and systems at such times of year when proper loading of system can be accomplished. Such tests shall be conducted within a one-year period from completion date. Contractor will be notified at least 10 days prior to start.

3.10 LOCATION

A. Location of piping, apparatus and equipment as indicated on Drawings is approximate only and shall be altered to avoid all obstructions, preserve headroom and keep openings and passageways clear.

B. Placement of equipment in locations and spaces indicated shall be Contractor's responsibility. Any disassembling and reassembling of equipment, or other work necessary, shall be done without extra cost to the City.

3.11 CUTTING, NOTCHING AND BACKING:

A. Conform to State Building Code, Title 24, Part 2, Section 2517(9) 8, 9, for notches and bored holes in wood; Section 2606, for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on Structural Drawings.

B. Where pipes or ducts pass through, or are located within 1" of any construction element, install a resilient pad, 1/2" thick minimum, to prevent contact.

C. Contractor shall make provisions for recesses, chases, accesses, and provide sheet metal spacers, channel and backing as necessary for proper reception and installation of Mechanical work.

3.12 SERVICE INTERRUPTIONS, OFFSITE, GAS AND WATER

A. Arrange work so that there will be NO service interruptions of any existing systems.

B. When service interruptions are mandatory, arrange in advance with the City Engineer as to time and date of such interruptions.

C. Systems, which are interrupted, shall be put back into operation in such manner that they will function as they were originally intended.

3.13 OPERATION AND MAINTENANCE MANUALS AND REPAIR MANUAL

A. General: Submit 2 copies of operation and maintenance manuals in acceptable form and content. If no revisions are required, furnish one additional acceptable copy. If revisions are required, one copy will be returned with instructions for changes; make such changes and return 3 copies of acceptable manuals. Manuals shall be bound in hard-back, three-ring, loose-leaf binders. Deliver manuals to the City Engineer Inspector.

B. Contents of Manual:

1. Title sheet with job name, and names, addresses and telephone numbers of Contractor, Subcontractor and related equipment suppliers.

2. Typewritten manufacturer's operating instructions describing how to start and stop each piece of equipment, how to set temperature control systems for normal operation and normal restarting procedures, and caution and warning notices.

3. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 15.

4. Project Record drawings of Electrical and control diagrams.

5. Test and balance reports.

6. Valve directory.

7. Pipe and component identification chart.

C. Submit one complete copy of repair manual.

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SECTION 15056
REINFORCED CONCRETE PIPE

PART 1—GENERAL

1.1 DESCRIPTION

A. Scope: This section specifies reinforced concrete pipe and gaskets. This section contains specifications for manholes and appurtenances.

B. Pipe Designations: Reinforced concrete pipe designations shall be as follows:

Designation	Definition
RCP	Reinforced Concrete Pipe

C. Definitions:

1. Pipe Joint: The area approximately 12 inches each way from the centerline of the visible gap between pipe lengths.

2. Pipe Length: The pipe between two joints; part of a pipe section.

3. Pipe Section: The reach of pipeline between two successive manholes.

1.2 QUALITY ASSURANCE

A. Reference Specifications, Codes and Standards:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASTM C76	Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
ASTM C139	Concrete Masonry Units for Construction of Catch Basins and Manholes

Reference	Title
ASTM C150	Portland Cement
ASTM C443	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C478	Precast Reinforced Concrete Manhole Sections
ASTM C497	Testing Concrete Pipe, Sections, or Tile
AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances

B. Testing:

1. General: The Construction Manager shall be notified of the place and time of testing 1 week prior to the commencement of testing.

2. Concrete Compression Tests: Compression tests shall be as specified in ASTM C76, Section 11.4.1.

3. D-Load Tests: Pipe shall be tested in accordance with ASTM C76, Section 11.3 and ASTM C497. Loads used for testing shall be the load to produce the 0.01-inch crack or the design test load, whichever is less.

   a. One percent of the total number of pipes, with a minimum of three pipe lengths, of each class, size and wall type shall be tested.

4. Hydrostatic Tests: Pipe specified to meet hydrostatic strength requirements shall be tested in accordance with ASTM C361, Section 10.4. Both pipe and joints shall be tested. The number and method of selection of pipe for testing, as well as the determination of acceptability for delivery to the job site, shall be in accordance with ASTM C361, Section 10.

1.3 SUBMITTALS

A. Per 01330.

1.4 PERMIT:

A. Obtain storm drain connection permit for connecting and discharging storm water into City storm sewer system.

PART 2--PRODUCTS

2.1 MATERIALS

A. Pipe: Unless otherwise specified, pipe shall conform to the following specifications:

1. RCP: Cast wall or spun pipe wall as per Section 207-2 of the SSPWC.

B. Cement shall be ASTM C150, Type II.

C. Gaskets: Gaskets shall conform to Section 15075 and the following specifications:

1. RCP: ASTM C443, Section 5.

D. Precast Concrete Manholes: Precast concrete manhole sections shall conform to the requirements of ASTM C478 or C 139. Cement shall be ASTM C150, Type II. Minimum wall thickness for nonreinforced sections shall be 6 inches. Minimum wall thickness for reinforced sections shall be 4 inches. Joints shall be tongue and groove mortared unless otherwise specified.

E. Manhole Masonry Units: Manhole masonry units shall be concrete manhole block conforming to ASTM C139 except that the nominal horizontal thickness shall be 6 inches measured radially. Semicircular grooves, 1 inch diameter, shall be provided in the ends.

2.2 MANUFACTURE

A. Pipe:

1. General: Unless otherwise specified, all pipe used for services other than storm drains shall be manufactured by the centrifugally spun or vertically wet cast method. Pipe manufactured by the vertically wet cast method shall be cast with the spigot end down. Reinforcing steel for each length of pipe shall be held in place throughout the casting operation. Lift holes are not acceptable.

2. RCP: Pipe shall be manufactured in conformance with ASTM C76. Joints shall be rubber gasket conforming to ASTM C443, unless otherwise specified.

B. Rubber Gasket Joints: Joints shall use either concrete bell and spigot or a double spigot and sleeve. In the latter case, the sleeve shall be a reinforced thermoset plastic collar or a steel band. If the steel band is provided, a minimum of 12 mils of coating system EP as specified in Section 09800 shall be applied in two coats of 6 mils minimum per coat.

C. Length and Bevels: Pipe shall be fabricated in nominal lengths of at least 8 feet except where shorter lengths are required to meet special conditions. Pipe ends may be beveled a maximum of 5 degrees to accommodate changes in alignment or curved alignments of the pipeline.

2.3 PRODUCT DATA

A. The following information shall be provided in accordance with Section 01330.

B. Fabrication Drawings: Drawings shall illustrate details of wall thickness, pipe joint, joint gasket, and reinforcement. Reinforcement details shall include the type of cage, the location of the cages in the pipe wall, the size and spacing of circumferential and longitudinal reinforcing steel, and the cross-sectional area of reinforcing steel in each cage per lineal foot of pipe. The gasket details shall include the diameter of the cross section and the circumferential length.

B. Layout Drawings: Layout drawings shall illustrate placement of each pipe length including fittings. Pipe lengths and joints shall be identified with a numbering system.

C. Test Results: The Contractor shall provide results of the following tests as specified in the referenced paragraphs of this section:

	Test	Paragraph
1.	Concrete compression	1.02 B.2.
2.	D-load	1.02 B.3.
3.	Hydrostatic	1.02 B.4.
4.	Procedures for pipe acceptance	3.03 A., 3.03 B., 3.03 C.

D. Certification: The Contractor shall provide certified copies of laboratory reports from his gasket supplier indicating conformance with the specified requirements of Section 15075 and this specification for each shipment of gaskets.

PART 3--EXECUTION

3.1 PIPE LAYING

A. RCP:

1. Preparation of bedding and backfill shall be as specified in Section 02200 and the drawing details. Pipe shall be laid with uniform bearing under the full length of the barrel of the pipe.

2. The interior of the pipeline shall be cleaned as the work progresses.

3. The line and grade of any one pipe shall not deviate more than that specified in the following table. The allowable deviation is not cumulative.

Pipe length, feet	Maximum deviation per pipe length, feet
8	0.06
10	0.09
12	0.11
16	0.14

4. Assembled pipe joints shall be kept in compression until the placement of the initial backfill is complete.

B. Jointing: During jointing, neither mortar nor buttering compound is acceptable on either the exterior or interior of the joints. After jointing, joints over 3/4 inch shall be mortared.

3.2 STRUCTURES

A. Structures shall be as specified. Openings for future connections shall be sealed with a precast concrete plug made watertight with mastic compound or rubber gaskets. Concrete mortar shaping within any structure shall be as specified in Division 3.

3.3 PIPELINE ACCEPTANCE

A. RCP: After backfilling and restoration of surfaces, pipelines shall be cleaned. Pipelines 21 inches or less in diameter shall be cleaned by the sewer ball method unless the pipeline can be shown to be clean by visual inspection.

B. RCP Leakage Tests:

1. General: Leakage tests shall be completed after pipelines have been cleaned of obstructions and inspected by the Construction Manager.

2. Section Leakage Test: Each section of pipeline shall be tested by closing the lower end of the pipe to be tested and the inlet pipe of the upper manhole with stoppers and then filling the pipe and manhole with water to a level 5 feet above the crown of the open pipe in the upper manhole or, if groundwater is present, 6 feet above the section's average adjacent groundwater level. The line shall be filled at least 1 hour prior to testing and shall be tested for 6 hours minimum, maintaining the specified head by measured additions of water. The sum of these additions shall be the measured leakage for the test period. The allowable leakage shall not exceed 0.05 gallon per hour per inch of diameter per 100 feet of pipe being tested.

3. Joint Leakage Test: For pipes 48 inches in diameter and larger, the Contractor may test each individual pipe joint for leakage with portable bulkheads or other testing apparatus as an alternative to testing each section. Each joint shall be tested as an integral unit. The test pressure shall be equivalent to the head of water specified for the section leakage test. The allowable leakage shall be the same as that specified for the pipeline section leakage test. The Contractor shall record the test pressure, time under pressure, and actual leakage of each joint tested.

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SECTION 15075
JOINT GASKETS

PART 1--GENERAL

1.1 DESCRIPTION

A. This section specifies rubber gaskets for push-on compression type joints used with fabricated steel pipe, steel pipe, reinforced concrete pipe, concrete cylinder pipe, and cement mortar lined and coated steel pipe.

1.2 QUALITY ASSURANCE

A. Reference Specifications, Codes and Standards:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Notice Inviting Bids. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASTM D395	Rubber Property--Compression Set, Test for
ASTM D412	Rubber Properties in Tension, Test for
ASTM D471	Rubber Property--Effect of Liquids, Test for
ASTM D573	Rubber--Deterioration in an Air Oven, Test for
ASTM D1149	Rubber Deterioration--Surface Ozone Cracking in a Chamber (Flat Specimens), Test for
ASTM D2240	Rubber Property--Durometer Hardness, Test for

B. Testing: Certified copies of test reports indicating that the gasket material has been tested and that the results of the tests comply with the requirements specified in paragraph 15075-2.2 shall be provided as product data.

PART 2--PRODUCTS

2.1 MATERIALS

A. Gasket stock shall be a synthetic rubber compound in which the elastomer is neoprene. The compound shall contain no less than 50 percent by volume neoprene and shall be free from factice, reclaimed rubber and other deleterious substances.

2.2 PHYSICAL REQUIREMENTS

A. The compound shall meet the following physical requirements when tested in accordance with the specified ASTM standards.

B. Tensile (ASTM D412): The tensile strength shall be 1500 psi minimum and the ultimate elongation shall be 350 percent minimum.

C. Hardness (ASTM D2240, Type A Durometer): The compound shall have a hardness in the range of 35 to 50 for concrete spigots and 50 to 65 for steel spigots.

D. Compression Set (ASTM D395):

1. The compression set shall not exceed 20 percent when compressed for 22 hours at 70 degrees C.

2. The test specimens shall be circular discs cut from the gaskets. Test specimens shall be 0.500 (+ 0.005 - 0.025) inches in height. The diameter of the test specimen shall be that of the gasket but not to exceed 1.129 + 0.010 inches in diameter.

E. Aging (ASTM D573): The test specimen deterioration shall be less than 20 percent reduction in tensile strength, 40 percent reduction in ultimate elongation, and 15 points increase in hardness.

F. Effect of Liquids (ASTM D471): The maximum volume change in oil and in water shall be as follows:

1. Oil: 100 percent in ASTM oil No. 3.

2. Water: 15 percent.

G. The test specimens shall have a thickness of 0.080 +0.005 inches and shall be circular discs cut from the gasket.

H. Ozone Cracking (ASTM D1149): The test specimen shall be a gasket loop mounted to give at least 20 percent elongation. There shall be no cracking visible at two times magnification of the gasket after 100 hours exposure to 1 mg/l ozone at 40 degrees C.

2.3 PRODUCT DATA

A. In accordance with Section 01330, the CONTRACTOR shall provide certified copies of test reports specified in paragraph 15075-1.2 B.

PART 3--EXECUTION

A. The gaskets shall be installed in accordance with the manufacturer's recommendations.

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SECTION 15140
PIPE SUPPORTS

PART 1– GENERAL

1.1 SUMMARY

A. This section covers the furnishing and installation of pipe hangers, brackets, and supports. Pipe supports shall be furnished complete with all necessary inserts, bolts, nuts, rods, washers, and other accessories. This section also covers the spacing of expansion joints in piping systems. Expansion joint products and materials are covered in the respective piping sections.

B. Concrete and fabricated steel supports shall be as indicated on the drawings, as specified in other sections, or, in the absence of such requirements, as permitted by Engineer.

C. This section covers pipe supports for Ductile Iron Pipes.

1.2 GENERAL

A. Pipe supports, anchors, and expansion joints have been indicated on the drawings in certain locations, but no attempt has been made to indicate every pipe support, anchor, and expansion joint. It shall be Contractor's responsibility to provide a complete system of pipe supports, to provide expansion joints, and to anchor all piping, in accordance with the requirements specified herein. Additional pipe supports may be required adjacent to expansion joints, couplings, or valves. When supports are shown on the drawings, Contractor shall not relocate supports without Engineer's approval. Contractor shall design all supports necessary which aren't shown on the drawings.

B. All piping shall be rigidly supported and anchored so that there is no movement or visible sagging between supports.

C. Pipe supports and expansion joints are not required in buried piping, but concrete blocking or other suitable anchorage shall be provided as indicated on the drawings or specified in other sections.

D. Piping support system components shall comply with specified plumbing code requirements.

1.3 SUBMITTALS

A. Complete data and catalog cuts or drawings covering fabricated pipe supports, fabricated inserts, and stainless steel, galvanized, and copper- and plastic-coated pipe supports shall be submitted in accordance with the Submittals section.

B. Data shall include a listing of the intended use and general location of each item submitted.

PART 2– PRODUCTS

2.1 MATERIALS

A. Unless otherwise indicated, all pipe supports shall comply with ANSI/MSS SP-58 and MSS SP-69. Materials of construction for fabricated steel supports are covered in the Structural and Miscellaneous Metals section. All pipe support materials shall be packaged as necessary to ensure delivery in satisfactory condition.

B. Unless otherwise specified or indicated on the drawings, pipe supports shall be fabricated of manufacturer's standard materials and provided with manufacturer's standard finish.

C. Design loads for inserts, brackets, clamps, and other support items shall not exceed the manufacturer's recommended loads.

D. Pipe supports shall be manufactured for the sizes and types of pipe to which they are applied. Strap hangers will not be acceptable. Threaded rods shall have sufficient threading to permit the maximum adjustment available in the support item. Continuously threaded rod is not acceptable for hanger rods over 12 inches [300 mm] in length.

E. Unless otherwise acceptable to Engineer, the use of supports which rely on stressed thermoplastic components to support the pipe will not be acceptable.

F. Contact between dissimilar metals, including contact between stainless steel and carbon steel, shall be prevented. Supports for brass or copper pipe or tubing shall be copper plated. Portions of pipe supports which come into contact with other metals that are dissimilar shall be rubber or vinyl coated.

G. Hot-dip galvanized supports shall be furnished and shall be in accordance with ASTM A153 and A385.

H. Pipe support types and application shall comply with Table 1.

2.2 WATER SLOSHING AND SEISMIC LOADS

A. For pipe supports that are designed by the Contractor, water sloshing and seismic loads shall be considered in the design as per the latest City building code and the applicable design criteria.

PART 3– EXECUTION

3.1 APPLICATION

A. Concrete inserts or anchor bolts shall be used to support piping from the reservoir wall. Expansion anchors shall be used to fasten supports to existing concrete and masonry.

B. Anchorage shall be provided to resist thrust due to temperature changes, changes in diameter or direction, or dead-ending. Anchors shall be located as specified to force expansion and contraction movement to occur at expansion joints, loops, or elbows, and as needed to prevent excessive bending stresses. Anchorage for temperature changes shall be centered between elbows and joints used as expansion joints.

C. When expansion joints are required, pipe guides shall be provided adjacent to bellows type expansion joints. Guides will not be required where mechanical couplings are permitted as expansion joints. Guides shall be located on both sides of expansion joints, except where anchors are adjacent to the joint. Unless otherwise indicated on the drawings, one guide shall be within four pipe diameters from the joint and a second guide within 14 pipe diameters from the first guide. Pipe supports shall allow adequate movement; pipe guides shall not be used for support. Pipe guides shall be provided at locations as recommended by the manufacturer.

3.2 TYPES OF SUPPORTS

A. The specific products for pipe supports shall be as indicated in Table 1 for the specified type and size of support.

TABLE 1 - TYPES OF SUPPORTS

Description and Service	Type	
	MSS SP 69 (Note 1)	Other
Hangers		
12 inch pipe		
Clevis or saddle	1	
14 inch and larger pipe		
Saddle	--	
Concrete Inserts, Steel		
12 inch and smaller pipe	18	Channel 12 ga, galv, 1-5/8 by 1-3/8 inches, min. 8 inches long, anchor lugs on 4 inch centers, at least three lugs, end caps, and filler strip.
14 inch and larger pipe, fabricated insert, except as noted	--	
Beam Clamps, Malleable Iron or Steel, 12 inch and smaller pipe	21	B-Line "3050" and "3055" or Anvil "133" and "134".
	28, 29	Anvil "292".
	30	B-Line "3054" or Anvil "228".
Side Beam Bracket	34	B-Line "B3062" or Anvil "202".
Wall Supports and Frames, Steel, 12 inch and smaller pipe (Note 2)		
Brackets	32	B-Line "B3066" or Anvil "195".
	33	B-Line "B3067" or Anvil "199".
Prefabricated channels	--	12 ga, galv, 1-5/8 inches, with suitable brackets and pipe clamps.
Floor Supports, Steel or Cast Iron		
8 through 24 inch pipe	38	B-Line "B3093" or Anvil "264".
Pipe Alignment Guides	--	B-Line "B3281" through "B3287" or Anvil "255".
Turnbuckles Steel	13	B-Line "B3202" or Anvil "230".
Weldless Eye Nut, steel	17	B-Line "B3200" or Anvil "290".
Insulation Protection Saddle	39	B-Line "B3160 Series" or Anvil "160 Series".
Insulation Protection Shield	40	B-Line "B3151" or Anvil "167".

Table 1 Notes:

1. MSS SP-69 supports and hangers are illustrated on Figure 1-15140.
2. Pipe clamps or other devices which rely on the application of a clamping force to the supported pipe in order to maintain the clamp position or location in a prefabricated channel or track will not be acceptable for use with nonmetallic pipe or tubing.

3.3 SUPPORT SPACINGS

A. Pipe supports and expansion joints shall be spaced in accordance with Tables 2 below. The types of pipes to be supported are as specified herein.

TABLE 2 – MAXIMUM PIPE SUPPORT SPACINGS AT STANDARD TEMPERATURES AND SERVICES

Type of Pipe	Pipe Support Max Spacing	Max Run Without Expansion Joint, Loop, or Bend (Note 1)	Expansion Joint Max Spacing (Note 2)	Type of Expansion Joints
	feet	feet	feet	
Ductile iron	15	80	80	Note 3

Table 2 Notes:

1. Unless otherwise acceptable to Engineer, an expansion joint shall be provided in each straight run of pipe having an overall length between loops or bends exceeding the maximum run specified herein.
2. Unless otherwise acceptable to Engineer, the spacing between expansion joints in any straight pipe run shall not exceed the maximum spacing specified herein.
3. Expansion joints shall be mechanical couplings.

B. Temperature Adjustments for PVC Pipe: Not used.

C. Temperature Adjustments for FRP Pipe: Not used.

E. Specific Gravity Adjustments for PVC and FRP Pipe: Not used.

3.4 INSTALLATION

A. General:

1. All piping shall be supported in a manner which will prevent undue stress on any valve, fitting, or piece of equipment. In addition, pipe supports shall be provided at changes in direction or elevation, adjacent to flexible couplings, and where otherwise shown. Pipe supports and hangers shall not be installed in equipment access areas.

2. Where horizontal piping is arranged with two or more parallel lines, trapeze hangers may be used in lieu of individual hangers. Trapeze assembly shall consist of structure attachments as previously specified with rod size dependent upon total weight supported. Spacing of assemblies shall be determined by the minimum pipe size included in the group supported. Trapeze horizontal assemblies shall be structural angle or channel section of sufficient size to prevent measurable sag between rods. All lines shall be attached to the horizontal with intermediate pipe guides and U-bolts or one-hole clamps. Pre-engineered support equipment may be used when selected and installed in accordance with the manufacturer's recommendations.

3. Anchorage shall be provided to resist both lateral and longitudinal seismic forces. Seismic forces shall be calculated assuming the pipes are full.

B. Inserts:

1. Reference building structural concrete drawings for concrete inserts. When not provided as part of the building concrete structure, provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete walls.

2. Where concrete slabs form finished ceilings, provide inserts flush with the slab surface.

3. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab. X-ray locate existing reinforcing rods before drilling.

C. Pipe Hangers and Supports

1. Hanger rod sizing for copper pipe and plastic pipe shall be same as for steel pipe. Install hangers to provide a minimum 1/2 inch space between finished covering and adjacent work.

2. A hanger shall be placed with 18 inches of each horizontal elbow, and on both sides of all piping accessories and valves weighing 20 lbs [9 kg] or more.

3. Hangers shall have 1-1/2 inches minimum vertical adjustment.

4. Support vertical piping at every floor using riser clamps.

5. Support riser piping independently of connected horizontal piping.

6. Hanger and hanger components shall be sized specifically for the pipe size it is to be used on.

3.5 PLACEMENT

A. Unless closer spacing is indicated on the drawings, the maximum spacing for pipe supports and expansion joints shall be as indicated in Table 2.

B. Unless otherwise indicated on the drawings or acceptable to Engineer, piping shall be supported approximately 1-1/2 inches out from the face of walls and at least 6 inches below the reservoir's ceiling.

* * * * * *

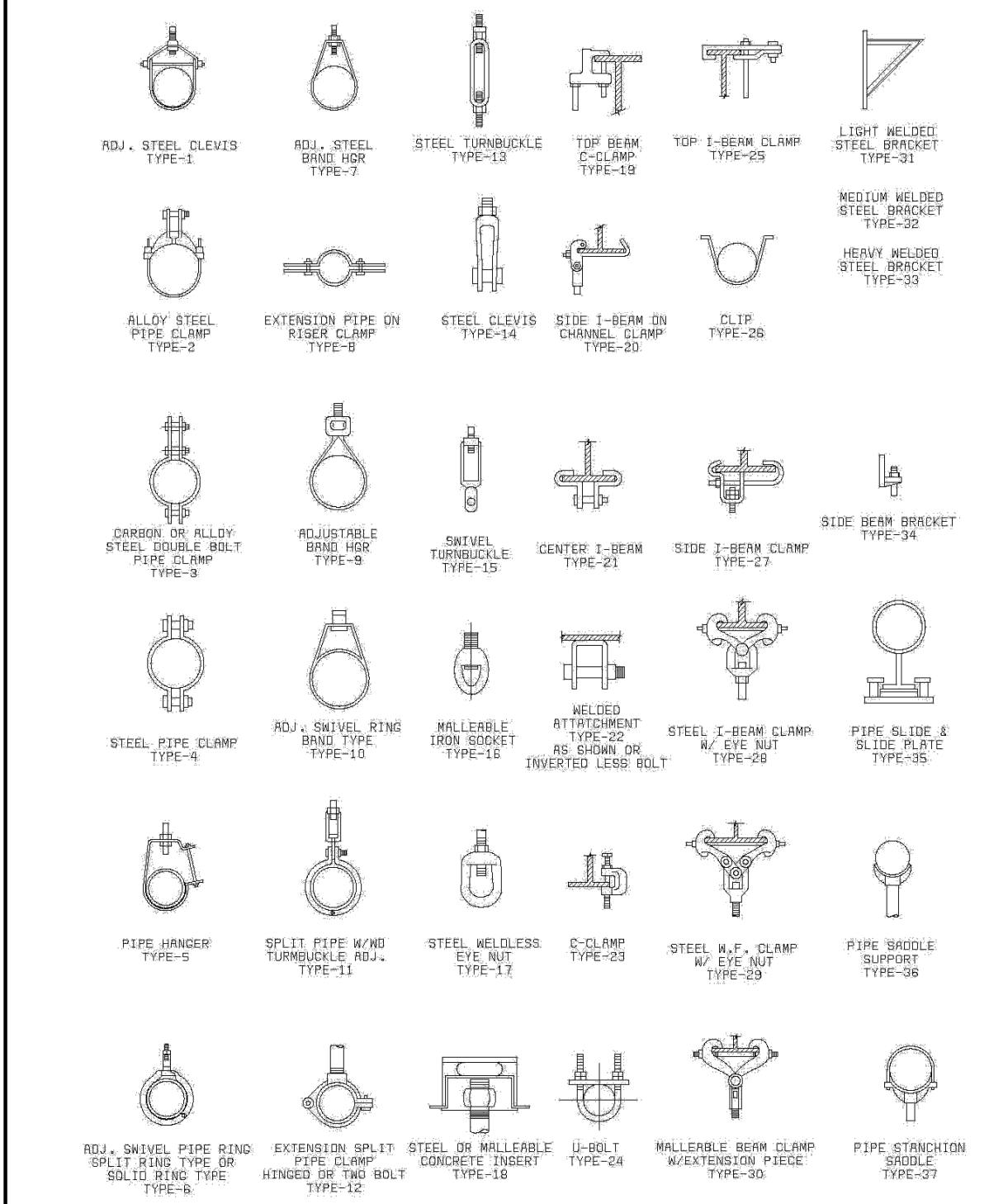

Figure 1 - Pipe Supports

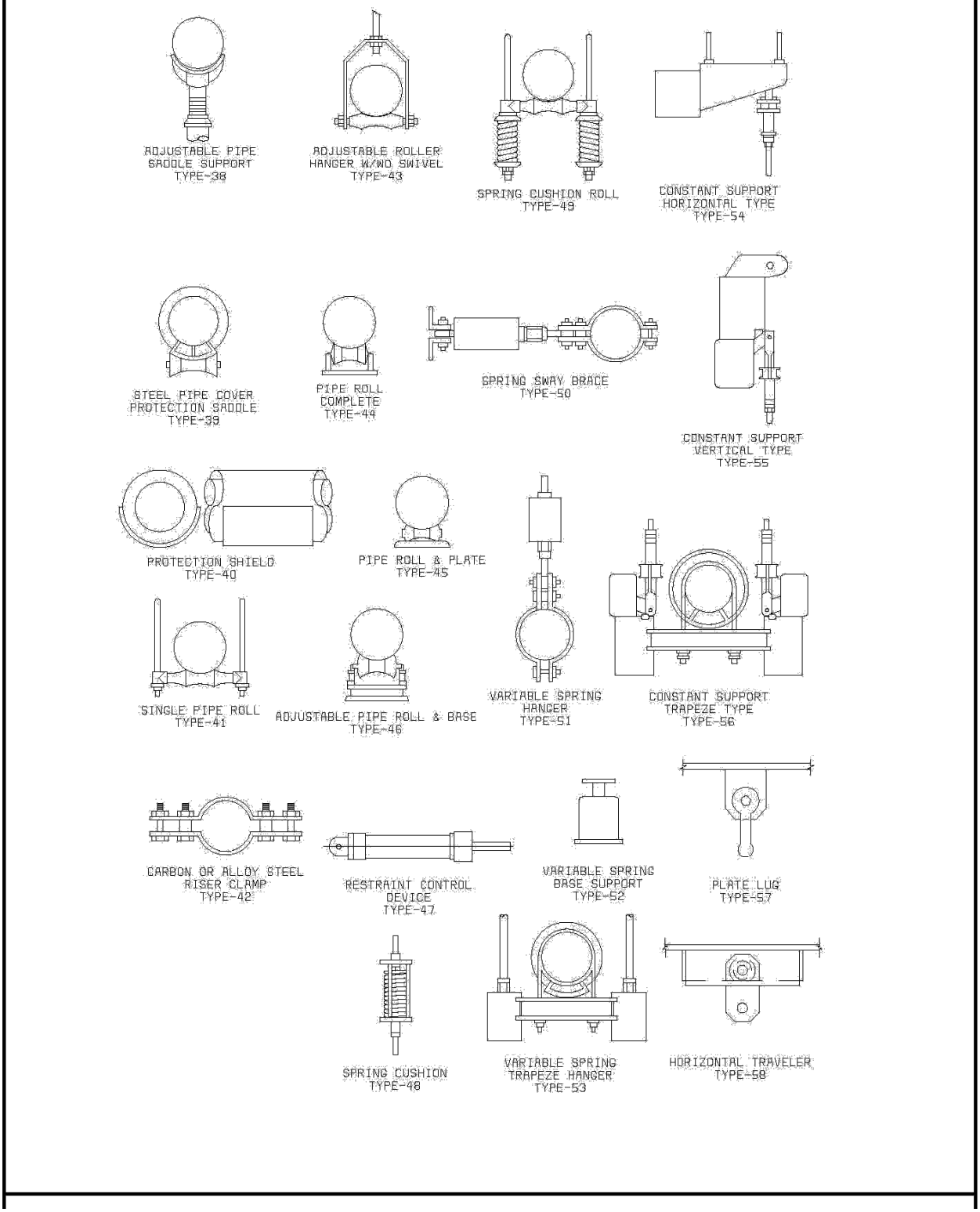

Figure 2 - Pipe Supports (Cont'd)

SECTION 15610
PIPING, GENERAL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. It shall be the responsibility of the CONTRACTOR to furnish and install all piping systems specified herein and shown on the contract drawings. Each system shall be installed complete with all applicable fittings, hangers, supports, anchors, expansion joints, flexible connections, valves, and accessories to provide a functional system as designed. In addition, all insulation, lining and coating, heat tracing, testing, disinfection, excavation, backfill and encasement shall be the responsibility of the CONTRACTOR.

B. The CONTRACTOR shall provide all tools, equipment, materials, and supplies necessary and shall perform all labor necessary to complete the work specified herein and indicated on the drawings. The CONTRACTOR shall provide all testing apparatus necessary to perform testing as required by the contract documents. The CONTRACTOR shall provide any equipment necessary for inspection of and testing of piping systems specified.

C. Piping shown on drawings and specified herein is intended to define the general layout, configuration, routing, required method of support, pipe size and type only. It is the responsibility of the CONTRACTOR to provide a complete system in accordance with the contract drawings and requirements set forth herein. All details necessary to provide a complete system as specified herein are the responsibility of the CONTRACTOR. The CONTRACTOR shall provide all spools, spacers, adapters, connectors, and supports necessary to provide a complete and functional system. The CONTRACTOR shall furnish pipe supports, hangers, anchors, etc., in addition to those shown on the contract drawings, when necessary to provide a system as specified herein. The CONTRACTOR shall provide lay-out drawings of all piping systems prior to installation showing all piping, equipment, accessories, supports, etc.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Division 02 as applicable. Site Work.

B. Section 02200 Earthwork.

C. Section 02730 Forcemain and Sanitary Sewer System Testing

D. Section 03300 Cast-in-Place Concrete.

E. Section 05500 Metal Fabrications.

F. Section 09800 Protective Coating.

G. Division 15 as applicable. Mechanical.

H. Section 15700 Ductile Iron Pipe, Fittings and Valves

I. Section 15770 Pipe Supports and Mechanical Joint Restraints.

J. Section 15780 Piping Identification Systems.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Comply with the reference specifications of the GENERAL REQUIREMENTS.

B. Commercial Standards:

ANSI/ASME B1.20.1	Pipe Threads, General Purpose (inch).
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys.
ANSI/AWWA C207	Steel Pipe Flanges for Water Works Service, Sizes 4 in through 144 in.
ANSI/AWWA C606	Grooved and Shouldered Joints.
ANSI/AWS D1.1	Structural Welding Code.
ASTM A 307	Specification for Carbon Steel Bolts and Studs, 6,000 psi Tensile.
ASTM A 325	Specification for High-Strength Bolts for Structural Steel Joints.
ASTM D 792	Test Methods for Specific Gravity and Density of Plastics by Displacement.
ASTM D 2000	Classification System for Rubber Products in Automotive Applications.

1.4 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall complete shop drawings of all piping systems, equipment, accessories, and supports in accordance with SUBMITTALS of the GENERAL REQUIREMENTS. The shop drawings shall include all necessary dimensions and details on pipe joints, fittings, fitting specials, valves, appurtenances, design calculations, and material lists. The submittals shall include detailed layout, spool, or fabrication drawings which show all pipe spools, spacers, adapters, connectors, fittings, and pipe supports necessary to accommodate the equipment and valves provided in a complete and functional system. The CONTRACTOR shall submit detailed LAY-OUT drawings of all systems for approval prior to starting installation. LAY-OUT drawings shall include all dimensions and spacings for pipe joints, fittings, fitting specials, valves, appurtenances, connectors, adapters, supports, hangers, anchors, etc. necessary to provide a complete and functional system as specified herein.

B. All expenses incurred in making samples for certification of tests shall be borne by the CONTRACTOR.

C. The CONTRACTOR shall submit as part of the shop drawings a statement from the pipe fabricator certifying that all pipes will be fabricated subject to a recognized Quality Control Program. An outline of the program shall be submitted to the ENGINEER for review prior to the fabrication of any pipe.

1.5 QUALITY ASSURANCE

A. Inspection: All pipe shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, the INSPECTOR shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.

B. Material Testing: The INSPECTOR shall have the right at any time to call for and witness the making of test specimens by any welder in accordance with these specifications. Any and all tests shall be at the CONTRACTOR'S expense. The CONTRACTOR shall furnish the ENGINEER 3(three) certified copies of mill test reports. Mill test reports shall show results of the chemical and physical tests made on each melt of steel representing the steel plate furnished for the manufacture of the pipe.

C. Specimen Plates: The INSPECTOR may require the CONTRACTOR to furnish specimen plates of the steel to be used in the fabrication of the pipe. Specimen plates shall be large enough to provide the number of test specimens required. Should any test specimen fail to meet the requirements of the plate specification, a second specimen plate of the same heat number shall be furnished. Should any one test specimen from the second plate fail, then all plates furnished from the same heat number will be rejected. Tests of these specimens will be made by an Independent Laboratory approved by the ENGINEER. The CONTRACTOR will be responsible for all expenses incurred in making the tests.

D. Required Tests: Specimen Plates shall be tested as follows:

E. Reduced Section Tensile Test: The yield point and ultimate tensile strength shall not be less than the minimum of the specified tensile range of the plate used.

F. Guided Bend Test: Bend tests shall be performed on both root and face weld specimens. The specimen shall be bent cold without fracture 180 degrees around a pin or mandrel, having a diameter 3 times the thickness of the plate, and shall show an elongation of not less than 20 percent across the weld.

G. Radiographic Test: A 4-1/2" by 17" spot x-ray shall be taken at a location as directed by the INSPECTOR. Procedures and interpretation shall be in accordance with ASME Boiler and Pressure Vessel Code, Section 8, Division I, Part UW51, with the exception that ASTM E94, Type I, industrial radiographic film shall be used.

H. Porosity: The maximum acceptable porosity shall be as set forth in Appendix IV of the ASME Boiler and Pressure Vessel Code.

I. Retest of Welds: Should any of the tests taken from a shift's production fail to meet any of the requirements of these specifications, one additional set of weld tests shall be made from each of the adjoining pipe sections. Retest of welds shall be performed at the CONTRACTOR'S expense, and shall be made and approved before beginning the next shift's production. Should any retest result in failure to meet any of the requirements of these specifications, all pipe sections of that shift's production will be rejected.

J. Welding Procedures: Welding procedure specifications shall be furnished to the ENGINEER for approval prior to the welding of pipe. The specifications shall specify, on a form equivalent to the ASME welding procedure form, the type of plate edge preparation, welding method, arc-voltage, arc-amperes, travel speed, wire size and type, flux type, and all other procedures necessary to make the weld.

K. Welder Qualifications: All welders and welding operators shall be qualified under the applicable provisions of the standard qualification procedure of the ASME Boiler and Pressure Vessel Code, Section IX.

1.6 MANUFACTURER'S SERVICE REPRESENTATIVE

A. Where the assistance of a manufacturer's service representative is advisable, in order to obtain perfect pipe joints, supports, or special connections, the CONTRACTOR shall furnish such assistance at no additional cost to the CITY.

1.7 MATERIAL DELIVERY, STORAGE, AND PROTECTION

A. All piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground, to provide protection against oxidation caused by ground contact. All defective or damaged materials shall be replaced with new materials.

1.8 CLEANUP

A. After completion of the work, all remaining pipe cuttings, joining and wrapping materials, and other scattered debris, shall be removed from the site. The entire piping system shall be handed over in a clean and functional condition.

PART 2 -- PRODUCTS

2.1 GENERAL

A. All pipes, fittings, and appurtenances shall be furnished in accordance with the requirements of the applicable Sections of Divisions **02** and **15** and as specified herein.

B. Pipe Supports: All pipes shall be adequately supported in accordance with the requirements of Section **15770**, "Pipe Supports and Mechanical Joint Restraints", and as shown.

C. Lining: All requirements pertaining to thickness, application, and curing of pipe lining, are in accordance with the requirements of the applicable Sections of Division **02**, unless otherwise specified.

D. Coating: All requirements pertaining to thickness, application, and curing of pipe coating, are in accordance with the requirements of the applicable Sections of Division **02**, unless otherwise specified. Pipes above ground or in structures shall be coated in accordance with Section **09800**, "Protective Coating."

E. Pressure Rating: All piping systems shall be designed for the maximum expected pressure as defined in Section **02730** "Sanitary Sewer System Testing" or as shown on the piping schedule.

F. Grooved Piping Systems: Piping systems with grooved joints and fittings may be provided in lieu of screwed, flanged, welded, or mechanical joint systems for steel and ductile iron yard piping, subject to approval of the ENGINEER. (Applicable to all piping above and below ground within the property limits of treatment plants, pump stations, and similar installations). All grooved couplings on buried piping must be bonded. To assure uniform and compatible piping components, all grooved fittings, couplings, and valves shall be from the same manufacturer.

G. Fasteners: Whenever stainless steel bolts are specified, it shall mean that all bolts, nuts and washers shall be made of Type 316 stainless steel, unless otherwise noted.

2.2 PIPE FLANGES

A. Flanges: Where the design pressure is 150 psi or less, flanges shall conform to either ANSI/AWWA C207 Class D or ANSI B16.5 150-lb class. Where the design pressure is greater than 150 psi, up to a maximum of 275 psi, flanges shall conform to either ANSI/AWWA C207 Class E, Class F, or ANSI B16.5 150-lb class. Where the design pressure is greater than 275 psi up to a maximum of 700 psi, flanges shall conform to ANSI B16.5 300-lb class. Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise shown. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207. Flanges for miscellaneous small pipes shall be in accordance with the standards specified for these pipes.

B. Blind Flanges: Blind flanges shall be in accordance with ANSI/AWWA C207, or with the standards for miscellaneous small pipes. All blind flanges for pipe sizes 12-inches and larger shall be provided with welded or screwed eye bolts.

C. Flange Coating: All machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.

D. Flange Bolts: All shall conform to ASTM A193; AISI Type 316 Stainless Steel, ANSI B18.2.1. Bolts shall be of such length that after installation, bolts will project 1/8 to 3/8 inch beyond the fact of the nut. No "all-thread" studs will be allowed. Flange Nuts: All shall conform to ASTM A194, AISI Type 316 Stainless Steel, ANSI B18.2.2, heavy hex pattern.

E. Insulating Flanges: Insulating flanges shall be used for joining flanged piping of dissimilar metals and for piping systems where corrosion or cathodic protection is involved. Insulated flanges shall have bolt holes 1/4-inch diameter greater than the bolt diameter.

F. Insulating Flange Sets: Insulating flange sets shall be provided where shown and where necessary to prevent contact between dissimilar metals. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers and a steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2-inch or smaller and shall be made of acetal resin. For bolt diameters larger than 1-1/2-inch, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic. Steel washers shall be in accordance with ASTM A 325. Insulating gaskets shall be full-face.

    1. Manufacturers:

        a. Improved Piping Products;

        b. Or equal.

G. Flange Gaskets: Gaskets for flanged joints shall be full-faced, 1/16-inch thick compressed sheets of aramid fiber base, with nitrile binder and non-stick coating, suitable for temperatures to 700 degrees F, a pH of one to eleven, and pressures to 1000 psig. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted:

    1. Water Service: Gaskets shall be ASTM D1330, GRADE I, red rubber with 1/8 inch minimum thickness and dimensions to suit contact facing.

    2. Oil Service: Gaskets shall be ANSI B16.21, non-asbestos filler with neoprene or nitrile binder, 1/16 inch minimum thickness for plain finished surfaces and 3/32 inch minimum thickness for serrated surfaces.

    3. Flat Face Flanges: Gaskets shall be ANSI B16.21, non-asbestos filler with neoprene or nitrile binder, 1/16 inch minimum thickness for plain finished surfaces and 3/32 inch minimum thickness for serrated surfaces.

4. Raised Face Flanges: Gaskets shall be continuous Stainless Steel ribbon wound into a spiral with non-asbestos filler between adjacent coils with a carbon steel gage ring. Compressed gasket thickness shall be 0.0095 inch -/+0.005 inch.

H. All flanges are subject to inspection and testing at the discretion of the INSPECTOR.

2.3 THREADED INSULATING CONNECTIONS

A. General: Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control or cathodic protection are involved.

B. Materials: Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other nonconductive materials, and shall have ratings and properties to suit the service and loading conditions.

2.4 GROOVED END COUPLINGS

A. General: Grooved End Couplings shall be provided where shown. The couplings shall conform to the requirements of ANSI/AWWA C606, "flexible" grooving for buried piping, or "rigid" grooving for above ground piping and gallery piping inside structures.

B. Gaskets: Shall be halogenated butyl rubber suitable for the service intended and designed for use with the specified pipe material.

C. Couplings: Shall be ductile iron conforming to ASTM A536; with Type 316 Stainless Steel bolts, ASTM A193, Grade B-8, Class 2, in buried locations and heat-treated track-head bolts conforming to ASTM A183, minimum tensile 110,000 psi for above ground piping and gallery piping inside structures.

1. The wall thickness of all grooved piping shall be as specified.

D. Grooved End Coupling Manufacturers:

1. Gustin-Bacon;

2. Victaulic;

3. Or equal.

Note: Ductile iron pipe couplings shall be furnished with flush seal gaskets.

2.5 SLEEVE-TYPE COUPLINGS

A. Construction: Sleeve-type couplings shall be of steel construction with steel bolts, and of sizes to fit the pipe and fittings. The middle ring shall be not less than 1/4-inch in thickness and 5 or 7-inches long for standard couplings, and 16-inches long for long-sleeve couplings. The followers shall be single-piece contoured mill section welded and cold-expanded to fit for the middle rings. They shall be of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be designed as to provide positive confinement of the gasket. Bolts and nuts shall be Type 316 Stainless Steel in buried locations and heat-treated Grade 5 or better for above ground piping and gallery piping inside structures. Buried sleeve-type couplings shall be factory-applied epoxy-coated as specified in Section **09800** "Protective Coating."

B. Pipe Preparation: The ends of the pipe shall be prepared to fit steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12-inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

C. Gaskets: Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," Grade 60, or equivalent suitable elastomer. The rubber in the gasket shall meet the following specifications:

1. Color - Jet Black

2. Surface - Non-blooming

3. Durometer Hardness - 74 5

4. Tensile Strength - 1000 psi minimum

5. Elongation - 175 percent minimum

6. The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000, AA709Z, meeting Suffix B13 Grade 3, except as noted above. All gaskets shall be compatible with the piping service and fluid utilized.

D. Insulating Couplings: Where insulating couplings are required, both ends of the coupling shall have a wedge-shaped gasket which assembles over a rubber sleeve of an insulating compound in order to obtain complete insulation of all coupling metal parts from the pipe.

E. Restrained Joints: Restrained joints for sleeve-type couplings shall be in accordance with AWWA M-11.

F. Sleeve-Type Couplings Manufacturers:

1. Smith-Blair;

2. Dresser;

3. Or equal.

2.6 EQUIPMENT CONNECTION FITTINGS

A. Equipment connection fittings shall provide both lateral and angular misalignment adjustment between equipment connection flanges and the connection to field piping systems by providing individually adjustable flexible joints at each connection. In addition, equipment connection fittings shall provide full pressure thrust restraint between the field piping connection and equipment connection flanges.

B. Equipment connection fittings shall consist of two flanged coupling adapters, a plain end section of pipe and thrust restraint rods and associated fittings designed to transmit thrust without transmitting shear to the thrust restraint rods and without compromising provisions for accommodating angular and parallel misalignment. Materials and features shall conform to the requirements established in this paragraph. Equipment connection fittings shall be Viking Johnson, Romac, or equal, modified as specified to provide the required features.

C. Equipment connection fittings shall each consist of a single sleeve of plain end piping conforming to the requirements of the specified piping system of sufficient length to span the gap between the connection at the equipment and the connection at the field piping with gasketed flange adapters at each end. Thrust restraint shall be provided by means of all threaded rod spanning between flanges and male rod nuts and female washers that are rounded to provide a ball-joint type self aligning feature. All threaded restraint rod shall project through flange and mating flange coupling adapter bolt holes or through holes in restraint lug plates that extend above the flanges and are secured to the flanges with a minimum of two flange bolts. Where the all threaded rods project through flange bolt holes, ball joint type nut and washer combinations and lock washers shall be provided at each face, each end. Where restraint lug plates are employed, ball joint type nuts and washers shall be provided only on the outside faces of the plates and the nuts shall have a self locking feature that prevents nut movement due to vibration or other operational or environmental causes. Double nutting with non-locking nuts shall not be an acceptable method of providing the self locking feature. Thrust rod diameter and material shall be selected to provide sufficient freedom of movement through all bolt holes to allow unrestricted maximum adjustment of equipment connection fittings to accommodate piping misalignment without transmitting any shear to the thrust rods and also to permit full development of thrust restraint at all thrust rod tension take-ups. Design of equipment connection fittings shall conform to AWWA C219.

D. Thrust rods, restraint lug plates, nuts, washers and lock washers shall be Type 316 stainless steel, all selected to develop full rated piping system pressure thrust forces. Dry film molybdenum di-sulfide anti-galling compound shall be factory applied to ends of thrust rods, covering all threads subject to nut travel and tightening. Gaskets shall be as specified in paragraph 15610-2.2-G. Flange gaskets shall be full face type. Follower gaskets shall be compression wedge type.

E. Sleeves shall be carbon steel or as specified for the specific piping system. Pressure rating of flange adapters shall equal or exceed the pressure rating of mating flanges. All metal portions of equipment connection fittings, with the exception of 316 stainless steel components, shall be coated and lined with fusion bonded epoxy conforming to AWWA C550 and NSF 61.

2.7 EXPANSION JOINTS

A. All piping subject to expansion and contraction shall be provided with expansion joints to compensate for movement, without exertion of undue forces to equipment or structures. Expansion joints shall be of stainless steel, monel, rubber, or other materials, suitable for each individual service. The CONTRACTOR shall submit detailed calculations and manufacturer's shop drawings and information on materials, temperature and pressure ratings.

2.8 PIPE THREADS

A. All pipe threads shall be in accordance with ANSI/ASME B1.20.

2.9 NOT USED

2.10 PIPE SLEEVES

A. Where specified or as indicated on the contract drawings, pipe sleeves shall be provided for piping passing through concrete or masonry walls.

B. Pipe sleeves shall be Type 316L stainless steel with a welded water-stop ring.

PART 3 -- EXECUTION

3.1 GENERAL

A. All piping and appurtenances shall be installed in accordance with the requirements of all applicable and related Divisions of these specifications.

B. Any deviation from lines, grades, or elevations shown on the Contract Drawings must be approved in writing by the ENGINEER

C. Where core drilling is required for pipes passing through existing concrete, all core drilling locations shall be determined by radiograph of the concrete construction to avoid damage to embedded raceways, conduits, and reinforcing steel.

D. Prior to any core drilling of existing concrete, the CONTRACTOR shall obtain approval of all locations, in writing, from the ENGINEER.

3.2 HANDLING

A. All pipe, fittings, and related appurtenances shall be handled in a manner that will insure installation in sound, undamaged, like new condition.

B. Pipe and fittings with cement mortar or epoxy lining or special coatings shall handled with rubber covered hooks, or other type of equipment to prevent damage.

C. Bare fork lift arms, hooks, cables, or chains shall not be used for handling pipe with special lining or coating.

D. Pipe and fittings in which the lining or coating has been damaged shall be immediately removed from the job site and replaced.

1. In instances where damage is minimal, the CONTRACTOR may, with approval from the ENGINEER, have the damage repaired by a qualified representative of the pipe manufacturer or fabricator.

3.3 STORAGE

A. All pipes shall be stored off the ground at all times, even during installation.

B. Store coated pipe on "extra wide" skids to protect the coating.

C. PVC pipe shall be stored out of direct sunlight to prevent damage and premature deterioration.

D. Pipe with special coatings shall be stored out of direct sunlight to prevent damage to coating.

E. Copper and galvanized pipe shall be covered or stored indoors.

F. Threaded ends of pipe shall be covered to protect the threads.

G. Flanged pipe shall have the flange faces protected.

H. Pipe that has become damaged or unidentifiable due to improper storage shall be rejected and immediately removed from the job site.

3.4 CUTTING PIPE

A. Cutting of pipe shall be done in a neat manner, without damage to the pipe, pipe lining, or pipe coating.

B. Cuts shall be smooth, straight, and at right angles to the pipe axis.

C. Pipe shall be cut using a portable guillotine saw, abrasive wheel "cut-off" saw, or milling cutter only. Use of gas torches for cutting pipe will not be permitted.

1. Where it becomes necessary to cut steel pipe larger than 6" in diameter, the CONTRACTOR may, with written permission of the ENGINEER, use gas torch to cut the pipe.

2. Only a qualified pipe fitter or boiler-maker shall make any approved torch cuts of pipe.

D. Field cut holes for saddles shall be made utilizing a hole saw or other mechanical means. Gas torch cutting of holes will not be permitted.

E. After cutting, the end of the pipe shall be dressed with a file or power grinder to remove all internal and external burrs and sharp edges.

F. All damaged or removed lining or coating shall be repaired by a qualified representative of the pipe manufacturer or fabricator.

3.5 CLEANING

A. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter prior to installation, and shall be kept clean until the work has been accepted.

B. Before jointing, all joint contact surfaces shall be wire brushed, wiped clean, and kept clean until the jointing is completed.

C. Flange faces shall be wire brushed and cleaned to remove all oil, grease, loose primer, mill scale, or any other foreign matter which could effect the proper seating of the gasket.

D. Prior to testing, pipe shall be thoroughly cleaned and/or purged in accordance with these specifications.

E. Cleaning of fresh and potable water lines shall be in accordance with these specifications, County of Los Angeles Health Department regulations, and shall be done under the supervision of the INSPECTOR and the Plant Fresh Water Supervisor.

F. Cleaning of weld joints and weld joint areas of stainless steel piping system, both before and after welding, shall conform to ASTM A380. Use only stainless steel brushes or stainless steel wool.

G. Finishing: Following fabrication of stainless steel piping connections, all weld areas shall be pickled to remove all mill scale, weld inclusions, and color, and passivated inside and out in conformance to ASTM A380.

H. Contractor shall submit the cleaning and passivation procedure of stainless steel piping system in compliance with the above requirements for ENGINEER’s review and approval.

3.6 PURGING

A. The CONTRACTOR shall coordinate all purging with adjacent work under other contracts as necessary to preclude work interference or duplication of effort, and to eliminate any safety hazard to adjacent work.

B. All purging work shall be done in the presence of the INSPECTOR, and in accordance with these specifications and the latest revisions of applicable City of Los Angeles codes.

C. All existing valves shall be operated by the City Plant Personnel only.

D. The ENGINEER shall be notified of purging operations as indicated per General Requirements. The notification shall include a detailed purging plan which includes the following:

1. Method of purging and proposed procedure

2. Required coordination

3. Drawings or sketches of lines to be purged

4. Sequence of operation

5. Anticipated flow rate in standard cubic feet per minute (scfm) of vented gas to be purged

6. Equipment to be used

7. Proposed method of disposing of vented gases

E. The CONTRACTOR shall provide all necessary piping connections, temporary piping, temporary valves, sampling taps, purge nitrogen, methane and oxygen monitoring apparatus, and all other items or equipment or material required to complete this work.

F. Pressure within the pipe shall be reduced to atmospheric pressure prior to beginning purging operations.

G. The pressure shall not exceed the normal operating pressure of the line being purged.

H. Unless otherwise approved in writing by the ENGINEER, vent gas containing digester/natural gas shall be disposed of in accordance with all applicable City, State, and Federal laws and regulations.

I. Other vent gases shall be piped outside of structures to the open atmosphere for disposal.

J. Pipelines Containing Digester/Natural Gas:

1. At least eight volume changes of Nitrogen gas shall be available for purging.

2. The CONTRACTOR shall utilize a combustible gas meter to determine the methane gas content in the vented gas.

3. The pipeline shall be purged until the residual methane in the vent gas is less than 1 percent.

Note: Following this purge, the piping is filled with Nitrogen, an asphyxiant. Proper ventilation must be provided if the pipe is opened.

K. Pipelines Containing Air:

1. Pipelines initially containing air, or pipelines which have been opened to atmosphere, shall be purged twice.

2. The first purge shall displace air with Nitrogen to minimize the explosive hazard of an oxygen-methane mixture.

   a. At least five volume changes of Nitrogen gas shall be available for the first purge.

   b. An oxygen meter shall be used to determine the oxygen content in the vented gas.

   c. The pipeline shall be purged until the oxygen in the vent gas is less than 5 percent.

   d. The purge rate shall not exceed the capacity of the pipeline.

3. The second purge shall displace the Nitrogen with Digester/Natural gas through the appliances or equipment to prevent supplying a noncombustible gas mixture to the equipment.

   a. The product gas, digester or natural gas, shall be introduced into the pipeline for the second purge.

   b. A combustible-gas meter shall be used to determine the methane gas content in the vented gas.

   c. The pipeline shall be purged through the appliance/equipment until methane gas can sustain a stable flame.

   d. The flow rate shall not exceed the capacity of the appliance/equipment.

L. After the piping has been purged, the CONTRACTOR shall notify the City, in writing, that the piping is ready to be placed in service.

M. City plant personnel will place the line in service.

3.7 PIPE SLEEVES

A. Unless otherwise specified or indicated on the contract drawings, pipes passing through concrete or masonry shall be installed through Type 316 stainless steel sleeves installed before concrete is placed or masonry is laid.

B. The CONTRACTOR shall be responsible for coordinating the installation of sleeves for all piping.

C. Pipe sleeves installed through floors provided with a special finish, such as ceramic tile, resilient tile, or seamless flooring, shall be flush with the finished floor surface, and shall be provided with nickel or chromium plated floor plates.

D. In all other locations where pipes pass through floors, pipe sleeves shall project 2" above the finished floor surface, with the projection uniform throughout each floor area.

E. In the case of insulated pipes, the insulation shall be carried through the pipe sleeve.

F. Where it is indicated on the contract drawings to provide for future installation of pipe, sleeves shall be provided and the ends sealed with an approved plastic cap/plug.

G. For piping passing through existing concrete or masonry floors or walls, core drilled holes will be accepted when approved in writing by the ENGINEER.

1. Any reinforcement which is cut while drilling holes in existing concrete or masonry must be coated with an approved epoxy coating prior to pipe being installed.

H. All pipes passing through interior concrete or masonry walls or slabs shall be caulked on both sides with approved caulking.

1. Caulking in fire-rated walls must be approved fire caulking of a color approved by the ENGINEER.

I. All pipes passing through walls or slabs which have one side exposed to the outside, have one side in contact with earth, or have one side exposed to a water bearing or water conveying structure, shall be sealed watertight by the use of modular casing seals ("link-seals") and be caulked on both sides of the wall or slab.

3.8 PIPE INSTALLATION

A. All piping shall be installed as specified, as indicated on the contract drawings and in a manner acceptable to the INSPECTOR.

B. The CONTRACTOR shall provide pipe cut from measurements made at the job site, and not from the contract drawings.

C. Provisions shall be made in laying out all piping throughout to provide for expansion and contraction.

D. Expansion joints or fittings shall be provided on all piping as specified or otherwise indicated on the contract drawings.

E. Piping shall not obstruct openings or passageways.

F. Piping shall be held free of any contact with building construction so as not to transmit noise.

G. All water, gas, and air supply piping at each fixture, or unit of equipment, shall be provided with an approved shutoff valve and union - WHETHER INDICATED ON THE CONTRACT DRAWINGS OR NOT - which will permit isolation and disconnection of each item without disturbing the rest of the system.

H. Air supply piping shall be provided with approved sectionalizing valves and valved air inlet connections as required for isolating portions of the system for periodic testing.

I. The gas supply line to each building shall be provided with an approved shutoff valve and union located above finish grade immediately outside the building. The gas shutoff valve shall have an approved, clearly visible, sign installed indicating "GAS SHUTOFF".

J. A union shall be provided within 2 feet of every threaded-end valve installed, unless there are other acceptable connections which will permit easy removal of the valve.

K. Unions shall also be provided in piping at locations adjacent to all devices or equipment which may require removal in the future, and at all locations specified or indicated on the contract drawings.

L. Non-pressure piping installed above electrical panels or cabinets shall be insulated and drip shields shall be installed to contain and channel any condensate or leakage away from the panels or cabinets.

M. Pressure piping shall not be installed above electrical panels or cabinets.

N. All air and digester gas piping shall be graded to points of drainage collection and approved drip legs and valve shall be installed.

O. Water supply piping within structures shall be arranged, and facilities provided, for complete drainage.

P. All piping serving metering equipment shall be uniformly graded so that air traps are eliminated and complete venting is provided.

Q. Seal water supply shall be piped to within 3 feet of the pumping unit seal box.

1. Connection to the pump from the seal water piping shall be made using stainless steel tubing as specified.

R. Stuffing box leakage from water sealed pumps shall be piped to the nearest point of drainage collection.

1. Seal water leakage shall not be allowed to free flow on the floor to the drainage collection point.

S. Taps for pressure gage connections on the suction and discharge sides of pumping units shall be provided with a nipple and an approved shutoff valve.

1. Drilling and tapping of pipe walls for installation of pressure gages or switches will not be permitted.

2. Taps shall be provided by factory threaded taps or a factory welded boss.

T. All branch connections in horizontal runs of air, gas, or steam piping shall be made from the top of the pipe.

U. In all piping, insulating fittings shall be provided to prevent contact of dissimilar metals wherever copper pipe, tubing, or fittings are connected to iron or steel pipe or fittings.

3.9 PIPE JOINTS

A. Pipe joints shall be provided as specified or as indicated on the contract drawings.

B. Threaded Joints:

1. Pipe threads shall conform to ANSI B2.1, NPT, and shall be full and cleanly cut.

2. Not more than three threads at each pipe connection shall remain exposed after installation.

3. Ends of pipe shall be reamed after threading and before assembly to remove all burrs.

4. Threaded joints in plastic piping shall be made up with Teflon thread tape applied to all male threads.

5. Threaded joints in stainless steel piping shall be made up with Teflon thread sealer and Teflon thread tape applied to all male threads.

6. Thread tape and joint compound or sealers are not to be used in threaded joints which are to be seal welded.

C. Compression Joints:

1. Ends of tubing shall be square cut and all burrs removed.

2. The tubing end shall be fully inserted into the compression fitting and the nut shall be tightened not less than 1-1/4 turns, and not more than 1-1/2 turns past finger-tight, or as recommended by the fitting manufacturer, to produce a leaktight, torque free connection.

D. Flared Joints:

1. The ends of annealed copper tubing shall be cut square and all burrs removed prior to flaring.

2. Ends shall be uniformly flared without scratches or grooves.

3. Fittings shall be tightened as required to produce a leaktight joint.

E. Solder and Brazed Joints:

1. Where solder fittings are specified in lines smaller than 2", joints may be soldered or brazed, at the option of the CONTRACTOR.

2. Joints in 2" and larger copper tubing shall be brazed.

3. Joints in copper refrigerant piping shall be brazed.

   a. Solder will not be accepted.

4. Surfaces to be joined shall be thoroughly cleaned with flint paper and coated with a thin film of flux.

5. At each joint, tubing shall enter to the full length of the fitting socket.

6. Care should be taken to avoid overheating the metal or flux.

7. While the joint is still hot, all excess filler metal and flux shall be removed with a rag or a brush.

F. Solvent Welded Joints:

1. All joint preparation, cutting, and jointing operations shall comply with the pipe manufacturer's recommendations and ASTM D2855.

2. Pipe ends shall be beveled or chamfered to the dimensions recommended by the pipe manufacturer.

3. Newly assembled joints shall be suitably blocked or restrained to prevent movement during the set time recommended by the manufacturer.

4. Pressure testing of solvent welded piping systems shall not be performed until the applicable curing time, set forth in Table X2.1 of ASTM D2855, has elapsed.

G. Flanged Joints:

1. Flange bolts shall be tightened sufficiently to slightly compress the gasket and effect a seal, but not so tight as to fracture or distort the flange.

2. A plain washer shall be installed under the head and nut of bolts connecting plastic pipe flanges.

3. Anti-seize thread lubricant shall be applied to the threaded portion of all stainless steel bolts during assembly.

4. Connecting flanges shall have similar facings (i.e., flat or raised face).

H. Welded Joints:

1. Welding shall conform to these specifications and recommendations contained in the "Code for Pressure Piping".

I. Rubber Gasketed Joints:

1. Clamps for hubless cast iron soil pipe shall be installed in accordance with the manufacturer's recommendations.

J. Grooved Couplings:

1. Grooves cut in steel pipe shall conform to flexible grooving dimensions as set forth in AWWA C606.

3.10 ALIGNMENT

A. All piping shall be installed to lines, grades, and elevations indicated on the contract drawings.

B. All deviations from the line, grade, or elevation as indicated on the contract drawings shall be approved in writing by the ENGINEER.

C. The CONTRACTOR is responsible for coordinating all other work to insure that piping is installed as indicated on the contract drawings.

D. Piping intended to be straight shall be straight. Deflections from a straight line or grade shall be approved in writing by the ENGINEER and shall be accomplished by the use of approved fittings.

E. For buried piping, all pipe subgrades shall be determined and checked by survey.

F. If laser equipment is used for piping installation, periodic elevation measurements shall be made with survey equipment to verify the accuracy of grade or elevation. If such measurements indicate thermal deflection of the laser due to differences between ground or atmospheric temperature and the air temperature within the pipe, steps shall be taken to prevent further thermal deflections.

3.11 PIPE INSULATION

A. All domestic hot water piping, cold water piping, and roof drain/overflow lines which pass through spaces above finished ceilings, or are suspended over equipment, electrical panels, or cabinets shall be insulated.

B. Piping shall be tested and shall be approved by the INSPECTOR prior to insulation installation.

C. All end joints of insulation shall be tightly butted.

D. All seams and joints shall be held by manufacturer's standard adhesive.

E. Jacket laps shall be neatly pasted in place.

F. All joints shall be pointed with insulating cement.

G. Fittings, flanges, and valves shall be insulated with approved molded insulation or insulating cement of the same thickness as the pipe insulation.

H. Hangers shall permit insulation to pass through and suitable saddles shall be provided to prevent the weight of the piping from being supported by the insulation.

3.12 PROTECTIVE COATING

A. All stainless steel, copper, and black steel pipe in buried locations shall have exterior surfaces protected in accordance with Section **09800**, Protection Coating.

3.13 COATING INSPECTION

A. All shop-applied coatings on pipe or fittings shall be inspected for holidays and other defects after receipt of the pipe or fittings on the job site, and again after installation if it is determined by the INSPECTOR that the coating may have been damaged.

1. Inspection shall be made using an electrical holiday detector.

2. The detector used, and inspection procedures, shall be in conformance with the requirements of Section 4.4 of AWWA C209.

B. All field-applied tape wrap on pipe, pipe joints, fittings and valves shall be inspected for holidays and other defects following completion of wrapping and again following installation if it is determined by the INSPECTOR that the wrapping may have been damaged.

C. Inspection of all field-applied wrapping shall be conducted by the City of Los Angeles Bureau of Standards.

D. Holidays and other defects detected during inspection shall be repaired in accordance with the recommendations of the coating or tape wrap manufacturer, as applicable.

1. At the discretion of the INSPECTOR, major areas of defects in pipe coatings may result in rejection of the pipe and its immediate removal from the job-site.

2. At the discretion of the INSPECTOR, major areas of defects in pipe coatings may be repaired on site by a qualified representative of the manufacturer or supplier.

3.14 BURIED PIPE

A. All stainless steel, copper, and black steel pipe in buried locations shall have exterior surfaces protected with a shop-applied plastic coating.

B. All galvanized piping in buried locations shall be wrapped with an approved pipe wrap, or be coated with an approved coal tar coating.

C. Buried pipe shall be protected from lateral displacement by use of the specified pipe embedment and/or encasement.

D. Under no circumstance shall pipe be laid in water.

E. All pipes will be laid on native material unless otherwise specified or indicated on the contract drawings.

F. All pipe subgrade shall be compacted to a relative density of 95%, unless otherwise indicated on the contract drawings.

G. All subgrade shall have compaction tests taken and be approved by the INSPECTOR prior to pipe installation.

H. When pipe laying is interrupted, or stopped at the end of the work shift, the open ends of pipe shall be sealed with a watertight plug, or other means acceptable to the INSPECTOR, to prevent water from entering the pipe.

I. Plastic pipe shall be "snaked" in the trench, and shall be kept shaded and shall be covered with backfill immediately following testing.

J. No piping will be encased or backfilled prior to testing and without approval of the INSPECTOR.

K. All fresh and potable water piping shall be completely encased in blue concrete after testing per Section 3.16 of this specification.

3.15 CONCRETE ENCASEMENT

A. All fresh water and potable water piping shall be encased in blue concrete, per the encasement detail in the contract drawings.

B. All other pipe encasement shall be installed where indicated on the contract drawings, per the encasement detail in the contract drawings.

C. Concrete and reinforcement for encasement shall be as specified in the cast-in-place concrete section of these specifications.

D. All pipe to be encased shall be suitably supported and blocked in proper position to allow for complete encasement.

E. All pipes to be encased shall be anchored to prevent floating.

F. All piping to be encased shall be tested as specified and the INSPECTOR shall approve the installation prior to encasement.

3.16 AS-BUILT DRAWINGS

A. The CONTRACTOR shall provide surveyed "as-built" drawings for all piping installed.

B. "As-built" drawings shall be provided for buried pipe installations as well as pipe installed in tunnels, galleries, inside buildings, and above-ground outside.

C. For buried pipe installations, surveyed "as-builts" shall include the elevation and location of pipe, valves, and all other pertinent information of the installation, as well as all existing piping or structures in the immediate area.

D. For buried installations, survey shall be taken of location and elevations of all piping installed prior to any encasement or backfill.

E. For buried, encased piping, survey shall be taken both prior to encasement and after the encasement is in place.

F. Drawings shall be forwarded to the ENGINEER for review and approval within five days after the installation is completed.

G. Progress payment will be withheld for all pipe installations for which "as-built" drawings are not received as specified.

3.17 TESTING

A. Testing of all pipe installations shall be done in conformance with Section **15620 "Pipe System Testing"** of the specifications.

3.18 DISINFECTION

A. Disinfection of miscellaneous piping, as applicable, shall be in conformance with the specifications.

1. Disinfecting Solution: Water solution containing chlorine at the minimum concentration of 50 parts per million.

2. Fill entire system with disinfecting solution.

3. Allow to stand 6 hours minimum.

4. Flush system until chlorine content is at or below content of local water supply.

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SECTION 15615
VALVES, GENERAL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and labor necessary for furnishing, epoxy coating, installing, adjusting, and testing of all valves and appurtenant work, complete and operable, in accordance with the requirements of the Contract Documents. Where buried valves are shown, the CONTRACTOR shall furnish and install valve boxes to grade, with covers, extensions, and position indicators.

B. The provisions of this Section shall apply to all valves and valve operators specified in the various Sections of Divisions 15 and 17 of these Specifications except where otherwise specified in the Contract Documents. Valves and operators in particular locations may require a combination of units, sensors, limit switches, and controls specified in other sections of these Specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Division 2 and 15, applicable sections, Pipe, Fittings, and Valves.

B. Section 09800 Protective Coating.

C. Section 11000 Equipment General Provisions.

D. Section 16800 Electric Motors.

E. Division 17 Instrumentation and Controls, applicable sections, Electric, Hydraulic, and Pneumatic Valves and Operators.

F. Section 15780 Piping Identification Systems.

G. Division 16 Electrical, applicable sections.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the reference specifications of the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards.

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
ANSI/ASME B1.20.1	General Purpose Pipe Threads (inch).
ANSI/ASME B31.1	Power Piping.
ASTM A 36	Specification for Structural Steel.

ASTM A 48	Specification for Gray Iron Castings.
ASTM A 126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
ASTM A 536	Specification for Ductile Iron Castings.
ASTM B 61	Specification for Steam or Valve Bronze Castings.
ASTM B 62	Specification for Composition Bronze or Ounce Metal Castings.
ASTM B 148	Specification for Aluminum-Bronze Castings.
ASTM B 584	Specification for Copper Alloy Sand Castings or General Applications.
ANSI/AWWA C500	Gate Valves for Water and Sewerage Systems.
ANSI/AWWA C502	Dry-Barrel Fire Hydrants.
ANSI/AWWA C503	Wet-Barrel Fire Hydrants.
ANSI/AWWA C504	Rubber-Seated Butterfly Valves.
ANSI/AWWA C506	Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valves Types.
ANSI/AWWA C507	Ball Valves 6 inches through 48 inches.
AWWA C508	Swing-Check Valves for Waterworks Service, 2 inches Through 24 inches NPS.
ANSI/AWWA C509	Resilient-Seated Gate Valves for Water and Sewage Systems.
AWWA C550	Protective Interior Coatings for Valves and Hydrants.
SSPC-SP-5	White Metal Blast Cleaning.
MSS-SP-70	Manufacturers Standardization Society of the Valve and Fitting Industry; Cast Iron Gate Valves. Flanged and Threaded Ends.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with GENERAL REQUIREMENTS. In addition to product information, the CONTRACTOR shall submit for approval lay-out drawings showing valve locations within the piping system, supports, and identification numbers.

B. The following submittals and specific information shall be provided.

1. Shop Drawings: Shop drawings of all valves and operators including associated wiring diagrams and electrical data, shall be furnished as specified in General Requirements. Submit for approval the following:

a. Manufacturer's literature, illustrations, paint certifications, specifications, detailed drawings, data and descriptive literature on all valves and appurtenances.

b. Deviations from Contract Documents

c. Engineering data including dimensions, materials, size and weight.

d. Fabrication, assembly and installation drawings.

e. CV values, head loss curves, and as required, calculations.

f. Special tools list.

2. Valve Labeling: The CONTRACTOR shall submit a schedule of valves to be labeled indicating in each case the valve location and the proposed wording for the label. Complete nameplate data of valves and actuators is required.

3. Operation and Maintenance Manuals:

a. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation, and spare parts information.

b. Furnish Operation and Maintenance Manuals in conformance with the requirements of the General Requirements.

4. Shop Tests: Hydrostatic tests shall be performed, when required by the valve specifications included herein.

5. Certificates: Where specified or otherwise required by ENGINEER, submit Test Certificates and Certificates of Compliance with AWWA standards and other specifications, especially where it concerns the suitability of the materials of construction for the particular application.

1.5 QUALITY ASSURANCE

A. Valve Testing: Valves shall be shop tested per manufacturer's recommendations and applicable AWWA/ANSI specifications prior to shipment. Manufacturer's certification that valves have been shop tested shall be submitted for approval 30 days prior to scheduled shipment.

B. Bronze Parts: Where specified, all interior bronze parts of valves shall conform to the requirements of ASTM B 62, or, where not subject to dezincification, to ASTM B 584.

C. Shop Inspection: Shop inspection of valve construction, testing and coating shall be witnessed and approved by the INSPECTOR. All valves will be shop inspected unless otherwise waived in writing by the INSPECTOR.

D. The CONTRACTOR shall demonstrate that each valve installed as a part of a piping system will operate under field conditions in a manner consistent with the design of the system. All testing of valves shall be witnessed and approved by the INSPECTOR.

E. For all pneumatic, hydraulic, and electric motor operators and controls, it shall be the responsibility of the CONTRACTOR to provide a qualified representative of the valve manufacturer to perform all field adjustments to set operator limit switches for the required functions. The cost of providing a qualified representative of the valve manufacturer for field adjustments shall be included in the CONTRACTOR'S bid. All wiring of motor operators shall be identified with a unique number unlike any other wiring identification. It is the responsibility of the CONTRACTOR to coordinate the requirements of this section with those involving both specifications of Division **16**, "Electrical" and Division **17**, "Instrumentation and Control."

F. All adjustments, calibration, and/or testing shall be done in the presence of the INSPECTOR.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the Work. Deliver anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay the Work.

B. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the site. CONTRACTOR shall notify ENGINEER if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition, in accordance with manufacturer's instructions.

C. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. Provide full-face protectors of waterproof material fastened to each side of the valve body to protect joints and the valve interior.

PART 2 -- PRODUCTS

2.1 VALVES

A. General: The CONTRACTOR shall furnish all valves, operators, actuators, valve-operating units, stem extensions, and other accessories as shown or specified. All valves shall have the name of the manufacturer and the site of the valve cast on the body or bonnet or shown on a permanently attached plate in raised letters. All valves shall be new and of current manufacture. All valves, 6-inch and larger, shall have operators with position indicators. Where buried, these valves shall be provided with valve boxes and covers containing position indicators, and valve extensions. Shut-off valves mounted higher than 5 feet 6 inches above working level shall be provided with chain operators.

B. Valve Flanges: The flanges of valves shall be in accordance with Section 15610, "Piping, General" and other Sections of Division 15, "Mechanical."

C. Valve Stems: Except where otherwise specified, valves with motorized operators shall have stems conforming to ASTM A276 Type 316 stainless steel with minimum tensile strength of 95,000 psi, and a minimum yield point of 75,000 psi, and elongation of 25% in 2 inches. Manually operated valves shall have silicon-bronze stems conforming to ASTM B 584-875, having minimum tensile strength of 60,000 psi, a minimum yield point of 24,000 psi, and elongation of 16% in 2 inches. Where subject to dezincification, manually operated valve stems shall be of bronze conforming to ASTM B 62, containing no more than 5% zinc, nor more than 2% aluminum.

D. Protective Coating: Except where otherwise specified, ferrous surfaces, exclusive of stainless steel surfaces, in the water passages of all valves 4-inch and larger, as well as the exterior surfaces of all submerged, buried or aboveground valves and operators, shall be coated as specified in Section 09800, "Protective Coating". Flange faces of valves shall not be coated. The valve manufacturer shall certify in writing that such coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications.

E. Valve Operators:

1. Where shown, certain valves shall be furnished with electric operators, provided by the valve manufacturer. All operators of a given type shall be furnished by the same manufacturer. Where these operators are supplied by different manufacturers, the CONTRACTOR shall coordinate their selection to provide uniformity of each type of electric operator. All valve operators, regardless of type, shall be installed, adjusted, and tested by the valve manufacturer at the manufacturing plant. Unless otherwise specified, all electric, pneumatic, and hydraulic

valve operators shall be in accordance with Sections of Division 17, "Instrumentation and Controls."

2. All manual operators shall have levers or handwheels, unless otherwise shown. Where buried, the valves shall have extensions with square nuts. Valves mounted higher than 5 feet-6 inches above floor or operating level shall have chain operators. Unless otherwise shown or specified, valves of sizes 4-inch and larger shall have gear-assisted operators.

F. Valve Labeling: Except when such requirement is waived by the ENGINEER in writing, a label shall be provided on all valves exclusive of hose bibs. The label shall be of 1/16-inch plastic or stainless steel, minimum 2 inches by 4 inches in size, as specified in Section **15780**, "Treatment Plant Piping Identification Systems", and shall be permanently attached to the valve or on the wall adjacent to the valve as directed by the ENGINEER.

G. Nuts and Bolts: All nuts and bolts on valve flanges and supports shall be Type 316 stainless steel.

H. Lubricating Gun: The CONTRACTOR shall supply a manual lubricating gun for lubricated plug valves in sizes up to 6-inch, inclusive. For larger valves the CONTRACTOR shall furnish a pneumatically operated lubricating gun. The guns shall be of the same manufacturer as the valves. They shall be equipped with flexible connector, pressure gage, and safety valve, with operating instructions and shipped in a labeled tool box.

PART 3 -- EXECUTION

3.1 VALVE INSTALLATION

A. General: All valves, operating units, controls, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as shown and specified. All valves shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.

B. Access: All valves shall be installed to provide easy access for operation, removal, and maintenance and to avoid conflicts between valve operators and structural members or handrails.

C. Valve Accessories:

1. Where combinations of valves, sensors, switches, and controls are specified, it shall be the responsibility of the CONTRACTOR to properly assemble and install these various items so that all systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on Shop drawing submittals.

2. Valve operators and controls are to be installed where specified and designated on the Contract drawings. The CONTRACTOR is responsible for installation of the correct valve operator and control as specified to provide a complete piping system as specified.

3. All buried valves shall be provided with cast iron valve boxes with extensions as needed sized appropriately for the valve size. Operating nut extensions shall be provided to bring the nut to within 6 inches of the surface. East Jordan Iron Works 8500 Series or equal.

D. All valves shall be field tested following installation to demonstrate that the valve operates under field conditions in a manner consistent with the design of the system.

E. All testing of valves shall be witnessed and approved by the INSPECTOR.

F. The CONTRACTOR shall demonstrate that each valve operator and control installed as a part of a piping system will operate under field conditions as designed and in the manner for which the operator was specified. All testing will be witnessed and approved by the INSPECTOR.

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SECTION 15620
PIPE SYSTEM TESTING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and all labor necessary for the testing of piping, all in accordance with the requirements of the Contract Documents.

B. The provisions of this Section shall apply to the testing of mechanical piping specified in Division 15 and piping related to equipment specifications in Divisions 11 and 13.

C. The CONTRACTOR shall obtain all necessary permits through regulatory agencies including, but not necessarily limited to, South Coast Air Quality Management District, State of California, and the City of Los Angeles for the use, venting, and disposal of test media employed. Unless otherwise specified, testing of piping systems shall be completed prior to final cleaning and disinfection.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The WORK of the following Sections and Divisions applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 15610 - Piping, General.

2. Division 15, Mechanical as applicable.

3. Section 02730, Forcemain and Sanitary Sewer System Testing

1.3 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with Section 15610 - Piping General and the GENERAL REQUIREMENTS.

B. The CONTRACTOR shall submit test procedures for all piping to the ENGINEER for approval prior to the start of testing.

C. A testing flow diagram indicating all lines to be field tested shall be prepared by the CONTRACTOR to facilitate the grouping of lines and connected equipment for a systems test. This testing flow diagram shall be submitted to the ENGINEER for review prior to the start of testing.

D. The testing flow diagrams shall contain the following information:

1. Individual Lines

a. Line Identification

b. Maximum Test Pressure

c. Test Medium Used

2. System Testing

a. Identification of lines in each group

b. Identification of connected equipment in each group

c. Test medium to be used in each group

d. Test pressure to be used in each group and point of application

e. Location of test blinds in each group

E. Upon satisfactory completion of each field test, a record containing the following information shall be made and submitted to the ENGINEER.

a. Date of test

b. Identification of item(s) tested

c. Test medium

d. Test pressure and duration

e. Test log, including procedure, leaks discovered, and corrective actions taken

f. Approval signature by INSPECTOR

F. Inspection: All testing of piping shall be conducted in the presence of the Inspector. Upon completion of testing, the CONTRACTOR shall complete and present for the Inspector's signature on Pipeline Test Report which indicates the piping tested, the test medium, the test duration, the pressure the piping was tested under and is signed by the CONTRACTOR'S authorized representative.

1.4 QUALITY ASSURANCE

A. Shall be in accordance with Section **15610** - Piping General, and the GENERAL REQUIREMENTS.

PART 2 -- (NOT USED)

PART 3 -- EXECUTION

3.1 SHOP TESTING OF PIPING

A. Unless otherwise specified, hydrostatic testing of shop fabricated pipe spools is not required. Fabricated spools shall be field tested after erection.

B. For jacketed piping, the internal line only shall be shop tested on the basis of the internal or external pressure whichever is critical. The jacket shall be field tested.

3.2 FIELD TESTING OF PIPING

A. General:

1. Fresh water piping shall be tested in accordance with Section 02666 Water Piping Testing and Disinfection. Gravity sewer and gravity drain lines shall be tested in accordance with Section 02730 - Sanitary Sewer System Testing. All liquid carrying lines shall be hydrostatic tested and all air/odor control lines shall be pneumatically tested. These results shall be reported to the ENGINEER using the attached form “PIPELINE TEST REPORT”.

2. All piping shall be pressure tested per the applicable piping code, unless otherwise specified herein.

3. Tests shall be applied after erection and before equipment is initially placed in service.

4. Tests shall be performed with all welded, threaded or flanged joints exposed, and before backfilling, insulating, or covering the joints of coated and wrapped buried lines.

5. The field test pressure shall not be applied until equipment and its contents reach approximately the same temperature.

6. The minimum test temperature is 50^{o} F. When testing through vessels, the metal temperature shall not be less than 60^{o} F. Deviation from this requires the ENGINEER's approval.

7. Pressure tests for vents, drains, relief valve discharge stacks, and lines open to atmosphere shall not be required.

8. In jacketed line, the jacket, complete with jumpovers, shall be field tested on the basis of jacket pressure.

9. The internal line of jacketed lines shall be retested in the field for flanged joint integrity.

10. In assembled equipment, it will be permissible to test piping in groups or systems only if the maximum test pressure rating of included equipment is equal to or more than 1-1/2 times the cold design service pressure.

11. Block valves at the process connections shall be tightly closed during pressure tests of the main process piping systems.

12. Instrument process piping beyond the first block valve shall not be tested prior to plant startup, except for careful inspection.

13. During the pressure test of the main process piping and/or equipment, the instrument process piping shall be vented to ensure that the instrument is not subjected to the test pressure due to a leaking process block valve.

14. The maximum test pressure applied to special piping components, such as displacement meters, expansion joints, strainers, etc., shall be the manufacturer's maximum allowable test pressure.

15. The ENGINEER shall be given five calendar days advance notice by the CONTRACTOR of any field testing to be performed.

16. Where codes require witnessing of field testing, the CONTRACTOR shall arrange for the presence of a properly authorized INSPECTOR.

17. The effect of hydrostatic head shall be considered when determining correct test gage reading and safe and/or effective test pressure of any element within a test system.

18. All orifice plates which interfere with filling, venting and draining shall be removed for testing.

19. Before pressure testing, all lines and/or systems shall be inspected to insure that all connected parts not to be included in the test are isolated.

20. Operational blinds may be used for field testing. Any other test blinds or blanks required for field testing during initial construction shall be furnished by the CONTRACTOR.

21. The correction of any shop fabricated defects revealed by the field testing procedure shall be repaired at the CONTRACTOR's expense.

22. Piping not pressure tested shall be checked for leaks after it is placed in service.

B. Hydrostatic Testing of Piping:

1. All piping to be hydrostatically tested per the applicable code to at least 1-1/2 times the design pressure but not less than 50 psig, except piping excluded herein. Ductile Iron piping design pressures shall be assumed to equal 35 psig.

2. Hydrostatic testing shall be done with clean water or water-glycol solution.

3. Testing of austenitic stainless steel shall be done using fresh potable water which shall be completely drained from the system following the test. The system shall be blown out with clean, dry air or nitrogen.

4. All water, steam and condensate systems shall be given full hydrostatic tests unless otherwise noted.

5. Liquid lines open to atmosphere shall be filled with water and tested to the maximum operating static head pressure.

6. Where any equipment is not designed for full hydrostatic test, or where the presence of water is not permitted in the equipment, such equipment shall be isolated from the test by blinds or valves or by disconnection.

7. Caution shall be exercised in hydrostatic system testing to assure that the simultaneous testing of large sized adjacent equipment and piping shall not overload supporting structures and foundations.

8. Any system under hydrostatic test shall be carefully observed, proper precautions shall be taken, and procedures established to prevent over pressuring of lines and any connected equipment.

9. Double valved 3/4 inch vents shall be installed at high points of the system. All vents and other connections which can serve as vents shall be open during filling so that all air is vented prior to applying test pressure to the system.

10. Double valved 3/4 inch drains shall be installed at low points to ensure complete filling of the piping and elimination of all air pockets..

11. During pressurization of the piping system, caution shall be exercised to ensure that the designated test pressure is not exceeded.

12. Test pressure shall be increased slowly in predetermined increments. Visual checks for leaks or damage shall be made at each increment. If any such leaks or damage are observed, the test shall be terminated, and suitable repairs made by the CONTRACTOR before retesting the system.

13. Tests shall be held at the final test pressure for a minimum of one hour or long enough to permit inspection of all joints and welds for leaks by means of soap and water solution, or other means approved by the ENGINEER.

14. Final approval of hydrostatic testing shall be made by the ENGINEER after completion of all testing and receipt of all test reports.

15. After satisfactory completion of hydrostatic testing, the piping system shall be restored to its normal operating configuration:

    a. All temporary blinds shall be removed and all lines and equipment shall be completely drained of the test fluid. The system shall be vented while draining to avoid a vacuum.

    b. All valves, orifice plates, expansion joints, short pieces of piping, and other equipment excluded from hydrostatic testing shall be installed.

    c. Valves closed solely for hydrostatic testing shall be opened.

    d. After system has been drained, temporary pipe supports shall be removed.

    e. Plant air, instrument air, nitrogen, hydraulic oil, and lube oil piping systems shall be blown dry with clean, dry air or nitrogen.

    f. Soap or other test solution residue shall be washed with potable water from the exterior of the piping system.

3.3 CLEANUP

A. Upon completion of the piping test, all debris and surplus materials from the work shall be removed from the site.

* * * * * *

PIPELINE TEST REPORT

DATE: _____

JOB NUMBER: _____ **ELEMENT:** _____

INITIAL TEST: _____ **RETEST:** _____

SYSTEM TESTED: _____

SECTION TESTED: _____

PLAN PAGE #: _____

PIPE MATERIAL: _____

TYPE OF TEST: _____

TEST MEDIUM: _____

TEST PRESSURE: _____

TEST DURATION: _____

TEST START TIME: _____ **FINISH:** _____

PRESSURE LOSS/GAIN: _____

REASON FOR LOSS/GAIN: _____

_____

ACTION TAKEN: _____

_____

TEST PERFORMED BY: _____
Print Name

_____
DATE **NAME OF CONTRACTOR**

TEST WITNESSED AND ACCEPTED BY: _____
Print Name

_____
DATE **BUREAU OF CONTRACT ADMINISTRATION**

SECTION 15670
HIGH DENSITY POLYETHYLENE (HDPE) PIPE, FITTINGS, AND VALVES

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B. This Section covers furnishing and installing High Density Polyethylene (HDPE) pipeline, fittings, flanges, and valves, complete, in place, in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 15610 Piping, General.

B. Section 09800 Protective Coating.

C. Section 02200 Earthwork.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Comply with the reference specifications of the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards.

1. Commercial Standards:

ASTM D1248	Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
ASTM D1785	Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
ASTM F477	Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
ASTM F894	Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. Shop Drawings: The CONTRACTOR shall submit shop drawings of pipe, fittings, flanges, valves, and appurtenances.

C. Certifications: The CONTRACTOR shall furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section of the Specifications, as specified in the referenced standards and the following supplemental requirements:

1. Hydrostatic proof test reports.

2. Sustained pressure test reports.

3. Burst strength test reports.

D. All expenses incurred in making samples for certification of tests and conducting the tests shall be borne by the CONTRACTOR.

1.5 QUALITY ASSURANCE

A. Inspection: All pipes shall be subject to inspection at the place of manufacture in accordance with the provisions of the referenced standards as supplemented by the requirements herein. The CONTRACTOR shall notify the INSPECTOR in writing of the manufacturing starting date not less than 14 calendar days prior to the start of any phase of the pipe manufacture.

B. During the manufacture of the pipe, the INSPECTOR shall be given access to all areas where manufacturing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.

C. Tests: Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of this Section of the Specifications, as specified in the referenced standards, as applicable.

D. The CONTRACTOR shall perform said material tests in accordance with the requirements of the Contract Documents. The INSPECTOR shall have the right to witness all testing conducted by the CONTRACTOR provided that the CONTRACTOR's schedule is not delayed for the convenience of the INSPECTOR.

E. In addition to those tests specifically required, the INSPECTOR may request additional samples of any material for testing by the ENGINEER. The additional samples shall be furnished at no additional cost to the CITY.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Materials shall consist of a black high-density polyethylene copolymer resin designed for extrusion for potable water and industrial applications per ASTM D1248 Type III Class C. The resin shall have a PE 3408 rating. The Manufacturer shall be ISO 9001 certified.

B. All pipe, fittings, and valve joints shall be joined using butt fusion or flanging. Flanged connections shall be made using a stub and backing ring arrangement, with the use of a suitable gasket material meeting the requirements of ASTM F477.

C. High Density Polyethylene piping systems shall have design pressure limit of 100 psig at SDR = 11 for exposed pipe and 64 psig at SDR = 26 for buried pipe with 3 feet of soil cover, unless otherwise noted.

D. High Density Polyethylene piping systems shall have a design temperature limit of 120 degree F, unless otherwise noted.

2.2 PIPE

A. For exposed pipe, HDPE pipe shall have SDR = 11 per ASTM D1248 Type III Class.

B. For buried pipe with 3 feet of soil cover, HDPE pipe shall have SDR = 26.

2.3 FITTINGS

A. For exposed pipe, HDPE fittings shall have SDR = 11.

B. For buried pipe with 3 feet of soil cover, HDPE fittings shall have SDR = 26.

C. Fittings shall be molded for sizes with nominal diameter up to 12" and fabricated thereafter.

D. Fasteners: All bolts, nuts, washers, and backing rings shall be made of Type 316 stainless steel, unless otherwise noted.

2.4 PIPE FLANGES

A. Flanges:

1. Class 150 Flat Face HDPE, ASTM F477.

B. Blinds Flanges:

1. Class 150 Flat Face, Schedule 80 PVC, ASTM D1785 Type 1 Grade 1.

C. Gaskets:

1. EPDM, Class 150 ANSI Full Face.

D. Bolts:

1. Studs: 316 Stainless Steel ASTM 193 Grade B8M.
2. Nuts: 316 Stainless Steel ASTM 194 Grade 8M.
3. Washers: 316 Stainless Steel ANSI B18.22.1.
4. Assemble with anti-seize compound.

PART 3 -- EXECUTION

3.1 GENERAL

A. All laying, jointing, and testing for defects and for leakage shall be performed in the presence of the INSPECTOR, and shall be subject to his approval before acceptance. All material found during the progress to have defects will be rejected and the CONTRACTOR shall promptly remove such defective materials from the site of the work.

3.2 HANDLING AND STORAGE

A. Handling: Pipe, fittings and accessories shall be carefully inspected before and after installation and those found defective shall be rejected. Pipe and fittings shall be free from fins and burrs. Before being placed in position, pipe, fittings, and accessories shall be cleaned, and shall be maintained in a clean condition. Proper facilities shall be provided for lowering sections of pipe

into trenches. Under no circumstances shall pipe, fittings or any other material be dropped or dumped into trenches.

B. Storage: Pipe should be stored, if possible, at the job site in unit packages provided by the manufacturer. Caution should be exercised to avoid compression damage or deformation to bell ends of the pipe. Pipe should be stored in such a way as to prevent sagging or bending and protected from exposure to direct sunlight by covering with an opaque material while permitting adequate air circulation above and around the pipe. Gaskets should be stored in a cool, dark place out of the direct rays of the run, preferably in original cartons.

3.3 TRENCHING AND BACKFILL

A. Trench excavation and backfill shall conform to the requirements of Section 02200 "Earthwork," and as specified herein. The minimum backfill compaction in the pipe zone shall be 90 percent of maximum density per ASTM D1557. At the end of each days work, open or unbackfilled sections of trench shall be covered with temporary steel plating.

3.4 INSTALLATION

A. Bell-and-spigot pipe shall be laid with the bell end pointing in the direction of laying. Pipe shall be graded in straight lines, taking care to avoid the formation of any dips or low points. Pipe shall not be laid when the conditions of trench or weather are unsuitable. At the end of each days work, open ends of pipe shall be closed temporarily with wood blocks or bulkheads.

B. Pipe shall be supported at its proper elevation and grade, care being taken to secure firm and uniform support under the pipe. Wood support blocking will not be permitted. The full length of each section of pipe and fittings shall rest solidly on the pipe bed, with recessed excavation to accommodate bells, joints, and couplings. Anchors and supports shall be provided where necessary and where indicated on the drawings for fastening work into place. Fittings shall be independently supported.

C. Short lengths of pipe shall be used in and out of each rigid joint or rigid structure. Piping that does not allow sufficient space for proper installation of jointing material shall be replaced by one of proper dimensions. Blocking or wedging between bells and spigots will not be permitted.

D. Joints shall be installed according to manufacturer's recommendations. Trenches shall be kept free of water until joints have been properly made. The maximum combined deflection at any coupling shall be in accordance with the manufacturer's recommendations.

E. Pipe shall be cut by means of saws, power driven abrasive wheels or pipe cutters, which will produce a square cut. No wedge-type roller cutters will be permitted. After cutting, the end of the pipe shall be beveled using a beveling tool, portable type sander or abrasive disc.

F. Joints shall be butt fused or flanged in accordance with the manufacturer's instructions.

3.5 SERVICE CONNECTIONS

A. Tapping sleeves shall be used for all outlet sizes greater than 2 inches in diameter. Tapping sleeves shall be assembled and installed in accordance with the manufacturer's recommendations. New replacement service connections shall be the same size as the existing connection that is being replaced, unless otherwise directed by ENGINEER.

3.6 CONNECTIONS TO EXISTING PIPELINES

A. The CONTRACTOR shall locate all underground improvements in the immediate vicinity of the proosed pipe installation and install the pipelines to the depths and grades shown on the drawings. Where the new work is to be connected to existing pipelines, the CONTRACTOR shall make arrangements with the serving utility well in advance of the connections, to allow adequate time for dewatering or temporary bypassing of the existing line, if necessary.

3.7 FIELD TESTING AND DISINFECTION

A. Field testing of all pipe installations shall be done in conformance with Section 15620 "Pipe System Testing."

3.8 PIPE SUPPORTS

A. Pipe supports, hangers, anchors, and guides shall be in accordance with the requirements of Section 15770, "Pipe Supports and Mechanical Joint Restraints."

3.9 PROTECTIVE COATING

A. Protective coating shall be provided in accordance with the requirements of Section 09800 "Protective Coating."

* * * * * *

SECTION 15700
DUCTILE IRON PIPE, FITTINGS, AND VALVES

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. Ductile iron pipe for water and other liquids shall be furnished in the sizes, classes, grades, or nominal thickness and joint types as specified herein or indicated on the Contract drawings.

B. It shall be the responsibility of the CONTRACTOR to furnish and install all ductile iron piping systems specified herein and as shown on the Contract drawings. Each system shall be installed complete with all applicable fittings, flanges, hangers, supports, anchors, expansion joints, flexible connections, valves, wall castings, sleeves, and accessories to provide a functional system as specified.

C. The CONTRACTOR shall be responsible for all insulation, lining and coating, piping identification, testing, cleaning, disinfecting, excavation, backfill and/or encasement specified herein or as shown on the Contract drawings.

D. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor necessary to complete installation of ductile iron piping systems as shown on the Contract drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 Earthwork.

B. Section 15620 Pipe System Testing.

C. Section 02730 Sanitary Sewer SystemTesting.

D. Division 17 Instrumentation and Controls, applicable sections, Electric, Hydraulic, and Pneumatic Valves and Operators.

E. Division 16 Electrical, applicable sections.

F. Section 09800 Protective Coatings.

G. Section 15610 Piping, General.

H. Section 15780 Piping Identification Systems.

I. Section 15770 Pipe Supports and Mechanical Joint Restraints.

J. Section 15615 Valves, General.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Comply with the reference specifications of the GENERAL REQUIREMENTS.

B. Commercial Standards:

ANSI/ASME B16.1	Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
ANSI/ASME B18.22.1	Plain Washers.
ANSI/AWWA C104/A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
ANSI/AWWA C110/A21.10	Ductile-Iron and Gray-Iron Fittings for Water.
ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
ANSI/AWWA C115/A21.15	Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
ANSI/AWWA C150/A21.50	Thickness Design of Ductile-Iron Pipe.
ANSI/AWWA C151/A21.51	Ductile-Iron Pipe, Centrifugally Cast, for Water.
ANSI/AWWA C153/A21.53	Ductile-Iron Compact Fittings for Water Service.
ANSI/AWWA C500	Metal-Seated Gate Valves for Water Supply Service.
ANSI/AWWA C504	Rubber-Seated Butterfly Valves.
ANSI/AWWA C507	Ball Valves, 6 In. Through 48 In.
ANSI/AWWA C508	Swing-Check Valves for Waterworks Service, 2 In. Through 24 In.
ANSI/AWWA C509	Resilient-Seated Gate Valves for Water Supply Service.
ANSI/AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances.
ANSI/AWWA C606	Grooved and Shouldered Joints.
ASTM A126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
ASTM A193	Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.
ASTM A194	Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
ASTM A276	Specification for Stainless Steel Bars and Shapes.
ASTM A395	Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
ASTM A536	Specification for Ductile Iron Castings.
ASTM B62	Specification for Composition Bronze or Ounce Metal Castings.
ASTM D698	Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.

ASTM D1557 Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.

1.4 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall submit complete shop drawings for approval in accordance with SUBMITTALS of the GENERAL REQUIREMENTS and as specified herein.

B. Shop drawings shall include all ductile iron pipes, fittings, flanges, gaskets, couplers, hangers, supports, wall castings, sleeves, valves, and all required appurtenances indicated on the Contract drawings or as specified herein necessary to provide a complete, operable piping system as specified.

C. The CONTRACTOR shall submit for review and approval complete piping lay-out drawings showing piping, fittings, couplers, hangers, supports, wall castings, sleeves, and all required appurtenances indicated on the Contract drawings or as specified herein necessary to provide a complete, operable piping system as specified. Layout drawings shall indicate all interfaces with other systems being installed which may cause interference with the piping system being installed.

D. It is the responsibility of the CONTRACTOR to coordinate all work being performed and review all shop drawings to insure that no unnecessary interferences exist.

E. The CONTRACTOR shall submit as part of the shop drawings for ductile iron piping a statement from the pipe manufacturer certifying that all pipes is being fabricated per the requirements of these specifications.

1.5 QUALITY ASSURANCE

A. The CONTRACTOR shall comply with SAMPLING, TESTING, AND FABRICATION INSPECTION of the General Requirements, as required by the INSPECTOR.

B. Inspection of ductile iron pipe manufacturing, grooving, lining and coating shall be at the discretion of the INSPECTOR.

C. All wall castings shall be shop inspected.

D. The CONTRACTOR shall be responsible for providing access to manufacturing and/or fabricating facilities at all times when so requested by the INSPECTOR.

E. Manufacturer shall perform Notched Charpy impact tests on at least one sample machined from the pipe wall during each hour to assure the desired toughness of the pipe.

F. Manufacturer shall perform Hydrostatic testing on pipe in conformance with AWWA C151.

G. Each pipe shall have clearly marked on each piece the words "DUCTILE IRON", the weight, class (nominal thickness) and the casting date.

H. Each piece of grooved end pipe shall have the groove type (flexible or rigid) clearly marked on each end of the pipe.

I. All valves shall be tested in accordance with manufacturer's recommendation and applicable AWWA/ANSI specifications.

1. Shop Inspection: All valves shall be shop inspected in accordance with Section 15615, "Treatment Plant Valves, General."

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All pipes, fittings, flanges, and valves shall be carefully examined for cracks and other defects prior to shipment. All defective pipes, fittings, flanges, and valves shall be rejected and replaced.

B. All pipes and equipment shall be supported in accordance with Section 15770, " Pipe Supports and Mechanical Joint Restraints."

C. Lining: All pipes and fittings shall be cement lined per ANSI/AWWA C104/A21.4.

D. Coating: All pipes, fittings, flanges, and valves shall be provided with coating in accordance with Section 09800 "Protective Coatings."

E. Ductile iron piping systems shall have design temperature limit of 200 degree F, unless otherwise noted.

A. Fasteners: All bolts, nuts, and washers shall be made of Type 316 stainless steel, unless otherwise noted.

F. Insulating connections: Protection shall be provided at all dissimilar metal connections.

1. General: Insulating gaskets, sleeves, washers, bushings, unions, couplings, or flanges, as appropriate, shall be used for joining pipes of dissimilar metals, and for piping systems where corrosion control and cathodic protection are required regardless of whether or not shown on Contract drawings.

2. Material: Insulating connections shall be in accordance with the requirements of Section 15610, "Piping, General."

2.2 DUCTILE IRON PIPE

A. General: Ductile iron pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51 and Cement Lined per ANSI/AWWA C104/A21.4.

B. Thickness: Ductile iron pipe shall be provided in accordance with the thickness class listed below:

PIPE SIZE	MINIMUM THICKNESS CLASS
4" to 16"	350
24" and LARGER	250

1. Contractor shall increase pressure class as needed to meet other requirements such as minimum pipe wall thickness for threaded flanges and thickness required for grooving.

2.3 FITTINGS

B. Fasteners: All bolts, nuts, and washers shall be made of Type 316 stainless steel, unless otherwise noted.

C. Grooved and Shouldered Fittings

1. Sizes 4" - 36": Grooved Ductile Iron per ANSI/AWWA C606-06, Wall Thickness per ANSI/AWWA C110/A21.10 or C153/A21.53, Center-to-End dimensions per ANSI/AWWA C110/A21.10, Cement Lined per ANSI/AWWA C104/A21.4.

PIPE SIZE	MAX. WORKING PRESSURE PSI
4"	500
6" - 8"	400
10" - 12"	350
14" - 18"	250
20" and LARGER	150

2. Couplings: Per ANSI/AWWA C606-06 with Buna-N Rubber Gasket.

   a. Manufacturers:
      (1) Gustin-Bacon;
      (2) Victaulic;
      (3) Or equal.

D. Mechanical or Push-on Joint Fittings

1. Only when specified or shown on Contract drawings, all ductile iron rubber gasket, push-on, or mechanical joint fittings shall be manufactured in accordance with ANSI/AWWA C110/A21.10.

2. Joints: Per ANSI/AWWA C111/A21.11 with Buna-N Rubber Gasket.

2.4 PIPE FLANGES

A. Flanges

1. Sizes 4" - 48": Class 125 Flat Face, drilled per ANSI B16.1, Ductile Iron, Threaded, ANSI/AWWA C115/A21.15.

B. Blind Flanges

1. Sizes 4" - 48": Class 125 Flat Face, drilled per ANSI B16.1, Ductile Iron.

C. Gaskets

1. Sizes 4" - 48": Buna-N Rubber, 1/8" Thick, Full Face.

D. Bolts

1. Studs: 316 Stainless Steel ASTM 193 Grade B8M.
2. Nuts: 316 Stainless steel ASTM 194 Grade 8M.
3. Washers: 316 Stainless Steel ANSI B18.22.1.
4. Assemble with anti-seize compound.

2.5 VALVES

A. General:

1. All valves shall comply with the requirements of Section 15615, "Treatment Plant Valves, General."

2. Valves with pneumatic, hydraulic, and electric motor operators and controls shall be in accordance with Division 17, "Instrumentation and Control" of these specifications.

3. Valves with manual operators shall be as specified herein.

B. Fasteners: All bolts, nuts, and washers shall be made of Type 316 stainless steel, unless otherwise noted.

C. Ball Valves:

1. Sizes 1/2" - 2":

a. Class: 150 psi, Threaded ends.
b. Type: Full port.
c. Body: Carbon Steel.
d. Ball: 316 Stainless Steel.
e. Seat: Teflon (PTFE).
f. Seals: Teflon (PTFE).
g. Stem: 316 Stainless Steel.
h. Operator: Manual, Lever.
i. Manufacturers:
(1) Jamesbury;
(2) Marwin;
(3) Or equal.

2. Sizes 3":

a. Class: 150 psi, 150 Flat Face Flanged.
b. Type: Full port.
c. Body: Carbon Steel.
d. Ball: 316 Stainless Steel.
e. Seat: Teflon (PTFE).
f. Seals: Teflon (PTFE).
g. Stem: 316 Stainless Steel.
h. Operator: Manual, Lever.
i. Manufacturers:
(1) Jamesbury;
(2) Marwin;
(3) Or equal.

3. Sizes 4" - 8":

a. Class: 200 CWP, 150 Flat Face Flanged.
b. Type: Full port.
c. Body: Cast Iron ASTM A126 Class B.
d. Ball: Cast Iron / Teflon Fused.
e. Seat: Reinforced PTFE.
f. O-rings: EPDM.
g. Stem: Stainless Steel.
h. Operator: Manual, Worm gear with handwheel.
i. Manufacturers:

(1) APCO Willamette;
(2) Valve Technology Company;
(3) Or equal.

4. Sizes 6" - 24":

a. Class: 150 psi, 150 Flat Face Flanged.
b. Type: Full port.
c. Body: Carbon Steel.
d. Ball: 316 Stainless Steel.
e. Seat: Teflon (PTFE).
f. Seals: Teflon (PTFE).
g. Stem: 316 Stainless Steel.
h. Operator: Manual, Worm gear with handwheel.
i. Manufacturers:
(1) APCO Willamette;
(2) Valve Technology Company;
(3) Or equal.

5. Sizes 4" - 60": Per ANSI/AWWA C507.

a. Class: 150 psi, 125 Flat Face Flanged.
b. Type: Full bore, Tight shut-off.
c. Body: Ductile Iron ASTM A536 65-45-12.
d. Ball: Ductile Iron ASTM A536 65-45-12.
e. Seats: Buna-N, Double seats.
f. O-rings: Buna-N.
g. Shaft: 316 Stainless Steel ASTM A276.
h. Operator: Manual, Worm gear with handwheel.
i. Manufacturers:
(1) APCO Willamette;
(2) Valve Technology Company;
(3) Or equal

D. Butterfly Valves:

1. Sizes 4” – 6”:

a. Class: 200 psi, 125 Flat Face.
b. Type: Lug style or Flanged as shown on Contract Drawings.
c. Body: Ductile Iron ASTM A395.
d. Disc: 316 Stainless Steel.
e. O-rings: Buna-N.
f. Seat: Buna-N.
g. Shaft: 316 Stainless Steel.
h. Operator: Manual, Lever.

2. Sizes 8” – 24”:

a. Class: 150 psi, 125 Flat Face.
b. Type: Lug style or Flanged as shown on Contract Drawings.
c. Body: Ductile Iron ASTM A395.
d. Disc: 316 Stainless Steel.
e. O-rings: Buna-N.
f. Seat: Buna-N.
g. Shaft: 316 Stainless Steel.
h. Operator: Manual, Worm gear with handwheel.

3. Sizes 4” and Larger: Per ANSI/AWWA C504.

a. Class: 150 psi, 125 Flat Face Flanged.
b. Body: Ductile Iron ASTM A536 65-45-12.
c. Disc: Ductile Iron ASTM A536 65-45-12 with 316 Stainless Steel disc edge.
d. Packing: Buna-N.
e. Seat: Buna-N.
f. Shaft: 316 Stainless Steel.
g. Operator: Manual, Worm gear with handwheel.

E. Check Valves:

1. Sizes 4" - 24":

a. Class: 150 psi, 125 Flat Face Flanged.
b. Type: Swing Check.
c. Body: Cast Iron ASTM A126 Class B.
d. Disc: Cast Iron ASTM A126 Class B.
e. Seat: Bronze.
f. Manufacturers:
(1) Golden Anderson;
(2) APCO;
(3) Or equal.

2. Sizes 4" - 24":

a. Class: 150 psi, 125 Flat Face Flanged.
b. Type: Wafer, Dual Flapper.
c. Body: Cast Iron ASTM A126.
d. Discs: Bronze.
e. Seal: Buna-N.
f. Spring: 316 Stainless Steel.
g. Manufacturers:
(1) APCO;
(2) Stockham;
(3) Gulf Valve;
(4) Or equal.

3. Sizes 4" and Larger: Per ANSI/AWWA C508.

a. Class: 150 psi, 125 Flat Face Flanged.
b. Type: Swing Check with Outside Lever and Spring or Weight.
c. Body: Cast Iron ASTM A126 Class B.
d. Body Seat: Bronze ASTM B62.
e. Disc: Cast Iron ASTM A126 Class B.
f. Disc Seat: Buna-N.
g. Hinge Pin: Stainless Steel.
h. Spring: Stainless Steel.
i. Controls: Position Switch per Section 17405, "Process Instrumentation and Control."
j. Manufacturers:
(1) Golden Anderson;
(2) APCO;
(3) Or equal.

F. Gate Valves:

1. Sizes 4" - 12":

a. Class: 200 psi, 125 Flat Face Flanged.

b. Type: Outside Screw and Yoke (OS&Y).
a. Body: Cast Iron.
b. Bonnet: Cast Iron.
c. Disc: Cast Iron.
d. Seats: Bronze.
e. Stem: Bronze.
f. Operator: Manual, Handwheel.
g. Manufacturers:
(1) ITT Engineered Valves;
(2) Walworth;
(3) Or equal.

2. Sizes 14" - 24":

a. Class: 150 psi, 125 Flat Face Flanged.
b. Type: Outside Screw and Yoke (OS&Y).
c. Body: Cast Iron.
d. Bonnet: Cast Iron.
e. Disc: Cast Iron.
f. Seats: Bronze.
g. Stem: Brass.
h. Operator: Manual, Worm gear with handwheel.
i. Manufacturers:
(1) ITT Engineered Valves;
(2) Walworth;
(3) Or equal.

3. Sizes 4" and Larger: Per ANSI/AWWA C500.

a. Class: 150 psi, 125 Flat Face Flanged.
b. Type: Metal-Seated, Double-disc, Solid wedge, Rising stem.
c. Body: Cast Iron.
d. Bonnet: Cast Iron.
e. Disc: Cast Iron.
f. Seats: Bronze.
g. Stem: Bronze.
h. Operator: Manual, Handwheel or Worm gear with handwheel.
i. Manufacturers:
(1) ITT Engineered Valves;
(2) Walworth;
(3) Or equal.

4. Sizes 4" and Larger: Per ANSI/AWWA C509.

a. Class: 150 psi, 125 Flat Face Flanged.
b. Type: Resilient-Seated, Rising stem.
c. Body: Cast Iron.
d. Bonnet: Cast Iron.
e. Disc: Rubber Coated Cast Iron.
f. Seats: Resilient Rubber.
g. Stem: Bronze.
h. Operator: Manual, Handwheel or Worm gear with handwheel.
i. Manufacturers:
(1) ITT Engineered Valves;
(2) Walworth;
(3) Or equal.

G. Plug Valves: Non-Lubricated, Eccentric Plug

1. Sizes 4" and Larger:

   a. Class: 150 WOG, 125 Flat Face Flanged.
   b. Type: Non-Lubricated, Eccentric Plug, bubble-tight shut-off.
   c. Body: Cast Iron.
   d. Plug: Cast Iron.
   e. Seat: Buna-N.
   f. Operator: Manual, Worm gear with handwheel.
   g. Manufacturers:
      (1) Dezurik;
      (2) Pratt;
      (3) Or equal.

PART 3 -- EXECUTION

3.1 HANDLING

A. Pipe, fittings, and accessories shall be handled in a manner that will insure installation in sound, undamaged condition.

B. Pipe and fittings with cement mortar or glass lining shall be handled with rubber covered hooks or other type of equipment to prevent damage to the cement lining.

C. Bare fork lift arms, hooks, or chains shall not be inserted into open ends.

D. Pipe and fittings in which the lining has been damaged shall be immediately removed from the job site and replaced.

3.2 STORAGE

A. All pipe and fittings shall be stored off the ground.

B. Pipe ends shall be covered to prevent foreign matter from entering the pipe during storage.

C. Pipe shall be stacked using suitable lumber between rows to prevent damage to pipe.

D. Any pipe that becomes damaged or unidentifiable due to improper storage shall be rejected and immediately removed from the job site.

3.3 REPAIR OF CEMENT MORTAR LINING

A. When approved and witnessed by the INSPECTOR, small and readily accessible damaged areas of cement mortar lining may be repaired in conformance with ANSI/AWWA C104/A21.4 and the following:

   1. Cut out the damaged lining to the metal, with square edges.

   2. Thoroughly wet the cut out area and adjoining lining.

   3. With the damaged area cleaned and the adjoining lining wet, spread the mortar evenly over the area to be patched.

   4. After the lining patch has become firm and adheres well to the surface, finish it with a wet 3" or 4" paint brush or similar soft bristle brush.

5. The repaired lining shall be kept moist by tying canvas wet burlap over the ends of the pipe or fitting for 24 hours.

6. After the lining patch is dry and hard, the asphaltic coating shall be replaced using approved coating material.

B. Repair mortar shall be in conformance with ANSI/AWWA C104/A21.4 and the following formula:

1. Cement Mortar mix by volume:

3 parts Portland Cement
2 parts clean sand
Necessary clean water for 5" to 8" slump

2. Sand shall be clean, free of clay, and screened through a No. 20 screen.

3.4 CUTTING PIPE

A. Cutting of pipe shall be done in a neat manner, without damage to the pipe or the lining.

B. Cuts shall be smooth, straight, and at right angles to the pipe axis.

C. Pipe shall be cut using a portable guillotine saw, abrasive wheel "cut-off" saw, or milling cutter only. Use of gas torches for cutting pipe will not be permitted.

D. Field cut holes for saddles shall be with mechanical cutters. Gas torch cutting will not be permitted.

E. After cutting, the end of the pipe shall be dressed with a file or power grinder to remove all roughness and sharp edges.

F. All damaged or removed cement mortar lining shall be repaired in accordance with Section 3.3 of these specifications.

3.5 CLEANING

A. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter prior to installation, and shall be kept clean until the work has been accepted.

B. Before jointing, all joint contact surfaces shall be wire brushed, wiped clean, and kept clean until jointing is completed.

C. Flange faces shall be wire brushed and cleaned to remove all oil, grease, loose primer, mill scale or any other foreign matter which could affect the proper seating of the gasket.

D. When pipe installation is stopped, precautions shall be taken to prevent foreign material from entering the pipe.

E. Prior to testing, the entire pipeline shall be flushed until the flushing water runs clear and clean.

F. Cleaning for final acceptance shall be in conformance with Section 02730, "Sanitary Sewer System Testing."

G. Cleaning of fresh and potable water lines shall be in accordance with these specifications, County of Los Angeles Department of Health requirements, and shall be done under the supervision of the INSPECTOR and the Plant Fresh Water Supervisor.

3.6 ALIGNMENT

A. Piping shall be installed to the lines and grades indicated on the Contract drawings.

B. Pipelines intended to be straight shall be laid straight Deflections from a straight line or grade shall not exceed the values stipulated in Table 5 of ANSI/AWWA C600, unless specially designed approved bells and spigots are provided.

C. Batter boards, laser beam equipment, or survey shall be used in all pipe installations to maintain alignment and grade.

D. Batter boards, if used, shall be erected at intervals not to exceed 25 feet.

E. All pipe subgrades shall be determined and checked by survey.

F. If laser equipment is used, periodic elevation measurements shall be made with survey equipment to verify accuracy of grade or elevation. If such measurements indicate thermal deflection of the laser due to differences between ground temperature and the air temperature within the pipe, steps shall be taken to prevent further thermal deflections.

3.7 AS-BUILT DRAWINGS

A. The CONTRACTOR shall provide surveyed "as-built" drawings for all piping installed.

B. "As-built" drawings shall be provided for buried pipe installations as well as pipe installed in tunnels, galleries, inside buildings, or above ground outside.

C. For buried pipe installations, surveyed "as-built" shall include the elevation and location of pipe, valves, and all other pertinent information on the installation, as well as all existing piping or structures in the immediate area.

D. For buried pipe installations, survey shall be taken of location and elevations of all piping installed prior to any encasement or backfill.

E. For buried, encased piping, survey shall be taken both prior to encasement and after the encasement is in place.

F. Drawings shall be forwarded to the ENGINEER for review and approval within five days after installation is completed.

G. Progress payment will be withheld for all pipe installations for which "as-built" drawings are not received as specified.

3.8 LAYING PIPE

A. Buried pipe shall be protected from lateral displacement by use of the specified pipe embedment and/or encasement.

B. Under no circumstance shall pipe be laid in water.

C. All pipes will be laid on native material unless otherwise indicated on the Contract drawings.

D. All pipe subgrade shall be compacted to 95% of maximum density per ASTM **D1557**, unless otherwise indicated on the Contract drawings.

E. All subgrade shall have compaction tests taken and be approved by the INSPECTOR prior to pipe installation.

F. When pipe laying is interrupted, or stopped at the end of the work shift, the open ends of pipe shall be sealed with a watertight plug, or other means acceptable to the INSPECTOR, to prevent water from entering the pipe.

G. All fresh water and potable water piping shall be completely encased in blue concrete after testing per Section 3.21 of this specification. No pipe will be encased prior to testing and without approval of the INSPECTOR.

3.9 FIELD JOINTS

A. All joints in buried locations shall be grooved-end type "flexible" joints unless otherwise indicated in these specifications or on the Contract drawings.

B. All joints of piping above ground outside, in tunnels, galleries, or inside buildings shall be grooved-end type "rigid" joints unless otherwise indicated in these specifications or on the Contract drawings.

C. All buried ductile iron pipe joints shall be field coated with a minimum 12 mils of an approved thixotropic coal tar coating. The coating shall cover the entire joint, including fasteners. This shall be in addition to the polyethylene encasement specified in Section 09800.

D. When specified or indicated on the Contract drawings, bells on flush mounted wall castings and wall sleeves shall be mechanical joint type with tapped holes for tie rods or stud bolts.

E. When specified or indicated on the Contract drawings, all wall castings other than flush mounted castings and wall sleeves shall be standard mechanical joint flanged joints as indicated.

F. Insulating Connections: All insulating connections shall be installed in accordance with manufacturer's printed instructions. Care shall be exercised to prevent damage to insulating fittings, while making up the joints.

3.10 GROOVED END JOINTS

A. When specified or indicated on the Contract drawings, grooved end couplings shall be installed in accordance with AWWA C606 and the manufacturer's recommendations and instructions.

B. Completed joints in piping above grade or within tunnels, galleries or buildings shall be rigid and shall not allow angular deflection or longitudinal movement.

C. Completed joints in buried piping shall be flexible and shall allow limited angular deflection and longitudinal movement, in accordance with the coupling manufacturer's recommended tolerances.

D. Except for closure pieces approved by the INSPECTOR, field grooving of pipe will not be permitted.

1. All field grooving allowed will be in strict accordance with AWWA C606.

2. Only grooving tools designed for cut-grooving of ductile iron pipe will be allowed for field grooving. Roll-grooving of field grooved pipe will not be allowed.

3. Cut-grooving tools shall be designed to be driven around a stationary pipe, shall have integral pipe stop to provide proper groove depth, and stops in the tool to provide proper dimension from the pipe end to the groove ("A" dimension).

4. Prior to beginning field grooving operations, the CONTRACTOR shall submit for approval the grooving tools intended for use.

5. All field grooving will be done in the presence of and approved by the INSPECTOR.

E. The outside surface of the pipe between the groove and the pipe end shall be smooth and free from deep pits or swells.

F. All rust, loose scale, oil, grease, and dirt shall be removed prior to installation of the coupler.

G. Following installation and before backfill or encasement, all joints in buried piping shall be thoroughly coated with a minimum of 12 mils of approved coal tar coating.

1. Joints may be wrapped with a minimum of 40 mils of approved pipe tape wrap.

3.11 MECHANICAL JOINTS

A. When specified or indicated on the Contract drawings, mechanical joints shall be carefully assembled in accordance with ANSI/AWWA C110/A21.10 and ANSI/AWWA C111/A21.11 and the manufacturer's recommendations.

B. If effective seating is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled.

C. Bolts shall be uniformly tightened to the torque values listed in Appendix A of ANSI/AWWA C111/A21.11.

D. Over tightening of bolts to compensate for poor installation will not be permitted.

E. Holes in mechanical joints with tie rods shall be carefully aligned to permit installation of the tie rods.

F. In flange and mechanical joint pieces, holes in the mechanical joint bells and the flanges shall straddle the top (or side for vertical piping) centerline. The top centerline shall be marked on each flange and mechanical joint piece at the foundry.

G. Minimum Number of Tie Rods:

PIPE SIZE	**OPERATING PRESSURE (PSI)**					
	50	75	100	125	150	200
3", 4", 6"	2	2	2	2	2	2
8"	2	2	2	2	4	4
10"	2	4	4	4	4	6
12"	2	4	4	6	6	6
14"	4	6	6	8	8	10
16"	6	6	6	8	8	12
18"	6	6	8	10	10	
20"	8	10	10	10	12	
24"	10	10	12	16		
30"	6	8	10	12	14	18
36"	8	10	14	16	20	

PIPE SIZE	OPERATING PRESSURE (PSI)					
	50	75	100	125	150	200
42"	6	8	12	14	16	22
48"	8	10	14	18	20	28

3.12 PUSH-ON JOINTS

A. When specified or indicated on the Contract drawings, joints shall be installed in conformance with ANSI/AWWA C111/A21.11 and the pipe manufacturer's instructions and recommendations for proper jointing operations.

B. All joint surfaces shall be properly lubricated with approved heavy vegetable soap solution immediately before the joint is completed.

C. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean at all times.

D. Each spigot end of the pipe shall be suitably beveled to facilitate assembly.

3.13 FLANGED JOINTS

A. When specified or indicated on the Contract drawings, flanges shall conform to ANSI B16.1, B16.2, and B21.10.

B. Bolts shall be tightened gradually and at a uniform rate to facilitate uniform gasket compression.

C. Care shall be taken when connecting to pumping equipment to insure that pipe stresses are not transmitted to the pump flanges.

D. All flanged piping connecting to pumping equipment shall be permanently supported so that accurate matching of bolt holes and uniform contact over the entire surface of abutting pump and piping flanges are obtained before the installation of any bolts in these flanges.

E. Pump connection piping shall be free to move parallel to its longitudinal centerline while the bolts are being tightened.

F. Each pump shall be leveled, aligned, and placed into position, but shall not be grouted until the initial fit-up and alignment of the pipe is completed.

G. Each pump shall be grouted before final bolting of the connecting piping.

3.14 FLANGED COUPLING ADAPTERS

A. When specified or indicated on the Contract drawings, flanged coupling adapters shall be installed in strict accordance with manufacturer's recommendations and instructions.

3.15 MECHANICAL COUPLINGS

A. When specified or indicated on the Contract drawings, mechanical couplings shall be installed in accordance with the manufacturer's recommendations and instructions.

B. A space of at least 1/4", and not more than 1", shall be left between the pipe ends.

C. All assembly bolts shall be uniformly tightened so that the coupling is free from leaks and all parts of the coupling are square and symmetrical with the pipe.

D. Following installation of the coupling, damaged areas of shop coatings of the pipe and coupling shall be repaired to the satisfaction of the INSPECTOR.

3.16 WALL CASTINGS

A. Unless otherwise specified or indicated on the Contract drawings, wall castings shall be provided where ductile iron pipe passes through concrete walls.

B. Where a flange and mechanical joint piece is to connect to a mechanical joint wall casting, the bolt holes in the bell of the wall casting shall straddle the top (or side for vertical piping) center line of the casting and shall align with the bolt holes in the flange and mechanical joint piece. The top center line shall be marked on the wall casting at the foundry.

3.17 WALL SLEEVES

A. Wall sleeves are to be provided where ductile iron pipe passes through concrete floors and where otherwise specified or indicated on the Contract drawings.

B. Wall sleeves are to be sealed using modular casing seals ("link seals") and approved caulking on both sides of the floor penetration.

3.18 REDUCERS

A. Reducers, adjacent to flow meters and pumps or in other locations as specified or indicated on the Contract drawings, shall be eccentric pattern, installed with the straight side on top so that air traps are not formed. All other reducers shall be concentric pattern.

3.19 OUTLETS

A. Where a 12" or smaller branch outlet is specified or indicated on the Contract drawings, and the diameter of the line pipe is at least twice the diameter of the branch, either a tee or factory welded-on boss shall be used.

B. Connections of gauges to 6" and smaller pipe shall be made using a tee complete with blind flange drilled and tapped to accept the gauge piping specified.

C. Connections of gauges to 8" and larger piping shall be made by means of a factory welded-on boss.

D. Tapping saddles shall be used for "hot taps" in specified instances or as shown on the Contract drawings.

1. Use of tapping saddles must be approved in writing by the ENGINEER prior to use in every instance.

3.20 CONNECTIONS TO EXISTING PIPING

A. Connections between new work and existing piping shall be made using fittings submitted and approved by the ENGINEER for each separate condition encountered.

B. Each connection to existing pipe shall be made at a time and under conditions which will least impact normal plant operations, and as authorized in writing by the ENGINEER.

C. The CONTRACTOR is responsible for making provisions for cutting of existing pipe when necessary, using approved mechanical means. Flame cutting of pipe will not be allowed.

D. The CONTRACTOR is responsible for making provisions for dewatering existing lines and for disposal of water from the dewatering operation.

E. Prior to construction, the CONTRACTOR shall submit for review and approval detailed procedures for pressure testing and the making of final connections to existing lines.

F. When connecting to existing fresh and potable water lines, all new piping and fittings shall be cleaned and disinfected prior to making the connection.

1. Provisions shall be made to prevent any cross-connection and contamination of existing lines.

2. Trench water, mud, or other contaminants shall not be allowed to enter the lines.

G. The CONTRACTOR is responsible for disinfection and chlorination of all fresh and potable water lines after connections are made in conformance with these specifications.

3.21 CONCRETE ENCASEMENT

A. All fresh water and potable water piping shall be encased in blue concrete, per the detail in the Contract drawings.

B. All other pipe encasement shall be installed where indicated on the Contract drawings, per the detail in the Contract drawings.

C. Concrete and reinforcement for encasement shall be as specified in the cast-in-place concrete section.

D. All pipes to be encased shall be suitably supported and blocked in proper position.

E. All pipes to be encased shall be anchored to prevent floating.

F. All pipes to be encased shall be tested as specified and the INSPECTOR will approve the pipe installation prior to encasement.

3.22 REACTION ANCHORAGE

A. All buried piping shall have thrust blocks placed at all changes of direction, tees, y-branches, valves, and at ends of pipe runs.

B. All piping with mechanical couplings or mechanical joints subject to internal pressure shall be anchored to prevent separation of joints.

C. All mechanical joint tees, y-branches, bends deflecting 22-1/2 degrees or more, and plugs which are installed in piping shall be provided with approved retainer glands.

D. When placing thrust blocks, the concrete shall extend from the pipe to solid, undisturbed earth, and all joints shall remain accessible for repair.

E. The dimensions of all concrete blocking shall be as indicated on the Contract drawings, or as directed by the INSPECTOR to accommodate field conditions.

F. If adequate support against undisturbed earth cannot be obtained, metal hamess anchorages shall be provided.

1. Metal harness anchorages shall consist of steel rods extending across the joint and securely anchored to the pipe.

G. All reaction anchorage and/or seismic anchorage shall be installed prior to pressure testing of any pipe.

H. Seismic anchorage for piping installed above ground outside, inside tunnels, galleries, or buildings shall be in conformance with the City of Los Angeles Building Code.

3.23 PRESSURE AND LEAKAGE TESTING

A. All pipe installations shall be hydrostatically tested for a period of two hours at pressure specified.

B. All pressure testing shall be done in the presence of, and approved by, the INSPECTOR.

C. All pipe supports and reaction anchorage/seismic anchorage must be installed prior to pressure testing.

1. Buried pipe may be center-loaded to preclude movement prior to testing.

D. The high point of all pipe installed shall be vented.

E. All leaking piping must be completely retested following repairs of leaks.

F. Acceptable leakage is **zero**.

G. If changes are made to piping installation after initial testing, such as addition of valves, routing changes, branches, etc., the entire line must be retested.

H. Testing against valves will not be permitted. All sections of pipe to be tested must be blind-flanged.

I. All pipelines tested shall be approved by the INSPECTOR, and a Pipeline Test Report completed for each test.

3.24 DISINFECTION

A. Disinfection of ductile iron pipe shall be performed in conformance with Section **02730**, "Sanitary Sewer System Testing."

3.25 VALVE INSTALLATION AND TESTING

A. Installation and field testing of valves shall be performed in accordance with manufacturer's recommendations, AWWA Standards, and the applicable provisions of Section **15615**, "Treatment Plant Valves, General."

B. All field testing shall be witnessed and approved by the INSPECTOR.

* * * * * *

PIPELINE TEST REPORT

DATE:_____

JOB NUMBER:_____ **ELEMENT:**_____

INITIAL TEST:_____ **RETEST:**_____

SYSTEM TESTED:_____

SECTION TESTED:_____

PLAN
PAGE#:_____

PIPE MATERIAL:_____

TYPE OF TEST:_____

TEST MEDIUM:_____

TEST PRESSURE:_____

TEST DURATION:_____

TEST START TIME:_____**FINISH:**_____

PRESSURE LOSS/GAIN:_____

REASON FOR LOSS/GAIN:_____

_____

ACTION TAKEN:_____

_____

TEST PERFORMED BY:_____
Print Name

_____
DATE **NAME OF CONTRACTOR**

TEST WITNESSED AND ACCEPTED BY:_____
Print Name

_____
DATE **BUREAU OF CONTRACT ADMINISTRATION**

c/c City of Los Angeles Project Engineer
Project Test Report File
DIV15.MCH\15005.WP

SECTION 15770
PIPE SUPPORTS AND MECHANICAL JOINT RESTRAINTS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and all labor necessary for the furnishing, construction, and installation of all pipe supports, hangers, guides, and anchors shown, specified, or required for a complete and operable piping system, in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 15610 Piping, General.

B. Section 09800 Protective Coating.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Comply with the reference specifications of the GENERAL REQUIREMENTS.

B. Comply with the current provisions of the following Codes and Standards.

ANSI/ASME B31.1	Power Piping
ASTM A 123	Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

1.4 CONTRACTOR SUBMITTALS

A. Shop Drawings: The CONTRACTOR shall furnish complete shop drawings of all pipe supports, hangers, anchors, and guides, as well as calculations for special supports and anchors, in accordance with GENERAL REQUIREMENTS.

1.5 QUALITY ASSURANCE

A. Comply with testing procedures as specified in the reference standards.

B. The CONTRACTOR shall comply with SAMPLING, TESTING, AND FABRICATION INSPECTION of the General Requirements, as required by the INSPECTOR.

C. Inspection of pipe support manufacturing and fabrication shall be conducted at the discretion of the INSPECTOR. The CONTRACTOR shall be responsible for providing access to manufacturing and/or fabrication facilities at all times when so requested by the INSPECTOR.

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Code Compliance: Code Compliance: All pipe supports shall comply with the City of Los Angeles Building Code Seismic Zone IV requirements and Section 2-2312 of the State Building Code, Part 2, Title 24, California Administrative Code, as applicable.

1. All supports and parts thereof shall conform to the requirements of ANSI/ASME B31.1 unless otherwise supplemented or modified by these specifications.

2. Supports and mechanical joint restraints for plumbing piping shall comply with the latest edition in effect of the City of Los Angeles Plumbing Code.

3. Supports for Heating, Venting, and Air Conditioning shall comply with the latest edition in effect of the City of Los Angeles Mechanical Code.

B. Structural Members: Wherever possible, pipes shall be attached to structural members. Where it is necessary to frame structural members between existing members, such supplementary members shall be provided by the CONTRACTOR at no additional cost to the CITY. All supplementary members shall be in accordance with the requirements of the building code and the American Institute of Steel Construction.

C. Pipe Hangers: Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow for free expansion and contraction of the piping, and shall prevent excessive stress on equipment. All hangers shall have a means of vertical adjustment after erection. Hangers shall be designed so that they cannot become disengaged by any movement of the supported pipe. Hangers subject to shock, seismic disturbances, or thrust imposed by the actuation of safety valves, shall include hydraulic shock suppressors. All hanger rods shall be subject to tensile loading, only.

D. Hangers Subject to Horizontal Movements: At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit such movement. Where horizontal pipe movement is greater than ½-inch, or where the hanger rod deflection from the vertical is greater than 4 degrees from the cold to the hot position of the pipe, the hanger rod and structural attachment shall be offset in such a manner that the rod is vertical in the hot position.

E. Spring-Type Hangers: Spring-type pipe hangers shall be provided for piping subject to vibration or vertical expansion and contraction, such as engine exhausts and similar piping. All spring-type hangers shall be sized to the manufacturer's printed recommendations and the loading conditions encountered. Variable spring supports shall be provided with means to limit misalignment, buckling, eccentric loading, or to prevent overstressing of the spring, and with means to indicate at all times the compression of the spring. The support shall be designed for a maximum variation in supporting effort of 25 percent for the total travel resulting from thermal movement.

F. Thermal Expansion: Wherever expansion and contraction of piping is expected, a sufficient number of expansion loops or joints shall be provided, together with the necessary rolling or sliding supports, anchors, guides, pivots, and restraints. They shall permit the piping to expand and contract freely in directions away from the anchored points and shall be structurally suitable to withstand all loads imposed.

G. Heat Transmission: Supports, hangers, anchors, and guides shall be so designed and insulated, that excessive heat will not be transmitted to the structure or to other equipment.

H. Riser Supports: Where practical, risers shall be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping.

I. Freestanding Piping: Free-standing pipe connections to equipment, like chemical feeders, pumps, etc., shall be firmly attached to fabricated steel frames made of angles, channels, or I-beams anchored to the structure. Exterior, free-standing overhead piping shall be supported on fabricated pipe stands, consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U-bolts or clamps, securing the pipes.

J. Submerged Supports: All submerged piping shall be supported with hangers, brackets, clips, or fabricated supports and anchors of Type 316 Stainless Steel.

K. Point Loads: All meters, valves, equipment, and other point loads shall be independently supported to prevent undue pipe stress and failure. No meter, valve, or other equipment shall be supported by the piping.

L. Noise Reduction: To reduce transmission of noise in piping systems, all copper tubes in buildings and structures shall be wrapped with a 2-inch wide strip of rubber fabric or similar, suitable material, at each pipe support, bracket, clip, or hanger.

M. All anchor bolts installed as part of a pipe support system, regardless of location or application, shall be manufactured of Type 316 Stainless Steel.

N. All hanger rods, bolts, u-bolts, turn buckles, aircraft cable, nuts, and washers shall be Type 316 stainless steel.

O. No "all thread" rod will be allowed. All hanger rods will be solid rod threaded as necessary to accommodate the hanger.

P. Pipe supports for brass and copper pipe shall be copper plated, or insulators provided. Protection shall be in the form of a rubber insert between the pipe and the support.

Q. Rubber hose and flexible tubing shall be provided with continuous angle or channel support.

R. Unless otherwise indicated on the drawings, piping shall be supported @ 1-1/2" out from the face of walls and at least 3" below ceilings.

2.2 MANUFACTURED SUPPORTS

A. Unless otherwise specified or indicated, pipe supports shall be fabricated of manufacturer's standard materials.

B. Manufacturers:

1. B-Line;

2. Anvil;

3. Carpenter & Patterson;

4. Or equal

2.3 MECHANICAL JOINT RESTRAINTS

A. The mechanical joint restraint shall be incorporated into the design of the follower gland. The restraint mechanism shall consist of a plurality of individually actuated gripping surfaces to maximize restraint capability. Glands shall be manufactured of ductile iron conforming to ASTM A536-80.

1. The gland shall be such that it can replace the standardized mechanical joint gland and can be used with the standardized mechanical joint gland and can be used with the standardized

mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of latest version.

2. The restraining glands shall have a pressure rating equal to that of the pipe on which it is used. The restraining glands shall have been tested to UNI-B-13-92, be listed by Underwriters Laboratories, and be approved by Factory Mutual.

B. Manufacturers:

1. Carpenter & Patterson;

2. B-Line;

3. Anvil;

4. Michigan;

5. Unistrut;

6. Or Equal

2.4 COATING

A. Galvanizing: Unless specified to be fabricated of stainless steel, all fabricated pipe supports shall be blasted to a white clean condition after fabrication and hot-dip galvanized in accordance with ASTM 123.

B. Other Coatings: Other than those supports specified to be manufactured of stainless steel, all manufactured pipe supports shall receive protective coatings in accordance with the requirements of Section **09800** "Protective Coating". "Protective Coating" shall be applied in addition to hot-dip galvanizing. Galvanizing is not to be considered as a "Protective Coating".

C. The CONTRACTOR is responsible for requesting SHOP INSPECTION of all hot-dip galvanizing of pipe supports.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. General: All pipe supports, hangers, brackets, anchors, guides, inserts and seismic bracing shall be fabricated per these specifications and installed in accordance with the specified spacings and manufacturer's approved submittals per ANSI/ASME B31.1. All concrete inserts for pipe hangers and supports shall be coordinated with the form work and installed per approved drawings.

B. All embedded pipe supports shall be in place prior to placement of cast-in-place concrete.

C. Power actuated drive pins are not acceptable for installing pipe hangers.

D. Any pipe supports/hangers installed in existing concrete shall be anchored by the use of Type 316 Stainless Steel anchors.

E. Contact between dissimilar metals shall be prevented. Dissimilar metals shall be isolated by the use of approved coal tar epoxy, zinc chromate, or approved isolation pads.

F. All connect points for hanger rods shall be locked off using lock nuts or double nuts.

3.2 FABRICATION

A. Shop Inspection: Shop inspection shall be required for all welded pipe hangers and supports. It shall be the responsibility of the CONTRACTOR to request shop inspection as required.

* * * * * *

SECTION 15780
PIPING IDENTIFICATION SYSTEMS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish, mark, and install identification devices for all exposed piping and piping in accessible chases and areas above ceilings with panels, and valves using color bands, lettering, flow direction arrows, and related permanent identification devices, and all appurtenant works, in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 09800 Protective Coating

B. Divisions 11 and 15 - Piping, Valves and Appurtenances as applicable.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the reference specifications of the GENERAL REQUIREMENTS.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with GENERAL REQUIREMENTS.

B. The following submittals and specific information shall be provided:

1. The CONTRACTOR shall submit samples of all types of identification devices to be used in the work.

2. The CONTRACTOR shall submit to the ENGINEER, for approval, a list of suggested wording for all valve tags prior to fabrication.

1.5 QUALITY ASSURANCE (NOT USED)

PART 2 -- PRODUCTS

2.1 IDENTIFICATION OF PIPING

A. All exposed piping and piping in accessible chases and areas above ceilings with panels, including stainless steel, galvanized steel, copper, PVC, and Fiberglass RTR piping, shall be completely and totally painted for identification purposes. Piping shall be identified with lettering or tags designating the service of each piping system, shall have flow directional arrows, and shall be completely painted and color coded as scheduled below. All piping scheduled to be color coded shall be completely painted or coated with the indicated colors.

B. Each pipe identification shall consist of color coding in accordance with Paragraph 3.4 IDENTIFICATION SCHEDULE, a painted label and a directional flow arrow. The painted label and directional arrow shall be placed between color bands. When more than one color band is used the different color bands shall be painted adjacent. Piping identification shall be located in accordance with Paragraph 3.3 PIPE IDENTIFICATION LOCATION.

C. Color Bands and Arrows: Pipe color bands shall be painted on the pipe. Paper or plastic banding of pipe shall not be acceptable. Arrows shall be of the same color as the lettering and shall point away from the lettered labels in the direction of the flow. Chlorinated service shall be identified by a yellow second band.

1. Color band size shall be as follows:

Pipe Size	Color Band Size
less than 1" diameter	1" wide
1" to 12" diameter	1 pipe diameter wide
greater than 12" diameter	12" wide

2. Yellow Second Band:

Pipe Size	Color Band Size
less than 1" diameter	½" wide
1" to 12" diameter	½ pipe diameter
greater than 12" diameter	6" wide

D. For cases where there are insulated lines wrapped with aluminum sheathing, stainless steel sheathing, or gray fabric, the background color shall be applied to a 24 inch length of pipe section and color band centered within the 24 inch field of background color.

E. Paint Colors: Paint colors shall conform to the following designations:

Color	Federal Number
Light Blue	15200
Dark Blue	15102
Red	11105
Yellow	13655
Orange	12246
White	17875
Light Brown	10219
Dark Brown	10080
Light Green	34540
Green	14187

Color	Federal Number
Black	17038
Silver	17178
Grey	16314
Purple	27144
Purple*	Pantone 512C

*For Reclaimed Water per Los Angeles County Reclaimed Water Advisory Committee.

F. Lettering: Contents identification labels shall be stenciled directly on pipes. Black identification letters shall be used where the background pipe color is light, and white identification letters where the background color is dark. The size of the letters for identification labels shall be as follows:

Pipe Outside Diameter	Letter Size
5/8" to 1"	5/16" high
1" to 3"	3/4" high
over 3"	2" high

2.2 EXISTING IDENTIFICATION SYSTEMS

A. In installations where existing piping identification systems have been established, the CONTRACTOR shall continue to use the existing system. Where existing identification systems are incomplete, utilize the existing system as far as practical and supplement with the specified system. The objective is to fully identify all new piping, valves and appurtenances to the level specified herein.

2.3 IDENTIFICATION OF VALVES AND SHORT PIPE LENGTHS

A. Identifying devices for valves and the sections of pipe that are too short to be identified with color bands, lettered labels, and arrows shall be identified with metal tags as specified herein.

B. Metal tags shall be of stainless steel with embossed lettering. All tags shall be designed to be firmly attached to the valves or short pipes or to the structure immediately adjacent to such valves or short pipes.

2.4 IDENTIFICATION OF PIPE 5/8 INCH OR SMALLER

A. Where the outside diameter of pipe or pipe covering is 5/8 inch or smaller, metal tags shall be provided instead of lettering. Tags shall have the specified identifying lettering stamped in the tag and shall be fastened to the pipe with suitable chains. Metal tags and chains shall be aluminum or stainless steel. Where tags are used, pipe shall be color coded as specified in Paragraph 3.4.

2.5 MISCELLANEOUS

A. Electrical conduit shall be painted to match ceiling or wall surfaces as directed by the Engineer.

B. Vent lines shall be painted to match the surfaces that they adjoin.

C. Valve handwheels and levers shall be painted red.

D. Hoist hooks and blocks shall be painted yellow with black stripes.

PART 3 -- EXECUTION

3.1 GENERAL

A. All labels and identification tags shall be installed in accordance with the manufacturer's printed instructions, and shall be neat and uniform in appearance. All such tags or labels shall be readily visible from all normal working locations.

3.2 VALVE TAGS

A. Valve tags shall be permanently attached to the valve or structure by means of 2 stainless steel bolts or screws.

B. The wording on the valve tags shall describe the exact function of each valve, e. g., " HWR-BALANCING," "CLS THROTTLING", "RAS-PUMP SHUT-OFF," etc.

3.3 PIPE IDENTIFICATION LOCATION

A. Straight lines of pipe shall be identified at intervals of 30 feet maximum, and at least once in each room unless otherwise directed by the Engineer.

B. Piping shall also be identified at a point approximately within 2 feet of all turns, ells, valves, and on the upstream side of all distribution fittings or branches and on both sides of each floor, wall or barrier through which the line passes.

C. For pipe runs of 50 feet or less the distance between bands shall be 30 inches. For pipe runs of 50 feet or more, spacing between bands shall be 72 inches.

D. Sections of pipe that are too short to be identified with color bands, lettered labels, and directional arrows shall be tagged and identified similar to valves.

3.4 IDENTIFICATION SCHEDULE

A. Application of identifying devices shall conform to the following color codes, or match existing color code as directed by the ENGINEER.

MATERIAL IN PIPE	**BACKGROUND COLOR/BAND COLOR(S)**
Potable Water (RP Device)	Light Blue
Fresh Water (Air Gap)	Light Blue
Industrial and/or Cooling Water	
LPE	Dark Blue/Red
MPE	Dark Blue/Red
HPE	Dark Blue/Red
HPE (continuously chlorinated)	Dark Blue/Red/Yellow
Fire Water	Red

MATERIAL IN PIPE	BACKGROUND COLOR/BAND COLOR(S)
Industrial and/or Cooling Water (continued)	
Industrial Water	Dark Blue
Cooling Water Supply-Plant Effluent	Dark Blue/Red
Cooling Water Return-Plant Effluent	Dark Blue/Red
Cooling Water Return-Industrial Water	Dark Blue
Cooling Water Supply-Industrial Water	Dark Blue
Reclaimed Water	Purple' (Pantone 512 C)
Final Effluent	Dark Blue/Red
Irrigation (continuously chlorinated eff.)	Dark Blue/Red/Yellow
Chemical Supply Lines (Extremely Dangerous)	
Chlorine (gas or liquid)	Yellow
Chlorine Solution	Yellow
Sodium Hydroxide	Yellow
Chlorinator Vent And Detection Lines	Yellow
Hydrazine	Yellow
Lime Slurry	Yellow
Sodium Hypochlorite	Yellow
Ferric Chloride	Yellow
Ferrous Chloride	Yellow
Phosphoric Acid	Yellow
Concentrated Sulfuric Acid	Yellow
Dilute Sulfuric Acid	Yellow
Chemical Draw and Vent	same color as the chemical line
Dilute Acid	Yellow
Chemical Supply Lines	
Polymer-Anionic	White/Yellow
-Cationic	White/Yellow
-Nonionic	White/Yellow
-Dist.	White/Yellow
-Effluent	White/Yellow
Chemical Draw and Vent	same color as the chemical line
Sulfite/Bisulfite Scrubbing Liquid	White/Yellow
Stratford Solution (Scrubbing Liquor)	White/Yellow
Sludge/Ash Transport and Process Lines	
Blended Sludge	Dark Brown
Bottom Sludge	Dark Brown
Centrate (from digested sludge dewatering)	Dark Brown/Dark Blue
Centrate (H_2S Scrubbing)	White/Yellow
Circulated Sludge	Dark Brown
Digested Sludge	Dark Brown
Sulfur Slurry (H_2S Scrubber)	Dark Brown
Sludge Filtrate	Dark Brown/Dark Blue
Raw Sludge	Dark Brown
Screened Digested Sludge	Dark Brown
Waste Activated Sludge	Light Brown
Digester Cleanings	Dark Brown
Digested Sludge to Screenings	Dark Brown
Digested Sludge to Blending Tanks	Dark Brown
Digested Sludge Recirculated/Transfer	Dark Brown

MATERIAL IN PIPE	BACKGROUND COLOR/BAND COLOR(S)
Sludge/Ash Transport and Process Lines (continued)	
Digested Sludge Withdrawal	Dark Brown
Thickened Waste Activated Sludge	Light Brown
Return Activated Sludge	Light Brown
Thickener Subnatant	Light Brown/Dark Blue
Thickener Subnatant Overflow	Light Brown/Dark Blue
Cyclone Effluent	Dark Brown/Dark Blue
Grit	Dark Brown
Mixed Liquor	Light Brown
Thickener Pressurized Recycle	Light Brown/Dark Blue
Scum	Dark Brown
Ash (hydraulic)	Light Brown
Processed Condensate	Dark Blue/Light Brown
Process Effluent	Dark Blue/Red
Final Clarifier Influent	Light Brown
Pneumatic Transport Lines	
Sludge Derived Fuel	Light Green/Orange
Hot Ash	Light Green/Yellow
Sand Transport	Light Green
Air and Vacuum Supply Lines	
Oxygen (gaseous)	Purple/Black
Oxygen (liquid)	Purple/Black
Combustion Air	Green
Compressed Air (non-instrument)	Green/Red
Instrument Air	Green/White
Process Air	Green
Product Air	Green/Light Green
Foul Air	Green/Grey
Nitrogen (liquid)	Green/Black
Nitrogen (gaseous)	Green/Black
Vacuum	Green
Vent Duct	same as line color
Boiler Waters	
Boiler Feedwater Makeup	Dark Blue/Orange
Boiler Feedwater	Dark Blue/Orange
Continuous Blow-down	Dark Blue/Orange
Demineralized Water	Dark Blue/Orange
H. P. Condensate	Dark Blue/Orange
L. P. Condensate	Dark Blue/Orange
M. P. Condensate	Dark Blue/Orange
Intermittent Blow-down	Dark Blue/Orange
Softened Water	Dark Blue/Yellow
Reverse Osmosis Treated Water (permeate)	Dark Blue/Orange
Steam	
L. P. Steam	Orange/Red
M. P. Steam	Orange/Red
H. P. Steam	Orange/Red

MATERIAL IN PIPE	BACKGROUND COLOR/BAND COLOR(S)
Lube and Hydraulic Oils	
Hydraulic Oil Supply	White/Orange
Hydraulic Oil Return	White/Orange
Lube Oil	White/Orange
Drain Oil	White/Orange
Oil Vapor	White/Orange
Grease	White/Orange
Defoamant-Sludge Blending Tanks (Kerosine)	White/Orange
Carver-Greenfield Process Oils	
Recovered Oil	Light Brown/Red
Fluidized Oil Makeup/Supply	Light Brown/Red
Oil/Sludge Slurry	Dark Brown/Red
Addback Slurry	Dark Brown/Orange
Centrate Oil	Light Brown/Yellow
Sludge Oil	Black/Red
Oil Vapor	White/Red
Fuel Supply	
Natural Gas/LNG/Propane	Orange
Digester Gas: LP, MP, and HP	Orange
Diesel	Orange
Lab	
Distilled Water	Dark Blue/Orange
Salt Water	Dark Blue/Light Green
Miscellaneous	
Equipment Vent	same as equipment
Sample Line	same as line or equipment being sampled
Spare Chemical	same as chemical
Sanitary Sewer/Storm Drains	
Roof Drain	Black or same color as bldg walls
Plant Drain	Black
Storm Drain	Black
Sump Pump Discharge	Black
Sanitary Sewer	Black
Sanitary Vent	Black
Influent Raw Sewage (up to primary tanks)	Grey
Demineralized Waste	Black/Yellow
Reverse Osmosis Reject	Black

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SECTION 15830
MISCELLANEOUS VALVES

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install miscellaneous valves as shown and as specified herein, complete and operable including accessories and, where designated, operators, in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 15615 Treatment Plant Treatment Plant Valves, General.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the reference specifications of the GENERAL REQUIREMENTS and Section 15615 "Treatment Plant Valves, General."

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS and Section 15615 "Treatment Plant Valves, General."

1.5 QUALITY ASSURANCE

A. QUALITY ASSURANCE shall comply with the quality requirements specified in RELATED WORK SPECIFIED ELSEWHERE above.

B. All valves shall be tested in accordance with manufacturer's recommendation and applicable AWWA/ANSI specifications

C. Shop Inspection: All valves shall be shop inspected in accordance with Section 15615, 1.5(c) of these specifications.

PART 2 -- PRODUCTS

2.1 AIR-VACUUM AND AIR-RELEASE VALVES

A. Sewage Air and Vacuum Valves: Sewage air and vacuum valves shall be capable of venting large quantities of air while pipelines are being filled, and allowing air to re-enter while pipelines are being drained. They shall be of the size shown, with flanged or screwed ends to match piping. Valves shall be designed for minimum 150 psi water-working pressure, unless otherwise shown.

B. Sewage Air-Release Valves: Sewage air-release valves shall vent accumulating air while system is in service and under pressure and be of the size shown and shall meet the same general requirements as specified for air and vacuum valves except that the vacuum feature will not be required. They shall have long float stems and bodies to minimize clogging. They shall be designed for a minimum water-working pressure of 150 psi, unless otherwise shown.

C. Sewage Combination Air Valves: Sewage Combination air valves (SCAV) shall combine the characteristics of air and vacuum valves and air release valves by exhausting accumulated air in systems under pressure and releasing or re-admitting large quantities of air while a system is being filled or drained, respectively. They shall have the same general requirements as specified for air and vacuum valves.

D. Sizing of orifices in valves shall consider the maximum pumping rate of the system as the fill rate of the pipeline.

E. Materials:

Component	Material
Body, cover	Cast iron, ASTM A126, Grade B
Float	Type 316 SS, ASTM A240
Seat	Buna-N or Type 316 SS
Trim	Type 316 SS, ASTM A240

F. Manufacturers, or Equal:

1. APCO manufactured by Valve and Primer Corporation
2. Crispin manufactured by Multiplex Manufacturing Company
3. Or equal.

2.2 BACKFLOW PREVENTER VALVES

A. General: Backflow preventers shall work on the reduced pressure principle. They shall consist of 2 spring-loaded check valves, automatic differential pressure relief valve, drain valves, and shut-off valves. The body material shall be bronze or cast iron for a working pressure of not less than 150 psi, with bronze or stainless steel trim. Drain lines with air gaps shall be provided.

B. See Section 15450 - Plumbing Equipment, for backflow preventer valves used in potable water systems, if used.

C. Manufacturers, or Equal:

1. Cla-Val Co.
2. Febco
3. Watts
4. Or Equal.

2.3 SMALL PRESSURE REDUCING VALVES (Air, chemical and water systems)

A. General: Small air and water pressure reducing valves less than 1 ¼ inches shall be of the spring-loaded diaphragm type with a minimum pressure rating of 250 psi, with bronze body, nickel alloy or stainless steel seat, and threaded ends. Each valve shall be furnished with built-in or separate strainer and union ends.

B. Small chemical (i.e. ammonium hydroxide, sodium bisulfite, and sodium hypochlorite) pressure reducing valves shall be of the spring-loaded diaphragm type with Teflon body, hastelloy or Teflon trim material, and Teflon seat material. Value body shall be flanged.

C. Manufacturers, or Equal:

1. Cash-Acme

2. Watts

3. Or equal.

2.4 LARGE WATER PRESSURE REDUCING VALVES

A. General: Large water pressure reducing valves 1 ¼ inches and larger shall be of the piston-type or diaphragm-actuated globe type, with cast iron body and stainless steel trim. Unless otherwise shown or specified, the valves shall have a pressure rating of not less than 150 psi, shall have 125-lb flanges, and shall have an adjustable downstream pressure range with a downstream setting as required.

B. Manufacturers, or Equal:

1. Cla-Val Co.

2. GA Industries

3. Or Equal.

2.5 SEWAGE SURGE RELIEF VALVES

A. Operating Requirements: The valve shall open immediately when the system pressure exceeds the load setting 50 psi of the counterweights and shall close slowly at an adjustable speed upon return of system pressure to normal.

B. Valve Body: Sewage surge relief valves shall be constructed of a heavy cast-iron or cast-steel body with a welded steel disc having rubber seating face, a non-corrosive shaft for attachment of counterweight arms and lever, and complete non-corrosive cushion chamber.

C. Cushion Chamber: The cushion chamber shall be attached to the side of the valve body externally and so constructed with a piston operating in a chamber that will effectively permit the valve to be operated without any hammering action. The cushioning shall be by oil stored in an oil reservoir attached by piping and fittings to the cushion chamber. The cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements.

D. Manufacturers, or Equal:

1. Cla-Val Co

2. Apco

3. Or equal.

2.6 TEMPERATURE AND PRESSURE RELIEF VALVES

A. Valve Construction: Temperature and pressure relief valves for cold and hot water, steam, and air service, unless otherwise shown or specified, shall have a minimum pressure rating of 250 psi, bronze, steel, or stainless steel bodies, adjustable spring action, screwed or flanged connections, and trim to suit individual applications. They shall be set for each specific condition.

B. Manufacturers, or Equal for air service:

1. Watts

2. Lonergan

3. Or equal.

C. Manufacturers, or Equal for water service:

1. McDonnell an Miller

2. Watts

3. Cash Acme

4. Lonergan

5. Or equal

2.7 SOLENOID VALVES

A. [illegible] valves shall be of the size, type, and class shown and shall be designed for not less than 150 psi water-working pressure. Valves for water, air, or gas service shall have brass or bronze body with screwed ends, stainless steel trim and spring, Teflon or other resilient seals with material best suited for the temperature and fluid handled. Valves with piping connections less than 1-1/2 inches in diameter shall be direct-acting type. Valves with piping connections 1-1/2 inches in diameter and greater shall be pilot operated globe body type. Solenoid valves in corrosive environment shall have stainless steel bodies. For chemicals and all corrosive fluids, solenoid valves with Teflon bodies and springs or other suitable materials shall be used. General purpose enclosures for indoors shall be NEMA type 2. For explosion proof, corrosive, special purpose, or outdoor locations NEMA type 4, 7, 8, 9, 9E, 9F, or 9G enclosures shall be used, as applicable. All coil ratings shall be for continuous duty. For electrical characteristics see electrical drawings or specifications.

B. Manufacturers, or Equal:

1. For general duty less than 1 ½ inches in diameter:

a. Automatic Switch Company

b. Honeywell-Skinner

c. Or equal.

2. For general duty 1 ½ inches in diameter or greater:

   a. Cla-Val Co.

   b. Golden Anderson

   c. Or equal

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Backflow preventers shall be installed in all potable water lines and where otherwise indicated on the contract drawings.

B. All valves shall be installed in accordance with the Manufacturer's printed recommendations.

C. All backflow preventers, as well as air and vacuum release valves, shall have piped outlets to the nearest acceptable drain, firmly supported, and installed in such a way as to avoid splashing and wetting of floors.

D. Field testing of valves shall be performed in accordance with manufacturer's recommendations and per Section 15615, of these specifications.

E. All field testing shall be witnessed and approved by the INSPECTOR.

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Divison 16 — Electrical

SECTION 16010
ELECTRICAL GENERAL PROVISIONS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. General:

1. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and all labor necessary for the furnishing, construction, installation, testing, and operation of all electrical work and appurtenant work necessary to provide a complete and operable system, all in accordance with the requirements of the Contract Documents.

2. The provisions of this Section shall apply to all electrical items specified in the various Sections of Division 16 and all other Divisions specifying electrical items of these Specifications, except where otherwise specified or shown in the Contract Documents.

B. Responsibility:

1. The CONTRACTOR shall be responsible for:

a. Complete systems in accordance with the intent of these Contract Documents.

b. Coordinating the incoming electrical service with the electric utility company providing service.

c. Coordinating the details of facility equipment and construction for all Specification Divisions which affect the work covered under Division 16, Electrical.

d. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.

e. Coordinating the incoming telephone service with the telephone company providing service.

2. Utility company requirements and fees:

a. The Contractor shall make application for electric service in their own name and pay all utility company fees, cable charges, and added facilities charges.

b. The Contractor shall have application for telephone service with the local telephone company in their own name and pay all associated installation and connection fees, and provide all conduit, wiring, and other appurtenances as indicated on the Contract Drawings.

c. The Contractor shall obtain service requirements from utility companies and make any service and installation agreements that the utility company may require.

d. Install electric service entrance equipment in accordance with the serving utility's requirements. Coordinate with the serving utility to ensure timely connection by the utility. Obtain utility company approval of service entrance and metering equipment shop drawings prior to starting fabrication.

e. Before completion of construction the contractor shall request for the power and telephone accounts to be transferred over to the CITY. BOS shall receive a signed letter of request by the contractor that obtained the permit and assign an effective date of transfer prior to being forwarded to contract services. The transfer letter shall be as follows:

To whom it may concern,
The city of Los Angeles is the owner of the facility and would like to take over the payment responsibilities of services located at the following address, effective xx/xx/xxxx (date provided by BOS).

PROJECT ADDRESS
Los Angeles, CA xxxxx

Telephone Number (if applicable)
Account Number

Please use the following for billing:
CITY OF LA DEPT OF PUBLIC WORKS
BUREAU OF SANITATION
ATTN: WCSD-MARK LANSANG
22714 MEDIA CENTER DR
LOS ANGELES, CA 90065-1733

C. Existing Conditions:

1. The electrical drawings were developed from past record drawings and information supplied by the CITY.

2. Carry out any work involving the shutdown of existing services to any piece of equipment now functioning or the tie-in of equipment to the existing system at such time as to provide the least amount of inconvenience to the CITY. Do such work when directed by the ENGINEER or the INSPECTOR.

3. After award of Contract, confer with ENGINEER/INSPECTOR to verify at each area of construction activity the location of existing underground utilities. Protect all existing underground utilities during construction.

4. NO work shall be started that involves the existing electrical system without first obtaining and completing all coordination forms required by the facility. All such coordination forms shall be submitted with drawings and procedures showing information about what, where, why and how the work will be done in accordance with the GENERAL REQUIREMENTS.

5. Prior to staring any underground work the CONTRACTOR shall obtain all the information of the underground utilities or obstructions from the ENGINEER and take proper precautions to locate the utilities by potholing or other approved means in accordance with PROTECTION OF PERSONS AND PROPERTY AND RESTORATION OF EXISTING IMPROVEMENTS of the GENERAL CONDITIONS, and POTHOLING of the GENERAL REQUIREMENTS.

D. Intent of Drawings:

1. Electrical plan drawings show only general locations of equipment, devices, and raceway, unless specifically dimensioned. The CONTRACTOR shall be responsible for the proper routing of raceway, subject to the approval of the ENGINEER.

E. Work Provided Outside this Contract:

1. Incoming aerial power lines.

2. Incoming underground power cables, materials, installation, termination, and connection; under this Contract, provide trench and backfill, and duct system.

3. Transformers supplying main electrical service to the facility; site preparation and transformer pad(s) included in this Contract.

4. Power company metering facilities, except as indicated.

5. Incoming telephone service.

F. Work Included in Division 16, Electrical:

1. Electrical - general provisions.

2. Basic materials and methods.

3. Raceways.

4. Conductors.

5. Low voltage motor control.

6. Grounding.

7. Lighting.

8. Electrical Tests

9. Electrical Service Distribution

10. Surge Arrestor

11. Electric Motors

12. Uninterruptible Power System

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The work of the following Divisions or Sections applies to the Work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

1. Section 02200 Earthwork.

2. Section 05500 Miscellaneous Metalwork.

3. Section 09800 Protective Coating.

4. Division 11 Equipment

5. Division 15 Mechanical

6. Division 17 Instrumentation and Control.

7. Work Specified Under Other Divisions:

a. All concrete work required for encasement, installation, or construction of the work specified in the various Sections of Division 16 is included as a part of the work hereunder, and shall be 2000 psi concrete conforming to the applicable requirements of Section 03300, "Cast-in-Place Concrete"; provided, that the following exceptions and supplementary requirements shall apply:

(1) Consolidation of encasement concrete around duct banks shall be by hand puddling, and/or mechanical vibration.

(2) A workability admixture shall be used in encasement concrete, which shall be a hydroxylated carboxylic acid type in liquid form. Admixtures containing calcium chloride shall not be used.

(3) Concrete for encasement of conduit or duct banks shall contain an integral red-oxide coloring pigment in the proportion of 8 pounds per cubic yard of concrete.

b. Components for systems, including conductors for control wiring, unless specifically shown on Electrical Drawings.

B. Materials and equipment furnished and installed under other divisions with raceway and electrical conductors furnished, installed, and connected under Division 16, Electrical.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of other requirements of these specifications, all work specified herein shall conform to or exceed the applicable requirements of the National Electric Code (NEC); provided, that where a local code or ordinance is in conflict with the NEC, the provisions of said local code ordinance shall take precedence.

B. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

1. Codes and Standards:

LAEC City of Los Angeles Electrical Code, latest adopted edition.

Title 8, Industrial Relations, Subchapter 5, Electrical Safety Orders, California Code of Regulations.

2. Commercial Standards: All material, equipment, and construction, installation, and testing procedures shall conform to applicable standards of NEMA, ANSI, and IEEE except where modified or supplemented by these Specifications. All equipment and materials shall be in accordance with the applicable requirements of the California Code of Regulations (CCR), Title 8.

C. All equipment furnished by the CONTRACTOR shall be listed by and shall bear the label of Underwriters' Laboratories, Incorporated, (UL) or of an independent testing laboratory acceptable to the Building and Safety Department of the City of Los Angeles.

D. The construction and installation of all electrical equipment and materials shall comply with all applicable provisions of the CalOSHA Safety orders (Title 8, CCR), State Building Standards, and applicable local codes and regulations.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

B. The CONTRACTOR shall submit complete material lists for the work of this Section. Such lists shall state manufacturer and brand name of each item or class of material. The CONTRACTOR shall also submit shop drawings for all grounding work.

C. Shop drawings are required for materials and equipment listed in this and other sections. Shop drawings shall provide sufficient information to evaluate the suitability of the proposed material or equipment for the intended use, and for compliance with these Specifications. The following shall be included:

1. Front, side, and rear elevations, footprints and top views, with dimensions.

2. Location and size of conduit entrances and access plates.

3. Component data.

4. Connection diagrams, terminal diagrams, schematic wiring diagrams, conductor size, and type, etc.

5. Method of anchoring and embedded structural members; weight.

6. Finish.

7. Nameplates.

8. Temperature limitations, as applicable.

9. Rating of equipment as per specifications and drawings.

10. NEMA rating of enclosures.

11. Approved listing.

D. Catalog data shall be submitted to supplement all shop drawings. Catalog cuts, bulletins, brochures, or the like or photocopies of applicable pages thereof shall be submitted for mass produced, non-custom manufactured material. These catalog data sheets shall be stamped to indicate the project name, applicable Specification section and paragraph, model number, and options. This information shall be marked in spaces designated for such data in the stamp.

E. Materials and Equipment Schedules: The CONTRACTOR shall deliver to the ENGINEER a complete list of all materials, equipment, apparatus, and fixtures which it proposes to use. The list shall include sizes, names of manufacturers, catalog numbers, and such other information required to identify the items.

F. Manuals: The CONTRACTOR shall furnish manuals as specified under TECHNICAL MANUALS of the GENERAL REQUIREMENTS.

G. Record Drawings: In addition to the Record Drawings as a part of the record drawing requirements specified in the GENERAL REQUIREMENTS, the CONTRACTOR shall show depths and routing of all concealed below-grade electrical installations. Said set of record drawings shall be available to the ENGINEER and the INSPECTOR during construction. After final inspection, the CONTRACTOR shall transfer all record drawing information to a set of reproducible vellums which shall then be delivered to the ENGINEER. In addition, the Record Drawings shall show all variations between the work as actually constructed and as originally shown on the Drawings, based upon information supplied by the CONTRACTOR.

H. Manufacturer's Drawings: One set of equipment manufacturer's drawings shall be submitted to the ENGINEER for its records.

I. The CONTRACTOR shall obtain and submit from the manufacturer a list of suggested spare parts for each piece of equipment according to the provisions of SPARE PARTS of the GENERAL REQUIREMENTS. After approval, CONTRACTOR shall furnish such spare parts suitably packaged, identified with the equipment number, and labeled. CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment. All spare parts are intended for use by the CITY, only. Any spare parts which the ENGINEER permits the CONTRACTOR to use for startup activities shall be replaced by the CONTRACTOR prior to the CITY's acceptance of beneficial use of the equipment.

1. During the term of this Contract the CONTRACTOR shall notify the ENGINEER in writing about any manufacturer's modification of the approved spare parts, such as part number, interchangeability, model change or others. If the ENGINEER determines that the modified parts are no longer applicable to the supplied equipment, the CONTRACTOR at its expense shall provide applicable spare parts.

J. The CONTRACTOR shall coordinate all necessary material and equipment inspection and testing with the CITY as specified under SAMPLING, TESTING AND FABRICATION INSPECTION of the GENERAL REQUIREMENTS.

K. The CONTRACTOR shall clearly state deviations from the specifications and/or drawings on the first page of the submittal.

1.5 QUALITY ASSURANCE

A. General:

1. Field Control of Location and Arrangement: The Drawings diagrammatically indicate the desired location and arrangement of outlets, conduit runs, equipment, and other items only. Exact locations shall be determined by the CONTRACTOR in the field based on the physical size and arrangement of equipment, finished elevations, required clearances and other obstructions. Locations shown on the Drawings, however, shall be adhered to as closely as possible.

2. All conduit and equipment shall be installed in such a manner as to avoid all obstructions and to preserve head room and keep openings and passageways clear. Lighting fixtures, switches, convenience outlets, and similar items shall be located within finished rooms, as shown. Where the Drawings do not indicate exact locations, the CONTRACTOR shall submit proposed locations to the ENGINEER for review. Where equipment is installed without instruction and must be moved, it shall be moved without additional cost to the CITY.

3. Workmanship: All materials and equipment shall be installed in accordance with printed recommendations of the manufacturer which have been reviewed by the ENGINEER and INSPECTOR. The installation shall be accomplished by workmen skilled in this type of work and installation shall be coordinated in the field with other trades so that interferences are avoided.

4. All work, including installation, connection, calibration, testing, and adjustment, shall be accomplished by qualified, experienced personnel working under continuous, competent supervision. The completed installation shall display competent work, reflecting adherence to prevailing industrial standards and methods.

5. Protection of Equipment and Materials: The CONTRACTOR shall provide adequate means for and shall fully protect all finished parts of the materials and equipment against damage from any cause during the progress of the work and until acceptable by the ENGINEER and the INSPECTOR..

6. All materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. All moving parts shall be kept clean and dry.

7. The CONTRACTOR shall replace or have refinished by the manufacturer, all damaged materials or equipment, including face plates of panels and switchboard sections, at no expense to the CITY.

8. Tests: The CONTRACTOR shall make all tests required by the ENGINEER or the INSPECTOR or other authorities having jurisdictions as per applicable standards.. All such tests shall be performed in the presence of the ENGINEER or the INSPECTOR. The CONTRACTOR shall furnish all necessary testing equipment and pay all costs of tests, including all replacement parts and labor necessary due to damage resulting from damaged equipment or from test and correction of faulty installation. Operational testing shall be performed on all equipment furnished and/or connected in other Sections of Division 16. Electrical and all other divisions specifying electrical items including furnishing of support labor for testing.

9. Standard test reports for mass-produced equipment shall be submitted along with the shop drawing for such equipment. Test reports on testing specifically required for individual pieces of equipment shall be submitted to the ENGINEER and the INSPECTOR for review prior to final acceptance of the project.

10. Any test failure shall be corrected in a manner satisfactory to the ENGINEER and INSPECTOR.

B. Area Designations:

1. General: For purposes of delineating electrical enclosure and electrical installation requirements of this project, certain areas have been classified in the Contract Documents as defined below. Electrical installations within these areas shall conform to the referenced code requirements for the area involved.

   a. General Purpose Locations: Electrical work installed in areas which are not otherwise specifically classified shall be "General Purpose." Workmanship and enclosures shall comply with the general requirements of these Specifications. Enclosures shall be NEMA Type 1.

   b. Outdoor Locations: In outdoor locations, raceway shall be rigid galvanized steel conduit; entrances shall be threaded; and fittings shall have gasketed covers. Provisions shall be made to drain the fitting or conduit system. Threaded fastening hardware shall be stainless steel. Mounting brackets shall be galvanized. Attachments or welded assemblies shall be galvanized after fabrication. Instruments and control cabinets, panels, switchboards and motor control centers shall be "Weatherproof NEMA Type 4X Stainless Steel." Enclosures shall be mounted 1/4-inch from walls to provide an air space, unless specifically shown otherwise.

   c. Damp Location: Locations which are indoors and 2 feet below grade elevation or which are classified as damp locations on the Drawings shall have electrical installations which conform to the requirements for outdoor locations; except, that the air space from walls may be less than 1/4-inch and endosures shall be NEMA Type 2. "Damp locations" shall include pipe galleries, tunnels, and basements. All rooms housing liquid handling equipment are also classified as damp locations regardless of grade elevation.

   d. Splash Locations: Areas shown as splash-proof shall have electrical installations as described for "outdoor locations"; except, that NEMA Type 4 enclosures shall be provided for instruments and controls, panels, switchboards, and motor control centers.

e. Corrosive Locations: Corrosive locations shall have stainless steel threaded hardware; all other electrical hardware, fittings, and raceway systems shall be PVC-coated. Enclosures shall be of fiberglass reinforced polyester or 316 stainless steel and meet NEMA Type 4X requirements.

f. Hazardous Locations: Areas shown as hazardous shall have electrical installations suitable for Class I, Division 2, Group D locations as required under Cal/OSHA Safety orders (Title 8, CCR). Enclosures shall be NEMA type 7.

C. Cleanup:

1. In addition to the requirements of ENVIRONMENTAL CONTROL of the GENERAL REQUIREMENTS, in all parts of the materials and equipment shall be thoroughly cleaned. Exposed parts shall be thoroughly clean of cement, plaster, and other materials. All oil and grease spots shall be removed with a non-flammable cleaning solvent. Such surfaces shall be carefully wiped and all cracks and corners scraped out.

2. During the progress of the work, the CONTRACTOR shall clean the premises and shall leave the premises and all portions of the site free of debris.

D. Shop Inspection:

1. All electrical materials and equipment shall be subject to shop inspection by the INSPECTOR or representative of a Testing Agency.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Unless otherwise indicated, provide all first-quality, new materials and equipment, free from any defects, in first-class condition, and suitable for the space provided. Provide materials and equipment listed by UL wherever standards have been established by that agency.

B. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer. Component parts of materials or equipment of the same manufacturer are preferred.

C. All electrical equipment shall be approved by a testing laboratory recognized by the CITY and shall conform to all applicable requirements of the City of Los Angles Department of Building and Safety. In lieu of such approval, the CONTRACTOR must submit the equipment for approval to the Department of Building and Safety electrical testing laboratory. This shall include the plant preferred list of equipment and components specified in the plans and specifications. CONTRACTOR shall also include in his delivery schedule the approval time required by the Department of Building and Safety electrical testing laboratory for equipment without UL listing. The recommended use of a product in these specifications in no way implies approval by the Department of Building and Safety. Shop drawings acceptance by the ENGINEER shall in no way invalidate the requirements of the Department of Building and Safety for listed equipment.

2.2 STANDARD PRODUCTS

A. Unless otherwise indicated, provide materials and equipment which are the standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturers' latest standard design that conforms to these Specifications.

2.3 EQUIPMENT FINISH

A. Provide materials and equipment with manufacturers' standard finish system, in accordance with Division 9 Finishes. Provide manufacturers' standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment in accordance with Division 9 Finishes with ANSI No. 61, light gray color.

2.4 OUTDOOR EQUIPMENT

A. Provide equipment and devices to be installed outdoors or in unheated enclosures capable of continuous operation within an ambient temperature range of 30 degrees F to 120 degrees F.

2.5 HAZARDOUS AREAS

A. Provide materials and equipment acceptable to the regulatory authority having jurisdiction for the Class, Division, and Group of hazardous area indicated.

2.6 SPECIAL TOOLS

A. The CONTRACTOR shall provide all special tools required for operation and maintenance of the equipment. The tools shall be considered as part of the product and become the property of the City.

PART 3 -- EXECUTION

3.1 GENERAL

A. Install materials and equipment in a workmanlike manner utilizing craftsmen skilled in the particular trade. Provide work which has a neat and finished appearance. Carry out work in accordance with NECA Standard of Installation unless otherwise specified.

B. Coordinate electrical work with ENGINEER and the INSPECTOR and work of all other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the plant during construction.

C. Every effort has been made to determine as accurately as possible the requirements of the electrical and telephone services. However, before submitting bid, the Contractor shall verify the locations shown on the plans and shall include sufficient funds for material, labor and utility fees for installation of an approved utility service.

D. Before any work is performed on these facilities, verify all electrical, civil, and structural, dimensional and other requirements related to these facilities with the serving utility companies.

E. Should any major changes to the work indicated be necessary to complete the power and telephone systems, notify the construction manager at once and cease all work affected until approval for required modifications has been obtained from the construction manager.

3.2 PROTECTION DURING CONSTRUCTION

A. Throughout this Contract, provide protection for materials and equipment against loss or damage in accordance with provisions elsewhere in these Contract Documents. Throughout this Contract, follow manufacturers' recommendations for storage. Protect everything from the effects of weather. Prior to installation, store items in clean, dry, indoor locations. Store in clean, dry, indoor, heated locations

items subject to corrosion under damp conditions, and items containing electrical insulation, such as transformers, conductors, motors, and controls. Provide temporary heating, sufficient to prevent condensation, in transformers, switchgear, switchboards, motors, and motor control centers which do not have space heaters.

B. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. When equipment intended for indoor installation is installed at the CONTRACTOR's convenience in areas where it is subject to dampness, moisture, dirt, or other adverse atmosphere until completion of construction, ensure that adequate protection from these atmospheres is provided that is acceptable to the ENGINEER and the INSPECTOR. Cap conduit runs during construction with manufactured seals. Keep openings in boxes or equipment closed during construction. Energize all space heaters furnished with equipment.

3.3 MATERIAL AND EQUIPMENT INSTALLATION

A. Follow manufacturers' installation instructions explicitly, unless otherwise indicated. Wherever any conflict arises between the manufacturers' instructions, codes and regulations, and these Contract Documents, follow ENGINEER's decision. Keep copy of manufacturers' installation instructions on the jobsite available for review at all times.

B. Use appropriate conduit and conductor entry fittings with enclosures which maintain the specified enclosure environmental capability after proper installation.

3.4 REMOVAL OR RELOCATION OF MATERIALS AND EQUIPMENT

A. Where existing materials and equipment are removed or relocated, remove all materials no longer used such as studs, straps, conduits, and wires. Remove or cut off concealed or embedded conduit, boxes, or other materials and equipment to a point at least 3/4-inch below the final finished surface.

B. Repair affected surfaces to conform to the type, quality, and finish of the surrounding surface in a neat and workmanlike manner. Follow any specific instructions given under Division [9], Finishes. Utilize skilled craftsmen of the trades involved.

3.5 CUTTING AND PATCHING

A. Lay out work carefully in advance. Do not cut or notch any structural member or building surface without specific approval of ENGINEER or the INSPECTOR. Carefully carry out any cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, paving, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment. Following such work, restore surfaces neatly to original condition. Utilize skilled craftsmen of the trades involved.

3.6 LOAD BALANCE

A. The Drawings and Specifications indicate circuiting to electrical loads and distribution equipment. Balance electrical load between phases as nearly as possible on switchboards, panelboards, motor control centers, etc.

3.7 PHASING SEQUENCE

A. Coordinate motor phasingchecks with the ENGINEER/INSPECTOR and the CONTRACTOR responsible for the driven equipment. Submit a written report to the ENGINEER for each motor verifying that phasing has been checked and corrected.

3.8 CLEANING AND TOUCHUP PAINTING

A. Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove all materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touch up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and type of surface of the original finish. If extensive damage is done to equipment paint surfaces, refinish the entire equipment in a manner that provides a finish equal to or better than the factory finish, that meets the requirements of the Specifications, and that is acceptable to the ENGINEER and the INSPECTOR.

3.9 HAZARDOUS AREAS

A. Install all materials and equipment in hazardous areas in a manner acceptable to the regulatory authority having jurisdiction for the Class, Division, and Group of hazardous area indicated.

3.10 INSPECTION

A. Allow materials, equipment, and workmanship to be inspected at any time by the ENGINEER or the INSPECTOR. Correct work, materials, or equipment not in accordance with these Contract Documents or found to be deficient or defective in a manner satisfactory to the ENGINEER and the INSPECTOR.

3.11 SERVICE CONTINUITY

A. Maintain continuity of electric service to all functioning portions of the process or buildings during hours they are normally in use. Temporary outages will be permitted during cutover work at such times and places as can be prearranged with ENGINEER and the electric utility company providing service to the facility. Such outages shall be kept to a minimum number and minimum length of time. Make no outages without prior written authorization of the ENGINEER and notification of the INSPECTOR. Include all costs for temporary wiring and overtime work required in the Contract price. Remove all temporary wiring at the completion of the work.

3.12 CHECKOUT AND STARTUP

A. During checkout and startup of the various plant systems, provide a crew of skilled craftsmen to be available for checkout and troubleshooting activities as required by the ENGINEER. Since coordination with other crafts and CONTRACTORS will often be required, the craftsmen assigned to checkout must be available outside normal working hours when necessary.

3.13 TESTS

A. General: Carry out tests specified hereinafter and as indicated under individual items of materials and equipment specified in other sections.

B. Operations: After the electrical system installation is completed and at such time as the ENGINEER or the INSPECTOR may indicate, conduct an operating test for approval. Demonstrate that the equipment operates in accordance with the requirements of these Specifications and Drawings. Demonstrate that protective functions are operating properly and are properly incorporated in control system, circuit breaker, and motor control center circuitry. Perform the test in the presence of the ENGINEER and the INSPECTOR. Furnish all instruments and personnel required for the tests.

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SECTION 16030
ELECTRICAL TESTS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. This Section specifies the work necessary to test, commission and demonstrate that the electrical work satisfies the criteria of these Specifications and functions as required by the Contract Documents.

B. The work of this Section includes furnishing the labor, equipment and power required to support the testing specified in other Divisions of these Specifications. Electrical testing specified herein, and functional testing of all power and controls not tested under Division 17, Instrumentation and Control shall be completed before commencement of plant start-up. This scope may require the CONTRACTOR to activate circuits, shutdown circuits, and run equipment, make electrical measurements, replace blown fuses, install temporary jumpers, etc.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Division 16 Electrical as applicable.

B. Division 17 Instrumentation and Controls as applicable.

C. Other Technical Sections which include requirements for factory testing, test standards, and test report submittals when requirements are applicable.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS: NETA Latest Edition.

1.4 CONTRACTOR SUBMITTALS: Test Reports and Procedures

1.5 QUALITY ASSURANCE

A. The following test requirements are intended to supplement test and acceptance criteria that may be stated elsewhere.

1. Lighting: Switching, including remote control, as shown. Circuitry is in accordance with panel schedules. Lighting fixtures located to minimize obstruction of illumination by mechanical equipment or building structural elements.

2. Power Metering: Demonstrate that voltmeter and ammeter switches are functional. Demonstrate that meters are within catalog accuracy as installed with specific reference to kilowatt meters.

3. Demonstrate mechanical and/or electrical interlocking by attempting to subvert the intended sequence.

4. Activate ground fault tripping by operating test features provided with ground current protective systems and by injecting a known, and reasonable, current in the ground current sensor circuit. In general, ground fault tripping should occur at a ground current equivalent to 20 percent of phase current. Current injection is not required of circuit 400 amperes or less.

5. Cable Testing: 480-volt circuits shall be tested for insulation resistance with a 1000-volt megohm meter. Testing shall be done after the 480-volt equipment is terminated. Phase-to-phase A-B, B-C, A-C and phase-to-ground insulation resistance tests shall be performed on each cable prior to 5-kV and 25-kV cable termination at equipment but subsequent to stress cone makeup. Test results shall be submitted for review 30 days prior to plant operation and any system testing. Equipment which may be damaged during this test shall be disconnected. Perform tests with all other equipment connected to the circuit. In order to be acceptable, the cable must withstand the test high voltage without breakdown, have steady or decreasing leakage current during the high potential test, and have satisfactory comparable megger readings in each megger test. Test results shall be submitted to the engineer and shall state equipment used and time of test. Cable operating at more than 2,000 volts shall be tested in accordance with ICEA publications S-68-61, S-61-402, S-19-81, and S-68-516. Cable testing and report submittal shall be performed by an organization sanctioned by the Manufacturer of the cable to be tested. Testing shall verify the quality of cable terminations. Test results for medium and high voltage cable shall be submitted to the ENGINEER 30 days prior to the time schedule for equipment energization.

6. Test ground fault interrupter (GFI) receptacles and circuit breakers for proper operation by methods sanctioned by the receptacle Manufacturer.

7. A functional test and check of all electrical components is required prior to performing subsystem testing and commissioning. Components and equipment shall be cleaned as required by other provisions of these Specifications before commencement of functional testing. Functional testing shall comprise:

    a. Visual and physical check of cables, busswork, circuit breakers, transformers, and connections associated with all new and modified equipment.

    b. Setting of protective relays in conformance with results of the Protective Devices Coordination Study and testing of relays to assure that relays will operate at the current value and time required by the Study.

    c. Circuit breakers which are specified with adjustable time or pick-up settings for ground current, instantaneous overcurrent, short-time overcurrent, or longtime overcurrent, shall be field adjusted by a representative of the circuit breaker Manufacturer. Time and pickup setting shall correspond to the recommendations of the Protective Devices Coordination Study. Setting shall be tabulated and proven for each circuit breaker in its installed position; test results shall be certified by the tester and transmitted to the ENGINEER (7 copies).

8. Complete ground testing of all grounding electrodes and grid prior to testing the equipment.

B. Subsystem testing shall occur after the proper operation of alarm and status contacts has been demonstrated or otherwise accepted by the ENGINEER and after process control devices have been adjusted as accurately as possible. It is intended that the CONTRACTOR will adjust limit switches and level switches to their operating points prior to testing and will set pressure switches, flow switches, and timing relays as dictated by operating results.

C. After initial settings have been completed, each subsystem shall be operated in the manual mode and it shall be demonstrated that operation is in compliance with the Contract Documents. Once the manual mode of operation has been proven, automatic operation shall be demonstrated to verify such items as proper start and stop sequence of pumps, proper operation of valves, proper speed control, etc.

D. Motor operated valves shall be tested after having been phased and tested for correct motor rotation and after travel and torque limit switches have been adjusted by a representative of the valve Manufacturer. Tests shall verify status indication, proper valve travel, and correct command control from local and remote devices.

E. Subsystems, in the context discussed here, shall mean individual and groups of pumps, conveyor systems, chemical feeders, air conditioning units, ventilation fans, air compressors, etc.

F. Start-up commissioning shall not be attempted until all subsystems have been found to operate satisfactorily. Start-up shall only be attempted as a function of normal plant operation in which plan process flows and levels are routine and equipment operates automatically in response to flow and level parameters shall be considered only upon receipt of a written request by the CONTRACTOR.

G. The motor current tabulation shall reflect the values occurring during start-up. The indications of all switchboard ammeters and kilowattmeters shall be recorded every half-hour during commissioning.

PART 2 -- (NOT USED)

PART 3 -- EXECUTION

3.1 **CONDUCTORS FIELD TEST**

A. Conductors 600 Volts and less

1. Perform insulation resistance testing of all power and control circuits 600 volts and less with a 500-volt megger.

2. Prepare a written test report of the results and submit to the ENGINEER prior to final inspection.

3. Minimum acceptable value for insulation resistance is 1 megohm.

4. Disconnect equipment that might be damaged by this test. Perform tests with all other equipment connected to the circuit.

B. After instrumentation cable installation and conductor termination by the instrumentation and control supplier, perform tests witnessed by the ENGINEER to ensure that instrumentation cable shields are isolated from ground, except at the grounding point. Remove all improper grounds.

3.2 UNIT SUBSTATION

A. Factory Tests: The contractor shall arrange for the Engineer/Inspector to witness the Unit Substation test at the Factory prior shipment. Notice shall be given at least two weeks ahead of the test date. Test shall be done for each component as described herein.

3.3 GROUNDING

A. Field Tests

1. Test in the ENGINEER's presence the ground resistance of the grounding system. Ground resistance shall not exceed 5 ohms.

2. Test all ground fault interrupter (GFI) receptacles and circuit breakers for proper connection and operation with methods and instruments prescribed by the manufacturer.

3. Provide copies of reports of all grounding system tests for inclusion in Technical Manuals and for review by the ENGINEER.

4. Provide ground resistance tests in the presence of the ENGINEER and submit results. Utilize a ground resistance meggar "Earth"tester with a minimum resistance capacity range of 0-5000 megohms at 2000 VDC. Utilize the full potential method or the three terminal method as described by Biddle or NETA national electrical test association.

3.4 LOW VOLTAGE MOTOR CONTROL CENTER

A. Functional Test: Prior to plant start-up, inspect all equipment for proper alignment, proper connection and satisfying performance.

3.5 SURGE ARRESTORS

A. The manufacturer shall provide copies of design test data on the arrester provided showing that the arrestors are in compliance with : IEEE C62.2 Guide for application of Gapped Silicon - Carbide Surge Arrestors for AC systems.

IEEE C62.11 Standard for Metal Oxide Surge Arrestors for AC Power Circuits.

IEEE CC2.22 Guide for Application of Metal Oxide Surge Arrestors for AC Systems.

B. The following tests shall be made on each arrester in conformance with ANSI 62.1:

1. Power frequency spark over.

2. Radio influence voltage

3. Sealing

C. The design test data and the individual arrester test results shall be certified and submitted.

3.6 UNINTERRUPTIBLE POWER SYSTEM

A. Factory Testing: The UPS shall be tested in accordance with the following test procedures. A test report showing that the equipment has passed the factory tests and has demonstrated the capability to support the load, as required by this specification, shall be available promptly after completion of the tests. A test battery shall be available for assuring proper operation of the UPS with a battery.

B. System Log: Establish a log to record all tests performed and results, and record any failures and corrections made during test, should any occur.

C. Visual Inspection:

1. Check for all Quality Assurance Stamps

2. Inspect Interior

D. Dielectric Tests:

1. Check for charger shorts

2. Check for dc shorts

E. Efficiency Test: Measure module efficiency by dividing inverter output power by the charger input power with a fully charged battery connected and float charger. Verify compliance with specifications under the following loads:

1. Half load, 1.0 power factor

2. Full load, 1.0 power factor

F. Field Testing

1. Demonstrate that upon finish of initial charge, and after having been on float charge for at least 72 hours, that individual cells, or monoblocks (each individual battery), are within the manufacturer's specifications.

2. Demonstrate that the DC bus is supplying voltage within manufacturer's specifications and is compatible with battery manufacturer's specifications.

3. Demonstrate the external bypass switch removes the UPS from the system without dropping out any loads.

4. Same as #3 above with the internal bypass switch.

5. Demonstrate the UPS will remain on line for a minimum of 8 hours under full load conditions without tripping to static bypass.

6. Demonstrate, upon removal of AC input power, the UPS will power all UPS loads automatically, without interruption.

7. Measure the run time of the UPS, with loss of AC input power, under full rated load conditions until lower battery limit is reached. This time shall comply with battery size and rating. If connected load is less than UPS full rated load contractor shall provide external loads.

3.7 ELECTRIC MOTORS

A. Tests shall be performed as per ANSI/IEEE standard 112-1978 "IEEE Standard Test Procedure for poly phase Instruction Motors and Generates".

3.8 FIRE ALARM SYSTEM

The complete system shall be tested by a qualified engineer to perform as specified.

3.9 COMMUNICATIONS SYSTEMS

The complete system shall be tested by a qualified engineer to perform as specified.

3.10 ADJUSTABLE FREQUENCY DRIVES

A. Accessories: Each drive shall be supplied with a magnetic contactor at the output terminals. The contactor shall be NEMA rated for at least the horsepower rating of the motor. The contactor shall be located within the enclosure of the adjustable frequency drive and shall be part of the packaged unit.

1. The output contactor shall be electrically interlocked with the input circuit breaker such that when the circuit breaker is opened, the drive is disconnected from the motor, and when the circuit breaker is closed, the drive is connected to the motor.

2. A warning nameplate shall be provided on each drive to warn the operator to trip the circuit breaker prior to performing any maintenance.

B. Testing: The drive manufacturer shall conduct all standard test in accordance with NEMA and ANSI standards to ensure conformance to specification requirements. All power switching components shall be prerun under temperature and load conditions.

C. Factory Testing: After the system has been assembled at the drive manufacturer's facility, a system (ADD3) test shall be performed before the drive package is shipped to the manufacturer of the driven equipment. The system test shall be not less than 24 hours in duration. The drive package shall be free of faults following the test.

1. The complete drive system, including all peripherals, shall be factory tested under simulated operating conditions. Normal operating sequences and fault conditions shall be simulated during the testing. Contact closure inputs and simulated driven-outputs shall be connected to the system input/output modules.

2. A test report summary, indicating satisfactory final test results, shall be submitted to the ENGINEER prior to shipment of the equipment.

D. Secondary Factory Testing: After shipment to the manufacturer of the LPE Pumps (ADD3), the drive units shall be assembled with the driven equipment for shop testing in accordance with Paragraph 11H-10 of Section 11H, Horizontal Split Case Centrifugal Pumps. The drive manufacturer shall provide the services of a qualified representative to work with the equipment manufacturer at the equipment manufacturer's facility to advise and assist in assembly of the equipment and drive unit packages and the performance of the specified tests.

1. Personnel conducting the tests shall be competent authorized representatives of the equipment and drive unit packages and the performance of the specified tests.

2. Personnel conducting the tests shall be competent authorized representatives of the equipment and drive manufacturers who are familiar with operation of the equipment furnished and who have previous satisfactory experience in conducting similar tests.

3. Qualified personnel shall perform the tests, record the data, make the required calculations, and prepare a report on the results; five copies of the report shall be submitted to the ENGINEER. The Engineer may observe the tests and collect a copy of the recorded data. The information collected will be used as a basis for determining acceptability of the manufacturer's results. In case of conflict, interpretations and calculations made by the ENGINEER will govern.

4. Testing shall be performed in a manner acceptable to the ENGINEER. At least 2 weeks prior to the proposed testing date, the Contractor shall notify the ENGINEER of the testing date and shall submit a report from the equipment manufacturer detaining the proposed performance testing.

E. Field Acceptance Testing: After installation of the system at the site of the work and checkout by the drive manufacturer, a field acceptance test shall be performed by the drive manufacturer in conjunction with the manufacturer of the driven equipment.

1. The field acceptance test shall consist of a repeat of the factory testing procedure and an additional 5 days of similar testing during which the system shall run continuously without loss of basic functions. Functional tests shall demonstrate satisfactory operation to all interlocks, alarms, and normal operation sequences. The supplier shall use suitable test equipment to locate the source of trouble or malfunction. Failure of redundant equipment will not be considered as downtime, provided automatic fail over occurs as specified herein and, in the opinion of the ENGINEER, the failure was not caused by deficiency in design or installation. Repeated failure of any component shall cause the acceptance test to be terminated and restarted.

F. Harmonic Distortion Test: The CONTRACTOR shall provide temporary four-channel power line monitoring equipment for a period of at least 30 calendar days to graph and record the harmonic line distortion for ac voltage, dc voltage, and current, and to compute individual harmonic values up to the 17th harmonic as well as total harmonic distortion (THD).

1. The monitoring equipment shall include a four-channel power line monitor, temperature and humidity compensation probes, a recorder, and additional options required to compute harmonic values and THD. The equipment shall be Basic Measuring Instruments Model 4800 Power scope, or equal.

2. Measurements shall include phase-to phase, phase-to-neutral, neutral-to-ground, and dc power. The harmonic distortion shall be monitored at the connection point of each drive, at motor control center buses common to more than one drive, at the service entrance, and at other locations as directed by the ENGINEER. The test shall be run for the full range of drive operation as is practicable. The test shall be conducted by a qualified individual acceptable to the ENGINEER.

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SECTION 16050
BASIC MATERIALS AND METHODS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B. This section covers the work necessary to furnish and install, complete, the materials specified hereinafter.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The WORK of the following Sections and Divisions applies to the WORK of this Section. Other Sections and Divisions, not referenced below, shall apply to the extent required for proper performance of this WORK.

1. Section 16010 Electrical General Provisions

2. Section 02200 Earthwork.

3. Section 05500 Miscellaneous Metalwork.

4. Section 09800 Protective Coating.

5. Division 17 Instrumentation and Control.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

1. Codes and Standards:

LAEC City of Los Angeles Electrical Code, latest adopted edition.

Title 8, Industrial Relations, Subchapter 5, Electrical Safety Orders, California Code of Regulations.

2. Government Standards:

FS W-C-596E/GEN(1)	Connector, Plug, Receptacle and Cable Outlet, Electrical Power.
FS W-S-896E/GEN(1)	Switches, Toggle (Toggle and Lode), Flush Mounted (ac).
FS WW-C-581E	Conduit, Metal, Rigid, And Intermediate; And Coupling, Elbow, and Nipple, Electrical Conduit: Steel, Zinc Coated.

3. Commercial Standards:

ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel, Nickel Alloy, and Other Special Alloys.
ANSI C80.1	Rigid Steel Conduit, Zinc Coated, specification for.
ANSI Z55.1	Gray Finishes for Industrial Apparatus and Equipment.
ANSI/UL 467	Grounding and Bonding Equipment, Safety Standard For.
NEMA WD-1-1.10	General Requirements for Wiring Devices.
NEMA AB-1	Molded Case Circuit Breakers.
NEMA PB-1	Panelboards.
NEMA KS-1	Enclosed Switches.
NEMA VE-1	Ventilated Cable Tray.
ICEA S-61-402	Thermoplastic - Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
ICEA S-19	Rubber - Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

B. All equipment furnished by the CONTRACTOR shall be listed by and shall bear the label of Underwriters' Laboratories, Incorporated, (UL) or of an independent testing laboratory acceptable to the CITY's Department of Building and Safety.

C. The construction and installation of all electrical equipment and materials shall comply with all applicable provisions of the Cal/ OSHA Safety Orders (Title 8, CCR), State Building Standards, and applicable local codes and regulations.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the requirements of Section 16010 Electrical General Provisions.

1.5 QUALITY ASSURANCE

A. Quality assurance shall be in accordance with all applicable requirements of Section 16010 Electrical General Provisions.

PART 2 -- PRODUCTS

2.1 SERVICE ENTRANCE

A. Provide labor and furnish equipment as required by the electric utility which will provide service to the facility. All such materials and work shall meet the requirements of the utility company.

B. Provide temporary service for construction tools and testing apparatus during construction.

2.2 HAZARDOUS AREAS

A. Provide devices, materials, and equipment for installation in hazardous areas that are specifically approved for installation in hazardous areas of the Class, Division, and Group indicated, and are of construction that will ensure safe performance under conditions of proper use and maintenance. Provide devices, materials, and equipment meeting the requirements of the NEC, applicable state and local codes, and the authority enforcing these codes. Acceptable manufacturers: Crouse-Hinds, Appleton, or equal.

2.3 OUTLET AND DEVICE BOXES

A. General: Provide boxes not less than 2-inches deep, unless shallower boxes are required by structural conditions and are specifically accepted by the ENGINEER. Do not use box extensions to provide wiring space required by the NEC. For hollow masonry construction, provide boxes of sufficient depth so that conduit knockouts or hubs are in the masonry void space.

B. Sheet Steel (SS) Boxes: Provide zinc- or cadmium-plated boxes of the one-piece drawn type. Install 4-inch minimum octagonal boxes for ceiling outlets, except where smaller boxes are required for the particular fixture being installed. Use concrete type boxes in poured concrete slabs. Provide 2-inch by 4-inch minimum boxes for switches and receptacles. Provide plaster rings where required.

C. Cast Steel (CS) Boxes: Provide boxes of cast ferrous metal with gasketed, watertight, cast ferrous metal covers and stainless steel screws. Provide boxes with threaded conduit hubs and cast mounting lugs where lugs are required. Use Crouse-Hinds or Appleton Type FS or FD boxes, or equal.

D. Cast Aluminum (CA) Boxes: Provide boxes of cast, copper-free aluminum with gasketed, watertight, cast copper-free aluminum covers and stainless steel screws. Provide boxes with threaded conduit hubs and cast mounting lugs where lugs are required. Use Crouse-Hinds or Appleton Type FS or FD boxes, or equal.

E. Nonmetallic (NM) Boxes: Provide fiberglass boxes with gasketed, watertight covers and stainless steel screws. Provide boxes with conduit hubs and any required mounting lugs. Use Crouse-Hinds Stahlin or equal.

F. Provide a box suitable for the conditions encountered at each outlet in the wiring or raceway system and sized in accordance with the LAEC. Use the listed types unless otherwise indicated or accepted.

1. Types to be provided, Steel Raceway System:

Locations	Box Type
All	Cast steel
Exterior Locations, with:	
Exposed Raceways	Stainless steel NEMA 4X
Concealed Raceways	Stainless steel NEMA 4X
Concrete Encased Raceways	Stainless steel NEMA 4X
Class I, II, or III Hazardous Areas	Cast steel, NEMA 7
Interior Dry Locations, with:	
Exposed Rigid Conduit	Sheet metal
Exposed EMT	Sheet steel
Concealed Raceways	Sheet steel
Concrete Encased Raceways	Cast steel
Lighting Circuits, Ceiling Portion	Sheet steel
Class I, II, or III Hazardous Areas	Cast steel, NEMA 7

Locations	Box Type
Interior Wet Locations, with:	
Exposed Raceways	Stainless steel NEMA 4X
Concealed Raceways	Stainless steel NEMA 4X
Concrete Encased Raceways	Cast steel
Lighting Circuits, Ceiling Portion	Sheet steel
Class I, II, or III Hazardous Areas	Cast steel, NEMA 7

G. Device Plates:

1. Types to be Provided:

Locations	Plate Type
All	Metal
All Interior	Metal
Office	Metal
WP Designation	Weatherproof
Interior	
Flush Mounted Boxes	Metal
Surface Mounted Cast Metal Boxes	Metal
Surface Mounted Sheet Metal Boxes	Metal

2.4 JUNCTION AND PULL BOXES

A. Utilize NEMA 4X 316 stainless steel or fiberglass UV-rated watertight enclosures for outdoor or wet and corrosive locations and where subscript WP is indicated at the box location on the Drawings.

B. Where outlet boxes are used as junction or pull boxes, use materials as specified under article 2.3, OUTLET AND DEVICE BOXES.

C. Where larger sheet steel boxes are required, utilize boxes of code-gauge, galvanized steel with full-access screw covers mounted with corrosion-resistant machine screws.

D. Where larger cast metal boxes are required, use neoprene gasketed, watertight boxes with hinged, cast metal full-access covers, stainless steel cover hardware, and drilled and tapped conduit entrances. Use Crouse-Hinds Series W, O.Z./Gedney Series Y boxes, or equal. For below grade conduit, use Crouse-Hinds Type WJBF, O.Z./Gedney Series YR, or equal, minimum size 8-inches by 8-inches by 6-inches. For hazardous areas, use boxes applicable for the location and hazardous atmosphere present.

E. Where larger nonmetallic boxes are required, they shall be gasketed, watertight, corrosive resistant, and have a hinged, full-access screw cover. The hinge and machine screws shall be stainless steel. The box and cover shall be of high impact strength fiberglass-reinforced polyester material with stability to high heat. The boxes shall have conduit hubs and any required mounting lugs. The minimum size shall be 7-inches by 10-inches by 6-1/2-inches deep. Use Crouse-Hinds, or equal, Type NJB boxes.

F. Use concrete boxes of reinforced, cast concrete, 10-inches by 17-inches minimum inside dimensions, Brooks Products, Inc., No. 3-1/2T, Quikset W.17 Associated, or equal. Mark cast iron cover, as per CITY standards. Boxes shall be inspected and approved by the CITY prior to site delivery.

G. Use special boxes where indicated on the Drawings.

2.5 TERMINAL JUNCTION BOXES (TJB)

A. Provide hinged-cover terminal junction boxes of the required type and size where indicated. Utilize NEMA 12 enclosures for indoor dry locations. Utilize NEMA 4X watertight enclosures, as described under article 2.4, JUNCTION AND PULL BOXES, for outdoor or wet locations and where subscript WP is indicated at the box location on the Drawings. Provide terminal blocks with a separate connection point for each conductor entering or leaving the box. Provide 25 percent spare terminal points for CITY use following completion of installation. Paint interior surfaces with white enamel or lacquer.

2.6 TELEPHONE TERMINAL CABINETS

A. Provide telephone terminal cabinets of the type and size indicated for incoming telephone service. Provide hinged doors code-gauge galvanized steel box containing a 3/4-inch plywood backboard. Utilize cabinet conforming to the requirements of the telephone company. Provide terminal blocks with 25 percent spare termination points for CITY use following completion of installation. Label and identify all conductors.

2.7 WIRING DEVICES

A. Switches:

1. General Use Switches: Provide specification grade, totally-enclosed, ac type, quiet tumbler switches meeting NEMA WD 1 performance standards and Federal Specification W-S-896E, and capable of control of 100 percent tungsten filament and fluorescent lamp loads. Use switches rated at 20 amps, 120/277 volts. Provide operating handles colored gray in all other areas. Switches shall have screw terminals.

2. Weatherproof Switches: Use switches mounted in a cast metal box with gasketed, weatherproof device plate.

3. Switches with Pilot Lights: Provide switches with 125-volt, neon light with red jewel, or lighted toggle which is lighted when the switch is ON.

4. Acceptable Manufacturers: Bryant, General Electric, Hubbell, Pass and Seymour, or equal.

B. Receptacles:

1. Single and Duplex: Provide specification grade receptacles meeting NEMA WD 1 performance standards and Federal Specification W-C-596, and having a contact arrangement such that contact is made on two sides of each inserted blade without detent. Use two-pole, three-wire grounding type receptacles rated 20 amps, 125 volts, NEMA Configuration 5-20R, and with screw type wire terminals suitable for No. 10 AWG. Provide high strength thermoplastic bases colored gray in all other areas. Acceptable manufacturers: Bryant, General Electric, Hubbell, Pass and Seymour, Sierra, or equal.

2. Weatherproof Receptacles: Receptacles shall be specified above mounted in a cast metal box with gasketed, weatherproof device plate as specified below.

3. Ground Fault Interrupter (GFI) Receptacles: Provide duplex specification grade GFI receptacles tripping at 5 milliamps; rated 20 amps, 120 volts, NEMA Configuration 5-20R; and capable of interrupting 1,000 amps without damage. Use units meeting NEMA WD 1, fitting standard sized outlet boxes, having No. 12 AWG copper TW insulated pigtails, having provision for testing, and ivory in color. Use standard model where ground fault protection is needed at an individual location. Use feed-thru model where ground fault protection is specified for "downstream"

conventional receptacles. Provide receptacles accepting standard device plates. Acceptable manufacturers: Pass and Seymour, Square D, General Electric, or equal.

4. Special Purpose Receptacles: Provide receptacles of the type, rating, and number of poles indicated or required for the anticipated purpose. Furnish a matching plug with cord-grip features for each special purpose receptacle.

5. Receptacles in Classified Areas: Receptacles located in classified areas shall comply with the requirements of LAEC Article 500.

C. Telephone Outlets: Provide empty outlet boxes and cover plates conforming to the requirements of the telephone company where telephone outlets are indicated.

D. Device Plates:

1. General:

a. Provide plates fitting closely and tightly to the box on which they are to be installed. On surface mounted boxes, provide plates which do not extend beyond the sides of the box unless the plates do not have sharp corners or edges.

b. Use plate material compatible with the box material such that galvanic corrosion of the plate and/or box does not occur.

2. Plastic (P) Plates: Provide specification grade device plates manufactured of 0.10-inch minimum thickness, noncombustible, thermosetting material. Provide ivory one-piece with oval-head metal mounting screws of a color matching that of the plate.

3. Metal (M) Plates: Provide specification grade, one-piece, 0.040-inch nominal minimal thickness, No. 430 satin finish stainless steel device plates with oval-head, matching mounting screws.

4. Engraved Plates: Where device titles are indicated, provide device plates engraved with the designated titles. Provide engraved letters, numbers, or characters 1/8 -inch high with filler of black color.

5. Cast Metal (CM) Plates: Provide cast metal device plates of malleable ferrous metal with gaskets and stainless steel screws with oval heads.

6. Weatherproof (WP) Plates:

a. Where weatherproof receptacles are designated, the receptacle shall be installed in the specified box with a gasketed, weatherproof, cast metal or stainless steel cover plate with individual cap over each receptacle opening and stainless steel mounting screws. Utilize plates with caps held tightly closed with stainless steel springs when receptacle is not in use. Acceptable manufacturers: General Electric, Bryant, Hubbell, Sierra, Pass and Seymour, Crouse-Hinds, Bell, or equal.

b. Where weatherproof switches are designated, the switch shall be installed in the specified box with a gasketed, weatherproof, cast metal cover plate incorporating an external operator for the internal switch and with stainless steel mounting screws. Acceptable manufacturers and types: Crouse-Hinds DS-181 or DS-185, Appleton FSK-1VTS or FSK-1VS, or equal.

7. Raised Sheet Metal (SM) Plates: Provide 1/2-inch high zinc or cadmium-plated steel device plates designed for one-piece drawn type sheet steel boxes.

2.8 LIGHTING AND POWER DISTRIBUTION PANELBOARDS

A. General: Provide circuit breaker panelboards including those in motor control equipment meeting standards established by UL, NEMA PB 1, and the NEC. Where used as service entrance equipment, provide panels UL labeled for that use. Furnish panels with fully rated short circuit current equipment rating. Series connected equipment ratings are not acceptable. Provide panels rated for connection to an electric system having an available amperes rms symmetrical short circuit current of 35,000 at 208Y/120 or 120/240 volts and 65,000 at 480Y/277 volts. Provide panelboards and circuit breakers suitable for use with 75 degrees C wire at full LAEC 75 degrees C ampacity.

B. Cabinets: Furnish boxes large enough to provide a minimum wiring gutter space on both sides and top and bottom of 4-inches by 4-inches minimum. Provide flush or surface mounted boxes as indicated manufactured with reinforced steel frame and code-gauge, hot-dip galvanized sheet steel. Utilize front trim the same size as the box for surface mounted panelboards and 3/4-inch larger all around than the box for flush mounted panelboards. Panel covers shall be installed with direct screw connections. Adjustable clamps shall not be used. Utilize fronts having doors with concealed hinges and flush type lock and catch device. Provide multipoint locking devices for all doors over 30-inches in height. Key all locks alike, and furnish two milled type keys with each lock. Furnish on door interior a metal directory frame with transparent plastic face and endosed directory card. Furnish an engraved, laminated plastic nameplate screwed (no adhesives) to the cabinet exterior face indicating the panelboard designation, service voltage, and phases. Nameplates shall be black, engraved to a white core. Letter height shall be 1/4 inch.

C. Interiors:

1. Furnished factory assembled panelboard interiors complete with circuit breakers as shown. In addition, space for future circuit breakers shall be provided with easily removable front cover. Utilize panelboards with interiors designed so that circuit breakers can be replaced without disturbing adjacent circuit breakers or without removing the main bus.

2. Provide copper bus bars full sized throughout their length. Make complete provisions for mounting future circuit breakers throughout the full length of the bus. Provide all machining, drilling, or tapping required to add or change circuit breakers in the future. Bolt together and rigidly support bus bars and connection straps on molded insulators.

3. Furnish an insulated neutral bus bar rated the same as the phase bus bars and having at least one terminal screw for each branch circuit. Furnish a copper ground bus bar installed on the panelboard frame, bonded to the box, and containing at least one terminal screw for each circuit. Provide solderless main lugs for main, neutral, and ground bus bars. Provide sub-feed or thru-feed lugs where indicated. Provide lugs and connection points on phase, neutral, and ground buses suitable for copper conductors.

D. Circuit Breakers:

1. Furnish indicating type molded circuit breakers providing ON/OFF and TRIPPED positions of the operating handle. Furnish thermal magnetic, quick-make, quick-break circuit breakers which are noninterchangeable in accordance with the LAEC. Do not use tandem or dual circuit breakers in normal single-pole spaces. Do not use single-pole circuit breakers with handle ties where multiple circuit breakers are indicated. Utilize multipole circuit breakers designed so that an overload on one pole automatically causes all poles to open. Provide circuit breakers meeting requirements of NEMA AB 1. Install bolt-on circuit breakers in all panelboards. Provide circuit breaker handle padlocking provisions where indicated or required.

2. Where ground fault interrupter (GFI) circuit breakers are indicated or required by the LAEC, provide a unit containing a conventional thermal magnetic trip and a ground fault sensor rated to trip the circuit breaker in approximately 0.025 second for a 5-milliampere ground fault (UL Class A sensitivity). Utilize a ground fault sensor having the same rating as the circuit breaker and having a push-to-test button.

E. Acceptable Manufacturers: Bryant, Cutler-Hammer, General Electric, Gould I-T-E, Square D, Westinghouse, or equal.

2.9 CIRCUIT BREAKERS, INDIVIDUAL, 600 VOLTS AND LESS

A. Mount individual circuit breakers in NEMA 12, industrial use enclosure unless otherwise indicated. Provide NEMA 4X, 316 stainless steel raintight enclosure for circuit breakers mounted outdoors and wherever the subscript WP is indicated on the Drawings. Provide circuit breakers with handles that can be locked in the OFF position. Interlock enclosure and circuit breaker to prevent opening the cover with the circuit breaker in the ON position. Provide quick-make, quick-break, thermal magnetic circuit breakers of the indicating type showing ON/OFF and TRIPPED positions of the operating handle. Do not use single-pole circuit breakers with handle ties where multipole circuit breakers are indicated. Utilize multipole circuit breakers designed so that an overload on one pole automatically causes all poles to open. Provide circuit breakers meeting the requirements of NEMA AB 1 and having a minimum interrupting rating of 65,000 amps rms symmetrical at 480 volts. Where circuit breakers are used as service entrance equipment, provide units UL labeled for that use. Provide circuit breakers with terminals suitable for use with 75 degrees C wire at full LAEC 75 degrees C ampacity.

2.10 FUSED SWITCHES, INDIVIDUAL, 600 VOLTS AND LESS

A. Mount individual fused switches in NEMA 12, industrial use enclosures unless otherwise indicated. Provide NEMA 4X, 316 stainless steel raintight enclosure for fused switches mounted outdoors and wherever the subscript WP is indicated on the Drawings. Provide fused switches that can be locked in the OFF position. Interlock enclosure and switch to prevent opening the cover with the switch in the ON position. Provide fused switches which are quick-make, quick-break, motor rated, load-break, heavy-duty (HD) type having external marking clearly indicating ON and OFF positions. Provide fuses of the current ratings indicated and types specified herein. Utilize fuse mountings that reject Class H fuses and will accept only the current-limiting fuses specified. Provide fused switches meeting the requirements of NEMA KS 1 and UL listed for application to a system having an available short circuit current 65,000 amps rms symmetrical. Provide switches with terminals suitable for use with 75 degrees C wire at full LAEC 75 degrees C ampacity.

2.11 NONFUSED SWITCHES, INDIVIDUAL, 600 VOLTS AND LESS

A. Mount individual switches in NEMA 12, industrial use enclosure unless otherwise indicated. Provide NEMA 4X, 316 stainless steel raintight enclosure for switches mounted outdoors and wherever the subscript WP is indicated on the Drawings. Provide switches that can be locked in the OFF position. Interlock enclosure and switches to prevent opening the cover with the switch in the ON position. Provide switches which are quick-make, quick-break, motor rated, load-break, heavy-duty (HD) type having external marking clearly indicating ON and OFF positions. Furnish switches meeting the requirements of NEMA KS 1. Provide switches with terminals suitable for use with 75 degrees C wire at full LAEC 75 degrees C ampacity.

2.12 FUSES, 600 VOLTS AND LESS

A. Provide a complete set of current-limiting fuses wherever fuses are indicated. Supply a set of six spare fuses of each type and each current rating installed. Utilize fuses that fit mountings specified with switches and which provide features rejecting Class H fuses. Provide the following types:

1. For motor and transformer circuits, 600 volts and less, 0 to 600 amps, UL Class RK-1 with time delay, Bussmann Type LPS-RK, Shawmut Type A6D-R, or equal.

2. For motor and transformer circuits, 250 volts and less, 0 to 600 amps, UL Class RK-1 with time delay, Bussmann Type LPN-RK, Shawmut Type A2D-R, or equal.

3. For feeder and service circuits, 600 volts and less, 0 to 600 amps, UL Class RK-1, Bussmann Type KTS-R, Shawmut Type A6K-R, or equal.

4. For feeder and service circuits, 250 volts and less, 0 to 600 amps, UL Class RK-1, Bussmann Type KTN-R, Shawmut Type A2K-R, or equal.

5. For feeder and service circuits, 600 volts and less, 601 to 6,000 amps, UL Class L, Bussmann Type KRP-C, Shawmut Type A4BY, or equal.

2.13 PUSHBUTTONS, INDICATING LIGHTS, AND SELECTOR SWITCHES

A. For nonhazardous, indoor, dry locations, including motor control centers, control panels, and individual stations, provide heavy-duty, oil tight type pushbuttons, indicating lights, selector switches, and stations for these devices. Utilize General Electric Type CR 104P, or equivalent by Square D, Cutler-Hammer, or other acceptable manufacturer.

B. For nonhazardous, outdoor, or normally wet locations, or where otherwise indicated, provide heavy-duty corrosion-resistant, watertight type pushbuttons, indicating lights, or selector switches mounted in NEMA 4X 316 stainless steel watertight enclosures. Provide special gasketing required to make complete station watertight. Utilize Square D Type SK, or equivalent by General Electric, Cutler-Hammer, or other manufacturers.

C. Provide devices meeting the requirements of NEMA ICS 2, and having individual, extra large nameplates indicating their specific function. Provide pushbutton stations with laminated plastic nameplates indicating the drive they control. Provide contacts with NEMA designation rating A600. Install provisions for locking pushbuttons and selector switches in the OFF position wherever lockout provisions are indicated.

D. For hazardous locations, enclosures for push buttons, indicating lights and selector switches shall be approved for classified areas and shall be in compliance with LAEC Article 500.

E. Utilize selector switches having standard operating levers. Make all indicating lights transformer push-to-test type. Provide ON or START pushbuttons colored black. Provide OFF or STOP pushbuttons colored red.

2.14 TERMINAL BLOCKS 600 VOLTS AND LESS

A. Provide 600-volts terminal blocks for termination of all control circuits entering or leaving equipment, panels, or boxes. Provide screw clamp compression, dead front barrier type terminal blocks with current bar providing direct contact with wire between the compression screw and yoke. Provide yoke, current bar, and damping screw constructed of high strength and high conductivity metal. Utilize yoke that guides all strands of wire into the terminal. Utilize current bar providing dependable vibration-proof connection. Supply terminals constructed to allow connection of wire without any special preparation other than stripping. Rail mount individual terminals to create a complete assembly and provide terminals constructed such that jumpers can be installed with no loss of space on terminal or rail.

B. Size all terminal block components to allow insertion of all necessary wire sizes and types. Supply terminal blocks with marking system allowing the use of preprinted or field-marked tags. Supply CSA certified and UL approved terminal blocks manufactured by Weidmuller, Ideal, Electrovert, or equal. Provide terminal blocks with 25 percent spare termination points for OWNER'S use following completion of installation.

2.15 CONTROL RELAYS

A. Provide magnetic control relays, NEMA Class**,** industrial control type with field convertible contacts, and meeting the requirements of NEMA ICS 2. Provide Cutler-Hammer Type M-300, General Electric Type CR120A, or equal.

B. Where time delay relays are specified or required, unless otherwise noted, provide magnetic control relays with a timer attachment adjustable over the range specified on the Drawings.

C. Where latching (mechanically held) relays or motor thermal detector relays are specified, provide magnetic control relays with mechanical latch attachment with unlatching coil and coil clearing contacts. Utilize an attachment allowing easy manual latching and unlatching.

2.16 RESET TIMERS

A. Provide synchronous-motor-driven reset timers with a solenoid-operated clutch and suitable for semiflush, panel mounting. Utilize timers with time range indicated and 10-amp, 120-volts contacts. Provide Eagle Signal Bulletin 125 timers, Automatic Timing and Controls Bulletin 305 timers, or equal.

2.17 ELAPSED TIME METERS

A. Provide synchronous-motor-driven, elapsed time meters, 0 to 99,999.9 hours range, nonreset type, suitable for semiflush, panel mounting. Provide General Electric Type 240, 2-1/2-inch Big Look unit, Eagle Signal Bulletin 705 unit, or equal.

2.18 MAGNETIC CONTACTORS

A. Provide contactors of the NEMA sizes indicated. Mount contactors in NEMA 12, dust-tight, drip-tight, industrial use] enclosures unless otherwise indicated. Utilize contactors manufactured and rated in accordance with NEMA ICS 2.

2.19 MAGNETIC LIGHTING CONTACTORS

A. Provide mechanically held lighting contactors of the current ratings indicated. Mount contactors in NEMA 12, dust-tight, drip-tight, industrial use enclosures unless otherwise indicated. Provide coil-clearing contacts on mechanically-held units. Utilize contactors manufactured and rated in accordance with NEMA ICS 2.

2.20 DRY TYPE SMALL POWER TRANSFORMERS (600-VOLTS AND LESS PRIMARY)

A. Provide self-cooled, two-winding, dry type transformers of the ratings indicated and built in accordance with the latest IEEE, ANSI, and NEMA standards. Utilize units with manufacturer's standard insulation class and standard temperature rise. For ratings 3 to 25 kVA single-phase and 3 to 15 kVA 3-phase, provide units with core and coils completely enclosed in a nonventilated, NEMA 3R weatherproof enclosure. Utilize encapsulated windings on single-phase units 0 to 25 kVA. On all transformers 15 kVA and larger provide units with at least four, 2-1/2 percent, full capacity voltage taps; two above and two below normal voltage rating. On units 75 kVA and larger, provide an impedance of 4.5 percent minimum.

B. Supply units where sound levels determined by tests in accordance with NEMA and ANSI standards do not exceed:

1. 40 decibels for 0 to 9 kVA.

2. 45 decibels for 10 to 50 kVA.
3. 50 decibels for 51 to 150 kVA.
4. 55 decibels for 151 to 300 kVA.
5. 60 decibels for 301 to 500 kVA.

C. For transformers 30 kVA and larger, equip units with integral vibration isolators completely isolating the core and coil assembly from the transformer enclosure. For smaller transformers, provide integral vibration isolators or install external vibration isolators which isolate the entire unit from the structure on which it is mounted. Utilize only integral or external vibration isolators which are rated for the weight of the transformer and provide 99 percent isolation efficiency at the fundamental frequency of sound emitted by the transformer.

D. Acceptable Manufacturers: General Electric, Hevi-Duty, Square D, Westinghouse, or equal.

2.21 LOW VOLTAGE SURGE PROTECTIVE EQUIPMENT

A. Provide secondary surge protective equipment consisting of a surge capacitor and surge arrestor combination located where indicated on the Drawings. Utilize components for all surge protective equipment covered by this Specification, designed and tested in accordance with NEMA LA-1 and ANSI/IEEE C62.1.

B. Provide a surge capacitor impregnated with non-pcb biodegradable dielectric fluid. Include an integral discharge resistor which will drain the residual voltage to 50 volts crest in less than 5 minutes after the unit has been disconnected from the circuit.

C. Provide an arrestor consisting of an assembly of high strength metal oxide valve elements enclosed in a high strength, corrosion-resistant, molded resin housing.

D. Provide a capacitor and arrestor having a mounting nipple, flat washer, and nut suitable for knockout mounting. Install capacitors and arrestors in NEMA 4X (stainless steel) enclosures.

2.22 ENCLOSURE PAINT AND FINISH

A. All metallic enclosures shall be finished with a prime coat of rust inhibitor and painted as per ANSI No. 61 or as per the ENGINEER's instructions.

PART 3 -- EXECUTION

3.1 OUTLET AND DEVICE BOXES

A. Installation:

1. Mount boxes at the following heights unless otherwise required by the Americans with Disabilities Act (heights are to the centerline of the box):

Wall switches	48-inches above floor
Thermostats	48-inches above floor
Wall telephone outlets	6-inches above counter tops; 12-inches above floor
Wall mounted telephone	52-inches above floor outlets for public pay telephone, 52-inches above floor for standard wall telephone

Office, Lab Receptacles:	Flush device plate bottom or side with top of the splashback on use areas, halls, etc. or 6-inches above counter tops without splashback; 12-inches above floor unless otherwise indicated.

a. Where above heights do not suit the building construction or finish, locate boxes where directed by the ENGINEER.

b. Locations indicated are approximate. Study the Drawings in relation to spaces and equipment surrounding each outlet. When necessary, with the approval of the ENGINEER, relocate outlets to avoid interference with mechanical equipment or structural features. Locate all light switches on lock side of doors. Locate all light fixture outlets in a symmetrical pattern according to the room layout unless otherwise indicated.

c. Mount all boxes plumb and level. Use flush mounted boxes with concealed conduits. Make edges of boxes flush with finished surface. Provide proper type extension rings or plaster covers for this purpose. For flush mounted boxes, make holes in the surrounding surface no larger than required to receive the box.

d. Install boxes in a secure, substantial manner supported independently of conduit by attachment to the building structure or a structural member. Fasten boxes with bolts and expansion shields on concrete or brick, toggle bolts on hollow masonry units, and machine screws or welded, threaded studs on steelwork. Threaded studs driven in by a powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields. Boxes embedded in concrete or masonry need not be additionally supported. Utilize galvanized mounting hardware in industrial areas.

e. Provide flush or recessed lighting fixtures with separate junction boxes when required by the fixture terminal temperature. Where boxes support fixtures, provide proper means of attachment with adequate strength.

f. Open no more knockouts in sheet steel boxes than are actually required. Seal any used openings in any type box.

3.2 JUNCTION AND PULL BOXES

A. Where indicated on the Drawings, and where necessary to terminate, tap-off, or redirect multiple conduit runs, provide and install appropriately designed junction boxes. Furnish and install pull boxes where necessary in the raceway system to facilitate conductor installation. Provide pull boxes to limit conduit runs to less than 150-feet and to contain no more than the equivalent of three right-angle bends unless accepted by the ENGINEER.

1. Types to be Provided:

a. Use boxes of the types listed for specific locations under article2.3, OUTLET AND DEVICE BOXES.

b. Use outlet boxes as junction boxes and pull boxes wherever possible and allowed by applicable codes.

c. Provide stainless steel (NEMA 4X) boxes as indicated for below grade conduit. Provide Stainless steel (NEMA 4X) for abovegrade locations.

2. Installation:

a. Make all boxes accessible. Do not install boxes in finished areas unless accepted by the ENGINEER. Mount all boxes plumb and level. Use flush mounted boxes with concealed conduits. Make edges of boxes flush with the final surface.

b. Mount boxes in a secure, substantial manner, supported independently of conduit by attachment to the building structure or a structural member. Fasten boxes with bolts and expansion shields on concrete or brick, toggle bolts on hollow masonry units, and machine screws or welded threaded studs on steelwork. Threaded studs driven in by a powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields. Boxes embedded in concrete or masonry need not be additionally supported. Utilize galvanized mounting hardware in industrial areas.

c. Install boxes for conduits under grade flush with finished grade in locations outside of paved areas, roadways, or walkways.

d. If adjacent structure is available, the box may be mounted on the structure surface just above finished grade in accessible but unobtrusive location. If it is found desirable to locate boxes in paved areas, roadways, or walkways, obtain ENGINEER's written approval and utilize boxes and covers suitable for the weights to which they may be subjected.

3.3 TERMINAL JUNCTION BOXES (TJB)

A. Install in accordance with all the requirements detailed under article 3.2, JUNCTION AND PULL BOXES above. Label each block and terminal with a permanently attached, nondestructible tag.

3.4 TELEPHONE TERMINAL CABINETS

A. Install telephone terminal cabinets where indicated so top of the cabinet is approximately 6 -feet above the floor. Mount cabinet where door can open at least 120 degrees and far enough to give full access to the insides.

3.5 WIRING DEVICES

A. Switches: Mount switches at the heights indicated under article 3.1, OUTLET AND DEVICE BOXES. Mount switches for switch operation in the vertical position.

B. Receptacles: Mount receptacles at heights indicated under article 3.1, OUTLET AND DEVICE BOXES. Mount receptacles with grounding slot up except where horizontal mounting is indicated, in which case mount with neutral slot **up.** Ground receptacles to boxes with grounding wire, not by yoke or screw contact. Mount weatherproof receptacles with the hinge for the protective cover above (not at side, or below) the receptacle opening.

1. Special Purpose Receptacles: Locate special purpose receptacles where shown. Install and mount the receptacles in accordance with the manufacturer's instructions and the applicable codes.

C. Multioutlet Surface Raceway System: Locate multioutlet surface raceway systems where shown and install in accordance with the manufacturer's instructions.

D. Telephone Outlets: Mount outlets at the heights indicated under article 3.1, OUTLET AND DEVICE BOXES. Mount outlets in the vertical position unless otherwise indicated.

E. Device Plates:

1. Installation: Securely fasten device plates to switch or receptacle boxes or the wiring device contained therein. Install device plates used with flush mounted boxes with all four edges in continuous contact with the finished wall surfaces without the use of mats or similar materials. Plaster fillings will not be acceptable. Install device plates vertically or horizontally with an alignment tolerance of 1/16-inch. Do not use sectional type device plates.

3.6 LIGHTING AND DISTRIBUTION PANELBOARDS

A. Mount panelboards securely where indicated, plumb, in-line, and square with walls. Unless otherwise indicated, mount panelboard with top of its cabinet approximately 6-feet above the floor. Provide a typewritten circuit directory under a metal-framed transparent plastic cover inside each panelboard. Provide an engraved, laminated plastic nameplate on the outside of the panelboard showing the panelboard designation, voltage, and phases.

3.7 DRY TYPE TRANSFORMERS (600-VOLTS AND LESS PRIMARY)

A. Mount transformers approximately where indicated. Load any vibration isolators external to the unit properly and provide complete isolation with no direct transformer unit metal in contact with the mounting surface. Connect electrical circuits to transformers by means of moistureproof, flexible conduit in a manner that prevents transformer vibrations from being transmitted to the building or other equipment.

B. Ground neutrals and enclosures of all transformers and all moisture proof flexible conduit in accordance with applicable codes and as otherwise may be indicated. Connect voltage taps on all transformers to give as close as possible to rated output voltage under normal plant load conditions.

3.8 DRY TYPE, SHIELDED, ISOLATION TRANSFORMERS (600-VOLTS AND LESS PRIMARY)

A. Follow instructions for DRY TYPE TRANSFORMERS (600-VOLTS AND LESS PRIMARY) above. In addition, ground isolation shields to the unit enclosure with a conductor of the same material, and at least as big, as the shield ground lead provided with the unit.

* * * * * *

SECTION 16110
CONDUITS AND RACEWAYS

PART 1 -- GENERAL

1.1 SCOPE

A. Furnish and install conduits and raceways as indicated on the Contract Drawings and herein specified.

B. Comply with the General Conditions, General Requirements and requirements of Section 16010 of this Division 16 concerning definitions, guarantees, submittals, as-builts, etc. as applicable to work of this Section.

1.2 SUBMITTALS

A. Shop Drawings: Layout drawings of exposed raceways in public spaces. These will be reviewed by the Architect for aesthetics only.

PART 2 - PRODUCTS

2.1 CONDUITS AND RACEWAYS

A. Steel Material: Galvanized raceways underground and in wet, damp or corrosive atmosphere shall be provided with 40 mil PVC coating. Provide PVC coated conduit that bears the ETL Verified PVC-001 label by Robroy Industries, Plasti-Bond, Perma-Cote, KorKap or equal.

B. All Conduit Shall Be Metallic Unless Otherwise Indicated or Noted: Metallic conduit incorporated in the work shall comply with applicable divisions of the National and American Standards Association publications.

1. Rigid Steel Conduit: full weight pipe, galvanized, threaded.

2. Intermediate Metal Conduit (IMC): Lightweight steel pipe, galvanized, threaded.
3. Aluminum Conduit: Full weight pipe, threaded.

4. Electro-Metallic Tubing (EMT): Thin wall pipe, galvanized, threadless.

5. Flexible Metal Conduit: Continuous single strip, aluminum or galvanized steel.

6. Polyvinyl Chloride Jacketed Conduit (PVC): Provide only where noted:

a. Self-extinguishing, NEMA TC-2, for 90 deg C rated cable and NEMA TC-6 for communication wiring only shall be flame retardant and not support combustion.

b. Concrete encased and direct burial: Schedule 40.

c. Buried locations subject to heavy vehicular traffic: Schedule 80.

d. Elbows: PVC coated galvanized rigid steel for underground conduits transitioning above grade..

C. Wireways: Complete with all fittings and accessories. Size as noted, baked enamel finish inside and outside, approved for support at minimum 10 feet on centers.

1. Interior Use: Hinged cover and base, minimum thickness 16 gauge galvanized steel.

2. Exterior Use: Hinged cover and base, minimum No. 14 gauge galvanized steel, weatherproof and gasketed.

D. Surface Metal Raceways: Complete with all fittings and accessories. Size as noted, baked enamel finish inside and out:

1. Snap-on covers, minimum No. 20 gauge galvanized steel.

2. Wiremold Co., Walker Parkersburg Textron, Power-Strut or equal.

E. Raceway Fittings:

1. Rigid Steel and Intermediate Metal Conduits: Non-split, threaded, steel or malleable iron. Zinc die cast not permitted.

2. Rigid Aluminum Conduit: Non-split, threaded, copper free aluminum alloy or hot dipped galvanized.

3. Electro-Metallic Tubing: Set screw type except waterproof compression type for outdoor installation.

4. Flexible Metallic Conduit: Angle wedge type with insulated throat.

5. Bushings: Metallic insulated type.

6. Weatherproof or Dustight Installations: Liquid-tight with sealing ring and insulated throat.

7. Hazardous Locations: Cast, copper-free aluminum, threaded covers.

8. Provide raceways complete with boxes, fittings and accessories.

F. Sleeves:

1. Exterior Non-Membrane Waterproofed Walls or Interior Load Bearing Walls: Galvanized cast iron, galvanized steel or wrought iron with continuously welded center flange.

2. Exterior Non-Membrane Waterproof Roofs: Galvanized cast iron, flashing flange and damping ring. Josam 26440 Series or equal.

3. Exterior Membrane Waterproof Walls, Floors and Roofs: Galvanized cast iron, flashing flange and clamping ring, equal to Josam 26400 Series or O.Z. type WSK or FSK.

4. Interior Membrane Waterproof Floors: Galvanized cast iron, flashing flange and clamping ring. Extend two inches above floor with pipe nipples. Clamp to flashing. Josam 26420 Series or O.Z. type WSL or FSK or equal.

5. Extend flashing 10 inches around edge of raceway. Flashing subject to review.

G. Seals:

1. Raceways in Waterproof Sleeves: O.Z. Type WSK through wall seal.

2. Raceways in Non-Watertight Sleeves: Sealing compound.

3. Thruwall Cable Seals: O.Z. Type WSCS.

4. Hazardous Areas, Cold Rooms Conductor Water Stops: Equal to Crouse-Hinds or Appleton type EYS, ESU, EYM, EYOM or SFM with matching sealing cement and fiber filler.

H. Expansion Fittings:

1. Exposed and In Furred Spaces: Flexible conduit with external bonding jumper strip.

2. In Slab: O.Z. Type AX or Appleton type XJ or XJF with ground continuity.

I. Cables in Raceways Through Sleeves: O.Z. type KSC compound or type C series terminators.

J. Fire Sealants - UL Listed: Chase Foam, CTC PR-855 or equal fire resistant foam sealant.

2.2 BOXES

A. Outlet Boxes, except as otherwise required by construction, devices or wiring, as follows:

1. Stamped or Welded Steel, 4-Inches, Square or Octagon For Lighting Fixtures: 1-1/2 inch deep above ceiling, 3 inch deep in slab, and 2-1.8 inch deep in wall.

2. In Wall For Receptacles and Switches: 4 inches square or octagon by 1-1/2 inch deep with raised covers and fixture studs where required. Through-the-wall type not permitted.

3. In Wall For Telephone or Data: 4-inches square or octagon by 2-1/8 inch deep with raised covers and fixture studs where required. Through-the-wall type not permitted.

4. Galvanized Cast-Iron or Aluminum With Threaded Hubs: 4 inch round, 2-inch deep on ceiling, and 4-inch square, 2-inch deep on wall.

5. Boxes For Outdoors and Damp Locations: Weatherproof, cast metal.

6. In Hazardous Locations: Cast, copper-free aluminum.

7. Boxes Without Fixture or Device: Provide with blank cover.

8. Offset back-to-back outlets with minimum six-inch separation except in "Acoustic partitions" where back-to-back outlets are not allowed. Refer to detail 5, architectural drawing sheet. *

9. Boxes in "Acoustic Partitions" shall be provided as detailed on architectural drawing sheet. *

B, Junction and Pull Boxes:

1. Galvanized Sheet Steel: Code size and gauge in accordance with voltage parameters.

2. Covers: Screw-on, except as noted.

3. With insulated supports for cables.

4. Locations: As indicated, where required and accessible.

5. Outdoors and Damp Locations: Galvanized cast iron or aluminum with threaded hubs and gaskets.

6. Provide barriers or separate boxes between wiring energized from different systems; and emergency and normal wiring.

C. Manholes for Serving Agency: As specified by serving agency.

D. Manholes and Handholes:

1. Precast concrete.

2. Reinforcement for H-20 bridge loading.

3. Water stopped joints.

4. Cast-iron rings and covers, except as noted on schedule.

5. Covers shall be permanently identified as to the name of the Project or City Facility.

6. Inside dimensions as required by NEC 370 size by the Contractor.

7. Complete with inserts, galvanized cable racks, insulated galvanized ladders, dry sumps, galvanized pulling irons, grounding, etc. necessary for complete and operational system.

8. Conduit entry as scheduled.

9. Install per manufacturer's instructions.

10. Manufactured by: Associated Concrete Products, Inc., Brooks Products, Inc., or equal.

E. Floor Boxes: Unless otherwise noted, galvanized cast iron with stainless steel covers and flanges, suitable for conduit and devices indicated. Harvey Hubbell, Dualevel Series or equal.

1. See also Section 16140 wiring devices for special outlet boxes.

2. For additions to existing areas, match existing.

PART 3 - EXECUTION

3.1 INSTALLATION OF CONDUITS AND RACEWAYS

A. Procedure:

1. All conduit joints shall be cut square, threaded, reamed smooth and drawn up tight. Bends or offsets shall be made with standard conduit ells, field bends made with an approved bender or hickey, or hub-type conduit fittings. Number of bends per run shall conform to Code limitations.

2. Paint male threads of field threaded conduit with homogenized blend of colloidal copper and rust and corrosion inhibitor pipe compound, Thomas and Betts Kopr-Shield or equal. Butt conduit ends.

3. Conduits shall be secured to all boxes with locknuts and bushings in such manner that each system shall be electrically continuous throughout.

4. Conduits shall be securely fastened in place on maximum 4 foot intervals; and within 12" of every outlet box, hangers, supports, or fastenings shall be provided at each elbow and at end of each straight run terminating at a box or cabinet.

5. Furnish and install pullboxes where required by Code and where necessary in the raceway system to facilitate conductor installation. In general, conduit runs of more than 100 ft., or with

more than three right-angle bends, shall have a pullbox installed at a convenient intermediate location. Support boxes independently of raceways, walls and partitions. Boxes shall have removable screw covers and shall be accessible.

B. Raceways shall be run concealed, except as noted.

C. Raceways shall not be buried in waffle floors.

D. Exposed raceways and raceways in hung ceilings shall be run parallel with or at right angles to walls.

E. Clearance From Water, Steam or Other Piping: Minimum three inches separation from hot water pipes, except one inch from pipe cover at crossings.

F. Keep raceways clear of motor foundations and underside of boilers.

G. Run raceways in walls vertically.

H. Maintain grounding continuity of interrupted metallic raceways with ground conductor, and in flexible conduit for feeders and motor terminal connections.

1. Include equipment grounding conductor in exposed, damp or wet locations.

I. Empty Raceways Over 10-feet Long: Provide with fish or pull wire, galvanized steel or nylon rope.

J. Raceways Located Underground, Beyond Building:

1. Minimum 24-inches top cover, 30-inches in areas subject to heavy vehicular traffic.

2. Slope away from building.

3. Building entry and preceding manhole:

a. Plug empty raceways.

b. Seal cables in raceways with terminators: Similar to O.Z. type CRC Series.

4. Manhole Entries: Through end bells perpendicular to entering wall.

5. Anchor raceways to prevent movement.

6. After Installation: Pass stiff bristle, mandrel (85 percent of raceway diameter) and plug.

7. Placement: Over well-tamped trench bottom and on concrete blocks, five feet on centers. Provide non-metallic spacers.

8. Joints: Minimum six inches apart and staggered.

9. Provide watertight joints.

K. Raceways Located Underground, Under Building:

1. Use steel conduit for bends.

2. Transition from PVC to steel must occur underground.

3. Separate pull boxes/handholes for normal and emergency circuits.

4. Concrete encasement to be continuous with floor.

L. Vibration and Noise Control:

1. Provide flexible conduit connections to all vibrating equipment as described in Section 15210, Para. 3.10.

2. See Section 16010, Para. 3.01L, item no. 2.b.

3. Provide expansion fittings and flexible connections across all joints or floated floors.

M. Rigid Steel Conduit:

1. In slabs (see 3.01.C), maximum outside diameter not to exceed 1/3 of the slab thickness.

2. Direct Buried Conduit: Provide 40 mil PVC coated conduit.

3. Under Building: Concrete encase.

4. Not permitted in terrazzo floor finish.

5. Minimum one-inch cover in concrete fill.

N. Intermediate Metal Conduit:

1. Same as Rigid Steel and:

a. Do not use in hazardous locations or direct burial.

b. Do not use for cables installed by Utility Company.

O. Flexible Metallic Conduit:

1. For short motor or vibrating equipment connections where rigid conduit is impracticable.

2. From Outlet Box to Recessed Lighting Fixture: Minimum four feet, maximum six-feet length.

3. For Final Connection to Motor Terminal Box, Transformers and Other Vibrating Equipment: With polyvinyl sheathing and ground conductor. Minimum length: 18 inches with minimum 50 percent slack. Connect ground conductor to enclosure or raceway at each end.

4. For expansion joint crossings, cross at right angles and anchor ends.

5. Provide liquid tight flexible conduit with separate insulated stranded copper equipment ground conductor for connections in area exposed to weather, damp locations and connections to transformers enclosures regardless of location. Use for all connections to kitchen and other appliances.

P. Plastic Conduit: (PVC SCHED 40)

1. Permitted Use: Only where noted on the Contract Drawings.

2. Cut ends square, ream smooth, wipe clean apply approved solvent weld cement and quarter turn as drawing up tight to shoulder. Seal joints watertight.

3. Convert to steel conduit through adaptors when entering building and for risers.

4. Clearance from hot water and steam lines: Three feet minimum.

5. Provide ground wire with power wiring and increase size if required.

6. Under roads, roadways and parking areas: outside the outside walls of the building, concrete encase underground.

7. General Interior Use: Not permitted.

Q. Outlet Boxes:

1. Set square and true with building finish and secure to building structure by adjustable strap irons.

2. Verify outlet locations in finished spaces with Drawings of interior details and finishes.

3. Provide barriers between switches connected to different phases for voltages exceeding 150 volts to ground.

R. Panel, Junction and Pull Boxes:

1. Location: Clear of other work. Conceal junction and pull boxes in finished spaces and maintain accessibility.

2. Support from building structure, independent of conduit. Provide floor to ceiling channels for mounting on drywall and lightweight construction.

3. Outlet boxes for fixtures recessed in hung ceiling: accessible through opening created by removal of fixture. Secure to black iron ceiling support.

4. Motor Terminal Boxes: Coordinate with motor branch circuit conduit and wiring.

5. Paint Life Safety system outlet, pull and junction boxes red color.

3.2 TESTS

A. Continuity:

1. Test resistance of feeder conduits from service to point of final distribution using 1 conductor return.

2. Maximum: 25 ohms resistance.

* * * * * *

SECTION 16120
CONDUCTORS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all tools, equipment, material, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The WORK of the following Sections or Divisions applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Division 11 Equipment, applicable Sections.

2. Division 15 Mechanical, applicable Sections.

3. Division 16 Electrical, applicable Sections.

4. Division 17 Instrumentation and Control, applicable Sections.

B. Materials and equipment furnished and installed under other divisions with raceway and electrical conductors furnished, installed, and connected under Division 16, Electrical.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

B. Comply with the current provisions of the following Codes and Standards.

1. Codes and Standards:

LAEC	City of Los Angeles Electrical Code, latest adopted edition.
Title 8, Industrial Relations, Subchapter 5, Electrical Safety Orders, California Code of Regulations.	

2. Commercial Standards:

ANSI/UL 467	Grounding and Bonding Equipment, Safety Standard For.
ICEA S-61-402/NEMA WC-5	Thermoplastic - Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

ICEA S-19/NEMA WC-3	Rubber - Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
ICEA S-68-524/NEMA WC-7	Cross Linked Thermosetting Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
ICEA S-68-516/NEMA WC-8	Ethylene Propylene Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
ANSI/UL 62	Flexible Cord and Fixture Wire.
ANSI/UL 510	Insulating Tape.
ANSI/UL 1277	Electric Power and Control Tray Cables with Optical Fiber Members.
ASTM B8	Standard Specifications from Concentric Lay Standard Copper Conductors, Hard, Medium-Hard or Soft.
IEEE 48	Standard Test Procedures and Requirements for High Voltage Alternating Current Cable Terminations.
NEMA WC-55	Instrumentation Cables and Thermocouple Wire
NEMA WC-57	Control Cables

C. All Conductors furnished by the CONTRACTOR shall be listed by and shall bear the label of Underwriters' Laboratories, Incorporated, (UL)..

D. The construction and installation of all electrical equipment and materials shall comply with all provisions of the CAL OSHA Safety Orders Title 8 CCR, as applicable), State Building Standards, and applicable local codes and regulations.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the Section 16010 Electrical General Provisions.

B. CONTRACTOR shall submit the following items.

1. Catalog cuts and other brochures depicting conductor characteristics.

2. Manufacturer’s certified test records and factory test procedures.

3. Manufacturer’s recommended splicing, testing, and installation procedures and practices.

4. Field testing using attached Cable Test Data Form, HI-POT and Megger tests including certified test reports. Also, include splicing personnel qualifications.

1.5 QUALITY ASSURANCE

A. Conductor Identification System:

1. Provide complete power and control conductor identification system so that after installation, circuits can be easily traced from origin to final destination.

2. Identify power and control conductors at each termination and in all accessible locations such as maintenance holes, handholes, panels, switchboards, pull boxes, terminal boxes, etc. For identification, use type of tags specified herein.

3. Tag conductors using a three-segment conductor numbering scheme which defines the origin of the conductor, the function of the conductor, and the destination of the conductor.

   Example: MCCA-P-MCCB where MCCA is the origin, P is the function identification (P = power, C = control, S = signal, etc.), and MCCB is the destination.

4. For conductors with one point of origin and two or more destinations, expand the function identification number, e.g., PA, PB, etc.

5. Make the origin and destination identification the specific names for the equipment used in the Contract Documents. Make the instrumentation and control identification names exactly as designated, i.e., FT-S-121.

B. Conductor Color Coding:

1. Color coding of multiconductor control and instrumentation cable is specified in the individual cable type specification.

2. For power conductors, provide all single conductors and individual conductors of multiconductor power cables with integral insulation pigmentation of the designated colors, except conductors larger than No. 6 AWG may be provided with color coding by applying a heat shrink tube of the appropriate color.

3. Phase A, B, C implies the direction of positive phase rotation.

4. Use the following colors:

System	Conductor	Color
All Systems	Equipment Grounding	Green
240/120 Volts	Grounded Neutral	White
1-Phase, 3-Wire	One Hot Leg	Black
	Other Hot Leg	Red
208Y/120 Volts	Grounded Neutral	White
3-Phase, 4-Wire	Phase A	Black
	Phase B	Red
	Phase C	Blue
240/120 Volts	Grounded Neutral	White
3-Phase, 4-Wire	Phase A	Black
Delta, Center Tap "High"	(wild) Leg	Orange
Ground on 1-Phase	Phase C	Red
480Y/277 Volts	Grounded Neutral	White, Black
3-Phase, 4-Wire	Tracer	
	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow

System	Conductor	Color
4,160 Volt	Grounded Neutral	White
4,800 Volt	Phase A	Yellow
13,800 Volt	Phase B	Red
34,500 Volt	Phase C	Blue

C. For all high voltage cable and all 600 volt cable sized AWG #2 and larger, CONTRACTOR shall furnish cable manufactured no more than one year prior to installation.

PART 2 -- PRODUCTS

2.1 GENERAL

A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. Products of other manufacturers will be considered in accordance with the GENERAL REQUIREMENTS.

2.2 CONDUCTORS

A. Conductors 600 Volts and Below:

1. Unless otherwise indicated, provide stranded conductors, except provide solid conductors where No. 10 AWG and No. 12 AWG are designated for branch circuit power wiring in lighting and receptacle circuits.

2. Provide Type THHN/THWN insulation for control & instrument cables. Provide conductors with Type XHHW insulation for power cables.

3. Use only copper conductors.

4. For all direct burial and aerial conductors and cables, provide conductors with UL labeling "TYPE USE" and RHW insulation with heavy-duty, black, neoprene sheath meeting the physical requirements and minimum thickness requirements of ICEA S-19-81 and NEMA WC 3.

5. Where flexible cords and cables are specified, provide Type SO, 600-volt, with the number and size of copper conductors indicated.

6. Conductors for applications of 600 volts and below shall be rated for 600 volts unless otherwise specified.

7. The name of the manufacturer, insulation type, voltage rating and wire size shall be clearly and permanently imprinted throughout the length of each conductor. All conductors and cables supplied shall bear the UL label.

B. Multi-Conductor Cable:

1. Provide cable that is UL listed Type TC and conforms to the requirements of UL 1277 and NEC Article 340, or UL listed Power Limited Circuit Cable that conforms to the requirements of Article 725 of the LAEC. Provide cables permanently and legibly marked with the manufacturer's name, the maximum working voltage for which the cable was tested, the type of cable, and labeled UL (or submit evidence of UL listing).

2. Provide cables as specified under the type number in this section (Type 1, Type 2, etc.). Conduits shown on the Drawings and in the Circuit/Raceway Schedule have been sized to accommodate the outside diameter for each type. For this reason, use cable diameters equal to or less than the diameters specified.

   a. Type 1 (600-Volt Multi-Conductor Control Cable, Type TC):

      (1) General: Multi-conductor control circuit interconnection cable with ground. Suitable for installation in open air, in cable trays, conduit, or other approved raceways. Maximum cable temperature rating 90 degrees C dry locations, 75 degrees C wet locations. Passes vertical tray flame test.

      (2) Individual Conductors: No. 14 AWG, 19-strand copper.

      (3) Insulation and Jackets: Provide conductors having 15-mil PVC insulation with 4-mil nylon jacket, and UL listed as Type THHN/THWN. Color code the conductor group in accordance with ICEA S-61-402, Appendix K, Method 1, Table K-2. Include one full size green equipment grounding conductor. Bind conductor group with a spiral wrap of barrier tape. Provide cable with overall outer PVC jacket which is flame-retardant, sunlight- and oil-resistant, and has a nominal thickness as shown in the table below.

      (4) Use only 5, 7, 9, 12, 19, 24, 25, and 37-conductor cables. The green grounding conductor is included in the number of conductors shown in the table below.

No. of Conductors	Max. Outside Diameter (inches)	Jacket Thickness (mils)
5	0.45	45
7	0.48	45
12	0.65	60
19	0.76	60
25	0.93	60
37	1.04	80

      (5) Manufacturers: The Okonite Company, Rome Cable, or equal.

   b. Type 2 (600-Volt No. 16 AWG Twisted, Shielded Pair Instrumentation Cable, Type TC) (UL 62 & 1277):

      (1) General: Single pair instrumentation cable designed for noise rejection for process control, computer, or data log applications. Suitable for installation in cable trays, conduit, or other approved raceways. Maximum cable temperature rating shall be 90 degrees C dry locations, 75 degrees C wet locations.

      (2) Individual Conductors: Bare soft annealed copper, Class B, 7-strand concentric per ASTM B 8; 20 AWG, 7-strand tinned copper drain wire.

      (3) Insulation and Jacket: Each conductor 15-mil nominal PVC and 4-mil nylon insulation. Pair conductors pigmented black and red. Jacket flame-retardant and sunlight- and oil-resistant PVC with 45 mils nominal thickness. Shield 1.35-mil aluminum/mylar overlapped to provide 100 percent coverage.

      (4) Dimension: 0.31 inch nominal OD.

      (5) Manufacturers: The Okonite Company, Alpha Wire Corporation, Belden or equal.

c. Type 3 (600-Volt No. 16 Twisted, Shielded Triad Instrumentation Cable, Type TC) (UL 62 & 1277):

(1) General: Single triad instrumentation cable designed for noise rejection for process control, computer, or data log applications. Suitable for installation in cable tray, conduit, or other approved raceways. Maximum cable temperature rating shall be 90 degrees C dry locations, 75 degrees C wet locations.

(2) Conductors: Bare soft annealed copper, Class B, 7-strand concentric per ASTM B 8; 20 AWG, 7-strand, tinned copper drain wire.

(3) Insulation and Jacket: Each conductor, 15-mil nominal PVC and 4-mil nylon insulation. Triad conductors pigmented black, red, and blue. Jacket flame-retardant and sunlight- and oil-resistant PVC with 45 mils nominal thickness. Shield 1.35-mil aluminum/mylar, overlapped to provide 100 percent coverage.

(4) Dimension: 0.32 inch nominal OD.

(5) Manufacturers: The Okonite Company, Alpha Wire Corporation, Belden or equal.

d. Type 4 (600-Volt No. 18 AWG, Multi-twisted Shielded Pairs with a Common Overall Shield Instrumentation Cable, Type TC)(UL 62 & 1277):

(1) General: Twisted, shielded pairs of instrument cables, grouped in a single cable, designed for use as instrumentation, process control, and computer cable. Suitable for installation in cable tray, conduit, or other approved raceways. Maximum cable temperature rating shall be 90 degrees C dry locations, 75 degrees C wet locations.

(2) Conductors: Bare soft annealed copper, Class B, 7-strand, concentric per ASTM B 8. Tinned copper drain wires. Pair drain wire size AWG 20, group drain wire size AWG 18.

(3) Insulation and Jacket: Each conductor 15-mil PVC and 4-mil nylon insulation. Pair conductors pigmented black and red with red conductor numerically printed for group identification. Outer jacket flame-retardant and sunlight- and oil-resistant PVC with nominal thickness as shown in table. Individual pair shield 1.35-mil aluminum/mylar. Group shield 2.35-mil aluminum/mylar, overlapped for 100 percent coverage.

(4) Dimensions as noted in table below:

Number of Pairs	Maximum Outside Dimension (inches)	Nominal Jacket Thickness (mils)
4	0.50	45
8	0.68	60
12	0.82	60
16	0.95	80
20	1.05	80
24	1.16	80
36	1.33	80
50	1.56	80

(5) Manufacturers: The Okonite Company, Alpha Wire Corporation, Belden or equal.

C. Conductor and Cable Tags:

1. Tags relying on adhesives or taped-on markers are not acceptable.

2. Provide conductor tags for conductors No. 12 AWG and below with legible permanent sleeve of yellow or white PVC with machine printed black marking.

3. Provide tags for cables, and for conductors No. 10 AWG and larger, consisting of permanent nylon marker plates with legible designations hot stamped on the plate. Attach these marker plates to conductors and cables with nylon tie cord.

D. Equipment Grounding Conductors:

1. Provide soft-drawn copper conductors, not smaller than AWG12 and as indicated or as required by NEC, for equipment grounding.

2. Provide conductors with green insulation of the same type as all other circuit wires.

E. Direct Buried Grounding Conductors:

1. Provide bare stranded copper conductors, size as indicated, for the ground system grid at transformers, switchgear, and where indicated.

2.3 MANUFACTURED WIRING SYSTEMS

A. Provide a flexible, coordinated means of distributing lighting branch circuit and control wiring.

B. Provide a system rated at 20 amperes load-carrying capacity per phase with final assemblies consisting of a maximum of three, phase conductors. Provide a system manufactured of Type MC cable with 90 degrees C insulation and stranded copper conductors.

C. Provide three, single-phase, five-wire circuit cable configuration with standard color wire coding as per Article 1.5 of this Section.

D. Provide a system having a latch/strike locking mechanism with voltage clearly marked on latch. Provide a system UL listed for use in air handling plenums, listed to connect or disconnect under load, and manufactured in accordance with Article No. 604 of the NEC.

PART 3 -- EXECUTION

3.1 GENERAL

A. Do not exceed cable manufacturer's recommendations for maximum pulling tensions and minimum bending radii. Where pulling compound is used, use only UL listed compound compatible with the cable outer jacket and with the raceway involved. contractor shall perform and submit pulling calculation per manufacturers recommendation to as certain that there is no overstrain to the cable. The calculation shall be submitted to the ENGINEER for approval."

B. Tighten all screws and terminal bolts using torque type wrenches and/or drivers to tighten to the inch-pound requirements of the NEC and UL.

C. Single conductors and cables in maintenance holes, handholes, vaults, cable trays, and other indicated locations shall be wrapped together by arc and fireproofing tapes, and shall be bundled throughout their exposed length with nylon, self-locking, releasable, cable ties placed at intervals not exceeding 12 inches on centers.

D. Wires and cables in each voltage classification shall be installed in separate raceways and shall be completely isolated at the cable and wire terminations.

E. No vehicles shall be used to pull conductors.

F. A means of monitoring cable tension shall be provided at all pulls. (I.e. dynamometer)

3.2 CONDUCTOR 600 VOLTS AND BELOW

A. Provide conductor sizes indicated on Drawings.

B. Wire nuts may be used on solid conductors of 120-volt and 277-volt lighting and 120-volt receptacle circuits only. Place no more than one conductor in any single-barrel pressure connection. Use crimp connectors with tools by same manufacturer and/or UL listed for connectors of all stranded conductors.

C. Soldered mechanical joints insulated with tape will not be acceptable.

D. Vinyl plastic insulating tape for wire and cable splices and terminations shall be flame retardant, 7-mil thick minimum, rated for 90 degrees C minimum meeting the requirements of UL 510.

E. Provide terminals and connectors acceptable for the type of material used.

F. Arrange wiring in cabinets, panels, and motor control centers neatly cut to proper length, remove surplus wire, and bridle and secure in an acceptable manner. Identify all circuits entering motor control centers or other control cabinets in accordance with the conductor identification system specified.

G. Terminate control and instrumentation wiring with methods consistent with terminals provided, and in accordance with terminal manufacturer's instructions. Where terminals provided will accept such lugs, terminate all control and instrumentation wiring (except solid thermocouple leads) with insulated, locking-fork compression lugs, Thomas & Betts Sta-Kon, or equal.

H. For terminals designed to accept only bare wire compression terminations, use only stranded wire, and terminate only one wire per terminal. Tighten all terminal screws with torque screwdriver to recommended torque values.

I. Attach compression lugs with a tool specifically designed for that purpose which provides a complete, controlled crimp where the tool will not release until the crimp is complete. Use of plier type crimpers is not acceptable.

J. Cap spare conductors and conductors not terminated with UL listed end caps.

K. Where conductors pass through holes or over edges in sheet metal, remove all burrs, chamfer all edges, and install bushings and protective strips of insulating material to protect the conductors.

L. For conductors that will be connected by others, provide at least 6 feet spare conductor in freestanding panels and at least 2 feet spare in other assemblies. Provide more spare conductor in any particular assembly where it is obvious that more conductor will be needed to reach the termination point.

M. CONTRACTOR shall provide cable pulling tension calculations for review and approval before pulling cables sized 4/0 and larger.

3.3 CABLES

A. Do not splice without permission of the ENGINEER or the INSPECTOR. Locate splices, when permitted, only in readily accessible cabinets or junction boxes using terminal strips. Splices will not be permitted unless deemed necessary by approved pulling tension calculations.

B. Where connections of cables installed under this section are to be made under Division Instrumentation and Controls, leave pigtails of adequate length for neat bundled type connections.

C. Instrumentation, computer, and control cables run under infinite access floors in control rooms may be installed under the floor without protection. Run individual wires, pairs, or triads in flex conduit under the floor or grouped into bundles at least ½ inch in diameter.

D. Maintaining the integrity of shielding of instrumentation cables is essential to the operation of the control systems. Take special care in cable installation to ensure that grounds do not occur because of damage to the jacket over the shield.

E. Cables entering maintenance holes, handholes or vaults shall be sealed using an expanding foam product approved for the purpose.

3.4 CONDUCTOR ARC AND FIREPROOFING TAPES

A. Use arc and fireproofing tapes on all 600-volt single conductors and cables except those rated Type TC at splices in all maintenance holes, handholes, vaults, cable trays, and other indicated locations.

B. Wrap together as a single cable all conductors entering from each conduit.

C. Follow tape manufacturer's installation instructions. Secure the arc and fireproofing tape at frequent intervals with bands of the specified glass cloth electrical tape. Make each band of at least two wraps of tape directly over each other.

D. Wrap together as far as possible, conductors carrying phases A, B, and C of the same feeder. Do not wrap together conductors carrying only two of the three phases.

E. The cables shall be trained as closely as possible to their final positions.

F. The cables shall be cleaned of all oil, grease, and cable pulling compounds using suitable solvents and cleaners non-injurious to cable and then wiped completely dry.

G. Any projecting surfaces such as fittings, ground connectors or bonding connections shall be covered with an insulating compound to present a smooth continuous surface for taping.

H. Fireproofing tapes shall be submitted as shop drawings for approval. Tapes shall be 3-inch width half-lapped and extend a minimum of 6-inches into the raceway. Use ¾" glass tape at three foot intervals to hold tape in place.

3.5 UNDERGROUND DIRECT BURIAL CABLE

A. Comply with requirements for Installation of Underground Direct Burial Raceways in Section 16110, "Raceway", including warning tapes above the cables. Such cable shall not be used in permanent installations.

3.6 FIELD TESTS

A. Field test shall be performed on conductors in accordance with Section 16030 Electrical Tests.

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SECTION 16123
MULTIMODE FIBER OPTIC
DATA COMMUNICATION SYSTEM

PART 1--GENERAL

1.01 SCOPE

A. This section specifies requirements for indoor/outdoor rated multi-mode fiber optic data communication cables including installation, terminations, termination cabinets, testing, and accessories.

B. Provide tools, supplies, materials, equipment, test equipment and the labor for the raceways system, cable installation, and testing of a complete and operable fiber optic cabling system as specified herein on the Cable Specification Sheets.

C. Provide fiber optic cable with each fiber usable and tested as specified herein.

D. Provide the fiber optic cable splices and appurtenances required to complete the fiber optic cabling system. Appurtenances are specified herein.

E. Refer to the drawings and drawing notes for specific requirement for the project, since not all specified products, methods, and procedures are applicable to the project.

1.02 QUALITY ASSURANCE

A. Manufacturer: Equipment and cabling shall be the product of firms regularly engaged in the design and manufacturer of equipment and cables for a minimum of five years. Manufacturer shall have minimum of seven years experience and shall be ISO 9001 certified.

B. Installer: Installation, termination, and testing of equipment and cabling provided under this section shall be performed by qualified, skilled technicians regularly engaged in fiber optic cabling system work of similar complexity and who possess the licenses or certificates required to perform such work.

C. References:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are

given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ANSI/ICEA S-87-640	Standard for Optic Fiber Outside Plant Communications Cable
BELLCORE GR-20-CORE	Generic Requirements for Optical Fiber and Optical Fiber Cables
BELLCORE GR-409-CORE	Generic Requirements for Intrabuilding Fiber Cable
BELLCORE GR-487-CORE	Generic Requirements for Electronic Equipment Cabinets
BELLCORE GR-771-CORE	Generic Requirements for Fiber Optic Splice Closures
ISO-9001	Quality Management Systems
NFPA 70	National Electric Code (NEC)
TIA/EIA-455-86	FOTP-86 Fiber Optic Cable Jacket Shrinkage
TIA/EIA-455-107A	FOTP-107 Determination of Component Reflectance or Link/System Return Loss Using a Loss Test Set
TIA/EIA-492AAAC	Detail Specification for 850 nm Laser-Optimized, 50μm Core Diameter/125 μm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers
TIA/EIA-598-B	Standard for Optical Fiber Cable Color Coding

3. The fiber optic cable shall meet the requirements of the referenced ANSI, BELLCORE, ICEA, ITU, TIA, and EIA standards for data communications cable.

D. Factory Test: Manufacturer's factory testing shall be conducted for all fiber optic cable reels provided for this Contract. Test documentation shall include the following:

1. Optical Time Domain Reflectometer (OTDR) measurement of the fiber length.

2. OTDR measurement of average attenuation.

3. Traces of OTDR measurements taken.

4. Visual Tracer for short distance cable fault detection.

1.03 SUBMITTALS

A. The following information shall be submitted for review in accordance with Section 01300:

1. Product Literature:

a. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.

b. A check mark shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

c. A copy of the contract document, fiber-optic network system block diagrams, cabinet and panel drawings, control single-line diagrams, and process and instrumentation diagrams that apply to the equipment in this section marked to show specific changes necessary for the supplied equipment.

d. If no changes are required, the drawings shall be marked "*No Changes Required."* Manufacturer's specifications, data sheets, and catalog literature for the indoor/outdoor rated fiber optic cable that clearly and unambiguously shows that the cable meets all the requirements specified herein.

e. Manufacturer's catalog literature and catalog data sheets for the following items, marked to indicate products proposed, as applicable to the project:

   (1) Fiber optic cables including manufacturers' maximum recommended pulling tension.

   (2) Fiber optic cable termination connectors

   (3) Fiber optic patch cords

   (4) Fiber optic termination panels

   (5) Fiber optic adapter plug-in

   (6) Fiber optic patch cord storage

   (7) Fiber optic cable clamp kit

   (8) Connector/Adapter cleaning kit

   (9) Protective tubing for fiber optic patch cords

   (10) Cable pulling grips, swivel, and lubricant

f. Shop drawings:

   (1) Termination panel fabrication and layout drawings with complete list of materials and nameplate engraving list.

   (2) Interconnection cable diagrams for the complete system, showing each fiber in each cable. Each termination point shall be clearly marked.

2. Qualifications:

   a. Contractor's experience and resumes for the personnel installing and testing the fiber optic system including factory training certifications.

   b. Information on five successfully performed cable installations of comparable size and complexity with name, address, and telephone number of facility owner, name of project and completion date, and type of conduit system and length of cable pulled.

3. Fiber cable pulling plan as specified in Part 3.

4. Test plan as specified in Part 3.

5. Submit cable samples for review that include the specified cable marking.

PART 2--PRODUCTS

2.01 GENERAL

A. Provide fiber optic cable jacket free of holes, splits, and blisters with no metal elements and of a consistent thickness.

B. Mark the exterior sheathing with the manufacturer's name, month and year of manufacture, and sequential meter or foot markings for easily determining the length of the cable at all points along the cable run,

C. Provide a telecommunication handset symbol as required by Section 350G of the National Electrical Safety Code® (NESC®), fiber count, and fiber type.

2.02 CONDUIT

A. Where shown, provide 2-inch diameter PVC Schedule 40 conduit

2.03 PULL BOXES

A. Unless otherwise shown, provide pull boxes with the approximate dimensions of 24 inches wide by 24 inches long, by 36” deep with hollow bottoms, designed for H-20 traffic loading.

B. Pull box covers shall be galvanized steel with the words "FIBER OPTICS" in raised letters on the upper surface. Covers shall have locking devices and form a watertight seal to prevent surface water from entering. Knockouts in the sidewalls shall permit underground conduit side entry and exit.

C. Pull boxes shall by George Ingraham, Vikamatic, or equal.

2.04 CONDUIT SEALANT

A. Conduit sealant shall be Semco duct sealing compound, or equal.

2.05 IDENTIFICATION TAPE

A. Where shown, provide a 6-inch wide magnetically detectable warning tape with red protective polyethylene jacket installed above the conduit along the entire length of the conduit route. Provide polyethylene tape continuously imprinted "CAUTION-FIBER OPTIC CABLE".

B. Warning tape shall be Teletrace by George Ingraham, Vikamatic, or equal.

2.06 TRACER WIRE

A. Where shown, provide a #12 AWG XHHW insulated black stranded copper wire installed in the trench with fiber optic cable conduit with a multi-pin terminal block for termination of the tracer wire in concrete manhole / pullbox for tracer wire access.

2.07 PULL ROPE

A. Where shown, provide a low friction, polyethylene jacketed, polypropylene rope with 1,800 psi of tensile strength.

B. Pull rope shall be Vikamatic "Fiber Glide" or equal.

2.08 SLACK

A. Provide sufficient tube slack at each handhole for thermal contraction.

2.09 DUCT PLUGS

A. Provide duct plugs to seal the ducts and to seal empty or spare conduit at the entrance of each pullbox/concrete manhole/vault.

B. Duct Plugs shall be Jackmoon or equal.

2.10 CABLE IDENTIFICATION TAGS

A. Provide and install fiber cable identification tags in each access vault, pullbox, and/or vault: “FROM _____ PUMP STATION”.

B. Cable identification tags shall be manufactured by Brady or Thomas & Betts, or equal.

2.11 FIBER OPTIC BUFFERED CABLE CONNECTORS AND PATCH CORDS

A. General:

1. Provide preparation for the connections including polishing, connectors, hardware, cleaving tool, continuity tester, visual fault locator, and supplies for installation of connectors. Multimode terminations shall be ST type. Fusion-spliced pigtails are not acceptable.

2. Fiber optic cable connections shall be Unicam-type with ceramic ferrules, polycarbonate not acceptable.

B. Connector Characteristics: Connectors shall be specifically designed for fiber optic buffered cables specified herein.

C. Patch Cord Characteristics: Patch cords shall be 3.0 mm single coated duplex fiber with jacket and connectors on both ends. Attenuation shall be a maximum of 0.3 dB. Provide length required for connection from patch panel to equipment.

2.12 FIBER OPTIC PANELS

A. General: Fiber optic patch panels shall consist of a system of components for routing, supporting, and terminating the fiber optic cables specified herein.

B. Description:

1. Provide RETMA rail-mounted type fiber optic patch panels constructed of aluminum or steel with hinged metal doors. Unit shall be configured so all connections are front-accessible, enclosure does not permit rear access.

2. Provide mounting hardware, cable clamps and grommets, cable routers, storage decks, connector racks, and items for a complete system.

3. Provide with a machine printed port labeling system.

4. Provide cable routers and storage decks to retain cables' minimum bending radius.

5. Provide sufficient quantity of ports to terminate the number of fiber strands specified and blank covers for unused port spaces.

6. Provide one port for each fiber in accordance with the specified cable type.

2.13 PRODUCT DATA

A. The following information and product data specified shall be provided in accordance with Section 01300:

1. Factory test results as specified in paragraph 1.02.
2. Cable pull records as specified in Part 3.
3. Pre-installation test results as specified in Part 3.
4. Post-installation test results as specified in Part 3.
5. Verification and a punch-list as specified in Part 3.

PART 3--EXECUTION

3.01 RACEWAY SYSTEM

A. Conduit Installation:

1. Conduit bends shall have a radius of 24 times the conduit diameter. Conduit sections shall be joined in accordance with the manufacturers' recommendations and shall be watertight.

2. Conduits entering pull boxes shall be capped or sealed watertight. Conduits entering access concrete manholes and vaults shall be terminated with flush end bells. Provide bushings on ends of conduits entering pull boxes.

3. Annular spaces around the conduit and precast unit walls shall be grouted. Bedding and backfill shall be as specified for the pipeline trench.

4. Concrete encasement shall be red concrete in accordance with Section 03300 placed at least 4 inches thick below and above the conduit.

5. Tracer wire shall be installed at pullbox with ten feet of tracer wire coiled and secured as specified herein.

B. Pull Box Installation:

1. Pull boxes shall be installed on a compacted level foundation consisting of 4 inches of granular material. Backfilling around pull boxes shall not be done until mortar sealant has thoroughly set.

2. Install the pull box covers with the top of the cover flush with the finished grade. Install pull boxes in soil areas with top of the cover 3 inches above the final grade level of the restored surface to prevent accumulation of dirt, silt and debris on the top of the cover. Perform conduit integrity tests for each section between the pull boxes after backfilling and compaction using the test and procedures described in this Section, prior to installation of the pull rope.

3. Pull boxes shall be free of debris and water, ready for cable installation upon final acceptance of the conduit system. Pull box conduit entries shall be sealed with grout to prevent the intrusion of water and debris into the pull boxes. Use red urethane: Greybar catalog #02044 or equal.

C. Conduit System Cleaning and Testing:

1. Conduits shall be cleaned of loose material by brush and compressed air following the backfill placement and compaction. Provide a test mandrel approximately 3/8 inch smaller than the inside diameter to be passed through conduits to detect alignment and deformation problems. Remove and replace conduit that fails the mandrel test. The replacement conduit shall then be cleaned and tested as described herein.

2. Cleaning and testing of the conduit shall be witnessed by the Inspector for conduit sections between adjacent pull boxes or manholes for the entire conduit route. Provide 5-day advance notice of the schedule and test location to the Inspector.

3.02 FIBER OPTIC CABLE INSTALLATION

A. Fiber Optic Cable Installation Pulling Plan:

1. Submit 30 days prior to cable installation.

2. Air assisted cable placement method using high speed air blowing, push-pull, cable jetting plan with the procedure, the equipment setup, and a work plan.

3. Work plan shall include the following:

a. Pull tension calculations.

b. Indicate additional pull boxes required, including station number and a written description of the location.

c. Detailed description of pull operation methods for raceways.

d. Tools and equipment for cable installation and testing

e. Physical location of equipment setup and type

f. Safety Plan and cable pulling operations

g. Detailed schedule for pulling and testing cables

B. Fiber Optic Cable Installation:

1. The installation of the fiber optic cable shall be performed and supervised by workers each possessing a minimum of three years experience in the installation, termination, and testing of fiber optic cable systems of the type specified herein. Installation shall be in accordance with cable manufacturer's recommendations. Prior to installation, perform delivery testing on fiber optic cables.

2. Notify the Inspector 5-days prior to fiber optic cable pull. Installation equipment and methods shall be reviewed and approved prior to installation.

3. Provide woven grips to pull the cable with minimum length of 18 inches and applied to the cable in conformance to the cable manufacturer's standard recommendations. Provide swivels between the pulling line and cable pulling grip to prevent twisting under strain. Provide shear or tension pins with a breaking strength of 600 pounds. Install cable using a hydraulic capstan or winch equipped with a recording dynamometer to measure the pulling tension to maintain a constant pulling force.

4. Pulling equipment shall be equipped with a hydraulic bypass set for 600 pounds pulling force. The dynamometer shall be connected and operational before pulling operation. Provide bull wheels, blocks, split wheels, cable feeders, and equipment for clean and safe operation.

5. Cable reel shall be positioned at the feed point in alignment with the raceway so the cable passes from the top of the reel in a long, smooth bend into the raceway system using a cable feeder.

6. Place a rim roller with a wheel radius greater than the minimum cable bending radius at the manhole or vault opening to prevent the cable from dragging on the manhole rim or steps.

7. Cable pull records shall be documented by a graph which is annotated with the following information:

    a. Reel number.
    b. Station or pullbox from and station or pullbox to.
    c. Date and time.
    d. Explanations for abnormalities in readings or interruptions.
    e. Sign-off by Contractor and Inspector.
    f. Submit fiber optic pull records as specified herein.

8. Racking shall conform to the following:

    a. Loosely secure innerduct/cables in racked position with Ty-Raps or equal.

    b. Attach imprinted plastic coated cloth identification/warning tags to the innerduct/cable in at least two locations in each pullbox/concrete manhole/vault.

    c. Provide tags manufactured by Brady or Thomas & Betts.

9. Protect coiled cable to prevent damage to the cable and fibers with racking securing cables to brackets and racking hardware that extend from the sidewalls of the handhole. When cables are securely racked, unused conduits and void areas around conduit containing cables shall be sealed. In concrete manholes and vaults, coiled cable shall be placed into a slack enclosure to prevent damage to the cable and fibers.

10. A minimum of 10 feet fiber optic cable service loop shall be used at each end of termination. Cable ends shall be sealed with temporary caps during installation, up to the time when they are terminated. Each end of the cable shall be clearly labeled.

3.03 FIBER TERMINATIONS

A. Active and spare fiber optic cables fibers shall be terminated with ST type terminations and connectors finished with an automatic polishing machine such as Corning SP500 Automatic Polisher or equal.

3.04 FIELD TESTS

A. General:

1. Perform field tests on each fiber of each cable and tested for breaks, abnormalities, and attenuation characteristics for the attenuation specifications specified herein.

2. Inspector shall witness testing and final checkout of the fiber optic system to determine fiber-optic cable system acceptability.

3. Submit the test results in accordance with paragraph 16123-2.13.

B. Test Equipment:

1. Test equipment shall have a calibration sticker indicating the equipment has been calibrated within the preceding 6 months and the other requirements in accordance with Section 01453.

2. Equipment for testing of the fiber optic cable; testing equipment shall be supplied and will remain the property of the Contractor unless otherwise specified:

a. Fiber Optic Test Set: Siecor Multimode MD55, LTK-400MD, or equal.

b. Optical Time Domain Reflector (OTDR): GNNettest Mini-OTDR Model 7500, Corning Siecor OTDR Plus 838-MD55-SRSD55 with plug-in module for multi-mode cable, or equal.

c. Fiber Optic Telephone Set: Siecor FTS-110, or equal.

d. Jumpers, connectors, adapters, 1-km backscatter suppression kit, attenuators, and miscellaneous items.

C. Pre-Installation Test:

1. After delivery and before cable installation, generate an end-to-end OTDR trace for each multimode fiber at 850 Nm wavelengths using the index of refraction for that fiber.

2. Use a 1-kilometer backscatter suppression fiber with a splice index-matching gel and submit traces that for the total optical length.

3. Submit test documentation within 5 days after the delivery test.

4. Replace cables that do not meet the performance levels of the manufacturer's factory tests at no additional cost or change in the completion schedule.

D. Post-Installation Tests:

1. Fibers shall be tested end-to-end after cable installation with an end-to-end OTDR trace made at 850 Nm wavelengths and record total optical length.

2. Use a 1-kilometer backscatter suppression fiber for OTDR testing.

3. For each 850 nm installed multimode optical fiber, the measured optical power loss in dB shall not exceed the following:

a. Measured loss less than: (0.0030)L + (0.30)N + (0.4)C + 3.00 dB

4. Fiber optic cables containing fibers not meeting the specified power loss shall be repaired or replaced.

E. End-To-End Attenuation Verification:

1. Test each optical fiber for end-to-end attenuation after the cable is installed with a stabilized optical source and power meter.

2. Test conducted per EIA Fiber Optic Test Procedure (FOTP) No. 171 Method "B."

3. Measured loss: Value of the reference measurement minus the algebraic average of the separate measurements.

4. Fiber optic cables containing fibers not meeting the specified optical power loss shall be repaired or replaced.

F. Site Acceptance Inspection:

1. Perform the inspection and establish a punch-list of the following:

a. Fiber splices: neatly organized.
b. Connectors: capped and undamaged.
c. Cabling: organized with no excessive bending.
d. Cable entrances to the cabinets secured.
e. Unused cable delivered to the Owner.

2. Identify cables with the directories installed in each fiber cabinet. Discrepancies found during the inspection of the fiber installation shall be listed and submitted on a punch-list. Inform the Inspector upon resolution and completion of the punch-list items.

3.05 CABLE SPECIFICATION SHEETS (CABLESPEC)

A. General:

1. Cable types for different locations, service conditions, and raceway systems are specified on individual cable specification sheets. Cables that are scheduled herein shall be installed in accordance with the CABLESPEC SHEETS.

2. Multi-mode fiber optic cables shall meet the requirements of the referenced ANSI, ICEA, ITU, TIA, and EIA standards for outside plant data communications cable.

B. Cablespec Sheets: The following CABLESPEC sheets are included in this section:

Type	Volt	Product	Purpose
FOC-MM	300	FIBER OPTIC CABLE INDOOR/OUTDOOR	DATA COMMUNICATION

3.07 CABLE SPECIFICATION SHEET--CABLESPEC

Cable System Identification:	FOC-MM
Description:	Multimode Fiber Optic Data Cable; **12-pair** fiber conductor Outdoor; Heavy Duty-MFPT; Cable Tray Rated. Loose tube construction. Optical fibers shall not adhere to the inside of the buffer tube. Fibers and buffer tubes shall be color coded with distinct and recognizable colors in accordance with EIA/TIA-598-B.
Material:	62.5/125/250 micron.
Jacket:	Chlorinated Polyethylene (CPE) Color: Orange
Type:	OFNR with industrial cable tray rating and IEEE flame test rated: 802.3Z Fiber Type: Multimode Clad Diameter: 125 ± 2.0 µm Coating Diameter: 245 ± 5 µm Core Diameter: 62.5 ± 2.5 µm Attenuation: ≤ 3.5 db/km @ 850 nm ≤ 1.0 db/km @ 1300 nm Maximum Bandwidth: 200 MHz-km @ 850 Nm Operating Temperature Range: -40 to +70 Deg C Maximum Tensile Loading: 180 lbf Minimum Cable Bending Radius: 10 x diameter
Manufacturers:	Alcoa Fujikura Optical Cable Corporation Corning Cable Systems or approved equal
Execution:	
Application:	Data Communications.
Installation:	Install in accordance with manufacturers instructions and as specified.
Testing:	Test as specified.

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SECTION 16140
WIRING DEVICES

PART 1 - GENERAL

1.1 SCOPE

A. Required: Provide and install wiring devices as indicated on the Contract Drawing and herein specified.

B. Comply with the General Conditions, General Requirements and Section 16010 of this Division 16 concerning definitions, guarantees, submittals, as-builts, clean-up, etc. as applicable to work of this Section.

1.2 SUBMITTALS

A. Required Shop Drawings for the Following:

1. Time switches

2. Occupancy sensors

3. Surface metal raceways with devices

4. Special outlet boxes

PART 2 - PRODUCTS

2.1 GENERAL

A. All wiring devices shall be specification grade, UL listed and labeled, conform to NEMA standards and meet the requirements of Federal specifications.

2.2 BOXES

A. Types:

1. Provide galvanized steel knockout type outlet boxes with suitable plaster rings of similar material, for interior concealed wiring in dry, non-hazardous (classified) locations.

2. Provide case metal boxes for floor outlets, and where installed in walls direct contact with the earth. Floor outlet boxes shall be Steel City Series 600, 640, 840, with P-60 or P-64 plates or equal, as required.

3. Provide weatherproof cast metal outlet boxes for surface wiring, or in wet or damp locations, or where indicated on the Drawings, unless otherwise directed by the City Engineer. Boxes shall be Crouse-Hinds FS, FD, GRF, GS, or VXF series.

4. Provide sheet steel type with screw cover for pull and junction boxes over 100 cubic inches, in dry non-hazardous (classified) locations.

B. Sizes: In accordance with Code for the number and size of conductors, but not less than indicated on the drawings nor less than 4 inch square trade size, except for cast metal type, or multigang masonry type embedded in concrete or masonry walls.

C. Accessories:

1. Plaster rings, fixture studs, covers, plates, dividers, etc., as required.

2. Weatherproof covers, plates, and other accessories in wet or damp locations. See Section 16140.

3. Service Fittings: Pedestal type power fittings for floor boxes shall be equal to Steel City Cat. No. SFH-40-RG; telephone and intercommunication fittings shall be Steel City Cat. No. SFL-30 where amphenol connectors are to be installed or Steel City Cat. No. SFL-10 where such connectors are not to be installed unless otherwise specified.

2.3 SWITCHES

A. All switches shall be specification grade and meet Federal Spec. W-S-896E.

B. Provide screw type; push-in type connections not acceptable.

C. Switches shall be self-grounding, color coded, silent or quiet type, and rated 120-277 Volts AC, 20 ampere rating, totally enclosed, where installed in AC systems Bakelite or composition base with "T" rating for AC loads, standard toggle handle, side wired only and binding screw terminals with screwdriver slot.

D. Where pilot lights are specified for switches, they shall be the neon type 1/25 W. mounted under the same plate as the switch. Lighted toggles are not acceptable.

E. Momentary contact switches shall be a three position toggle, 20 Ampere rating at 120 Volts AC.

F. Single pole switches shall be equal to Bryant 1121-I; two pole switches Bryant 1122-I; three way switches Bryant 1123-I; four way switches Bryant 1124-I.

G. Approved manufacturers are Bryant, Hubbel, Leviton, Pass & Seymour, and General Electric.

2.4 PLATES AND COVERS

A. Required: For all switches, receptacles, junction boxes, telephone and other outlets.

B. Finishes of Plates and Devices:

Location	Plate	Device
General interior finished areas	White	White
Interior finished areas over wood panels	Black	Black
On exterior with spring loaded cover	Corrosion resistant	Brown
In equipment rooms or other generally unfinished areas	Galvanized	Brown

C. Provide the Following: Unless otherwise directed by the City Engineer, provide telephone, TV, and communication outlet plates with a bushed hole.

D. Provide engraved or etched plates for all lock switches, pilot switches, switches from which the equipment or circuit controlled cannot be readily seen, three or more switches under a common plate and for switches as indicated.

E. Stainless steel plates, type 302 non-magnetic with beveled edges, 0.040" thick with satin finish. Leviton 84000-40 series or approved equal.

F. Galvanized steel plates shall be square or rectangular and hot dipped galvanized or sherardized beveled edges and 0.040" thick.

G. Provide weatherproof receptacles with spring-loaded, corrosion resistant covers with gasket for mounting on outdoor type or flush wall boxes. Leviton 6196-V or approved equal.

H. Provide plates equipped with close fitting openings for the exact device to be used. Provide plates for telephone outlets equipped with bushed openings. Synthetic plates shall be smooth finish as manufactured by Pass & Seymour, Sierra, Leviton, or approved equal.

I. Provide brass covers for data and communications floor outlets with 2-1/8 x 1 inch combination threaded opening.

J. Engraved plates and covers for equipment and controls, motors, for switches out of sight of the equipment controlled, for receptacles rated other than 125 volts, and for ganged switches (except no more than two switches controlling lights in the same room). Engraving shall provide positive identification acceptable to the Architect or the City Engineer.

2.5 RECEPTACLES

A. Types:

1. All receptacles shall be specification grade and meet Federal Spec. WC 596 E.

2. Provide screw terminal type receptacles. Push-in type connections are not acceptable.

3. Straight blade 125 volt, 15 and 20 ampere duplex type shall be equal to Bryant 5262-I or 5263-I; single type shall be Bryant 5661-I or 5461-I.

4. Straight blade 250 volt, 15 and 20 ampere duplex type shall be equal to Bryant 5662-I or 5462-I; single type shall be Bryant 5661-I or 5461-I.

5. Combination duplex receptacles, straight blade 125/250 volt, 15 and 20 amperes, shall be equal to Bryant 5292-I or 5492-I.

6. Special outlets of other types shall be as indicated on the Contract Drawings.

2.6 CONTROLS

A. Required: For all equipment furnished in this and other divisions, as required by Code, and as indicated on the Contract Drawings and in the specifications. All devices shall be listed by U.L. or another approved testing laboratory.

B. Types:

1. Circuit Breakers: Thermal-magnetic with interrupting and trip ratings as indicated on the drawings. Equip each breaker with a device for individual padlocking. Circuit breakers shall meet Federal Specifications W-C-375B.

2. Enclosed Safety Switches: Shall be externally operable, heavy duty "tease-proof", fusible and nonfusible with number of poles and ratings as indicated on the Contract Drawings. Provide suitable rejection type fuseholders for Class R fuses. Switches shall meet Federal Spec. W-S-865C. Switches shall be as manufactured by Square D Co. or equal.

3. Fuses: All fuses shall meet U.L. Standard 198. Provide a label within each fuse enclosure indicating fuse replacement type and ratings. Provide one complete set of each type and rating of fuses and limiters, as spares. Fuses shall be one of the following types:

   a. Current-limiting Class L; Bussman KRP-C or KTU.

   b. Current-limiting Class J; Bussman JKS or JHC.

   c. Dual element Class RK-1; Bussman KTS-R or KTN-R.

   d. Dual element Class RK-5; Bussman FRS-R or FRN-R.

   e. Low Peak dual element Class RK-5; Bussman LPS-R or LPN-R.

   f. For secondary protection of control transformers rated 500 V.A. and 50 volts, or less; Bussman FNQ fuses with HPS-D or HPL-B fuseholder or equal.

   g. Fuses for direct-current circuits shall be identified for the use.

   h. Other required fuses, if not specified, shall be standard nonrenewable type; Bussman FRN or FRS for circuits where available fault current is 10,000 amperes or less.

4. Terminal connection blocks shall be provided in switch and circuit breaker enclosures in which grounded (neutral) conductors are installed.

5. Magnetic Motor Starters: Shall be across-the-line start type with overload and low voltage protection; Square D. Co. Class 8536. Combination starters shall be fusible or nonfusible disconnect switch type; Square D. Co. Class 8538, or motor circuit protector type (instantaneous trip only); Square D. Co. Class 8539. Reversing starters shall be Square D. Co. Class 8736 or 8739 or equal. Ratings shall be as indicated on the Drawings. Equip each circuit breaker with a device for individual padlocking.

6. Manual Motor Starters: Pushbutton type with overloads; Square D. Co. Class 2510 Type M. Toggle type with overloads; Square D. Co. Class 2510 Type F. Toggle type without overloads; Square D. Co. Class 2510 Type K or equal. Each device shall have provision for padlocking.

7. General Purpose Contactors: Shall be ASCO 1000 Series or equal with number of poles and ratings as indicated on the drawings. Provide suitable hinged door enclosures.

8. Lighting Contactors: Electrically operated, mechanically held, with coil clearing contacts; ASCO Remote Control (RC) Switches or equal with number of poles and ratings as indicated on the Drawings. Provide suitable hinged door enclosures.

9. Pushbutton and Other Control Devices: Shall be Square D.Co. Class 9001 Type K or equal, in suitable enclosures with legend plates.

10. Pilot Lights: Shall be Square D. Co. Class 9001 Type K, transformer type or equal. Shall have push-to-test feature where installed in switchboards or motor control centers.

11. Control Relays: Shall be Square D. Co. Class 8501 Types D, H, or L. or equal. Install relays in suitable enclosures.

12. Time Switches: Provide types with minimum 8-hour spring driven automatic rewind reserve power. For control of mechanical systems or equipment provide 7 day dial type with features permitting daily control or omission; Paragon 7000 Series. For direct control of lighting circuits provide astronomic dial type with day-omitting device; Paragon 4200 Series. For control of mechanically-held lighting contactors provide astronomic type with day omitting device and momentary contact single pole double-throw switching; Paragon 47216-OSZ or equal. Number of poles and voltages for time switches shall be as indicated on the Drawings.

13. Emergency Control Switches: Shall be ASCO equal to #124 Series break-glass devices for mechanical or data processing rooms or similar applications.

14. Three-Position Selector Switches: Shall be equal to Bryant 4922-I for maintained contact type; Bryant 4921-I for momentary contact type.

15. Manual Timers: Spring-wound timers shall be equal to M.R. Rhoades Inc. "Mark-Time" 125 V. 20 A.

16. Identification: Identify all control and disconnecting devices by engraved laminated plastic nameplates designating the equipment controlled, except where device plates are engraved.

    a. Motors and other equipment shall be suitably and durably identified to correspond to the control or disconnecting device. Nameplate lettering shall be white on black finish and 1/8 inch high minimum.

    b. Marking shall be as indicated on the drawings or as approved by the Architect or the City Engineer. Nameplates shall be affixed with a minimum of two escutcheon pins or screws.

PART THREE - EXECUTION

3.1 GENERAL

A. Each class of device shall be furnished by one manufacturer for the total project. Mixing of devices by different suppliers will not be permitted.

3.2 BOX INSTALLATION

A. Install boxes where indicated on the Contract Drawings and coordinate locations with structural and architectural features for proper installation. Boxes shall be accessible.

B. Install boxes for wall mounted local switches at 4 feet to center above floor or standing surface unless otherwise directed by the Architect or the City Engineer. The maximum height in handicapped areas shall be 40 inches.

C. Install boxes for wall mounted receptacles, signal and communication outlets at 15 inches to center above floor or standing surface except where located above counter tops, or used for clock outlets, or as otherwise indicated on the Drawings or directed by the Architect or the City Engineer.

D. Install boxes for wall mounted fixtures, speakers, cameras, etc., at 7 feet to center above floor or standing surface, or as otherwise indicated on the Contract Drawings or directed by the Architect or the City Engineer.

E. Install boxes for wall mounted thermostats at 5 feet to center above floors or standing surface, or as otherwise indicated on the Contract Drawings or directed by the City Engineer or Architect.

F. Junction and pull boxes shall only be installed where indicated on the Drawings unless otherwise approved by the Architect or the City Engineer.

G. Boxes shall be securely supported. Boxes for flush outlets shall be mounted on bar hangers or brackets with the front edge of the box or plaster ring flush with combustible finish surfaces and not more than 1/4 inch behind non-combustible finish surfaces. Do not use nails for direct support of boxes. Do not use extension boxes (rings) for installation of flush outlets. Flush boxes used for support lighting fixtures or other equipment shall be securely fastened to two structural support members unless embedded in masonry or concrete. Do not use powder-driven fastening devices unless specifically approved by the Architect or the City Engineer.

3.3 RECEPTACLE AND SNAP SWITCH INSTALLATION

A. General:

1. Install receptacles and switches square, level, secure, and connected to a single set of circuit conductors at each outlet. Plaster ears of receptacles and switches installed in flush boxes shall be seated against the finish surface.

2. Install closely adjacent snap switches in a single multi-gang type box, unless otherwise directed by the Architect or City Engineer.

3. Install permanent barriers between switches where the voltage between switches exceed 300 volts.

4. Connect all devices by wrapping conductor around binding screw terminals.

5. Provide GFCI type receptacles in toilet, kitchen counters and for all outdoor locations where required by code.

3.4 OUTLET PLATES AND COVER INSTALLATIONS

A. General:

1. Install square, level and secure. Plates installed at flush outlets shall be seated against the finish.

2. Properly identify plates and covers as required and noted in Subsections 2.05 D and K of this Section as applicable.

3. Provide jumbo size plates for outlets installed in masonry walls.

4. Properly align and plumb all devices and plates. Fit plates flat against walls and tights against surfaces of devices without strain on the plate.

5. Code sized (#12 minimum) bonding jumper shall connect grounded outlet box to receptacle grounding terminal on all flush mounted units.

3.5 MISCELLANEOUS

A. Install switches, convenience, and telephone outlets vertically in all locations unless otherwise indicated.

B. Install convenience and telephone outlets horizontally where noted on Drawings, elevations, mill work, or notations. Locate grounding prong to the left when facing the outlets.

C. Where convenience outlets are mounted vertically, locate ground prong at bottom.

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SECTION 16141
NAMEPLATES AND WARNING SIGNS

PART 1 - GENERAL

1.1 SCOPE

A. Required: Furnish and install nameplates and warning sign where indicated on the Contract Drawings or herein specified.

B. Comply with the General Conditions, General Requirements and Section 16010 of this Division 16 concerning definitions, guarantees, submittals, as-builts, clean-up, etc. as applicable to work of this Section.

C. Work includes but is not necessarily limited to the following:

1. Nameplates and warning signs permanently installed on all electrical equipment and devices including, but not limited to, the following items:

2. Enclosures for transformers, switchboards, motor control, panels, pullboxes, cabinets and motors.

3. Enclosures for all separately enclosed devices including, but not limited to, disconnect switches, circuit breakers, contactors, time switches control stations and relays, fire alarm panels and lighting control panel.

4. Wall switches not within sight of outlet controlled.

5. Special systems such as, but not limited to, telephone, fire alarm, warning and signal systems. Identification shall be at each equipment rack, terminal cabinet, control panel, annunciator and pullbox.

6. Devices mounted within and part of equipment including circuit breakers, switches, control devices, control transformers, relays, indication devices and instruments.

PART 2 - PRODUCTS

2.1 NAMEPLATE DESIGNATIONS SHALL CLEARLY STATE

A. Manufacturer's nameplate including equipment design rating of current, voltage, KVA, HP, bus bracing rating or as applicable.

B. Equipment nameplates designating system usage and purpose, system nominal voltage, equipment rating in KVA, amperes, HP and RPM as applicable. Designation data per drawings are to be supplied with Shop Drawings approval.

C. Panelboard nameplates showing panel designation, voltage, phase and source.

2.2 MANUFACTURERS DEVICE NAMEPLATES

A. Device usage, purpose, or circuit number; manufacturer and electrical characteristic ratings including the following:

1. Circuit Breakers: Voltage, continuous current, maximum interrupting current and trip current.

2. Switches: Voltage, continuous current, horsepower or maximum current switching. If fused, include nameplate stating "Fuses must be replaced with current limiting type of identical characteristics".

3. Contactors: Voltage, continuous current, horsepower or interrupting current, and whether "mechanically held" or "electrically held".

4. Motors: Rated voltage, full load amperes, frequency, phases, speed, horsepower, code letter rating, time rating, type of winding, class and temperature.

5. Controllers: Voltage, current, horsepower and trip setting of motor running overcurrent protection.

2.3 MATERIALS

A. For Nameplates: Three layer laminated plastic or micarta with engraved white letters over black background.

B. For Emergency Equipment: Use engraved white letters over red background.

C. For Warning Signs: Minimum 18 gauge steel with red lettering on white porcelain enamel finish.

PART 3 - EXECUTION

3.1 MOUNTING

A. Nameplates shall be mounted by self-tapping, threaded screws and bolts, or by rivets. Adhesive types are not acceptable.

3.2 MINIMUM LETTER HEIGHTS ON NAMEPLATES (AS APPLICABLE)

A. Panelboards, Switchboards and Motor Control Centers and Special Systems Enclosures: 1/4 inch identify equipment designation; 1/8 inch identify voltage rating and source.

B. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 3/16 inch identify circuit and load served, including location.

C. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 3/16 inch identify load served.

D. Transformers: 3/16 inch identify equipment designation; 1/8 inch identify primary and secondary voltages, primary source and secondary load. Include location of primary source or secondary load if remote from transformer.

3.3 WARNING SIGNS

A. Warning signs shall be permanently mounted with cadmium plated steel screws or nickel-plated brass bolts.

B. Warning signs to read "DANGER - HIGH VOLTAGE", with letters 1-1/2 inch high, 3/16 inch stroke minimum.

C. Provide warning sign on all doors or immediately next to door for equipment rooms or closets containing equipment energized above 150 volts to ground.

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SECTION 16400
ELECTRICAL SERVICE AND DISTRIBUTION

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install all electrical service sections, distribution switchboards, motor control centers, special control panels and switchboards, control and terminal cabinets, control devices, circuit breakers, and all appurtenant work, complete and operable, all in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 02200 Earthwork.
2. Section 03300 Cast-in Place Concrete.
3. Section 16010 Electrical General Provisions.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of these specifications, all work specified herein shall conform to or exceed the applicable requirements of the National Electric Code (NEC), provided, that where a local code or ordinance is in conflict with the NEC, the provisions of said local code or ordinance shall take precedence.

B. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of he following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

1. Codes:

LAEC	City of Los Angeles Electrical Code, latest adopted edition.

2. Commercial Standards:

ANSI/IEEE C37.20	Switchgear Assemblies, including Metal-Enclosed Bus.
ANSI/NEMA ICS-2	Devices, Controllers, and Assemblies for Industrial Control.
ANSI/UL 1008	Automatic Transfer Switches, Safety Standard for.
IEEE	Institute of Electrical and Electronic Engineers
NEMA	National Electrical Manufacturers Association

NFPA	National Fire Protection Association
UL	Underwriters' Laboratories, Inc.

1.4 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall submit shop drawings of all Service and Distribution components in accordance with the requirements of Section 16010 Electrical General Provisions.

B. The Service Section and the revenue metering compartment shall comply with all utility requirements. After review of shop drawings of the Service Section by the ENGINEER, they shall also be submitted to the utility company for approval prior to fabrication.

1.5 QUALITY ASSURANCE

A. Quality assurance shall be in accordance with the requirements of Section 16010 Electrical General Provisions.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Materials: All equipment and materials furnished under this specification shall be new, unused and free of defects, and shall be in accordance with the specifications of the Institute of Electrical and Electronic Engineers, National Electrical Manufacturer's Association, National Fire Protection Association, and the National Electrical Code.

B. Equipment: All equipment for the same purpose shall be of the same manufacturer and make.

C. Enclosure Requirements: All outdoor equipment, fixtures, and wiring devices shall be of approved, weatherproof, corrosion-resistant, stainless steel 316 construction.

D. Standard Products: Materials and equipment submitted for approval shall be the cataloged products of companies regularly engaged in the manufacture of such items, shall be the latest standard design that conforms to the specification requirements, and where applicable, shall essentially duplicate material and equipment that have been in satisfactory use for several years.

2.2 MAIN SERVICE SWITCHBOARD

A. General: The main service switchboard shall consist of a free-standing assembly which complies with the Contract Documents.

1. Switchboard shall be totally enclosed, NEMA 1 and shall have ventilating louvers top and bottom. Where full length doors are required, they shall have continuous hinges with lockable handles and 3-point catches. All doors at the same switchgear lineup shall be hinged on the same side. Doors shall have welded corners ground smooth.

2. Bus bar shall be copper fully insulated and shall be silver plated at joints. Bus bars shall be braced for short circuits of **65,000** amperes minimum. A full length copper ground bus bar shall be provided at the bottom of the switchboard enclosure.

B. Outdoor construction shall be as described in the previous paragraph, except that louvers shall have dust filters. Switchboard installation shall be rodent- and bird-proof. Outdoor switchboard construction shall be, NEMA 3R non-walk-in type with sufficient enclosed aisle space provided to allow the outer door to close with circuit breakers in the “test” position. Every other section shall be equipped with a switched overhead lighting fixture. One convenience receptacle shall be provided for the entire enclosure. An insulating compound shall be applied to the interior surface of roof panels for condensation control.

C. Floor-standing main service switchboard shall be cataloged products of the main circuit breaker manufacturer. Floor-standing switchboard shall be shipped fully assembled and tested. If not practicable to ship fully assembled, the units shall be assembled and tested, then broken down for shipping.

D. Switchboard: Switchboard shall be front-accessible. Switchboards shall be constructed to accommodate additional distribution sections. The switchboard shall consist of the sections described in the following paragraphs herein.

1. Service Section: The service section shall consist of an underground pull compartment and a revenue metering compartment all to utility requirements. Ground fault interrupting system initially set to the maximum setting

2. Main Circuit Breaker Compartment: The main circuit breaker compartment's circuit breaker unit shall have the ratings shown on the Drawings. Service neutral shall be brought to a terminal in the main circuit breaker compartment. A disconnecting link shall be provided in a bus bar connection between the neutral terminal and the switchboard ground bus. Main circuit breaker shall be fixed insulated-case power circuit breaker with solid state trip.

3. Distribution Section: The distribution section shall consist of stationary, individually mounted molded case circuit breakers of the size indicated. Full length vertical bus shall be provided for each distribution section. Rating shall be 300-amperes, or more where indicated on the Drawings.

E. NAMEPLATES: In addition to the manufacturer's identification, an external nameplate shall be provided with equipment number and name as shown.

1. Each section compartment shall be provided with nameplates indicating utility meter, main breaker circuit name with equipment number and description of load, pull sections, TVSS, and any additional designations describing the compartment function or usage.

2. Provide machine engraved laminated white phenolic nameplates with black lettering for panel-mounted equipment with the instrument tag number/description in 3/32-inch minimum size lettering and attach to the panel or enclosure with a minimum of two self-tapping 316 stainless steel screws. Provide nameplates for power sources indicating the power loads and nameplates for power loads that indicate the power sources, in accordance with these specifications and the NEC.

F. WIRING: Internal switchboard wiring shall consist of single conductor SIS 90 degree C copper wire and UL listed for panel wiring. The wire shall be sized to suit load requirements. Minimum size shall be No. 14 AWG.

2.3 SWITCHBOARD INSTRUMENTS

A. Indicating instruments shall be approximately 4-1/2-inch square with 250-degree scales and white dials with black graduations. Case shall be semi-flush mounted with anti-glare glass. Front access zero adjustment shall be provided. Indication accuracy shall be within 2 percent.

B. Instrument transformers shall comply with ANSI/IEEE C37.20 and shall have standard accuracy for relaying with the burdens imposed. Mechanical and thermal ratings of current transformers

shall be coordinated with short circuit ratings of related circuit breakers. Potential transformers shall be mounted on a disconnecting rack and shall have primary fuse protection.

C. Protective relays shall be mounted within draw-out cases; current measuring circuits shall be fitted with jacks to short circuit current transformers when relays are withdrawn. Relays shall have means for testing measuring circuitry with the relay in place. Relays shall be solid state type General Electric, Westinghouse or equal.

2.4 Non-Automatic Transfer Switch:

1. Non-Automatic transfer (NT) switch shall be a 3-pole, double-throw, with a definite neutral position; switch shall be rated at 480-volts and shall have the continuous current rating indicated on the Drawings. NT switch shall be able to withstand the short circuit currents indicated or shall have the same withstand rating as the switchboard in which it is installed. The load terminals of the NT switch shall be de-energized when the NT switch is in the neutral position; the duration of the neutral position shall be adjustable from zero to 30 seconds. The NT switch shall comply with requirements of ANSI/UL 1008 and ANSI/NEMA ICS-2. The NT Switch shall be by Cutler-Hammer or equal.

2 The NT switch shall be electrically operable but manual operating mechanism shall be declutched when the electric operator becomes energized. Mechanical and electrical interlocks shall be provided to prevent simultaneous closure of the normal and emergency positions.

3. The transfer switch shall include integrated controls featuring solid state timing and sensing relays. Protective features and indicators shall include:

a. Three-phase, close-differential undervoltage protection on the Normal source; drop-out shall be adjustable from 80-85 percent; pick-up shall be adjustable from 90-95 percent.

b. Circuitry shall be provided to prevent transfer to the Emergency source until Emergency source voltage and frequency are within 90 percent of nominal values.

c. In the event of a primary power source interruption, the operator shall manually transfer the load to the standby power source through the use of the pushbuttons.

d. Once the primary power has been restored, the operator shall manually transfer the load back to the primary power source through the use of the pushbuttons.

e. NT switch shall be equipped with indicator lamps for the Normal and Emergency positions. Two "dry" contacts shall be provided for the Emergency position and one "dry" contact for the Normal position; said contacts shall be wired to identified terminals.

f. NT switch shall be constructed to accommodate NEMA 3R 480V, 3W, 4P, pin and sleeve type receptacle for reverse service from a portable generator in standby mode. Receptacle shall be Appleton AR Series or equal.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Circuit breakers having a frame size of 150-amperes or less shall be molded-case type with thermal magnetic non-interchangeable, trip-free, sealed trip units. Breaker contact material shall be a non-weldable silver alloy. Breakers shall have arc-extinguishing chutes. Ground fault tripping shall be provided as required and as specified in the short circuit and coordination study.

B. Circuit breakers with a frame size of 225-amperes to 600-amperes shall be molded case with interchangeable thermal and adjustable magnetic trip elements but otherwise shall be as specified in the paragraph above. Ground fault protection, where required, shall be provided by means of a

core balance transformer encircling all feeder leads. The transformer shall energize a surface-mounted, solid-state relay, adjustable from 10-20 percent of phase current with an adjustable time delay of zero to 36 cycles. Ground fault protection shall include a test panel containing indication and test tripping circuits.

C. Circuit breakers with a frame size more than 600-amperes shall be molded case as described in the foregoing Paragraph B, except if power circuit breakers are indicated. Molded case circuit breakers shall have an integral, solid state over-current trip unit and line current sensors. Trip units shall have adjustable long time tripping in the range of 60 to 100 percent of continuous rating, instantaneous tripping adjustable in the range of 300 to 1000 percent of continuous rating, and ground fault tripping adjustable in the range of 20 to 60 percent of continuous rating with adjustable delay of approximately 5 to 40 cycles.

D. Power circuit breakers shall be the draw-out type and shall be either air breaker units or insulated case units. Draw-out mechanism shall be 4-position: connected, test, disconnect and remove. Circuit breaker element shall be able to assume the connected, test, and disconnected positions with the circuit breaker cubicle door closed.

E. Interlocks shall be provided to assure that the circuit breaker element is open before movement from a position is possible; stored energy mechanism shall be discharged automatically prior to removal of the circuit breaker element from its cubicle. Charging of stored energy springs shall be by manual closing of the main power contacts which shall automatically charge the tripping springs. A manual trip button, position indicators, and status of stored energy mechanism shall be fitted to the front panel.

F. Power circuit breakers shall be equipped with an integral solid-state 3-phase tripping unit as described above.

G. Circuit breaker interlocking shall include an anti-pumping circuit.

H. An external power source shall not be required for circuit breaker tripping.

I. Circuit breaker accessories shall include switchgear mounted traveling lift-out hoist. Power circuit breakers shall be Westinghouse, General Electric, Square D, or equal.

PART 3 -- EXECUTION

3.1 INSTALLATION - GENERAL

A. All electrical equipment materials shall be installed securely in place. Equipment shall be mounted parallel and perpendicular to the walls, floors, and ceilings.

B. All anchors and fasteners shall be types designed for the intended purpose and shall be capable of adequately, safely, and permanently securing the material in place. Generally, screws shall be used on wood surfaces, masonry anchors in concrete or brick, toggle bolts on hollow walls, machine screws, bolts, or welded studs on steel. Nails shall be used only for temporary attachment or support.

C. Omissions or conflicts on Drawings or between Drawings and Specifications shall be brought to the attention of the ENGINEER for clarification before proceeding with the work.

D. The CONTRACTOR shall make all necessary provisions throughout the site to receive the work as construction progresses and shall furnish and install adequate backing, supports, inserts, and anchor bolts for the hanging and support of all electrical fixtures, conduit, panelboard, and switches, and shall furnish and install sleeves through walls, floors, or foundations where electrical lines are required to penetrate.

E. Floor standing equipment shall be leveled with shims as required to maintain horizontal surfaces within 1/32-inch per horizontal foot; after leveling, equipment shall be anchored, then grouted so that no space is existing between concrete and equipment support beams.

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SECTION 16470
PANELBOARDS

PART 1 - GENERAL

1.1 SCOPE

A. Required: Provide and install complete equipment including circuit breakers and panelboards as indicated on the Contract Drawings and herein specified.

B. Comply with the General Conditions, General Requirements and the requirements of Section 16010 of this Division 16 concerning definitions, guarantees, submittals, as-builts, clean-up, etc. as applicable to work of this Section.

1.2 QUALITY ASSURANCE

A. Comply with applicable provisions of Subsection of Section 16010.

B. Conform to the applicable provisions of Subsection 1.3 of Section 16010 related to legal requirements and standards including NEMA, ANSI and IEEE Standards and Federal Specifications.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Cabinets to House Panelboards: Cabinets shall be formed of galvanized metal, chemically cleaned, and all breaks in galvanizing shall be painted with metallic aluminum paint. Minimum size: 20 inches wide by 5-3/4 inches deep. Trims and doors shall be chemically cleaned. Provide ANSI synthetic alkalyd factory enamel finish on the exterior and interior of panels. Provide for circuit directory behind door with glass or heavy plastic protection. Cabinets shall be flush or surface mounted type as indicated with screw cover, hinged doors with flush lock keyed to operate from one key. Cabinets greater than three feet shall have three trim bolts on each side.

B. Identification: Each panel board shall have an exterior engraved laminated plastic nameplate identifying the panelboard as designated on the Drawings and indicating voltage, phases, and number of system conductors. For example:

1. "Panel A 277/480V. 3o 4W". Lettering shall be white on black finish and 3/16 inch high minimum. Nameplates shall be affixed with a minimum of two escutcheon pins or screws. Each circuit breaker shall have a permanent metal or plastic number to identify each circuit. A circuit schedule card and holder shall be mounted on the inside of the door and covered with plastic.

C. Protective Devices:

1. Protective devices, main, branch or sub-feed shall be thermal-magnetic circuit breakers, bolt-on type ampacities as scheduled on Drawings. Provide single handle, common trip for two and three-pole units. Handle ties are not acceptable.

2. Protective devices for exterior receptacle circuits shall be provided with ground fault circuit interrupter. Square D "Quick Guard" or approved equal.

D. Electrical Equipment Adjacent to Panelboards: Where scheduled provide a separate cabinet with screw cover and hinged door with flush lock keyed alike with panelboard. A single cabinet may be used when a barriered compartment under separate lockable door and cover is provided.

E. Finish: As specified for service switchboards in Section 16400 electrical service and distribution.

2.2 DISTRIBUTION PANELBOARDS

A. Each distribution panelboard shall be a deadfront, deadrear, U.L. listed, circuit breaker type and comply with Federal Specification W-P-115a. Construction shall be NEMA Class I. Electrical ratings shall be as indicated on the Drawings. Series-connected or "integrated equipment" short circuit ratings shall not be applied in lieu of, or to comply with, short circuit and interrupting capacity ratings indicated on the Drawings unless specifically approved by the City Engineer. Provide fronts with flush cylinder tumbler locks, trim clamps, and concealed hinges. Double doors or doors over 48 inches high shall have 3 point latching. Provide 2 keys for each panelboard. Furnish panelboards with main lugs or main circuit breakers and all other circuit breakers as indicated on the drawings. Each circuit breaker shall be provided with a means for individual padlocking. Distribution panelboards shall be Square D. Co. I-line type or equal.

2.3 LIGHTING AND APPLIANCE PANELBOARDS

A. Each lighting and appliance panelboard shall be a U.L. listed circuit breaker type and meet Federal Spec. W-P115a. Electrical ratings shall be as indicated on the Drawings. Series connected or "integrated equipment" ratings shall not be applied in lieu of or to comply with short circuit and interrupting ratings indicated on the Drawings, unless specifically approved by the City Engineer. Provide fronts with flush cylinder tumblerlocks, trim clamps, and concealed hinges. Provide two keys for each panelboard. Furnish panelboards with main lugs or main circuit breakers and all circuit breakers as indicated on the Drawings.

B. Each circuit breaker shall be provided with a means for individual padlocking. Lighting and appliance panelboards shall be Square D. Co. Type NQO for 120/240 or 208/120 volt systems, and Type NEHB for 480/277 volt systems.

PART THREE - EXECUTION

3.1 GENERAL INSTALLATION OF PANELBOARDS

A. Install equipment square, level and secure to the building structure by bolting.

B. Align top of adjacent panelboards unless specifically noted otherwise. Install panelboards over 29 inches high to mount highest protective device handle a maximum of 6'-6" or 5'-6" for panelboards up to 29 inches high, except where adjacent to taller panelboards.

C. Flush enclosures shall be installed with the front edge flush with combustible finish surfaces and not more than 1/4 inch behind noncombustible finish surfaces, and shall be secured to framing or blocking except where embedded in masonry or concrete.

D. Provide weather-proof gaskets on trims and doors of panelboards located in mechanical areas.

3.2 OTHER APPLICABLE REQUIREMENTS

A. Provide a typewritten circuit directory for each branch circuit. Obtain City facility room numbers and use in final directory.

B. Provide a schematic diagram and sequence of operation for control devices installed under separate door adjacent to panelboards.

C. Install nameplates in accordance with provisions noted in Section 16141 - NAMEPLATES AND WARNING SIGNS.

D. Equip each circuit breaker for electrical discharge lamps with a locking device unless circuit will be switched at panelboard. Equip each circuit breaker for night-light circuits, fire alarm, security and control circuits with a locking device.

E. Provide filler plates for all unused spaces.

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SECTION 16480
LOW VOLTAGE MOTOR CONTROL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install all group-mounted and unit motor control as required for each motor furnished for installation all in accordance with the requirements of the Contract Documents.

B. When motors furnished differ from the indicated, the CONTRACTOR shall, at no additional cost to the CITY, make the necessary adjustments to wiring, conduit, disconnect devices, motor starters, branch circuit protection, and other affected material or equipment to accommodate the motors actually installed.

C. Make like items of equipment provided hereunder the end products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's service.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The work of the following Divisions or Sections applies to the work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

1. Section 16010 Electrical General Provisions.

2. Section 16030 Electrical Test.

3. Section 16050 Basic Materials and Methods.

4. Section 16400 Electrical Service and Distribution.

5. Section 16800 Electric Motors

6. Section 11030 Variable Speed Drives, General

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

1. Codes and Standards:

LAEC	City of Los Angeles Electrical Code, latest adopted edition
California Code of Regulations	Title 8, Industrial Relations, Subchapter 5, Electrical Safety Orders.

2. Commercial Standards:

UL 845	Standard for Safety Electric Motor Control Centers.
NEMA ICS-1	General Standard for Industrial Control and Systems
NEMA ICS-2	Industrial Control Devices, Controllers and Assemblies

1.4 CONTRACTOR SUBMITTALS

A. Shop drawing submittals shall comply with the "Contractor Submittals" paragraph of Section 16010, "Electrical General Provisions".

B. Final submittal shall include spare parts lists, catalog data for various motor control elements in addition to the submittals required by Section 16010 "Electrical General Provisions".

C. The following submittals and specific information shall be provided.

1. One-line diagrams
2. Elementary diagrams
3. Connection diagrams
4. Interconnection diagrams
5. Protective device time-current characteristics on conventional-sized transparencies
6. Operational description
7. Installation instructions
8. Maintenance instructions
9. Spare parts list
10. Test reports, including procedures, test conditions, results and graphs.

1.5 QUALITY ASSURANCE

A. Quality assurance shall be in accordance with Section 16010 Electrical General Provisions.

B. Electrical and Mechanical Testing: All components shall be factory tested in accordance with the applicable NEMA ICS requirements.

C. Field Testing: Field tests shall be performed in accordance with Section 16030 Electrical Tests.

PART 2 -- PRODUCTS

2.1 MOTOR CONTROL, GENERAL

A. Provide each motor with a suitable controller and devices that will function as specified for the respective motors and meeting NEMA ICS 2, the NEC, and UL.

B. Provide each motor controller with thermal overload protection in all ungrounded phases. Use protection consisting of thermal overload relays meeting NEMA ICS 2 which are sensitive to motor current and mounted within the motor controller, or a combination of thermal protectors embedded within the motor windings and controller-mounted overload relays, as indicated. Use overload protection devices of the inverse-time current characteristic type.

C. Provide controller-mounted overload relays of the manual-reset type with externally operated reset button when used without motor thermal protectors; when used in conjunction with thermal protectors, provide the automatic reset type. Select and install overload relay heaters after the actual nameplate full-load current rating of the motor has been determined.

D. If power factor correction capacitors are connected on the load side of the overload relays, incorporate the resulting reduction in line current in the selection of overload relay heaters.

E. Install and connect any required thermal protector monitoring relay provided by motor manufacturer in motor-control circuit and provide manual reset function

2.2 MANUALLY OPERATED STARTERS, FRACTIONAL HORSEPOWER

A. Provide starters meeting NEMA ICS 2 with the enclosures shown, rated 1 hp at single-phase, ac voltages of 115 and 230 volts, and with thermal overload protection, and toggle or pushbutton operation. Provide for locking in the OFF position.

2.3 MANUALLY OPERATED STARTERS, INTEGRAL HORSEPOWER

A. Provide starters meeting NEMA ICS 2 of the horsepower rating, voltage, number of phases, and enclosure shown and with thermal overload protection, and pushbutton or toggle switch operation. Provide for locking in the OFF position. Provide running overcurrent protection.

2.4 FULL VOLTAGE MAGNETIC STARTERS

A. Provide starters meeting NEMA ICS 2, Class A, with the rating and endosure shown. Starters shall be full voltage, non-reversing horsepower rated, providing combined protection against running and stalled overloads. Thermal overload relays on all phases shall be temperature compensated bimetallic type with manual reset and inherent single phasing prevention.

2.5 CONTROL POWER TRANSFORMERS

A. Supply individual control power transformers unless noted otherwise. The transformers shall have sufficient capacity to serve the connected load and limit voltage regulation to 10 percent during contact or pickup. Fuse one side of the secondary winding and ground the other side. Provide primary, current limiting fuses where fuses shown on Drawings, or where required by applicable codes and standards.

2.6 MOTOR CONTROL CENTERS

A. Provide motor control centers and components meeting the requirements of the latest revised NEMA and UL standards and the following requirements, unless otherwise indicated:

RATING	
Voltage	As indicated on the Drawings

RATING

Short Circuit Rating	65,000 amps rms symmetrical unless otherwise shown on the electrical drawings
NEMA Class	Class 1 Type B all additions and revisions shall be included in the final as-built record drawings

ENCLOSURE

Type	NEMA Type 3R weatherproof Non-walk-in enclosure
Vertical Section	90-inches high, 20-inches wide
Dimensions	20-inches deep
Finish	Exterior: manufacturer's standard gray over a primer and rust inhibitor or as per architectural standard; Interior: white lacquer or enamel
Construction	Sheet steel reinforced with channel or angle irons, section constructed so they may be butted flush, end-to-end against a similar section without bolts, nuts, or cover plates causing interference; removable top cover plates Exterior weatherproof doors shall be gasketed with lockable door handles
Section Mounting	Removable formed steel channel sills and removable lifting angles
Horizontal Wiring Compartments	Full width, top and bottom, accessible from front
Vertical Wiring	Full height, isolated from unit Compartment starters with a separate door, accessible from front

BUS

Horizontal Power Bus	3-phase tin-plated copper bus entire width of control center rated 600A, constructed to allow future extension of additional sections; pressure type solderless lugs for each incoming line cable; Belleville washers on all bus connection bolts.
Vertical Power Bus	3-phase tin-plated copper bus full height of section rated 300 amps minimum "sandwich" type bus insulation that provides dead front construction with starter units removed except for bus stab openings; Belleville washers on all bus connection bolts
Neutral Bus	None
Ground Bus	Copper 400A minimum capacity; Belleville washers on all bus connection bolts
Bus Bracing	65,000 amps rms symmetrical.

MOTOR STARTER UNITS

General	Individual components and control devices including pushbuttons, selector switches, indicating lights, control relays, time delay relays, and elapsed time meters as specified in Section 16050, "Basic Materials and Methods".
Construction	Drawout combination type with stab connections, except where size and weight of equipment make this impracticable; readily interchangeable with starters of similar size; provide pull-apart unit control wiring terminal boards on all units
Starters	NEMA standard rating, NEMA Size 1; minimum meeting requirements specified under article 2.1, MOTOR CONTROL, GENERAL;
Disconnecting Device	As indicated; disconnecting device lockable in CLOSED position
Circuit Breakers	Molded case motor circuit protectors with manufacturer's recommended trip setting for maximum motor protection, tripping indicated by operating handle position; interrupting capacity required for connection to system with short circuit capacity indicated; shunt trip for ground fault protection; copies of circuit breaker time-current characteristics
Fused Switches	Heavy-duty (HD), motor rated, load-break, quick-make, quick-break type meeting requirements of UL and NEMA KS 1; current-limiting fuses as specified with rejection clips
Load Detector Relays	Manual reset with adjustable differential; Relays Cutler-Hammer Type D60LA, or equal
Motor Overload	Temperature compensated, three-pole, Protection bimetallic thermal overload relay automatic-reset when used with integral motor thermal protector.
Motor Thermal	automatic-reset interposing Protection Interface relay for connection to motor-mounted thermal protector system
Ground Fault	Same as under FEEDER UNITS Protection AND MAIN PROTECTIVE DEVICE, except instantaneous operation device
Capacitor Connection	Special terminals to allow easy connection of power factor correction capacitors on the source side of starter overload relays on all starters where capacitor connection is shown

CONTROL UNITS

Disconnecting Device	Disconnecting device capable of de-energizing all circuits in the unit. Provide a warning sign giving location of disconnecting device if not located in the unit.

Control Devices	As indicated on the Drawings and as specified in Section 16050, "Basic Materials and Methods". Permanent sleeve type markers to be applied to all wires.
Wire Markers Control Wiring	Minimum wire size 14 AWG copper

FEEDER UNITS AND MAIN PROTECTIVE DEVICE

Construction	Same as under MOTOR STARTER UNITS UL service entrance label on main protective device
Circuit Breakers	Unless otherwise indicated, molded case with thermal-magnetic trip and interrupting capacity required for connection to system with short circuit capacity indicated; tripping indicated by operating handle position; suitable for use with 75 degrees C wire at full NEC 75 degrees C ampacity.
SPACE HEATERS	[illegible] 45 [illegible]. [illegible] 120 [illegible]. [illegible]
DIAGRAMS	Schematic (elementary) and outline diagrams, equipment schedules, wireless unit connection diagrams, interconnection diagrams

2.7 ACCEPTABLE MANUFACTURERS

A. General Electric

B. Allen Bradley

C. Cutler-Hammer

D. Square D

E. Furnas

F. Siemans

G. Or equal.

PART 3 -- EXECUTION

3.1 GENERAL

A. Perform work in a workmanlike manner with craftsmen skilled in the particular trade. Provide work presenting a neat and finished appearance.

3.2 INSTALLATION

A. Install equipment in strict accordance with submittal drawings and manufacturer's recommendations. Install motor control centers in accordance with NEMA ICS 2.3 as a minimum. Secure motor control centers using approved means as per latest standards and regulations. Grout mounting channels provided with motor control into the floor or mounting pads.

B. Retighten to NEMA standards all current-carrying bolted connections and all support framing and panels.

C. Field adjust the trip settings of all motor starter magnetic trip only circuit breakers. Adjust as per manufacturer’s recommendations. Determine motor rated current from motor nameplate following installation. In the selection of overload relay heaters, allow for motor current reduction where power factor correction capacitors are installed on the load side of the overload heaters. Prepare a typed tabulation of motor name, motor horsepower, nameplate full load current, measured load current, heater catalog number, protective device, trip setting, and include copy in the Technical Manual. Attach to the tabulation a copy of the starter manufacturer's overload heater selection tables, including only the tables for the particular starters provided.

D. After the equipment is installed, touch up any scratches, marks, etc., incurred during shipment or installation of equipment. If required by the ENGINEER because of undue amount of scratches, repaint the entire assembly.

3.3 FIELD TESTS

A. Field tests shall be in accordance with Section 16030 Electrical Tests.

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SECTION 16800
ELECTRIC MOTORS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. General: The CONTRACTOR shall furnish and install electric motors, accessories, and appurtenances as specified herein and in conformance with the individual specifications of driven equipment, to provide a complete and operable installation, all in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The work of the following Sections and Divisions applies to the work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the estent required for proper performance of this work.

1. Section 16010 Electrical General Provisions.

2. Division 16 as applicable, Electrical.

3. Division 11 as applicable, Equipment.

4. Division 15 as applicable, Mechanical.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

1. LAEC: City of Los Angeles Electrical Code, latest adopted edition.

2. Commercial Standards:

NEMA MG 1	Motors and Generators
NEMA MG 2	Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators
NEMA MG 10	Energy Management Guide for Selection and Use of Polyphase Motors
IEEE 43	Recommended Practice for Testing Insulation Resistance of Rotating Machinery
IEEE 85	Standard Test Procedure for Airborne Sound Measurement on Rotating Electric Machinery
IEEE 112	Standard Test Procedure for Polyphase Induction Motors and Generators.

I EEE 113	Guide on Test Procedures for DC Machines
I EEE 115	Test Procedure for Synchronons Machines

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the requirements of Section 16010 Electrical General Provisions.

B. Complete motor data shall be submitted with the driven machinery shop drawings. Motor data shall include:

1. Machine name and specification number of driven machine.
2. Motor manufacturer.
3. Motor type or model and dimension drawing.
4. Nominal horsepower.
5. NEMA design.
6. Frame size.
7. Enclosure.
8. Winding insulation class and treatment.
9. Rated ambient temperature.
10. Service factor.
11. Voltage, phase, and frequency rating.
12. Full load current at rated horsepower for application voltage.
13. Starting code letter, or locked rotor kVA, or current.
14. Special winding configuration such as part-winding, star-delta. Include winding diagram.
15. Rated full load speed.
16. Power Factor at full load.
17. Noise certification and data sheets.
18. Replica of motor nameplate.
19. Bearing types and catalog numbers.

C. If water cooling is required for motor thrust bearings, the shop drawing submittals shall indicate this requirement.

D. The following submittals and specific information shall be provided.

1. General Description:

a. Motor dimensional drawings. Net motor weight shall be noted on the dimensional drawings. Shipping weight shall also be noted if motors are to be shipped separately from the driven equipment.

b. Complete motor rating and enclosure type.

c. Lists of special characteristics and features being provided as specified.

d. Thrust bearing life.

e. Type of thrust bearing lubrication.

f. Type of guide bearing lubrication.

g. Statement that carbon brushes are being provided that are suitable for the low speed, continuous operation specified.

2. Motor Characteristics:

a. Guaranteed minimum efficiency at rated load at rated voltage.

b. Guaranteed minimum power factor at rated load at rated voltage.

c. Expected efficiency at 1/2, 3/4, and full load at rated voltage.

d. Expected power factor at 1/2, 3/4, and full load at rated voltage.

e. Motor no-load current at rated voltage.

f. Full load current at rated voltage.

g. Full load current at 110 percent voltage.

h. Starting current at rated voltage.

i. Full load speed.

j. Certified copy of test report for identical motor tested in accordance with NEMA MG 1-12.53a and IEEE Standard 112, Test Method B, showing full load efficiency not less than specified value. Motors not as specified will be rejected.

k. Recommended maximum kVAR of power factor correction capacitors when capacitors are switched with motor.

l. Time in seconds motor can be subjected to locked rotor current at rated voltage without damage to motor with (1) motor initially at rated ambient temperature, and (2) with motor initially at rated temperature rise.

m. Speed torque curves.

3. Motor Tests and Test Reports:

a. Short commercial tests, including running light current at rated voltage, high potential, and locked rotor current.

1.5 QUALITY ASSURANCE

A. Quality assurance shall be in accordance with all applicable requirements of Section 16010 Electrical General Provisions.

B. Adjustable frequency driven motors shall be tested as an assembly with the drive and the driven equipment prior to delivery to the site.

1.6 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. Where motors are part of packaged equipment such as Bridge Crane and Air-Conditioning Unit, a qualified manufacturer's representative shall supervise the unpacking, installation and field testing.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. Materials and equipment shall be standard products of established manufacturers who have produced continuously the type of equipment specified. All equipment and material shall be new and of high quality insuring long life and reliable operation.

2.2 SERVICE CONDITIONS

A. Motors shall be designed and manufactured for continuous severe duty service.

2.3 RATING AND APPLICATION

A. Unless indicated otherwise in Divisions 11, 13, 14 and 15 in which the design equipment is specified or on the motor data sheets, motor enclosures shall be of the following type(s) approved for its intended purpose:

1. Motors installed indoors and outdoors shall be totally enclosed fan cooled (TEFC) with a service factor of 1.15.

2. Motors to be installed in classified areas shall conform to the requirements of NEC Article 500.

B. Motors shall be rated in accordance with the following, unless otherwise specified.

1. Motors below 1/2 hp shall be rated 115 volts, single phase, 60 Hertz and shall be of the capacitor-start, induction-run type.

2. Motors 1/2 hp through 200 hp inclusive shall be rated 460 volts, three phase, 60 Hertz.

C. Motor mechanical design shall be in accordance with this Specification and the detailed requirements indicated on the individual motor data sheet.

D. The design and construction of all motors shall be coordinated with the driven equipment requirements.

E. Motors shall be designed for full-voltage starting and rated for continuous operation as shown on the Contract Drawings.

F. Motors shall operate successfully under running conditions at rated load at plus or minus 10 percent of rated voltage or plus or minus 5 percent of rated frequency or a combination of the two.

G. In sizing motors, the horsepower rating of the motor, as stamped on the nameplate, shall not be exceeded during any operating conditions of the driven equipment.

H. Starting current at full voltage shall not exceed 650 percent of the motor full load current for all integral horsepower alternating current motors.

I. All motors shall have a safe stall (locked rotor) time equal to or greater than the maximum accelerating time under the worst voltage conditions specified.

J. Motor fans shall be suitable for rotation in either direction. They shall be nonsparking, corrosion resistant material, accurately balanced before assembly on the motor.

K. All motors shall be NEMA Design "B" unless otherwise specified on the motor data sheet, or required by the application.

L. Totally enclosed motors shall be "Severe Duty Chemical Service" type including shaft seals, internal surfaces coated with corrosion resistant paint or epoxy varnish, external surfaces coated with alkyd paint or epoxy enamel.

M. All motors shall be "high-efficiency" design, capable of operating at a higher normal efficiency than the standard industry design.

1. Motors built in NEMA Frames 143T through 445T shall have the guaranteed efficiency stamped on the nameplate. The basis for motor efficiency evaluation shall be IEEE test procedure 112, Method B, using accuracy improvement by segregated loss determination including stray load loss measurements.

2. Motors built in frames larger than 445T shall have the guaranteed efficiency stamped on the nameplate. The test method used in determining efficiency (e.g. Method B-Dynamometer, Method E-Input or Method F-Equivalent Circuit) shall be designated by the CONTRACTOR.

2.4 TERMINAL BOXES

A. Terminal boxes of the split type shall be furnished for each motor unless the base or housing of the motor is of a design which incorporates provisions for incoming cables.

B. Terminal boxes for medium-voltage motors shall have sufficient interior space to permit stress cones to be formed on the incoming cables and to permit the cable shields to be properly terminated and grounded. In addition, boxes shall be sized to contain surge protection equipment.

C. Separate terminal boxes shall be furnished for each accessory device, such as space heaters, temperature detectors, and other items.

D. All boxes shall be heavy duty class, weather tight and thoroughly coated internally and externally with corrosion-resistant paint.

2.5 INSULATION

A. The insulation system shall be Class F with temperature rise (based on maximum ambient temperature of 40 degrees C) of 80 degrees C measured by the resistance method.

B. Motors constructed in NEMA Frame 364 and larger, except totally enclosed motor, shall be vacuum pressure impregnated with 100 percent solids epoxy resins. The completed insulation shall have a minimum resistance of 10 megohms after 168 hours of testing in a humidity chamber maintained at 100 percent relative humidity and 40 degrees C ambient. In addition, motors with form wound coils shall also meet NEMA MG1-20.48 Qualification Test.

C. Totally enclosed motors shall be dipped and baked in epoxy resin. The completed insulation shall have a minimum resistance of 1.5 megohms after testing as in 2.5B above.

2.6 BEARINGS AND LUBRICATION - HORIZONTAL MOTORS

A. Not used.

2.7 BEARINGS AND LUBRICATION - VERTICAL MOTORS

A. Vertical motors shall be solid shaft or hollow shaft and bearings shall be anti-friction type grease.

B. Motors for "Process" or "In-Line" service shall be "In-Line, Solid Shaft" type construction with a clamped and locked bearing arrangement. Mounting and shaft extension dimensions and tolerances shall be in accordance with NEMA MG1-18.620 or 18.625. The bearings shall be rated for a L10 minimum life of 2 years or 17,500 hours at the maximum expected up or down thrust the driven equipment may impose during startup or operation at any capacity including shutoff.

2.8 SPACE HEATERS

A. Not used

2.9 WINDINGS AND WINDING PROTECTION

A. Stator windings shall be copper.

B. Leads shall be brought out to a terminal box separate from the main power leads terminal box.

C. Motors controlled by variable frequency shall be supplied with thermostats in two phases as a minimum. Any overload condition shall cause all phases to open.

2.10 GROUNDING

A. Each motor shall have a threaded hole in the motor frame with either a bronze bolt and lock washer or a bronze post-type connector for connection to an external ground conductor. The hole shall be for a 1/2 inch bolt or post-type connector except for motors of 100 hp or less where the size of the bolt or post-type connector may be 3/8 inch. The hole in the motor frame shall be threaded to a depth not less than 1 1/2 times the diameter of the hole to ensure a firm connection. If necessary, a metal pad shall be bonded to the motor frame to provide this depth for the threaded hole. The grounding means shall be located on the same side of the motor as the main lead terminal box.

2.11 BALANCE AND VIBRATION

A. Motors shall be dynamically balanced. Method of measuring dynamic balance shall be when measured in accordance with NEMA MG1-12.06 or MG1-20.52 and with the maximum amplitude values as shown in NEMA MG1-12.05.

B. Motors shall have a maximum peak-to peak amplitude of vibration in accordance with MG1-20.52 when measured in accordance with MG1-12.06 B or MG1-20.53.

2.12 NOISE

A. Maximum sound pressure levels 3 feet from any motor shall not exceed 85dbA.

B. All motors shall be "quiet line" type and shall be so indicated on the submittals, Quiet Line type motors shall be capable of operating at a lower noise level than the standard industry design.

C. Measurement procedures shall in general be guided by the provisions of IEEE Publication No. 85.

2.13 NAMEPLATES

A. Each motor shall have a corrosive-resistant nameplate containing information in accordance with NEMA MG1. In addition the service factor and efficiency shall be included. For motors of 250 hp and larger, the nameplate shall also state any limitations on the number of starts per day, and conditions of restarting.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Motors shall be installed in accordance with Division 11, EQUIPMENT, Division 16, ELECTRICAL and in accordance with the manufacturers recommendations.

B. CONTRACTOR shall make provision to protect motors from moisture by connecting space heaters. The space heaters shall be connected while in storage and/or before Commissioning.

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SECTION 16995
ELECTRICAL SYSTEMS COMMISSIONING

PART 1 – GENERAL

1.1 DESCRIPTION

A. The purpose of this section is to specify Division 16 responsibilities in the commissioning process which are being directed by the commissioning agent. Other electrical systems testing are required under the direction of the construction manager.

B. The list of commissioned equipment and systems is found in Section 01810, Part 1.12.

C. Commissioning requires the participation of Division 16 to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Division 01. Division 16 shall be familiar with all parts of Division 01 and the commissioning plan issued by the commissioning agent and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.2 RESPONSIBILITIES

A. Electrical Contractors. The commissioning responsibilities applicable to the electrical contractor are as follows *(all references apply to commissioned equipment only)*:

1. Construction and Acceptance Phases:

a. Include the cost of commissioning in the contract price, if not yet let.

b. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.

c. Attend a commissioning kickoff meeting and other necessary meetings scheduled by the commissioning agent to facilitate the Cx process.

d. Contractors shall provide normal cut sheets and shop drawing submittals to the commissioning agent of commissioned equipment.

e. Provide additional requested documentation, prior to normal O&M manual submittals, to the commissioning agent for development of start-up and functional testing procedures.

(1) Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.

(2) The Commissioning Agent may request further documentation necessary for the commissioning process.

(3) This data request may be made prior to normal submittals.

f. Provide a copy of the O&M manuals submittals of commissioned equipment, through normal channels, to the commissioning agent for review and approval.

g. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

h. Provide assistance to the commissioning agent in preparation of the specific functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

i. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the commissioning agent. Submit manufacturer's detailed start-up procedures and the full start-up plan and procedures and other requested equipment documentation to commissioning agent for review.

j. During the startup and initial checkout process, execute and document the electrical-related portions of the prefucntional checklists provided by the commissioning agent for all commissioned equipment.

k. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the commissioning agent.

l. Address current punch list items before functional testing.

m. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

n. Perform functional performance testing under the direction of the commissioning agent for specified equipment. Assist the commissioning agent in interpreting the monitoring data, as necessary.

o. Correct deficiencies (differences between specified and observed performance) as interpreted by the commissioning agent and construction manager and retest the equipment.

p. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

q. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing). Prepare red-line as-built drawings for all drawings and final as-builts for contractor-generated coordination drawings.

r. Provide training of the Owner's operating personnel as specified.

s. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

2. Warranty Period:

a. Execute seasonal or deferred functional performance testing, witnessed by the commissioning agent, according to the specifications.

b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

PART 2 – PRODUCTS

2.1 TEST EQUIPMENT

A. Division 16 shall provide all test equipment necessary to fulfill the testing requirements of this Division (i.e. light meters).

PART 3 – EXECUTION

3.1 SUBMITTALS

A. Division 16 shall provide submittal documentation relative to commissioning to the commissioning agent as requested by the commissioning agent.

3.2 STARTUP

A. Division 16 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent or Owner.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems, or sub-systems at the discretion of the commissioning agent and construction manager. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

3.3 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. Division 16 shall compile and prepare documentation for all equipment and systems covered in Division 16 and deliver to the GC for inclusion in the O&M manuals.

B. The commissioning agent shall receive a copy of the O&M manuals for review.

3.4 TRAINING OF OWNER PERSONNEL

A. The GC shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed. Refer to Section 01820 for additional details.

B. The commissioning agent shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment. Refer to Section 01810 for additional details.

C. Electrical Contractor. The electrical contractor shall have the following training responsibilities:

1. Provide the commissioning agent with a training plan two weeks before the planned training according to the outline described in Section 01820.

2. Provide designated Owner personnel with comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.

3. Training shall start with classroom sessions, if necessary, followed by hands on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.

4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.

6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

7. Training shall include:

   a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.

   b. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.

   c. Discuss relevant health and safety issues and concerns.

   d. Discuss warranties and guarantees.

   e. Cover common troubleshooting problems and solutions.

   f. Explain information included in the O&M manuals and the location of all plans and manuals in the facility.

   g. Discuss any peculiarities of equipment installation or operation.

   h. The format and training agenda in Guidelines for Commissioning HVAC Systems, ASHRAE, 1989R, 1996 is a recommended reference.

   I. Classroom sessions shall include the use of overhead projections, slides, video and audio taped material as might be appropriate.

8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and maintenance of all pieces of equipment.

9. The electrical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.

10. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.

11. Duration of Training. The electrical contractor shall provide training on each piece of equipment.

3.5 WRITTEN WORK PRODUCTS

A. Written work products of Contractors will consist of the startup and initial checkout plan and the filled out startup, initial checkout and pre-functional checklists.

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Division 17 — Instrumentation and Control

SECTION 17150
METERS, GENERAL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install all meters and flow measurement devices with associated instrumentation and controls as shown and specified herein, complete and operable, for functions including flow measurement, density determination, and batch metering of fluids including water, wastewater, chemicals, gases, and sludges, in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Division 2 and 15, as applicable Piping.

B. Section 09800 Protective Coating.

C. Section 11000 Equipment General Provisions.

D. Section 16050 Basic Materials and Methods.

E. Section 17405 Process Instrumentation and Control.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Comply with reference specifications of the GENERAL REQUIREMENTS and Section 17405 "Process Instrumentation and Control".

B. Commercial Standards:

ANSI - B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
ANSI/AWWA C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 In Through 144 In.
ANSI/AWWA C701	Cold-Water Meters - Turbine Type for Customer Service.
ANSI/AWWA C702	Cold-Water Meters - Compound Type.
AWWA C704	Cold-Water Meters - Propeller Type for Main Line Applications.
ASME REPORT	Fluid Meters, Sixth Edition, 1971.

1.4 CONTRACTOR SUBMITTALS

A. Comply with applicable subsections of Section [17405] "Process Instrumentation and Control."

B. Shop Drawings: The CONTRACTOR shall submit complete shop drawings of all meters for review in accordance with SUBMITTALS of the GENERAL REQUIREMENTS. Each meter shall be identified with its equipment number, as shown or specified.

C. Manufacturer's Data: With the shop drawings, the CONTRACTOR shall also furnish certified curves indicating flow versus differential pressure and any other information called for in the individual meter specifications.

D. O & M Manuals: The CONTRACTOR shall furnish to the ENGINEER 4 copies of complete operation and maintenance instructions of all the metering systems including instrumentation and controls, as specified under TECHNICAL MANUALS of the GENERAL REQUIREMENTS.

E. Spare Parts:

1. The CONTRACTOR shall obtain and submit from the manufacturer a list of suggested spare parts for each piece of equipment according to the provisions of SPARE PARTS of the GENERAL REQUIREMENTS. After approval, CONTRACTOR shall furnish such spare parts suitably packaged, identified with the equipment number, and labeled. CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment. All spare parts are intended for use by the CITY, only, after expiration of the guaranty period. Any spare parts which the ENGINEER permits the CONTRACTOR to use for startup activities shall be replaced by the CONTRACTOR prior to the CITY's acceptance of beneficial use of the equipment.

2. During the term of this Contract the CONTRACTOR shall notify the ENGINEER in writing about any manufacturer's modification of the approved spare parts, such as part number, interchangeability, model change or others. If the ENGINEER determines that the modified parts are no longer applicable to the supplied equipment, the CONTRACTOR at its expense shall provide applicable spare parts.

F. Special Tools: A list of special tools required shall be submitted to the ENGINEER for approval. After approval the CONTRACTOR shall supply these tools suitably wrapped and identified for application. Special tools shall include substitute steel spools for each meter for maintenance purposes. Each spool shall be labeled to identify the meter for which temporary replacement is required. The label shall include the meter identification number, size and service.

1.5 QUALITY ASSURANCE

A. Inspection and Testing Requirements: After installation, the CONTRACTOR shall obtain the services of an experienced factory service representative to inspect and test all meters for proper performance and installation.

B. Accuracy Requirements: Unless otherwise specified herein, the flow meters shall be guaranteed to register flow to an accuracy of $\pm$2 percent of actual flow throughout the range specified. (All density measuring equipment shall have a degree of accuracy within $\pm$2 percent of actual solids content over the range specified for each density measurement system.)

1.6 MANUFACTURER'S SERVICE REPRESENTATIVE

A. Erection and Startup Assistance: During erection and startup of the plant the CONTRACTOR shall obtain all necessary assistance from an experienced factory service representative to ensure a correct and first class installation, in accordance with the manufacturer's instructions.

B. Instruction of CITY'S Personnel: After completion of the installation and during startup of the plant, the CONTRACTOR shall instruct the CITY'S personnel in the proper operation, maintenance and repair of all metering equipment. For this purpose, the CONTRACTOR shall

obtain the services of an experienced factory service representative, who shall spend sufficient time on the site to fully instruct the CITY'S operating personnel on all phases of its equipment.

1.7 CLEANUP

A. After completion and testing of its work, the CONTRACTOR shall remove all debris from the site, clean all meters, controls, cabinets, and other metering appurtenances, to hand over each system in perfect operating condition.

1.8 GUARANTEES, WARRANTIES

A. After completion the CONTRACTOR shall furnish to the CITY the manufacturer's written guarantees that the metering systems will operate within the published accuracies and flow ranges and meet these Specifications. The CONTRACTOR shall also furnish the manufacturer's warranties as published in its literature and as specified.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 INSTALLATION

A. The CONTRACTOR shall assemble and install all equipment specified herein, in strict accordance with the manufacturer's published instructions, under the supervision of the manufacturer's representative, under the general review of the ENGINEER. All installations shall be accomplished by competent craftsmen in a workmanlike manner.

B. The meters shall be installed in easily accessible locations for ease of reading and maintenance and, where shown, for balancing of flow in several lines, in conjunction with throttling and shut-off valves. Wherever possible, all meters shall be installed in such a way to provide the manufacturer's recommended straight approach and straight piping downstream. All meters, shut-off and balancing valves shall be firmly supported from the structure or from the floor with approved supports. In-line meters shall be installed to provide full-line flow and not less than the manufacturer's recommended head at all times.

3.2 TESTING

A. Equipment shall be prepared for operational use in accordance with manufacturer's instructions, including bench test and calibration, where required.

B. Each item shall be subjected to an operating test over the total range of capability of the equipment. Where applicable, tests shall be conducted in accordance with the Test Code of the Standards of the Hydraulic Institute. The CONTRACTOR shall obtain copies of factory test certifications and shall notify the ENGINEER 1 week in advance of all tests to be conducted on site.

3.3 ACCEPTANCE BY CITY

A. Final acceptance of the equipment is contingent on satisfactory operation after installation.

3.4 INSTALLATION, CALIBRATION, TESTING, PRECOMMISSIONING, START-UP AND INSTRUCTION

A. Comply with the applicable subsections of Section 17405 "Process Instrumentation and Control," Part 3 - EXECUTION.

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SECTION 17156
MAGNETIC FLOW METERS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install magnetic flow meters and all appurtenant work suitable for storm water, at ambient temperatures, complete and operable, and capable of continuous operation with minimum error due to pipe deposits, in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17150 Meters, General.

B. Section 17405 Process Instrumentation and Control.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the reference specifications of the GENERAL REQUIRMENTS and Section 17405 "Process Instrumentation and Control".

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS, Section 17150 "Meters, General", and Section 17405 "Process Instrumentation and Control".

1.5 QUALITY ASSURANCE

A. Comply with Section 17405 "Process Instrumentation and Control"

PART 2 -- PRODUCTS

2.1 METERS

A. General: The magnetic flowmeter shall utilize characterized electromagnetic induction to produce a voltage linearly proportional to the average flow rate. The metering system shall consist of a sensor with field coils, transmitter and interconnecting cables to make a complete operating flow metering system. The meter shall be of the bi-polar pulsed dc type with continuous automatic zeroing.

B. Schedule of Magnetic Flow Meters: The CONTRACTOR shall furnish the following magnetic flow meters of the 4-20 mA-dc:

I.D. No.	Service	Size inches	Flow Range fps	Transmitter Location	Pressure Rating psi	Liner Material	Electrode Material	Sensor Rating
FIT-01	WATER	6	2-30	DISCHARGE OUTLET	350	NEOPRENE	316L SS	NEMA4
FIT-02	WATER	6	2-30	RESERVOIR OUTLET	350	NEOPRENE	316L SS	NEMA4

2.2 BASIC MATERIALS

A. Construction: The sensor shall be a flanged tube with non-conductive liner. The tube shall be constructed of Type 304 stainless steel with carbon steel flanges AWWA Class D if the coils are external to the tube. If the coils are encapsulated inside the tube, the tube and flanges may be of carbon steel. Sensor rating shall be either NEMA-4 or capable of withstanding accidental submergence in water to a depth of 30 feet for 48 hours as called out in schedule above. The meter shall include a positive zero feature for periods when the metering portion of the process pipe is not full. The power supply shall be 117-volt ac ±10 percent, 60-Hz ±5 percent. Power consumption shall not exceed 42 watts regardless of size. Accuracy of the flowmeter system shall be ±0.5 percent of rate from 10 to 100 percent of scale. Below 1 full percentage scale [fps] it shall be ±0.1 percent of full scale. Repeatability shall be 0.1 percent of rate. Liner material shall be neoprene. (See schedule above). External surfaces shall be factory-finished with a corrosion resistant coating. The specific conductivity of the liquid shall not preclude meter operation.

B. Grounding: Grounding rings or electrodes of the same material as the sensing electrodes shall be furnished mounted in each end of all meters one inch and larger in size. Provide grounding strap between adjacent pipe, grounding rings and flow tube, unless adjacent pipe is either non-conductive or lined with non-conductive materials, in which case provide grounding string between the rings and tube only. If grounding electrodes are provided, grounding rings shall also be provided for liner protection.

C. Transmitter: The transmitter may be either meter or remote mounted as shown or specified. If the transmitter is remote mounted, the interconnecting cable shall be furnished by the manufacturer of the metering system. Remote transmitters shall be housed in NEMA-4X enclosures suitable for wall mounting. The transmitter shall produce a 4-20 mA dc output signal into a minimum load of 800 ohms linear to flow, and a scaled pulse when called for above for totalization.

D. Sludge Meters: All raw, primary, and thickened sludge meters shall be furnished with Teflon liners.

E. Manufacturers, or Equal:

1. Fischer and Porter;

2. Foxboro Company;

3. Sparling Instrument Co., Inc.

4. Krone

PART 3 -- EXECUTION

3.1 INSTALLATION

A. All magnetic flow meters and all appurtenant work shall be installed in strict accordance with the manufacturer's printed instructions. All meters shall be properly grounded to the adjacent pipe as specified, and located in such a way to assure a full pipe at all times.

3.2 INSTALLATION, CALIBRATION, TESTING, PRECOMMISSIONING, START-UP AND INSTRUCTION

A. Comply with the applicable subsections of Section 17405 "Process Instrumentation and Control," Part 3 - EXECUTION.

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SECTION 17405
PROCESS INSTRUMENTATION AND CONTROL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. This section sets forth the general specification and requirements for the instrumentation work for the construction of the Penmar water quality improvement project phase I.

B. A single system CONTRACTOR, through the use of a qualified Instrumentation Subcontractor, shall furnish, install, place, and program into service the operating process instrumentation, all the control systems, and all the appurtenant work, being provided under this section of these Specifications and the integration of the Control and Instrumentation system and control devices provided under this project; all in accordance with the requirements of the Contract Documents. The prime CONTRACTOR may act as a systems CONTRACTOR provided the prime CONTRACTOR has been qualified to do the work as required in Section 17405-1.1 C for Instrumentation Subcontractors.

1. Supply and install complete instrumentation systems as indicated on the Contract Drawings and as specified herein. Complete all required engineering work such as installation details, As-built drawings, Shop submittals, test procedures, training syllabuses and materials, and similar work described in this Specification, to produce a complete, fully documented and properly operating process instrumentation and control system. It will be necessary to produce additional drawings and text records in order to complete this work.

2. Due to the complexities associated with the interfacing of numerous control system devices, it is the intent of these specifications to have the Instrumentation Subcontractor assume full responsibility for all engineering design, equipment supply, submittal preparation, programming, graphic generation, system integration, testing, training, installation supervision, startup and implementation activities with existing devices and devices provided under other specification sections with the objective of providing a completely integrated control system free of signal incompatibilities.

3. As a minimum, the Instrumentation Subcontractor under the direction of the CONTRACTOR shall assume full responsibility for the following:

   a. Implementation of the control and instrumentation system;

      (1) Provide all engineering, labor and materials required to; prepare analog hardware submittals; design, develop, electronic drafting and submit loop drawings and control panel designs; prepare test plan, training plan, and spare parts submittals; procure hardware; fabricate panels; factory test panels; supervise the installation of all instrumentation devices and control panel devices; perform and document all loop tests, system commissioning, and the performance of the seven (7) day test for the entire control and instrumentation system.

      (2) Provide all engineering, labor, and materials required to prepare Operations and Maintenance Manuals, conduct training classes, and to submit "as-built" or record drawings which reflect the installed state of the control and instrumentation system at the time of acceptance.

   b. Integration of the control and instrumentation system with instrumentation and control devices being provided under other specification sections;

(1) Provide all engineering, labor, and materials required to review vendor drawings and to design, develop, electronically draft and submit all requisite loop drawings and "As-Built" loop drawings associated with;

(a) Equipment being provided under other divisions of these specifications.

(b) Owner furnished or existing equipment.

(2) Provide all engineering, documentation, labor, and materials required to resolve signal, power, or functional incompatibilities between the control and instrumentation system and interfacing devices.

(3) Provide all engineering, labor, and materials required to; supervise and install all instrumentation and control panels (including City supplied equipment); verify compliance with the manufacturer's installation recommendations; supervise the performance and document loop testing.

c. The design, development, drafting and submission of all required loop drawings and as-built loop drawings associated with; (a) equipment provided under Division 17; (b) equipment provided under other divisions of these specifications; and (c) CITY furnished equipment. It is the intent of these specifications to have all instrumentation loops associated with this project drafted and documented in a uniform format by the CONTRACTOR. All loop drawings shall be developed in an electronic format. INTEGRAPH as-builts shall be submitted both in hard copy and electronic format.

d. All instruments shown on the loop drawings shall be itemized in an instrumentation summary generated by the Instrumentation Subcontractor. The instrument summary shall be on an electronic or oracle and hardcopy format and shall list all of the key attributes of each instrument provided under this contract. As a minimum, attributes shall include:

(1) Tag Number
(2) Reference Drawing No.
(3) Loop Drawing Number
(4) Service
(5) Area Location
(6) Associated LCP, PLC PCM, or RTU
(7) Calibrator Range
(8) Manufacturer
(9) Model Number

e. Provide programming of the new and existing PLCs including communication with CITYs existing network. HMI programming shall be provided with monitoring and control functions defined in specification 17900 and related mechanical equipment specifications.

(1) Graphical HMI screens shall be programmed for all equipment, new or modified, included in this project including vendor supplied and controlled equipment. Screens shall match the color schemes, structure, quality and detail of the existing HMI screens.

4. The Instrumentation Subcontractor shall obtain from the CONTRACTOR the required information on those primary elements, valve actuators, vendor packages, and other control equipment or devices which are furnished by others but are required to be interfaced under this Division.

5. The Instrumentation Subcontractor shall coordinate his work to ensure that:

a. All components provided under this Section are properly installed and configured.

b. The proper type, size, and number of control wires with their conduits are provided and installed.

c. The proper type, size, and number of flexible pneumatic tubes with their conduits are provided and installed.

d. Proper electric power circuits are provided for all instrumentation components and systems.

C. Instrumentation Subcontractor Experience Requirements: Contractor shall at bid, submit to the CITY documentation listed below for his proposed bid listed Instrumentation Subcontractor:

1. Documentation describing at least two projects of similar size and complexity that have been successfully completed in which the Instrumentation Subcontractor performed system engineering, system fabrication and installation, documentation (including schematic, wiring and panel assembly drawings), field testing, calibration and start-up, operator instruction and maintenance training. In addition, list the following information for each project:

   a. Name of plant, owner, contact name and telephone number.

   b. Name of manufacturer for the majority of instrumentation furnished.

   c. Type of equipment furnished (i.e., transmitters, recorders, indicators, etc.).

   d. Approximate number of input functions to the system, analog and digital.

   e. Approximate number of output functions from the system, analog and digital.

   f. Contracted cost of the instrumentation and Control System including change orders cost.

   g. Date of completion or acceptance.

2. Identify individual responsible for office engineering and management, and the individual who will be responsible for field testing, calibration, start-up and operator training for this project. Include references of recent projects of these persons.

3. Documentation showing that the Instrumentation Subcontractor has been in the instrumentation and control systems business for minimum of four years.

4. Instrumentation Subcontractors not having the experience requirements and / or failing to submit the above listed documentation will be deemed non-qualified for the project. The Contractor shall be responsible for substituting the bid listed Instrumentation Subcontractor with one having the required experience and documentation at no extra cost of the City.

D. The CONTRACTOR shall assign the Instrumentation Subcontractor full responsibility for the complete operation of all new and modified instrumentation and control systems. The CONTRACTOR shall have said Subcontractor perform all engineering and coordination necessary in order to select, furnish, install, connect, calibrate, and place into operational sensors, instruments, alarm equipment, control boards, panels, computers, process control modules, human-machine interfaces, accessories and all other equipment as specified herein. Furthermore, said Subcontractor must calibrate and demonstrate the operability of said systems in accordance with the Contract Documents.

E. The Subcontractor shall provide all engineering work and installation drawings to produce a complete instrumentation system. If it is necessary for the CONTRACTOR to produce additional drawings in order to complete its work, such drawings shall be made at no additional cost to the CITY.

F. The Instrumentation Subcontractor shall examine all drawings, specifications, and details to become fully acquainted with the method of construction and to evaluate the quantity of Work to be performed. In case of conflicting or incomplete technical information, the Instrumentation Subcontractor shall include costs in its lump sum bid to coordinate the resolution of these conflicts and deficiencies with the ENGINEER at no additional cost to the CITY. Resolution of these discrepancies shall be obtained from the ENGINEER by the Instrumentation Subcontractor prior to purchasing of the instrument item.

G. Instrumentation Subcontractor shall note that the equipment loop, logic and elementary diagrams are based on non-certified vendor information and indicate minimum scope of supply from the Equipment Manufacturer. The Instrumentation Subcontractor shall include all costs in this bid to add additional instruments, wiring, computer inputs/outputs, controls, conduit, interlocks, electrical hardware, drawing revisions etc., into the design based on Equipment Manufacturer's final certified prints. Such changes to instrumentation and electrical work shall be incorporated into the scope of work at no additional cost to the CITY.

H. The CONTRACTOR shall provide all instrumentation and all related wiring as specified on any one of the following instrument or electrical documents: instrument location drawings, Instrument Index, I/O Tabulation, Loop Descriptions, one-line electrical diagrams, or as indicated on any other Contract Document. Indication of required instrumentation work on any one of these Contract Documents shall require supply and installation of the instrument and related wiring, supports and appurtenances by the CONTRACTOR at no additional cost to the CITY.

I. The CONTRACTOR shall provide all equipment, all materials, all labor supervision, all consumables and all scaffolding for the installation of the instrumentation systems. The CONTRACTOR shall:

Provide field engineering design, as required, for mounting and supporting details of all field mounted components.

1. Provide coordination, as required, between manufacturer's drawings and Contract Installation Drawings.

2. Provide any additional schematics and any additional interconnection diagrams that may be required to facilitate erection or completion of equipment installation.

3. Assemble and make interconnection of instruments disconnected for shipping purposes.

4. Remove all temporary supports, all bracing or other foreign objects that were installed in instrument control panels or other equipment to prevent damage during shipping, storage and/or erection.

5. Coordinate work with that of the different trades and disciplines so that interference between conduit, piping, equipment, architectural and structural work shall be avoided.

6. Install and support all instruments and all instrument piping not installed and supported by others. The Instrumentation Subcontractor shall furnish all hardware and all stands required to mount these items and provide modifications, as required, to meet actual site conditions.

7. All piping shall be field measured prior to fabrication/or erection. Any significant discrepancies between drawings and field measurements shall be reported to the ENGINEER. The CITY shall not be responsible for any costs to the CONTRACTOR for rework because of CONTRACTOR'S failure to field measure prior to initiating fabrication.

8. Capillary tubing shall be adequately supported and protected. All extra tubing shall be carefully coiled, tied, and protected at the instrument location by the CONTRACTOR.

9. Provide temporary nitrogen purging to all panels (LCP, PCM, CSI, City supplied equipment, etc.) on site before being permanently installed only where the environment requires purge.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 11000 Equipment General Provisions

2. Section 6010 Electrical General Provisions

3. Section 16050 Basic Materials and Methods

4. Section 09800 Protective Coating

5. Section 15615 Treatment Plant Valves, General

B. The monitoring and control system configurations indicated are diagrammatic. The locations of equipment are approximate unless dimensioned. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment.

C. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The CITY reserves the right to require minor changes in location of equipment prior to roughing in without incurring any additional costs or charges.

D. The CONTRACTOR shall determine exact routing and final terminations for all wiring and cables. A site visit and review of the existing system control panel is mandatory.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the reference specifications of the GENERAL REQUIREMENTS

B. The CONTRACTOR will procure all necessary permits, pay all associated costs, and shall furnish the ENGINEER with evidence of permit procurement prior to the commencement of the Work.

C. The equipment, materials and installation shall comply with the applicable standards, specifications and regulations of the following:

1. Instrument Society of America (ISA).

2. American Petroleum Institute (API).

3. National Electrical Manufacturers Association (NEMA).

4. Occupational Safety and Health Administration (OSHA).

5. American National Standards Institute (ANSI).

6. Military Standards (MIL Standards).

7. National Fire Protection Association (NFPA).

8. Scientific Apparatus Makers Association (SAMA).

9. Institute of Electrical and Electronic Engineers (IEEE).

10. National Electrical Code (NEC).

11. Insulated Cable Engineers Association (ICEA).

12. Local Power and Telephone Companies.

13. Local Authorities having jurisdiction over the work.

14. City of Los Angeles Electrical Code (CLAEC)

15. Underwriters Laboratories (UL)

16. City of Los Angeles, Department of Public Works, Bureau of Sanitation, " Operator Interface Graphic Display Standards"

17. National Institute of Standards and Technology (NIST)

18. Society of Automotive Engineers (S.A.E)

19. American Society for Testing and Materials (ASTM)

20. Steel Structures Painting Council (SSPC)

D. All electrical equipment, components, devices, etc. shall be Underwriters Laboratories APPROVED (have the UL label or be listed with reexamination in UL Publication Reference No.1). Alternatively, the equipment, etc. shall be APPROVED by a testing laboratory recognized by the City of Los Angeles and shall conform to all applicable requirements of the City of Los Angeles Department of Building and Safety.

1. In the event that the CONTRACTOR seeks approval by a recognized testing laboratory (in lieu of UL listing), the CONTRACTOR must submit the equipment, components or devices for approval to the Department of Building and Safety Electrical Test Laboratory (ETL). Where major equipment is submitted to ETL for approval, the CONTRACTOR shall submit to the ENGINEER a detailed schedule showing the approval process and approximate equipment delivery dates to insure that there will be no effect on the project completion date. No electrical equipment will be approved for delivery to the jobsite without ETL approval. All costs incurred in the approval process shall be the responsibility of the CONTRACTOR and included in the Bid.

2. A particular product being specified in the Contract Specifications does not warrant or imply approval by UL, the Department of Building and Safety or any other recognized testing laboratory. Shop drawings approval by the ENGINEER shall not supersede the requirements of the Department of Building and Safety for listed equipment.

1.4 CONTRACTOR SUBMITTALS

A. Submittals shall be made in accordance with SUBMITTALS of the GENERAL REQUIREMENTS.

B. Shop Drawings: The CONTRACTOR shall coordinate the work specified in these Sections so that a complete instrumentation and control system for the facility will be provided and will be supported by accurate shop and record drawings. As a part of the responsibility assigned to the CONTRACTOR, the Instrumentation Subcontractor shall prepare and submit through the CONTRACTOR, complete and organized shop drawings, as specified herein. Interface between instruments, motor starter, variable speed drives, flow meters, and other equipment related to instrumentation and control shall be included in the shop drawing submittal.

C. During the period of preparation of this submittal, the CONTRACTOR shall authorize direct, informal liaison between the Instrumentation Subcontractor and the ENGINEER for exchange of technical information. As a result of this liaison, certain minor refinements and revisions in the Systems as specified may be authorized informally by the ENGINEER, but these shall not alter the scope of work or cause increase or decrease in the Contract price. During this informal exchange, no oral statement by the ENGINEER shall be construed to give formal approval of any component or method, nor shall any statement be construed to grant formal exception to or variation from these Contract Documents.

D. The CONTRACTOR shall submit an analog hardware submittal that utilizes detailed shop drawings and data prepared and organized by the CONTRACTOR. All shop drawings shall include the letter head and/ or title block of the CONTRACTOR responsible for this project. The title block shall include, as a minimum, the CONTRACTOR'S registered business name and address, project name, drawing name, revision level, and personnel responsible for the content of the drawing. The quantity of submittal sets required shall be as specified in Section entitled, "Contractor Submittals." The analog hardware submittal shall be submitted as a complete bound package at one time within ninety (90) calendar days of receipt of Notice to Proceed, and shall include:

1. Drawings showing definitive diagrams for every instrumentation loop system. These diagrams shall show and identify each component of each loop or system using legend and symbols from ANSI/ISA S5.4, extending the format as shown on Drawing I-1 and as defined by the most recent revision in ISA. Each System or Loop diagram shall be drawn on a separate drawing sheet with no more than ten loops per drawing. The CONTRACTOR shall have complete responsibility to develop, submit, update and maintain in an as-built condition the loop drawings for all loops in this project including vendor supplied packages, equipment supplied under Division 17 and CITY supplied packages. The loop drawings shall also show all software modules and linkages. In addition to the expanded ISA S5.4 requirements the Loop Diagrams shall also contain the following details:

   a. ISA tag number

   b. Functional name of each Loop

   c. Tag number of the loop

   d. Reference name, drawing, and Loop diagram numbers for any signal continuing off loop diagram sheet.

   e. MCC Panel, circuit, and breaker numbers for all power feeds to the loops and instrumentation (i.e., 24VDC and 120VAC).

   f. Designation and if appropriate terminal assignments associated with every manhole, pullbox, junction box, conduit and panel the loop circuits pass through.

   g. Vendor panel, instrument panel, conduit, junction boxes, equipment and DCS terminations, termination identification wire numbers and colors, power circuits, and ground identifications.

2. Fully executed ISA-S20 data sheets for each component, together with a technical product brochure or bulletin. The technical product brochures must be complete enough to verify conformance to all Contract Document requirements. The data sheets, as a minimum, shall show:

   a. Component functional description used herein and on the Drawings;

   b. Manufacturer's model number or other product designation;

   c. Project tag number used herein and on the Drawings;

d. Project system or loop of which the component is a part;

e. Project location or assembly at which the component is to be installed;

f. Input and output characteristics;

g. Scale range and units (if any) and multiplier (if any);

h. Requirements for electric supply (if any);

i. Requirements for air supply (if any);

j. Materials of component parts to be in contact with, or otherwise exposed to, process media; and

k. Special requirements or features.

3. A complete index shall appear in the front of each bound submittal volume. A separate technical brochure or bulletin shall be included with each instrument data sheet. The data sheets shall be indexed in the submittal by systems or loops, as a separate group for each system or loop. If, within a single system or loop, a single instrument is employed more than once, one data sheet with one brochure or bulletin may cover all identical uses of that instrument in that system. Each brochure or bulletin shall include a list of tag numbers for which it applies. System groups shall be separated by labeled tags.

4. Drawings showing both schematic and wiring diagrams for control circuits: Complete details on the circuit interrelationship of all devices within and outside each Control Board shall be submitted first, using schematic control diagrams. Subsequent to return of this first submittal by the ENGINEER, piping and wiring diagrams shall be prepared and submitted for review by the ENGINEER; the diagrams shall consist of component layout drawings to scale, showing numbered terminals on components together with the unique number of the wire to be connected to each terminal. Piping and wiring diagrams shall show terminal assignments from all primary measurement devices, such as flow meters, and to all final control devices, such as pumps, valves, chemical feeders and vendor panels. Should an error be found in a shop drawing during installation on start-up of equipment, the correction, including any field changes found necessary, shall be noted on the drawing and a " Record" drawing be prepared and submitted by the CONTRACTOR, reviewed and accepted by the ENGINEER prior to the acceptance of the project. The CONTRACTOR shall furnish all necessary equipment supplier's shop drawings to facilitate inclusion of this information by the CONTRACTOR. The CONTRACTOR shall respond to all comments on the shop drawing resubmittals made by the ENGINEER either by noted corrections or stating why it was not revised. Any resubmittals received by the ENGINEER which do not contain responses to the ENGINEER's previous comments shall be returned to the CONTRACTOR marked "Rejected." No further review by the ENGINEER shall be performed until the CONTRACTOR responds to these comments.

5. Assembly and construction drawings for each alarm annunciator, local indicating panel and for other special enclosed assemblies for field installation: These drawings shall include dimensions, identification of all components, surface preparation and finish data, nameplates, and the like. These drawings also shall include enough other details, including prototype photographs, to define exactly the style and overall appearance of the assembly; a finish treatment sample shall be included.

6. Installation, mounting, and anchoring details for all components and assemblies to be field-mounted, including conduit connection or entry details.

7. A bill of material list shall be submitted for each field mounted device or assembly as well as cabinet assemblies and sub assemblies. Bills of material shall include all items within an enclosure. The submittal shall be a complete and detailed bill of materials. An incomplete submittal shall be rejected and no further evaluation performed until a completed and detailed bill is submitted.

E. Organization and Binding of Shop Drawings: The organization of the initial shop drawing submittal shall be compatible to eventual inclusion with the technical manuals submittal and shall include final alterations reflecting "record" conditions. Accordingly, the final approved multiple-copy shop drawing submittal shall be separately bound in 3-ring binders of the type specified in TECHNICAL MANUALS of the GENERAL REQUIREMENTS.

F. Technical Manuals: In addition to updated shop drawing information to reflect actual existing conditions, each set of technical manuals shall include installation, connection, operating, troubleshooting, maintenance and overhaul instructions in complete detail. This shall provide the CITY with comprehensive information on all systems and components to enable operation, service, maintenance and repair. Exploded or other detailed views of all instruments, assemblies and accessory components shall be included together with complete parts lists and ordering instructions. Technical Manuals shall be in accordance with TECHNICAL MANUALS of the GENERAL REQUIREMENTS

G. Control Panel Engineering Submittal: The Instrumentation Subcontractor shall submit a control panel engineering submittal (CPES) for each control panel being provided under this Specification Section. The CPES shall completely define and document the construction, finish, layout, power circuits, signal and safety grounding circuits, fuses, circuit breakers, signal circuits, internally mounted instrumentation components, faceplate mounted instrumentation components, internal panel arrangements, and external panel arrangements. All panel drawings shall, as a minimum, be "B" size with all data sheets and manufacturer specification sheets being "A" size. The submittal shall be in conformance with NEMA Standard ICS 1-1.01, shall be submitted as a single complete bound volume or multi-volume package within 120 calendar days after contract award and shall have the following contents:

1. A complete index shall appear in the front of each bound volume. All drawings and data sheets associated with a panel shall be grouped together with the panels being indexed by systems or process areas. All panel tagging and nameplate nomenclature shall be consistent with the requirements of the Contract Documents.

2. Construction drawings drawn to a 1-1/2-inch = 1-foot scale which define and quantify the type and gage of fabrication steel to be used for panel fabrication, the ASTM grade to be used for structural shapes and straps, panel door locks and hinge mechanisms, type of bolts and bolt locations for section joining and anchoring, details on the utilization of "UNISTRUT" and proposed locations, stiffener materials and locations, electrical terminal box and outlet locations, electrical access locations, print pocket locations, writing board locations and lifting lug material and locations.

3. Physical arrangement drawings drawn to 1-1/2-inch = 1 foot scale which define and quantify the physical groupings comprising control panel sections, auxiliary panels, subpanels, and racks. Cutout locations with nameplate identifications shall be provided.

4. Schematic/Elementary diagrams shall depict all control devices and circuits and their functions.

5. Wiring/Connection diagrams shall locate and identify electrical devices, terminals and interconnecting wiring. These diagrams shall show interconnecting wiring by lines, designate terminal assignments, and show the physical location of all electrical and control devices.

6. Interconnection diagrams shall locate and identify all external connections between the control panel/control panel devices and associated equipment. These diagrams shall show interconnecting wiring by lines, designate terminal assignments, and show the physical location of all panel ingress and egress points.

7. Control sequence diagrams shall be submitted to portray the contact positions or connections required to be made for each successive step of the control action.

8. Completed ISA-S20 data sheets for all instrumentation devices associated with each control panel supplemented with manufacturer specification sheets which verify the products conformance to the requirements of the Contract Documents.

9. A bill of material which enumerates all devices associated with the control panel.

H. Test Procedure Submittal: The Instrumentation Subcontractor shall submit the procedures proposed to be followed during the tests required under this project. Procedures shall include statement indicating test objectives, test descriptions, forms, and checklists to be used to control and document the required tests. Prior to the preparation of the detailed test procedures, the CONTRACTOR shall submit outlines of the specific proposed tests. Submittals shall include examples of the proposed forms and checklists. Once the Preliminary Test Procedure Submittals have been reviewed by the ENGINEER and returned stamped either "no exceptions noted" or "make corrections noted", the Instrumentation Subcontractor shall submit the proposed detailed test procedures, forms, and checklists. Once the detailed Test Procedures Submittals have been reviewed by the ENGINEER and returned stamped either "no exceptions noted" or "make corrections noted", the tests may be scheduled. Upon completion of each required test, a copy of the signed-off test procedures shall be submitted as test documentation. These requirements shall apply to the factory testing of all panels, and all on-site tests.

I. The organization of the initial shop drawing submittal required above shall be compatible to eventual inclusion with the Technical Manuals submittal and shall include final alterations reflecting "record" conditions. Submittals not organized as described above and incomplete submittals for a given Loop will not be accepted. Accordingly, the initial multiple-copy shop drawing submittal shall be separately bound in a standard size, 3-ring, loose-leaf, vinyl plastic, hard cover, binder suitable for bookshelf storage. Binder ring size shall not exceed 2-inches.

J. Control Valve Submittal: The CONTRACTOR shall submit the following data 90 days after Notice to Proceed:

1. Dimensional Outline and Mounting Details
2. Diagrams (wiring, schematic, logic, etc.)
3. Certified Performance Data
4. Calculations for Valve Sizing
5. Welding procedures and Qualification Test
6. Cross Sections with Parts List
7. Non-destructive Testing Procedures
8. Inspection and Test Plan

K. Instrument Installation Detail and Submittal: The CONTRACTOR shall submit the following data 180 days after Notice to Proceed:

1. Detail and Instrument Installation drawings.

2. Bill of Materials.

3. Prior to acceptance, the control valve suppler shall submit function test verification certifications and hydrostatic leak test certifications.

1.5 QUALITY ASSURANCE

A. Accuracy: The accuracy of each instrumentation system or loop shall be as determined as a probable maximum error; this shall be the square-root of the sum of the squares of certified "accuracies" of the designated components in each system, expressed as a percentage of the actual span or value of the measured variable. Each individual instrument shall have a minimum accuracy of ±0.5 percent of full scale and a minimum repeatability of ±0.25 percent of full scale unless otherwise specified. Instruments which do not conform to or improve upon these criteria are not acceptable.

B. Where materials and equipment are specified to conform to the standards of the Underwriter's Laboratories, the label of, or listing with reexamination in UL Publication Reference No. 1, shall be accepted as sufficient evidence that the items conform to Underwriter's Laboratories requirements. In lieu of such label, listing of the materials or equipment by a recognized approved testing laboratory as stated in the CITY of Los Angeles Electrical Code will be acceptable as interpreted by the CITY's Department of Building and Safety.

1.6 PRESUBMITTAL CONFERENCE

A. The CONTRACTOR shall arrange and conduct a Presubmittal Conference on the instrumentation and control system work 15 days after the Notice to Proceed. The Instrumentation Subcontractor shall allow one eight-hour working day for the conference. The purpose of the Presubmittal Conference shall be to informally review and approve the manner in which the Instrumentation Subcontractor intends to respond to the Contract requirements before any submittals are prepared. The Instrumentation Subcontractor shall prepare the following items for presentation at the Presubmittal Conference:

1. A list of equipment and materials required for the control system and the manufacturer and model number which the Instrumentation Subcontractor proposes to use for each item.

2. A list of proposed exceptions to the Specifications and Drawings, along with a brief explanation of each. Approval shall be subject to formal submittal and review by the ENGINEER.

3. An exact one-to-one sample of each type of submittal specified herein.

4. A bar chart type schedule for all system related activities from the Presubmittal Conference through startup and training. The schedule shall include the dates relative to submittals, design, fabrication, programming, factory testing, deliveries, installation, field testing, and training. The schedule shall be subdivided to show activities relative to each major item or group of items.

5. The CONTRACTOR shall provide 3 copies of Presubmittal Conference data to the ENGINEER.

B. The CONTRACTOR shall keep formal meeting minutes. Prior to adjournment of the conference, all parties must concur in writing with the accuracy of the CONTRACTOR'S minutes.

C. Preparation of shop drawings shall not commence until after the Presubmittal Conference. Submittals required for that conference are exempted.

1.7 GUARANTEE

A. The Instrumentation Subcontractor shall guarantee all equipment and installation, as specified herein, for a period of one year following the date of completion of the work. To fulfill this obligation, the Instrumentation Subcontractor shall utilize technical service personnel designated by the Instrumentation Subcontractor to which the Instrumentation Subcontractor originally assigned project responsibility for instrumentation. Services of a noncritical nature shall be performed within 5 calendar days after notification by the CITY and critical services within 24 hours after notification.

1. CONTRACTOR supplied equipment, software, and materials which do not achieve design requirements after installation shall be replaced or modified by the CONTRACTOR to attain compliance at no additional cost to the CITY. Following replacement or modification, the CONTRACTOR shall retest the system and perform any additional procedures needed to replace the complete system in satisfactory operation at no additional cost to the CITY and attain design compliance approval from the ENGINEER.

2. All parts, materials (excluding consumables), labor, travel, subsistence, or other expenses incurred in providing all services and service visits during the one-year warranty period shall be borne by the CONTRACTOR.

1.8 MANUFACTURER'S REPRESENTATIVE SERVICES

A. The CONTRACTOR shall provide jobsite visits and services of a manufacturer's technical field representative of the following items of equipment for calibration, testing and start-up:

1. flow meters

2. programmable controller

3. any process sensing devices and indicating devices.

B. At no separate additional cost to the CITY, the CONTRACTOR shall include the following services of qualified technical representatives (see Installation, Calibration, Testing, Precommissioning, Start-up, and Instruction herein):

1. Install and connect all instruments, all elements, and all components of every system, including connection of instrument signals to primary measurement elements and to final control elements such as pumps, valves, and chemical feeders.

2. Make all necessary adjustments, calibrations and tests, as called out in Paragraphs 3.3 and 3.4 of this section. The results will be logged and witnessed on test sheets supplied in this section.

3. Instruct plant operating and maintenance personnel on the instrumentation. This time shall be in addition to whatever time is required for other facets of work at the site, and shall be the OWNER's normal working days and hours.

1.9 SHOP INSPECTION

A. Shop Inspection and Performance Testing: The CONTRACTOR shall arrange for shop inspection and performance testing of the equipment according to Section 11000, Equipment General Provisions.

1. All equipment shall be subject to shop inspection in accordance with SAMPLING, TESTING, AND FABRICATION INSPECTION of the GENERAL REQUIREMENTS.

2. The equipment shall be performance tested and witnessed by the INSPECTOR and/or the Control System ENGINEER in accordance with SAMPLING, TESTING, AND FABRICATION INSPECTION of the GENERAL REQUIREMENTS.

a. Performance testing shall be conducted at the Manufacturer's shop or factory.

3. For all equipment, the CONTRACTOR shall obtain and submit the following to the ENGINEER at least 6 weeks before test date for approval:

   a. The Manufacturer's factory test procedure, including test raw data and report forms, and testing schedule prior to equipment testing.

   b. The CONTRACTOR shall obtain and submit to the ENGINEER for approval the final factory test reports prior to shipping of equipment.

B. Field Performance Test and Reports: All equipment shall be performance tested after installation at the field operating site according to Section 11000, Equipment General Provisions.

1. Testing shall not start until all preliminary checks and calibrations have been completed, the installation has been certified ready for testing by the Manufacturer's representative, and the test forms and procedure have been approved by the ENGINEER.

2. All test information shall be recorded on forms provided by the CITY or approved by the ENGINEER. If forms are not available from the CITY, the CONTRACTOR shall prepare forms and submit for approval prior to the scheduled start of the test.

3. The CONTRACTOR shall submit the test procedure for approval prior to the scheduled start of the test.

4. The CONTRACTOR shall prepare a field performance test report, including all raw data, and submit the report within 14 calendar days after approved completion of the equipment field test.

1.10 PERSONNEL TRAINING

A. The CONTRACTOR shall provide a comprehensive manufacturer training program for CITY personnel in the operation and maintenance of the equipment.

1. The training program shall be divided into at least two (2) separate sessions, namely:

   a. Operations Training: To be conducted during the CITY's overall process training sessions.

   b. Maintenance Training: To be conducted during or after the start-up and commissioning phase of the project.

   c. Include training for programming and operation of installed PLCs.

2. The training program shall be composed of the following elements:

	Number of 8-hour Sessions:	Number of CITY Personnel Attending Sessions:
OPERATIONS	2	10
MAINTENANCE	2	8

3. The CONTRACTOR shall submit the Manufacturer training program to the ENGINEER for approval.

4. The Manufacturer training program shall be in accordance with OPERATIONS AND MAINTENANCE TRAINING of the GENERAL REQUIREMENTS and as specified herein.

PART 2 -- PRODUCTS

2.1 GENERAL

A. The CONTRACTOR shall provide all instrumentation and related wiring as specified on any one of the following instrument or electrical documents:

1. Instrument Location Drawings, Instrument Index, Instrument Data Sheets, Loop & Logic Diagrams, I/O Tabulation, Loop Description, One-Line Electrical Diagrams, or as indicated on any other contract document.

2. Indication of required instrumentation work on any one of these contract documents shall require supply and installation of the instrument and related wiring, supports, appurtenances, etc., by the CONTRACTOR at no additional cost to the CITY.

3. Assume full responsibility to perform all engineering to select, furnish, install, program, test, calibrate, and place into operation all instrumentation, control panels, and programmable controller for a complete and functional system.

B. The monitoring and control system configurations indicated are diagrammatic. The locations of equipment are approximate unless dimensioned. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The CITY reserves the right to require minor changes in location of equipment prior to roughing in without incurring any additional costs or charges. The Instrumentation Subcontractor shall review the existing site conditions and examine all shop drawings for the various items of equipment in order to determine terminations for all wiring and cables. All deviations from the Drawings or Specifications must be approved in writing by the ENGINEER.

C. All meters, instruments, and other components shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the shop drawings unless otherwise specified to match existing equipment.

D. All panel mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be of one manufacturer.

E. All instrumentation shall be rated for operation in the ambient conditions at the equipment installation locations. NEMA 4X rated enclosures suitable for the environment shall be furnished in all general purpose areas.

F. All instrumentation in hazardous areas shall be approved for use in the particular hazardous location in which it is to be installed.

G. Analog measurements and control signals shall be electrical as indicated herein, and shall vary in direct linear proportion to the measured variable, except as noted. Electrical signals outside control board(s) shall be 4 to 20 milliamperes dc except as noted. Signals within enclosures may be 1-5 volts dc. Dropping resistors shall be installed at all field side terminations in the control panels to ensure loop integrity.

H. All control panels shall be provided with redundant power supplies which are configured in a fault-tolerant manner to prevent (a) interruption of service upon failure, and (b) interruption of service necessitated by the replacement of a power supply. All power supplies shall have an excess rated capacity of forty (40) percent.

I. Each control loop shall be individually fused.

J. Equipment or methods requiring redesign of any project details are not acceptable without prior approval of the ENGINEER. Any changes inherent to a proposed alternative shall be at no additional cost to the CITY. The required approval shall be obtained in writing by the Instrumentation Subcontractor through the CONTRACTOR prior to submittal of shop drawings and data. Any proposal for approval of alternative equipment or methods shall include evidence of improved performance, operational advantage and maintenance enhancement over the equipment or method specified, or shall include evidence that a specified component is not available. Otherwise, alternative equipment (other than direct, equivalent substitutions) and alternative methods shall not be proposed.

K. All field mounted instrument and control equipment mounted outside of protective structures shall be equipped with suitable surge-arresting devices to protect the equipment from damage due to electrical transients induced in the interconnecting lines from lightning discharges or nearby electrical devices. Protective devices used on 120V ac inputs to field mounted equipment shall be secondary surge protectors conforming to the requirements of IEEE Standard 28-1972 (ANSI C62.1-1971).

L. The CONTRACTOR shall provide all equipment, material, labor supervision, consumables, scaffolding, etc., for the installation of the instrumentation systems in accordance with the drawings and specification listed herein.

1. Provide field engineering design, as required, for mounting and supporting details of all field mounted components.

2. Provide coordination, as required, between manufacturer's drawings and contract installation drawings.

3. Provide any additional schematic and interconnection diagrams that may be required to facilitate erection or complete the installation of equipment.

4. Assemble and make interconnection of instruments disconnected for shipping purposes.

5. Remove all temporary supports, bracing or other foreign objects that were installed in instruments, control panels or other equipment to prevent damage during shipping, storage and/or erection.

6. Coordinate his work with that of the different trades so that interference between conduit, piping, equipment, architectural and structural work shall be avoided.

7. Install and support all instruments and instrument piping not installed and supported by others. The CONTRACTOR shall furnish all hardware and stands required to mount these items and modify to meet actual site conditions.

8. All piping shall be field measured prior to fabrication/or erection. Any significant discrepancies between drawings and field measurements shall be reported to the ENGINEER. The CITY shall not be responsible for any costs to the CONTRACTOR for rework because of the CONTRACTOR's failure to field measure prior to initiating fabrication.

9. Adequately support and protect capillary tubing. All extra tubing shall be carefully coiled, tied, and protected at the instrument by the CONTRACTOR.

M. The equipment loop, logic and elementary diagrams are based on non-certified vendor information and indicate minimum scope of supply from the equipment manufacturer. The CONTRACTOR shall include additional costs in his bid to add additional instruments, wiring, computer inputs/outputs, controls, conduit, interlocks, electrical hardware, etc., into the design based on equipment manufacturer's final certified vendor prints. The CONTRACTOR shall revise or produce new loop,

logic, or elementary diagrams to meet the equipment manufacturer's wiring requirements. Such changes to instrumentation and electrical work shall be incorporated into the scope of work at no additional cost to the CITY in light of the CONTRACTOR's knowledge that non-certified vendor information has been used in the design.

2.2 SPARE PARTS

A. The CONTRACTOR shall obtain and submit from the manufacturer a list of suggested spare parts for each piece of equipment according to the provisions of SPARE PARTS of the GENERAL REQUIREMENTS. The CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment.

1. During the term of this Contract the CONTRACTOR shall notify the ENGINEER in writing about any manufacturer's modification of the approved spare parts, such as part number, interchangeability, model change or others. If the ENGINEER determines that the modified parts are no longer applicable to the supplied equipment, the CONTRACTOR at its expense shall provide applicable spare parts.

2.3 CONTROL PANELS

A. General:

1. The Instrumentation Subcontractor shall furnish, supply and install all control panels and enclosures for this project needed for complete installation of instrumentation and control equipment as shown on the drawings and specified herein.

2. All panels and enclosures shall meet the NEMA classification (NEMA rated 7 or 9 for hazardous environments and 4X for corrosive environments) for the environment where they are installed.

3. Front of panel layouts for all control panels shall be submitted to the ENGINEER for review and approval prior to start of fabrication.

4. Dimensions shall be in accordance with manufacturer's requirements. Elevations and horizontal spacing shall be subject to ENGINEER's approval.

5. The CONTRACTOR shall furnish, supply and install all control panels for this project in accordance with the below listed specifications. This section, also, covers requirements for local control panels being supplied by the Equipment Manufacturer. Additionally, due to the corrosive nature of environments at solids handling plants, the control panels shall be provided with all required taps, fittings, rotameters, regulation and when specified alarm interlocks to enable the implementation of an air purge system which is in conformance with ISA-S12.4 Type Z requirements.

6. This specification covers the requirements for the fabrication of instrument panel boards, mounting, finishing, piping and wiring of instrument equipment.

7. Front of panel layouts for all control panels shall be submitted to the ENGINEER for review and approval prior to start of fabrication. Refer to other requirements as outlined in Paragraph O-Drawings, below.

8. For panels and enclosures with NEMA ratings of 2, 3, 3S, 3R, 4, 4X, 6 and 12, all conduit entries shall be Myers hubs or equivalent.

B. Mounting of Instruments:

1. The panel vendor shall provide cut-outs, and shall mount all instrument items shown or specified to be panel mounted, including any instruments specified to be furnished by other vendors but installed in panel (if applicable).

2. The panel vendor shall also mount, behind the panels, other instrument accessory items as required and/or specified.

3. Enclosure for all the front panel mounted instruments shall be NEMA 4X rated. Instruments which are not rated NEMA 4X shall be covered with a door and a window to provide overall NEMA 4X rating.

4. Rear of panel mounted equipment shall be installed with due regard to commissioning adjustments, servicing requirements and cover removal.

5. Spare space shall be kept clear of wiring, etc., to give maximum space for future additions.

C. Piping Requirements:

1. The panels shall be furnished with terminal connections near the top, rear of the panel for all tubing and piping which connect to instruments, valves, instrument air supply and other pressure leads to the panel. Terminal connections for tubing are to be bulkhead tube unions as described below. Those for pipe shall be threaded couplings, plugged for shipping purposes.

2. All tubing and pipe fittings, and instrument valving shall be 316 stainless steel (SS).

3. Each terminal connection shall have an engraved metal or plastic plate with a terminal and instrument tag number.

D. Electrical Requirements for Control Panels:

1. The CONTRACTOR shall furnish and install all the necessary conduit, wireways, switches, and electrical fittings with wire for all circuits to instruments and other panel electrical devices to assure a complete and acceptable installation.

2. Signal and low voltage wiring shall be run separately from power and 120-volt control wiring.

3. Conduit, wireways, junction boxes and fittings shall be installed for all signal wire, all thermocouple or resistance thermometer lead wire. Conduit or wireway runs shall include those required between temperature sensors and temperature indicators and between the thermocouple wireway or junction box to instruments.

4. Each terminal connection shall have a plastic plate with a terminal and instrument tag number. All wiring shall be identified with stamped tubular wire and markers.

5. Freestanding panels shall be provided with switched fluorescent back-of-panel lights. One light shall be provided for every 4-feet of panel width and shall be mounted inside and in the top of the back-of-panel area.

6. Freestanding panels shall be provided with a 15-amp, 120-volt, ground fault interrupted (GFI) service outlet circuit within the back-of-panel area. The circuit shall be provided with three-wire, 120-volt, 15-ampere, duplex receptacles, one for every 4-feet of panel width (two minimum per panel) and spaced evenly along the back-of-panel area.

7. Smaller panels shall be so sized as to adequately dissipate heat generated by equipment mounted in or on the panel.

8. Where smaller panels are mounted outside or in unshaded areas, they shall be provided with thermostatically controlled heaters that will maintain their inside temperature above 40 F.

    a. Provide a hand switch controlled 100-watt incandescent light and a breaker protected 120-volt, 15-amp duplex receptacle within each smaller panel

9. Wiring Methods:

    a. Wiring methods and materials for all panels shall be in accordance with the N.E.C. requirements for General Purpose (no open wiring) unless otherwise specified. Open wiring in close cabinet type panels is allowed when specified in the material specifications. Unless otherwise specified by the material specification, design and installation of materials shall conform to the requirements of the latest edition of the following standards and codes as a minimum.

        - The National Electrical Code
        - All National Safety Codes
        - American Petroleum Institute Standard RP-550
        - Applicable Local Law and Regulations

    b. Unless otherwise specified by the material specifications, all instruments, alarm systems and motor controls shall operate on 115-volt, 60-Hertz circuits.

    c. At a location near the top of the panel (or bottom), the panel fabricator is to furnish terminal box connections for the main power supply entry.

    c. Power supply switches for alarm units shall be three-pole type, arranged to open both the power and alarm circuits. Each annunciator equipped with a separate switch.

    d. Instruments located on the same panel section and serving the same process unit may be connected to a common branch circuit from the power supply. The numbers of circuits depends on the circuit load as noted herein. A 15-amp, two-pole circuit breaker shall be provided in each branch circuit. The circuit load shall not exceed 10 amps. Different panel sections or different process units must not use common branch circuits.

    e. When instruments do not come equipped with integral fuses, the panel fabricator shall furnish and install fuses as required for the protection of individual instruments against fault currents. Fuses shall be mounted on the back of the panel, in fuseholder and each fuse shall be identified by a service name tag. Fuses shall be as manufactured by Bussman Manufacturing Division, or equal, Type KAW TRON.

    f. Where alarm units are single unit types, one switch may be used to disconnect not more than six alarm units located on the same or adjacent panels.

10. Material:

    a. Wire for all 120 volt circuits shall be No. 14 AWG stranded with lugs with Type THWN or THHN insulation. All terminals for external wiring connections shall be suitable for No. 12 AWG wire.

    b. Flexible conduit is not allowed except when specifically approved by the ENGINEER in writing.

    c. Conduit fittings shall be Crouse-Hinds cast fittings or equal.

    d. Splicing of wires in conduits will not be allowed. All wire terminations shall have crimped wire lugs and terminated on strips or blocks in pull boxes or panels.

e. For case grounding, panels shall be furnished with a 1/4" x 1" copper ground bus..

11. Electrical Locations:

a. When contract drawings or specifications call for thermocouple actuated instruments, the thermocouple lead wire will be installed, without junction, by CONTRACTOR. The panel vendor shall furnish dedicated empty conduit or wireway running from the instrument(s) to the top or bottom of the panel as called for in the material specifications or as otherwise required. Sizing of the conduit or wireway shall be in accordance with the capacity of the instrument(s).

b. Single case (no remote logic) annunciator units installed at the top of a panel may be considered as being a terminal box when top of panel wire entry is specified. If bottom of panel entry is specified, a terminal box shall be provided at the bottom of the panel and wired to the annunciator. Terminals shall be identified with plastic marker strips.

c. Terminal boxes for incoming and outgoing signal leads shall be located at the top or bottom of the panel as specified in the material specification, or as otherwise required.

E. Panel Annunciation:

1. Unless otherwise noted, the following color code and inscriptions shall be followed for the lenses of all indicating lights:

TAG	INSCRIPTION(S)	COLOR
ON	ON	Red
OFF	OFF	Green
OPEN	OPEN	Red
CLOSED	CLOSED	Green
LOW	LOW	Red
FAIL	FAIL	Red
HIGH	HIGH	Red

2. Lettering shall be black on white and amber lenses. Lettering shall be white on red and green lenses.

3. Unless otherwise noted, the following color codes and inscriptions shall be followed for all pushbuttons:

TAG	INSCRIPTION(S)	COLOR
OO	ON	Green
	OFF	Amber
OC	OPEN	Green
	CLOSE	Amber
OCA	OPEN	Green
	CLOSE	Amber
	AUTO	Blue

TAG	INSCRIPTION(S)	COLOR
OOA	ON	Red
	OFF	Green
	AUTO	Amber
MA	MANUAL	Amber
	AUTO	Blue
SS	START	Red
	STOP	Green
RESET	RESET	Red

4. All unused or noninscribed buttons shall be black. Lettering shall be black on white and yellow buttons. Lettering shall be white on black, red and green buttons.

F. Construction Methods:

1. Materials: 316 stainless steel.

   a. Panel section faces shall be #10 gage minimum thickness steel for free standing panels and #14 gage minimum thickness steel for smaller panels. All materials shall be selected for levelness and smoothness.

   b. Relay rack high density type panels shall utilize standard relay racks with 14 gage steel frame and supports.

   c. Structural Shapes and Strap Steel: ASTM A-283.

   d. Bolting Material: Commercial quality carbon steel bolts, nuts and washers, all 1/2-inch diameter with UNC threads. Carriage bolts shall be used for attaching end plates. All other bolts shall be hex head machine bolts. All nuts shall be hot pressed hex, American Standard, heavy. Standard wrought washers shall be used for foundation bolts and attachments to building structures. All other bolted joints shall have S.A.E. standard lock washers.

2. Construction: All dimensions shall be in accordance with vendors' requirements. The elevations and horizontal spacing shall be subject to the ENGINEER's approval.

G. Fabrication Requirements:

1. End plates, top plates and top closure panels (to hung ceiling) shall be furnished when required by the material requisition. End plates, top plates and top closure panels shall be removable with countersunk bolts to match panels. Top closure panels shall be furnished in lengths which match the widths of standard panels, except that one top closure panel may extend across two 4-feet 6-inches wide or five 2-feet 0-inches wide standard panels. The vertical joints of these panels shall align with the vertical joints of the standard panels.

2. End closure or rear closure doors shall be provided. Such doors shall be flush fitting and gasketed and be of the hinged lift-off type with lockable door handles. A common key shall be provided for all doors on one panel assembly. Where removable access panels are specified they shall be furnished with dished handle fasteners. Screw driver 1/4 turn or Dzus type fasteners are not acceptable.

   a. The flanged edges of all panels shall be straight and smooth. Corners shall be welded and ground smooth.

b. The face of the panel shall be true and level after flanging.

c. All panel cut-outs and holes may be cut or drilled by any standard method that will not cause deformation. Burrs shall be ground smooth.

d. Adjacent panels shall assemble with faces flush. Gaps or cracks shall not be visible from the front of the assembled instrument board.

e. Stiffeners shall be welded to the back of panels, as required to prevent panel deformation due to the weight of front of panel mounted instruments.

f. Panels shall be self-supporting as defined below.

H. Frameworks and Supports:

1. The rear of each panel section shall have a steel framework assembled to it for supporting conduit, tubing, wireways, switches, air piping and all instrument accessory items such as relay or terminal enclosures, transducers, pressure switches, valves and air relays. The main frame work shall be constructed of standard structural shapes. Special shapes such as "Unistrut" may be used for secondary supports. Framework must not interfere with instrument connections or access needed for maintenance or adjustments.

2. Steel framework shall extend 2-feet 8-inches back of the panel face, or as specified in the material requisition. Where specified, individual adjustable leg supports shall be provided at the back of the framework so that the entire panel shall be self-supporting.

3. Two removable lifting lugs shall be provided as shown.

I. Preparation of Panel Surface:

1. The surface of the panel shall be prepared for finishing in a manner equal to that described below. The entire surface shall comprise the front and rear face of the panel, both sides and the edges of all flanges, and the periphery of all holes or cut-outs.

a. All high spots, burrs, and rough spots shall be ground smooth.

b. The surfaces shall be sanded or sandblasted to a smooth, clean bright finish.

c. All traces of oil shall be removed with a solvent.

d. The first coat of primer shall be applied immediately.

J. Panel Finishing:

1. A thin coat primer surface shall be applied over the entire panel surface. Minimum dry film thickness of primer coat shall be 1 mil.

2. A primer surface shall be applied on the front of the panel only. Minimum dry film thickness of primer coat shall be 1 mil.

3. Wet sand to smooth clear finish, then dry.

4. At least two coats of air-dry, epoxy paint shall be applied over the entire surface. Dry film thickness of lacquer enamel shall be 1 to 2.5 mil. Color to be as approved by the ENGINEER.

5. The CONTRACTOR shall supply two pint containers of air drying, matching paint for field touch-up of the panel face.

K. Instrument Finishing: The final coats applied to painted surface of instrument cases, doors, or bezels which are visible from the front of panels shall be manufacturer's standard unless otherwise specified. Black japan or "crinkle" finishes on instrument cases are not acceptable.

L. Piping Requirements for Control Panels:

1. General Requirements:

a. The panel vendor shall furnish terminal connections near the top, rear of the panel for all tubing and piping which connect to instruments, valves, instruments air supply and other pressure leads to the panel. Terminal connections for tubing are to be bulkhead tube unions as described below. Those for pipe shall be threaded couplings, plugged for shipping purposes.

b. Each terminal connection shall have an engraved metal or plastic plate with a terminal and instrument tag number.

c. The panel vendor shall furnish the air supply pressure reducing station, all instrument and supply piping and all pneumatic tubing or piping to terminal connections and between instrument items located within the confines of the panel and supporting framework.

M. Preparation for Shipment and Shipping:

1. All panels are to be crated for shipment using a heavy framework and skids. The panel sections shall further be cushioned satisfactorily to protect the finish of the instruments and panel during shipment. All instruments which are shipped with the panel shall further have suitable shipping stops and cushioning material installed in a manner to protect instrument parts which could be damaged due to mechanical shock during shipment. Each separate panel unit shall be provided with removable lifting lugs to facilitate handling.

2. All shipments shall be by air ride van, unless otherwise specified or approved.

N. Labor and Workmanship: All panels shall be fabricated, piped and wired by fully qualified workers who are properly trained, experienced and supervised.

O. Drawings:

1. The vendor is required to furnish copies of preliminary drawings for approval. These drawings shall include:

a. Complete panel layouts showing all outside dimensions, locations and dimensions of panel cutouts, locations of back of panel stiffeners, and panel face drawings to exact scale.

b. Terminal point locations with coded identification for wiring, and piping connections (includes all 1/4" pneumatic transmission lines).

c. Back of panel piping.

d. Back of panel wiring, including dimensioned location of connections.

2. Fabrication of panels, piping and wiring is to be withheld pending written release for fabrication or approval of preliminary drawings by the ENGINEER.

3. The ENGINEER's requirements for final certified drawings include final approved copies of the above described preliminary drawings as well as certified drawings of instrument equipment furnished by the panel fabricator.

4. The number of copies of final certified drawings required by the ENGINEER and the required procedure for identification of these drawings are covered by the GENERAL CONDITIONS.

P. Inspection and Approval:

1. Panel fabricator must carry out the following tests prior to arrival of the ENGINEER and the INSPECTOR:

a. All air lines adequately tested for leaks.

b. All alarm circuits rung out to determine their operability.

c. All electrical circuits checked for continuity and where applicable, operability.

d. All nameplates checked for correct spelling and correct size of letters.

e. Any other test required to place the panel in an operating condition.

2. It shall be the responsibility of the CONTRACTOR to furnish all necessary testing devices and sufficient manpower to perform the tests required by the ENGINEER and the INSPECTOR.

3. If the above tests have not been per formed prior to the arrival of the ENGINEER and the INSPECTOR, the CONTRACTOR shall be liable for back charges by the ENGINEER for the extra time required for the inspection services.

Q. Photographs: Fabricator shall furnish two (2) copies of 8 x 10 glossy photographs of the front and rear of the finished panel for ENGINEER's record.

2.4 GENERAL ENCLOSURE COMPONENTS

A. Signal Isolators, Converters, and Power Supplies: Signal isolators shall be furnished and installed in each measurement and control loop, wherever required, to ensure adjacent component impedance match, or where feedback paths may be generated or to maintain loop integrity when the removal of a component of a loop is required. Signal converters shall be included where required to resolve any signal level incompatibilities. Signal power supplies shall be included, as required by the manufacturer's instrument load characteristics, to ensure sufficient power to each loop component.

B. General Purpose Relays: General purpose relays in the Control Boards(s) shall be plug-in type with 2DPDT contacts rated 10 amperes at 120 volts ac. Each relay shall be enclosed in a clear plastic heat and shock resistant dust cover. Sockets for relays shall have screw type terminals. Relays shall be Potter and Brumfield Type KRP or KUP, Square D Type K, or equal.

C. Time Delay Relays: Time delay relays shall be pneumatic on-delay or off-delay type, with contacts rated 10-amperes at 120-volts ac. Units shall include adjustable dial with graduated scale covering the time range in each case. Time delay relays shall be Agastat Series 7000 or equal.

D. Slave Relays: Additional relays (slave relays) shall be installed and wired when the number or type of contacts shown exceed the contact capacity of the specified relays and timers.

E. Circuit Breakers: Circuit breakers shall be single pole, 120-volt, 15 ampere rating or as required to protect wires and equipment and mounted inside the panels.

F. Nameplates:

1. Nameplates shall be provided for instruments, function titles for each group of instruments, and other components mounted on the front panel(s) as shown. A nameplate shall be provided for

each signal transducer, signal converter, signal isolator, each electronic trip, and the like, mounted inside the panel(s). These shall be descriptive, to define the function and system of such element. These nameplates shall be of the same material as those on the front of the panel(s). The nameplates shall be descriptive to define the equipment tag, function and system. The nameplates shall be made from phenolic material 1/8 inch thick having a black exterior and white center. They shall be fastened with stainless steel machine screws. Tag numbers shall be coded to CITY numbering system (Ref. to Sec. 11000).

2. Nameplates shall be fabricated from VI-LAM, Catalog No. 200, manufactured by N/P Company, or equivalent by Formica, or equal. Colors, lettering, styles, abbreviations and sizes shall be in conformance with ISA-RP-60.6 (1984) with an intended viewing distance of three (3) to six (6) feet as shown or as selected by the ENGINEER.

3. Before being produced, the CONTRACTOR shall submit a list indicating the wording and tag numbering of all equipment identification Nameplates along with a sample to the Engineer for approval.

G. Terminal Blocks: Terminal blocks shall be molded plastic with barriers and box lug terminals, and shall be rated 15 amperes at 600-volts. White marking strips, fastened securely to the molded sections, shall be provided and wire numbers or circuit identifications shall be marked thereon with permanent marking fluid. Terminal blocks shall be General Electric Type CR 151A1 with mounting rack, equivalent by Cinch-Jones, or equal.

H. Signal and Control Circuit Wiring:

1. Wire type and sizes:

a. Conductor shall be flexible stranded copper machine tool wire; these shall be UL listed Type MTW and shall be rated 600-volts. Wires for instrument signal circuits and alarm input circuits shall be No. 14 AWG. All other wires, including shielded cables, shall be No. 16 AWG minimum.

b. All signal and low voltage wiring shall be run separately from power supply and 120V control wiring.

2. Wire Insulation Colors: Conductors supplying 120-volts AC power on the line side of a disconnecting switch shall have a black insulation for the ungrounded conductor. Grounded circuit conductors shall have white insulation. Insulation for ungrounded 120-volt AC control circuit conductors shall be red. All wires energized by a voltage source external to the Control Board(s) shall have yellow insulation. Insulation for all DC conductors shall be blue.

3. Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all shop drawings. These numbers shall be marked on all conductors at every terminal using white numbered wire markers which shall be plastic-coated cloth, Brady Type B-500, or equal or shall be permanently marked heat-shrink plastic.

I. Painting: Control Panel(s) shall be thoroughly cleaned and sand blasted per Steel Structures Painting Council Specification SSPC-SP-6 (Commercial Blast) after which surfaces shall receive a prime coat (Amercoat 185, Koppers 622H B, or equal) 3-mils dry, for a total thickness of the complete system of 6 mils. The finished color of the outside surfaces will be selected by the CITY, unless otherwise specified. The inside surfaces shall have a white finish coat.

2.5 EQUIPMENT SPECIFICATIONS

A. Ultrasonic Level Transmitter: The system shall use ultrasonic ranging to measure the level of liquid and shall consist of a sensor with interconnecting cable and control transmitter unit which can be

located up to 600 feet from the sensing unit. Level sensing shall be automatically compensated over the system temperature range of at least 0 to 50 degrees C and shall incorporate non-linear digital filtering and moving average techniques to reduce noise and atmospheric interference. Transmitter shall be microprocessor based. Calibration shall require no reference targets. Accuracy shall be 1 percent or better. In the case of momentary signal loss, relays shall maintain their last state. Output shall be 4 - 20 mA proportional to the range of level sensing. Ultrasonic transmitter shall also have a minimum of five contact outputs (SPDT each) with adjustable set points and deadbands which can be used for pump control. The ultrasonic unit shall be powered by 115 volts ac. Fifty feet of transducer to transmitter interconnecting cable shall be provided or as specified in the Instrument Schedule. Ultrasonic unit shall be Milltronics Hydro-Ranger or equal.

B. Level Switch Float Type:

1. Liquid level switches shall be the side mounted floated actuated type. The float displaces a shuttle which magnetically actuates hermetically sealed SPDT switch within the unit. The unit will be NPT threaded to suit field requirements. Switch enclosure shall be the appropriate NEMA rating. Process wetted materials shall be 316 Stainless Steel.

2. Liquid level switches shall be W. E. Anderson Flotech Model L4, or equal.

C. Rotameters:

1. General: Meters in gas or air services shall be of the standard rotameter design with screwed ends, bottom entry and top exit with or without flow control needle valve, vertical mounting, rated minimum of working pressure 150#, scale calibrated in engineering unit, with accuracy of ±10% or better, over the capacity range shown in the data sheets. Rotameter shall be installed in strict accordance with the manufacturer's instructions. Suppliers: Wallace and Tiernan or equal.

D. Gage, Pressure and Vacuum:

1. General: Pressure gages shall be provided where shown. In all locations where pressure may vary from below to above atmospheric head, compound gages shall be installed.

2. Gage Construction: Gages shall be industrial quality type with Type 316 stainless steel movement and stainless steel or alloy case or phenol case. Unless otherwise shown or specified, gages shall have a 4-1/2-inch dial, ½-inch threaded connection, a Type 316 stainless steel snubber adapter, and a shut-off valve. Gages shall be calibrated to read in applicable units, with an accuracy of ±1 percent, to 150 percent of the working pressure or vacuum of the pipe or vessel to which they are connected. All gages shall be vibration and shock resistant. Pressure gages shall be Ashcroft Duragage, Model 1279 or equal.

a. Diaphragm Seal:

(1) Gages attached to systems involving chemical solutions, corrosive fluids, or other liquids containing one percent or less of solids, shall be equipped with diaphragm seals, or equal protective pressure sensing devices, as follows:

(2) For liquid having 1 per cent or greater solids content saddle type diaphragm seals, Ashcroft Model 205 or equal shall be used.

b. For liquids containing solids, pulsating flow:

(1) Seals of the Type 316 stainless steel, with solids, pulsating flow switches steel diaphragm. Diaphragm for pressures over 15 psi, and elastomer diaphragm for pressures of 15 psi and below, Type 316 stainless steel nuts, and bolts, fill connection and valved flush port size 1/4-inch NPT, capable of disassembly without loss of filler fluid. Diaphragm seals shall be Ashcroft, Model 101, U.S. Gauge (Ametek) or equal.

4. Installation: All gages and appur tenances s hall be i nstalled at t he l ocations s hown i n t he Contract Documents and in strict accordance with the manufacturer's printed instructions. Care shall be t aken to minimize the effect of w ater hammer or vibrations on the gages. In extreme cases, the gages may have to be mounted independently, with flexible connectors.

E. Gage, Differential Pressure With Alarm Set points:

1. Differential pressure/flow rate indicators shall have a six inch dial with differential pressure flow in engineering units. Accuracy shall be ±0.5 percent of full scale.

2. Each indicator shall be furnished with a three valve manifold. Wetted materials shall be 316 SS. Differential p ressure gages s hall be c omplete w ith i ntegral h igh and l ow al arm s et poi nts as shown on t he C ontract D ocuments. Alarm s etpoint c ontrols s hall hav e i ndicating s cales and shall be adjustable over the entire scale range. Each alarm output shall be a SPDT dry contact rated at 5 am ps at 120 V AC m inimum. The enc losure s hall be N EMA 4X f or c orrosive nonhazardous locations and NEMA 7 or 9 f or haz ardous l ocations. Indicators s hall be D wyer Photohelic Model A3000, or equal.

F. Indicator, B argraph: Indicator shall be t he el ectronic gas-discharge type s uitable for i nstallation i n flush panel mounting shelves. Indicator shall provide for two nonisolated input circuits. Input signal level shall be 4 to 20 mA DC through a shelf-mounted 250 ohm resistor. The unit shall contain an integral power supply suitable to energize two (2) 4 t o 20 m A DC 2-wire transmitters. Unit power supply shall be 120 V AC. Indicator accuracy s hall be ± 0.5 per cent of s pan w ith a r epeatability of 0.1 percent of span. Indicator scales shall be in process engineering units. Bargraph indicator shall be as manufactured by Fisher and Porter or equal.

G. Totalizer LED: Totalizers (counters) shall be el ectronic LED type with 7 (minimum) non-resettable digits. Counters s hall be appr oximately 2" h x 2" w x 3" d and s hall be s uitable f or f ront panel mounting. Character height shall be 0. 140 inches minimum. Each electronic counter shall have a standby battery capable of maintaining the last totalized value for a m inimum of 72 hours after a utility pow er failure. Totalizers (counters) s hall be D urant S eries 3100, Kessler-Ellis K Se ries, o r equal.

H. Signal Isolator: Signal isolators shall have complete isolation of the input, output and power circuits. Signal i nput s hall be 4 -20 mA into 50 ohms m aximum; s ignal out put s hall be 4 -20 m A i nto 1000 ohms minimum. Power input shall be 120 VAC 60 Hz. Span and zero shall be adjustable; accuracy shall be ±1 percent of span. Units shall be surface or rack mounted. Signal isolators shall be Moore Industries Model SCT, or equal.

I. Signal Converter: Signal c onverters s hall hav e c omplete i solation of t he input, output and power circuits. Signal i nput s hall be 1 -5 VDC i nto a m inimum of 5 m egohms i nput i mpedance. Signal output shall be 4-20 mA into 1000 ohms minimum. Power input shall be 120 VAC 60 Hz. Span and zero shall be adjustable; accuracy s hall be ± 0.1 per cent of s pan. Units s hall be s urface or r ack mounted. Signal converters shall be Moore Industries Model SCT, or equal.

J. Current Alarm Trip (Switches): Current alarm trips shall be single or dual type as shown. Units shall accept voltage or current input signals. Dead bands shall be factory set at 100 percent of full span for dual trips and adjustable over 100 percent of span for single trips. Alarm trips shall be equipped with 10A DPDT contacts. Alarm trips shall include setpoint dials calibrated 0-100 percent for each trip poi nt. Single al arm t rips s hall i nclude a dead band adjustment dial calibrated 0-100 per cent. Alarm trips shall be Moore Industries Model DCA, or equal.

K. Selector and Pushbutton Switches: Selector and pushbutton switches shall be rated 10-amperes at 600 volts, shall be heavy-duty, oil-tight and shall have the number of positions and poles indicated. Operators shall be nickel or chrome plated. Switches shall be Honeywell, or equal.

L. Indicating Lights: Indication lights shall be incandescent push-to-test type, and shall be heavy-duty, oil tight. Each light shall have a crewed-on glass prismatic lens approximately one-inch in diameter. Indicating lights shall be Honeywell, or equal. Each light shall have a factory-engraved legend plate, as shown on the Drawings.

2.6 PROGRAMMABLE LOGIC CONTROLLER

A. General: The CONTRACTOR shall program, test, calibrate, and place into operation, a Programmable Logic Controller (PLC).

B. Construction: The PLC Central Processing Unit (CPU) shall be of solid-state design. The CPU operating logic shall be contained on plug-in modules for quick replacement. Chassis wired logic is not acceptable. The controller shall be capable of operating in a hostile industrial environment (i.e., heat, electrical transients, RF1, vibrations, etc.), without fans, air conditioning, or electrical filtering (up to 60 degrees C and 95 percent humidity.

C. Design - General: The PLC shall have input facilities for the discrete input and 4-20 mA analog unit signals specified and shown on the drawings. The PLC shall produce isolated output contacts and 4-20 mA signals for control functions. Each CPU shall provide internal fault analysis with a fail-safe mode and a dry contact output for remote location alarming, and a local indicator on the PLC frame in the event of a fault in the PLC.

1. Central Processor: The central processor shall contain all the relays, timers, counters, number storage registers, shift registers, sequences, arithmetic capability, and comparators necessary to perform the specified control functions. It shall be capable of interfacing sufficient discrete inputs, analog inputs, discrete outputs, and analog outputs to meet the specified requirements plus 25 percent excess capacity. The power supply shall contain capacitors to provide for orderly shutdown in the event the incoming power does not meet specifications. If this occurs the processor will cease operation, forcing all outputs off. The processor shall have a key type memory protect switch to prevent unauthorized program changes.

2. Memory:

   a. The programmable controller memory shall have CMOS semi-conductor memory with battery backup or EPROM electrically alterable read only memory. The CMOS memory shall be a minimum of 2K with battery backup to retain the program during power interruptions of up to 1 year. An indicator shall show the status of the batteries and a reference shall be available through the discrete outputs, to alarm the operator that the batteries should be changed.

   b. The unit shall be supplied with sufficient memory to implement the specified control functions plus a reserve capacity of 25 percent of the total provided. This reserve capacity shall be totally free from any system use. The memory shall be programmed in a multi-node configuration with multiple series or parallel contact, counters, timers, and arithmetic functions.

3. Controller: The controller shall be programmed in annotated "ladder diagram" language. It shall be easily reprogrammed with a portable programmer. The PLC system shall be programmed by the VENDOR to accomplish the control and monitoring specified and shown on the drawings. Two documented copies of the operating program shall be furnished which allow direct, step-by-step, reloading of the system program. Copies of this program shall be furnished in the format used in the contract diagrams for conventional relay control systems. These diagrams shall reflect equipment name designations used in the PLC as well as the contract diagram equipment name designations (i.e., timer "Q" in the "Contract Drawing may become timer OL in PLC, Program). Two sets of application software on 3 ½" floppy disk and CD shall be provided.

4. Power Supply: The power supply shall operate at the following:

   a. 120V AC rms plus or minus 15 percent continuously.

   b. 120V AC rms plus or minus 30 percent maximum 30 seconds.

   c. 120 AC rms plus or minus 100 percent maximum 17 milliseconds.

   d. Line spikes at 1000V ac (5000 micro-seconds duration; 0.5 percent maximum duty.

5. Input/Output Modules: All I/O housings and modules shall be rugged construction with modules in place. Sufficient input and output modules shall be provided to implement the specified control functions.

   a. Discrete Input Modules: Defined as contact closure inputs from devices external to the programmable controller module. Input modules shall be shielded from short time constant noise and 60 Hz pickup. Individual inputs shall be optically isolated from low energy common mode transients to 1500 volts peak from users wiring or other I/O modules. The modules shall have LED lights to indicate a discrete input.

   b. Discrete Output Modules: Defined as contact closure outputs for ON/OFF operation of devices external to the programmable controller module. The output modules shall be fused (typically 5-A at 115V AC) with blown fuse indicator lights. The output modules shall be optically isolated from inductively generated, normal mode and low energy, common mode transients to 1500 volts peak. All output modules shall have LED lights to indicate output has been cycled ON by the controller.

   c. Analog Input Modules: Defined as analog inputs or 1 to 5V DC, 0 to 10V DC, or 4 to 20 mA DC signals, where an analog to digital conversion is performed and the digital result is entered into the processor. Inputs are read every scan.

   d. Analog Output Modules: Defined as analog output or 1 to 5V DC, 0 to 10V DC, or 4 to 20 mA DC signals, where a digital to analog conversion is performed and the analog result is produced as an output. Outputs are produced on every scan.

   e. Discrete I/O Expander: Where required the CONTRACTOR shall provide I/O expander to enable the controller to access additional I/O points.

6. Data Access Panel: A Data Access Panel with LCD display and keypad shall be furnished to allow the operator to monitor and make changes in set point registers of internal timers and counters in the PLC. Program logic or sequence changes shall not be made from this panel unless a security code or key lock is used to prevent unauthorized changes. Interconnecting cables between the Data Access Panel and the PLC shall be furnished. The PLC shall be Allen Bradley or equal.

7. Input/Output (I/O) Section: Defined as heavy duty housing containing input and output control devices that are directly connected to the controller.

8. Programming Unit: All programming shall be accomplished with a Laptop CRT programmer. The programmer shall be capable of being directly plugged into the system without the requirement of additional hardware. All programming, monitoring, searching, and editing shall be accomplished with the programmer. These functions shall be capable of being done both "on line" while the process is scanning or "off line." The programmer shall display multiple series and parallel contact, coils, timers, counters, and calculate functions. The programmer shall also be able to monitor the status of all inputs, outputs, timers, counters, and coils. It shall have the capability to disable/force all inputs, outputs, and coils to simulate system operation. It shall also indicate "power flow" through all elements and include a search function to locate any element and its program location. The processor status information, such as error indication

and amount of memory remaining, shall be shown on the CRT screen. The programmer shall be of rugged construction and portable, allowing it to be used in an industrial environment, without special protection. Two sets of system operating software on 3 ½" floppy disk and CD along with documentation shall be provided. The laptop shall be at a minimum a pentium.

9. Shop Drawings:

   a. The shop drawings shall include a full description of the PLC system, including documentation of operation theory, programming methods, i.e. ladder logic diagram (All contacts, coils, timers, latches and each section of the ladder shall be clearly annotated and defined. The annotation of each of the input contacts representing a field device will clearly define the status of the device.), data codes and security features, maintenance and trouble-shooting information. Schematics of all cards or units within the system along with point-to-point wiring diagrams shall be furnished after award of contract.

   b. The documentation shall, also, provide a sequential flow chart of the logic implemented. The format of the flow chart and the annotation shall be proposed for acceptance by the ENGINEER before implementation.

   c. Two sets of the program and documentation shall be forwarded for review and comments at least 30 days before factory test.

10. Test: All electrical equipment containing solid-state logic systems shall be tested for a minimum of 100 hours at an ambient temperature of 120 F prior to shipment from the factory. For testing, the equipment shall be interconnected with devices which will cause it to repeatedly perform all operations it will be expected to perform in service with loads on the various components equivalent to those which will be experienced in actual service. The ENGINEER may witness testing of the units. Solid-state logic systems shall be tested as complete assemblies. Testing of individual components or modules will not be acceptable.

11. Training: A manufacturer's representative shall supply 40 hours of on-site training for the personnel. The training shall include, but not be restricted to, operation of programming unit, trouble shooting of system hardware, software, and program development.

12. Seven Day Acceptance Test:

   a. After start up has been completed, the System will undergo a 7-day acceptance test. The System must run continuously for 7 consecutive days. During this period, all System functions shall be exercised, and any System interruption and accompanying component, subsystem, or program failure shall be logged for cause of failure, as well as time of occurrence and duration of each failure. A failure shall cause termination of the 7-day acceptance test. When the cause of a failure has been corrected, a new 7-day acceptance test shall be started.

   b. Each time the CONTRACTOR's technician is required to respond to a System malfunction, he must complete a report which shall include details concerning the nature of the complaint or malfunction and the resulting repair action required and taken.

13. Operations and Maintenance Manuals:

   a. The CONTRACTOR shall furnish to the ENGINEER 10 complete set of operation and maintenance manuals. The manuals shall include data, information drawings, etc., for the system, subsystems, and all components, and shall include names, addresses and telephone numbers of equipment suppliers, representatives and repair facilities.

b. This shall include a complete description of the recommended operating procedures, maintenance procedures, and spare/replacement parts list for equipment items with catalog data, diagrams, and drawings or cuts describing the equipment. Each set shall include full size assembly and wiring diagrams; drawings showing "as built" conditions shall be furnished to the CITY.

2.07 UNINTERRUPTIBLE POWER SYSTEM (UPS)

A. The UPS shall be on-line, computer-grade with electrical isolation including output neutral. UPS shall be packaged for panel enclosure mounting using a back-panel bracket or holder:

1. Nominal input voltage: 120Vac.

2. Nominal output voltage: 120Vac.

B. The online UPS system shall be provided with integral sealed no maintenance batteries, sized to provide full capacity backup power for 4-hours minimum at connected load with integral battery charger.

C. The panel supplier shall calculate the required kVA rating at 150 percent of connected load. Submit load calculations, schematic diagrams, and wiring connection diagrams. Provide battery cabling and other required cabling for a complete system.

D. The UPS shall be mounted within the panel on a pedestal or tray with stainless-steel legs to provide space for wire entry and passage.

E. Uninterruptible power supply systems shall be as manufactured by Best Power Technology, Inc., Necedah, American Power Conversion, Wisconsin, or equal.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. The Instrumentation Subcontractor shall utilize personnel provided by its assigned organization to accomplish, or oversee the physical installation of all elements, instruments, accessories or assemblies which it furnishes. The Instrumentation Subcontractor shall employ installers who are skilled and experienced in the installation and connection of all elements, instruments, accessories, and assemblies being furnished under this Contract.

B. In summary, it is the general intent of this Contract that all field wiring, i.e., wiring external to the Local Control Boards, shall be furnished and installed under provisions of Division 16 Electrical. Computer and PCM equipment cables, data highway and grounding shall be furnished by the manufacturer and installed by the Instrumentation Subcontractor. Further, it is the general intent that all field wiring, i.e., 4-20 mA signal circuits, process equipment control wiring, signal wiring to field instruments, LCPs and PCM input and output wiring, be furnished and installed under Division 16 and be terminated and identified under provisions of Division 17 Instrumentation and Control.

C. The Instrumentation Subcontractor's attention is directed to the electrical and mechanical schematics and details of this project. Referral to these portions of the contract design shall be required in order to understand the full intent and scope of work required.

3.2 CONTROL PANEL SIGNAL AND CONTROL CIRCUIT WIRING

A. Wiring Installation: All wires shall be run in plastic wireways except (1) field wiring, (2) wiring run between mating blocks in adjacent sections, (3) wiring run from components on a swing-out panel to components on a part of the fixed structure, and (4) wiring run to panel-mounted components. Wiring run from components on a swing-out panel to other components on a fixed panel shall be made up in tied bundles. These bundles shall be tied with nylon wire ties, and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at the terminals.

B. Wiring run to control devices on the front panels shall be tied together at short intervals with nylon wire ties and secured to the inside face of the panel using adhesive mounts.

C. Wiring to rear terminals on panel-mount instruments shall be run in plastic wireways secured to horizontal brackets run above or below the instruments in about the same plane as the rear of the instruments.

D. Conformance to the above wiring installation requirements shall be reflected by details shown on the shop drawings for the ENGINEER'S review.

E. Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all shop drawings. These numbers shall be marked on all conductors at every terminal using white numbered wire markers which shall be plastic-coated cloth, or permanently marked heat-shrink plastic.

3.3 INSTRUMENT CABLE TESTS

A. General: The following tests shall be performed on each instrumentation and control system cable which is installed under this Contract. All tests shall be end-to-end tests of installed cables with the ends supported in free air, not adjacent to any grounded object. Complete records of all tests shall be made and delivered to the ENGINEER.

B. Continuity tests shall be performed by measuring wire/shield loop resistance of each signal cable as the wires, taken one at a time, are shorted to the channel shield. No loop resistance measurement shall vary by more than ±2 ohms from the calculated average loop resistance value.

C. Insulation resistance tests shall be performed by using a 500 volt megohmmeter to measure the insulation resistance between each channel wire, between each channel wire and the channel shield, between individual channel shields in a multichannel cable, between each individual channel shield and the overall cable shield in a multi channel cable, between each wire and ground, and between each shield and ground. Values of resistance less than 1 megohms will be unacceptable.

3.4 INSTALLATION, CALIBRATION, TESTING, PRECOMMISSIONING, START-UP AND INSTRUCTION

A. General: All systems specified in the applicable Sections of Division 17, shall be installed, connected, calibrated and tested, and in coordination with the ENGINEER, shall be started to place the plant processes in operation. This shall include final calibration in concert with equipment specified elsewhere in these Contract Documents, including pumps, samplers, valves and chemical feeders. The installation personnel shall be provided with a final reviewed copy of the shop drawings and data.

B. Installation and Connection: The CONTRACTOR shall install and connect all field-mounted components and assemblies under the criteria imposed in this Section under "Manufacturer's Representative Services." The installation personnel shall be provided with a final reviewed copy of the shop drawings and data.

1. Bends shall be formed with the proper tool and to uniform radii and shall be made without deforming or thinning the walls of the tubing. Ends of tubing shall be square-cut and cleaned before being inserted in the fittings. Bulkhead fittings shall be provided at all panels requiring pipe and/or tubing entries.

2. All instruments and connecting lines shall have allowance made for movement of equipment caused by seismic loading, vibration, or expansion or contraction caused by temperature changes. The CONTRACTOR's Field Instrument Engineer should check equipment and layout drawings as necessary for this purpose.

3. All accessory items required for installation shall be procured by the CONTRACTOR. Such items may include instrument valves, seal pots pigtails, etc.

4. Lines or connections open to atmosphere should be protected against ingress of foreign matter. Unprotected openings should have a goose neck, or equivalent, attached to protect against falling particles. A bird screen or insect screen should be installed if required.

5. The CONTRACTOR shall comply with installation detail in the specifications for mounting of the instrument.

6. All flexible cables and capillary tubing shall be installed in flexible conduits. The lengths shall be sufficient to withdraw the element for periodic maintenance.

7. All power and signal wires shall be terminated with spade type lugs.

8. All connectors shall be, as a minimum, watertight.

9. All wires shall be mounted clearly with an identification tag that is of a permanent and reusable nature.

10. All wire and cable shall be connected from terminal to terminal without splices unless specifically approved by the ENGINEER and arranged in a neat manner and securely supported in cable groups. All wiring shall be protected from sharp edges and corners.

11. The CONTRACTOR shall verify that all mounting stand and bracket materials and workmanship comply with requirements set forth in the specifications and drawings.

12. The CONTRACTOR shall have a technical field representative to instruct the installation personnel on any and all installation requirements; thereafter, the technical field representative shall be readily available by telephone to answer questions and supply clarification when needed by the installation personnel.

13. Finally, after all installation and connection work has been completed, the technical field representative shall check for correctness, verifying polarity of electric power and signal connections, making sure all liquid or pnuematic process connections are free of leaks, and all other similar details. The technical field representative shall certify in writing to the CONTRACTOR that for each loop or system checked out, all discrepancies have been corrected by the installation personnel.

14. The CONTRACTOR shall bear all costs and provide all personnel, equipment and materials necessary to implement all activities specified herein.

C. Process Connections: Process Connections and root valves should be located so that they are accessible. Root valves stem and handle shall be installed clear of mainline insulation.

1. Consistent with measuring needs, process connections should be located to have minimum movement. Therefore, they should be as close to the system anchor points as possible.

2. For instruments mounted on a local board, the process connection should be located as close as practical to the board.

3. Process connections in pipelines shall be oriented to avoid gas pockets in the sensing lines for liquid and vapor, and to avoid liquid pockets in the sensing lines for gas.

D. Valves: Root valves shall conform in design to the main-line class. If a globe-pattern root valve is used for pressure ranges of 0-15 psig, or lower, or differential pressure ranges of 0-100 inches H20, or lower, its stem shall be installed horizontally. All other globe-pattern root valves should have the stem vertical. Consider full port ball valves.

1. Relief valves shall be installed without isolation valves.

2. To allow isolation of instruments, each instrument, EXCEPT FOR RELIEF VALVES, should have a shutoff valve that is close to the instrument and is readily accessible. Where the root valve serves this purpose, instrument valves are not required.

3. If the root valve for a test point is not accessible, pipe or tubing should be added and an instrument valve installed at convenient location.

E. Fittings: Fittings shall not be used between the process connection and the root valve nor for pipe on the process side of condensate or seal pots, except that displacement and float-type level instruments are normally installed using pipe fittings.

1. So far as practical, bends rather than fittings shall be used to change the direction of a run of tubing or pipe. The minimum bending radius for cold-bending of tubing shall be three times the outside diameter of tubing and is covered by ANSI B31.1.

2. The ferrule of a flareless tube fitting shall be harder than the tube on which it is used.

3. Lubricant and sealant compounds shall be used as required by the city and equipment suppliers.

4. Where a detail specifies a size and type of fitting, a combination of fittings of other sizes but of the same or equivalent type giving the same or better overall effect may be substituted for convenience or if the desired part is not available. Flareless or threaded connections may not be used where weld connections are required. Socket-weld fitting is required, a pipe 1/2" tube socket-weld fitting plus a 1/2" x 3/8" tube socket-weld fitting may be substituted. A flareless-end valve may be substituted for a threaded valve with flareless connectors, or vice versa. A weld fitting may replace a threaded or flareless fitting.

5. Welding shall conform to project requirements.

F. Instrument Installation Notes - Flow:

1. Condensate pots are not required for a sensing element, e.g., a force balance flow transmitter, which has negligible dynamic displacement. If displacement is not negligible, as for a U-tube manometer, and if the process fluid is either steam, other condensable fluid, water hotter than 250 F, other fluid that may flash, or moisture laden air then condensate pots shall be used. The pots shall have a volume not less than three times the displaced volume.

2. A pair of condensate pots shall be at the same elevation and as high as, or higher than, the higher process connection.

3. The pipe from a process connection to a condensate pot shall be insulated for process fluids hotter than 250 F.

4. A pair of head-type sensing lines shall be run together to the maximum extent practical so as to keep both lines at the same temperature. If they are to be insulated, they shall be insulated together.

5. Head-type sensing lines shall be checked to make sure that they are connected to the proper sides, HP and LP, of the instrument.

6. The edges of the holes for orifice taps shall be square or slightly rounded, clean, and free from burrs, wire edges, or other irregularities.

7. A pair of head-type sensing lines shall have an equalizing manifold with bleed valves. Due to support problems, commercial manifold assemblies with flanged outlets shall not be used in seismic applications, nor is their use recommended for other applications.

8. Flowmeter Installation Criteria: The following table lists the straight pipe run requirement upstream and downstream of each type of meter in terms of the number of required pipe diameters.

TYPE	UPSTREAM	DOWNSTREAM
Orifice plates	20	5
Venturi Tubes	20	5
Pitot Tubes	40	10
Propeller Meters	15	4
Ultrasonic Meters	10	5
Magnetic Meters	5	2

G. Instrument Installation Notes - Level:

1. The lower connection on a vessel for piping to a level instrument is preferred to be on the side of the vessel rather than to come vertically down from the bottom. The intent is to minimize the trapping of solids in the sensing lines.

2. Head-type level instruments shall be located below the process connections on the vessel unless a gas purge is used, in which case the instruments may be located at any convenient elevation.

3. A stilling well should be used in all cases to reduce the turbulence for displacement or float-type elements located inside a vessel, except for rotary-type floats. A well may be required to protect a bubble tube against excessive turbulence.

4. So far as practical, level devices should be placed away from areas of turbulence and should not interfere with other vessel parts or instruments, such as thermowells or sample nozzles, that may be required.

5. Stilling wells and bubble tubes shall be firmly supported. Head room should be provided to permit withdrawing them if they are removable.

6. Gage glasses and their associated level instruments shall be installed adjacent to each other. The gage glasses and the other instruments should be visible from a walkway.

7. External-chamber level instruments shall be installed with main-line-class pipe. Gate valves shall be used for root valves and other shutoff valves for these instruments, except that the manufacturer's standard pattern may be used for gage-glass valves.

8. An external-chamber instrument or a differential-pressure-type instrument used to measure level in a vessel that is open to atmosphere may have one of its input connections, as appropriate, open to atmosphere instead of being connected to the vessel. An external-chamber instrument thus installed may require additional bracing.

9. A pair of sensing lines for head-type level measurement shall have an equalizing manifold with bleed valves. Because of support problems, commercial manifold assemblies having flanged outlets shall not be used in seismic applications. In other applications, their use is not recommended for the same reason.

10. The usual level-instrument connections on vessels are:

Head-type instrument:	Piped	3/4"
	flanged-mounted	3"
Float or displacement-type switches		1-1/2"
Displacement-type transmitters or controllers:	external	1-1/2" or 2"
	internal	4"
Multi-instrument standpipes		3"

11. Displacement and float-type level instruments shall be placed as close as possible to the vessel to improve response. If any external-chamber instrument or a standpipe unavoidably cannot be located close to the vessel, the size of the connecting pipes should be enlarged to facilitate the transfer of liquid on level changes, thereby reducing the loss of response caused by the long sensing and equalizing lines. The ENGINEER should be consulted in such a case.

H. Calibration:

1. Analog instrumentation and control system equipment shall be calibrated and tested after installation to verify that contract system requirements are satisfied. The Instrumentation Subcontractor shall provide all necessary labor, tools, and equipment to calibrate and test each instrument in accordance with the manufacturer's specifications and instructions. Each instrument shall be calibrated at a minimum of three points using test equipment to simulate inputs and read outputs. A fewer number of calibration steps may be used for selected instruments if prior written approval has been obtained from the ENGINEER. All test equipment and instruments used to simulate inputs and read outputs shall be suitable for the purpose intended and shall be related to an accuracy greater than the required accuracy of the instrument being calibrated. Such test equipment shall have accuracy traceable to the National Bureau of Standards as applicable. All analog instruments shall be calibrated and tested in place without removal. All test data shall be entered on test forms. These test forms shall verify compliance with all applicable contract accuracy requirements, instrument manufacturer published performance specifications and permissible tolerances at each point of calibration. A report shall be delivered to the ENGINEER for each instrument, certifying that the instrument has been calibrated, in the presence of the ENGINEER or the ENGINEER's designated representative and meets contract and system requirements.

2. The report shall include but not be limited to pertinent manufacturers name plate data, units span setting, any error in percent at each test point, switch and alarm set points, valve stroking and controller balancing information, etc.

I. Analog Loop Tests:

1. The Instrumentation Subcontractor shall provide all necessary labor, tools, and equipment to field test, inspect and adjust each instrument installed under this contract to its specified performance requirement in accordance with manufacturer's specifications and instructions.

Any instrument furnished by the Instrumentation Subcontractor which fails to meet any Contract requirement, or any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, by Instrumentation Subcontractor at no cost to the CITY. The Instrumentation Subcontractor shall bear all costs and provide all personnel, equipment and materials necessary to implement all installation tests and inspection activities specified herein.

2. At least 15 days before the anticipated initiation of installation testing, the Instrumentation Subcontractor shall submit to the ENGINEER a detailed description, in duplicate, of the installation tests to be conducted to demonstrate the correct installation of the instrumentation and control system and the anticipated dates the testing will occur.

3. Elements such as controllers, electronic function modules, etc., shall be tested and exercised by the Instrumentation Subcontractor to demonstrate correct operation, first individually and then collectively as functional analog networks. Each hardwired analog control network shall be tested to verify proper performance within specified accuracy tolerances. Specified accuracy tolerances for each analog network is defined as the root-mean-square-summation of individual component accuracy requirements. Individual component accuracy requirements shall be as specified by contract requirements or by published manufacturer accuracy specifications, whenever contract accuracy requirements are not specified.

4. Each analog network shall be tested by applying simulated analog and/or discrete inputs to the first element(s) of an analog network (i.e., applying simulated analog and/or discrete signals to element(s) of the network; e.g., controllers, alarms, indicators, valve operators, etc.). For networks which incorporate analog elements, simulated sensor inputs corresponding to 10 percent, 50 percent, and 90 percent of span shall be applied, and the resulting element outputs read to verify compliance to calculated root-mean-square- summation accuracy tolerance requirements. Continuously variable analog inputs shall be applied to verify the proper operation and setting off discrete devices (i.e., alarms, etc.). Provisional settings shall be made on controllers, alarms, etc., during analog loop tests. All analog loop test data shall be recorded on test forms, which include calculated root-mean-square-summation system accuracy tolerance requirements for each output.

5. Air systems shall be tested for leaks in compliance with ISA RP7.1. When installation tests have been successfully completed for all individual instruments and all separate analog control networks, a certified copy of all test forms signed by the ENGINEER or the ENGINEER's representative as a witness, with test data entered, shall be furnished to the CITY together with an unequivocal statement that all instrumentation has been successfully calibrated, inspected, and tested.

J. System Pre-commissioning:

1. System pre-commissioning shall comply with the requirements specified herein. Pre-commissioning shall commence after acceptance of all wire, calibrating and loop tests, and all inspections have demonstrated that the instrumentation and control system complies with all contract requirements. Pre-commissioning shall demonstrate proper operation of all systems under this Contract with process equipment operating over full operating ranges under actual operating conditions.

2. All pre-commissioning and test activities shall follow detailed test procedures, check lists, etc., previously developed by the Instrumentation Subcontractor and reviewed and accepted by the ENGINEER. All test data shall be acquired using equipment as specified and recorded on test forms, previously reviewed by the ENGINEER, which include calculated tolerance limits for each step. Completion of all system pre-commissioning and test activities shall be documented by a certified report, including all test forms with test data entered, delivered to the ENGINEER with a clear and unequivocal statement that all system pre-commissioning and test requirements have been satisfied.

3. The proper operation of all final control elements, control panels and instrumentation furnished under this Contract shall be verified by tests conducted in accordance with the requirements specified herein. Where feasible, system pre-commissioning activities shall include the use of water to establish service conditions that simulate, to the greatest extent possible, normal final control element operating conditions in terms of applied process loads, operating ranges and environmental conditions. Final control elements, control panels, and ancillary equipment shall be tested under start-up and steady-state operating conditions to verify that proper and stable control is achieved using motor control center and local field mounted control circuits. All hardwired and software control circuit interlocks and alarms shall be operational. The control of final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits. The stable steady-state operation of final control elements running under the control of field mounted automatic analog controllers or software based controllers shall be assured by adjusting the controllers, as required, to eliminate oscillatory final control element operation. The transient stability of final control elements operating under the control of field mounted, and software based automatic analog controllers shall be verified by applying control signal disturbances, monitoring the amplitude and decay rate of control parameter oscillations (if any) and making necessary controller adjustments, as required, to eliminate excessive oscillatory amplitudes and decay rates.

4. All electronic control stations incorporating proportional, integral and/or differential control circuits shall be optimally tuned, experimentally, by applying control signal disturbances and adjusting the gain, reset and/or rate setting(s) as required to achieve a proper response. Measured final control element variable position/speed setpoint settings shall be compared to measured final control element position/speed values at 10 percent, 25 percent, 50 percent, 75 percent and 90 percent of span and the results checked against specified accuracy tolerances. Specified accuracy tolerances are defined as the root-mean-square-summation of individual component accuracy requirements. Individual component accuracy requirements shall be as specified in the Contract or as specified by published manufacturer accuracy specifications whenever Contract accuracy requirements are not specified.

5. The Instrumentation Subcontractor shall submit an instrumentation and control system pre-commissioning completion report which shall state that all Contract requirements have been met and which shall include a listing of all instrumentation and control system maintenance/repair activities conducted during the pre-commissioning testing. Prior to the seven day operational test, acceptance of the instrumentation and control system pre-commissioning testing must be provided in writing by the engineer before the seven day operational testing may begin. Final acceptance of the control system shall be upon contract completion as stated in the GENERAL CONDITIONS.

K. 7-Day Operational Testing: The Instrumentation Subcontractor shall provide start-up support to include the Instrumentation Subcontractor's personnel, electrical personnel, and any instrument manufacturers representatives as required during the testing period to produce a fully operational system. This support shall be provided at no additional cost to the CITY.

L. Record Drawings: The CONTRACTOR through its Instrumentation Subcontractor shall keep current an approved set of complete loop and schematic diagrams which shall include all field and panel wiring, piping/tubing runs, routing, mounting details, point-to-point diagrams with cable, wire, tube and termination numbers. These drawings shall include all instruments and instrument elements for the complete instrument loop as furnished under Divisions 13, 15, 16 and 17 of this contract. Drawings shall be a record of work as actually constructed and shall be prepared and submitted as specified in the GENERAL REQUIREMENTS.

3.5 INSTRUMENT AND I/O SUMMARIES - SEE INSTRUMENT SUMMARY, ATTACHMENT "A"

A. General: An Instrument and I/O Summary has been compiled for most instruments specified to be furnished under this contract. This index is intended to complement the plans and specifications and shall not be construed as representing a complete itemization of instruments specified to be furnished under this contract. Instruments not presently included in these Contract Documents shall be added by the CONTRACTOR and incorporated into the instrument and I/O summary.

* * * * *

ATTACHMENT A
INSTRUMENT SUMMARY

ITEM	DESCRIPTION	P&ID TAG	I/O TYPE	RACK	SLOT	TERM	PLC ADD.	SCADA	MMI TAG
1	IMPROPER SEQUENCE								
2	POWER FAIL								
3	PLC-1 NORMAL STATUS								
4	PLC-1 FAILURE								
5	RIO-1 NORMAL STATUS								
6	RIO-1 FAILURE								
7	PUMP #1 GENERAL FAIL ALARM								
8	PUMP #1 AT PRIORITY 1 INDICATOR (MMI)								
9	PUMP #1 AT PRIORITY 1 INDICATOR (SCADA)								
10	PUMP #1 AT PRIORITY 2 INDICATOR (MMI)								
11	PUMP #1 AT PRIORITY 2 INDICATOR (SCADA)								
12	PUMP #1 AT PRIORITY 3 INDICATOR (MMI)								
13	PUMP #1 AT PRIORITY 3 INDICATOR (SCADA)								
14	PUMP #1 AT PRIORITY 4 INDICATOR (MMI)								
15	PUMP #1 AT PRIORITY 4 INDICATOR (SCADA)								
16	PUMP #1 TO PRIORITY 1 COMMAND (MMI)								
17	PUMP #1 TO PRIORITY 1 COMMAND (SCADA)								
18	PUMP #1 TO PRIORITY 2 COMMAND (MMI)								
19	PUMP #1 TO PRIORITY 2 COMMAND (SCADA)								
20	PUMP #1 TO PRIORITY 3 COMMAND (MMI)								
21	PUMP #1 TO PRIORITY 3 COMMAND (SCADA)								
22	PUMP #1 TO PRIORITY 4 COMMAND (MMI)								
23	PUMP #1 TO PRIORITY 4 COMMAND (SCADA)								
24	PUMP #1 START COMMAND (SCADA)								
25	PUMP #1 STOP COMMAND (SCADA)								
26	PUMP #2 GENERAL FAIL ALARM								
27	PUMP #2 AT PRIORITY 1 INDICATOR (MMI)								
28	PUMP #2 AT PRIORITY 1 INDICATOR (SCADA)								
29	PUMP #2 AT PRIORITY 2 INDICATOR (MMI)								
30	PUMP #2 AT PRIORITY 2 INDICATOR (SCADA)								
31	PUMP #2 AT PRIORITY 3 INDICATOR (MMI)								
32	PUMP #2 AT PRIORITY 3 INDICATOR (SCADA)								
33	PUMP #2 AT PRIORITY 4 INDICATOR (MMI)								
34	PUMP #2 AT PRIORITY 4 INDICATOR (SCADA)								
35	PUMP #2 TO PRIORITY 1 COMMAND (MMI)								
36	PUMP #2 TO PRIORITY 1 COMMAND (SCADA)								
37	PUMP #2 TO PRIORITY 2 COMMAND (MMI)								
38	PUMP #2 TO PRIORITY 2 COMMAND (SCADA)								
39	PUMP #2 TO PRIORITY 3 COMMAND (MMI)								
40	PUMP #2 TO PRIORITY 3 COMMAND (SCADA)								
41	PUMP #2 TO PRIORITY 4 COMMAND (MMI)								
42	PUMP #2 TO PRIORITY 4 COMMAND (SCADA)								
43	PUMP #2 START COMMAND (SCADA)								
44	PUMP #2 STOP COMMAND (SCADA)								
45	PUMP #3 GENERAL FAIL ALARM								
46	PUMP #3 AT PRIORITY 1 INDICATOR (MMI)								

ITEM	DESCRIPTION	P&ID TAG	I/O TYPE	RACK	SLOT	TERM	PLC ADD.	SCADA	MMI TAG
47	PUMP #3 AT PRIORITY 1 INDICATOR (SCADA)								
48	PUMP #3 AT PRIORITY 2 INDICATOR (MMI)								
49	PUMP #3 AT PRIORITY 2 INDICATOR (SCADA)								
50	PUMP #3 AT PRIORITY 3 INDICATOR (MMI)								
51	PUMP #3 AT PRIORITY 3 INDICATOR (SCADA)								
52	PUMP #3 AT PRIORITY 4 INDICATOR (MMI)								
53	PUMP #3 AT PRIORITY 4 INDICATOR (SCADA)								
54	PUMP #3 TO PRIORITY 1 COMMAND (MMI)								
55	PUMP #3 TO PRIORITY 1 COMMAND (SCADA)								
56	PUMP #3 TO PRIORITY 2 COMMAND (MMI)								
57	PUMP #3 TO PRIORITY 2 COMMAND (SCADA)								
58	PUMP #3 TO PRIORITY 3 COMMAND (MMI)								
59	PUMP #3 TO PRIORITY 3 COMMAND (SCADA)								
60	PUMP #3 TO PRIORITY 4 COMMAND (MMI)								
61	PUMP #3 TO PRIORITY 4 COMMAND (SCADA)								
62	PUMP #3 START COMMAND (SCADA)								
63	PUMP #3 STOP COMMAND (SCADA)								
64	PUMP #4 GENERAL FAIL ALARM								
65	PUMP #4 AT PRIORITY 1 INDICATOR (MMI)								
66	PUMP #4 AT PRIORITY 1 INDICATOR (SCADA)								
67	PUMP #4 AT PRIORITY 2 INDICATOR (MMI)								
68	PUMP #4 AT PRIORITY 2 INDICATOR (SCADA)								
69	PUMP #4 AT PRIORITY 3 INDICATOR (MMI)								
70	PUMP #4 AT PRIORITY 3 INDICATOR (SCADA)								
71	PUMP #4 AT PRIORITY 4 INDICATOR (MMI)								
72	PUMP #4 AT PRIORITY 4 INDICATOR (SCADA)								
73	PUMP #4 TO PRIORITY 1 COMMAND (MMI)								
74	PUMP #4 TO PRIORITY 1 COMMAND (SCADA)								
75	PUMP #4 TO PRIORITY 2 COMMAND (MMI)								
76	PUMP #4 TO PRIORITY 2 COMMAND (SCADA)								
77	PUMP #4 TO PRIORITY 3 COMMAND (MMI)								
78	PUMP #4 TO PRIORITY 3 COMMAND (SCADA)								
79	PUMP #4 TO PRIORITY 4 COMMAND (MMI)								
80	PUMP #4 TO PRIORITY 4 COMMAND (SCADA)								
81	PUMP #4 START COMMAND (SCADA)								
82	PUMP #4 STOP COMMAND (SCADA)								
83	PRIORITY #1 ON SETPOINT								
84	PRIORITY #1 OFF SETPOINT								
85	PRIORITY #2 ON SETPOINT								
86	PRIORITY #2 OFF SETPOINT								
87	PRIORITY #3 ON SETPOINT								
88	PRIORITY #3 OFF SETPOINT								
89	PRIORITY #4 ON SETPOINT								
90	PRIORITY #4 OFF SETPOINT								
	DISCRETE INPUTS								
91	PUMP #1 IN REMOTE								
92	PUMP #1 FAIL								
93	PUMP #1 READY								

ITEM	DESCRIPTION	P&ID TAG	I/O TYPE	RACK	SLOT	TERM	PLC ADD.	SCADA	MMI TAG
94	PUMP #1 RUN								
95	PUMP #2 IN REMOTE								
96	PUMP #2 FAIL								
97	PUMP #2 READY								
98	PUMP #2 RUN								
99	PUMP #3 IN REMOTE								
100	PUMP #3 FAIL								
101	PUMP #3 READY								
102	PUMP #3 RUN								
103	PUMP #4 IN REMOTE								
104	PUMP #4 FAIL								
105	PUMP #4 READY								
106	PUMP #4 RUN								
107	PUMP #5 IN REMOTE								
108	PUMP #5 FAIL								
109	PUMP #5 READY								
110	PUMP #5 RUN								
111	PUMP #6 IN REMOTE								
112	PUMP #6 FAIL								
113	PUMP #6 READY								
114	PUMP #6 RUN								
115	PUMP #7 IN REMOTE								
116	PUMP #7 FAIL								
117	PUMP #7 READY								
118	PUMP #7 RUN								
119	PUMP #8 IN REMOTE								
120	PUMP #8 FAIL								
121	PUMP #8 READY								
122	PUMP #8 RUN								
123	ATS-1 NORMAL STATUS								
124	ATS-1 FAULT								
125	ATS-2 NORMAL STATUS								
126	ATS-2 FAULT								
127	PLC-1 UPS LOW BATT								
128	RIO-1 UPS LOW BATT								
129	STORM DRAINAGE WETWELL TROUBLE								
130	STORM DRAINAGE WETWELL WARNING								
	ANALOG INPUTS								
131	BAR RAKE LEVEL								
132	STORM DRAINAGE WETWELL LEVEL								
133	STORM DRAINAGE FLOW								
134	PUMP #5 SPEED FEEDBACK								
135	PUMP #6 SPEED FEEDBACK								
136	PUMP #7 SPEED FEEDBACK								
137	PUMP #8 SPEED FEEDBACK								
138	RESERVOIR TANK LEVEL								
139	RESERVOIR WETWELL LEVEL								
140	RESERVOIR DRAINAGE FLOW								

ITEM	DESCRIPTION	P&ID TAG	I/O TYPE	RACK	SLOT	TERM	PLC ADD.	SCADA	MMI TAG
	DISCRETE OUTPUTS								
141	PUMP #1 START/STOP								
142	PUMP #2 START/STOP								
143	PUMP #3 START/STOP								
144	PUMP #4 START/STOP								
145	PUMP #5 START/STOP								
146	PUMP #6 START/STOP								
147	PUMP #7 START/STOP								
148	PUMP #8 START/STOP								
	ANALOG OUTPUTS								
149	PUMP #5 SPEED								
150	PUMP #6 SPEED								
151	PUMP #7 SPEED								
152	PUMP #8 SPEED								

SECTION 17510
AMBIENT AIR POLLUTION MONITORING SYSTEMS

PART 1--GENERAL

1.01 DESCRIPTION

A. This section specifies general requirements for air pollution monitoring systems which include field mounted sensing elements and monitoring assemblies which are field or panel mounted as specified.

PART 2--PRODUCTS

2.01 GENERAL

A. Unless otherwise specified, air pollution monitoring systems shall comply with the following requirements:

1. Field elements shall be suitable for the atmospheric pollution monitored; i.e., combustible gas detectors shall be explosion proof as specified.

2. Power supplies shall be 120 volts, 60 hertz nominal with integral backup sufficient for not less than 4 hours operation.

3. Concentration indication shall be provided on the monitoring assembly.

4. Two contact outputs with adjustable set points shall be provided for "warning" and "danger" levels. Contact outputs shall be suitable for actuation of annunciator equipment.

2.02 INSTRUMENTATION SPECIFICATION SHEETS (INSTRUSPEC)

A. General requirements for instruments specified in this section are given on INSTRUSPEC sheets in paragraph 17510-3.03.

2.03 BATTERY EQUIPMENT

A. Batteries shall be sealed lead-calcium type and shall be provided with a charger of sufficient capacity to return full charge within 24 hours of 4-hour discharge.

PART 3--EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions

3.02 TESTING

A. Test as recommended by the instrument manufacturer.

3.03 INSTRUSPEC (AIR POLLUTION MONITORING SYSTEMS)

A. Air pollution monitoring systems are specified on the following INSTRUSPECS. They are arranged alphabetically in Table A by system identification coding.

Table A, List of Air Pollution Monitoring Systems

INSTRUSPEC symbol	System description	System function
MI	Infrared combustible gas detector	Ambient air pollution monitor

3.03 INSTRUMENT SPECIFICATION SHEET--INSTRUSPEC

Instrument Identification:	MI
Instrument Function:	Ambient air pollution monitor
Instrument Description:	Infrared combustible gas detector
Power Supply:	120 volts AC, 60 hertz nominal
Signal Input:	Ambient air
Signal Output:	One 4 to 20 milliampere into 0 to 600 ohm signal proportional to 0 to 100 percent lower explosive limit of methane and two independent nonlatching alarm contacts set at 20 and 25 percent lower explosive limit for methane.
Process Connection:	N/A
Product Requirements:	System shall consist of one or more infrared analyzers located in the monitored area and a remote alarm processor. Analyzers shall be open cell infrared units housed in NEMA 7B, C, D case. Analyzers shall be designed for in situ measurement, and the ambient gas shall be completely isolated from the detection system by a window and mirror assembly. Automatic compensation for dirt buildup on mirror and window assembly shall be provided. Analyzer shall be Astro Model 5600, or equal. Processor shall be a multiunit assembly for panel face mounting. Processor shall include a gas concentration indicator calibrated in percent of lower explosive limit (LEL), channel selector, test pushbutton, reset pushbutton, set point calibration facility, power supply monitor lamps, and individual plug-in units for each analyzer. Plug-in units shall include latching warning lamp and contacts, latching alarm lamp and contacts fault lamp and normal lamp. The alarm contacts shall be wired together to provide a common alarm output to the plant annunciator. Alarm processor shall be ASTRO Series 600, or equal. One set of calibration filters shall be provided by the Contractor.

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SECTION 17900
CONTROL SPECIFICATIONS

LOOP 1 - SECONDARY EFFLUENT FLOW EQUALIZATION PUMPING SYSTEM

1.1 SYSTEM DESCRIPTION:

There are three sets of pumps and a reservoir that operate as a diversion system. The two Discharge Pumps and two Reservoir Pumps are VFD controlled, 1.8 cfs submersible pumps. The four Storm Pumps are single speed, 5 cfs submersible chopper pumps. The reservoir is a 3.75 million gallon concrete, below ground reservoir.

Flow from a storm drain is diverted to a pumping station from where it is discharged into the sanitary sewer (sewer) by one of two methods: 1) during dry weather it is pumped directly to the sewer using the Discharge Pumps, and 2) during wet weather it is pumped to the reservoir using the Storm Pumps from where it is pumped to the sewer at a later time using the Reservoir Pumps. The Discharge Pumps and the Storm Pumps are located in a single wet well near the diversion point. The reservoir and Reservoir Pump sump are located about 2,000 feet away, partially under an athletic field.

1.2 REFERENCES:

P&ID	DESCRIPTION
P-3	PUMP STATION PROCESS AND INSTRUMENTATION - 1
P-4	PUMP STATION PROCESS AND INSTRUMENTATION - 2

1.3 SYSTEM COMPONENTS:

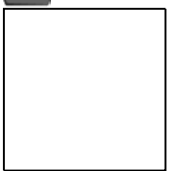
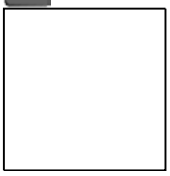
P1 Storm Pump 1
P2 Storm Pump 2
P3 Storm Pump 3
P4 Storm Pump 4
P5 Discharge Pump 1
P6 Discharge Pump 2
P7 Reservoir Pump 1
P8 Reservoir Pump 2

FE/FIT1 Discharge Flow Meter
FE/FIT2 Reservoir Flow Meter

LIT01 Pumping Station Wetwell Level
LSL01 Discharge Pump Low Level Switch
LIT02 Reservoir Sump Level
LSL02 Reservoir Sump Low Level Switch
LIT03 Reservoir Level
LSH03 Reservoir High Level Switch
LSL04 Storm Pump Low Level Switch
LIT05 Pumping Station Bar Rack Level

1.4 OPERATOR CONTROL LOCATIONS:

A. Discharge Pumps

LOCATION	DEVICE	SELECTION	DESCRIPTION
Variable Frequency Drive (Field)	On-Off	Start	Starts the pump.
		Stop	With pump running -- Stops the pump.
		  Increase	Increases the speed of the pump.
		  Decrease	Decreases the speed of the pump.
		Other Keys	See the Adjustable Frequency Drive User Manual.
		Reset	Resets the VFD and all auxiliary devices.
	LOR	Local	The pump operates from Start-Stop switch located on the VFD.
		Off	The pump stops.
		Remote	The pump operates from SCADA system.
SCADA Screen Pop-up Control Panel	Run Control	Start	The pump starts and operates under the direction of the speed controller.
		Stop	The pump stops
	Speed Control	Manual	The pump operates at the speed selected by the operators.
		Auto/Level	The pump speed is automatically set by the PLC to achieve the flow set point entered by the operator.
	Lead/ Follow Control	Lead/Stand by	Operator selects which pump is to be “Lead” and the other is, by default, “Standby”.
		Lead	This pump is the first to respond to PLC “Start” command.
		Standby	This pump will start upon failure of “Lead” pump, or if Lead pump is called upon, flow is zero, and level in the wetwell rises.

B. Storm Pumps:

LOCATION	DEVICE	SELECTION	DESCRIPTION
MCC (field)	On-Off	Start	Starts the pump.
		Stop	With pump running -- Stops the pump.
	LOR	Local	The pump operates from Start-Stop switch located on the MCC.
		Off	The pump stops.
		Remote	The pump operates from SCADA system.
SCADA Screen Pop-up Control Panel	Run Control	Start	The pump starts and operates under the direction of the speed controller.
		Stop	The pump stops
	Lead/ Follow1/ Follow2/ Follow3 Control	Lead/Follow	Operator selects which pump is to be “Lead”, Follow1, Follow2, and Follow3
		Lead	This pump is the first to respond to PLC “Start” command.
		Follow 1 Follow 2 Follow 3	Additional pump will start in order of designation based on rising wetwell level.

C. Reservoir Pumps:

LOCATION	DEVICE	SELECTION	DESCRIPTION
MCC (field)	On-Off	Start	Starts the pump.
		Stop	With pump running -- Stops the pump.
	LOR	Local	The pump operates from Start-Stop switch located on the MCC.
		Off	The pump stops.
		Remote	The pump operates from SCADA system.
SCADA Screen Pop-up Control Panel	Run Control	Start	The pump starts and operates under the direction of the speed controller.
		Stop	The pump stops
	Lead/ Follow1/ Follow2/ Follow3 Control	Lead/Follow	Operator selects which pump is to be “Lead”, Follow1, Follow2, and Follow3
		Lead	This pump is the first to respond to PLC “Start” command.
		Follow 1 Follow 2 Follow 3	Additional pump will start in order of designation based on rising wetwell level.

1.5 CONTROL STRATEGY OVERVIEW:

There is typically a small about of drainage that continuously flows in the storm drain even without precipitation. This flow is diverted by means of a weir to the wet well where the Discharge Pumps pump it to the sewer. Only one Discharge Pump operates at any time with the speed of the pump modulated to keep an operator-adjustable flow set point which automatically varies based on the time of day [initially 1.0 cfs from 6AM to 12AM (18 hours), and 1.5 cfs from 12AM to 6AM (6 hours)]. The lead pump starts at a preset level in the wetwell, but only if at least 72 hours (operator adjustable) has elapsed since any of the Storm Pumps have operated. If the lead pump fails or flow is restricted, then the lead pump stops and the standby pump starts.

When the diverted flow increases to greater than the capacity of the Discharge Pump, the level in the wet well increases. When the wet well level rises above a preset level then the Discharge Pump shuts off and the Storm Pumps start. This is considered wet weather flow. Pumps are added one at a time as the wet well elevation rises. The Storm Pumps pump to the reservoir until the reservoir is full or the level decreases. Storm Pumps turn off on at a time as the wetwell level decreases.

The Reservoir Pump also discharges to the sewer. Only one Reservoir Pump operates at any time with the speed of the pump modulated to keep an operator-adjustable flow set point which automatically varies based on the time of day [initially 1.0 cfs from 6AM to 12AM (18 hours), and 1.5 cfs from 12AM to 6AM (6 hours)]. The lead pump starts when the water level in the sump reaches a preset level AND a Discharge Pump is not operating AND at least 72 hours (operator adjustable) has elapsed since any of the Storm Pumps have operated.

A. Control Strategy - Discharge Pumps:

1. Local Manual Control: Local Manual Control occurs at the MCC. When the pump LOR at the MCC is placed in the LOCAL position, the pump shall start/stop via the local START/STOP pushbuttons and the speed will be controlled via the VFD keypad.

2. Local Automatic Control: None.

3. PLC Automatic Control:

   a. The HMI shall be located remotely at the Venice Pumping Station.

   b. When the pump LOR at the MCC is placed in the REMOTE position and the HMI MANUAL/AUTO (M/A) switch is in the AUTO position, the pump shall start/stop and the speed shall vary based on the logic below via the SCADA system.

   c. The pumps shall be in LEAD or STANDBY via an HMI switch. Because there are only two pumps, the pump not in LEAD automatically is selected for STANDBY.

   d. The LEAD pump will start when the elevation in the wetwell has reached a preset value (elev 7.85, adjustable) and the speed shall vary via PID control to meet a flow setpoint. Flow control shall be based on the Discharge Flow Meter. The setpoint for the flow controller will be manually input using the HMI. Pump will shutoff when the wetwell elev decreases to a preset level (elev 5.0, adjustable).

   e. Automatically switch to the Standby pump if the Lead pump fails, is prevented from starting, or if the flow meter reads less than 85% of the flow meter setpoint. Only one pump operates at any time. Alarm to SCADA when standby pump is activated.

   f. If the equipment was running prior to a power outage, allow the equipment to restart when the Utility power comes back online.

4. HMI Manual Control: When the pump LOR at the VFD is placed in the REMOTE position and the HMI M/A switch is in the MANUAL position, the pump shall start/stop via HMI START/STOP pushbuttons and the speed shall be set by an operator input HMI setpoint.

5. Failure Modes: None.

6. Software Alarm: The PLC shall initiate software alarms if a pump is called, does not start, or does not achieve desired flow, or when the standby pump is activated, after a tunable setpoint [10 sec] time delay.

7. Hardware Interlocks: When the LOS at the MCC is pressed, the pump shall be stopped and shall not be permitted to operate until the LOS is released.

   The pumps have a dedicated low-low level float switch (elev 4.5). When activated, this switch turns off all discharge pumps and alarms to SCADA.

   The pumps have a dedicated moisture switch at the MCC. When activated, the latched switch turns off discharge pump and alarms to SCADA. The pumps will not turn back on until the manual reset button has been pressed to unlatch the switch.

8. Software Interlocks: The Discharge Pumps cannot operate when any of the Storm Pumps are operating or when any storm pump has operated in the past 72 hours.

9. Out of Service Status: Operators may place individual equipment OUT OF SERVICE. When tagged OUT OF SERVICE, the selected equipment shall be inhibited from operation from the PLC and shall have all associated alarms inhibited.

B. Control Strategy - Storm Pumps:

1. Local Manual Control: Local Manual Control occurs at the MCC. When the pump LOR at the MCC is placed in the LOCAL position, the pump shall start/stop via the local START/STOP pushbuttons.

2. Local Automatic Control: None.

3. PLC Automatic Control:

   a. The HMI shall be located remotely at the Venice Pumping Station.

   b. The pumps shall be in LEAD, FOLLOW 1, FOLLOW 2 or FOLLOW 3 via an HMI designation for each pump. The pumping system shall be placed in automatic mode at the HMI via a M/A switch. When the pump LOR at the MCC is placed in the REMOTE position and the HMI M/A switch is in the AUTO position, the pumps shall start/stop based on the logic below via the SCADA system.

   c. The LEAD pump will start when the level in the wetwell increases to reach a preset value (elev 8.5, adjustable), and FOLLOW pumps will start in numerical order as the wetwell level increases to additional preset values (elev 8.83, 9.16, 9.5, adjustable).

   d. Pumps will shutoff in reverse order when the wetwell elev decreases to preset elevations (9.16, 8.83, 8.5 and 7.4, adjustable).

   e. If a pump fails or is prevented from starting, automatically switch to the next pump in the start sequence. Alarm to SCADA when this occurs.

   f. If the equipment was running prior to a power outage, allow the equipment to restart when the Utility power comes back online.

4. HMI Manual Control: When the pump LOR at the MCC is placed in the REMOTE position and the HMI M/A switch is in the MANUAL position, each pump shall start/stop via HMI START/STOP pushbuttons.

5. Failure Modes: None.

6. Software Alarm: The PLC shall initiate a software alarms if the pump is called and does not start after a tunable setpoint [10 sec] time delay.

7. Hardware Interlocks:

   a. When the LOS at the MCC is pressed, the pump shall be stopped and shall not be permitted to operate until the LOS is released.

   b. The pumps have a dedicated low-low level float switch (elev 4.5) in the wet well. When activated, this switch turns off all storm pumps and alarms to SCADA.

   c. There is a high-high float switch in the reservoir (elev 21.0). When activated, this switch turns off all Storm Pumps and alarms to SCADA.

   d. The pumps have a dedicated moisture switch at the MCC. When activated, the latched switch turns off storm pump and alarms to SCADA. The pumps will not turn back on until the manual reset button has been pressed to unlatch the switch.

8. Software Interlocks: When the reservoir is full (elev 20.0, adjustable) the Storm Pumps cannot operate.

9. Out of Service Status: Operators may place individual equipment OUT OF SERVICE. When tagged OUT OF SERVICE, the selected equipment shall be inhibited from operation from the PLC and shall have all associated alarms inhibited.

C. Control Strategy - Reservoir Pumps:

1. Local Manual Control: Local Manual Control occurs at the MCC. When the pump LOR at the MCC is placed in the LOCAL position, the pump shall start/stop via the local START/STOP pushbuttons and the speed will be controlled via the VFD keypad.

2. Local Automatic Control: None.

3. PLC Automatic Control:

   a. The HMI shall be located remotely at the Venice Pumping Station.

   b. When the pump LOR at the VFD is placed in the REMOTE position and the HMI M/A switch is in the AUTO position, the pump shall start/stop and the speed shall vary based on the logic below via the SCADA system.

   c. The pumps shall be in LEAD or STANDBY via an HMI switch. Because there are only two pumps, the pump not in LEAD automatically is selected for STANDBY.

   d. The LEAD pump will start when the elevation in the wetwell has reached a preset value (elev 4.25, adjustable) and the speed shall vary via PID control to meet a flow setpoint. Flow control shall be based on the Reservoir Flow Meter. The setpoint for the flow controller will be manually input using the HMI. Pump will shutoff when the wetwell elev decreases to a preset elev (1.5, adjustable).

   e. Automatically switch to the Standby pump if the Lead pump fails, is prevented from starting, or if the flow meter reads less than 85% of the flow meter setpoint. Only one pump operates at any time. Alarm to SCADA when standby pump is activated.

f. In the event of a power outage, allow the equipment to restart when the facility restarts under Utility power, if it was running before the power outage occurred.

4. HMI Manual Control: When the pump LOR at the VFD is placed in the REMOTE position and the HMI M/A switch is in the MANUAL position, the pump shall start/stop via HMI START/STOP pushbuttons and the speed shall be set by an operator input HMI setpoint.

5. Failure Modes: None.

6. Software Alarm: The PLC shall initiate software alarms if a pump is called, does not start, or does not achieve desired flow, or when the standby pump is activated, after a tunable setpoint [10 sec] time delay.

7. Hardware Interlocks:

a. When the LOS at the MCC is pressed, the pump shall be stopped and shall not be permitted to operate until the LOS is released.

b. The pumps have a dedicated low-low level float switch (elev (-)0.67) in the sump. When activated, this switch turns off all reservoir pumps and alarms to SCADA.

c. The pumps have a dedicated moisture switch at the MCC. When activated, the latched switch turns off the reservoir pump and alarms to SCADA. The pump will not turn back on until the manual reset button has been pressed to unlatch the switch.

8. Software Interlocks: The Reservoir Pumps cannot operate when any of the Storm Pumps are operating, when any storm pump has operated in the past 72 hours, or when the Discharge Pumps are operating.

9. Out of Service Status: Operators may place individual equipment OUT OF SERVICE. When tagged OUT OF SERVICE, the selected equipment shall be inhibited from operation from the PLC and shall have all associated alarms inhibited.

D. Auxilliary Systems:

1. Flow Meters:

a. There is a flow meter for the Discharge pumps and for the Reservoir pumps. The PLC shall totalize the flowrate (display on MHI) and initiate an alarm if the totalized flowrate is greater than the flow set points either the Discharge pumps or the Reservoir pumps (1.0 cfs or 1.5 cfs, depending on time of day). The PLC shall also calculate the total flow (volume) pumped by the Discharge and Reservoir pumps and display an ongoing total.

b. Alarm shall be initiated for flow meter failure (0<4mA signal).

2. Level Indication: At the HMI, provide level indication for the stormwater pumping station wetwell, the wetwell upstream of the pumping station bar rack, the reservoir, and the reservoir sump. Alarm shall be activated at HMI for high reservoir level (20.0, adjustable).

1.6 SCADA MONITORING AND DISPLAY:

A. The following monitoring and display items are considered a minimum. Additional items may be required if needed to fulfill the control and indication of the system indicated elsewhere.

1. Indications and Recordings:

Pump ready status (8X)
Pump running status (8X)

Pump in remote status (8X)
Pumping Station wet well level (2X)
Reservoir sump wet well level
Reservoir level
Discharge pump flow rate
Reservoir pump flow rate
Totalized flow rate
Totalized flow
Delay time before discharging to sewer
Flow Rate set points with applicable hours
Pump start and stop levels (3X)
Manual/Auto status
Local/Remote status
ATS normal power status (2x)
PLC normal status
RIO normal status

2. Alarms/Annunciations:

Pump common failure (8X)
Standby pump operation (2X)
Storm Pump low low level
Discharge pump low low level
Reservoir pump low low level
Flow meter failure (2X)
High totalized flow
ATS fault (2X)
PLC failure
UPS low batt (2X)
RIO failure

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