WARNING: ALL INDIVIDUALS INTERESTED IN BIDDING ON THIS PROJECT MUST OBTAIN THE FINAL PLANS AND SPECIFICATIONS FROM THE DEPARTMENT MANAGING THE PROJECT OR AS OTHERWISE STATED IN THE ADVERTISEMENT FOR BIDS FOR THE PROJECT. DO NOT USE THE PLANS AND SPECIFICATIONS POSTED ON THE CLERK OF THE BOARD'S WEBSITE FOR BIDDING ON THIS PROJECT.

Architecture & Engineering Department
385 N. Arrowhead Avenue, 3rd Floor
San Bernardino, CA 92415
www.SBCounty.gov

Our job is to create a county in which those who reside and invest can prosper and achieve well-being.

SAN BERNARDINO COUNTY
CIVIL & STRUCTURAL SPECIFICATIONS

For:

Fuel Tank Infrastructure Phase III – Victorville Fuel Site

Prepared by:
Psomas
5 Hutton Centre Drive, Suite 300
Santa Ana, CA 92707
714.751.7373

Robert Talafus, PE
Vice President, Civil Engineering Services

Preparation Date: February 19, 2021

SECTION 00 00 1.1
TABLE OF CONTENTS

DIVISION 33 UTILITIES

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 01 00
SUMMARY OF WORK AND SEQUENCE OF CONSTRUCTION

PART 1 - GENERAL

1.1 Work Covered by Contract Documents

A. The Work includes furnishing products, labor, tools, transportation, and services to:

1. Protect existing facilities in place.
2. Demolish existing pavement in the limits as shown on plans.
3. Construct (2) new 10,000-gallon fuel tanks at project site as shown on plans.
4. Construct new tank appurtenances, including tanks, valves, and dispensers, as shown on plans.
5. Construct new masonry containment wall.
6. Connect tank and appurtenant piping to fueling system.
7. Pave site to provide access to all new equipment.

B. Furnish and install complete operating engineered systems including appurtenant structural, mechanical and/or electrical mountings fittings or connections required for compliance with Manufacturer's installation requirements, for compliance with applicable building, fire, plumbing, mechanical, electrical, fuel gas, and energy codes and standards, and as needed to permit systems to perform all functions required by Contract Documents and described in Manufacturer's printed literature.

1.2 Project Location

A. Project is located at 15000 Tokay Street, Victorville, CA 92395.

1.3 Reference Standards

A. Where items of Work are not fully specified in this document, refer to the following Reference Standards in order of precedence shown.

1. Federal, State, and local regulations and permit requirements,
2. These Contract Documents,
3. Owner's published Design Criteria, Standard Drawings, and Standard Specifications
4. Published Design Criteria and Standard Drawings of public and private agencies having jurisdiction over portions of work within their service area. These include:
    a. Agency Standards
        i. County of San Bernardino Standard Plans and Specifications
5. Standard Specifications for Public Works Construction "Greenbook,"

B. The most recent editions and supplements to these documents adopted as of date of advertisement for bid shall govern Work covered by these Contract Documents except as expressly modified herein.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 Work Sequence

A. General sequence of Work shall be as follows:

Preparation

1. Before beginning Work, coordinate with servicing electrical utility regarding electric service to site. Obtain required permits, licenses and construction easements. Call **Underground Service Alert** and utilities to obtain staking and marking of buried utilities. Submit proposed schedule of Work, insurance and bonds. Pothole as needed to supplement staking and marking. Take preconstruction photographs.

2. Verify utility locations, field dimensions, pipe types and voltage and phase of on-site electrical services. If discrepancies or conflicts are found, bring these to attention of Owner's Representative.

3. Submit shop drawings and other submittals.

4. Begin manufacturing and shipping materials and equipment after receiving approved submittals.

5. Complete construction of above-ground and buried piping according to proposed Work schedule.

6. Demonstrate satisfactory installation and operation of installed work, including performing vendor and system functional tests.

Closeout

7. Provide operator training, including O&M manuals that contain engineering cut-sheets on all equipment.

8. Provide record drawings.

9. Clean up and restore construction areas.

10. Provide warranty as specified.

3.2 Normal Working Hours

A. Contractor shall conduct all Work within the following Owner-accepted schedule:

1. Normal Work Hours: 8:00 AM to 4:00 PM

2. Normal Work Days: Monday through Friday, excepting legal holidays.

B. Exceptions to this Work schedule shall be only as accepted in writing by Owner per Paragraph 1.5 below.

C. No work shall be done outside of normal work hours and work days, except where necessary for proper care and protection of Work already performed, or except in case of emergency, and in any case only with written notice to Owner's Representative.

D. Night work may be established as regular procedure by Contractor if they first obtain written acceptance from Owner. Such notice may be revoked at any time by Owner if Contractor fails to maintain adequate nighttime force and equipment for reasonable prosecution and to justify inspection of Work.

3.3 Cooperation with Other Contractors

A. Owner may have additional work performed in this area by other Contractors. Contract requires cooperation with those contractors in the area. Any difference or conflict which may arise between Contractor and other contractors shall be adjusted and determined by Owner. Contractor shall conduct their operations as to minimize interference with work being done by other contractors. Contractor shall, at their sole expense, make good, promptly, any injury or damage to other contractors' work caused at their hands.

3.4 Contractor Use of Premises

A. The following facilities shall remain operational during construction of this project:

1. Do not shut off pipelines or power or take action which might adversely affect Owner's use or operation of his facilities or premises without prior written authorization from Owner.

2. Install approved signs, barricades and lights necessary to ensure public safety and safety of Owners operators and personnel. Provide steel plates across ditches to enable safe access of Owner's personnel to facilities.

B. Fences, walls, shrubs, sprinkler systems, substructures or other improvements removed or disturbed by Contractor during construction shall promptly be replaced and/or repaired at Contractor's sole expense to Owner's satisfaction.

3.5 Responsibility for Job Site Conditions

A. Contractor agrees they shall assume sole and complete responsibility for job site conditions during course of construction of Work, including safety and health of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that Contractor shall defend, indemnify and hold Owner and design consultant harmless from any and all liability except that arising from the sole negligence of Owner or design consultant.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 04 00
COORDINATION

PART 1 - GENERAL

1.1 Work Included

A. Licenses, permits, sales taxes, coordination with Owner, Federal, State and Local authorities, utilities, neighboring property owners, special events, design engineer, and other contractors.

1.2 Related Work

A. Section 01 31 19: Project Meetings

1.3 Permits

A. Obtain, pay for, and comply with required permits, licenses, work permits and authorizations from appropriate agencies, including:

1. Licenses

   a. Before submitting bids, Contractors shall be licensed in accordance with provisions of Chapter 9, Division 3, of Business and Professions Code of State of California.

2. Local permits

   Owner will have the following permits on-hand (i.e. issued by regulatory agency) prior to commencement of construction.

   a. SBC Fire Permit for installation of Fuel Tanks

   Contractor shall obtain:

   a. Encroachment Permit from County for any work in the public right-of-way.

B. Obtain permits before starting construction.

1.4 Coordination with Owner

A. Notify Owner at least 72 hours before start of construction.

B. Submit written details and reasons for proposed deviations from Contract Documents. Do not deviate from Contract Documents until written authorization is received.

C. If Contractor fails to comply with a request of Owner, or is unable to comply with a request, and it is necessary for Owner's forces to do Work that is Contractor's responsibility, Owner will bill Contractor. Each incident requiring work by Owner's forces will be covered by a separate billing.

1.5 Requests for Information (RFI's)

A. Immediately upon discovery of need for additional information or interpretation of Contract Documents, Contractor shall prepare and submit an RFI in format specified.

1. Owner's Representative will only respond to RFI's submitted by Contractor. RFI's submitted by other entities will be returned with no response.

B. Coordinate and submit RFIs in prompt manner to avoid delays in Contractor's Work or Work of subcontractors.

C. RFI's shall include detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Engineer of Record
6. Name of Owner's Representative.
7. RFI number, numbered sequentially.
8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's suggested resolution impacts Contract Time or Contract Sum, Contractor shall state impact in RFI.
13. Contractor's signature.
14. Attachments, including sketches, descriptions, measurements, photos, catalog data, shop drawings, coordination drawings, and other information necessary to fully describe items needing interpretation. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

D. RFI Forms shall be software-generated forms with content shown above, acceptable to Owner's Representative.

E. Attachments shall be electronic files in Adobe Acrobat PDF format.

F. Owner's Representative will review each RFI, determine action required, and respond. Allow 7 working days for Owner's response for each RFI. RFIs received by Owner's Representative after 1:00 p.m. will be considered as received the following working day.

G. The following Contractor-generated RFIs will be returned without action:

1. Requests for acceptance of submittals.

2. Requests for acceptance of substitutions where no monetary rebate is included.

3. Requests for acceptance of Contractor's means and methods.

4. Requests for coordination information already indicated in Contract Documents.

5. Requests for adjustments in Contract Time or Contract Sum.

6. Requests for interpretation of actions of Owner's Representative on submittals.

7. Incomplete RFIs or inaccurately prepared RFIs.

H. Owner's Representative's action may include request for additional information, in which case Owner's Representative's time for response will date from time of receipt of additional information.

I. Owner's Representative's action on RFIs that may result in changes to Contract Time or Contract Sum may be eligible for Contractor to submit Change Order requests.

J. If Contractor believes RFI response warrants change in Contract Time or Contract Sum, notify Owner's Representative in writing within 10 days of receipt of RFI response.

K. Prepare, maintain, and submit tabular log of RFIs organized by RFI number. Submit log weekly. Include the following:

1. Project name.

2. Name and address of Contractor.

3. Name and address of Owner's Representative.

4. RFI number including RFIs returned without action or withdrawn.

5. RFI description.

6. Date RFI was submitted.

7. Date Owner's Representative's response was received.

L. On receipt of Owner's Representative's action, update RFI log and immediately distribute RFI response to affected parties. Review response and notify Owner's Representative within 7 days if Contractor disagrees with response.

1.6 Coordination with County of San Bernardino

A. Contact County of San Bernardino 72 hours before start of construction at the following location:

County of San Bernardino
Dani Fox
Architecture & Engineering Department
Project Manager III

385 N. Arrowhead Avenue, 3rd Floor
San Bernardino, CA 92415
Cell: (909) 601-1165

B. Do not begin Work until Contractor's schedule, traffic control plans, haul routes, and permits have been reviewed and approved by City.

1.7 Coordination with Utilities

A. Obtain service requirements from public utilities for water, sewer, gas, power, telephone, telemetering and other utility requirements. Work needed to connect to public utilities shall comply with utility service requirements. Pay service charges of utilities, including charges for trenching, piping, conduit, cables, boxes, metering, grounding and backfill.

B. Protect existing underground utilities.

C. Electrical utility companies may maintain energized aerial electrical power lines in immediate vicinity of Work. Do not consider these lines to be insulated. Construction personnel working near these lines are exposed to extreme hazard from electrical shock. Contractors, their employees, and construction personnel working on this project must be warned of danger and instructed to take adequate protective measures, including maintaining at least 10 feet clearance between lines and construction equipment and personnel. (See OSHA Std. 1926.550(A)15). As additional safety precaution call electrical utility company to arrange, if possible, to have these lines de-energized or relocated when Work reaches their immediate vicinity. Cost of such temporary arrangements shall be borne by Contractor.

1.8 Coordination with Design Engineer

A. Engineering firm responsible for preparation of Civil Plans and Specifications is:

Psomas
Robert Talafus, PE
Civil Engineering Services
5 Hutton Centre Drive, Suite 300
Santa Ana, CA 92707
714-751-7373

Contact: Robert Talafus, PE

1.9 Lines of Communication

A. Lines of communication between Contractor, Owner, and other parties shall be defined at Preconstruction Conference. Contractor shall adhere to direction regarding this matter given to them at that time.

1.10 Submittals

A. Supplementary progress schedules shall be submitted after Work is in progress, when requested by Owner’s Representative. Schedule changes requiring increase in Owner's, Servicing Utility's or City's Engineering personnel on project shall not be put into effect until Owner, Servicing Utility, or City has made arrangements for additional personnel.

1.11 Unit Prices

A. Payment for obtaining and complying with permits during construction, including NPDES permits, building permits, encroachment permits, excavation permits, drilling permits, disposal permits, temporary easements, licenses, inspection fees, and Federal, State and local taxes will be included in prices bid for Work for which such costs are appurtenant.

B. Payment for coordinating with agencies, events and persons described will be included in prices bid for Work to which coordination is appurtenant.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 21 00
ALLOWANCES

PART 1 - GENERAL

1.1 Work Included

A. This section includes administrative and procedural requirements governing allowances.

B. Certain materials, equipment and fees are specified in Contract Documents by allowances. Allowances have been established in the following cases:

1. To reimburse Contractor for out of pocket expenses for utility fees and permit fees in cases where any single incidental fee exceeds $1,000.

2. Where Owner has elected to defer selection of precise materials and equipment to a later date when additional information is available for evaluation.

3. As a contingency allowance where unknown utilities are encountered, necessitating unexpected Extra Work or where other Extra Work not required by Contract Documents is required by Owner at their discretion.

C. If necessary, additional requirements will be issued by Change Order.

1.2 Related Work

A. Section 01 22 00: Unit Prices
B. Section 01 33 00: Submittal Procedures

1.3 References

A. Standard Specifications for Public Works Construction Section 3-3 Extra Work

1.4 Allowance for Out-of-Pocket Expenses for Utility Fees and Permits

A. Allowances for out-of-pocket expenses paid to utilities for utility fees, or to agencies for permits, where said fees are uncertain at time of bid shall be used to reimburse Contractor for out-of-pocket expenses in question as described in Section 01 22 00.

1.5 Allowance for Finish Upgrades

B. Allowances for finish upgrades shall be used to reimburse Contractor for:

1. Materials costs for equipment based on Manufacturer's suggested retail list prices FOB jobsite plus applicable taxes for these items.

2. Costs of upgrades to specified finishes where upgrades are requested in writing by Owner's Representative based on difference between Manufacturer's suggested retail list prices FOB jobsite plus applicable taxes for base bid items and upgraded items.

C. Items of Work for which materials are to be reimbursed under this allowance are listed in Section 01 22 00.

D. Only material costs will be reimbursed under this allowance. Contractor's labor, tools, equipment, overhead, profit, and other related costs for products and equipment ordered by

Owner under this particular allowance (up to the maximum allowance amount) shall be considered a part of the Contract Sum. Contractor shall include compensation for costs other than material costs in the price bid for the building to which improvements are attached.

1.6 Contingency Allowance (Field Orders)

A. Contingency allowance shall be used to cover items of work unanticipated at time of bid and shall be made under Contract provisions for Extra Work.

B. In the event an unknown underground obstruction not shown on the Plans is encountered, payment for necessary additional work shall be paid for under this stipulated bid item allowance.

C. Use contingency allowance only as directed by Owner's Representative for Owner's purposes, and only following receipt of Change Orders indicating amounts to be charged against allowance.

D. Contractor's costs of labor, tools, equipment, overhead, profit, and other related costs for products and equipment ordered by Owner under contingency allowance (field orders) are not part of the Contract Sum and shall be paid for as Extra Work.

1.7 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Documentation of Expenses	For utility expense, or permit fee submit copy of cancelled check made out to appropriate utility or permitting authority.	
	For interior finishes and improvements, submit documentation of Manufacturer's invoice price information and quantities ordered.	
	For contingency allowance, submit documentation of costs as described under Contract provisions for Extra Work.	

1.8 Unit Prices

A. Payment for work under allowances shall be as specified in Section 01 22 00.

PART 2 – PRODUCTS

(not used)

PART 3 - EXECUTION

3.1 Preparation

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure each allowance item is completely integrated and interfaced with related Work.

3.2 Contract Closeout

A. At contact closeout, all unused allowance amounts remaining shall be credited to Owner by Change Order.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 22 00
UNIT PRICES

PART 1 - GENERAL

1.01 Description

A. Measurement and payment for Bid Items listed in proposal shall be based upon use of lump sum or unit price method. Extra Work or changes in Work shall be accomplished as provided in Special Provisions.

1.02 Payment

A. Payment for Unit Price Items

Payment for unit price Bid Items shall be based upon amount shown in bid schedule multiplied by total quantity measurement of item, and shall be full compensation for furnishing all supervision, planning, design, design engineering fees, labor, transportation, materials, equipment, tools, and appurtenances required for construction of item complete in place in accordance with Plans and Specifications.

B. Payment for Lump Sum Items

Payment for lump sum Bid Items shall be based upon amount shown in bid schedule and shall be full compensation for furnishing all supervision, planning, design, design engineering fees, labor, transportation, materials, equipment, tools and appurtenances required for construction of unit of Work complete in place in accordance with Plans and Specifications.

C. Work Not Listed in Bid Schedule

Costs for related Work and appurtenances which are required and/or implied by General Provisions, Technical Specifications, Special Provisions, and Plans and are not listed as separate Bid Item but are necessary to complete project shall be included in appropriate Bid Item or items within proposal.

PART 2 - MATERIALS

2.01 General (Measurement)

A. Measurement for unit price quantities shall be based upon appropriate Bid Item in proposal. Actual quantity of measurement shall be as constructed by Contractor in place in conformance with Plans and Specifications.

2.02 Linear Measurements

A. Pipe, fencing, curbs, gutters, walls and other horizontal Work shall be measured in horizontal plane along centerline of Work, through tees, bends, valves, fittings, fence gates, and driveways, within limits of Work shown in Contract Documents.

2.03 Area Measurements

A. Measurement for Bid Items involving area units shall be based on horizontal-plane or vertical-plane surface areas measured in units shown in bid schedule.

B. In event of dispute, areas will be computed based on theoretical areas obtained from digital models, Autocad or Cogo prepared using best field surveys and record drawings available.

C. For convenience, Owner may use “approximate areas” for payment based on one of the following procedures:

1. Planimeter measurements using record drawings.

2. Accepted mathematical formulas for circle or polygon areas.

D. Measurements of paving or flatwork areas shall measure area enclosed by exterior perimeter of measured surface. Areas of vaults, pads, manhole covers, valve box covers, drainage features, hatches, pipe penetrations, bollards, and vents shall be included within area measured for payment when surrounded by measured surface on 3 or more sides or at least 270° of arc measured from centers of circles.

E. In absence of Owner-prepared survey and digital model, Contractor may, at their expense, retain licensed surveyor to prepare surveys and sealed calculations of theoretical areas obtained from digital models. In such case, Contractor’s surveyor’s computed volumes shall govern over any “approximate areas” but shall not supersede similar surveys and digital models prepared at Owner’s expense by licensed surveyor.

2.04 Volume Measurements

A. Measurement for Bid Items involving volume units shall be based upon volume measured in units shown in bid schedule.

B. In event of dispute, payment volumes shall be computed based on theoretical volumes obtained from digital terrain models prepared using best field surveys and record drawings available.

C. For convenience, Owner may use “approximate volumes” for payment based on one of the following procedures:

1. Average end area volumes computed as product of average area of vertical or horizontal sections and intervening horizontal or vertical dimension.

2. Accepted mathematical formulas for cylinder, cone, sphere, polyhedron or prism volumes.

3. Analog volumes based on measured weights of delivered materials divided by densities shown in submittals or, in absence of submittal densities, values commonly accepted.

D. In absence of Owner-prepared survey and digital terrain model, Contractor may, at their expense, retain licensed surveyor to prepare surveys and sealed calculations of theoretical volumes obtained from digital terrain models. In such case, Contractor's surveyor's computed volumes shall govern over any "approximate volumes" but shall not supersede similar surveys and digital terrain models prepared at Owner's expense by licensed surveyor.

2.05 Weight Measurements

A. Measurement for Bid Items involving volume units shall be based upon weight measured in units shown in bid schedule.

B. Weights for payment shall be based on load slips from state-certified scales delivered to Owner's Representative.

2.06 Contractor-Furnished Surveys

A. No payment will be made to Contractor for Contractor-furnished surveys other than such additional payment Contractor may be entitled to due to corrected payment quantities based on Contractor-furnished surveys.

2.07 Unit Measurements

A. Measurement for Bid Items involving units of item shall be based upon quantity of units counted as indicated in Bid Item.

2.08 Lump Sum Measurement

A. Measurement for lump sum Bid Items shall be considered as a complete project or portion of project constituting a unit. Items to be included in lump sum Bid Items shall be as specified in proposal Bid Item and/or Standard or Special Provisions.

2.09 Payment for Testing

A. Party responsible for payment for testing is identified in individual sections of Contract Documents under tests required. Where specifications are silent regarding responsible party paying for tests, costs of first tests will be paid by Owner.

B. If testing or inspection indicates failure of material or procedure to meet Contract Document requirements, Owner will back-charge Contractor for retesting and reinspection costs incurred by testing or inspection agency of Owner's choice.

C. Additional tests and inspections not specified herein but requested by Owner will be paid for by Owner, unless result of such tests and inspections are found to not comply with Contract Documents, in which case Owner will pay all costs for initial testing as well as retesting and reinspection and back-charge Contractor for retesting and reinspection.

D. Costs for additional tests or inspections required because of change in materials being provided or change of source or supply shall be paid by Contractor direct to testing laboratory.

E. Cost of testing which is required solely for convenience of Contractor in his scheduling and performance of Work shall be borne by Contractor.

F. Contractor shall pay all costs for correcting deficiencies.

2.10 Changes in Quantities Initiated by Owner

A. Owner may change Contract Documents or character and quantity of work provided total arithmetic dollar value of all changes, both additive and deductive, does not exceed 25% of Contract Price. Changes in allowance Bid items with stipulated prices will not be considered to contribute toward this total.

B. Should it become necessary to exceed this limitation, change shall be documented by written Supplemental Agreement between Contractor and Owner unless both parties agree to proceed under Change Order.

C. Changes ordered in Work items which do not substantially change character of Work from that shown in Contract Documents, will be accompanied by proportional adjustment in payment to reflect quantity changes using unit prices bid, provided Bid quantity does not change by more than 25%.

D. Where Bid quantities under any Bid item are limited to 2 or 3 integral units (*eg.* 2 valves) the 25% figure above shall be revised upward (to 50% or 34% respectively) to permit addition or deletion one integral unit without changing Bid price.

E. Payment for quantities in excess of 125% of quantities (or appropriate percentage for 2- or 3-unit Bid items) will be made at mutually agreed rate lower than Bid amount since Contractor's fixed costs shall be deemed to have been recovered through payment for Bid quantity at Contract unit price.

F. Payment for quantities less than 75% (or appropriate percentage for 2- or 3-unit Bid items) will only be adjusted by mutual agreement if Contractor requests so in writing. In no case will payment be less than Contractor is entitled to under original Bid prices nor more than payment due for 75% (or appropriate percentage for 2- or 3-unit Bid items) of Bid quantity at Contract Unit Price.

G. If mutual agreement cannot be reached, Owner may direct Contractor to proceed on basis of Extra Work as covered in General Provisions.

H. Should any Bid item be eliminated in its entirety, payment will be made to Contractor for actual out-of-pocket costs incurred in connection with eliminated item prior to written notification from Owner of deletion of Bid item. Where applicable, Contractor will also be reimbursed for out-of-pocket shipping costs and Manufacturer's restocking fees.

I. If materials have been ordered prior to date of written notification of deletion of Bid item and order cannot be cancelled, Contractor will be paid for actual cost of ordered item and ordered material shall become Owner's property.

J. In no case shall expenses such as bonding costs expressly covered under other Bid items be double-charged to Owner.

2.11 Increases in Payment due to Unanticipated Rock Excavation during Trenching

A. For payment purposes, “rock excavation” shall be defined as excavation of any material Contractor cannot excavate at rate of more than one foot per hour using standard backhoes or trenching machines, plus 50’ of adjacent material on each end of said unrippable material.

B. If rock excavation does not exceed “Basis of Payment,” full payment for excavation shall be considered to be included in Contractor’s unit price bid for pipeline construction.

C. If rock trenching exceeds “Basis of Payment,” payment will be made at Contractor’s unit price bid per lineal foot of excess rock excavation. Payment quantities will be based on difference between agreed upon total constructed lineal footage of rock excavation less “Engineer’s Opinion of Probable Quantity” of rock excavation.

D. Contract change orders and additional payment will be permitted, based on unit price bid by Contractor for excess rock excavation, only where Contractor demonstrates to Owner’s satisfaction rock excavation quantities exceed “Basis of Payment” above. Such demonstration shall include daily documentation of total lineal feet of rock excavation requiring special equipment or procedures, along with photos and rental receipts for any special equipment or procedures used. Documentation of daily rock excavation quantities claimed by Contractor shall be submitted to Owner’s Representative at end of each working day during which rock excavation equipment or procedures were used. Owner’s Representative will acknowledge receipt of Contractor’s daily documentation and return copy to Contractor for their records. Acknowledgement of receipt of Contractor’s daily documentation does not imply Owner or Owner’s Representative agrees with Contractor’s numbers. Owner’s Representative may employ their own methodology to arrive at independent estimate.

E. Submit claims for compensation for excess rock excavation to Owner’s Representative for review and consideration.

F. Notify Owner’s Representative in writing at such time as quantities reach 80% of quantities shown as “Basis of Payment.” Failure to provide written notice within 5 days of such time shall result in denial of any subsequent claim for additional compensation.

2.12 Increases in Payment due to Unanticipated “Large Boulder” Excavation during Trenching

A. For payment purposes, rocks exceeding 24” in any dimension are defined as “large boulders.”

B. As “Basis of Payment,” design engineer has estimated 20 tons of “large boulders will be required to be removed during trench excavation.

C. If “large boulder” removal quantities do not exceed “Basis of Payment,” full payment for “large boulder” excavation shall be considered to be included in Contractor’s unit price bid for pipeline construction.

D. If “large boulder” removal quantities exceed “Basis of Payment,” payment will be made at Contractor’s unit price bid per ton of excess large boulder excavation. Payment quantities will be based on load slips from state-certified scales.

E. Contract change orders and additional payment will be permitted, based on unit price bid by Contractor for excess “large boulder” excavation, only where Contractor demonstrates to Owner’s satisfaction “large boulder” excavation quantities exceed “Basis of Payment.” Prior to disposal, Contractor shall stockpile “large boulders” as required to allow Owner’s Representative to verify dimensions for payment purposes.

F. Notify Owner's Representative in writing at such time as quantities reach 80% of quantities shown as "Basis of Payment." Failure to provide written notice within 5 days of such time shall result in denial of any subsequent claim for additional compensation.

2.13 Reduction in Payment for Deficient Concrete Work

A. Payment for concrete failing to meet compressive strength requirements specified, but accepted at Owner's discretion, shall be reduced as follows.

B. If additional test cylinders are available, Contractor may furnish cylinders to Owner up to 42 days after placement to allow concrete to obtain additional strength which will be credited as 28-day compressive strength for payment purposes.

C. Owner may at their sole discretion accept other standard test methods proposed by Contractor to verify concrete strength.

D. If tests verify compressive strength exceeds specified 28-day compressive strength after 42 days, no penalty will be deducted.

E. If compressive strength equals or exceeds 95% of specified strength but is less than 100% of specified strength, $10 per cubic yard of concrete will be deducted.

F. If compressive strength equals or exceeds 85% of specified strength, but is less than 95% of specified strength, $15 per cubic yard of concrete will be deducted.

G. If compressive strength is below 85% of specified strength, Contractor shall remove concrete and replace at no expense to Owner.

PART 3 - EXECUTION

3.01 Scope

A. This section defines Bid Items listed in Bid schedule and describes measurement and payment provisions for each item.

3.02 Bid Item – Mobilization/Demobilization

A. Amount bid for Mobilization/Demobilization shall not exceed 5.0% of Contractor's Bid total for either schedule. Any amount bid in excess of stipulated 5.0% cap will not be paid until project completion.

B. Payment for this item will be made at lump sum price named in Bid Schedule under Item Number 1, which price shall constitute full compensation for all Work and expenditures required to mobilize, provide bonds and insurance, obtain required permits, take preconstruction photos and videos, prepare project schedule, provide project sign, construct temporary bypass facilities, construct temporary traffic control facilities, perform required surveys, testing, site maintenance and cleanup, remove and reinstall existing site facilities as required, comply with all General and Supplementary conditions, demobilize, provide record drawings, operation and maintenance manuals, and warranties, and provide cleanup of construction site complete in place, as required by Contract Documents with sole exclusion of payments to be made as defined herein for other items in Bid Schedule.

C. Work to be paid for under this item shall also include furnishing, setting up, and removing Contractor's operations at project site including temporary offices, utilities, staging areas, security, etc. Work shall also include furnishing any temporary construction facilities and trailers required by Contract Documents.

D. Work to be paid for under this item shall also include protecting existing survey monuments in place and, if Contractor's operations disturb any such monuments, hiring registered land surveyor to reestablish and reset disturbed monuments.

E. Upon completion of mobilization, 50% of amount bid for this item (or 50% of stipulated 5.0% cap, whichever is less, will be paid to Contractor. Remainder will be paid as part of final contract payment upon project completion.

3.03 Bid Item – Additional Demobilization/Remobilization for Owner's Convenience

A. Payment for this item will be made at lump sum price named in Bid Schedule, which price shall constitute full compensation for all Work and expenditures required to demobilize and remobilize during course of Work to facilitate Owner's work.

B. Demobilization/Remobilization will be required on several occasions to facilitate Owner's operations at plant. Events triggering Demobilization/Remobilization may include:

1. Scheduled completion of Work in one basin by Contractor more than 15 consecutive calendar days prior to next basin being available for decommissioning by Contractor to allow for Contractor's operations.

2. Discovery of contaminated soils on site requiring remediation by others, and requiring Contractor to vacate and subsequently reoccupy site.

3. Any other unanticipated event where Owner directs Contractor to idle Contractor's operations for more than 15 consecutive calendar days, except where need for idling is precipitated in whole or in part by Contractor's actions.

C. Work to be paid for under this item shall include dismantling and removing Contractor's operations at project site including temporary offices, construction facilities, trailers, utilities, staging areas, security, cleaning equipment, etc., and subsequently replacing these facilities when directed by Owner.

D. Upon completion of demobilization, 50% of amount bid for this item will be paid to Contractor. Remainder will be paid when Contractor returns to Work site and recommences Work.

3.04 Bid Item – Bonds

A. Lump sum Bid Item for bonds shall include full compensation for actual costs of payment and performance bonds. Contractor may submit request for payment of actual invoiced costs up to bid amount, but not to exceed 2½% of Contract amount, not less than 10 working days after Award of Contract.

B. If lump sum Bid Item for bonds exceeds invoiced costs, any such differential amount up to lump sum bid amount, will be paid as part of final contract payment.

3.05 Bid Items – Survey Staking and Verification of Utility Locations, Field Dimensions, and Existing Electrical Work

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all survey staking and verification of utility depths, locations, and field dimensions prior to ordering materials and equipment including potholing, field surveys, measurements, and electrical inspections as needed to ascertain materials and equipment ordered can be properly and legally installed within verified field conditions. Work to be paid for under this Bid Item shall include notifying Owner's Representative of any found discrepancies between conditions shown on Plans and field conditions, and appurtenant Work as required by Contract Documents.

C. Lump sum price bid for this item shall include potholing all utilities shown on plans plus one additional pothole for every 1000' or fraction thereof of pipeline or utility trench. If this number of potholes is exceeded, Contractor will be entitled to fair compensation for any additional potholing of utilities:

    1. Which are not shown on plans at time of Bid and are subsequently identified in field by Underground Service Alert, surface features or walking alignment with reliable electronic pipe finder, or;

    2. Which are not shown on plans in their proper location such that multiple potholes are necessary to find them.

D. Before ordering manufacture of equipment or structures described in submittals, Contractor shall verify the following under this pay item:

    1. That submitted item(s) can be delivered to point of installation and will fit through applicable doors, hatches, gates and/or openings both during construction and following completion of construction.

    .

    2. That flanges or ends of pumps, tanks, valves, and piping equipment are of compatible sizes, offsets, configurations and pressure classes to mate with adjacent piping.

    3. That weights of equipment are within lifting capacity of on-site overhead crane systems planned for use for their installation and future removal.

    4. That power requirements, including voltage, phase and full-load amperage of electrical equipment and motors are consistent with power available on site.

E. If discrepancies are discovered between field conditions and dimensions shown on submittals and Contract Documents, Owner's Representative will work with Contractor to prepare such modifications to Contract Documents as required to address issues brought up.

F. If discrepancies are discovered between field conditions and dimensions shown on submittals and Contract Documents, but said discrepancies are not brought to attention of Owner's Representative by Contractor in clear and timely manner, Owner's liability shall be limited to difference in cost between Work shown in Contract Documents and Work that would be necessary had Contractor notified Owner of said discrepancy at time submittals were delivered.

3.06 Bid Item 01 75 00 – Startup and Testing

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all labor, materials and equipment for start-up, testing, troubleshooting, calibration, system demonstration and presenting Work to Owner in satisfactory working condition and in accordance with warranty requirements as required by Contract Documents.

3.07 Bid Item 01 78 39 – Record Documents, O&M Manuals and Warranties

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all labor, materials and equipment for operation and maintenance manuals, record drawings and warranties including but not limited to cost of document assembly, binders, reproduction, and all appurtenant Work as required by Contract Documents.

C. Payment for operation and maintenance manuals shall be made as follows:

- 30% of lump sum Bid price will be paid after Contractor submits O&M manuals and record drawings for initial review by Owner's Representative.

- 70% of lump sum Bid price will be paid after Contractor submits final O&M manuals and record drawings incorporating or responding to comments of Owner's Representative and successfully demonstrates system operation.

3.08 Bid Item 01 78 43 – Spare Parts

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all labor, materials and equipment for spare parts listed in applicable sections of Contract Documents.

C. Payment for spare parts shall not be made until all specified spare parts have been delivered to Owner.

3.09 Bid Item 01 79 00 – Training

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all labor, materials and equipment for training listed in applicable sections of Contract Documents.

C. Payment for training shall not be made until all specified training has been completed.

3.10 Bid Item 03 30 00 – Concrete Work

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all labor, materials, and equipment to construct new concrete Work where shown including excavation, backfill, bedding, compaction, falsework, formwork, steel reinforcement, concrete, anchors, embedments, special inspection, removal of forms, curing, testing, finishing, and all appurtenant Work as required by Contract Documents.

3.11 Bid Item 04 29 00 – Reinforced Concrete Masonry Containment Wall

A. Measurement will be based on linear footage of masonry wall installed, measured in horizontal plane at centerline of wall.

B. Work to be paid for under this item shall include all labor, materials, and equipment to construct reinforced concrete masonry unit fence wall of height shown, including excavation, soil preparation and compaction beneath footing, reinforced concrete footing, backfill, compaction above footing, reinforced masonry block wall, mortar and grouting, disposal of excess excavated material, and any appurtenant Work as required by Contract Documents.

3.12 Bid Item 10 73 16 –Canopy

A. Measurement will be based on quantity of items furnished and installed.

B. Work to be paid for under this item shall include all labor, materials, and equipment to construct new steel canopy over vertical turbine water pumps including excavation, footings, anchorage to foundation column base plates steel columns, steel roof framing, steel roof deck, removable skylights, sound panels beneath canopy, roofing, painting, canopy wiring and lighting, gutters, and any appurtenant Work as required by Contract Documents.

3.13 Bid Item 26 05 33 – Yard Conduit

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all labor, materials, and equipment to construct conduit including excavation, conduit, fittings, conduit hangers, installation, junction boxes, pull boxes, pull wires, protection of existing utilities, restoration of existing improvements, backfill, compaction, warning and detection tape, cleanup, and any appurtenant Work as required by Contract Documents.

3.14 Bid Item 27 00 00 – Instrumentation, Telemetry, and Control System

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all labor, materials, and equipment to construct all new instrumentation, telemetry and controls as shown and as required to provide complete operating integrated system including pressure, flow, level, intrusion, position and

temperature instruments and switches, connections, wiring, cables, grounding, interconnection with motor control center, tie-in with Owner's SCADA system, and any appurtenant Work as required by Contract Documents.

3.15 Bid Item 31 10 00 – Clearing and Grubbing, Site Demolition and Soil Preparation

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include furnishing all labor, materials, and equipment for site demolition and soil preparation including removal of existing fencing, piping, asphalt and trees where shown, localized pavement or concrete flatwork saw-cutting, removal and replacement where shown, abandoning utilities in place including disconnection from existing work and backfilling existing pipe with 2 sack cement slurry, removal and salvage of existing valves, scarifying, and sterilizing existing soil beneath concrete pads and asphalt paving, preparation and compaction of subgrade beneath new improvements in accordance with geotechnical report requirements, disposal of excess excavated material, and any appurtenant Work as required by Contract Documents.

3.16 Bid Item 31 23 00 – Grading and Structural Excavation

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all labor, materials and equipment for grading and structural excavation including excavation, ripping, blasting, stockpiling, hauloff and disposal of excavated material, placement of suitable fill. backfill, compaction, preparation and compaction of subgrade beneath new improvements in accordance with geotechnical report requirements, scarifying and sterilizing existing soil where shown, and any appurtenant Work as required by Contract Documents.

3.17 Bid Item 31 23 00 – Excess Rock Excavation

A. Payment under this item will only occur if the benchmark "Basis of Payment" shown above under "Increases in Payment due to Unanticipated Rock Excavation during Trenching" is exceeded.

B. Measurement will be based on daily documentation of total lineal feet of rock excavation requiring special equipment or procedures, along with photos and rental receipts for any special equipment or procedures used. Documentation of daily rock excavation quantities claimed by Contractor shall be submitted to Owner's Representative at end of each working day during which rock excavation equipment or procedures were used. Owner's Representative will acknowledge receipt of Contractor's daily documentation and return copy to Contractor for their records. Acknowledgement of receipt of Contractor's daily documentation does not imply Owner or Owner's Representative agrees with Contractor's numbers. Owner's Representative may employ their own methodology to arrive at an independent estimate.

C. Work to be paid for under this item shall include all labor, materials and equipment for rock excavation including excavation, ripping, blasting, stockpiling, haul-off and disposal of excavated material, placement of suitable fill. backfill, compaction, preparation and compaction of subgrade beneath new improvements in accordance with geotechnical report requirements, and any appurtenant Work as required by Contract Documents.

3.18 Bid Item 31 23 00 – Excess Boulder Excavation

A. Payment under this item will only occur if the benchmark “Basis of Payment” shown above under “Increases in Payment due to Unanticipated Large Boulder Excavation during Trenching” is exceeded.

B. Measurement will be based on Contractor-submitted load slips from state-certified scales. Only rocks exceeding 24” in any dimension will be paid for under this item.

C. Work to be paid for under this item shall include all labor, materials and equipment for large boulder excavation including excavation, blasting, jack-hammering, removal from trench, segregation from other excavated material, stockpiling, breaking up boulders to facilitate haul-off, haul-off and disposal of excavated large boulders, placement of suitable fill. backfill, compaction, preparation and compaction of subgrade beneath new improvements in accordance with geotechnical report requirements, scarifying and sterilizing existing soil where shown, and any appurtenant Work as required by Contract Documents.

3.19 Bid Item 32 10 00 –Walls, Paving and Flatwork

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all asphalt and concrete paving, concrete flatwork and walls, including excavation, subgrade preparation and compaction, bender boards, subdrainage, subbase, base, concrete formwork, concrete reinforcement, concrete slabs, sidewalks, gutters, ribbon drains, swales, paving, steps, ramps, retaining walls, and flatwork, asphalt paving, manhole and valve rings, slurry seal, striping, and all appurtenant Work in accordance with Contract Documents.

3.20 Bid Items 32 12 16 – Asphalt Concrete Paving

A. Measurement will be based on square footage of asphalt installed, measured in horizontal plane.

B. Work to be paid for under this item shall include all labor, materials and equipment to construct asphalt concrete paving on aggregate base of thicknesses shown and at locations shown on plans, including subgrade preparation, aggregate base, compaction, asphalt, rolling, sealing, and any appurtenant Work as required by Contract Documents.

3.21 Bid Item 32 31 10 – Bollards

A. Measurement will be based on quantity of items furnished.

B. Work to be paid for under this item shall include all labor, materials, and equipment to construct 4” concrete-filled Schedule 40 steel bollards with welded cap where shown, including excavation, concrete foundation, steel bollard and cap, hardware for removal and replacement, painting, backfill, surface repair, and all appurtenant Work as required by Contract Documents.

3.22 Bid Items 33 05 31 – Connect to Existing Piping

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all labor, materials and equipment to connect to existing piping including maintenance of water service to existing customers during tie-in, saw-cutting existing pavement, excavation, cutting, tapping or preparation of existing pipe, preparation of old surface to mate with new work, fittings, couplings, thrust blocks and restraints, saddles, spools, butt straps, piping, flanges, bedding, backfill, testing, disinfection, backfill, compaction, aggregate base and pavement replacement, pavement seals, re-striping, and any appurtenant Work as required by Contract Documents.

3.23 Bid Item 33 05 35 – Expansion Joints

A. Measurement will be based on quantity of items furnished and installed.

B. Work to be paid for under this item shall include all labor, materials, and equipment to furnish and install expansion joints of size, type and class shown, including expansion joint, thrust restraint, and any appurtenant Work as required by Contract Documents.

3.24 Bid Item 33 11 00 – Yard Piping and Fittings

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all labor, materials, and equipment to construct new piping of size, class and type as shown, including protection of existing utilities, trench excavation, bedding, piping, manifolds, fittings, spools, joints, couplings, dismantling joints, welds, bolts, flanges, gaskets, hangers, supports, brackets, saddles, wall penetrations and spools, thrust restraint, concrete collars and encasement, coatings, linings, warning and detection tape, locating wire, identification labels and signage, incidental valves, gauges and appurtenances, backfill, compaction, surface restoration, testing and disinfection, flange insulating kits, cathodic protection test stations, cleanup, and any appurtenant Work as required by Contract Documents.

3.25 Bid Item 33 16 13 –Tank Ladder

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include all labor, materials, and equipment to erect fiberglass interior ladder with stainless steel Saf-T-Climb appurtenance including bolts and embedments, supports, framing, ladder, steps, Saf-T-Climb, and all other appurtenant Work as required by Contract Documents.

C. Work to be paid for under this item shall also include all labor, materials, and equipment to erect steel flush-bottom cleanout retrofit in doorsheet per API 650l including bolts and embedments, steel framing, welding, inspection, and all other appurtenant Work as required by Contract Documents.

3.26 Bid Item 50 00 01 – All Other Work

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include any Work shown in Contract Documents for which no bid item is expressly provided.

C. To facilitate progress payments, Contractor shall provide breakdown of Work items included in this bid item at Preconstruction Meeting.

D. In absence of said breakdown, Contractor will be paid for this item in percentages equal to percentage of Work completed.

3.27 Stipulated Bid Item A1 – Allowance for Reimbursement for Permit Fees

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include permitting fees required by public agencies in excess of $1,000 to perform Work within public agency jurisdictions as required by public agencies and Contract Documents. No reimbursement will be made for any fees less than $1,000.

C. Stipulated allowance shown on Bid Form has been set aside to reimburse Contractor for permit fees from any agency invoiced to and paid for by Contractor where any single permit fee exceeds $1,000.

D. Notwithstanding stipulated allowance, payment will be made at exact invoice amount shown by invoice, receipt, or cancelled check received from or paid to permitting agencies, less $1,000 per agency, upon submittal by Contractor of said invoices, receipts or cancelled checks. No additional allowance for expenses, overhead, or profit will be paid under this Bid Item.

E. Contractor's costs for administration, overhead and profit for permit application, payment and compliance shall be included under lump-sum Bid Item for Mobilization-Demobilization.

3.28 Stipulated Bid Item A2 – Allowance for Reimbursement for SCE Power Service and Transformer

A. No measurement will be made for this item.

B. Work to be paid for under this item shall include servicing electrical utility fees in excess of $1,000. No reimbursement will be made for any fees less than $1,000.

C. Stipulated allowance shown on Bid Form has been set aside to reimburse Contractor for electrical utility service charges and fees for power service and transformers invoiced to and paid for by Contractor where any single fee at any single address exceeds $1,000. Payment under this item shall include full compensation for all invoices billed by servicing electrical utility to Contractor for Work by servicing electrical utility to provide power to site up to stub-up from transformer for meter.

D. Notwithstanding stipulated allowance, payment will be made at exact invoice amount shown on invoice, receipt, or cancelled check received from or paid to servicing electrical utility, less $1,000, upon submittal by Contractor of said invoices, receipts or cancelled checks. No additional allowance for expenses, overhead, or profit will be paid under this Bid Item.

E. Contractor's costs for administration, overhead and profit for working with servicing electrical utility shall be paid under lump-sum Bid Item for Mobilization-Demobilization.

3.29 Design Engineer's Rough Quantity Takeoff.

A. Design Engineer's rough quantity takeoffs used to prepare Engineer's Opinion of Probable Cost are appended following this section for use by Contractor at Contractor's sole risk.

B. Said quantity takeoffs are for informational purposes only and shall not be construed to be a part of these Contract Documents.

C. For payment purposes in event of discrepancy, payment will be based solely on quantities shown on Plans or shown within sections of Contract Documents describing Work.

D. Bidders are advised to prepare their own independent quantity takeoffs and to use Design Engineer's rough quantity takeoffs appended after this section solely as a check toward identifying Work items Bidders might otherwise overlook.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.1 Scope

A. Requirements for preconstruction meeting, progress meetings, specially-called meetings and post-construction meeting.

B. Owner's Representative will schedule and conduct meetings and conferences at Work site unless otherwise indicated.

1.2 Contractor's Responsibilities

A. Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.

B. For all meetings other than those required by Contract Documents or Owner's Representative, Contractor shall record minutes, including significant proceedings and decisions for each meeting. Reproduce and distribute copies of minutes within 5 days after each meeting. Provide copies to Owner's Representative, all other participants in meeting, and all other parties affected by decisions made at meeting.

1.3 Pre-Construction Meeting

A. Before issuance of Notice to Proceed, preconstruction meeting will be held at time and location designated by Owner's Representative.

B. Meeting shall be attended by Owner's Representative, Engineer of Record, Representatives from affected cities, counties, agencies and utilities, Contractor and his superintendent, all major subcontractors and other persons designated by Owner.

C. Agenda for preconstruction meeting shall include:

1. Scheduling items

    a. Tentative construction schedule

    b. Phasing.

    c. Critical work sequencing and long-lead items.

    d. Procedures for schedule revisions

2. Designation of key personnel and their duties.

    a. Designation of persons authorized to sign documents for Owner and Contractor, with examples of signature of each.

    b. List of names, addresses and telephone numbers of those persons authorized to act for Contractor in emergencies

    c. Safety procedures including designation of Contractor's safety officer.

3. Lines of communications.
    a. Procedures for processing field decisions and Change Orders.
    b. RFI procedures
    c. Submittal procedures
    d. Testing and inspection procedures.
    e. Payment application and processing procedures.
    f. Change Order procedures
4. Distribution of Contract Documents.
5. Preparation of record drawings.
    a. Title 24 Energy Code, Green Building Code, ISI Envision, or LEED documentation.
6. Use of premises,
    a. Parking availability.
    b. Office, work, and storage areas.
    c. Equipment deliveries and priorities.
    d. Work restrictions.
    e. Working hours.
    f. Owner's occupancy requirements.
    g. Responsibility for temporary facilities and controls including barricades, utilities, sanitary facilities, signs and other facilities required.
    h. Procedures for disruptions and shutdowns.
    i. Construction waste management and recycling.
7. First aid.
8. Security.
9. Progress cleaning and housekeeping.
10. Construction permit requirements, procedures and posting.
11. Establishment of schedule for progress meetings.
12. Other administrative items as appropriate.

1.4 Progress Meetings

A. Progress meetings shall be held at dates and times scheduled at preconstruction meeting unless changes are agreed to by all parties and appropriate notification of such changes has been given.

B. Meetings shall be attended by Owner's Representative and Contractor's superintendent. When requested by Owner's Representative or Contractor; subcontractors, and Owner's consultants shall also attend.

C. Agenda for these meetings shall include:

1. Review progress of construction since previous meeting.

2. Discuss field observations, problems and conflicts.

3. Identify problems which impede planned progress and develop corrective measures as required to regain projected schedule. Revise construction schedule if necessary.

4. Plan progress during next construction period.

5. Coordinate progress of subcontractors.

6. Review changes proposed by Owner for their effect on construction schedule and completion time.

7. Review Contractor's record drawings.

1.5 Special Meetings

A. Upon appropriate notice to other parties, special meetings may be called by Owner's Representative or Contractor, at times agreed to by all parties involved.

1.6 Post-Construction Conference

A. Post-construction conference shall be held after system demonstration but before final inspection of Work to discuss and resolve all unsettled matters.

B. Prior to post-construction conference, bonds and insurance to remain in force, and other documents required to be submitted by Contractor will be reviewed and deficiencies identified if any.

C. Agenda shall include:

1. Preparation of record documents.

2. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.

3. Submittal of written warranties.

4. Requirements for submitting operations and maintenance data.

5. Requirements for delivery of spare parts.

6. Requirements for demonstration and training.

7. Preparation of Contractor's punch list

8. Contractor’s schedule for addressing punch list items.
9. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
10. Coordination with other contractors on site.
11. Owner's partial occupancy requirements.
12. Installation of Owner's furniture, fixtures, and equipment.
13. Responsibility for removing temporary facilities and controls.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 Work Included

A. General procedures and requirements for submittals, initial submittal, submittals required on Owner's request, progress reports, Shop Drawings, product data and samples, notification of affected residences and businesses, and submittal forms.

1.2 Related Work

A. Section 01 40 00: Quality Requirements
B. Section 01 61 00: Common Product Requirements
C. Section 01 65 00: Product Delivery Requirements
D. Section 01 66 00: Product Storage and Handling Requirements
E. Section 01 73 00: Execution

1.3 References

A. ANSI AWS A2.4 Standard Symbols for Welding, Brazing and Nondestructive Examination

1.4 Electronic (Digital) Submittals

A. Submit digital copy of **each** submittal using one of following methods chosen by Owner:

1. Email: Send submittal as pdf attachment to Owner and Owner's Representative.

2. Data tracking System (DTS): Upload digital file to server maintained by Owner's Representative.

3. CD: Burn a CD containing one or more submittals and furnish copy of CD to Owner and Owner's Representative.

B. Multiple hard copies of submittals will not be accepted in lieu of digital submittal unless otherwise authorized or directed by Owner's Representative.

C. One digital copy of stamped submittal with cover letter will be returned to Contractor by email or DTS as appropriate.

D. Contractor shall verify emails sent with large attachments have been successfully received by Owner and Owner's Representative. Files in excess of 5 MB in size shall not be sent as attachments to emails due to size restrictions associated with users' email systems.

E. Number submittals using numbering system as directed by Owner's Representative.

F. Shop Drawing Transmittal Form. Use form included at end of this section unless otherwise directed by Owner. Submit separate form for each submittal and assign a submittal number. Form shall be first page of each digital submittal. Submittals without completed Contractor's Transmittal Form as first page will be returned without review and stamped "REJECTED/RESUBMIT AS SPECIFIED."

G. Stock or standard drawings will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.

H. Exceptions and departures from Contract Documents shall be clearly noted, along with brief justification for each exception or departure.

1.5 Paper Submittals

A. Submit paper submittals for:

1. Electrical submittals
2. Reinforcing steel schedules larger than 11”x17” original format
3. Steel pipe lay diagrams larger than 11”x17” original format
4. Original drawings larger than 11”x17” size

B. Submit 6 copies of submittals unless otherwise stated.

C. Fold paper submittals to approximately 9”x12”.

D. Three copies will be returned to Contractor.

E. Number submittals using numbering system as directed by Owner’s Representative.

F. Shop Drawing Transmittal Form. Use form included at end of this section unless otherwise directed by Owner. Submit separate form for each submittal number. Submittals without completed Contractor's Transmittal Form attached to each copy of each submittal listed in Schedule of Submittals will be returned without review and stamped "REJECTED/RESUBMIT AS SPECIFIED."

G. Stock or standard drawings will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.

H. Exceptions and departures from Contract Documents shall be clearly noted, along with brief justification for each exception or departure.

1.6 Owner’s Review of Submittals

A. Owner’s review or acceptance of submittals shall only constitute acceptance of the following:

1. Portions of submittal in compliance with Contract Documents.

2. Exceptions or departures expressly noted on Contractor’s submittal as “exceptions” or “departures” and accepted in writing by Owner.

3. Exceptions or departures Owner or their Representative may by chance discover and acknowledge and accept in writing in Owner’s response to said submittal.

B. If any submittal’s exception or departure from Contract Documents is neither noted by Contractor on their submittal nor acknowledged and expressly accepted by Owner, Contract shall remain unchanged. Owner’s failure to discover all exceptions and departures in submittals whether intentional or unintentional on Contractor’s part shall not relieve Contractor of any Contract responsibilities.

C. Review of submittals will proceed as follows:

1. Submit specified quantity of complete submittals together with Contractor's submittal forms to Owner's Representative for review. At Owner's discretion, Owner may review submittals prior to, parallel with, or after Owner's Representative has reviewed submittals.

2. Submittals will be stamped "ACCEPTED", "ACCEPTED AS NOTED", "REVISE AS NOTED/RESUBMIT", "REJECTED/RESUBMIT AS SPECIFIED," "NO ACTION REQUIRED," or "SUBMITTAL NOT REQUESTED, RETURNED WITHOUT REVIEW." Three copies with letter of transmittal will be returned to Contractor.

3. If drawing or data is returned stamped "ACCEPTED", "ACCEPTED AS NOTED", "NO ACTION REQUIRED," or "SUBMITTAL NOT REQUESTED, RETURNED WITHOUT REVIEW." No further resubmittals will be required for that item.

4. If drawing or data is stamped "REVISE AS NOTED/RESUBMIT," or "REJECTED/RESUBMIT AS SPECIFIED," make necessary corrections and resubmit documents as required in Instruction 1. Contractor's submittal form transmitting revised documents shall show that documents comprise a resubmittal. Revisions and re-submittals shall be numbered as Revision #1, Revision #2, or as appropriate.

5. If changes other than those noted by Owner are made on submittal before resubmittal, note such changes on resubmittal.

6. Revise and resubmit submittals as required, until confirmation of compliance is obtained.

D. Costs incurred by Owner for original submittal and first re-submittal will be paid by Owner. Costs incurred by Owner for second and subsequent re-submittals will be deducted from payment due Contractor.

E. Allow not less than 31 calendar days for review and response to submittals. Review may be delayed if contingent on receipt of other submittals. Upon timely written request by Contractor, Owner's Representative will make reasonable efforts to shorten review periods which may fall on Contractor's critical path.

F. Correct and resubmit rejected submittals within 14 calendar days.

G. Do not order products or begin work described in required submittals until such submittals have been reviewed and returned by Owner stamped "ACCEPTED" or "ACCEPTED AS NOTED". Contractor's acceptance of delivery of products prior to receipt of Owner's Representative's satisfactory return of applicable submittals shall be at Contractor's risk.

H. Review of submittals by Owner's Representative shall extend solely to general type and layout of Work and shall not be construed as relieving Contractor of full responsibility for adequacy and accuracy of submitted designs and details shown in submittals.

1.7 Initial Submittal

A. Submit the following within 72 hours after bid opening.

1. Names and addresses of Manufacturers furnishing products valued greater than either 4 percent of contract value or $40,000, whichever is less. State locations of shops at which manufacture will take place. State whether products are already designed or in production. Include brief description of products proposed, including sizes and catalog numbers.

2. Letter addressed to Owner's Representative identifying Contractor's superintendent, safety officer, and traffic control coordinator, including emergency telephone numbers and signature authorization, and listing names, addresses and telephones for subcontractors.

3. Proposed Construction Schedule.

1.8 Submittals on Owner's Request - Supplemental Information

A. Detailed construction schedule updates shall be submitted, with monthly pay requests to describe scheduling of elements of construction requiring Owner's or Contractor's coordination with public, or other private parties or public agencies.

B. Supplemental information will be requested for "accepted equals" and may be requested when there is a question a Manufacturer's product conforms to Contract Documents. Owner reserves right to require submittal of supplemental information as described herein before acceptance of product.

C. Certification of compliance with listed reference standards shall be submitted by Manufacturers on Owner's request. Failure of Owner to request certification of compliance shall not serve as waiver of Contractor's duty to comply with reference standards.

D. Transcripts of results of acceptance tests performed at point of manufacture of products furnished shall be submitted by Manufacturers on Owner's request.

E. Samples shall be submitted on Owner's request.

F. Names and addresses of nearest local service representatives maintaining technical service personnel and complete inventory of spare parts and accessories shall be submitted on Owner's request.

G. List of 3 installations in which products comparable in size, capacity and rating with those required in Contract Documents are now in regular operation shall be submitted on Owner's request. Include listing of size capacity or rating of each installation. Include name and telephone number of at least one reference responsible for operations at each installation whom Owner's Representative may contact.

1.9 Progress Reports

A. Daily log shall be submitted by Contractor's superintendent on one-page form provided by Owner. These logs shall be detailed with activities that took place during each day. Submit logs daily to Owner's Representative by end of following workday.

B. Schedule updates shall be submitted with monthly pay requests. If Work falls behind schedule, monthly pay requests shall include revised schedules to demonstrate how Contractor intends to bring work back on schedule.

C. Record drawings, consisting of one set of full size annotated blue-line plans and other drawings forming a part of contract, showing installed locations of improvements and all changes made during construction shall be available to Owner for inspection throughout project. Record all deviations from Contract Documents, including accepted change orders, using additional sketches or ink revisions, immediately after installing each portion of Work. Show locations of underground piping, conduit, sensor lines, valves, capped ends, branch fittings, pull boxes and Work. Keep one current record copy of Contract Documents, addenda, supplementary drawings, working drawings, change orders and clarifications at site and in good order. Report changes and deviations promptly to Owner's Representative.

D. Partial payment requests may be withheld if daily logs, schedule updates or record drawings are damaged, lost or not kept current to satisfaction of Owner's Representative.

1.10 Contractor's Notice of Pending Delay Claim

A. In event a delay claim is foreseen by Contractor, Contractor shall immediately notify Owner in writing. Following said notice, Contractor shall have no more than 7 calendar days to furnish follow-up information as required by Owner to allow Owner to act judiciously to minimize losses. As a minimum, said information shall consist of a letter identifying and substantiating cost of expected claim per day of delay accompanied by schedule showing any available float and delay's impact on overall schedule.

1.11 Shop Drawings and Product Data

A. Shop Drawings shall be defined as job-specific drawings showing details of manufactured or assembled products.

B. Shop Drawings shall be prepared to scale wherever possible and shall include project name on shop drawing.

C. Except where preparation of a submittal is contingent upon acceptance of a prior submittal, Contractor shall make every reasonable effort to combine all submittals relating to same class or portion of Work into one package, regardless of variety of trades or types of equipment required to construct that portion of Work. *e.g.* all above ground piping, fittings, valves, actuators, pipe stands, couplings, flow meters and appurtenances shall be submitted as one package for review.

1. Packages shall clearly reference specification sections and specified submittal requirements therein, showing where in submitted literature each submittal requirement is satisfied.

2. Packages clearly incomplete will be returned without review.

3. To facilitate approval of critical path items or to facilitate Contractor's communication with multiple suppliers and subcontractors, packages may contain several submittals from several suppliers so long as all relevant submittals are contained in package.

4. Where expedited review of one submittal item within package is desired to facilitate critical path items, notify Owner's Representative in writing to request expedited review of said item. Contractor's request for expedited review of a portion of a submittal package shall be taken as full acceptance of responsibility by Contractor for any subsequent field modifications or substitutions later necessary to remedy any conflict between expedited submittals and other submittals or to remedy any conflict between expedited submittals and Contract Documents not brought to Owner's attention at time of submittal.

D. Catalog Data shall be defined as Manufacturer's pre-printed drawings which need not include project name. However, where multiple products or options are shown in same catalog cut, product or option being furnished shall be clearly delineated as specified below.

E. All submittals shall show US units. For submittals prepared in foreign countries where Manufacturer's literature is printed solely in metric units, Contractor may make hand annotations to convert to US units as long as annotations are legible. Submittals not bearing US units will be returned without review.

F. Submittals bearing text in languages other than English will be returned without review.

G. Shop Drawings for piping or ductwork shall include:

1. Key or index showing locations of spools and fittings.

2. Order of installation. Each spool shall receive a unique mark number. No other spool or fitting, even on separate pipelines or casings included in Contract, shall have same mark number. Sequential order of mark numbers shall correspond to a logical order of installation for each pipeline.

3. Laying lengths, dimensions, clearances and tolerances for all spools and fittings.

4. Clearly legible drawing showing each pipe or duct fitting and/or spool in plan view and in profile.

5. Station and invert elevation of all grade changes and changes in horizontal alignment

6. Slopes of pipe not vertical or horizontal.

7. Horizontal and vertical alignment data for all curves, bends, tees and outlets.

8. Couplings and end types of all pipe, spools, fittings, outlets and adjacent valves or pipeline equipment.

9. Proposed pipeline linings and coatings including thicknesses.

10. How connections will be made between Work under this contract and existing work or work under other contracts.

11. Pipe, duct and valve support sizes and locations including anchor bolt sizes and embedments.

12. Relationship of piping and ductwork to other Work.

H. Shop Drawings for valves, pumps or pipeline equipment shall include:

1. Laying lengths and dimensions, clearances, tolerances and end types.

2. Weight and type of valves, pumps or equipment.

3. Valve and pump port sizes and tolerances.

4. Dimensions and orientation of actuators and pilot systems. Locations of actuator stops.

5. Proposed linings and coatings.

6. Performance characteristics.

7. Parts and materials lists and ratings and details of appurtenances to be furnished, along with references to appropriate ASTM, Federal Specifications and other reference standards and grades.

8. Piping and conduit attachments and sizes.

I. Shop Drawings for structural and architectural items shall include:

1. Lengths, widths, thickness, embedment, dimensions and tolerances of structural members or architectural items.

2. Detailing of openings and wall penetrations including doors, windows, hatches, louvers, vents, ducts, pipes and all floor, slab, wall and door penetrations.

3. Connection details including applicable sizes, diameters, thickness, spacing, embedment and edge distances of bolts, anchors, rivets, nails, screws, spikes, connection plates, holdowns, joints, sleepers and other fasteners and fastening systems.

4. Welding details using standard ANSI/AWS 2.4 symbols and showing type, electrode, length, spacing and thickness of welds.

5. Materials listing and properties, including types, strengths and finishes of concrete, masonry, metals, wood, plastics and other construction materials.

J. Shop Drawings for equipment shall include:

1. Dimensions, clearances and floor space requirements.

2. Weight and type of equipment.

3. Location where product will be installed.

4. Anchor bolt sizes and embedments.

5. Finishes and coatings.

6. Performance characteristics.

7. Parts and materials lists and ratings and details of appurtenances to be furnished, along with references to appropriate ASTM, Federal Specifications and other reference standards and grades.

8. Piping and conduit attachments and sizes.

K. In addition to above requirements for Shop Drawings for equipment, Shop Drawings for electrically powered or controlled equipment shall include:

1. Elevations showing arrangements and positions of all panel components including nameplates.

2. Electrical diagrams as needed to show wiring circuit schematics, single line diagrams, voltage wire numbers and identified interlocks and terminals.

3. Logic diagrams for programmable controllers or relays if used.

4. Nameplate data showing nameplate material, height of letters, number of lines, inscriptions and dimensions.

L. Shop Drawings for replacement items shall include field measurements needed to verify fit in existing spaces.

M. Catalog Data shall clearly indicate applicable items when several products are covered on one page. Using black ink, indicate on submitted catalog data, specification section or plan reference being satisfied.

N. Installation Instructions or Application Instructions shall be defined as Manufacturer's printed instructions including warranty requirements, clearances required and proper field procedures to deliver, handle, install and prepare product for use. In absence of Manufacturer's published literature, ASTM, AWWA or trade standards for installation will usually be accepted. If no instructions are submitted for installing or applying item of Work, Owner reserves right to stop work on subject item at any time, and to retain experts of Owner's choosing to prepare appropriate instructions to control Contractor's work. Installation Instructions shall include recommended bolt torques for assembly and installation of bolted items.

O. Operation and Maintenance Instructions shall be defined as Manufacturer's printed instructions for correct operation and maintenance procedures for product, along with data which must accompany manual as directed by current regulations of government agency. Include operating instructions for each piece of equipment. Describe equipment function, operating characteristics, limiting conditions, operating instructions, startup procedures, normal and emergency conditions, regulation and control, and shutdown. Include preventative maintenance instructions. List warranty requirements. Explain and illustrate preventative maintenance tasks. Include lubrication charts, lists of acceptable lubricants, trouble shooting instructions, and lists of required maintenance tools and equipment. List recommended spare parts, their costs, and ordering information for one Manufacturer who can supply these parts. Index instructions for easy reference. Include information for installed equipment only.

P. Manufacturer's Statement of Responsibility shall be copy of form attached, signed by authorized factory representative for Manufacturer whose product is being furnished.

Q. Certificate of compliance shall certify materials or procedures have been sampled, tested and found to comply with applicable reference standards, and shall be accepted by Owner prior to shipping items described therein.

R. Engineering calculations shall be clearly legible, shall follow recognized engineering principles and shall be sufficiently detailed to permit ready check of procedures used. Where published tables or charts are included in calculations, clearly show design or load variables used to make selection, highlighting applicable columns or rows in tables and highlighting intersecting variables on chart axes. Engineering calculations shall demonstrate compliance with current state and local codes, applicable standards, and contract requirements. Calculations shall be sealed by registered engineer licensed in State of California. Calculations or drawings bearing seals with expired expiration dates will not be accepted.

S. Foundry or test record transcripts shall fully describe required tests in accordance with specified test standards, shall certify that factory quality control, testing and inspection requirements have been successfully completed and shall be accepted by Owner prior to shipping items described therein.

T. Statements of Qualifications for optional maintenance contracts from Manufacturers or suppliers of products shall fully describe Manufacturer's qualifications, experience, pricing, and recommended maintenance schedule. Contractor's submittal of Manufacturer's qualifications for optional maintenance contracts shall not be construed as placing

maintenance service contracts within scope of this contract, except Contractor may be obligated to pay for maintenance contract if:

1. Contract Documents expressly state Contractor shall bear this responsibility and expense under warranty or other express obligations, or

2. Acceptance of a Manufacturer as an accepted equal is predicated in writing on Contractor's furnishing operation and maintenance services for stipulated period as part of warranty requirement.

U. Furnish the following submittals

SUBMITTAL	DESCRIPTION	
Preconstruction Photographs or Videos	Preconstruction photographs or videos shall be submitted to Owner before Work is performed which has potential to disturb or modify public or private property not owned by Owner. Photographs shall be of sufficient quality and thoroughness to fully document preexisting damage or wear to photographed property for which Contractor or Owner might be asked to compensate property owner were it not for photographic evidence of preexisting damage. Where existing cracks in concrete, masonry or other materials are wider than thickness of a dime, include dime or similar visual standard in photo or video for reference. Failure by Contractor to submit preconstruction photographs or videos, may be taken by owner as evidence that subsequent claims by property owners for damage to their property can be rightfully attributed to Contractor's actions.	
	See Section 01 32 33.	
Schedule for Lubrication and Run-in Procedures	Submit 2 weeks before beginning procedures.	
Manufacturer's Written Acceptance of Installation (where "Manufacturer's Statement of Responsibility" is required)	Written acceptance of installation of products shall be certified and submitted by authorized factory representative. This written acceptance shall state factory authorized representative has inspected installation, alignment, lubrication and operation of furnished equipment and found it to fully comply with specified design and warranty requirements and be ready for safe operation.	.
Warranty	Unless otherwise stated, furnish one-year warranty from date of final acceptance.	

V. Owner's Representative's review of submittals shall be limited to review of products to be incorporated in Work and to remain in place upon project completion.

1. Contractor shall have sole responsibility at all times for construction means, methods and jobsite safety.

2. Contractor shall retain services of California-licensed civil, structural or traffic engineer, as appropriate, to design and prepare plans for necessary safety equipment required by OSHA, Cal OSHA and other state and local regulatory authorities during construction, and to prepare summary documents for Contractor's use for accomplishing said work including, but not limited to sheeting, shoring, trench plating, excavation protection, falsework, formwork, scaffolding, barricading, pedestrian safety and traffic control.

3. Originals of summary documents, signed and sealed by engineer of record who prepared them, shall be submitted solely as proof this requirement has been fulfilled.

4. Since Contractor has sole responsibility for means, methods and jobsite safety, review of said documents will be limited to verifying preparing engineer's registration is current and that engineer of record has no active complaints filed against them with California Board for Professional Engineers and Land Surveyors.

W. Use of contract drawing reproductions for shop drawings is subject to rejection.

1.12 Samples

A. Furnish samples, finished as specified, and as intended to be used on or in Work. Send samples to Owner's Representative, carriage prepaid.

B. Submit samples at least 21 days before date by which Owner's approval is required. Allow 14 days for review and return of samples.

C. Submit 2 of each sample, except for field samples. Attach completed Contractor's submittal form to sample. List items being transmitted, stating proposed use and location, product, color, trade name, lot, style, and model as appropriate.

D. Resubmit samples until acceptable. One of each sample will be returned to Contractor upon acceptance.

E. Samples of finishes shall be 8" x 10". and shall be of minimum thickness consistent with sample presentation. In lieu thereof, submit actual full-size item.

F. Samples of value may be returned to Contractor for use in Work after review, analysis, comparison, and/or testing as may be required by Owner's Representative.

G. Furnish one sample of accepted products, colors, or textures to Owner's Representative for final record. Show identification previously described including, if finish sample, Manufacturer, mix proportion, name of color, building, Contractor, subcontractor, and surfaces to which applied on back of sample.

1.13 Notification of Affected Residences and Businesses

A. Written notification, with Contractor's 24-hour emergency phone number, shall be provided to residences and businesses fronting project on either side of street. Notify these parties 72 hours in advance of construction which will affect these properties. Door-hangers or other means of notification shall be submitted to and accepted in advance by Owner's Representative.

1.14 Unit Prices

A. Payment for submittals and re-submittals, will be included in price bid for those items of Work for which submittals are required.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SHOP DRAWING TRANSMITTAL FORM

FROM: _____ DATE: _____

PROJECT NAME: _____

TO: Psomas
3 Hutton Centre Drive, Suite 200
Santa Ana, CA 92707

PROJECT NO.: _____

OWNER: _____

ATTN: _____
Construction Manager

SUBMITTAL NO.: _____ THIS IS AN ORIGINAL SUBMITTAL _____ THIS IS A REVISION OF SUBMITTAL NO.: _____

SUBJECT OF SUBMITTAL: _____

SPECIFICATION SECTION(S): _____

PLAN SHEET NUMBER(S): _____

CONTRACTOR'S CERTIFICATION: Check & Complete either (A) or (B) below:

(A) We have reviewed in detail and certify the material, equipment or construction procedure(s) contained in this submittal meet all requirements specified in or shown on Contract Documents, with no exceptions.

(B) We have reviewed in detail and certify the material, equipment or construction procedure(s) contained in this submittal meet all requirements specified in or shown on Contract Documents, except for the following deviations:

_____

_____

_____

CONTRACTOR'S AUTHORIZED SIGNATURE:

_____

MANUFACTURER'S STATEMENT OF RESPONSIBILITY

Project Name:
_____

Specification Section Number: _____

Item:
_____

Serial Numbers:_____

Owner:
_____

Contractor:
_____

Supplier:
_____

1. **We have reviewed applicable sections of the Contract Documents** describing requirements for our product, including Sections entitled "Submittal Procedures," "Quality Requirements," "Product Requirements," "Starting and Adjusting," " Closeout Procedures," "Operating and Maintenance Data," "Demonstration and Training," "Basic Civil Engineering Requirements," and "Painting and Coating."

2. **Before shipping, we promise to review Contractor's submittals from other Manufacturers** who will supply products that interface with our product, and may affect our product's performance. In addition we promise to request and review data concerning quality of water, soils or any other materials which may contact or adversely impact performance of our product.

3. **Should we have cause to believe our product is, for any reason, incompatible** with an interfacing product or material, we will inform Owner of our concern before shipping our product. In such case, we will not ship our product until our concerns have been satisfactorily resolved.

4. **We further understand that Owner reserves right to request a factory-authorized representative's written acceptance of installation, application and/or erection of our product** as described in Section of Contract Documents entitled "Starting and Adjusting", before paying Contractor for our product.

_____
Authorized Factory Representative

THIS PAGE INTENTIONALLY BLANK

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 Work Included

A. Inspection and testing laboratory qualifications, duties and responsibilities.

B. Contractor's quality control requirements.

C. Owner's inspection and testing.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 75 00: Starting and Adjusting

1.3 Reference Standards

A. ASTM E329 Agencies Engaged in Construction Inspection, Testing, or Special Inspection

1.4 Quality Assurance

A. Work shall conform to Federal, State and local building codes, electrical codes, fire codes, mechanical codes, energy codes, green building standards codes, and plumbing codes, and to Occupational Safety and Health Act (OSHA) Regulations. Nothing in Contract Documents shall be interpreted as permission or direction to violate any governing code or ordinance.

B. Where reference is made to third-party standards such as ANSI, AWWA or ASTM specifications, or any standard or code adopted or promulgated by a public agency, it shall mean latest edition thereof formally adopted and published at time of advertisement for bids.

C. “Tying” or “Bundling” of manufactured equipment into packages to thwart competition shall be considered in non-compliance with Contract Documents. Owner is under no obligation to accept any Manufacturer based on such “bundling” arrangements, and may elect to reject any bundled Manufacturer solely on basis such bundling in Owner’s opinion represents an unfair business practice.

D. Manufacturer’s production facilities shall be open for inspection by Owner or Owner’s Representative at all times during production of products furnished under this contract.

1. Notify Owner’s Representative in writing of time and place of shop tests no later than 14 calendar days before they begin. Complete manufacturing operations, checks, adjustments and tests before factory inspection.

2. Notify Owner’s Representative promptly if scheduled test or inspection must be cancelled or rescheduled. Owner will back-charge Contractor for costs incurred by Owner due to Contractor’s failure to notify Owner’s Representative of scheduling, rescheduling or cancellation of tests and inspections in a prompt and timely manner.

3. Factory-witnessed tests, where required, shall be completed no sooner than 14 calendar days after written notification is delivered to Owner. Owner will pay travel expenses for Owner’s personnel to and from laboratory performance test location within 50 miles of Work for first test only. Should test results indicate, in opinion of

Owner's Representative, that tested equipment fails to meet specified requirements, Owner's Representative will notify Contractor of performance test failure. Contractor shall thereupon notify Manufacturer to reschedule testing and notify Owner of time of retest. Manufacturer shall thereupon at no expense to Owner, make modifications and perform tests as required to demonstrate compliance with Specifications. Additional costs for job specific travel and subsistence shall be reimbursed to Owner by Contractor.

E. Furnish samples required for testing. Cost of material samples to be tested shall be paid by Contractor in all cases. Cost of testing, sampling and laboratory services shall be paid for by Owner or Contractor as shown.

F. Testing by independent testing agencies shall proceed as follows:

1. Testing Agencies shall comply with ASTM E329 and have 5 years minimum experience in appropriate area of specialty and shall be listed on "Roster of Approved Testing Agencies" for either City of Los Angeles, or City of San Diego, or shall be accepted by Owner.

2. Where required by these specifications, or where tests occur more than 50 miles from Work, Contractor shall hire Owner-accepted independent laboratory to perform testing and certify results. Provide labor, products, tools, instruments, water, and power as directed for sampling for required tests.

3. Samples for testing shall be representative of final work product. Samples treated differently from final work product will not yield valid test results.

4. Tests of products shall follow commonly recognized standards of national technical organizations, and specified sampling and testing methods.

5. Contractor shall pay for quality assurance testing unless otherwise shown.

6. Retest costs or other testing costs invoiced to Owner and specified to be paid by Contractor may be deducted from Contractor's next progress payment in lieu of Contractor's direct payment of invoice.

7. Owner may test representative samples of each type and size of product furnished using independent testing agency. Failure of samples to pass tests will be deemed sufficient cause to reject entire lot delivered.

G. Testing by Owner shall proceed as follows:

1. Notify Owner's Representative in writing at least 14 calendar days before Owner testing of materials is required. Written notice shall include name of supplier along with contact information, address and telephone number for source of material.

H. Employ only competent workers on Work. Any person employed found to be incompetent, intemperate, troublesome, disorderly, or otherwise objectionable or who fails to perform Work properly, acceptably and in accordance with Manufacturers' installation and warranty requirements, shall be immediately removed from Work by Contractor and not reemployed on Work.

1. Welders shall be AWS certified for type of work they are performing.

2. Welders on steel pressure piping or tank work shall be AWS certified as boiler and pressure vessel welders per Section IX Part A of AWS B2.1 as required by AWWA C200 paragraph 3.3.3.1.

3. Fabricators shall have 5 years minimum experience in appropriate area of specialty and shall be listed on "Roster of Licensed Fabricators" for either City of Los Angeles, or City of San Diego, or shall be accepted by Owner.

4. Deputy Inspectors shall comply with ASTM E329 and have 5 years minimum experience in appropriate area of specialty and shall be listed on "Roster of Approved Testing Agencies" for either City of Los Angeles, or City of San Diego, or shall be accepted by Owner.

I. Upon completion of Contract, Work shall be finished, tested and ready for operation. Work shall fulfill its intended purpose as described in Contract Documents, in submittals, and in Manufacturer's literature.

1.5 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Certificates of Compliance	Furnish on Owner's Request	.
Transcripts of Acceptance Test Results	Furnish on Owner's Request as needed to verify quality of manufactured products	
Manufacturer's Statement of Responsibility	Furnish where required in Contract Documents.	

B. Furnish samples required for testing. Cost of material samples to be tested shall be paid by Contractor in all cases. Cost of testing, sampling and laboratory services shall be paid for by Owner or Contractor as shown.

1.6 Contractor's Quality Control

A. Arrange work to be readily accessible and easy to operate and maintain where detail drawings are not included in Contract Documents, supplementary drawings or shop drawings and submittals.

B. Combinations of manufactured equipment shall be fully compatible and work safely and successfully as a unit. Furnish necessary mountings, couplings and appurtenances with each unit.

C. Relocations or adjustment of existing facilities noted in Contract Documents shall be done as needed. If existing items are lost or damaged during construction, replace with new items of equal or better quality.

1.7 Project Conditions

A. Ascertain suitability of native soil for backfill before submitting bid. If native soil is found to be unsuitable, provide suitable material for meeting compaction requirements at no additional cost to Owner.

B. Items furnished shall be capable of fulfilling their intended purpose in environment in which they are installed. Allow for local temperature extremes, climactic conditions and corrosive environments where necessary to ensure proper functioning of furnished products.

1.8 Unit Prices

A. Payment for Contractor-provided testing required in Contract Documents will be included in price bid for items of work for which Contractor-provided testing is specified.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 Inspection

A. Products and Work shall be subject to field and factory inspection and testing in accordance with standards required and defined in Contract Documents. Waiver by Owner of their right to inspect shall not relieve Contractor of duties to comply with Contract Documents.

B. Contractor shall provide and pay for independent inspection, deputy inspection and testing services required by Contract Documents.

C. Owner will provide certain inspection and testing duties not required of Contractor under Contract Documents. Performance of these tests and costs will be borne by Owner; except, Contractor shall pay cost of any failing test.

D. Inspection will be provided by Owner's Representative. Inspection shall not be considered as direct control of individual workman and his work. Inspections, tests, or approvals by Owner's Representative or others shall not relieve Contractor from their duty to perform Work in accordance with Contract Documents.

E. Inspection and testing fees imposed by public agencies other than Owner shall be paid for by Contractor. If Contract Documents, permits, laws, ordinances, rules, regulations or orders of public authorities having jurisdiction require Work to be inspected, tested, or accepted by someone other than Contractor, give Owner's Representative timely notice of readiness. Submit required certificates of inspection, testing or approval to Owner's Representative.

F. Maintain access to Work for Owner and Owner's Representatives. Permit authorized representatives and agents of Federal or State agencies to inspect work, products, and other relevant data and records. Provide safe and proper facilities to access and observe Work and to inspect or perform tests.

G. Owner’s Representative will inspect products after delivery and throughout construction process. Products will be subject to rejection at any time on account of failure to meet Contract Documents even though samples may have been accepted as satisfactory at place of manufacture.

H. Before backfilling, request inspection by Owner’s Representative to verify proper installation of buried work.

I. Before finishing, request inspection by Owner’s Representative to verify no surfaces to receive product have defects or errors which could result in poor or potentially defective application or cause latent defects in workmanship.

J. If Work is covered contrary to written instructions or work is covered before Contractor requests and receives inspection, uncover it at Contractor's expense, if requested by Owner's Representative. Replace at Contractor's expense.

K. If Owner's Representative considers it advisable covered Work be reinspected or tested by others, at Owner's Representative's written request, uncover Work in question, furnishing

necessary labor, products, and tools. If Work is found defective, Contractor shall pay for uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, Work is not found defective, Contractor will be allowed an increase in Contract Price or an extension of Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction, and a Change Order will be issued.

3.2 Field Quality Control

A. Frequency of sampling and testing shall be as shown, and shall be performed at such other times as necessary to document contract compliance.

B. Notify Owner's Representative and regulating authorities 3 days before field tests.

C. Perform field tests in presence of Owner's Representative who will record results.

D. Pipework, valves, fittings, conduit, tanks, and appurtenances shall have no visible leaks at design pressures. Joints shall be watertight.

E. Buried pipework and conduit shall provide clear and unobstructed pathway free from obstructions due to pipe or conduit deflection and free from interior debris. Where Owner has reason to suspect presence of such obstructions, Owner's Representative reserves right to require mandrel testing to demonstrate compliance before subsequent work such as paving, before charging or commissioning of piping, or before installation of wire within conduit.

F. Remove rejected work from jobsite. Work rejected by Owner's Representative for failure to comply with Contract Documents, shall be removed within 10 calendar days after Written Notice of rejection, whether incorporated in Work or not, unless repairs have been made to Owner's satisfaction.

G. Promptly replace and reexecute removed Work in accordance with Contract Documents and without expense to Owner. Contractor shall bear cost of making good Work of other Contractors destroyed or damaged by such removal or replacement.

H. Removal and replacement work shall be at Contractor's expense. If Contractor does not act to remove rejected Work within 10 calendar days after receipt of Written Notice, Owner may remove such Work and store products at Contractor's expense.

I. Repair, correct or replace work failing tests or inspection. Repeat tests at Contractor's expense, until results satisfy specifications.

J. Repair damage to work that is not cause for rejection.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 42 13
ABBREVIATIONS AND ACRONYMS

PART 1 - GENERAL

1.1 Work Included

A. This section lists abbreviations and defines them for use in these Contract Documents.

1.2 References

A. Publications listed below form part of this specification to extent referenced and are referred to in text by the basic designation only. Reference shall be made to the latest edition of said standards at time of bid.
   1. CSI TD-2-4 - Construction Specifications Institute Abbreviations
   2. SSPWC - Standard Specifications for Public Works Construction "Greenbook"

1.3 Application

.

A. When references are made in these specifications to standards, specifications, or other published data of various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only.

B. If an abbreviation is not listed below refer to CSI TD-2-4

C. Where use of Standard Specifications for Public Works Construction "Greenbook" is made, refer to SSPWC for use and description of abbreviations.

D. Interpretation of abbreviations shall consider context or discipline in which they are used. For example:

   1. FF means "finish floor" when referring to a floor slab.
   2. FF means "flat face" when referring to a pipe flange.

E. Refer discrepancies to Owner's Representative for interpretation.

1.4 List of Abbreviations

A Ampere / Area / Architectural Sheet
AA Aluminum Association
AASHTO American Association of State Highway and Transportation Officials
AB Anchor Bolt / Aggregate Base
ABAN Abandoned
ABC Asphalt Base Course
ABS Acrylonitrile Butadiene Styrene
AC Acre / Asphalt Concrete / Alternating Current
ACI American Concrete Institute
ACP Asbestos-Cement Pipe
ACU Access Door
ADA Americans with Disabilities Act of 1990 (Public Law 101-336, 104 Sat. 1990,42 USC 12101-12213 (as amended))
AE Architect-Engineer
AFF Above Finished Floor
AGG Aggregate
AI The Asphalt Institute

AIA American Institute of Architects
AISC American Institute of Steel Construction, Inc.
AISI American Iron and Steel Institute
AL Aluminum
AMB Ambient
AMP Ampere
ANG Angle
ANSI American National Standards Institute
APA American Plywood Association
APC Air Placed Concrete
API American Petroleum Institute
APWA American Public Works Association
ARCH Architecture / Architectural
ARAM Asphalt Rubber and Aggregate Membrane
ARHM Asphalt Rubber Hot Mix
ARV Air-Release Valve
ARVV Air-Release and Vacuum Valve
ASCE American Society of Civil Engineers
ASHRAE American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME American Society of Mechanical Engineers
ANSI American National Standards Institute
ASPH Asphalt
AREA American Railway Engineering Association
ASSY Assembly
ASTM American Society for Testing and Materials
ATS Automatic Transfer Switch
AVE Avenue
AVG Average
AWG American Wire Gage
AWPA American Wood Preservers Society
AWS American Welding Society
AWWA American Water Works Association

BB Back-to-Back
BC Beginning of Curve / Back of Curb / Bare Copper
BEG Begin
BETW Between
BF Blind Flange
BHP Brake Horsepower
BK Back / Brake
BKR Breaker
BL Building
BLK Block
BLVD Boulevard
BM Bench Mark / Beam
BMP Best Management Practice
BO Blowoff
BOP Bottom of Pipe
BOT Bottom
BP Baseplate
BRG Bearing
BRNZ Bronze
BTN Button
BTU British Thermal Unit
BUR CBL Buried Cable

BFV Butterfly Valve
BVC Begin Vertical Curve
BW Block Wall

C Conduit / Celsius / Civil Drawings / Copper
CAB Crushed Aggregate Base
CAP Capacity / Corrugated Aluminum Pipe
CAPA Corrugated Aluminum Pipe Arch
CB Catch Basin / Circuit Breaker
CBC California Building Code
CBR California Bearing Ratio
CC Cooling Coil / AWWA C800 Table 7 Pipe Thread Taper
CCFRPM Centrifugally Cast Fiberglass Reinforced Plastic Mortar
C-C Center-to-Center
CCB Concrete Block
CCR California Code of Regulations
CCTV Closed Circuit TV
CD Cross Drain / Condensate Drain / Ceiling Diffuser
CEC California Electrical Code
CEM Cement
CEnC California Energy Code
CF Cubic Feet / Curb Face
CFC California Fire Code
CFH Cubic Feet Per Hour
CFM Cubic Feet Per Minute
CFS Cubic Feet Per Second
CG Construction Grade
C&G Curb and Gutter
CHDPE Corrugated High Density Polyethylene
CHG Change
CHKD PL Checkered Plate
CI Cast Iron
CIP Cast-in-Place / Cast-Iron Pipe
CIPCP Cast-in-Place Concrete Pipe
CIPP Cured in Place Pipe
CISP Cast Iron Soil Pipe
CISPI Cast-Iron Soil Pipe Institute
CJ Construction Joint
CL Centerline / Class / Clearance / Chlorine
CLR Clear
CLSM Controlled Low-Strength Material
CMB Crushed Miscellaneous Base
CMC California Mechanical Code
CMLCSP Cement-Mortar Lined & Coated Steel Pipe
CMLSP Cement-Mortar Lined Steel Pipe
CMP Corrugated Metal Pipe
CMPA Corrugated Metal Pipe Arch
CMU Concrete Masonry Unit
CO Cleanout / Conduit Only
COL Column
COMM Communication
COMP Composite
COMPL Complete
CONC Concrete
CONN Connection
CONST Construct or Construction

CONT Continuous
CONTR Contractor
COORD Coordinate / Coordinated
COP Copper
COR Corner
CORP Corporation
CP Cathodic Protection
CPC California Plumbing Code
CPLG Coupling
CPVC Chlorinated Polyvinyl Chloride
CQS Cationic Quick Setting
CRM Crumb-Rubber Modifier
CRS Cationic Rapid Setting
CRSI Concrete Reinforcing Steel Institute
CRUMAC Crumb-Rubber-Modified Asphalt Concrete
CRUMAC-GG Crumb-Rubber-Modified Asphalt Concrete Gap-Graded
CS Commercial Standard, US Department of Commerce
CSP Corrugated Steel Pipe
CSS Cationic Slow Setting
CT California Test / Center Top / Current Transformer
CTG Coating
CTR Center
CULV Culvert
CU YD, CY Cubic Yard
CYL Cylinder

D Degree of Curvature
DB Direct Buried / Decibel
DBL Double
DC Direct Current
DEPT Department
DET Detail / Detour
DG Decomposed Granite
DI Drop Inlet
DIA Diameter
DIAG Diagonal
DIM Dimension
DIMJ Ductile-Iron Mechanical Joint
DIP Ductile-Iron Pipe
DIPRA Ductile-Iron Pipe Research Association
DISCH Discharge
DIST Distance
DMH Drop Manhole
DN Down
DR Drain / Door
DSL Diesel
DWG Drawing
DWY Driveway

E East / Electrical Drawings
EA Each
EC End of Curve
ECC Eccentric
ED External Distance
EE Each End
EF Each Face / Exhaust Fan

EFF Efficiency
EFL Effluent
EGL Energy Grade Line
EIA Electronics Industries Alliance
EL Elevation / Each Layer
E/L Easement Line
ELEC Electric
ELP Elliptical
ENC Encasement or Encased
ENCL Enclosure
ENG Engine
ENGR Engineer
EOS Equivalent Opening Size
EP Edge of Pavement / Explosion Proof
EPA Environmental Protection Agency (Federal)
EQ Equation
EQL Equal
ESMT Easement
EST Estimate or Estimated
ETC And so Forth
ETL Electrical Testing Laboratories
EVC End Vertical Curve
EW Each Way
EXC Excavate or Excavation
EXP Expansion
EXST Existing
EXT Exterior / Extension

F Fahrenheit / Floor
FAB Fabricate
FAT Functional Acceptance Test (site)
FBRBD Fiberboard
FC Foot-Candle
FCC Federal Communications Commission
FCO Floor Cleanout
FCV Flow Control Valve
FD Floor Drain
FDN Foundation
FDT Factory Demonstration Test.
FE Flanged End / Fence
Fed Spec Federal Specification
FF Finished Floor / Flat Face
FG Finished Grade
FH Fire Hydrant
F&I Furnish and Install
FIG Figure
FIP Female Iron Pipe Thread
FIPT Female Iron Pipe Thread
FIT Fitting
FL Floor / Flow Line
FLG Flange
FM Force Main / Factory Mutual
FMH Flexible Metal Hose
FNSH Finish
FNTP Female National Pipe Thread Taper
FOC Face of Concrete

FPC Flexible Pipe Coupling
FPM Feet Per Minute
FPS Feet Per Second
FS Finished Surface / Floor Sink / Federal Specifications
FSTNR Fastener
FT Feet
FTG Footing
FUT Future

G Gas / General Drawings / Gram
GA Gage
GAL Gallon
GALV Galvanized
GB Grade Break
GDR Guard Rail
GR Grooved End
GENL General
GFI Ground Fault Interrupter
GG Gap-Graded
GM Gas Main
GND Ground
GPD Gallons Per Day
GPM Gallons Per Minute
GR Grade
GRI Geosynthetic Research Institute
GSKT Gasket
GUI Graphical User Interface.
GUT Gutter
GV Gate Valve

H Humidistat / Horizontal
HARN Harness
HB Hose Bib
HC House Connection
HD Heavy Duty
HDPE High-Density Polyethylene
HGL Hydraulic Grade Line
HGT Height
HI Hydraulic Institute
HMI Human-Machine-Interface. (Software providing graphical user interface to control system
HMWPE High-Molecular Weight Polyethylene
HORIZ Horizontal
HP Horsepower / High Pressure
HPT High Point
HR Hour / Handrail
HRWRA High-Range Water-Reducing Admixture
HS High Strength
HV Hose Valve
HVAC Heating, Ventilating, and Air Conditioning
HW Headwall / Hot Water
HWL High Water Level
HWY Highway
HYDR Hydraulic
HZ Hertz (cycles per second)

I Intersection Angle / Instrumentation Drawings
ICBO International Conference of Building Officials
ICC International Code Council
ID Inside Diameter
IE Invert Elevation
IEEE Institute of Electrical and Electronics Engineers
IMSA International Municipal Signal Association
IN Inches
INCL Include
INL Inlet
INSUL Insulating
INSTL Install or Installation
INT Interior
INTR Intersection
INV Invert
I/O Inlet / Outlet
IP Iron Pipe / Internet Protocol
IPS Iron Pipe Size
IPT Iron Pipe Thread
IRR Irrigation
ISA Instrument Society of America
ITE Institute of Traffic Engineers

JB Junction Box
JCT Junction
JN Join
JT Joint

KG Kilogram
KM Kilometer
KIPS Thousands of Pounds
KPA Kilopascal
KV Kilovolt
KW Kilowatt
KWH Kilowatt-Hour
KWHM Kilowatt-Hour Meter

L Length of Curve / Long / Landscaping Drawings
LATL Lateral
LB Pound
LCL Local
LF Linear Foot
LNDSCP Landscaping
LOCN Location
LP Light Pole
LPG Liquified Petroleum Gas
LPT Low Point
LR Long Radius
LS Lift Station / Lump Sum
LT Left / Light
LWC Lightweight Concrete
LWIC Lightweight Insulating Concrete
LWL Low Water Level

M Mechanical Drawings / Meter
MATL Material

MAX Maximum
MB Machine Bolt / Megabyte / Millibars
MC Medium Curing / Metal Channel
MCM Thousand Circular Mils
ME Machined End
MECH Mechanical
MFR Manufacturer
MG Million Gallons / Milligram
MGD Million Gallons Per Day
MH Manhole
MHZ Megahertz
MI Malleable Iron / Mile
MIL Military Specifications
MIL- Military Specification (leading symbol)
MIN Minimum
MIP Male Iron Pipe Thread
MISC Miscellaneous
MJ Mechanical Joint
MM Millimeter
MNTP Male National Pipe Thread Taper
MO Motor Operator / Motor Operated / Masonry Opening
MOD Modification
MON Monument
MOT Motor
MOV Motor Operated Valve
MSDS Material Safety Data Sheet
MSL Mean Sea Level
MTD Mounted
MUTCS Manual on Uniform Traffic Control Devices

N North / Neutral / Nitrogen
N/A Not Applicable
NACE National Association of Corrosion Engineers
NBS National Bureau of Standards
N & C Nail and Cap
NC Normally Closed
NCV Normally Closed Valve
NE Northeast
NEC National Electrical Code
NEMA National Electrical Manufacturers Association
NFC National Fire Code
NFPA National Fire Protection Association
NIC Not in Contract
NIP Nipple
NO Number / Normally Open
NOM Nominal
NPT National Pipe Thread Taper
NRS Non-Rising Stem
NSF National Sanitation Foundation
NTS Not to Scale
NW Northwest
NWL Normal Water Level

OA Overall / Outside Air
OC On Center / Overcurrent
OD Outside Diameter

OE Or Equal
OF Outside Face
OFCI Owner-Furnished Contractor-Installed
OFCR Owner-Furnished Contractor-Relocated
O/ I PLC Inputs and Outputs.
OPER Operator
OPNG Opening
OPP Opposite
OSHA Occupational Safety and Health Administration, U.S. Department of Labor
OS&Y Outside Screw and Yoke
O TO O Out to Out
OUTL Outlet
OVFL Overflow
OVHD Overhead
O&M Operations and Maintenance.

P Pole
PARA Paragraph
PAV Pressure-Aging Vessel
PB Push Button / Pull Box
PC Point of Curvature / Programmable Controller
PCA Portland Cement Association
PCC Point of Compound Curvature / Portland Cement Concrete
PCS Process Control System
PE Plain End / Polyethylene / Professional Engineer
PEN Penetration
PG Performance Graded / Pressure Gage
PI Point of Intersection
PJTN Projection
PKWY Parkway
PL Plate / Property Line
PLATF Platform
PLC Programmable Logic Controller.
PLF Pounds Per Lineal Foot
PLI Pounds per Lineal Inch
PM Parcel Map
PMB Processed Miscellaneous Base
PNL Panel
PO Push-On
POB Point of Beginning
POC Point of Connection
PE Polyethylene
POR Portion
PP Power Pole / Polypropylene
PPB Parts Per Billion
PPI Plastic Pipe Institute
PPM Parts Per Million
PR Pair
PRC Point of Reverse Curve
PRCB Precast Reinforced Concrete Box
PRESS Pressure
PRL Parallel
PRPSD Proposed
PRVC Point of Reverse Vertical Curve
PSI Pounds Per Square Inch
PSIG Pounds Per Square Inch Gage

PSF Pounds Per Square Foot
PT Point of Tangency
PV Plug Valve
PVC Polyvinyl Chloride / Point of Vertical Curvature
PVI Point of Vertical Intersect
PVMT Pavement
PWR Power
P&ID Process and Instrumentation Diagram.

Q Flow Rate
QTY Quantity

R Radius / Resistance Value / Right
RA Reclaimed Aggregates
RAC Recycled Asphalt Concrete
RAF Return Air Fan
RAP Reclaimed Asphalt Pavement
RAT Reliability Acceptance Test
RC Rapid Curing / Reinforced Concrete
RCP Reinforced Concrete Pipe
RCPA Reinforced Concrete Pipe Arch
RCPCC Reclaimed Plastic Portland-Cement Concrete
RD Road
RDC Reduce
RDCR Reducer
RDWY Roadway
REF Reference
REINF Reinforce or Reinforced
RELOC Relocate
REQD Required
RES Reservoir
REV Revise / Revision
RF Raised Face
RH Relative Humidity
RJ Restrained Joint
RND Round
RM Record Map
ROS Record of Survey
RPM Revolutions Per Minute
RS Road Survey / Rising Stem
RSD Regional Standard Drawings
RST Reinforcing Steel
RT Right
RTFO Rolling Thin-Film Oven
RUS Retail Utilities Service
RW Recycled Water
R/W Right-of-Way
RWGV Resilient-Wedge Gate Valve
S Hveem Stability / South
SA Sweetwater Authority
SAE Society of Automotive Engineers
SAN Sanitary
SAPP Structural Aluminum Plate Pipe
SAPPA Structural Aluminum Plate Pipe Arch
SC Seal Coat / Slow Curing
SCADA Supervisory Control and Data Acquisition

SCFM Standard Cubic Feet Per Minute
SCH Schedule
SCM Supplementary Cementitious Material
SCRN Screen
SD Storm Drain
SDG Siding
SDR Standard thermoplastic pipe dimension ratio (ratio of pipe OD to minimum wall thickness)
SE Sand Equivalent / Southeast
SECT Section
SF Square Feet
SG Specific Gravity
SGL Single
SH Sheet / Sheeting / Shielded / Structural Sheet
SHT Sheet
SI International System of Units (Metric)
SIM Similar
SKWK Sidewalk
SLC Service Lateral Connection
SLP Slope
SLV Sleeve
SM Sheet Metal
SOL Solenoid
SOV Solenoid-Operated Valve
SP Space / Steel Pipe / Static Pressure / Spare / Stand Pipe
SPCG Spacing
SPEC Specification
SPLC Splice
SPRT Support
SQ Square
SS Sanitary Sewer / Slow Setting
SSPC Steel Structures Painting Council
SSPP Structural Steel Plate Pipe
SSPPA Structural Steel Plate Pipe Arch
SSPWC Standard Specifications for Public Works Construction
SS Stainless Steel
ST Street
STA Station
STBY Standby
STD Standard
STK Stake
STL Steel
STR Straight
STRL Structural
STRUCT Structure
STS Storm Sewer
SURF Surface
SW Southwest
SWG Swing
SYMM Symmetrical
SWPPP Storm Water Pollution Prevention Plan
SYS System

T Ton / Tangent Length of Curve
TAN Tangent
T/B Top of Beam

TB Top of Bank / Terminal Board
T&B Top and Bottom
TBG Tubing
TBM Temporary Bench Mark
TC Top of Curb
TCP Traffic Control Plan
TDH Total Dynamic Head
TDS Total Dissolved Solids
TEL Telephone
TEMP Temperature / Temporary
THB Thrust Block
THD Thread or Threaded
THH Thrust Harness
THK Thick
TO Turnout
T/O Top of
TOC Top of Concrete / Top of Curb
TOP Top of Pipe
TOS Top of Slab
TOT Total
TP Telephone Pole
TRD Thread
TRA Tie Rod Assembly
TRMAC Tire-Rubber-Modified Asphalt Concrete
TS Tube Sheet
TTC Temporary Traffic Control
TYP Typical

UD Underdrain
UG Underground
UL Underwriters Laboratories, Inc.
ULT Ultimate
UON Unless Otherwise Noted
UPS Uninterruptible Power Supply.
US United States
USC United States Code
UTC Underground Telephone Cable
UTIL Utilities

V Vent / Valve / Volt / Vertical
VAC Vacuum / Volts Alternating Current
VAI Virtual PLC analog input
VAO Virtual PLC analog output
VC Vertical Curve
VCP Vitrified Clay Pipe
VDC Volts Direct Current
VDI Virtual PLC discrete input
VDO Virtual PLC discrete output
VEL Velocity
VERT Vertical
VFD Variable Frequency Drive
VOL Volume
VPC Vertical Point of Curve
VPI Vertical Point of Intersection
VPT Vertical Point of Tangency
VTCSH Vehicle Traffic Control Signal Heads

W West / Watt / Wide / Water / Wire
W/ With
WADG Water Agencies' Design Guide
WAS Water Agencies' Standards
WASC Water Agencies' Standards Committee
WATCH Work Area Traffic Control Handbook
WE Weld End
WG Water Gage
WL Waterline
WLD Welded
WM Water Meter
W/O Without
WOG Water Oil Gas
WP Waterproof / Working Point
WSE Water Surface Elevation
WSP Water Stop
WT Weight
WTAT Wet Track Abrasion Test
WTR Water
WWF Welded Wire Fabric
WWM Woven Wire Mesh
WWR Welded Wire Reinforcement

X by

YCO Yard Cleanout
YD Yard
YP Yield Point
YR Year
YS Yield Strength

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 57 23
TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 - GENERAL

1.1 Work Included

A. Storm Water Pollution Prevention Plans and pollution prevention during construction.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 74 00: Cleaning and Waste Management

1.3 References

A. California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook for Construction

1.4 Submittals

A. Furnish the following submittals

SUBMITTAL	DESCRIPTION	
Storm Water Pollution Prevention Plan (SWPPP)	See Paragraph 1.5 below	
Spill Prevention, Control, and Countermeasure Plan (SPCCP)	See Paragraph 1.6 below	

1.5 Pollution Prevention and Storm Water Pollution Prevention Plan (SWPPP)

A. Comply with current California State Water Control Board (SWRCB) General Construction Activity NPDES Stormwater Permit (General Construction Permit**) for all construction disturbing one acre or more of land** (including all staging areas, access routes, material storage yards, etc.) Where more than an acre is disturbed, this permit includes a requirement to develop a Stormwater Pollution Prevention Plan (SWPPP) and Monitoring Plan (MP) which will outline site-specific Best Management Practices (BMPs) to prevent impairment to surface water quality from construction site discharges to surface waters

B. No SWPPP is available. Contractor shall manage operations so no more than 0.999 acres are disturbed by Contractor's operations.

C. Pay all fines associated with failure to comply with Storm Water Pollution Prevention Plan (SWPPP) requirements of applicable Regional Water Quality Control Board, except where such fines are assessed due to sole negligence of Owner.

D. Where a SWPPP has been prepared for project, comply fully with all requirements of SWPPP governing Contractor's operations and record keeping requirements.

E. Where no SWPPP is available:

1. Exercise every reasonable precaution to protect channels, gutters, storm drains, and bodies of water from pollution using best management practices (BMPs) listed in California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook for Construction.

2. Water pollution control Work shall consist of Work necessary to construct facilities required to protect Work area from damage from erosion or impounding of water, prevent erosion and discharge of sediments, and control and abate water pollution.

3. Such work shall include, but not be limited to constructing rock bag berms, desilting basins, drains, fiber rolls and mats, and concrete washout areas.

F. Prohibit rain runoff or other water from entering pipe trenches and infiltrating to ground water by redirecting surface flows with berms, temporary drains, or other suitable measures. Pump water out of trenches as necessary to control water in excavations.

G. Construct silt fence around disturbed soil areas. Take all measures necessary to prevent erosion and transport of sediment into waterways in accordance with SWPPP. Stockpile excavated material within construction staging area. Cover stockpiles with plastic sheets to prevent erosion.

H. In absence of published SWPPP where disturbing more than 0.999 acres by construction operations is unavoidable, Contractor shall retain certified SWPPP preparer accepted in writing by Owner's Representative to prepare SWPPP for approval by Owner and applicable local agency and Regional Quality Control Board.

1.6 Watershed Protection

A. Enforce strict on-site handling rules to keep construction and maintenance materials out of receiving waters.

1. Store all reserve fuel supplies only within confines of designated construction staging area.

2. Refuel equipment only within designated construction staging area.

3. Regularly inspect all construction vehicles for leaks.

B. For Work on sewers or sewage equipment outside wastewater plants, prepare Spill Prevention, Control, and Countermeasure Plan (SPCCP). Plan shall include measures to be taken in event of an accidental wastewater spill.

C. Clearly mark and stake construction and staging areas shown on Plans. Do not use heavy equipment outside this area. Design construction staging areas to contain contaminants such as oil, grease, and fuel products, so they do not drain towards receiving waters or storm drain inlets. If heavy-construction equipment is stored overnight adjacent to a potential receiving water, place drip pans beneath machinery engine block and hydraulic systems.

1.7 Unit Prices

A. Cost for compliance with SWPPP requirements shall be included in the various bid items set forth in these documents and no additional compensation will be granted.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 61 00
COMMON PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 Work Included

A. Basic requirements for all products used in Work.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 63 00: Product Substitution Procedures
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 01 73 24: Seismic Restraint
H. Section 01 73 33: Mechanical Identification
I. Section 01 77 00: Closeout Procedures

1.3 Quality Assurance

A. Piping systems and elements shall comply with ASME Codes, and appropriate ASTM, API, AWWA, or NFPA standards.

B. Products requiring electrical connection shall be listed and classified by Underwriters Laboratories, Inc. as suitable for purpose shown.

C. Wiring terminations shall match branch circuit conductor quantities, sizes, and materials shown. Enclose terminal lugs in terminal box sized to NFPA 70.

D. If furnished products differ from those shown and require changes to enclosures, mounting and support structures, power and control circuitry or other Work to accommodate furnished product, provide changes required at no additional cost to Owner and of same quality as shown.

1.4 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. Products of listed acceptable Manufacturers shall meet specifications notwithstanding the fact Manufacturer is "listed". Owner reserves right to reject submittals and products from "acceptable Manufacturers" if they fail to demonstrate compliance with specifications.

B. Similar items on project shall be products of same Manufacturer.

C. Equipment furnished shall operate through its full operating range powered by amperages specified or shown on Plans. Equipment requiring larger amperage than specified or shown is unacceptable absent written statement from Owner electrical infrastructure and switchgear can support increased amperage.

D. Where plans and specifications are silent regarding specific acceptable Manufacturers, acceptable Manufacturers shall meet minimum requirements outlined in Section 01 63 00 for "accepted equals."

2.2 Materials

A. Products shall be new and of current design and manufacture, free from defects and imperfection that might impede serviceability of product for its intended purpose.

B. Products and workmanship shall match Contractor's submittals as reviewed by Owner's Representative.

C. Products or Work for which no technical specifications are set forth shall be of best grade in quality and workmanship obtainable in market from firms of established good reputation, or, if not ordinarily stocked, shall conform to usual standards for first class products of kind required, considering intended use. Work shall be in full conformity and harmony with intent to secure best standard of products and construction.

D. Materials and materials sources shall be accepted by Owner at least 3 days before use of materials in Work.

E. Dissimilar metals, when used in conjunction with each other shall have suitable insulation provided between adjoining surfaces to eliminate direct contact and resultant current.

F. Insulation shall be bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators, bushings, washers, or other accepted materials.

G. All-thread or close nipples are prohibited.

H. Mating ends of pipe shall match.

I. Mating ends of valves, meters and couplings shall match ends of adjacent pipe.

J. Minimum working pressure of valves, couplings and fittings shall equal or exceed class of pipe to which they are attached or 150 psi, whichever is higher.

K. Castings shall be sound, clean, free from porosity, cold shots, blisters, holes and defects of any nature that would render them unacceptable. No plugging, filling, brazing or welding of defects will be allowed.

L. Connections and mountings required to install products shall comply with connections and mountings shown in Contract Documents and Submittals on location-specific basis. Do not assume acceptance of connections or mountings at one location constitutes acceptance of same at all locations.

M. Comply with federal, state and local regulations governing VOC content, lead content, percentage solids by volume, and other paint and solvent properties.

N. Corresponding parts of identical products shall be interchangeable.

O. Materials for complete paint or sealant system, including primer, finish coats, thinners, cleaners and drying agents, and other additives shall be end products of one Manufacturer to ensure product compatibility and unit responsibility.

P. Design and fabrication of products shall ensure products withstand stresses and loads which may occur during testing, installation, start-up, and normal operation.

Q. Products shall be capable of fulfilling their intended purpose in environment in which they are installed. Allow for local temperature extremes, climactic conditions and corrosive environments where necessary to ensure proper functioning of furnished products.

R. Electrical equipment shall be built to NEMA and UL standards for NEC Article 505 Classification specified.

2.3 Equipment

A. Stainless steel inscribed nameplates shall be securely fastened in conspicuous locations for mechanical equipment having moving parts. Show Manufacturer's name, year of manufacture, serial number, principal rating data and equipment item number. Nameplates shall be in English and use American measuring units.

B. Valves shall be marked to show name of Manufacturer, year of manufacture, size of valve, maximum working pressure, and arrow to show direction of flow.

C. Valves shall close drip tight at rated pressures.

D. Valves shall be satisfactory for applications involving valve operation after long periods of inactivity.

E. Motors shall meet, as minimum requirements, published standards, rules and regulations of NEMA, ANSI and IEEE as to application, manufacture and tests. Motor windings shall be insulated and braced for full voltage operation.

F. Motors shall develop sufficient torque for required service throughout acceleration range at voltage 10 percent less than motor nameplate rating. Motors shall develop sufficient torque when started using reduced voltage starters.

G. Provide grounding lugs inside conduit boxes for motor frame grounding.

H. Provide grounding rods as required for grounding magnetic meters and other electrical equipment requiring grounding for proper operation.

I. Grease fittings shall be standard button-head type. Grease fittings shall be serviceable by a single type of grease gun. Extend fittings as necessary to provide easy access, or as directed by Owner's Representative.

J. Furnish special tools, wrenches and appliances needed to adjust, operate, maintain or repair mechanical equipment supplied.

PART 3 - EXECUTION

3.1 Installation

A. Furnish mounts, guides, bearing plates, flanges, anchor and attachment bolts and screws, saddles, supports, pads and skids necessary to securely mount products and equipment.

B. Tighten bolts to Manufacturers' specifications using torque wrenches. Unless otherwise directed, use lubricant such as Copperkote or blue Teflon when making up bolts.

C. Manufacturer's instructions and warranty requirements for installation, application, connection, erection, maintenance, operating, cleaning and conditioning of products shall be strictly followed.

D. Contractor shall require Manufacturers to furnish factory-authorized technical representative to visit site as needed to provide technical support in resolving field problems associated with Manufacturer’s product.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 63 00
PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 Scope

A. Acceptable manufacturers, accepted alternates, and procedures for seeking product substitutions.

1.2 Related Work

A. Section 01 24 00: Cost Reduction Incentive Proposals
B. Section 01 33 00: Submittal Procedures
C. Section 01 64 50: System Integrators

1.3 General Requirements

A. Pursuant to California Public Contract Code §3400, Deadline for receipt of Substitution Requests shall expire at 5:00 P.M. Pacific Standard Time, 7 calendar days after date of bid opening published in Notice Inviting Bids.

B. Where products are specified solely by reference standard, any product meeting standards referenced may be used. Information on such products shall be submitted in accordance with requirements of Section 01 33 00.

C. Where products or processes are specified by trade, patent or proprietary name, said specification, unless marked "no exceptions", shall be deemed to be followed by the words "or equal accepted in writing by Owner's Representative." In such case substitution of similar products as "accepted equals" will be considered under this section.

D. Where more than one proprietary name is specified, Contractor may provide any one of products specified or submit a request for an "or equal" substitution consistent with paragraph C above.

E. Only one manufacturer shall be used for each specific application throughout Work notwithstanding that similar materials or equipment of 2 or more manufacturers or producers may be specified for same application.

F. Substitution Request Procedure Before Bid Opening - Submit written request on enclosed form for proposed substitutions to Owner's Representative prior to deadline for receipt of substitution requests. Submit proposed substitutions relating to a particular subcontract or trade in one package. If Owner accepts any proposed substitutions, such acceptance will be set forth by addendum. No substitution will be considered after deadline for receipt of substitution requests has expired unless accompanied by an offer of savings to Owner.

G. Substitution Request Procedure After Bid Opening – Owner will only consider substitutions after bid opening if accompanied by an offer of savings to Owner in excess of $1,000. Submit written request on enclosed form to Owner's Representative. Submit proposed substitutions relating to a particular subcontract or trade in one package. If Owner accepts any proposed substitutions, such acceptance will be set forth by change order.

H. Contractor's Responsibility for Construction Modifications - Drawings have been detailed in compliance with dimensions and International Code Council (ICC) Evaluation Report data for products specified. If proposed substitute product is accepted by Owner's Representative,

Contractor shall assume both responsibility for construction modifications and additional costs required by reason of this acceptance. If substitution decreases Contractor's cost, potential savings to Owner may be submitted to Owner's Representative for consideration.

I. No time extension will be allowed for substitution of materials.

1.4 Standardization of Equipment and Certain Materials

A. Systems of Like Manufacture - To ensure standardization and uniformity in all parts of Work and to provide Owner with inter-changeability capabilities, simplified spare parts inventory, and standardized maintenance programs and Manufacturers' services, where products are specified in groups to be furnished by one manufacturer, no substitution will be considered not similarly furnished by one manufacturer. Where Contractor proposes to use system of equipment other than that shown in Contract Documents, substitution shall be proposed as complete system.

B. Material items exempt from standardization include structural steel, reinforcing steel, fasteners and bolting materials, building insulation, sheet metal, materials specified only by reference to recognized standard, and items hidden from view where inter-changeability, color, and texture is no significant factor for standardization.

C. Contractor shall inform their suppliers and subcontractors of these requirements, and shall provide necessary coordination to accomplish standardization specified.

D. Pursuant to California Public Contract Code §3400(b), Owner reserves right to reject product substitutions (1) on the basis of maintenance of economies of scale available to Owner through standardizing of manufacturers and minimizing spare parts inventories, or (2) if Owner has provided in Invitation for Bids that the product is necessary to (i) field test or experiment to determine the product's suitability for future use, (ii) match other products in use on a completed public improvement or one in the course of completion, (iii) obtain a necessary item only available from one source, or (iv) respond to an emergency declared in accordance with requirements of California Public Contract Code §3400(c)(4).

1.5 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Substitution Request Form	Submit Substitution Request on form furnished below.	
Contractor's Certification of Performance and Assumption of Liability	Submit Certificate of Performance certifying proposed substitution is equal to or better in all respects to product specified and proposed substitution will, in all respects perform function for which it is intended.	
Certificate of Compliance	Required as needed to substantiate Product Substitutions	
Dimensional Data:	Required for Product Substitutions	
Material Samples	Required as needed to substantiate Product Substitutions	
Manufacturer's Statement of Responsibility	Required at Owner's discretion for Product Substitutions. See form at rear of Section 01 33 00.	
Foundry or Test Record Transcripts	Required as needed to substantiate Product Substitutions	
Material List and Ratings	Required as needed to substantiate Product Substitutions	
Names and Addresses of Nearest Local Manufacturer's Representatives	Required for Product Substitutions (Use allotted space on attached Substitution Request Form)	
List of 3 Local Product Installations	Names and contact information for three installations within 150-mile radius of project completed in prior 3 years. Required for Product Substitutions (Use allotted space on attached Substitution Request Form)	

SUBMITTAL	DESCRIPTION	
Manufacturer's Service Contract Statement of Qualifications	Required for installations of products which include optional maintenance service contracts.	
Warranty	Furnish warranty equal to or better than warranty required for specified product.	

B. Burden of proof of equality of substituted item shall be on Contractor. Acceptance of such substitutions is entirely at Owner's discretion.

C. List of Accepted Substitutions - Owner will issue to bidders by addendum a list setting forth accepted substitutions. No products proposed for substitution, shall be ordered before being accepted in writing by Owner's Representative.

D. Products accepted as "accepted equals" shall, in Owner's opinion, meet the following requirements:

1. Products shall be of equal quality, substance and function to those listed.

2. Architectural finishes and colors of accepted equals shall, in Owner's opinion be compatible with existing finishes and colors.

3. Products shall be standard products of a reputable manufacturer having regularly been engaged for 5 years in manufacture of products furnished.

4. Products shall have a reputation for assuring long-lasting trouble-free service.

5. Factory-authorized, factory-trained and competent service personnel and stocked service parts shall be available within a 150-mile radius of Work.

6. Manufacturer shall be capable of certifying compliance with listed reference standards.

E. System integrators accepted as "accepted equals" shall, in Owner's opinion, meet the following requirements:

1. System integrator, including key personnel assigned to project shall have regularly been engaged for 5 years in system integration of products furnished.

2. Work provided by system integrator on prior projects shall have a reputation for delivering long-lasting trouble-free service.

3. Key personnel proposed for work on project shall be factory-trained and competent full-time employees of system integrator, and shall reside within a 150-mile radius of Work.

4. System integrator shall maintain inventory of stocked service parts available within a 150-mile radius of Work.

5. System integrator shall be capable of certifying compliance with listed reference standards.

F. If, in Owner's opinion, proposed substitution is not equal to or better in every material respect to specified product, or was not submitted for acceptance in manner outlined above, Contractor shall furnish products specified.

G. Contractor shall inform all other trades, vendors, and subcontractors of effects of substitutions on their Work or products. Failure to so notify shall not relieve Contractor of their

duty to make payments arising from alterations in specified products or methods needed to complete Work in acceptable manner.

1.6 Contractor's Responsibility for Cost of Substitution Reviews

A. Contractor shall pay all costs incurred by Owner's Representative and Owner to review Requests for Substitutions.

1.7 Responsibility for Spare Part Inventories

A. Provide spare parts inventory for 2 years' typical maintenance. See technical specifications for further information for specific equipment items.

1.8 Bid Shopping and Reverse Auctions

A. Substitutions for products and services of Manufacturers, system integrators, or subcontractors listed at time of bid and/or in Contractor's initial Submittal will only be permitted under one or more of the following circumstances:

1. Where Contractor offers a credit to Owner sufficient in Owner's opinion to justify accepting substitution by Change Order.

2. Where Contractor-listed manufacturer, system integrator or subcontractor has gone out of business.

3. Where Contractor-listed manufacturer, system integrator or subcontractor has, in Owner's opinion, failed to perform or no longer possesses both capability and willingness to perform to standard required by Contract Documents.

.

4. Where Contractor-listed manufacturer, supplier or subcontractor increases price quoted to Contractor above that quoted at time of bid, and Contractor submits evidence of this acceptable to Owner.

5. With respect to subcontractors listed at time of bid, substitution is for a circumstance permitted by California Public Code Section 4107.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SUBSTITUTION REQUEST FORM

TO: _____
Owner

_____
Address

_____
City/State/ZIP

PROJECT NAME: _____

_

FROM CONTRACTOR:_____

We hereby submit for consideration the following product substitution of specified item for above project:

DRAWING OR SECTION NO.	**SHEET NUMBER OR PARAGRAPH**	**SPECIFIED ITEM**
_____	_____	_____

PROPOSED SUBSTITUTION:_____

Attach complete dimensional information and technical data needed to substantiate product substitution, including ICBO reports and laboratory tests, if applicable.

Include complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation.

Where product substitutions are proposed at multiple locations, submit copies of plans showing in red each location where product substitution is proposed.

Submit with request all necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance. Differences in quality of materials and construction shall be indicated.

Submit Manufacturer’s Statement of Responsibility.

SUBSTITUTION REQUEST FORM

Fill in Blanks Below:

A. Does the substitution affect dimensions shown on Drawings?

Yes ___ No ___ If yes, attach copy of plans and clearly indicate changes.

B. Will the undersigned pay for changes to building design, including engineering, detailing and review costs caused by requested substitution? Yes ___ No ___

C. What effect does substitution have on other trades?

1. _____

2. _____

3. _____

D. What effect does substitution have on applicable code requirements?

1. _____

2. _____

3. _____

E. What is the ICC Approval Number? _____

F. Differences between proposed substitution and specified item:

1. _____

2. _____

3. _____

G. List three installations where product is in use:

1. _____

2. _____

3. _____

H. Address of Authorized Manufacturer's Representative:

_____
Representative

_____
Address

_____
City/State/ZIP

I. Manufacturer's guarantees of proposed and specified items are:

Same ___ Different ___ (Explain) _____

J. Owner's share of cost savings if substitution is accepted $_____

SUBSTITUTION REQUEST FORM

CONTRACTOR'S CERTIFICATION OF PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUAL PERFORMANCE

I certify the proposed substitution is equal to or better in all respects to the product specified and that the proposed substitution will, in all respects perform the function for which it is intended.

Submitted By:

_____
Signature Title

_____
Firm

_____
Address

_____
Telephone Date

For use by Design Engineer:

__ Accepted
__ Accepted as Noted
__ Not Accepted
__ Received Too Late

By _____

Date _____

Remarks _____

Concurrence By:

_____
Owner

Signature must be by person having authority to legally bind his firm to the above terms. Failure to provide legally binding signature will result in retraction of acceptance.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 65 00
PRODUCT DELIVERY REQUIREMENTS

PART 1 - GENERAL

1.1 Work Included

A. Transportation and delivery of products.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 66 00: Product Storage and Handling Requirements

1.3 References

A. ANSI/NSF 60 Drinking Water Treatment Chemicals – Health Effects
B. ANSI/NSF 61 Drinking Water System Components – Health Effects

1.4 Delivery

A. Do not ship any item until Owner has accepted all applicable submittals.

B. Before shipping materials and/or equipment, Contractor shall also be responsible for verifying field dimensions, utility locations and electrical compatibility for items of Work which may require relocation, refitting, or different electrical motors and wiring if field dimensions differ from those shown on Plans.

C. Should Contractor discovers a conflict during surveying, staking, verification of field dimensions, verification of utility locations or verification of electrical compatibility, they shall bring this matter to Owner's attention as soon as conflict is discovered and before materials or equipment are shipped. Owner will make adjustments to Contract requirements needed to accommodate field conditions, and will pay reasonable costs for upgrades or modifications required to be made at place of manufacture prior to shipping to accommodate conflicts discovered.

D. Owner will not pay costs of shipping and returning items to place of manufacture unless:

1. Owner has acted to prevent Contractor from completing surveys, staking, verification of field dimensions, verification of utility locations or verification of electrical compatibility, and Contractor has notified Owner of this fact in writing before shipping equipment, or

2. Changes required are direct result of buried utility conflicts where said utilities were neither shown on Plans in their approximate location, nor located by Underground Service Alert, nor evident from surface features.

E. Ship and deliver products to jobsite as follows:

1. Do not ship, accept delivery of or store items on site for which applicable submittals have not been accepted.

2. Before shipping, operate valves, motors, pumps, actuators, and mechanical equipment at factory to ensure products are complete and in working condition.

3. Only products of accepted Manufacturers shall be delivered to or stored at site.

4. Deliver products to jobsite in Manufacturer's original, unbroken, unopened, labeled packaging containers or bundles. Tag or label packages containers or bundles as needed to identify contents and name of equipment of which contents form a part.

5. Deliver large multi-component assemblies in sections facilitating field handling and installation.

6. Oil-lubricated gearing, bearings, and other lubricated components shall be shipped with oil soluble protective coating as described in warranty requirements or recommended by Manufacturer. For parts contacting potable water, coating shall be NSF-approved. Coating shall provide protection for one year after final acceptance.

1.4 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 Warranty Requirements

A. Manufacturer’s instructions and warranty requirements for delivery of products shall be strictly followed.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 66 00
PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 - GENERAL

1.1 Work Included

A. Handling, storage and protection of products.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements

1.3 References

A. ANSI/NSF 60 Drinking Water Treatment Chemicals – Health Effects
B. ANSI/NSF 61 Drinking Water System Components – Health Effects

1.4 Storage and Handling

A. Store products at jobsite as follows:

1. Contractor shall be responsible for damage or loss to products until Final Acceptance.

2. Store materials per Manufacturer's recommendations, and in protected area at temperature between 35°F and 110°F.

3. Store products so as to preserve their quality and fitness for Work. Locate stored products and equipment to be incorporated in Work to facilitate prompt inspection.

4. Protect products against moisture, weather, temperature extremes, dust, debris, tampering, theft, vandalism, ultraviolet radiation, or damage from improper handling, storage, or exposure.

5. Protect exposed metals from rust and corrosion, even for items which may be sandblasted or otherwise cleaned before painting. Any corrosion in evidence prior to final acceptance shall be removed, or product shall be removed or replaced.

6. Store items not designed for outdoor exposure off-ground and under cover.

7. Store aggregate in well-drained area to minimize change in moisture content. Prevent contamination by other materials.

8. Store cementitious materials in weather-tight spaces. Keep free from moisture.

9. Store fasteners and connectors in original unopened containers until used.

10. Cover stored materials with tarpaulin or other covering to prevent soiling or exposure to weather. Fasten coverings to prevent removal by wind

11. Cover plastic and similar brittle items to protect from sun exposure and temperature extremes.

12. Store flammable products to conform with City, County, State, and Federal safety codes for storage of flammable materials.

13. Cover, plug, or cap pipe ends, valve ends, and equipment openings with rubber, plastic, or canvas to prevent intrusion or contamination.

14. Stringing of pipe along right of way shall be done in manner that will not interfere with free passage of vehicles.

15. Do not store pipe on roadway or parkway of residential streets for more than 10 days, or on business streets for more than 3 days.

16. Store items in accordance with requirements of project Storm Water Pollution Prevention Plan (SWPPP), if applicable. If a SWPPP has not been prepared for project, store items in accordance with appropriate best management practices (BMP's) listed in California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook for Construction latest edition. Comply with all City, County, State and Federal pollution prevention laws and permits.

17. Notify Owner in writing if delivered or stored product is damaged. Exterior surfaces of delivered items shall be in perfect unblemished condition. Do not repair damaged products without prior written approval.

B. Handle products as follows:

1. Handle products with care, using proper equipment according to Manufacturer's recommendations. Lift large heavy items only at points designated by Manufacturer. Do not drop, drag, bump, bend or handle products in manner that causes abrasions, bruises, cracks, mars, scars, scratches, or other damage. Use padded slings and hooks for lifting as needed to prevent damage. Improper handling shall be cause to reject mishandled products.

2. Coated pipe, valves and other products shall be lifted, lowered or suspended using rubber or canvas belt slings or pneumatic-tired cradles. Sling width shall equal or exceed pipe or product diameter. Do not handle coated products using ropes, hooks, chains, calipers or cables. Store such materials on padded skids.

3. Inspect each product item for damage, defects, completeness and correct operation before installing.

4. Before installation, swab joints and interiors of piping materials to remove foreign matter and contaminants.

5. Clean and protect machined surfaces and shafting from corrosion using proper type and amount of coating as described in Manufacturer's warranty requirements to assure protection to one year after final acceptance.

6. Maintain records for Owner's review of deliveries to show Contractor's order number, purchase order number, and equipment number. Include labeling or shipping tag in records.

1.4 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 Warranty Requirements

A. Manufacturer's instructions and warranty requirements for storage and handling of products shall be strictly followed.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 73 00
EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 Work Included

A. Examination of site before bidding, preparation for construction, and execution of Work

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 24: Seismic Restraint
G. Section 01 73 33: Mechanical Identification
H. Section 01 74 00: Cleaning and Waste Management
I. Section 01 75 00: Starting and Adjusting
J. Section 01 77 00: Closeout Procedures
K. Section 01 78 36: Project Warranties
L. Section 01 78 39: Project Record Drawings
M. Section 01 78 43: Spare Parts
N. Section 01 79 00: Demonstration and Training
O. Section 31 05 50: Protecting Existing Utilities

1.3 Project/Site Conditions

A. Review existing soils reports to ascertain suitability of native soil for backfill before submitting bid. If native soil is found to be unsuitable, provide suitable material for meeting compaction requirements at no additional cost to Owner.

B. Items furnished shall be designed to fulfill their intended purpose in environment in which they are installed. Allow for local temperature extremes, climactic conditions and corrosive environments where necessary to ensure proper functioning of furnished products.

C. The action of beginning installation, application or erection of any product shall be deemed sufficient evidence that both Contractor and installer accept existing field conditions as acceptable for installation, application or erection of that product, except where written notice is given of Contractor or installer's concerns before starting applicable work.

1.4 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid for which such Work is appurtenant. No additional payment will be made for Work in this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 Preparation

A. Damage not documented as preexisting before start of construction will be attributed to Contractor's activities in absence of conclusive evidence to contrary.

B. Carefully lay out work in advance to minimize cutting, channeling, chasing or drilling of structural pads or elements. Cuts, channeling, drilling, or welding required to accommodate mechanical or electrical equipment shall be reviewed in advance with Owner's Representative. Do not begin such work until notified by Owner's Representative. Repair damage to structures, piping equipment or finishes using skilled workers of appropriate trades.

C. Relocations or adjustment of existing facilities needed to facilitate construction must be accepted in writing by Owner's Representative and subsequently relocated or adjusted by Contractor as directed. If existing items are lost or damaged during construction, replace with new items of equal or better quality.

D. Trimming of existing tree branches and roots required to accommodate construction activities shall be done under direction of certified arborist.

E. Make field measurements needed to fabricate and install Work before ordering or beginning work. Make minor changes in alignments and dimensions as needed to remedy or avoid utilities and structural conflicts.

F. Material safety data sheets (MSDS) shall be available and maintained at project site.

3.2 Installation / Application / Erection

A. Maintain complete set of Contract Documents including shop drawings at jobsite field office or superintendent's truck at all times.

B. Install products in accordance with shop drawings and submittals.

C. Install products according to Manufacturer's installation and warranty requirements. Manufacturer's requirements for installation, application, connection, erection, maintenance, operating, cleaning, conditioning and startup of products shall be strictly followed.

D. Products shall be installed by Contractor at location shown on Plans and submittals.

E. Install products to tolerances recommended by Manufacturer. Unless otherwise shown, install equipment true and level, using precision gauges and levels.

F. Refer variances between Manufacturer's installation instructions and Contract Documents to Owner's Representative.

G. Construct walls, floors, and flatwork plumb, straight, level, square and true. Acceptable deviations from plumb or level shall not exceed ¼" in any 32" section. Flatwork shall not deviate from plan elevation by more than ¾" at any location.

H. Welds, unless otherwise shown, shall be continuous, watertight, and conforming to Structural Welding Code of American Welding Society. Welds shall be free of sharp points or edges.

I. Before welding, abutting joints shall be free of strain.

J. Exposed surfaces shall be finished in appearance. Grind smooth exposed welds. Round or chamfer corners of exposed structural shapes for personnel protection.

K. Roofing systems shall be leak free, demonstrated by a 1-hour hose test.

L. Prime and paint exposed surfaces of ferrous products, piping, and conduit except for stainless steel or galvanized or sherardized surfaces or unless otherwise shown. Clean painted surfaces and touch up bare or marred spots with finish to match factory finish.

M. Paint and coat in workmanlike manner to produce an even film of uniform thickness. Pay attention to edges, angles, flanges, corners, crevices, and joints to insure they have been thoroughly cleaned and they receive specified thickness of paint or coating. Finished surfaces shall be free from runs, drops, ridges, waves, shiners, laps, brush marks, and variations in color, texture and finish. Hiding shall be so complete that addition of another coat would not increase hiding. Apply coats so as to produce film of uniform thickness.

N. Do not force-fit or spring pipe, conduit or equipment into place. Corrective measures for cases of poor alignment shall be accepted in advance by Owner's Representative.

O. Deflections at joints shall fall within Manufacturers' published tolerance limits.

P. Mitered piping joints are not permitted.

Q. Pipe bends shall conform to ASME B31.3 and be free from wrinkles, creases or corrugations.

R. Water pipe bends shall use accepted AWWA fittings.

S. Cut pipe threads with sharp dies and make up joints with accepted thread sealing compound. Threads to be seal-welded shall be made up dry. Do not use Teflon sealers.

T. Epoxy coated pipe, valves and fittings shall be fabricated and installed without cutting, notching or welding.

U. Install valves and equipment so as to be easy to operate and service. Where geometry of manufactured valves and equipment and field conditions make it difficult or impossible for average worker to operate or service an installed item, notify Owner’s Representative of conflict before installing item.

V. Unless otherwise shown, encase buried valves and ductile iron pipe in two layers of 8-mil polyethylene wrap in accordance with AWWA C105.

W. Repair damage to Work that is not cause for rejection.

X. Repair, correct or replace Work failing tests or inspection. Repeat tests until results satisfy specifications. Repair damages resulting from tests.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 73 24
SEISMIC RESTRAINT

PART 1 - GENERAL

1.1 Work Included

A. Seismic restraint systems for mechanical and electrical equipment other than tanks, vessels, bins, hoppers, freestanding signs, or storage racks.

B. For seismic restraint of tanks, vessels, bins, hoppers, freestanding signs or storage racks refer to specifications for those sections.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 61 00: Common Product Requirements
C. Section 01 73 00: Execution

1.3 System Description

A. Furnish and install complete seismic restraint systems, including appurtenant structural, mechanical and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building, mechanical, and electrical codes and standards.

1.4 References

A. ASCE 7 Minimum Design Loads for Buildings and Other Structures Chapter 13 and Chapter 15
B. California Building Code (CBC) Chapter 16
C. MSS SP127 Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application
D. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems

1.5 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required per structural shop drawing requirements.	.
Catalog Data	Required for pre-manufactured systems per catalog data requirements.	
Engineering Calculations	Required for seismic anchorage systems per engineering calculations requirements.	

B. Refer to Section 01 33 00 / 02 05 00 for definition of requirements for shop drawings, catalog data and engineering calculations.

C. Under California Building Code and ASCE 7 Section13.1.4, engineering calculations are not required for:

1. Seismic restraint of components weighing 20 pounds or less.

2. Seismic restraint of components mounted 4 feet or less above floor level weighing 400 pounds or less.

3. Seismic restraint of piping, utility or distribution systems weighing 5 pounds per lineal foot or less.

D. For wall and slab-mounted equipment, requirement for engineering calculations will be waived if Contractor submits unsealed calculations demonstrating to Owner's satisfaction that either

1. Bolting strength in shear for floor-mounted equipment exceeds weight of equipment. (For bolt strengths in shear, see CBC Table 1911.2 or ICBO data for concrete anchors)

2. Bolting strength in shear for wall-mounted equipment exceeds twice weight of equipment. (For Bolt strengths in shear, see CBC Table 1911.2 or ICBO data for concrete anchors)

E. Calculations required for seismic restraint of nonstructural components shall be sealed by California-licensed civil or structural engineer and shall follow ASCE 7 Section 13.3 where:

1. I_p shall be assumed to be 1.5 unless otherwise shown on Structural Plans.

2. S_{DS} shall be as shown on Structural Plans or Geotechnical Report. If not shown, use S_{DS} equal to 1.0

3. a_p and R_p shall be as shown in ASCE 7 Table 13.5-1 or Table 13.6-1 as appropriate.

4. Under ASCE 7, Section 13.4.2, anchors in concrete and masonry shall be designed for 1.3 times calculated force F_p

5. Where earthquake lateral design loads for nonstructural components are shown on Plans for Contractor's convenience, typically as a multiple of wet weight (W) of furnished item shown on Sheet S1, either this conservative Plan value may be used, or a more exact value based on exact elevation of furnished item may be used and substantiated by calculation.

1.6 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Materials

A. Refer to Section Section 01 61 00 for basic requirements for products and materials.

PART 3 - EXECUTION

3.1 Preparation

A. Make field measurements needed to install seismic restraint systems before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

3.2 Installation

A. Refer to Section 01 73 00 for basic execution and installation requirements.

B. Furnish and install seismic restraint systems as required by code and at locations shown on Plans and Submittals.

C. The following installation standards shall be followed:

    1. Manufacturer's installation and warranty requirements

    2. Applicable OSHA and Cal OSHA regulations

    3. Applicable building, fire, plumbing, mechanical and electrical code requirements

D. Refer variances between above documents and Contract Documents to Owner's Representative.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 73 33
MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 Work Included

A. Materials, and installation of mechanical identification on above-ground pipes, ducts, valves and equipment, for hazardous materials warnings, and for miscellaneous services.

B. Manhole covers and utility castings shall be marked and identified per Section 05 56 00.

C. Buried pipes, ducts, tanks and equipment shall be marked and identified per Section 33 05 26.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution

1.3 System Description

A. Furnish and install mechanical identification on pipe including appurtenant structural and mechanical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 References

A. ASME/ANSI A13.1 Scheme for Identification of Piping Systems
B. ANSI Z535.1 Safety Color Code

1.6 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required per architectural shop drawing requirements.	.
Catalog Data	Required per catalog data requirements.	
Installation Instructions	Required per installation instruction requirements.	
Material Samples	Required, showing materials, colors and label sizes and letter sizes to be furnished	
Warranty	Furnish one-year warranty from date of final acceptance	

B. Refer to Section 01 33 00 / 02 05 00 for definition of requirements for shop drawings, catalog data, installation instructions, and material samples.

1.7 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 for delivery storage and handling requirements.

B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of mechanical identification on pipes shall be strictly followed.

1.8 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Labels for Exterior Piping	Calpico, Inc. Self-Adhesive Pipe Markers	South San Francisco, CA
	Seton Name Plate Corporation Pipe Markers	Branford, CT
	W.H. Brady B-946	Milwaukee, WI
	Accepted equal	
Labels for Piping Inside Buildings	Calpico, Inc. Self-Adhesive Pipe Markers	South San Francisco, CA
	Seton Name Plate Corporation Pipe Markers	Branford, CT
	W.H. Brady B-500 Vinyl Cloth	Milwaukee, WI
	Accepted equal	
Snap-on Type Pipe Markers	Seton Name Plate Corporation Set Mark	Branford, CT
	W.H. Brady B-500 Vinyl Cloth	Milwaukee, WI
	Accepted equal	
Tracer Tape for Buried Piping	Calpico, Inc.	South San Francisco, CA
	Terra Tape Division Reef Industries	Houston, TX
	Accepted equal	
Labels for Valves	Seton Name Plate Corp. Series SVT	Branford, CT
	W.H. Brady B-60	Milwaukee, WI
	Accepted equal	
Labels for Mechanical Equipment	Seton Name Plate Corp. Style 2065	Branford, CT
	W.H. Brady B-120 Fiber-Shield	Milwaukee, WI
	Accepted equal	
Labels for Tanks	Seton Name Plate Corp. PSPL	Branford, CT
	W.H. Brady B-946	Milwaukee, WI
	Accepted equal	

2.2 Materials

A. Refer to Section 01 61 00 for basic requirements for products and materials.

B. Lettering shall conform to OSHA requirements on all signage and labels.

C. Mechanical identification on pipes shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Labels for Piping Exterior	Weather and Ultraviolet-Resistant Acrylic Plastic	
Labels for Piping Inside Buildings	Vinyl Cloth	

ITEM	MATERIAL	SPECIFICATION
Labels for Valves	Aluminum or 1/16" Fiberglass Tags	Aluminum tags shall have black-filled letters
Labels for Mechanical Equipment	Aluminum, Brass, or ⅛" -thick Fiberglass Tags	Aluminum tags shall have black-filled letters

D. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Labels for Piping	Label Color	Conform to ANSI A13.1 and Z553.1 See below
	Text	Show full piping system name with no abbreviations
	Text Size	Conform to ANSI A13.1 and Z553.1
	Flow Arrows	Provide flow-directional arrows next to each label
	Design	Pre-printed semi rigid, color-coded, snap-on type pipe markers may be provided. Label shall cover 360º (minimum).
Labels for Valves	Tag Requirement	Tag each valve larger than 1"
	Tag Size	2"x2" square identification tag
	Text	Show valve tag number and full name or designation shown on Plans
Labels for Mechanical Equipment	Tag Requirement	Show tag number and equipment name
	Tag Size	½" by 4"
Labels for Instruments and Gauges	Tag Requirement	Show tag number and name of instrument
	Tag Size	1½" by 4"
Signs for Tanks	Sign Requirement	See Section 10 14 00.
	Sign Size	See Section 10 14 00.
Manhole Lids	See Section 05 60 00.	

E. Except where otherwise directed by Owner, color scheme for piping shall follow 10-States standards and be as follows: (4000-series colors reference numbers are Sherwin Williams color chips)

PIPING SERVICE	PIPE COLOR	BANDS	LABEL COLOR	LEGEND
OTHER LINES				
Compressed Air	4071 Rain Forest		Safety Blue	White Text
Vacuum	4069 Emerald Ice		Safety Blue	White Text
Gas	4040 Deck Red		Safety Yellow	Black Text
Other Pipelines	4019 Flint Gray		Conform to ANSI A13.1 and Z553.1	
Hoists, Trolleys	4084 Safety Yellow			
Fire Protection	4081 Safety Red		Safety Red	White Text
Steam	4083 Safety Orange		Flint Gray	Black Text
Oil	4036 Mill Ivory		Safety Yellow	Black Text
BURIED UTILITIES (IDENTIFICATION TAPE COLOR)				
Potable Water	Light Blue		Safety Blue	White Text "Caution - Potable Water Line"
Recycled Water	Purple		Safety Purple	White Text "Caution - Recycled Water Line"
Nonpotable Water	Yellow		Yellow	Black Text "Caution – Non-potable Water Line"
Industrial Water	Yellow with Direction of Flow shown		Yellow	Black Text "Caution – Industrial Water Line"
Cistern Water			Yellow	Black Text "Caution – Cistern Water Irrigation System Sub-surface only, Danger – Unsafe Water"

PIPING SERVICE	PIPE COLOR	BANDS	LABEL COLOR	LEGEND
Gray Water			Yellow	Black Text "Gray Water Irrigation Sustem Subsurface only, Danger – Unsafe Water"
Sewage	Light Green		Safety Green	White Text "Caution - Sewer"
Natural Gas			Safety Yellow	Black Text "Caution – Industrial Natural Gas Line"
Oil			Safety Yellow	Black Text "Caution – Oil Line"
Steam			Safety Yellow	Black Text "Caution – Steam Line"
Cable TV and other Communications			Safety Orange	White Text "Caution Cable TV"
Telephone			Safety Orange	White Text "Caution Telephone"
Electrical	Encase in Red Concrete		Safety Red	White Text "Caution Electrical"

PART 3 - EXECUTION

3.1 Preparation

A. Make field measurements needed to install mechanical identification on pipes before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

3.2 Installation

A. Refer to Section 01 73 00 for basic execution and installation requirements.

B. Furnish and install mechanical identification at locations shown on Plans and Submittals.

C. The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements
2. Applicable OSHA and Cal OSHA regulations
3. Applicable building, fire, plumbing, mechanical and electrical code requirements

D. Refer variances between above documents and Contract Documents to Owner's Representative.

E. In addition to locations shown on Plans and Submittals, provide label and flow arrow at each connection to pumps or other mechanical equipment, at wall boundaries, at tees and crosses, and at 20' centers on straight piping runs. Provide full-band pipe markers, extending 360° around pipe at each location.

F. Attach labels to valve or piece of equipment with Type 304 or 316 stainless-steel chains or wires. Attach label to valve by tying tag wire or chain around operating shaft or nut.

G. Attach signs directly to equipment or on adjacent wall as directed by Owner's Representative.

H. Install mechanical identification on pipes and equipment true, plumb, and level using precision gauges and levels.

3.3 Field Quality Control

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Mechanical Identification	Installation and Level	Visual inspection of finished installation	1 inspection	Owner	Owner
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 74 00
CLEANING AND WASTE MANAGEMENT

PART 1 - GENERAL

1.1 Work Included

A. Cleaning during construction, final cleaning on completion of Work and disposal of waste.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 57 23: Temporary Storm Water Pollution Control
C. Section 02 41 13: Selective Site Demolition

1.3 Submittals

A. Furnish the following submittals

SUBMITTAL	DESCRIPTION	
Dust Control Plan (SWPPP)	See Paragraph 1.4 below	

1.4 Air Pollution Control

A. Comply with all laws, ordinances, rules, regulations, and orders pertaining to air pollution.

B. Do not discharge smoke, dust, equipment exhaust, or any other air contaminants into atmosphere in quantities sufficient to violate Federal, State, AQMD or local regulations.

C. Maintain equipment engines in proper tune and operate construction equipment so as to minimize exhaust emissions. Do not discharge air pollutants (dust, smoke, or other air contaminants) into atmosphere in such quantities to violate regulations of any legally constituted authority.

D. Phase and schedule polluting construction activities to avoid emission peaks.

E. Do not allow fugitive dust to be visible beyond City facilities' property lines.

1. Employ dust control measures to Owner's satisfaction throughout project duration to prevent construction dust from harming or annoying persons living in or occupying buildings near Work.

2. Use reasonable and typical watering and dust preventative techniques to reduce fugitive dust emissions. Furnish all labor, equipment, and means required (including watering or soil binders), and carry out effective measures wherever and as often as needed to prevent Contractor's operations from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals; or causing a nuisance as determined by Owner.

3. Wet all unpaved demolition and construction areas as necessary during excavation and construction.

4. Use temporary dust covers to reduce dust emissions and meet SCAQMD Rule 403.

5. Cover or wet loads of excavated material or rubbish leaving site or of material being imported to prevent blowing dust.

6. Spread soil binders on site, unpaved roads, and parking areas when needed to control dust and wind-blown particles from causing a nuisance or violating air quality standards.

7. Submit dust control plan and obtain Owner's acceptance before beginning work off paved roads or any activity that might stir up dust.

F. Pursuant to Title 13 of California Code, §2449(d)(3), Contractor shall ensure all self-propelled diesel-fueled vehicles on jobsite, 25-hp and up and not designed for on-road driving, limit idling to no more than 5 consecutive minutes, with the following exceptions:

1. Idling when queuing;

2. Idling to verify vehicle is in safe operating condition;

3. Idling for testing, servicing, repairing, or diagnostic purposes;

4. Idling necessary to accomplish work for which vehicle was designed (such as operating a crane)

5. Idling required to bring machine system to operating temperature; and

6. Idling necessary to ensure safe operation of vehicle.

G. Contractor shall be responsible for promptly paying any fines assessed for noncompliance with Title 13 idling limitations for any equipment owned or rented by Contractor or his subcontractors.

H. Portable engine-driven equipment shall comply with air quality regulations pertaining to portable engines with rated horsepower of 50-bhp or greater and other applicable portable equipment. This includes the following requirements:

1. Engines or other applicable portable equipment shall have SCAQMD permit or be registered with CARB.

2. Engines furnished shall satisfy applicable emissions standards, as set forth in Title 13 of California Code of Regulations (Article 5, §2450-2466) and Title 40 of Code of Federal Regulations, Part 89.

3. Engines shall be equipped with a non-resettable elapsed-operating-time meter. Submit activity reports to regulators as required.

4. If portable engines and other portable equipment permitted with SCAQMD are to be located on Owner's property for more than 12 consecutive months, provide Owner with all information necessary for Owner to revise their Title V operating permit. This information shall include, but is not limited to, detailed equipment description, specifications, emissions information, dispersion modeling, permits, registrations, monitoring records, and source tests reports required by permit for subject equipment. Submit this information to Owner prior to the end of 6th month equipment is located at Owner's facilities. If Contractor fails to provide specified information in specified time frame, Contractor shall bear all fees, costs, and penalties including, but not limited to, filing fees, attorney fees, fees associated to acquire necessary offsets, fees for

excessive emissions, etc. associated with City obtaining necessary variances from SCAQMD.

I. Provide responsible personnel in direct control of all vehicle and equipment fueling operations at all times to prevent fuel spills. All fueling must be continually monitored at all times and shall comply with SCAQMD Rule 461, Gasoline Transfer and Dispensing.

J. Per SCAQMD Rule 401 – Visible Emissions, no visible emissions from any engine shall be as dark as or darker than No. 1 in the Ringleman Chart for a period or periods aggregating more than 3 minutes per hour.

K. Maintain usage records of volatile organic compound (VOC) materials according to SCAQMD Rule 109 and pay annual fees according to Rule 301. Usage records shall contain:

1. Manufacturer's Name
2. Product Name/Number
3. Quantity (in gallons)
4. VOC Content (in lb/gal)
5. SCAQMD Rule Number or California Code section

1.5 Cleaning During Construction

L. Maintain areas impacted by Work, including adjacent properties, and public and on-site access roads. Keep these areas free from construction waste, mud, debris and rubbish.

M. Treat access roads and parking areas as needed to control dust and prevent tracking of mud onto paved streets.

1. Minimize spillage on haul routes.
2. Clean public access roads to site. Remove material falling from haul trucks and clean spill areas.
3. Wet down dry materials and rubbish on site.
4. Under no circumstances shall vehicles leaving Work site track mud onto public right-of-way.
5. Sweep streets daily using self-loading rear-broom motor sweeper with vacuum and spray nozzles to remove any mud or waste tracked from Work site to public streets. If streets are kept clean, Owner's Representative may accept less frequent cleaning.

N. Dispose of rubbish, surplus, and waste materials occurring at Work site offsite per local, state, and federal codes, ordinances, and antipollution laws governing locations and methods of disposal.

1. Provide containers for collecting and disposing of waste materials.
2. Do not stockpile rubbish or debris. Store worksite rubbish and debris in roll-off, enclosed containers prior to disposal.
3. Do not burn or bury rubbish and waste materials on project site.

4. Do not dispose of volatile wastes, such as mineral spirits, oil or paint thinner, in storm or sanitary drains.

5. Do not dispose of wastes into streams or waterways.

6. Dispose of asbestos as required by law.

7. Establish regular intervals of collection and disposal of materials and waste.

O. Obtain written permission from property owner prior to disposing of surplus materials, waste products or debris on private property.

P. Use only cleaning materials recommended by Manufacturer of surface to be cleaned.

Q. If Contractor fails to keep Work site free from rubbish and debris, Owner's Representative may suspend Work until condition is corrected.

1.6 Containment of Hazardous Materials

A. Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by discharge of noxious substances from construction operations.

B. Provide equipment and personnel required to perform emergency measures required to contain any spillages and to remove contaminated soils or liquids.

C. Excavate and dispose of any contaminated earth off-site and replace with suitable compacted fill and topsoil.

D. Take special measures to prevent harmful substances from entering public waters. Prevent disposal of wastes, effluents, chemicals, or other such substances near rivers, drainages, or in sanitary or storm sewers.

E. Provide systems for control of atmospheric pollutants. Prevent toxic concentrations of chemicals. Prevent harmful dispersal of pollutants into the atmosphere.

F. Contractor's equipment used during construction shall conform to all current federal, state and local laws, ordinances, regulations and standards.

G. Provide adequate protection of site to prevent leaks and spills of fuel, oil, solvents, grease and other chemicals onto ground or pavement. Place plastic sheeting with berms beneath drill rig, compressor, pump rigs, test engines, welding machines and fuel/oil storage areas. Place absorbent material on plastic sheeting, remove when saturated, and replace with fresh absorbent material. Closely monitor fueling and equipment servicing to prevent leaks and spills. Store absorbent material in dry condition on-site for clean-up of any spills.

1.7 Disposal of Hazardous Wastes

A. Within framework of Federal and State Laws and as prescribed therein, dispose of all materials categorized as hazardous waste by virtue of ruling of Federal, State or County Regional Environmental Control Agencies.

B. Employ qualified testing laboratory to test for hazardous and toxic components in accordance with California Administrative Code of Environmental Health, Title 22 Division 4.

C. Test results shall include testing laboratory's determination as to whether or not materials to be disposed of conform to limits set forth in Title 22 for both Soluble Threshold Limit Concentrations (STLC) and Total Threshold Limit Concentration (TTLC) values.

D. Remove, transport and dispose of products or materials deemed hazardous in strict accordance with Title 22, including items scheduled for demolition as well as paint, spent abrasives, solvents, cleaning compounds and contaminated soils. Provide written notification of intent to dispose of waste to State of California Department of Public Health Services whether sold to recycling firm or consigned to hazardous waste hauler.

E. Obtain from consignee a receipt for disposition of these materials and provide certified copy to Owner showing amounts and destination or end use.

1.8 Final Cleaning

A. Restore construction areas to preconstruction conditions after completing of Work and immediately before final inspection.

B. Restore lines and grades of areas used for earthwork storage.

C. Clean, sweep, and wash Work and equipment including finishes.

D. Remove grease, dust, dirt, stains, labels, fingerprints, and foreign materials from sight-exposed interior and exterior finished surfaces. Polish surfaces so designated.

E. Repair, patch, and touch up marred surfaces to specified finish to match adjacent surfaces.

F. Broom-clean paved surfaces.

G. Rake-clean other surfaces of grounds.

H. Remove from Owner's property temporary structures and materials, equipment and appurtenances not required as part of, or appurtenant to, completed Work.

I. After Work is complete, remove from site loose concrete, lumber, wire, aggregate or rock piles, reinforcing, rubbish, debris and materials not incorporated in Work. Remove excess pointing mortar materials and other debris within pipes.

1.9 Unit Prices

A. Payment for cleaning, waste management, and disposal will be included in items of Work to which cleaning, waste management, and disposal is appurtenant.

B. Cost for processing and disposing of hazardous wastes shall be included in bid items set forth in these documents, and no additional compensation will be granted.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 75 00
STARTING AND ADJUSTING

PART 1 - GENERAL

1.1 Work Included

A. Testing, adjusting, and balancing of systems, Manufacturers' approvals of installation, and systems demonstrations.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 73 00: Execution
D. Section 01 77 00: Closeout Procedures
E. Section 01 78 23: Operation and Maintenance Data
F. Section 01 79 00: Demonstration and Training

1.3 Submittals

A. Furnish the following submittals before startup or system demonstration.

SUBMITTAL	DESCRIPTION	
Manufacturer's Written Approval of Installation (where "Manufacturer's Statement of Responsibility" is required)	Written approval of installation of products shall be certified and submitted by Manufacturers factory-authorized representative. This written approval shall affirm factory-authorized representative has inspected installation, alignment, lubrication and operation of furnished equipment and found it to fully comply with specified design and warranty requirements and be ready for safe operation.	.

1.4 Unit Prices

A. Payment for startup, including materials, equipment, devices, labor, travel costs, expenses, and maintenance items, required in Contract Documents will be included in price bid for items of work for which systems demonstration and startup is specified.

B. Payment for services of Manufacturer's representatives will be included in price bid for their products or items to which their products are appurtenant. No additional payment will be made for services or expenses needed for testing, startup, or demonstration if duration of services needed to provide complete working system exceeds those expected or exceeds durations stated in writing in correspondence from Manufacturer to Owner, Contractor or other party.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 Preparation

A. Pre-startup checkout and functional testing shall be conducted upon completion of Work.

B. Operate and test all mechanical and electrical Work to satisfaction of Owner. Tests shall demonstrate Work has been properly assembled, aligned, adjusted, wired and connected.

Any changes, adjustments or replacements of equipment which due to errors or omissions on part of Contractor shall be done at Contractor's sole expense.

C. Test equipment at rated speeds for required performance, instrumentation control, and automatic operation.

D. Water used during tests shall be at Contractor's expense.

E. Clean foreign material from new Work.

F. To extent possible, turn rotating equipment, operate valves and gates, and check for binding or interference.

G. Check incoming electric power for voltage amplitude and voltage balance. Check motor driven equipment for correct rotation. Check power draw of equipment.

H. Verify safety equipment is in place.

I. Debugging, tuneup and adjustments shall be done as needed.

J. Lubricate mechanical equipment per Manufacturer's instructions using oils and greases of type and viscosity recommended by Manufacturer. Furnish lubricants with flushing oils. Following flushing, fill oil lubrication system with "run-in" oil. Run in equipment at no-load condition for 2 hours. Drain and flush equipment again with flushing oil and refill with lubricant. All equipment shall be properly lubricated and furnished with a one-year supply of all necessary lubricants.

K. Manufacturer's factory-authorized representative shall check all equipment for lubrication, alignment, rotation, and vibration, and shall notify Contractor and Owner of anything in installation which might nullify Manufacturer's warranty.

L. Upon request by Owner, during performance test, furnish services of factory-authorized Manufacturer's representative to inspect and approve, in writing, installation and lubrication of mechanical equipment furnished by that Manufacturer, to place it into operation, to assist in necessary adjustments and tests and to instruct operating personnel in equipment operation and maintenance.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 Work Included

A. Specific administrative procedures, closeout submittals, and forms to be used at substantial completion and final completion of Work.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 74 00: Cleaning and Waste Management
D. Section 01 75 00: Starting and Adjusting
E. Section 01 78 23: Operating and Maintenance Data
F. Section 01 78 36: Product Warranties
G. Section 01 78 39: Project Record Documents
H. Section 01 78 43: Spare Parts
I. Section 01 79 00: Demonstration and Training

1.3 Quality Assurance

A. Upon completion of Contract, Work shall be finished, tested, and ready for operation. Work shall fulfill its intended purpose as described in Contract Documents, in submittals, and in Manufacturer's literature.

B. Where connections or disruptions have been made to existing work, repair, reactivate, refill and recharge components, restoring them to preconstruction conditions. Follow procedures of authorities having Ownership or jurisdiction for Work involving existing utilities and services.

1.4 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Monument Survey	Show record locations of monuments or benchmarks disturbed and reset by Contractor. Monument survey, if required shall be sealed by surveyor licensed to practice in California.	.
Record Drawings	See Section 01 78 39.	
O&M Manuals	See Section 01 78 23.	
Warranties	See Section 01 78 36.	
Spare Parts	See Section 01 78 43.	

1.5 Unit Prices

A. Payment for monument survey required in Contract Documents will be included in price bid for items of work for which monument survey is required.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 Field Quality Control

A. Following system demonstration, Contractor shall schedule and attend final inspection and walkthrough with Owner's Representative. At walkthrough, Owner's Representative will review Owner-prepared punch list of items requiring correction with Contractor and present punch list to Contractor within 72 hours of meeting. Contractor shall address punch list items promptly.

B. Should Contractor elect to protest a punch list item rather than address it to Owner's satisfaction, Owner reserves right to withhold payment in an amount sufficient to hire a third party to perform unfinished work until such time as dispute between Owner and Contractor is resolved in Contractor's favor.

C. Eleven month warranty inspection shall be conducted prior to release of bonds. Any work failing to comply with specifications or performance standards stated in Manufacturers submittals or printed promotional literature will at that time be tagged as defective and scheduled for repair. Repair all defective work in strict accordance with Contract Documents and to satisfaction of Owner's Representative.

1. Owner will establish inspection date and will notify Contractor at least 30 days in advance.

2. Warranty Inspection Report will be prepared by Owner's Representative and delivered to Contractor. It will set forth number and type of failures observed and names of persons making inspection.

3. Repairs shall proceed promptly. Upon completion of inspection and receipt of Inspection Report, Owner will establish a date for Contractor to proceed with remedial Work. Delay on part of Contractor to proceed with remedial work on schedule shall constitute breach of this Contract. In such case, Owner may proceed to have defects remedied as outlined in Contract Documents.

4. Costs of warranty inspection and repair shall be borne by Contractor, who shall include an appropriate amount for testing and repair in his bid. No additional allowance will be paid by Owner for Warranty Inspection and repairs.

3.2 Adjusting and Cleaning

A. Valve box cover elevations are not shown on Plans. Determine and set cover elevations in field so finished rim elevations are flush with finished pavement where directed by Owner's Representative.

3.3 Extra Stock/Spare Parts

A. Special tools and Manufacturer's standard spare parts, if required by Contract Documents or for normal operation and maintenance during first year of operation, shall be supplied with the Work. Tools shall be packaged in a steel case, clearly and indelibly marked on exterior to indicate equipment for which tools are intended.

B. Spare parts shall be delivered in Manufacturer's original containers labeled to completely describe contents and equipment for which it is furnished.

C. Provide to Owner a list of all spare and replacement parts with individual prices and location where they are available. Prices shall remain in effect for not less than one year after final acceptance.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 Work Included

A. Operation and maintenance manual.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 75 00: Starting and Adjusting
C. Section 01 78 36: Project Warranties
D. Section 01 79 00: Demonstration and Training

1.3 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Operation and Maintenance Manual	Furnish as described below.	
Equipment Data Sheets	Submit for equipment furnished under each specification section. Include data sheets in Operation and Maintenance Manual. Use attached form and follow format of attached sample Data Sheet to summarize equipment furnished, nameplate data, and equipment Manufacturer's maintenance instructions and recommendations.	

1.4 Operation and Maintenance Manual

A. Prepare and submit 6 copies of Operation and Maintenance Manual containing information itemized and requested in Contract Documents. Deliver 5 copies in D-ring binders tabbed and indexed by specification sections. Include table of contents. Label binders with project name. Sixth electronic copy shall be scanned onto CD Rom disc or flash drive and delivered to Owner in labeled plastic case.

B. Each section of Operation and Maintenance Manual shall include the following submittals (where required by contract documents) returned and stamped “accepted:”

1. List of equipment furnished for project with name, address, and telephone number of each vendor
2. List of serial numbers of equipment furnished
3. Equipment data sheet describing function of equipment
4. Tabulation of motor nameplate horsepower, nameplate current, field-measured current, overload relay setting, and catalog number for poly-phase motors
4. Catalog data
5. Shop drawings for mechanical, electrical, and instrument equipment in final form
6. Installation or application instructions
7. Operation and maintenance instructions
8. Parts list

9. List of fuses, lamps, seals, and other expendable equipment and devices. Specify size, type, and ordering description. List name, address, e-mail address, fax number, and telephone number of vendor.

C. Operation and Maintenance Manual for engine generator set shall be Manufacturer's complete service repair manual with full instructions on all aspects of engine generator set maintenance, lubrication, operation and repair delivered in its own dedicated binder.

D. Provide manuals for each piece of equipment including individual components and subsystems of complete assemblies. Line out non-applicable text and illustrations. Manual section on operation shall describe functions and limitations of each component and its relationship to system of which it is part. Where several models, options, or styles are described, manual shall identify items actually provided.

E. Provide the following in each manual:

1. Manufacturer's identification, including order number, model, and serial number.

2. Paper prints or reviewed shop drawings and diagrams of all systems.

3. Certified equipment drawings or reviewed shop drawing data clearly marked for equipment furnished.

4. Complete operating and maintenance instructions for each and every item of equipment, setting forth in detail and step-by-step the procedure for starting, stopping, operating, and maintaining entire system as installed. Include schedule of recommended maintenance intervals.

5. Complete parts list of replaceable parts, their part numbers, and name and address of their nearest vendor.

6. Any special emergency operating instruction and list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of system.

7. Copy of Manufacturer's equipment guarantees and warranties.

F. Brochures shall be loose leaf with durable plastic or fiberboard covers. Each sheet shall be reinforced to prevent tearing from continued use, and each brochure shall have the following information clearly printed on its cover:

1. Project name, name of Owner, and address.

2. Name and address of Owner's Representative.

3. Name and addresses of contractors and subcontractors and department to contact.

4. Telephone number of contractors, including night and emergency numbers.

5. Major equipment vendors' names and telephone numbers.

B.

G. Before requesting payment for 80% completion point for total contract, submit two of 6 required copies of Operation and Maintenance Manual containing copies of material available at that time.

H. Within 30 days after review and approval by Owner of 2-copy submittal, submit remaining 3 hard copies and one electronic copy of Operation and Maintenance Manual.

I. Operation and maintenance manuals specified herein are in addition to any operation, maintenance, or installation instructions required by Contractor to install, test, and start up equipment.

1.5 Unit Prices

A. Payment for operation and maintenance manuals required in Contract Documents will be included in price bid for items of Work for which sections of Operation and Maintenance Manuals are required.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

EQUIPMENT MAINTENANCE DATA SHEET

PREVENTATIVE MAINTENANCE PROGRAM	EQUIPMENT RECORD NUMBER		
EQUIPMENT DESCRIPTION	**ELECTRICAL OR MECHANICAL DATA**		
Name:	Nameplate Horsepower:		
Serial No.:	Model:		
Vendor:	Catalog Number (polyphase motors):		
Vendor Address:	Type:		
	Manufacturer:		
Vendor Rep:	Voltage:	Measured Current:	Nameplate Current:
Phone:	Phase:	Overload Relay Setting:	rpm:

MAINTENANCE AND LUBRICATION WORK TO BE DONE	Frequency*

SPARE PARTS LIST		FUSES/LAMPS/SEALS		
Quantity	Part & Part Number	Qty	Size	Type & Ordering Description

WARRANTY AND OPERATING REQUIREMENTS AND REFERENCE

*D - Daily; W - Weekly; B - Biweekly; M - Monthly; Q - Quarterly; S - Semiannually; A - Annually

SAMPLE

EQUIPMENT MAINTENANCE DATA SHEET

PREVENTATIVE MAINTENANCE PROGRAM	EQUIPMENT RECORD NUMBER		
EQUIPMENT DESCRIPTION	**ELECTRICAL OR MECHANICAL DATA**		
Name: Influent Pump No. 1 Tag No.: P01-1	Nameplate Horsepower: 15 HP		
Serial No.: 123456ABC	Model: 140T Frame Serial No. 987654ZY Class F Insulation w/ Space Heater		
Vendor: ABC Pump Co.	Catalog Number (polyphase motors): M36999b		
Vendor Address: 1234 Richter Avenue Gotham City, NY 12345	Type:		
	Manufacturer: DEF Motors, Inc.		
Vendor Rep: XYZ Equipment, Inc.	Voltage: 460	Measured Current: 18 amps	Nameplate Current: 20 amps
Phone: 949-752-0505	Phase: 3	Overload Relay Setting: 25 amps	rpm: 1,800

MAINTENANCE AND LUBRICATION WORK TO BE DONE	Frequency*
1. Operate valves and check such things as a) bearing temperature, b) changes in running sound, c) suction and discharge gage readings, d) pump discharge rate, and e) general condition of drive equipment.	D
2. Check packing.	D
3. Check pumping unit for any dust, dirt or debris.	W
4. Lubricate bearing frame and motor bearings (consult manufacturer's instructions for type of grease or oil).	Q
5.Disassemble and change or repair the following: a) impeller, b) shafts, c) shaft sleeve, d) rotary seals, and e) sleeve bearings.	A

SPARE PARTS LIST		FUSES/LAMPS/SEALS		
Quantity	Part & Part Number	Qty	Size	Type & Ordering Description

WARRANTY AND OPERATING REQUIREMENTS AND REFERENCE
For manufacturer's instructions regarding installation, operation, maintenance and troubleshooting of this equipment, see Volume ____, Section ____.

*D - Daily; W - Weekly; B - Biweekly; M - Monthly; Q - Quarterly; S - Semiannually; A – Annually

THIS PAGE INTENTIONALLY BLANK

SECTION 01 78 36
PRODUCT WARRANTIES

PART 1 - GENERAL

1.1 Work Included

A. Warranties are required for all Work furnished under this contract.

B. Manufacturer's warranties shall not relieve Contractor of liability required under Contract Documents. Such warranties only shall supplement Contractor's responsibility.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 75 00: Starting and Adjusting
D. Section 01 77 00: Closeout Procedures

1.3 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Warranty	For equipment bearing manufacturer's warranty in excess of one year, furnish copy of warranty to Owner with Owner named as beneficiary.	

1.4 One-Year Product Warranties

A. Warranties shall cover improper assembly or erection, defective workmanship and products, and incorrect or inadequate operation.

B. One-year warranty shall be furnished for all Work and manufactured items unless otherwise stated. Warranty shall cover parts, labor, and prompt service for repair of defects, performance failure or damage due to normal wear and tear or due to any cause other than acts of God, or intentional or active and extreme abuse of product. Warranty period shall extend one year beyond final acceptance of completed contract by Owner.

C. In addition to Manufacturer's standard warranty, furnish services of factory-authorized and factory-trained service technician to promptly provide repair service for mechanical equipment for specified warranty period. This service shall be provided at no cost to Owner and shall include cost of all replacement parts and labor required during that period.

1.5 Inspection of Installation by Manufacturer

A. Should Manufacturer or supplier of any product have reason to suspect said Manufacturer’s product has not been installed in accordance with Manufacturer’s warranty requirements, Manufacturer shall have right to send their factory authorized representative to inspect facility.

B. Should Manufacturer’s factory-authorized representative elect to inspect installation, said Manufacturer shall promptly notify Owner in writing of any observed deficiencies in installation procedures which might affect required warranty.

C. Should Manufacturer elect to forego inspection of installation of their products, said Manufacturer shall be precluded from claiming faulty installation by others as relief from honoring furnished warranties.

1.6 Eleven-Month Anniversary Warranty Inspection

A. Warranty inspection shall be conducted during 11th month following completion of Work.

B. Locations found in warranty inspection where paving, coating, or paint has peeled, bubbled, or cracked, and locations where rusting is evident will be considered a system failure. Repair defective work identified during warranty inspection by removing deteriorating paving, coating or paint system, cleaning surface, and repaving, recoating, or repainting with same system. Electrically test repaired painted areas. If area of failure exceeds 25% of total paved, coated or painted surface for pavement, coating or paint system on any structure or surface, remove and recoat entire paving, coating or paint system per original specification.

C. Other failed products found in warranty inspection shall be repaired per warranty requirements.

D. Owner shall establish date for warranty inspection and shall notify Contractor at least 30 days in advance. If notification of inspection date does not occur within 12 months after final acceptance, the first anniversary inspection shall be considered to be waived.

1.7 Three-Year Product Warranties and Other Extended Warranties

A. Three-year minimum warranty shall be furnished for:

1. Manhole linings
2. Pumps
3. Other motorized equipment using motors 2-hp or larger
4. Tanks
5. Seismic valve controllers
6. Air-conditioning and refrigeration systems

B. Three-year warranty shall be 3-year parts-and-labor non-prorated warranty extending from date of Owner's final acceptance. Warranty need not exceed 5 years from date of shipping.

C. Where System Integrators or unit manufacturers are required to furnish skid-mount or packaged, air conditioning or refrigeration systems requiring 3-year or extended warranties, every component of system furnished shall be covered under extended warranty, not withstanding clauses in other sections which may stipulate a lesser warranty for certain components.

D. Ten-year minimum warranty shall be furnished for:

1. Reservoir coatings and liners
2. Roofing

E. Ten-year warranty shall be 10-year parts-and-labor non-prorated warranty extending from date of Owner's final acceptance. Warranty need not exceed 12 years from date of shipping.

F. Extended warranty shall cover parts, labor and prompt service for repair of defects, performance failure or damage due to normal wear and tear, or due to any cause other than acts of God, Owner's failure to perform minimum maintenance as set forth in O&M instructions furnished with warranty, or intentional or active and extreme abuse of product. Warranty period shall extend the stipulated number of years beyond final acceptance of completed contract by Owner.

G. Extended warranties shall cover Owner's full cost of restoring non-functional components to their full function as described in Contract Documents and in Manufacturer's published literature. Prorated warranties will not be accepted. Replacement of damaged parts with old or recycled parts will not be accepted.

H. Should Manufacturer refuse to provide full extended warranty, Contractor may be required to purchase extended warranty or negotiate with Owner a fair value for a shorter warranty period.

1.8 General Warranty Clauses

A. Where sections of specifications stipulate longer warranty period than stipulated in this section, the longest and most stringent warranty requirement shall apply.

B. Warranty period shall begin on the earliest of the following 2 milestones:

1. Date of formal notification of completion or

2. 30 calendar days after both substantial completion and Owner taking over beneficial use of project.

C. Warranties shall cover:

1. Parts

2. Labor

3. Diagnostics

4. Servicing

5. Removal or Installation Charges

6. Setup and Reconfiguration of System with Replacement Parts

7. Shipping

D. Where a part is replaced during warranty period, warranty for replaced part and shipping shall be extended to not less than one year following date of replacement. Warranty for labor shall be unchanged.

E. Following notification of Contractor of a warranty issue, Contractor or their agent shall have 2 weeks to inspect and 30 days to remedy defective work. Failure to perform within this stipulated period will result in damages being assessed against Contractor and responsible parties retroactive to date of discovery.

1.9 Unit Prices

A. Payment for warranties required in Contract Documents will be included in price bid for items of work for which warranties are required.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - SCOPE

1.1 General Requirements

A. Contractor shall keep one accurate, legible set of Record Drawings at site and available for review by Owner's Representative in Contractor's field office or in superintendent's truck throughout project.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 79 00: Demonstration and Training

1.3 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Record Drawings	Required as described below	.
PLC Programming CD Rom Discs	Required as described below	
Programmers for Instruments and Devices	Required as described below	

1.4 Detailed Requirements

A. Record drawings shall be on one set of full-size project blackline prints of Contract Drawings and other drawings forming part of contract, showing installed locations of improvements and all changes made during construction.

B. Record drawings shall show locations by key dimensions, depths, elevations of all underground piping, conduit, sensor lines, valves, capped ends, branch fittings, pull boxes, and Work.

C. Show all Record Drawing changes in contrasting color to original.

D. In showing changes in Work, or added Work, use same legends used on Contract Drawings. Show locations and elevations to same level of accuracy as original Contract Documents. Tie dimensions to permanent point with 2-point tie-down system.

E. Report changes and deviations promptly to Owner's Representative.

F. Record drawings shall incorporate addenda, supplementary drawings, working drawings, change orders and clarifications.

G. Record drawings shall incorporate survey notes, field notes and system demonstration logs.

H. Maintain Record Drawings on an up-to-date basis with all entries reviewed by Owner's Representative. Bring record drawings to all progress meetings.

I. Protect Record Drawings from damage or loss.

J. Record Drawings shall clearly show all discrepancies between Contract Documents and installed Work.

K. Record information on how to maintain and/or service concealed Work.

L. Concealed shall mean construction installed underground or in area which cannot be readily inspected by use of access panels, inspection plates or other removable features.

M. Record finalized hydraulic and electrical equipment control settings in appropriate tables and spaces provided on Record Drawings.

N. In addition to paper record drawings, provide PDF copy of record drawings on CD ROM disc or flash drive delivered to Owner in labeled plastic case.

O. Provide 2 copies of PLC programming CD ROM discs delivered to Owner in labeled plastic jewel cases.

1.5 Unit Prices

A. Payment for record drawings required in Contract Documents will be included in price bid for items of work for which record drawings are required.

B. Progress payment requests may be withheld if daily logs, schedule updates or Record Drawings are damaged, lost or not kept current to satisfaction of Owner's Representative.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 General

A. During progress payment request meetings, present current record drawing documents for review prior to submittal of progress payment request.

B. Deliver marked record set of Record Drawings to Owner prior to final acceptance of Work. Owner will use these Record Drawings to modify original mylars to create reproducible Record Drawings.

END OF SECTION

SECTION 01 78 43
SPARE PARTS

PART 1 - GENERAL

1.1 Work Included

A. Delivery packaging and quality of spare parts

1.2 Related Work

A. Section 01 75 00: Starting and Adjusting
B. Section 01 78 23: Operation and Maintenance Data
C. Section 01 79 00: Demonstration and Training

1.5 Unit Prices

A. Payment for spare parts required in Contract Documents will be included in price bid for items of work for which spare parts are is specified.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 Extra Stock/Spare Parts

A. Spare parts required shall be delivered in Manufacturer's original containers labeled to completely describe contents and equipment for which it is furnished.

B. At completion of system demonstration, refill or recharge all operating fluids, including but not limited to fuel, oil, coolant and refrigerant tanks and vessels.

C. For any device requiring hardware to program, provide one programmer apparatus for each device at each site.

D. In addition to spare parts listed in respective technical specifications that follow, provide the following spare parts in lockable toolbox:

ITEM	DESCRIPTION	EQUIPMENT TYPE	QUANTITY
Spare Parts Equipment Storage Container	Storage Box	Storage Box	1 unit
Each Pilot-Operated Control Valve	Diaphragm and Rubber Kit	Mechanical	1 kit
Each Injection Quill (except where integral with static mixer)	Spare Quill	Mechanical	2 quills
Motor Control Center Light Bulbs	One-Year Supply of Fuses and Panel Lights	Electrical	10% of units
Each Chart Recorder	One-Year Supply of Charts and Pens	Instrumentation	52 charts
PLC Software	Software Reload Diskettes	Instrumentation	2 sets of CD's
Quantum PLC Controller	Additional PLC Controller	Instrumentation	1 extra unit

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 Work Included

A. System Demonstration and training of Owner's personnel

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 75 00: Starting and Adjusting
C. Section 01 78 23: Operation and Maintenance Data
D. Section 01 78 43: Spare Parts

1.3 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
System Demonstration Plan	• Submit within 30 days following pre-construction meeting. • Outline each test procedure proposed for final testing. • Describe each system to be tested, functional test methods, test materials, test instruments and recorders, and results to be recorded. • Include continuous 72-hour demonstration of operation of entire installed system. Shorter demonstration period may be authorized by Owner's Representative if external constraints make 72-hour test impractical. • Demonstrate operation of all instruments, set points, alarms, telemetry, software, safety interlocks and back-up operation modes. • Incorporate Manufacturer's start-up and demonstration procedures. Owner may modify proposed procedures as deemed necessary to demonstrate system operation. • Operate all new equipment through entire no-load to full-load range.	
Control System Demonstration Plan	Submit	
System Demonstration Log	Submit for final operations test period.	
Control Software	Submit current copy of all control software.	
Training Outline	Submit for instruction program for Owner's personnel	

1.5 Unit Prices

A. Payment for system demonstration including materials, equipment, devices, labor, travel costs, expenses, and maintenance items, required in Contract Documents shall be included in price bid for items of work for which systems demonstration and startup is specified.

B. Payment for costs and expenses of representatives of material and equipment suppliers and subcontractors shall be included in price bid for items of work for which systems demonstration and startup Is specified.

C. Payment for operation and maintenance training required in Contract Documents shall be included in price bid for items of work for which operation and maintenance training is required.

D. If it is necessary for any of Owner's inspectors or Owner's Representatives to be present for retests or reinspections of installed facilities, Contractor shall pay all costs on per-diem rate

as established between Owner and Owner's Representative or inspector. Said amounts will be deducted from final payments to Contractor.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 System Demonstration

A. System demonstration shall conform to accepted demonstration plan

B. Notify Owner's Representative of time and place of system demonstrations at least 7 calendar days before they begin.

C. Arrange for representatives of equipment suppliers and subcontractors to be present as required to successfully demonstrate installed system.

D. Furnish and install any temporary valves, fittings, bulkheads, taps or other items necessary for system demonstration.

E. Prior to formal system demonstration, provide test runs as needed and verify all parts are in place and in working order. Owner's costs for delays during system demonstration due to Contractor's failure to pretest system and verify all products are in place and functional will be back-charged to Contractor.

F. Perform systems demonstrations in presence of Owner's Representative who will record results. Start up and operate individual subsystems, pieces of equipment, instruments, etc.

G. Defects and malfunctions disclosed during testing and system demonstration shall be corrected immediately. Work failing to perform its intended function, and which cannot be repaired, shall be replaced with new equipment.

3.2 Field Quality Control

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Finished Installation	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Owner
	System Demonstration	Demonstrate compliance to Contract Documents and Manufacturer's printed literature using accepted system demonstration plan described above	One 72-hour demonstration without interruption. (If test is interrupted, clock restarts at zero for 72-hour demonstration)	Contractor (Owner will pay for test water)	Contractor
	Control System Demonstration	Section 40 90 00	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

B. Correct all deficiencies found during system demonstration, including malfunctions of equipment or control systems, leakage, excessive vibration and excessive noise.

C. Following testing, remove all bulkheads and temporary equipment. Dispose of test water according to local regulations and NPDES requirements.

3.3 Training of Owner's Personnel

A. After functional testing is complete, conduct training and instruction program on system operation for Owner-designated personnel. Furnish services of qualified factory-trained instructors from applicable equipment Manufacturers. Include instruction covering overview of system, basic operation theory, routine preventative maintenance and repair, safety procedures, and "hands-on" operation of equipment. If not otherwise specified, base duration of program on complexity of equipment involved. Obtain Owner's approval of instruction adequacy before terminating program. Consult Owner to schedule instruction.

B. For electrically powered equipment include training on operator interfaces, switchboards, and MCC's, including operation, setup, maintenance and trouble-shooting of solid-state starters, variable frequency drives, power monitoring and Ethernet and Devicenet communications.

C. As part of training, provide attendees with names, contact persons, telephone numbers and addresses of authorized service centers within 100-mile radius of jobsite for equipment on which training is taking place.

D. System demonstration testing, final operation testing, and instruction of Owner's personnel may be performed simultaneously, subject to prior approval of extent of consolidation.

E. The following training is required:

ITEM	LOCATION	CLASSROOM TRAINING DURATION	FIELD TRAINING DURATION	APPROXIMATE NUMBER OF ATTTENDEES
System Overview	On-site	2 hours	2 hours	3-10 people
Building Maintenance including HVAC, Plumbing and Lighting	On-site	2 hours	2 hours	3-10 people
Instruments and Controls	On-site	2 hours	2 hours	3-10 people
Pilot-Operated Control Valves	On-site	2 hours	2 hours	3-10 people
Pumping System	On-site	4 hours	4 hours	3-10 people
Electrical System	On-site	4 hours	4 hours	3-10 people

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 02 41 13
SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 Work Included

A. Site, mechanical and electrical demolition outside building envelope.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 01 74 00: Cleaning and Waste Management
H. Section 02 41 14: Paving Removal and Resurfacing
I. Section 31 23 00: Excavation and Fill
J. Section 31 23 33: Trenching and Backfilling

1.3 System Description

A. Remove the following items.

1. Site items including:
    a. Reinforced concrete pavement
    b. Asphalt pavement
    c. Landscape immediately inside project limits
2. Mechanical items including:
    a. Instrumentation to be replaced
3. Items shown on Plans for demolition including asphalt, fencing, concrete work, piping, valves, and electrical work.

B. Abandon the following items in place:

1. Other items shown on plans for abandonment in place

C. Legally dispose of Items not designated for salvage.

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods needed for proper performance of Work of this section.

1.5 References

A. California Building Code (CBC)
B. California Fire Code (CFC)
C. California Green Building Code (CGBC)
D. California Mechanical Code (CMC)
E. California Plumbing Code (CPC)
F. NFPA 70 National Electric Code (NEC)

1.6 Hazardous Materials Survey

A. A hazardous materials survey has / has not been completed for this project.

B. Under EPA Regulations and if >100 square feet of material containing over 1% asbestos, must be disturbed during construction, a California Occupational Safety Health Administration (CAL-OSHA)-certified site surveillance technician and or certified asbestos consultant (CAC) is required to:

   a. Conduct visual and/or bulk surveys of property prior to demolition and to prepare a hazardous material survey outlining appropriate remediation measures.

   b. Prepare hazardous material survey, reporting testing results and recommending appropriate remediation measures.

C. In addition, per Cal-OSHA and EPA requirements, if lead, or other hazardous material must be disturbed during construction, DPH Certified Inspector must:

   a. Conduct visual and/or bulk surveys of property prior to demolition and to prepare a hazardous material survey outlining appropriate remediation measures.

   b. Prepare a hazardous material survey, reporting testing results and recommending appropriate remediation measures.

or

D. Onsite survey of hazardous materials was completed by A-Tech Consulting, Inc. on April 27, 2011. Copy of report may be obtained from Owner / are appended to these documents. Results of hazardous materials testing are as follows:

HAZARDOUS MATERIALS	LOCATIONS TESTED	RESULT
Asbestos	6" Transite Pipe	Nonfriable asbestos found – 2 pipes 40LF
	Gaskets	Not tested – May be present
Cadmium (Bolt Plating)	Bolt Plating	Not tested – May be present
Chromium (Paint)		Not tested – May be present
Lead (Paint)	Exterior Main Building Door South Entry	Lead found in tan paint
	Other Painted Areas	Not found in surface layer
Mercury	Light Ballasts	Mercury found in intact ballasts – 34 ballasts
	Switches	Not found
Polychlorinated Biphenyls (PCB's)	Light Ballasts	Not found
	Transformers	Believed to be present

E. Contractor shall hire remediation firm separate from hazardous materials consulting firm to perform appropriate remediation measures. For asbestos concentrations exceeding 0.1%, or other hazardous material concentrations exceeding 1%, remediation work shall be done by personnel OSHA-certified and trained in use of OSHA-required PPE and respirators.

1.7 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 – PRODUCTS

2.1 Acceptable Consulting and Remediation Firms

A. Acceptable hazardous material consulting firms include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Hazardous Materials Consulting Firms	A-Tech Consulting, Inc. (714) 434-6360	Orange, CA
	Citadel, Inc.	Glendale, CA
	Patriot Environmental Services, Inc.	Wilmington, CA
	Accepted equal	

B. Acceptable remediation firms include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Hazardous Materials Removal and Disposal	Advanced Cleanup Technologies, Inc.	Carson, CA
	Ocean Blue Environmental	Long Beach, CA
	Patriot Environmental Services, Inc.	Wilmington, CA
	PSC Industrial Outsourcing	Long Beach, CA
	Specialized Environmental (562) 698 9222	Anaheim, CA
	Accepted equal	

2.2 Acceptable Manufacturers

C. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Asbestos Encapsulation Compound	Certane 1000 Post Removal Encapsulant.	Eden Prairie, MN
	Accepted equal	

PART 3 - EXECUTION

3.1 Preparation

A. Shut off or disconnect utilities affecting demolition work. Schedule shutdowns with Owner, and notify Owner 3 days in advance of any shutdown required to perform Work.

B. Owner will open/close valves on piping and electrical disconnects required for shutdowns.

3.2 Demolition

A. Refer to Section 01 73 00 for basic execution requirements.

B. Demolish items as shown on Plans.

C. Nonstructural items not shown on Plans for demolition but interfering with (or damaged by) installation of large tanks or other new items, may, at Contractor's option, and pending acceptance by Owner's Representative, be temporarily demolished and replaced following installation of new items subject to the following:

1. Items to be demolished may not be on a structural load path and may not include roofing, decking, trusses, beams, columns, bearing walls, shear diaphragms, connections, or foundations.

2. Non-structural and non-essential items including railings, ladders, supports, piping, conduit, wiring, boxes, lighting fixtures, and other interferences may be removed and

shall be replaced with new and similar material pending written permission in advance from Owner.

D. The following demolition standards shall be followed:

1. Applicable EPA, OSHA and Cal OSHA regulations

2. Other applicable building, fire, plumbing, mechanical and electrical code requirements

E. Refer variances between above documents and Contract Documents to Owner's Representative.

F. Asbestos shall be remediated according to guidelines set up by EPA, OSHA, Cal OSHA and other regulatory agencies. Procedures shall include but not be limited to:

1. Adhere to California Code of Regulations, Title 8, §1529, including construction safety orders regulating dusts, fumes, mists, vapors, and gases associated with asbestos.

2. Asbestos removal shall be performed by trained and registered personnel.

3. Within vaults, deactivate all HVAC systems prior to asbestos removal. Close and temporarily seal registers.

4. Control measures may include wet methods, encapsulation, or removal with HEPA-filter-equipped vacuums into labeled polyethylene bags.

5. Demolition shall comply with SCAQMD Rule 1403. Asbestos-related work conducted during demolition shall be performed by a California-licensed asbestos-abatement contractor under supervision of a California State Certified Asbestos Consultant.

6. Remove and dispose of asbestos-containing construction materials (ACCM's) in compliance with notification, monitoring, and asbestos-removal procedures stipulated in SCAQMD Rule 1403 to reduce asbestos-related health risks.

7. Throughout Work, maintain all records of compliance with Rule 1403 for Owner inspection upon request, including:

a. Evidence of notification of SCAQMD pursuant to Rule 1403,

b. Contact information for Asbestos-Abatement Contractor,

c. Contact information for Asbestos Consultant,

d. Receipts or other evidence of legal off-site disposal of all ACCM's.

8. Air monitoring relating to asbestos removal work shall be performed by or under direct supervision of a California State Certified Asbestos Consultant as required by law.

9. Properly manifest all scrap ACP and prepare for transport, complying with State and local criteria. Deliver scrap material to landfill permitted for disposal of asbestos containing materials.

G. Lead-based paint (LBP) shall be remediated according to guidelines set up by EPA, OSHA, Cal OSHA, South Coast Air Quality Management District (SCAQMD), and other regulatory agencies. Procedures shall include but not be limited to the following:

1. Lead-based paint removal shall be performed by trained and registered personnel.

2. Notification to California Department of Public Health (DCPH) shall be completed through filing of an Abatement of Lead Hazards Notification CDPH Form 8551.

3. Removal of LBP's shall be completed by Certified Lead Supervisor or Certified Lead Works as defined by §35008 and §35009 of the LBP Regulations respectively.

4. Work shall conform to procedures specified In Chapter 12 Abatement in "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing" published by the United States Department of Housing and Urban Development in June 1995.

5. Encapsulate any deteriorating lead paint prior to removal.

6. Lead paint that is intact and not delaminating may be disposed of as construction material as long as it is attached to its original substrate.

7. Non-encapsulated paint chips and debris shall be wet-sanded or scraped, collected and disposed of in accordance with local, state and federal regulations.

8. If any paints containing Lead or Chromium must be disturbed or made airborne during Work by activities such as abrasive blasting, welding, cutting or torch burning, provide worker protection in accordance with OSHA Lead in Construction Standard and other applicable regulations.

9. Containment of LBP shall prevent contamination of non-work areas with lead-contaminated dust, lead-contaminated soil, or lead-based paint debris.

10. Removal of LBP materials shall be conducted in accordance with an Abatement Plan prepared by a Certified Lead Supervisor, Certified Lead Project Monitor, or Certified Lead Project Designer. Abatement plan shall encompass all requirements specified in §35100(4)(A) of the LBP Regulations.

11. Throughout Work, Certified Lead Supervisor shall maintain all records of compliance with LBP regulations for Owner inspection upon request, including:

    a. Evidence of notification of CDPH,

    b. Maintenance of Abatement Plan shall be retained on-site throughout demolition activities for Owner review upon request,

12. All demolition activities shall be subject to inspection by CDPH or Owner to verify compliance with requirements of LBP regulations and Abatement Plan.

13. Following completion of abatement activities, retain services of a Certified Lead Inspector/Assessor or Certified Lead Project Monitor to conduct clearance inspection in accordance with Title 17 of California Code of Regulations Division 1 Chapter 8 §35000a and §36000(c)(3).

14. Submit copy of results of clearance inspection to Owner and to City Planning Division upon completion of abatement and inspection activities.

15. Legally dispose of all paint removed during progress of demolition and Work. When paint debris is found to contain >5 ppm lead or hexavalent chromium when tested in accordance with Waste Extraction Test (WET) method of California Code of Regulations, Title 22, it shall be disposed of as hazardous waste.

H. Mercury shall be remediated according to guidelines set up by EPA, OSHA, Cal OSHA and other regulatory agencies. Dispose of intact units in accordance with local, state and federal regulations.

I. Polychlorinated biphenyls (PCB's) shall be remediated according to guidelines set up by EPA, OSHA, Cal OSHA and other regulatory agencies. Dispose of intact units in accordance with local, state and federal regulations.

J. Chemical storage tanks shall be remediated according to guidelines set up by EPA, OSHA, Cal OSHA and other regulatory agencies. Procedures shall include but not be limited to:

1. Owner will drain contents of tank to within 1' of bottom or less.

2. Contractor shall remove remaining contents, haul it to legal disposal site, and pay for legal disposal of contents.

3. After completely draining tank, Contractor shall triple-rinse tank, haul waste washwater to legal disposal site, and pay for legal disposal of contents.

4. Owner may be able to perform above services for less than cost of remediation where options exist for locally recycling waste material within plant At Contractor's option, Contractor may request quote (offer) from Owner to perform tasks 2 and 3 above. If Contractor elects to use Owner's forces for remediation, quoted price offered by Owner for said work will be deducted from payment due Contractor. Contractor is under no obligation to accept Owner's offer.

5. Prior to tank demolition, Contractor shall retain certified remediation firm experienced in neutralizing chemical tank surfaces prior to demolition and removal.

6. After neutralizing chemical tank surface, Contractor shall legally dispose of tank and attached residue.

K. Following remediation, demolition shall occur as follows:

1. Facilities scheduled for demolition shall be removed, salvaged and disposed of as shown in Contract Documents. Remove and dispose of all portions of items scheduled for demolition which interfere with project construction.

2. Backfill and compact site areas disturbed by demolition work with earth or gravel backfill in accordance with Section 31 23 00 / 31 23 33.

3. Protect work not intended to be removed or salvaged. If in opinion of Owner's Representative a demolition method used may endanger or damage parts of structure or affect satisfactory operation of facilities, promptly change method upon receipt of notification from Owner's Representative.

4. No blasting will be permitted.

5. All equipment, material and piping, scheduled for demolition and not required to be salvaged to Owner shall become Contractor's property and shall be removed from project site and disposed of legally.

6. Do not reuse material salvaged from demolition work on this project except where permitted by Contract Documents.

L. Patching shall occur as follows:

1. Patching shall include restoration of surface or item to condition as near as practicable to match existing adjoining surfaces unless otherwise directed.

2. Where patching involves cleaning, painting, special coating, wall covering or other applied finish, clean and refinish entire surface plane, wall or ceiling unless complete refinishing of entire space is required elsewhere.

M. Each load for landfill disposal shall be accompanied by manifest verifying hazardous materials were legally disposed of to absolve Owner of responsibility. Return completed copy of manifest to Owner after disposal.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 02 41 14
PAVING REMOVAL AND RESURFACING

PART 1 - GENERAL

1.1 Work Included

A. Materials, testing, removal and replacement of paved surfaces disturbed by construction.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 31 23 00: Excavation and Fill
H. Section 31 23 33: Trenching and Backfilling
I. Section 32 12 16: Asphalt Paving
J. Section 32 13 13: Concrete Paving

1.3 Quality Assurance

A. Resurfacing of existing pavement and surfaces disturbed in connection with construction of project improvements and appurtenances, shall conform to provisions of applicable permits issued by agencies having jurisdiction over work within their right-of-way.

1.4 References

A. Asphalt Institute MS-4 The Asphalt Handbook
B. Orange County Environmental Management Agency Standard Plans
C. SSPWC Standard Specifications for Public Works Construction (Greenbook)

1.5 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Certificate of Compliance	Submit report from testing laboratory certifying that aggregate material is asbestos-free and conforms to specified gradations or characteristics.	
Delivery Tickets	Required for all asphalt and concrete used. Deliver submittal to jobsite inspector.	

B. Refer to Section 01 33 00 for definition of requirements for certificates of compliance.

1.6 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 for delivery, storage, and handling requirements.

B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of asphalt materials shall be strictly followed.

1.7 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Materials

A. Refer to Section 01 61 00 for basic requirements for products and materials.

B. Removal and resurfacing products shall conform to the following specifications:

ITEM	MATERIAL	SPECIFICATION
Subgrade Preparation	Suitable material	Section 31 23 00 / 31 23 33
Soil Sterilant	Herbicide	Section 31 23 00 / 31 23 33
Base	Aggregate Base	Section 32 13 13
Prime Coat	Liquid Asphalt	Section 32 13 13
Asphalt Paving Materials	Asphalt	Section 32 13 13
Seal	Slurry Seal	Section 32 13 13
Concrete Paving Materials	Portland Cement Concrete	Section 03 30 00

PART 3 - EXECUTION

3.1 Preparation

A. Make field measurements needed to install pavement before beginning work. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

B. Photograph and measure locations of all pavement markings to allow replacement upon completion of paving operations.

3.2 Pavement Removal

A. Remove pavement or road surfacing within limits of construction excavations prior to excavation operations of any nature. Remove surplus material and dispose of as specified.

B. Prior to removal of existing surfacing, make pavement cuts for pipelines at limits of excavations as shown or required by permit. Pavement cuts for trenches shall be neat and straight along both sides of trench and shall parallel pipe alignment to provide unfractured level pavement joints for bonding existing surfacing to new pavement replacement. Make pavement cuts for pipelines at least 12 inches outside trench face to provide benched surface of undisturbed base on which new pavement will be placed to match existing pavement.

C. Where large irregular surfaces are removed, trim or cut paving parallel or perpendicular to roadway centerlines. Cut edges shall have clean, solid vertical faces free from loose material.

D. For trenches 5 feet deep or less, tunnel under existing curbs, gutters, sidewalks and concrete flatwork.

E. Cutting of concrete flatwork shall be done only by permission granted in excavation or encroachment permit.

F. Portland cement concrete pavement, including cross gutters, curbs and gutters, sidewalks, driveways, and other concrete surfaces shall be saw cut to minimum depth of 1½ -inches prior to removal.

G. Sawcut concrete pavement at edge of trench or excavation. Sawcut concrete curbs, gutters and sidewalks to the nearest score marks or construction joints beyond damaged portion as may be required in each case by authority having jurisdiction.

H. Pneumatic tools may be used to cut concrete pavement only with written permission of Owner's Representative. In such event, a subsequent saw cut shall be made after backfilling, and additional concrete pavement shall be removed and disposed of by Contractor prior to resurfacing.

I. Do not demolish Portland cement concrete using impact equipment such as stomper attachments on backhoes and excavators, wrecking balls, or other means of demolition that may result in vibration and ground shaking unless prior written consent is secured from Owner's Representative at least 3 working days before start of demolition.

J. Asphalt concrete surfaces shall be initially cut by means of sawcutting or pneumatic pavement cutters or other accepted equipment prior to removal of surfacing. Pavement saw-cutting will be required within rights-of-way of county roads and highways, or as required by permits or local governing bodies.

K. Road-mixed surfaces shall be cut at limits of trench and/or excavation prior to removal of existing surfacing. Cuts may be made with pneumatic tools or other accepted equipment. The extra trimming width by saw cuts prior to resurfacing will not be required unless otherwise shown.

3.3 Temporary Paving

A. Replace pavement removed by trenching operations with minimum 2 inches of temporary asphalt paving mix after compaction is accepted by Owner's Representative or within 3 days after pipe installation, whichever comes first.

B. Place temporary pavement on cross streets and all accesses on same day that excavation is made.

C. Maintain temporary pavement so a smooth traversable surface is available at all times for vehicular traffic, free from ruts, depressions, holes, or loose gravel.

D. Inspect temporary paving at no greater than 12-hour intervals, 7 days per week during periods of measurable precipitation. Repair and/or replace temporary asphalt paving as needed on discovery of damage.

E. Cost for installing, maintaining and removing temporary paving shall be included in contract unit prices for Work, and no extra compensation will be made to Contractor.

3.4 Installation

A. Refer to Section 01 73 00 for basic execution and installation requirements.

B. Furnish and install asphalt concrete resurfacing at locations shown on Plans and Submittals and approved by Owner's Representative.

C. The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements

2. Applicable OSHA and Cal OSHA regulations

3. Applicable building and plumbing code requirements

4. Standard Specifications for Public Works Construction

5. Asphalt Institute MS-4 The Asphalt Handbook

D. Refer variances between the above documents and Contract Documents to Owner's Representative.

E. Installation shall proceed as follows:

1. After trench is backfilled and passes compaction testing, sawcut paving to minimum depth of 1½ inches not less than 12 inches outside limits of excavation or previous pavement cut, whichever limits are greater. Remove additional surfacing and dispose of prior to resurfacing.

2. Restore surface to original grade and crown section in all areas where surface is removed, broken, or damaged by equipment, or where ground has caved or settled due to the installation of the Work.

3. Restore subgrades, base materials, and paved surfaces above trenches or damaged sections with subgrades, base materials and paved surfaces equal to or better than those found prior to Contractor beginning Work.

4. Unless otherwise shown on Contract Documents or permits, thickness of finished asphalt concrete course shall be one inch greater than asphalt thickness prior to construction.

5. Remove existing surfacing before resurfacing.

6. Work shall match appearance of existing improvements.

7. Where large irregular surfaces are to be resurfaced, cut and remove existing surfacing as provided herein.

8. Apply asphaltic emulsion to vertical faces of all asphalt concrete pavement against which pavement replacement materials are to be placed.

9. When ready for acceptance, thoroughly compact completed surface true to grade and cross section.

10. Lap trench section at least 12-inches on each side and hand rake so that lapped section will feather-in smoothly with existing pavement. Resulting edge of contact between new and existing pavement on each side shall parallel the existing trench and be a straight and neat join line.

F. Portland cement resurfacing shall be installed according to requirements of the Standard Specifications for Public Works Construction. Installation shall proceed as follows:

1. Replace Portland cement concrete sidewalks, curbs, gutters and driveways to nearest scoreline or over sufficient width to replace any portions of concrete damaged, fragmented, cracked, or otherwise disturbed due to construction operations.

2. Where new PCC pavement contacts existing PCC pavement, dowel and epoxy #4 smooth bars, 16 inches in length, spaced at 18 inches on-center, located vertically in

center of the PCC pavement. Drill 8¾-inch-long hole in exposed edge of existing PCC pavement just large enough to accept #4 smooth bar and epoxy bar into place in existing PCC prior to placing new concrete. Install expansion joint material as required by local governing body, agency, or association having jurisdiction over public and private streets.

3. Construct cold joints between sections of new PCC pavement using either #4 deformed bars spaced at 18 inches on-center, located vertically in center of PCC pavement, or by forming keyway at cold joints. Thoroughly vibrate PCC into adjoining keyway during placement of each pavement section.

G. Minimum paving course thicknesses are shown below under field quality control.

H. Following pavement replacement and sealing, replace all pavement markings in kind.

3.5 Field Quality Control

A. Field testing shall include the following for asphalt paving:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Asphalt Concrete Paving	Minimum thickness	Thickness of section removed plus one inch	As directed	Owner	Contractor
Aggregate Base	Minimum thickness	Thickness to equal thickness of section removed and shall extend at least 4-inches beneath asphalt	As directed	Owner	Contractor
Finish Grade	Finish surface	No deviations from existing grade in excess of ⅛-inch in 10 feet	As directed	Owner	Contractor
		No ruts, depressions or irregularities in excess of ⅜-inch deep	As directed	Owner	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Permit Requirements	1 test	Owner	Contractor

B. Field testing shall include the following for Portland cement concrete paving:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Portland Cement Concrete	Minimum thickness	Thickness to equal thickness of section removed (4-inch minimum)	As directed	Owner	Contractor
Aggregate Base	Minimum thickness	Thickness to equal thickness of section removed and shall extend at least 8-inches beneath PCC	As directed	Owner	Contractor
Finish Grade	Finish surface	No deviations from existing grade in excess of ⅛-inch in 10 feet	As directed	Owner	Contractor
		No ruts, depressions or irregularities in excess of ⅜-inch deep	As directed	Owner	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Permit Requirements	1 test	Owner	Contractor

C. Contractor shall furnish and place permanent resurfacing within 7 days after order to do so by Owner.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 03 10 00
CONCRETE FORMING

PART 1 - GENERAL

1.1 Work Included

A. Materials, testing, erection and removal of concrete formwork including formwork, bracing, shoring, supports, falsework, and all appurtenant work.

B. Setting of embedded bolts, anchors, pipe sleeves, conduit sleeves, conduit and similar work under direction of respective trades.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 31 23 00: Excavation and Fill
H. Section 31 23 33: Trenching and Backfilling
I. Section 03 20 00: Concrete Reinforcing
J. Section 03 30 00: Cast-in-Place Concrete

1.3 System Description

A. Furnish and install concrete formwork including appurtenant structural, or mechanical mountings or connections required for compliance with applicable building codes and standards.

B. Forms, shoring and falsework shall:

1. Confine concrete ingredients including water, sand and cement while placing concrete,

2. Confine concrete to required lines, grades and construction tolerances.

3. Provide safe working environment in accordance with OSHA regulations.

4. Support all dead loads and live loads plus superimposed construction loads including equipment, stored materials, personnel, impact loads form falling concrete or other materials, foundation pressures repetitive stress loads from vibrating concrete, and all other vertical and lateral loads during construction.

5. Be of sufficient number and area to allow construction to proceed on schedule.

6. Upon removal, leave concrete with nontoxic, clean, dry surface, free from ridges, fins, offsets, deflection marks, or similar defects. Surface shall be in condition that can be finished by Contractor as required by Contract Documents.

C. It shall be Contractor's responsibility to design, construct and maintain safe forms, shoring and falsework at all times in accordance with applicable OSHA regulations.

D. If adequate foundation for shores cannot be secured, provide truss supports.

E. Forms, shoring and falsework failing to provide all above functions shall be removed from jobsite immediately at no additional cost to Owner.

F. Cap protruding reinforcement bars for worker protection in accordance with applicable safety codes.

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

B. Design of structures shown on drawings includes no allowance for imposed construction loads. Provide forms, shoring and falsework adequate for dead loads and live loads plus imposed loads during construction.

C. Formwork shall comply with ACI 347, except as exceeded by requirements of other regulatory agencies or as otherwise shown.

D. Tolerances of formwork shall comply with ACI 117. Failure of finished concrete work to meet specified tolerances shall be remedied at Contractor's expense.

1.5 References

A. ACI 117 Standard Tolerances for Concrete Construction and Materials
B. ACI 318 Building Code Requirements for Reinforced Concrete
C. ACI 347 Recommended Practice for Concrete Formwork
D. California Building Code (CBC)
E. California Division of Occupational Health and Safety Construction Safety Orders
F. PS1 U.S. Product Standard Code for Concrete Forms, Class 1
G. PS20 American Softwood Lumber Standard

1.6 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required for construction and expansion joints placement and for sequence of forming and concrete placing operations per structural shop drawing requirements.	.
	Required for falsework, formwork, and vertical shoring per structural shop drawing requirements.	
	Required for embedments, conduit, piping and other wall penetrations per structural Shop Drawing requirements.	
Catalog Data	Required for form ties, taper tie plugs (if used), form gaskets related work per catalog data requirements.	
	Required for form liners. Include dimensional data and photograph of finished appearance	
Engineering Calculations	Required for falsework, formwork and vertical shoring per engineering calculations requirements. Calculations shall include statement from preparing engineer certifying falsework, formwork and vertical shoring design meets or exceeds design requirements of Cal OSHA Construction Safety Orders including Article 29 §1717, "Falsework and Vertical Shoring."	

B. Refer to Section 01 33 00 for definition of requirements for shop drawings, catalog data, and engineering calculations.

C. Maintain at least one copy of accepted shop drawings on site throughout concrete placing operations.

1.7 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 for delivery, storage, and handling requirements.

B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of concrete formwork shall be strictly followed.

1.8 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Form Ties	Burke Company (Penta-Tie System)	San Mateo, CA
	Dywidag Systems International	Munich. GE
	Richmond Screw Anchor Company (Snap Tys)	Fort Worth, TX
	Accepted equal	
Reusable and Wash-off Forms for Site Concrete	Labrado – wash off	
	L.M. Scofield (Lascolite) - reusable	
	Accepted equal	
Formliners	U S Formliner Div Reckli International	Bogart, GA
	Accepted equal	
Form Coatings	Grace Construction Matierials (Formfilm)	
	Sika Chemical Corporation (Antisot)	Lyndhurst, NJ
	Sonneborn Building Products, Inc. (Form-Saver)	
	Accepted equal	

2.2 Materials

A. Refer to Section 01 61 00 for basic requirements for products and materials.

B. Unless expressly accepted by Owner's Representative, all lumber brought onto jobsite for use as forms, shoring, or bracing shall be new material of grade shown on accepted shop drawings. Form surfaces shall be smooth.

C. Form materials that remain or leave residues on or in concrete must be classified as acceptable for potable water use by Environmental Protection Agency within 30 days of application or use. Concrete formwork containing arsenic or other toxic materials shall be removed from jobsite and disposed of off site.

D. Formwork shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Wall Forms	Steel	Design per ACI 347 Provide rubber grommets where ties pass through forms to prevent loss of cement paste.

ITEM	MATERIAL	SPECIFICATION
	Plywood panel	PS1 Class 1 edge-sealed Douglas Fir or Southern Yellow Pine plywood 5/8" minimum thickness with stud spacing close enough to prevent deflection marks.
	Floor gasket	1" to 1½" diameter polyethylene rod gasket to seal bottom of wall forms resting on floor slabs or footings to prevent loss of fines and paste during concrete placing and vibration.
Column Forms	Steel or Fiberglass	Design per ACI 347 Provide rubber grommets where ties pass through forms to prevent loss of cement paste.
	Plywood Panel	PS1 Class 1 edge-sealed Douglas Fir or Southern Yellow Pine plywood 5/8" minimum thickness Stud spacing close enough to prevent deflection marks.
Roof and Floor forms	Plywood	ACI 347, PS1 Class 1 edge-sealed Douglas Fir or Southern Yellow Pine plywood 5/8" minimum thickness Stud spacing close enough to prevent deflection marks.
All Other Forms	Steel Panels or Tongue-and-Groove Lumber	ACI 347 Provide rubber grommets where ties pass through steel forms to prevent loss of cement paste.
	Plywood	ACI 347, PS1 Class 1 edge-sealed Douglas Fir or Southern Yellow Pine plywood ⅝" minimum thickness Stud spacing close enough to prevent deflection marks.
Lumber for Falsework	Douglas Fir or Southern Yellow Pine	PS 20 Construction Grade or better
Plywood Forms for Surfaces to be Painted	Plywood	Medium Density Overlaid Plywood, MDO Ext. Grade
Form Ties	Plastic	Plastic removable cone type with integral water stops. Do not use wire form ties. Do not use snap ties which cause spalling of concrete upon form stripping or tie removal.

E. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Forms and Falsework Strength Design	Design Load	Design for total dead load plus live load of 50 psf.
	Minimum Vertical Design Load	100 psf.
		Design of structures shown on drawings includes no allowance for imposed construction loads. Provide forms, shoring and falsework adequate for dead loads and live loads plus all imposed vertical and lateral loads during construction.
Chamfers and Fillets	Chamfers	Provide ¾" chamfer on exterior corners except where otherwise shown.
	Fillets	Do not provide fillets on reentrant corners except where shown.
Form Ties – Water Retaining Structures or Structures in Contact with Groundwater	Maximum Diameter of Removable Cone	1½"
	Holes	Form ties shall leave holes of regular shape for reaming.
	Design	Provide with plastic cone or other means of forming conical hole to ensure form tie may be broken off back of concrete face.
	Removable Taper Ties	May be used if accepted by Owner's Representative. Insert preformed neoprene or polyurethane tapered plug (sized to seat at wall center) in hole left by taper tie removal.

ITEM	DESCRIPTION	
Formliners	Simulated CMU Design Modular Size, Finish and Color	Precision block / Precision block one-score / Precision block three score / Precision block five score / Combed / Hi-lite ¾" Projection / Double hi-lite ¾" projection / Split-face / Split-face one-score / Split-face 3-score / Split-face 5-score / Split-face 6-taper score / Split-face 3-wide-score / Split-face 4-wide score / Split-face 4-flute / Slumped block unless otherwise shown on plans. Color = dark earth tone / sand. Submit sample to Owner's Representative for confirmation
	Simulated Brick Design Simulated CMU Design Modular Size, Finish and Color	Running Bond Color = light concrete gray / dark concrete gray / dark earth tone / sand. / red clay Submit sample to Owner's Representative for confirmation
	Simulated Stone Design Size, Finish and Color	Color = light concrete gray / dark concrete gray / dark earth tone / sand. Submit sample to Owner's Representative for confirmation
	Simulated Wood Design Size, Finish and Color	Color = light concrete gray / dark concrete gray / dark earth tone / sand. Submit sample to Owner's Representative for confirmation
	Geometric Design Size, Finish and Color	Color = light concrete gray / dark concrete gray / dark earth tone / sand. Submit sample to Owner's Representative for confirmation
Form Coating	Acceptable Materials	Non-grainraising, nonstaining resin or polymer type coating
	Unacceptable Materials	Coatings leaving residual matter on concrete surface. Coatings adversely affecting concrete bonding to paint, plaster, mortar, protective coatings, waterproofing or other applied materials. Coatings containing mineral oils, paraffins, waxes or other nondrying ingredients.
	Unacceptable Materials against Surfaces Contacting Potable Water	Any toxic or partially toxic materials
Form Joint Sealers	Design	Resilient foam rubber strips, non-hardening plastic type caulking compound free of oil.
	Alternate Design	Waterproof pressure sensitive plastic tape of minimum 8-mil thickness and 2" width.
	Form Tie Hole Filling	Use rubber plugs, plastic caulking compound or equal

PART 3 - EXECUTION

3.1 Preparation

A. Make field measurements needed to install concrete formwork before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

B. Install plumb and string lines before placing concrete and maintain throughout concrete placement.

C. Set pipe stubs, wall sleeves, anchor bolts and other embedded work in forms where required before placing concrete. Use templates to maintain anchor bolts in position during concrete placing.

D. Embedded items shall be subject to the following constraints.

1. Locate embedded items so as not to reduce strength of construction.

2. No embedded item (parallel to surface) shall have an outside diameter greater than ⅓ of slab or wall thickness.

3. Embedded items parallel to surface shall be placed between top or interior reinforcing steel and bottom or exterior reinforcing steel.

4. Embedded items shall not be spaced closer than 3 diameters on center. Diameter shall be taken as largest outside diameter of embedded item.

5. Embedded items shall be supported independently from reinforcing steel in manner preventing metallic contact and electrolytic deterioration.

6. Walls or slabs 4½" or less in thickness shall have no embedded items (parallel to surface) other than conduit.

7. For corrosion protection, place embedded metallic items so at least 2" clearance is provided between any embedded metallic item and any part of concrete reinforcement. Do not secure embedded items in place by wiring or welding to reinforcement.

8. Supplemental reinforcing shall be placed around openings as required.

E. Thoroughly clean forms and embedments before placing concrete.

1. Remove any encrusted dirt, concrete, mortar or grout from forms or embedments.

2. Treat form surfaces with lubricant acceptable to Owner's Representative at least 2 weeks before using forms.

3. Remove any excess lubricant before placing concrete.

4. Take care to keep lubricant off surfaces of steel reinforcement and embedded items.

3.2 Installation

A. Refer to Section 01 73 00 for basic execution and installation requirements.

B. Furnish and install concrete formwork at locations shown on Plans and Submittals.

C. The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements

2. Applicable OSHA and Cal OSHA regulations

3. Applicable building code requirements

D. Refer variances between above documents and Contract Documents to Owner's Representative.

E. Install concrete formwork to tolerances recommended by Manufacturer and as described below to meet tolerances shown under "Field Quality Control." Unless otherwise shown, install concrete formwork true, plumb and level using precision gauges and levels.

F. Form all vertical surfaces except where concrete placement against earth is shown.

G. For members of comparatively limited height, where character of ground is such it can be trimmed to required lines and stand securely without caving or sloughing throughout concrete placement, Owner's Representative may permit placing concrete against earth at Contractor's risk. Should ground fail during concrete placement for any reason, including weather, or other natural or manmade causes, Contractor shall remove concrete in areas of earth failure and reconstruct with forms and new concrete at Contractor's sole expense.

H. Where concrete is permitted to be placed against trimmed ground in lieu of forms, add at least 1" thickness of additional concrete to face of concrete being formed against earth.

I. Where taper ties are approved for use, larger end of taper tie shall be on wet side of walls in structures retaining water or groundwater

J. Secure gaskets at bottom of wall forms before placing concrete.

K. Provide adequate cleanout holes at bottom of each lift of forms.

L. Provide form windows where concrete cannot be placed from top of wall in manner that meets contract document requirements.

M. Quantity and dimensions of cleanout holes and form windows shall be subject to approval by Owner's Representative.

N. Concrete construction joints shall only be made where shown on Contract Documents and accepted shop drawings or approved in writing by Owner's Representative. When second lift is placed on hardened concrete, Contractor shall take care to ensure quantities, locations, and tightness of form ties prevents unsatisfactory effects on finished concrete.

3.3 Field Quality Control

A. Monitor plumb and string line positions continually throughout concrete placement and correct deficiencies immediately.

B. Special inspection and field testing required by Chapter 17 of CBC (Table 1704.4) shall be completed by an ICC-certified special inspector selected by Owner and shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Concrete Formwork	Shape, Location and Dimensions of Item Being Formed	ACI 318 6.1.1, and paragraph C below	Periodic per CBC Table 1704.4	Owner	Contractor to reimburse Owner for costs of first deputy inspector if re-inspection is required

C. Additional field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Formwork and Finished Concrete	Tolerance of Finished Concrete Work	As described below and ACI 117 Manometer survey may be required for horizontal slabs to demonstrate compliance	Inspection at Owner's discretion (may occur after concrete is in place)	Owner	Owner

D. Tolerances of finished concrete shall be as follows:

ITEM	TOLERANCE
Variation of Constructed Linear Outline from Established Position in Plan	¼" maximum in 10' ½" maximum in 20' or more
Variation from Level or from Grades Shown	¼" maximum in 10' ½" maximum in 20' ¾" maximum over entire structure
Variation from Plumb	¼" maximum in 10' ½" maximum in 20' or more
Variation in Thickness of Slabs and Walls	Minus ¼" Plus ½"
Variation in Locations and Sizes of Slabs and Wall Openings	±¼"

3.4 Adjusting and Cleaning

A. Remove forms being careful not to damage concrete. Contractor shall remedy damage from improper or premature form removal at his sole expense.

1. No heavy loading on green concrete will be permitted.

2. Forms supporting non-load bearing vertical members including walls and columns shall remain in place for at least 2 days.

3. Forms supporting roof slabs and above-ground floor slabs shall remain in place for at least 14 days and until test cylinders for supported item show all tested concrete has attained 90% of specified 28-day compressive strength,

4. In addition, forms supporting roof slabs and above-ground floor slabs shall remain in place and until test cylinders for slabs, panels, walls, columns, and supporting members adjacent to that item show all tested concrete has attained 90% of specified 28-day compressive strength,

5. Time required to reach 90% of specified 28-day compressive strength shall be established by Owner's Representative based on test cylinders taken for this purpose.

6. Forms for all items of work not specifically mentioned herein shall remain in place for time periods determined by Owner's Representative.

7. Immediately after removing forms, wet concrete surfaces and keep surface moist until curing procedures begin.

8. Do not apply construction, equipment or permanent loads on columns, supported slabs or supported beams until all concrete in load path to foundation has attained 28-day design compressive strength.

B. Form tie removal shall proceed as follows:

1. No form-tying device or part thereof other than metal shall be left embedded in concrete.

2. Do not remove ties in such manner as to leave hole extending through interior of concrete members.

3. Where metal rods extend through concrete to support or strengthen forms, rods shall remain embedded and shall terminate at least 1” back from formed face or faces of concrete,

4. Where taper ties are removed, ream holes left by removal of form tie cones with suitably toothed reamers. Finished surface of holes shall be clean and roughened for bond before being filled with mortar.

5. A precast neoprene or polyurethane tapered plug shall be placed at wall centerline. Hole shall then be completely filled with non-shrink or regular cement grout for above grade walls that are dry on both sides.

6. Exposed faces of walls and ceilings, and floors shall have outer 2” of exposed face filled with cement grout matching color and texture of surrounding wall surface.

C. Forms may be reused only if in good condition and only if acceptable to Owner’s Representative.

1. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces.

2. Fill residual tie rod holes with metal caps or other methods accepted by Owner’s Representative.

3. Thoroughly clean form before reuse.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 03 15 00
CONCRETE ACCESSORIES

PART 1 - GENERAL

1.1 Work Included

A. Materials, testing, and installation of waterstops and construction joints.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 01 74 00: Cleaning and Waste Management
H. Section 03 10 00: Concrete Forming
I. Section 03 20 00: Concrete Reinforcing

1.3 System Description

A. Furnish and install concrete accessories where shown, including waterstop and construction joint materials.

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 References

A. California Building Code (CBC)

1.6 Submittals

A. Furnish the following submittals:

SUBMITTAL	DESCRIPTION	
Catalog Data	Required for waterstops and other accessories per catalog data requirements.	
Installation Instructions	Required for accessories per installation instruction requirements.	
Certificate of Compliance	At least 24 hours before placing concrete, submit certification from each trade having embedded items in concrete to be placed stating embedded items for each trade are properly located, placed and braced.	
Warranty	Furnish one-year warranty from date of final acceptance	

B. In addition to requirements of ACI, refer to Section 01 33 00 for definition of requirements for catalog data, installation instructions, and certificates of compliance.

1.7 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 for delivery storage and handling requirements.

B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of concrete accessories shall be strictly followed.

C. Storage of materials shall conform to requirements of ACI 301.

D. Store materials to prevent damage by moisture or breakage.

E. Do not use aluminum embedments in concrete.

1.8 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Detectable Warning Surfaces on Curbs and Curb Access Ramps	ADA Solutions, Inc.	North Billerica, MA
	Accepted equal	
Joint Filler	DFC "Denver Foam"	
	Sonneborn Building Producte, Inc. "Sonofoam"	
	Accepted equal	
Waterstops	Greenstreak Inc.	St Louis, MO
	Vinylex Corp.	Knoxville, TN
	Accepted equal	
Waterstops for Chemical Containment	J.P Specialties, Inc.	Lake Elsinore, CA
	Accepted equal	
Waterstops for Retrofit	J.P Specialties, Inc.	Lake Elsinore, CA
	Accepted equal	
Waterstops, Stainless Steel	J.P Specialties, Inc.	Lake Elsinore, CA
	Accepted equal	

2.2 Materials

A. Refer to Section 01 61 00 for basic requirements for products and materials.

B. Concrete accessories shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Detectable Warning Surfaces on Curbs and Curb Access Ramps	Dimensions	Raised truncated domes with nominal 0.9" base diameter, nominal 0.2" height and nominal 2.35" center-to-center spacing
	Color	Gray / Blue
Joint Filler - Preformed		ASTM D1751 Nonextruding resilient bituminous type
Joint Sealer - Elastomeric		See Section 07 92 00.
Joint Sealer - Mastic	Asphalts or similar materials blended with lubricants or plasticizers	No evaporating solvents or volatile oils or lubricants permitted Shall tenaciously adhere to concrete surfaces

ITEM	MATERIAL	SPECIFICATION
		Shall remain permanently resilient and pliable Shall not be affected by continuous presence of water Shall in no way contaminate potable water Shall effectively seal joints from moisture infiltration even when joints are subject to expansion or contraction movements

C. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Waterstops	Corners	Provide shop-made corner fittings. Do not splice corners in field.

D. All materials furnished for Work must be classified by Environmental Protection Agency as acceptable for potable water use within 30 days of application.

PART 3 - EXECUTION

3.1 Preparation

A. Make field measurements needed to install concrete accessories before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

B. Before placing concrete within forms, each trade having embedded items, including water stops within forms and affected by pour shall certify all items are properly located, placed and braced.

C. Construction joints shown on Contract Documents and accepted shop drawings may be made as shown with provision of keys or other locking shapes to secure proper union with subsequent work.

D. Before placing concrete, verify location of embedded items with affected trades. Accuracy of placement of embedded items is Contractor's responsibility.

3.2 Installation/Application

A. Refer to Section 01 73 00 for basic execution and installation requirements.

B. Furnish and install concrete accessories at locations shown on Plans and Submittals.

C. The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements
2. Applicable OSHA and Cal OSHA regulations
3. California Building Code Chapter 19 "Concrete"
4. Other applicable building code requirements
5. ACI 301 Structural Concrete for Buildings Chapter 8.
6. ACI 318 Building Code Requirements for Reinforced Concrete

D. Refer variances between above documents and Contract Documents to Owner's Representative.

3.3 Field Quality Control

A. Field testing of concrete accessories shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Water-Bearing Concrete Structures	Waterstop and Joint Effectiveness	Section 03 08 50	As directed	Owner	Owner
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 - GENERAL

1.1 Work Included

A. Materials, testing, and installation of steel reinforcement in concrete and masonry, including reinforcing bar, welded wire fabric, couplers, concrete inserts, wires, clips, supports, chairs, spacers, epoxy embedment, and other embedded accessories.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 03 10 00: Concrete Forming
H. Section 03 30 00: Cast-in-Place Concrete
I. Section 33 05 16: Precast Concrete Utility Structures

1.3 System Description

A. Furnish and install complete steel reinforcement including appurtenant structural, mechanical and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

B. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Steel Reinforcement	Material Properties	ASTM A615	As required by Owner	Owner	Contractor
Steel Reinforcement Welding	Compliance with AWS D1.4	AWS D1.4	As required by Owner	Owner	Contractor
	Radiographic testing	AWS D1.4	As required by Owner	Owner	Contractor

1.5 References

A. ACI 117 Standard Tolerances for Concrete Construction Materials
B. ACI 315 Details and Detailing of Structural Reinforcement
C. ACI 318 Building Code Requirements for Reinforced Concrete
D. ASTM A82 Steel Wire, Plain, for Concrete Reinforcement
E. ASTM A185 Welded Steel Wire Fabric, Plain, for Concrete Reinforcement
F. ASTM A615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

G. ASTM A706 Low-Alloy Steel Deformed Bars for Concrete Reinforcement
H. ASTM A775 Epoxy-Coated Reinforcing Steel Bars
I. ASTM A934 Epoxy-Coated Prefabricated Steel Reinforcing Bars
J. ASTM C1116 Fiber-Reinforced Concrete
K. ASTM D3963 Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
L. AWS D1.4 Structural Welding Code – Reinforcing Steel
M. California Building Code (CBC)
N. CRSI MSP Concrete Reinforcing Steel Institute Manual of Standard Practice
O. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 201-2 "Reinforcement for Concrete"
P. WRI Manual of Standard Practice for Welded Wire

1.6 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
CBC Chapter 17 Special Inspection Required Contractor Statement of Responsibility	As required in CBC Section 1706	
Shop Drawings	Shop bending diagrams, placing lists and drawings of reinforcing steel required per structural shop drawing requirements. Comply with ACI 315.	.
	Show actual bar lengths to nearest inch measured to intersection of tangent extensions of outside bar surface. Bar placement diagrams shall clearly show dimensions of each bar splice. Show location of any coupler used with details of how they are installed in formwork.	
	Show locations of construction and expansion joints. Show locations of all embedded items including anchor bolts, wall sleeves, conduit and piping which may conflict with steel reinforcing	
Catalog Data	Required for mechanical couplers with ICBO test reports per catalog data requirements.	
Installation Instructions	Submit written welding procedure for each type of rebar weld for each size of bar intended to be spliced by welding. (A mere statement that AWS procedures will be followed is unacceptable.)	
Test Record Transcripts	For each load of steel reinforcement delivered, submit mill certificates and Manufacturer's certification of chemical and physical properties of steel as needed to verify steel materials. Also, submit information needed to determine carbon equivalent of any steel to be welded in accordance with AWS D1.4 and per test record transcript requirements. For epoxy-coated steel reinforcing, submit evidence plant is certified under CRSI Fusion-Bonded Epoxy Coating Applicator Plant Certification Program.	
Material Samples	Required from each heat of reinforcing steel upon Owner's Representative's request. Sample quantities required if requested shall conform to SSPWC Section 201-2.4 Required for each type of welded splice upon Owner's Representative's request.	
Welder Qualification Certificates	Required as specified in AWS D1.4 for all welders performing welding of steel reinforcement. Also submit certifications of procedure qualifications for each welding procedure used.	

B. Refer to Section 01 33 00 for definition of requirements for shop drawings, catalog data, installation instructions, test record transcripts, and material samples.

1.7 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 for delivery, storage, and handling requirements.

B. CRSI recommendations included in Manual of Standard Practice for delivery, storage and handling of steel reinforcement shall be strictly followed.

C. Bundle reinforcement and tag with suitable identification to facilitate sorting, placing and transport.

D. Bars with kinks or bends not shown on shop drawings shall be removed from site.

E. Bars with rust, scale, oil or any other coating that would reduce or destroy bond between concrete and steel shall be removed from site.

F. Epoxy-coated reinforcing bars shall be stored, transported and placed in accordance with ASTM D3963 and in such a manner to avoid chipping of epoxy coating.

1. Use nonabrasive fabric slings for handling.

2. Repair any chips in epoxy coating with compatible epoxy repair material accepted by bar supplier before placing concrete.

3. Use plastic-headed concrete vibrators during concrete placement around epoxy-coated rebar.

1.8 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 – PRODUCTS

2.1 Acceptable Manufacturers

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Dowel System (alternate to slip dowels)	Greenstreak (Speed Dowel)	St Louis, MO
	Accepted equal	
Mechanical Bar Couplers	Dayton Superior (Dowel Bar Splicer System)	Dayton, OH
	Erico Products, Inc. (Lenton Form Saver)	Solon, OH
	Richmond Screw Anchor Company (Dowel Bar Splicer System)	Fort Worth. TX
	Accepted equal	
Rebar Anti-Corrosion Coating	Pecora Corporation	Harleysville, PA
	Accepted equal	
Epoxy Grout Systems for Rebar Dowels into Existing Concrete	Edoco “BurkEpoxy NS”	Kansas City, KS
	Master Builders Inc. “Concresive Paste LPL”	Cleveland, OH
	Pecora Corporation “Dynapoxy EP430 Fast”	Harleysville, PA
	Sika Corporation “Sikadur 31 Hi-Mod Gel” (vertical or overhead applications)	Lyndhurst, NJ
	Sika Concrete Restoration Systems SikaDur 32, Hi-Mod LPL	Lyndhurst, NJ
	Simpson Strong Tie Co.	Dublin, CA
	Accepted equal	
Epoxy-Coated Rebars	Obtain from plant certified under CRSI Fusion-Bonded	

ITEM	MANUFACTURER	MANUFACTURER LOCATION
	Epoxy Coating Applicator Plant Certification Program.	
Rebar Supports	Dayton Superior	Dayton, OH
	Accepted equal	

2.2 Materials

A. Refer to Section 01 61 00 for basic requirements for products and materials.

B. Materials which remain or leave residues on or within concrete shall be classified as acceptable for potable water use by Environmental Protection Agency within 30 days of application or use.

C. Steel reinforcement shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Steel Bar Reinforcement	Steel	ASTM A615 Grade 60 Billet Steel Deformed Bars
Steel Bar Reinforcement - Welded	Low Alloy Steel	ASTM A706 Grade 60 Deformed Bars
Steel Bar Reinforcement – Epoxy Coated	Epoxy-Coated Steel	ASTM A775 or ASTM A934 Grade 60
Welded Wire Fabric	Steel Wire	ASTM A185 For wires smaller than W4 size, provide in flat sheets. Do not use roll mesh. For wires larger than W4 size, provide in flat sheets only
Wire Reinforcement	Cold Drawn Steel Wire	ASTM A82
Tie Wire	Annealed Steel	14 gauge minimum
Fiber Reinforcement	Steel Fiber	ASTM C1116 Type I
	Glass Fiber	ASTM C1116 Type II
	Polypropylene or Other Synthetic Fibers	ASTM C1116 Type III

A. Bar supports, chairs or dobies shall comply with CRSI Manual of Standard Practice Chapter 3 and shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Concrete Blocks (Dobies) (Do not use in slabs or walls less than 6" thick, or where architectural finish is to be applied.)	Concrete	Minimum 28-day compressive strength f'_c equal to that of concrete but not less than 4000 psi. Embed wire ties in concrete block bar supports.
Plastic Bar Supports (Do not use on grade)	Plastic	CRSI Class 1 gray
Wire Bar Supports (Do not use in wastewater environments or environments exposed to continuous moisture, water or corrosion.)	Steel Wire	CRSI Class 1 (with ⅛"-thick gray plastic coating) / Class 1A (epoxy coated, vinyl coated or plastic coated for use with epoxy-coated rebar / Class 2A SAE Type 430 stainless steel with ¼" clearance from form surface / Class 2B SAE Type 430 stainless steel with ¾" clearance from form surface

B. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION
Mechanical Couplers	Provide where shown on approved shop drawings. Couplers shall develop 125% of yield strength of reinforcement being spliced. Do not reduce bar cross section to accommodate couplers. Threaded couplers require use of next larger size of reinforcing.

ITEM	DESCRIPTION
	Supply all components needed for complete splice.
Welded Splices	Provide where shown on approved shop drawings. Splices shall develop 125% of yield strength of reinforcement being spliced. Provide all materials required to meet AWS D1.4.
Bending and Forming Bars	Conform to ACI 315 and ACI 318. Fabricate to tolerances shown in ACI 117. Reinforcing for masonry shall be shop fabricated, ready for installation by masons.

PART 3 - EXECUTION

3.1 Preparation

A. Make field measurements needed to install steel reinforcement before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

3.2 Installation

A. Refer to Section 01 73 00 for basic execution and installation requirements.

B. Furnish, accurately position and install steel reinforcement at locations shown on Plans and Submittals.

C. The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements
2. Applicable OSHA and Cal OSHA regulations
3. California Building Code Chapter 19 "Concrete" Section 1907 "Modifications to Reinforcement" and Section 1908 "Modifications to ACI 318"
4. Other applicable building code requirements
5. ACI 315 Details and Detailing of Structural Reinforcement
6. ACI 318 Building Code Requirements for Reinforced Concrete
7. For epoxy-coated rebar, comply with ASTM D3963

D. Refer variances between above documents and Contract Documents to Owner's Representative.

E. Minimum cover for non-pre-stressed steel reinforcement per ACI 318 shall be as follows:

LOCATION	BAR SIZE	MINIMUM COVER
Concrete Cast Against and Permanently Exposed to Earth	#4- #18	3.0"
Formed Concrete Exposed to Earth or Weather	#3-#5	1.5"
	#6-#18	2.0"
Formed Concrete Not Exposed to Weather or Earth: Beams, Girders or Columns	#4- #18	1.5"
Formed Concrete Not Exposed to Weather or Earth: Slabs, Walls or Joists	#3-#11	0.75"
	#14-#18	1.5"
Concrete Exposed to Saltwater	#4- #18	4.0"

F. Minimum spacing between parallel bars per ACI 318 shall be 1.0” or 1 bar diameter, whichever is greater.

G. Installation of steel reinforcement bars shall proceed as follows:

1. Install steel reinforcement to tolerances shown in ACI 117 and Section 7.5 of ACI 318.

2. Do not straighten or re-bend reinforcing steel in manner that will damage material. Do not use bars with bends not shown on Plans. Bends shall be cold-bent. Do not use heat.

3. Reinforcing shall be supported and wired together to prevent displacement using annealed iron wire ties or suitable clips at intersections. Use concrete, plastic or metal supports, spacers or metal hangers which are strong and rigid enough to prevent displacement of steel during concrete placement.

4. Where concrete is placed against earth, use supporting concrete dobies in sufficient numbers to support bars without settlement, but in no case shall support be continuous. Tie reinforcing steel to dobies with wire ties embedded in blocks.

5. Where concrete is placed over formwork, furnish concrete, metal, plastic or other acceptable bar chairs and spacers.

6. Bend tie wires away from forms to provide specified concrete cover.

7. Accessories used to support reinforcing bars shall be placed and spaced such that deflections of supports due to weight of supported bars is within tolerances specified by ACI 117 and ACI 318.

8. Where additional bars are provided by Contractor for any reason, they shall be provided at no additional cost to Owner unless Owner’s preapproval is evidenced by written change order issued prior to placing steel reinforcement.

9. Bars may be moved as necessary to avoid conflicts with other reinforcement steel, conduits or embedded items. If bars are moved by more than one bar diameter or enough to exceed specified tolerances, secure approval from Owner’s Representative before placing concrete.

10. Provide additional reinforcing bars around sleeves and openings as shown on Drawings.

H. Installation of welded wire fabric reinforcement shall proceed as follows:

1. Welded wire fabric placed over horizontal forms shall be supported on slab bolsters. Space slab bolsters no greater than 30” on centers, Bolsters shall extend continuously across entire width of reinforcing mat and shall support mat in plane indicated.

2. Welded wire fabric placed over ground shall be supported on wired concrete dobies spaced not more than 36” on center in any direction.

3. The construction practice of placing welded wire fabric on ground and hooking it into place in freshly placed concrete shall not be used.

4. Straighten mesh to lie in flat plane and bend mesh as shown or required to fit work.

5. Provide laps of at least one complete mesh, unless otherwise detailed. Tie every other wire at laps.

I. Splices shall be made as follows:

1. Splicing shall meet requirements of ACI 318 and applicable building codes unless noted otherwise on drawings.

2. Splicing of vertical bars in concrete is not permitted, except at indicated or approved horizontal construction joints or as detailed on plans or shop drawings.

3. Splicing of horizontal bars in concrete is not permitted, except as detailed on plans or shop drawings.

4. Use of mechanical couplers is not permitted, except as detailed on plans or shop drawings.

5. Welding of reinforcing bars is not permitted, except as detailed on plans or shop drawings.

J. Dowelling and epoxying of rebar into hardened concrete shall proceed as follows:

1. Hole diameter shall be as recommended by epoxy Manufacturer but shall be at least ¼" greater in diameter than outer surface of reinforcing bar deformations.

2. Depth of hole shall be as recommended by epoxy Manufacturer, but shall not be less than 12 bar diameters, unless noted otherwise or unless required to prevent penetration through opposite surface of existing concrete member.

3. Drill hole using methods that do not interfere with proper bonding of epoxy.

4. Field locate reinforcement in existing concrete before drilling using pachometer or other approved locator device. Adjust location of holes to be drilled to avoid drilling through or nicking any existing reinforcing bars.

5. Use compressed air to remove all dust and loose material from freshly drilled holes.

6. Inject epoxy into hole through tube placed at bottom of hole. Withdraw tube as epoxy is placed but keep injection tip immersed to prevent air pockets from forming.

7. Fill hole to a depth that ensures excess material will be expelled from hole during dowel placement.

8. Twist dowels during insertion into partially filled hole to guarantee full wetting of bar surface with epoxy. Insert bar slowly to prevent air pockets from forming.

3.3 Field Quality Control

A. Special inspection and field testing required by Chapter 17 of CBC (Table 1704.3 and 1704.4) shall be completed by an ICBO-certified special inspector selected by Owner and shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Steel Reinforcement	Size Grade and Type	Compliance with Contract Documents	Periodic per CBC Table 1704.3	Owner	Contractor to reimburse Owner for costs of first deputy inspector if re-inspection is required
	Verification of Weldability (for Steel Other than ASTM A706)	AWS D1.4, & ACI 318 Sec 3.5.2	Periodic special inspection per CBC Table 1704.3		
	Welding	AWS D1.4 & ACI 318 Sec 3.5.2 Also inspect for proper dimensions and absence of cracks, undercutting, surface holes or slag inclusions	Periodic per CBC Table 1704.3		
	Welding for Special Moment Frames, Boundary Elements of Special Reinforced Concrete Shear Walls and Shear Reinforcement		Continuous per CBC Table 1704.3		
	Placement	ACI 318 Sec 3.5, & 7.1-7.7 & CBC 1913.4	Periodic per CBC Table 1704.3		
	Epoxy Embedded Dowels	Epoxy Manufacturer's Requirements	All dowels		
Prestressing Tendons	Size Grade and Type	Compliance with Contract Documents	Periodic per CBC Table 1704.3		
	Placement	ACI 318 Sec 3.5, & 7.1-7.7 & CBC 1913.4	Periodic per CBC Table 1704.3		

B. Additional field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Welded Wire Fabric	Placement	Prepour photographs (with yardstick) showing support system and separation from grade	All Welded Wire Fabric	Contractor	Contractor

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 Work Included

A. Materials, testing, and installation of concrete for buried and above-ground cast-in-place structures, flatwork and paving.

B. Refer to Section 03 10 00 for concrete forming.

C. Refer to Section 03 15 00 for concrete accessories, including waterstops, construction joints, and cast-in-concrete anchors.

D. Refer to Section 03 20 00 for concrete reinforcing.

E. Floor hardener shall be applied to entire concrete slab around pump cans and in shop area.

F. In accordance with CALGreen Code Section A5.405.5, cement and concrete shall be made with recycled products such as fly ash or pozzolan, and shall comply with requirements of Section CALGreen Code Section A5.405.5.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 01 74 00: Cleaning and Waste Management
H. Section 03 10 00: Concrete Forming
I. Section 03 15 00: Concrete Accessories
J. Section 03 20 00: Concrete Reinforcing
K. Section 03 60 00: Grout
L. Section 31 13 13: Concrete Paving
M. Section 31 23 00: Excavation and Fill
N. Section 31 23 33: Trenching and Backfilling

1.3 System Description

A. Furnish and install complete concrete structural system including appurtenant structural, mechanical and/or electrical mountings, embedments or connections required for compliance with Manufacturer's installation requirements of other trades and compliance with applicable building codes and standards.

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

B. Installers of floor surface hardeners shall have minimum of 3 years specialized experience in application of dry shake surface hardeners.

C. Proportion mixes either by laboratory trial batch or field experience methods, using specified materials acceptable for each type of concrete required, and complying with ACI 211.1.

D. Factory (batch plant) testing of aggregate shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Aggregate	Ratio of Silica Released to Reduction in Alkalinity	ASTM C33	As directed	Owner	Contractor
	Loss with Sodium Sulfate	ASTM C33	As directed	Owner	Contractor
	Sieve Analysis	ASTM C136	1 each trial batch	Owner	Contractor
Coarse Aggregate	Abrasion Loss	ASTM C33	As directed	Owner	Contractor
Fine Aggregate	Sand Equivalent	ASTM D2419	As directed	Owner	Contractor
	Organic Impurities	ASTM C40	As directed	Owner	Contractor
	Color of Supernatant on Washing	ASTM C33	As directed	Owner	Contractor

E. Plant testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Concrete	Certification of Mix Design	ACI 301 certified by independent testing laboratory	1 per mix	Contractor	Contractor
Ready-Mix Concrete Materials	Materials Inspection	See Paragraph 2.2 below	As directed	Owner	Owner

1.5 References

A. ACI 117 Standard Tolerances for Concrete Construction Materials
B. ACI 211.1 Selecting Proportions for Normal, Heavyweight, and Mass Concrete
C. ACI 214 Evaluation of Strength Test Results for Concrete
D. ACI 301 Structural Concrete for Buildings
E. ACI 304 Measuring, Mixing, Transporting, and Placing Concrete
F. ACI 305 Hot Weather Concreting
G. ACI 306 Cold Weather Concreting
H. ACI 309 Consolidation of Concrete
I. ACI 315 Details and Detailing of Concrete Reinforcement
J. ACI 318 Building Code Requirements for Reinforced Concrete
K. ACI 350 Environmental Engineering Concrete Structures
L. ASTM A820 Steel Fibers for Fiber-Reinforced Concrete
M. ASTM C31 Making and Curing Concrete Test Specimens in Field
N. ASTM C33 Concrete Aggregates
O. ASTM C39 Compressive Strength of Cylindrical Concrete Specimens

P. ASTM C40 Organic Impurities in Fine Aggregates for Concrete
Q. ASTM C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
R. ASTM C78 Flexural Strength of Concrete Using Simple Beam with Third Point Loading
S. ASTM C88 Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
T. ASTM C94 Ready-Mixed Concrete
U. ASTM C117 Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
V. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates
W. ASTM C138 Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
X. ASTM C143 Slump of Hydraulic Cement Concrete
Y. ASTM C150 Portland Cement
Z. ASTM C156 Water Retention by Concrete Curing Materials
AA. ASTM C157 Length Change of Hardened Hydraulic Cement Mortar and Concrete
BB. ASTM C172 Sampling Freshly Mixed Concrete
CC. ASTM C173 Air Content of Freshly Mixed Concrete by Volumetric Method
DD. ASTM C191 Time of Setting of Hydraulic Cement by Vicat Needle
EE. ASTM C192 Making and Curing Concrete Test Specimens in Laboratory
FF. ASTM C231 Air Content of Freshly Mixed Concrete by Pressure Method
GG. ASTM C260 Air Entraining Admixtures for Concrete
HH. ASTM C266 Time of Setting of Hydraulic Cement Paste by Gillmore Needlesw
II. ASTM C289 Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
JJ. ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete
KK. ASTM C330 Lightweight Aggregates for Structural Concrete
LL. ASTM C494 Chemical Admixtures for Concrete
MM. ASTM C595 Blended Hydraulic Cement
NN. ASTM C618 Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
OO. ASTM C881 Epoxy-Resin-Base Bonding Systems for Concrete
PP. ASTM C932 Surface-Applied Bonding Compounds for Exterior Plastering
QQ. ASTM C989 Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
RR. ASTM C1017 Chemical Admixtures for Use in Producing Flowing Concrete
SS. ASTM C1077 Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
TT. ASTM C1116 Fiber-Reinforced Concrete
UU. ASTM C1157 Performance Specification for Hydraulic Cement
VV. ASTM C1240 Silica Fume Used in Cementitious Mixtures
WW. ASTM D1751 Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
XX. ASTM D2419 Sand Equivalent Value of Soils and Fine Aggregate
YY. ASTM E119 Fire Tests of Building Construction and Materials
ZZ. California Building Code (CBC)
AAA. California Green Building Standards Code (CALGreen Code)
BBB. Caltrans Standard Specifications – Section 90 Portland Cement Concrete
CCC. California Test Method 214 Soundness of Aggregates
DDD. California Test Method 227 Cleanness Value
EEE. California Test Method 229 Durability
FFF. California Test Method 515 Relative Mortar Strength of Portland Cement Concrete Sand
GGG. California Test Method 530 Effect of Water-Reducing and Set-Retarding Admixtures on Drying Shrinkage of Concrete
HHH. Fed Spec UU-B-790A Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellent and Fire Resistant
III. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 201 “Concrete, Mortar, and Related Materials
JJJ. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 303 “Concrete and Masonry Construction.”

1.6 Submittals

A. Furnish the following submittals in accordance with ACI 301 and California Building Code.

SUBMITTAL	DESCRIPTION	
CBC Chapter 17 Special Inspection Required Contractor Statement of Responsibilitiy	As required in CBC Section 1704	
Shop Drawings	Required per structural shop drawing requirements. In addition to requirements listed under steel reinforcement, show construction joints and placement schedule.	.
Catalog Data	Required for admixtures and curing compounds per catalog data requirements.	
Installation Instructions	Required for admixtures per installation instruction requirements.	
	Submit materials and methods for curing per installation instruction requirements.	
Certificate of Compliance	Submit certification from independent testing laboratory mix design complies with these specifications.	
	Submit mill test certification including fineness for each shipment of cement per ACI 301.	
	Submit aggregate gradation and certification per ACI 301.	
	Submit admixture certification including chloride ion content per ACI 301.	
	For cementitious materials, admixtures and curing compounds used in walls, floor, roof, columns, and interior concrete appurtenances of potable water storage or treatment tanks. Submit certification of compliance with NSF 61 requirements Requirement for NSF 61-certified cement will be waived if no NSF 61-certified cement is available within 25-mile radius of project site.	
	At least 24 hours before placing concrete, submit certification from each trade having embedded items in concrete to be placed stating embedded items for each trade are properly located, placed and braced and equipment pads are properly sized.	
	Submit certification concrete furnished complies with requirements of CALGreen Code Section 5.405.5	
Engineering Calculations (Mix Design)	Required for concrete mix design per engineering calculations requirements sealed by California-licensed Civil Engineer.	
	In addition to original mix design, provide new mix design if change in brand or type of cement or change in source or gradation of aggregates is permitted or if defective concrete occurs.	
Brand and Type of Cement/Source of Aggregate	Submit brand and type of cement and source of aggregates to allow sampling and testing by Owner's Representative.	
Welder Qualification Certificates	Required for all welders performing reinforcement welding	
Product Samples	Provide mock-up for all architectural finishes and all colored or textured concrete.	
Delivery Tickets	Required for ready-mix concrete as needed to document delivery quantities. In accordance with ASTM C94 Sections 16.1 and 16.2, each ticket shall show • Name of ready-mix batch plant, • Serial number of ticket, • State certified equipment used in preparing mix, • Truck number. • Name of purchaser & name & location of job • Mix number, • Quantities by weight of cement, sand, each class of aggregate, admixtures and water added in batching plant, • Type and brand of cement & admixtures, • Source & identification of aggregates, • Amount of water allowed to be added at site for specified mix, • Total yield in cubic yards, • Date & time of day to nearest minute corresponding to time batch was	

SUBMITTAL	DESCRIPTION	
	dispatched, time batch left plant, time batch arrived on site, time unloading began and time unloading was completed. • Reading of revolution counter at first addition of water Certificates shall be from public weighmaster. Owner's Representative will not accept concrete in absence of certificate.	
Warranty	Furnish one-year warranty from date of final acceptance	

B. In addition to requirements of ACI, refer to Section 01 33 00 for definition of requirements for Shop Drawings, Catalog Data, Installation Instructions, Certificates of Compliance, Engineering Calculations, Test Record Transcripts, and Material Samples.

1.7 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 for delivery storage and handling requirements.

B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of concrete admixtures and curing compounds shall be strictly followed.

C. Storage of materials shall conform to requirements of ACI 301 or SSPWC.

D. Store materials to prevent damage by moisture or breakage.

E. Store sacked cement in manner permitting access for inspection and sampling.

F. Use cement in sequence of receipt of shipments.

G. Coarse aggregate with maximum size greater than ¾" shall be prepared, stored, and handled in 2 or more size groups. When aggregates are proportioned for each batch of concrete, the 2 size groups shall be combined.

H. Do not use any aluminum materials for handling concrete.

1.8 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Admixtures – Air Entraining (Use when freeze-thaw cycles are expected)		
	Accepted equal	
Admixtures – Dampproofing – Integral Hydrophobic Waterproofing (Alternate to crystalline waterproofing)	Hycrete	Carlstadt, NJ
	Accepted equal	
Admixtures – Plasticizers		

ITEM	MANUFACTURER	MANUFACTURER LOCATION
	Accepted equal	
Admixtures – Set Accelerating (Use when air temperature is less than 40°F)	Grace Concrete Products "Daraset"	Cambridge, MA
	Master Builders Inc. "Pozzutec 20"	Cleveland, OH
	Sika Corporation "Plastocrete 161FL"	Lyndhurst, NJ
	Accepted equal	
Admixtures – Set Retarding (Use when air temperature exceeds 80°F)	Grace Concrete Products "Daratard"	Cambridge, MA
	Master Builders Inc. "Pozzolith 300R"	Cleveland, OH
	Sika Corporation "Plastocrete"	Lyndhurst, NJ
	Accepted equal	
Admixtures – Water Reducing (Normal Range)	Grace Concrete Products "WRDA 79"	Cambridge, MA
	Master Builders Inc. "Pozzolith 322-N"	Cleveland, OH
	Sika Corporation "Plastocrete 161"	Lyndhurst, NJ
	Accepted equal	
Admixtures – Water Reducing (High Range)	Grace Concrete Products "WRDA 19 or Duracem 100"	Cambridge, MA
	Master Builders Inc. "Rheobuild 716 or Rheobuild 1000"	Cleveland, OH
	Sika Corporation "Sikament FF or Sikament 86"	Lyndhurst, NJ
	Accepted equal	
Bonding Agent (Hardened Concrete to Fresh Concrete)	Edoco "BurkEpoxy MV"	Kansas City, KS
	Concresive Div BASF 1001 LPL	Freeport, TX
	Epoxtile 2391	
	Euco Epoxy 463	
	Master Builders Inc. "Concresive Liquid LPL"	Cleveland, OH
	Pecora Corporation "Dynapoxy EP420"	Harleysville, PA
	Sika Corporation "Sikadur 32 Hi-Mod" or "Sikadur 32 Hi-Mod (LPL)" Epoxy Adhesive	Lyndhurst, NJ
	Accepted equal	
Epoxy Bonding Adhesive for Rebar	Edoco "BurkEpoxy NS"	Kansas City, KS
	Master Builders Inc. "Concresive Paste LPL"	Cleveland, OH
	Pecora Corporation "Dynapoxy EP430 Fast"	Harleysville, PA
	Sika Corporation "Sikadur 31 Hi-Mod Gel" (vertical or overhead applications)	Lyndhurst, NJ
	Sika Concrete Restoration Systems SikaDur 32, Hi-Mod LPL	Lyndhurst, NJ
	Simpson Strong Tie Co.	Dublin, CA
	Accepted equal	
Cement – NSF 61-certified for structures holding potable water	Robertson Ready Mix Concrete	Riverside, CA
	Accepted equal	
Curing Compounds Use where air quality regulations do not prohibit use of solvent based compounds	Edoco "Spartan Cote Cure-Seal Hardener"	Kansas City, KS
	Euclid Chemical Company "Aqua-Cure"	Cleveland, OH
	Master Builders Inc. "Masterkure-W"	Cleveland, OH
	Accepted equal	
Curing Compounds (Water-Based Resin Type) Use where air quality regulations prohibit use of solvent based compounds	Edoco "Aqua Resincure"	Kansas City, KS
	Euclid Chemical Company "Super Rez Seal"	Cleveland, OH
	Master Builders Inc. "MB429"	Cleveland, OH
	Accepted equal	
Dampproofing Agent	Euclid Chemical Company	Cleveland, OH
	W. R. Meadows Inc. "Sealmastic"	Hampshire, IL
	Sonneborn Div. Chemrex Inc. "Hydrocide 600"	Shakopee, MN
	Accepted equal	
Evaporation Retardant for Curing	Euclid Chemical Company "Eucobarl"	Cleveland, OH
	Master Builders Inc. (Confilm)	Cleveland, OH
	Accepted equal	

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Floor Hardener (Surface-Applied)	Euclid Chemical Company "Diamon-Plate"	Cleveland, OH
	Master Builders Inc. "Lumiplate"	Cleveland, OH
	Accepted equal	

B. Use only one brand of cement.

C. All admixtures shall be compatible and by one Manufacturer capable of providing qualified field service representation.

2.2 Materials

A. Refer to Section 01 61 00 for basic requirements for products and materials.

B. Concrete structural systems shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Cement	Standard Brand Portland Cement	ASTM C150 Type I Normal Type II Modified Low Alkali Type II/V Modified Low Alkali/Sulfate Resisting Type III High Early Strength Type IV Low Heat of Hydration Type V Sulfate Resistant Also meet Table 2 optional requirements At least 85% of cement by weight shall pass 325 screen. NSF 61-certified for potable water tanks where finished concrete will contact potable water, and NSF 61-certified cement is available within 25-mile radius of project site.
	Supplementary Cementitious Materials	ASTM C595 and California Green Building Standards Code Section A5.405.5 (See below)
Water	Clean, Clear Potable Water	TDS<1000 mg/l
Coarse Aggregate	Specification	Meet ASTM C33 requirements Gravel, crushed gravel, crushed rock or combination From pits acceptable to Owner's Representative
	Cleanness Value per California Test Method 227	75 minimum
	Percentage Wear per ASTM C131	Abrasion loss < 10.5% / 15% after 100 revolutions
		Abrasion loss < 42% / 52% after 500 revolutions
	Specific Gravity per ASTM C127	2.58 minimum
	Ratio of Silica Released to Reduction in Alkalinity	1.0 maximum
Fine Aggregate	Specification	Meet ASTM C33 requirements Nonreactive clean, hard durable washed material From pits acceptable to Owner's Representative
	Organic Impurities per ASTM C40	Satisfactory Resultant color of testing solution shall not be darker than ASTM C40 standard
	Mortar Strength Relative to Ottawa Sand per California Test Method 515	100% minimum
	Sand Equivalent	>75% average for 3 samples >70% for any one sample
	Percent Clay, Silt, Loam per ASTM C117	<3%

ITEM	MATERIAL	SPECIFICATION
	Soundness per California Test Method 214	<10% Soundness requirement will be waived if durability index D_f>60 per California Test Method 229.
		Ratio of silica released to reduction in alkalinity <1.0 Lightweight sand not permitted
Aggregate for Exposed Aggregate Concrete	Pea Gravel	¼" to ⅝" water washed pea rock with smooth edges
Lightweight Aggregate		ASTM C330 all-lightweight (110 pcf) / sand-lightweight (115 pcf) aggregate
Surface-Applied Bonding Agent	Surface-Applied Bonding Compound	ASTM C932
Epoxy Bonding Agent	Epoxy Resin	ASTM C881
Curing Blankets	Polyethylene Sheet	White 10-mil nominal PE thickness Loss of moisture per ASTM C156<0.055 grams/cm^2
	Polyethylene-Coated Burlap	White opaque polyethylene film impregnated or extruded onto one side of burlap 4-mil nominal PE thickness Burlap weight 9oz/sy or greater Loss of moisture per ASTM C156<0.055 grams/cm^2
	Polyethylene-Coated Waterproof Paper Sheeting	White polyethylene sheeting 2- mil nominal PE thickness Permanently bond to waterproof paper per Fed Spec UU-B-790A Loss of moisture per ASTM C156<0.055 grams/cm^2
Curing Compounds		ASTM C309 White pigmented, resin based Do not use sodium silicate compounds. Meet requirements of floor hardener Manufacturer where applicable NSF 61-certified for potable water tanks where finished concrete will contact potable water.
Curing Mats	Heavy Shag Rugs, Carpets or Cotton Mats Quilted at 4" on center	Minimum dry weight of 12 oz/sy
Dampproofing	Coal Tar	Two coats of single-component self-priming heavy duty material.
Grout for Smooth Concrete Finish		1 part Portland cement (½ gray & ½ white Portland cement) White Portland cement to be Atlas white or equal. 1 part fine sand passing No. 16 sieve Calcium chloride (add amount equal to 5% of cement by volume.) Sufficient water to provide consistency of thick paint. NSF 61-certified for potable water tanks where finished grout will contact potable water.
Ready-Mix Concrete		ASTM C94
Repair Mortar	Two-Component Cement Based Product	Low shrinkage. Designed for repairing damaged concrete surfaces. Use medium slump repair mortar on horizontal surfaces. Use non-sag low-slump repair mortar on vertical or overhead surfaces. NSF 61-certified for potable water tanks where finished mortar will contact potable water.

C. Concrete aggregate will be designated by number per Standard Specifications for Public Works (Greenbook) Tables 200-1.4 (B) and 200-1.5.5 (A) and shall conform to the following gradations:

PERCENTAGE PASSING SIEVES BY WEIGHT

SIEVE SIZE	NO. 2 COARSE AGGREGATE (For concrete street surface paving not integral with curb. For concrete channel or box invert paving)	NO. 3 COARSE AGGREGATE (For Class AA, A, A2 or B concrete not used for paving or channel or box inverts. May be used for Class C Concrete)	NO. 4 COARSE AGGREGATE (For trench backfill, slurry and masonry grout. May be used for Class C concrete. May be used for Class B extruded curbs and gutters or for gunite)	FINE AGGREGATE (sand)
2"	100%			
1½"	90-100%	100%		
1"	5-40%	90-100%		
¾"	0-15%	55-85%	100%	
⅜"	0-5%	8-20%	85-100%	100%
No. 4		0-5%	0-30%	95-100%
No. 8		0-5%	0-10%	75-90%
No. 16				55-75%
No. 30				30-50%
No. 50				10-25%
No 100				2-10%
No. 200	0-2%	0-2%	0-2%	0-5%
ASTM C131 Test Grading	A	B	C	

or

D. Concrete aggregate will be designated by letter per Standard Specifications for Public Works (Greenbook) Section 201 and shall conform to the following gradations:

PERCENTAGE PASSING SIEVES BY WEIGHT					
SIEVE SIZE	GRADING A (For concrete street paving not integral with curb)	GRADING B (For concrete channel and box inverts)	GRADING C (For Class AA, A, A2 or B concrete not used for paving or channel or box inverts. May be used for Class C Concrete)	GRADING D (May be used for Class B extruded curbs and gutters or for gunite)	GRADING E (For trench backfill, slurry and masonry grout May be used for Class C concrete.)
2"	100%	100%			
1½"	95-100%	95-100%	100%		
1"	64-80%	80-96%	95-100%		
¾"	55-71%	64-80%	77-93%	100%	100%
⅜"	37-53%	40-52%	50-70%	92-100%	90-100%
No. 4	32-42%	35-46%	39-51%	42-60%	60-80%
No. 8	25-35%	28-38%	31-41%	33-47%	50-70%
No. 16	18-28%	21-31%	22-32%	22-38%	33-53%
No. 30	10-18%	10-20%	12-22%	17-25%	19-35%
No. 50	3-9%	3-10%	3-15%	6-15%	5-15%
No 100	0-4%	0-4%	0-5%	1-6%	2-7%
No. 200	0-2%	0-2%	0-2%	0-3%	0-4%

E. Concrete mix shall be designed to meet properties and proportions specified. In general, mix shall be designed to minimize shrinkage, surface flaws, honeycombing and rock pockets around steel reinforcing. Limiting parameters specified are not intended to be a mix design. Additional cement or water reducing agent may be required to achieve workability demanded by Contractor's methods and aggregates. Contractor is responsible for any costs associated with furnishing concrete with required workability, density and strength.

F. Admixtures shall consist of the following materials:

ITEM	MATERIAL	SPECIFICATION

ITEM	MATERIAL	SPECIFICATION
Admixtures	General Requirements	Do not use to reduce cement requirement Shall be free from thiocyanates Chloride ion <0.05% NSF 61-certified for potable water tanks where finished concrete will contact potable water.
Air-Entraining Agents (Use when freeze-thaw cycles are expected)		ASTM C260
Coloring Agents	Commercially Pure Mineral Pigments	Weight of pigments < 10% of cement content Color selected by Owner's representative
Fly Ash and other SCM's		Not permitted / Shall not exceed 700 lbs per cubic yard
Fly Ash and other SCM's (Meet requirements of California Green Building Standards Code Section A5.405.5 using supplementary cementitious materials (SCM's))	Fly Ash	ASTM C618
	Ultra Fine Fly Ash (UFFA)	ASTM C618
	Metakaolin	ASTM C618
	Natural Pozzolan	ASTM C618
	Slag Cement (GGBFS)	ASTM C989
	Silica Fume	ASTM C1240
	Blended Cement	ASTM C595 or ASTM C1157
	Mix Design Equation	Use any combination of one or more SCM's satisfying equation F/25+SL/50+UF/12=1 where F=% of fly ash or pozzolan in mix, SL =% slag cement in mix and UF =% silica fume, metakaolin or UFFA in mix)
Plasticizing Agents		ASTM C1017
Set Accelerating Agents (Use when air temperature is less than 40°F)		ASTM C494 Type C Do not use calcium chloride or other chloride-based accelerators in concrete having steel reinforcing or embedments.
Set Retarding Agents (Use when air temperature exceeds 80°F)		ASTM C494 Type B
Water Reducing Agents (High Range)		ASTM C494 Type F or G Only one water-reducing admixture shall be used
Water Reducing Agents (Normal Range)		ASTM C494 Type A Only one water-reducing admixture shall be used
Water Reducing and Set Accelerating Agents		ASTM C494 Type E Only one water-reducing admixture shall be used
Water Reducing and Set Retarding Agents		ASTM C494 Type D Only one water-reducing admixture shall be used

G. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Class AA "Premium" Concrete Greenbook 680-C-5000 (Use for box culvert, valve vault and bridge top decks, and for prestressed concrete such as core walls and shotcrete.)	f'_c	4500 / 5000 psi per ASTM C39
	Cement Content	680 lb cement per cubic yard minimum but ≤700 lb cement per cubic yard
	Maximum Water/Cement Ratio	0.40 by weight
	Aggregate	SSPWC Greenbook No 3 Coarse Aggregate / SSPWC Greenbook Grading C
	Maximum Aggregate Size	1½"
	Slump	4" maximum per ASTM C143
	Water Reducing Admixture	Required
	Maximum Transit Time	60 minutes (250 revolutions maximum)
Class A "Structural" Concrete Greenbook 600-C-4000 (Use for foundations, footings, ring walls, retaining walls, slabs	f'_c	4000 psi per ASTM C39
	Cement Content	600 lb cement per cubic yard minimum but ≤700 lb cement per cubic yard
	Maximum Water/Cement Ratio	0.45 by weight

ITEM	DESCRIPTION	
on grade, beams, columns, walls, roof and floor slabs, and other structural concrete.)	Aggregate	SSPWC Greenbook No 3 Coarse Aggregate / SSPWC Greenbook Grading C
	Maximum Aggregate Size	1½"
	Slump	4" maximum per ASTM C143
	Water Reducing Admixture	Required
	Maximum Transit Time	60 minutes (250 revolutions maximum)
Class A2 "Structural – No Special Inspection" Concrete Greenbook 600-C-2500 (Use for pads and minor structures where Owner elects to waive CBC Special Inspection requirements.)	f'_c	2500 psi per ASTM C39
	Cement Content	600 lb cement per cubic yard minimum but ≤700 lb cement per cubic yard
	Maximum Water/Cement Ratio	0.45 by weight
	Aggregate	SSPWC Greenbook No 3 Coarse Aggregate / SSPWC Greenbook Grading C
	Maximum Aggregate Size	1½"
	Slump	4" maximum per ASTM C143
	Water Reducing Admixture	Optional
	Maximum Transit Time	60 minutes (250 revolutions maximum)
Class B "Street Paving" Concrete (Use for street pavement not integral with curb and gutter.) Greenbook 520-A-2500	f'_c	2500 psi per ASTM C39
	Cement Content	520 lb cement per cubic yard minimum but ≤700 lb cement per cubic yard
	Maximum Water/Cement Ratio	0.55 by weight
	Aggregate	SSPWC Greenbook No 2 Coarse Aggregate / SSPWC Greenbook Grading A
	Maximum Aggregate Size	2"
	Slump	3" maximum per ASTM C143
	Water Reducing Admixture	Optional
	Maximum Transit Time	90 minutes
Class B "Site Paving" Concrete (Use for curbs, gutters, sidewalks, and non-vehicular paving.) Greenbook 520-B-2500	f'_c	2500 psi per ASTM C39
	Cement Content	520 lb cement per cubic yard minimum but ≤700 lb cement per cubic yard
	Maximum Water/Cement Ratio	0.55 by weight
	Aggregate	SSPWC Greenbook No 3 Coarse Aggregate / SSPWC Greenbook Grading B
	Maximum Aggregate Size	2"
	Slump	4" maximum per ASTM C143
	Water Reducing Admixture	Optional
	Maximum Transit Time	90 minutes
Class B "Site Paving" Concrete (Use for extruded curbs and gutters.) Greenbook 520-D-2500	f'_c	2500 psi per ASTM C39
	Cement Content	520 lb cement per cubic yard minimum but ≤700 lb cement per cubic yard
	Maximum Water/Cement Ratio	0.55 by weight
	Aggregate	SSPWC Greenbook No 4 Coarse Aggregate / SSPWC Greenbook Grading D
	Maximum Aggregate Size	¾"
	Slump	2" per ASTM C143
	Water Reducing Admixture	Optional
	Maximum Transit Time	90 minutes
Class C "Utility" Concrete (Use for encasement, thrust blocks, fence and guardrail posts, and mass concrete.) Greenbook 520-C-2500	f'_c	2500 psi per ASTM C39
	Cement Content	520 lb cement per cubic yard minimum but ≤700 lb cement per cubic yard
	Maximum Water/Cement Ratio	0.55 by weight
	Aggregate	SSPWC Greenbook No 3 Coarse Aggregate / SSPWC Greenbook Grading C
	Maximum Aggregate Size	1½"
	Slump	3-6" per ASTM C143
	Water Reducing Admixture	Optional
	Maximum Transit Time	90 minutes
Class D "Slurry Backfill"	f'_c	100 psi per ASTM C39

ITEM	DESCRIPTION	
Concrete (Use for trench backfill.) Greenbook 94-E-100	Cement Content	94 lb cement per cubic yard
	Maximum Water/Cement Ratio	0.60 by weight
	Aggregate	¾"
	Maximum Aggregate Size	SSPWC Greenbook No 4 Coarse Aggregate / SSPWC Greenbook Grading E
	Slump	5" / 6" maximum per ASTM C143
	Water Reducing Admixture	Optional
	Maximum Transit Time	120 minutes
Class E_l "Low Sulfate Exposure" (Use for concrete exposed to 0.10-0.20% water soluble SO_3 in soil samples or 150-1500ppm in water samples whichever requires mix of most severe exposure) Greenbook 650-CLE-4000	f'_c	4000 psi per ASTM C39
	Cement Content	650 lb per cubic yard minimum but ≤700 lb cement per cubic yard 80%Type II/V cement +20% Class F Fly Ash
	Maximum Water/Cement Ratio	0.50 by weight
	Aggregate	1½"
	Maximum Aggregate Size	SSPWC Greenbook No 3 Coarse Aggregate / SSPWC Greenbook Grading C
	Slump	4" maximum per ASTM C143
	Water Reducing Admixture	Required
	Calcium Chloride Admixtures	Prohibited
	Maximum Transit Time	90 minutes
Class E_m "Moderate Sulfate Exposure" (Use for concrete exposed to 0.20-2.00% water soluble SO_3 in soil samples or 1500-10,000ppm in water samples whichever requires mix of most severe exposure) Greenbook 650-CME-4500	f'_c	4500 psi per ASTM C39
	Cement Content	650 lb per cubic yard minimum but ≤700 lb cement per cubic yard 80%Type II/V cement +20% Class F Fly Ash
	Maximum Water/Cement Ratio	0.45 by weight
	Aggregate	1½"
	Maximum Aggregate Size	SSPWC Greenbook No 3 Coarse Aggregate / SSPWC Greenbook Grading C
	Slump	4" maximum per ASTM C143
	Water Reducing Admixture	Required
	Calcium Chloride Admixtures	Prohibited
	Maximum Transit Time	90 minutes
Class E_s "Severe Sulfate Exposure" (Use for concrete exposed to >2.00% water soluble SO_3 in soil samples or >10,000ppm in water samples whichever requires mix of most severe exposure) Greenbook 750-CSE-5000	f'_c	5000 psi per ASTM C39
	Cement Content	750 lb per cubic yard 80%Type II/V cement +20% Class F Fly Ash
	Maximum Water/Cement Ratio	0.40 by weight
	Aggregate	1½"
	Maximum Aggregate Size	SSPWC Greenbook No 3 Coarse Aggregate / SSPWC Greenbook Grading C
	Slump	4" maximum per ASTM C143
	Water Reducing Admixture	Required
	Calcium Chloride Admixtures	Prohibited
	Maximum Transit Time	90 minutes
Reinforcing Steel	f_y	40 / 60 ksi See Section 03 20 00.
Fiber-Reinforced Concrete (Provide in Class AA, A, A2 and B concrete mixes to limit microcracking and shrinkage cracks)	Synthetic Fibers	ASTM C1116 Add 0.1% by volume.
	Steel Fibers	ASTM A820 Add 0.1% by volume.
Additional Requirements for Concrete to which Floor Hardener is to Be Applied	Slump	<4", except where ambient temperatures are below 65°F, use slump < 3".
	Air Content	<3%
	Other Requirements	Do not use set-accelerating admixtures containing calcium chloride.
		Do not use admixtures that increase bleeding.
Floor Hardener	Manufacture	Premeasured, premixed and prepackaged at factory

ITEM	DESCRIPTION	
	Application Rate	1.8-2.5 lb per square foot.
	Evaporation Retarder	Monomolecular film evaporation retarder recommended by floor-hardener Manufacturer to maintain moisture during early curing

H. With addition of high range water reducer, slump shall be 7" +/- 2".

I. All materials furnished for Work shall comply with requirements of Sections 201, 203, and 204 of ACI 301 as applicable.

J. Cement shall be clean and free from contaminants. Do not use cement reclaimed from cleaning bags or leaking containers. Do not use lumpy cement.

K. All materials furnished for Work must be classified by Environmental Protection Agency as acceptable for potable water use within 30 days of application.

2.3 Mixes

A. Proportioning shall meet requirements of ACI 301 Chapter 3 "Proportioning."

B. Quantity of water shall be just sufficient to produce workable batches of concrete which can be worked into place without segregation or other flaws and compacted using vibratory methods to provide desired density, impermeability, and smoothness of surface. Adjust water quantity added if needed to adjust for variations in moisture content of aggregate while providing uniform consistency between batches. Determine consistency of batches by slump testing as described below.

C. Mixing shall meet requirements of ACI 301 Chapter 7 "Mixing."

D. Apply admixtures according to Manufacturer's installation and warranty requirements.

E. Set controlling and water reducing admixtures shall be applied as follows:

1. Use or addition of admixtures shall be at Contractor's option to increase workability and shall result in no increase in cost to Owner.

2. Use or addition of admixtures shall be subject to approval by Owner's Representative.

3. Concrete containing admixture shall be first placed at location determined by Owner's Representative.

4. High range water reducing admixtures shall be added to concrete on site after all other ingredients have been mixed and initial slump has been verified. Do not use more than 14 ounces of water reducer per sack of cement. Water reducer shall be considered as part of mixing water when calculating water cement ratio.

5. If high-range water reducer is added to concrete on site, it may be used in conjunction with same water reducer added at batch plant. Concrete shall have slump of 3" ±½" before adding high range water reducing admixture at job site.

1. High-range water-reducing admixture shall be accurately measured and pressure injected into mixer as single dose by experienced technician. Standby system shall be provided and tested before each day's operation of job site system.

2. Mix concrete at mixing speed for at least 30 mixer revolutions after adding high-range water reducer.

F. Retempering of partially hardened concrete or mortar will not be permitted.

G. Trial batch testing shall proceed as follows:

1. Before placing any concrete, testing laboratory designated by Owner's Representative shall prepare trial batch of each class of "structural" or "premium" concrete based on preliminary concrete mixes submitted by Contractor and using aggregates, cement and admixtures proposed.

2. During trial batch, testing laboratory may adjust aggregate proportions to obtain required properties. Such adjustments shall be considered refinements to mix design and shall not justify extra compensation to Contractor.

3. All concrete shall meet specified requirements whether aggregate proportions are from Contractor's preliminary mix design, or whether proportions have been adjusted during trial batch process.

4. Trial batch materials shall be sufficient to yield 3 drying shrinkage and 10 compression test specimens from each batch.

5. Test 5 cylinders at 7 days to establish 7-day average compressive strength.

6. Test remaining 5 cylinders no more than 28 days after molding.

7. Required average compressive strengths shall be as follows:

SPECIFIED COMPRESSIVE STRENGTH (f'_c)	28-DAY LABORATORY TRIAL BATCH COMPRESSIVE STRENGTH MINIMUM TEST RESULTS		28-DAY FIELD TEST COMPRESSIVE STRENGTH MINIMUM TEST RESULTS
	5-CYLINDER AVERAGE	ANY SINGLE TEST	5-CYLINDER AVERAGE
$0 < f'_c < 3000$ psi	f'_c +1000 psi	f'_c	f'_c + 600psi
3000 psi ≤ f'_c < 5000 psi	f'_c +1200 psi	f'_c	f'_c + 600psi
5000 ≤ f'_c	f'_c +1400psi	f'_c	f'_c + 600psi

8. Do not place "structural" or "premium" concrete until mix design has been qualified under test criteria above. Should source of materials or established procedures change, Owner may require new trial batch testing.

9. Field trial batches may be placed in Work at designated locations accepted by Owner's Representative where concrete of lower quality is required. For payment purposes, concrete so placed will be considered to be type of concrete specified at that location.

H. Measure cement and aggregate for mixing concrete using direct weighing equipment accessible to Owner's Representative.

I. Tolerances of measurement equipment shall be as follows:

1. Cement: Use weighing equipment accurate to ±1% of total weight
2. Aggregate: Use weighing equipment accurate to ±3% of total weight
3. Admixtures: Use weighing equipment accurate to ±3% of total weight

4. Water: Use metering equipment accurate to ±3% of total volume

J. Water feed control mechanism shall be capable of being locked in position to deliver constant flow of water to each batch of concrete. Use positive quick-acting valve for cut-off in water line to mixer. Operating mechanism shall not allow leakage to occur when valves are closed.

K. Ready mixed concrete shall meet ASTM C94 and requirements below.

1. Materials used in ready-mixed concrete shall be subject to continuous inspection at batching plant by Owner's Representative.

2. Transport and deliver all ready-mixed concrete to site using agitating equipment. Do not use non-agitating equipment or combination truck and trailer equipment to transport or deliver ready-mixed concrete.

3. Deliver ready-mixed concrete to site and complete discharge within "maximum travel time" specified above after addition of cement to aggregates. Also, deliver mixed concrete to site and complete discharge before drum has been revolved specified maximum number of revolutions.

4. Truck mixers shall have electrically actuated counters to record number of revolutions of drum or blades. Counter shall be resettable recording type, and shall be mounted in driver's cab. Counters shall be actuated at time of starting mixers at mixing speeds.

5. Completely empty mixer of any previously mixed load before adding new concrete.

6. Each batch of concrete shall be mixed in truck mixer for at least 70 revolutions of drum or blades at rotation rate designated by equipment manufacturer. Additional mixing, if any, shall be at agitating speed designated by equipment manufacturer. All materials, including mixing water shall be in mixer drum before actuating counter to count rotations.

7. Truck mixers and their operation shall ensure concrete throughout mixed batch is discharged within acceptable limits of uniformity of consistency, mix and grading.

8. Slump tests taken at approximately ¼ point and ¾ points of load during discharge shall give slumps within 2" of each other. Mixers failing to meet this requirement shall not be used on job until causing condition is corrected and satisfactory performance is verified on-site using additional slump tests. All mechanical parts of failing mixer, including water measurement and discharge apparatus, blades, rotation speed and drum clearances shall be serviced and checked before further attempt to use equipment.

9. Each delivery of ready-mixed concrete shall be accompanied by delivery ticket furnished to Owner's Representative as described in Paragraph 1.6 above.

PART 3 - EXECUTION

3.1 Preparation

A. Make field measurements needed to install Concrete structural systems before submitting Shop Drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

B. Before placing concrete within forms, each trade having embedded items, including water stops within forms and affected by pour shall certify all items are properly located, placed and braced.

C. Thoroughly wet earth surfaces by sprinkling before placing concrete. At time of concrete placement, ground surface shall be moist, but free from standing water, mud and debris.

D. Cold joints in concrete shall be deemed to occur whenever placement of concrete is interrupted for any reason so new concrete is neither incorporated integrally with previously placed concrete in opinion of Owner's Representative nor keyed in place with preformed construction joint shown on Contract Documents or accepted Shop Drawings. Prepare horizontal surfaces of cold joints as follows:

1. Compacting and roughen horizontal with minimum ¼" amplitude profile for good bond.

2. Clean tooled joint surface of all laitance, loose or defective concrete and foreign matter by hydroblasting or sandblasting to expose aggregate.

3. Thoroughly wash hydro-blasted or sandblasted surface with clean water.

4. Remove all ponded water from surface of construction joints.

5. Coat joint surface with epoxy-bonding agent unless otherwise shown.

E. Construction joints shown on Contract Documents and accepted Shop Drawings may be made as shown with provision of keys or other locking shapes to secure proper union with subsequent work.

F. Before placing concrete, verify location of embedded items with affected trades. Accuracy of placement of embedded items is Contractor's responsibility.

G. Before placing concrete, secure inspection of steel reinforcement and obtain acceptance by Owner's Representative at least 4 hours before placing concrete.

H. Before placing concrete, provide dewatering, runoff diversion and protection as needed to ensure proper and water-free environment suitable for concrete hardening and curing. Do not place concrete underwater or in spaces where standing water is present. Protect uncured concrete from exposure to rain, runoff or groundwater.

I. Notify Owner's Representative in writing at least 24 hours before placing any concrete. Do not place concrete except when Owner's Representative or his duly authorized representative is present.

J. Order of placement of concrete shall be acceptable to Owner's Representative. To minimize shrinkage effects, place concrete in units bounded by construction joints shown in Shop Drawings. Placement shall occur such that each unit shall cure at least 7 days for hydraulic structures and 3 days for all other structures before contiguous units are placed, except corner sections of vertical walls shall not be placed until the 2 adjacent wall panels have cured at least 14 days for hydraulic structures and 7 days for all other structures.

K. For placement of concrete in pre-stressed circular tanks, adjacent wall sections may be placed only after 72 hours of curing using Class AA concrete as described herein. If Contractor desires to construct adjacent wall sections in circular tanks sooner than 72 hours after placement, Contractor shall submit request for substitution for alternate

concrete mix design demonstrating alternate mix achieves equal or greater strength at time of form stripping as Class AA concrete after 72 hours of curing. Contractor shall bear all responsibility for safety, quality control, and all additional labor and materials costs associated with use of alternate concrete mixes for Contractor's convenience. Test cylinders will be broken to coincide with form stripping.

L. Provide sufficient illumination in interior of all forms so concrete at places of deposit is visible from deck or runway.

M. Schedule concrete placement during evening or morning hours or provide ice or pre-cooled aggregate as needed to maintain temperature of concrete within the following ranges immediately before placement.

1. Concrete less than 12" thick: 55°F to 90°F

2. All other concrete: 50°F to 90°F

3. When concrete temperature exceeds 80°F, only set retarding admixtures shall be used.

4. When concrete temperature exceeds 85°F, time between introducing cement to aggregates and discharge shall not exceed 45 minutes.

5. No additional compensation will be made to contractor for measures used to maintain concrete temperature within specified limits.

N. Cold weather placement shall proceed as follows:

1. Comply with ACI 306.

2. Remove snow, ice and frost from surfaces, including reinforcement against which concrete is to be placed.

3. Before placing concrete, thaw subgrade to depth of at least 6".

4. Before placing concrete, warm embedded items to above 32°F.

O. Hot weather placement shall proceed as follows:

1. Comply with ACI 305.

2. From initial placement through curing, protect concrete from adverse effects of high temperature, low humidity and wind.

P. All ends of chutes, hopper gates, and all other points of concrete discharge shall be arranged so concrete passing from them will flow continuously into receiving vessel without separation. Conveyor belts, if used, shall be wiped clean by device operated so mortar adhering to belt is not wasted and shall be of type acceptable to Owner's Representative. Chutes shall be no longer than 50' long. Slopes of chutes shall permit free and continuous flow of concrete being placed.

3.2 Installation/Application

A. Refer to Sections 01 73 00 for basic execution and installation requirements.

B. Furnish and install concrete at locations shown on Plans and Submittals.

C. The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements
2. Applicable OSHA and Cal OSHA regulations
3. California Building Code Chapter 19 "Concrete"
4. Other applicable building and CalGreen code requirements
5. ACI 301 Structural Concrete for Buildings Chapter 8.
6. ACI 318 Building Code Requirements for Reinforced Concrete
7. Standard Specifications for Public Works Construction Section 303 "Concrete and Masonry Construction."

D. Where hydrophobic waterproofing admixtures are added, admixture Manufacturer's installation and warranty requirements shall also be followed.

E. Refer variances between above documents and Contract Documents to Owner's Representative.

F. Pumping of concrete will only be permitted if satisfactory end results are obtained.

1. For redundancy, provide standby pump on site or provide pumping equipment with two cylinders, designed to operate with one cylinder only.
2. Replace pumping equipment or hoses that fail to function properly.
3. Minimum diameter of hose and conduits shall be in accordance with ACI 304
4. Do not use aluminum conduits to convey concrete.
5. Concrete samples for slump, air content and test cylinders will be taken at placement (discharge) end of line.

G. Do not drop concrete through reinforcing steel or into any deep form, nor place concrete in any form in manner permitting accumulation of mortar on surfaces above placed concrete. If necessary, use hoppers or vertical ducts of canvas, rubber or metal to convey concrete to place of final deposit without separation or splashing. Free fall shall not exceed 4' below ends of ducts, chutes or buggies except in column forms. In no case shall concrete be displaced horizontally in forms by more than 6' after depositing. Deposit concrete in uniform horizontal layers not deeper than 2'. Avoid inclined layers or inclined construction joints except where required for sloping members. Place each layer while previous layer is still soft. Rate of placement in forms shall not exceed 5 vertical feet of rise per hour.

H. Thrust blocks shall be placed behind all non-welded, non-flanged or non-restrained valves, fittings, reducers, tees, crosses, bends and dead ends. Place thrust blocks as follows:

1. Wrap fittings and valves, leaving stainless steel bolts exposed. Do not allow concrete to contact flanges or bolts.
2. Owner's Representative shall inspect formwork and be present throughout placement of concrete.

3. Unless otherwise shown on Plans, provide bearing surface not less than 3 times pipe diameter in all directions.

4. Thrust block shall bear against undisturbed soil.

5. In soft or disturbed soil, increase bearing surface as directed by Owner's Representative.

I. Concrete in ramps and sloping slabs shall be placed uniformly from bottom to top for full width of placement. As work progresses, vibrate concrete and carefully work it around reinforcement. Screed ramp surface in an up-slope direction.

J. Thoroughly settle, compact and consolidate concrete in forms or excavations throughout entire depth of concrete layer being placed.

1. Consolidate concrete into dense, homogeneous mass, filling all corners and angles, thoroughly embedding reinforcement and embedments, eliminating all rock pockets and bringing only a slight excess of water to exposed concrete surface during placement.

2. Vibrators shall be Group 3 per ACI 309. Use high-speed power vibrators (8,000 rpm to 12,000 rpm) of immersion type in sufficient number and with (at least one) standby units as required to accomplish specified results within 15 minutes after concrete is deposited. Group 2 vibrators may be used only at specific locations when accepted by Owner's Representative.

3. When placing concrete around waterstops, carefully rod and vibrate concrete to eliminate all air and rock pockets. Where flat-strip waterstops are placed horizontally, work concrete under waterstops by hand, making sure all air and rock pockets are eliminated. Concrete surrounding waterstops shall receive additional vibration over and above that used for adjacent concrete to assure complete embedment of waterstops in concrete.

4. Concrete in walls shall be internally vibrated and at same time, rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills forms or excavations and closes snugly against all surfaces. Do not place subsequent layers of concrete until previously placed layers have been worked thoroughly as specified. Keep vibrating head from contact with form surfaces.

5. Do not vibrate concrete excessively or work it in any manner causings segregation of its constituents.

K. Horizontal surfaces of concrete shall be level whenever run of concrete is stopped. To ensure level, straight joint on exposed surfaces of walls, tack wood strip at least ¾" thick to forms on these surfaces. Carry concrete about ½" above underside of strip. About one hour after concrete is placed, remove wood strip. Using trowel, remove irregularities in edge formed by strip, and remove all laitance.

L. Concrete finishing shall proceed as follows:

1. As soon as forms are removed, examine all exposed surfaces and rub or grind all fins, bulges or ridges in satisfactory method to provide smooth, uniform and continuous surface.

2. Do not plaster or coat surfaces to be smoothed.

3. Do not use aluminum finishing tools.

4. Finished surfaces shall present finished, smooth, continuous hard surface.

5. Tolerances of finished concrete shall be as shown in Section 03 10 00.

6. Owner's Representative will inspect finished surface for voids, holes, honeycombing, rock pockets or similar depression defects. Damage shall be repaired as specified.

7. Repair surface defects within 2 hours of form removal.

8. Surface defect repairs that cannot be made within 2 hours following form removal shall be delayed until after curing compound has been applied. In such case, area involved shall then be wet sandblasted to remove curing compound following which repairs shall be made as specified, and curing compound shall be reapplied over repaired area.

M. Repair defective work at Contractor's expense as follows:

SURFACE DEFECTS	
DEFECT	**REPAIR METHOD**
Tie Rod Cone Holes	Ream circular holes with suitable toothed reamers to leave surfaces of holes clean and rough. Do not ream rectangular holes or holes deeper than their least surface dimension. Repair holes in approved manner with dry-packed cement grout.
Cracks in Retaining Walls and Walls in Contact with Backfill	Apply waterproofing membrane to cover fill side of wall. or Vee cracks on water-bearing face with suitable tools. Fill with construction joint sealant designed for water-bearing structures
Cracks in Water-bearing Structures	Vee cracks on water-bearing face with suitable tools. Fill with construction joint sealant designed for water-bearing structures.
Minor Voids, Holes or Honeycombing	Cut back from trueline at least ½" over entire area. Use chipping and cutting tools as needed. Do not feather edges. Remove 1/32" of surface film from hardened and cured portions by wet sandblast. Remove all laitance or soft material before bonding. Moisten exposed surface but do not wet it enough to overcome suction needed for bond. Mix for repair shall be 1 sack cement to 3 cubic feet sand with Atlas white Portland cement added as needed on interior walls to make patch match finish. Apply bonding agent if required. Apply repair mix.
HOLES EXTENDING THROUGH CONCRETE	
DEFECT	**REPAIR METHOD**
Small Holes less than 12" in least dimension	Fill hole with non-shrink grout. Where face of repaired surface is exposed to view, hold grout back 2" from finished surface. Patch remaining 2" as described above for "Minor Voids, Holes or Honeycombing." For water bearing structures, apply bentonite or other accepted waterstop material around perimeter of hole.
Large Holes greater than 12" in least dimension	Chip keyway into edge of opening. Repair keyed opening as described above for "Small Holes."
Large Holes greater than 24" in least dimension	Chip keyway into edge of opening If reinforcing is not present, dowel and epoxy reinforcing of size matching reinforcing in existing wall across opening in both directions. Repair keyed and reinforced opening as described above for "Small Holes.".

N. Perform all repairs using approved methods that do not disturb bond or cause sagging or horizontal fractures. Finished surfaces shall be cured using methods and duration similar to that for adjacent concrete.

O. Concrete finishing of unformed surfaces shall proceed as follows:

1. After proper and adequate vibration and tamping, bring unformed surfaces of slabs, floors, walls and curbs to uniform surface with suitable tools.

2. Screed concrete and then immediately treat with liquid evaporation retardant. Reuse retardant as needed after each operation to prevent drying shrinkage cracks.

3. Classes of unformed surfaces shall be as follows:

FINISH	LOCATION	DESCRIPTION
U1 (screeded finish)	Grade slabs and foundations to be covered with concrete or fill material	Sufficient leveling and screeding to produce even, uniform surface with surface irregularities not exceeding ⅜". No further special finish.
U2 (float finish)	Floors to be covered with grouted tile or topping grout Slabs to be covered with built-up Roofing	After sufficient stiffening of concrete, float finish surface with wood or metal floats or with finishing machine using float blades. Do not excessively float surfaces while concrete is plastic. Floating shall be minimum necessary to produce uniform-texture surface free from screed marks. Do not dust dry cement or sand on concrete surface to absorb excess moisture. Surface irregularities shall not exceed ¼"..
U3 (steel trowel finish)	Interior slabs to receive architectural finish Top surface of walls Water-bearing slabs with slopes of 10% or less	After floated finish U2 hardens sufficiently to prevent excess of fine material from being drawn to surface, steel trowel surface with firm pressure to flatten sandy texture of floated surface and produce dense uniform surface free from blemishes, ripples and trowel marks. Finish shall be smooth and free from all irregularities.
U4 (hairbroom finish)	Non water-bearing slabs Water bearing slabs with slopes >10%	After completing steel trowel finish U3, add light hairbroom finish with brooming perpendicular to drainage unless otherwise shown. Resulting surface shall be rough enough to provide nonskid finish.

P. Do not backfill against walls until concrete has obtained 100% of specified 28-day compressive strength.

Q. Concrete floor slab surface hardeners shall be applied as follows:

1. Notify surface hardener Manufacturer at least 3 days before initial use of product.

2. Place job mockup of 100 square feet using materials proposed for project as follows.

3. After concrete has been leveled and as soon as concrete will support operator and machine without disturbing level or working up excessive fines, float surface of slab using mechanical float fitted with float shoes.

4. Following floating, apply ½ to ⅔ of total amount of dry shake surface hardener so uniform distribution of surface hardener is obtained. Use of mechanical spreader is recommended.

5. Do not place dry shake on concrete surface when bleed water is present.

6. Once shake has absorbed sufficient moisture (indicated by darkening of shake), float the surface.

7. Immediately apply remaining ⅓ to ½ of shake and allow to absorb moisture.

8. Use finishing machines with detachable floor shoes. Compact surface by a third mechanical floating if time and set of concrete allow this. Do not add water to surface.

9. As surface further stiffens, indicated by loss of sheen, hand or mechanically trowel with blades set relatively float. Remove all marks and pinholes in final raised trowel operation.

10. Cure finished floors using fill-forming curing compound recommended by surface hardener Manufacturer. Uniformly apply curing compound over entire surface at coverage providing moisture retention in excess of requirements of ASTM C309.

11. Maintain ambient temperature of at least 50°F throughout curing period.

12. Factory-trained full-time representative of surface hardener shall be present during installation of mockup and initial period of installation to advise on proper use of product.

13. After review of mockup, revise materials and procedures as recommended by surface hardener representative to obtain acceptable surface finish.

14. Complete application of floor hardener using same controls and procedures used in mockup with revisions recommended by surface hardener representative to obtain acceptable surface finish.

15. Keep floors covered and free of traffic and loads for at least 14 days after completion.

R. Concrete curing shall proceed as follows:

SURFACE	DESCRIPTION
Unstripped Forms	Method 1: Wet wood forms completely after concrete has been placed, and keep wet with water until forms are removed. For steel forms, keep exposed concrete surfaces continuously wet until forms are removed. If forms are removed within 14 days of placing concrete, continue curing as described for surfaces with forms removed
Construction Joints between Footings & Walls & between Floor Slab & Columns	Method 2: Cover surface with burlap mats. Wet mats with water for duration of curing period until concrete in walls has been placed. Do not apply curing compound to these surfaces.
Encasement Concrete & Thrust Blocks	Method 3: Cover surface with moist earth 4 to 24 hours after concrete is placed. Earthwork operations that may damage concrete shall not begin until at least 7 days after concrete is placed.
Concrete Surfaces not Described Elsewhere	Method 4: As soon as concrete hardens enough to prevent marring on unformed surfaces, and within 2 hours after form removal, spray surface with liquid curing compound in accordance with Manufacturer's application instructions. Cover no more than 200 square feet of surface per gallon with uniform film that seals thoroughly. Do not damage seal during curing. If seal is damaged or broken, apply additional curing compound over damaged portion. Where curing compound is accidentally applied to surfaces against which concrete is to be subsequently placed, remove curing compound by wet sandblasting just before placing new concrete. Where concrete is placed adjacent to panel coated with curing compound, apply curing compound to all previously coated panel areas within 6' of joint and apply to any other location where curing membrane is disturbed. Following curing, remove all visible traces of curing compound in such manner that surface finish is not damaged.

SURFACE	DESCRIPTION
Floor Slabs on Grade	Method 5: Before curing medium is applied, keep entire surface damp using nozzles that atomize flow so surface is not marred or washed. Apply curing material using Method 4 described above. After 1 hour but not more than 4 hours have elapsed after applying curing material, wet surface with water delivered through fog nozzle. Place concrete curing blankets on slab, with edges butted together and with joints between strips sealed with 2" wide strips of sealing tape or with edges lapped at least 3" and fastened with waterproof cement to form continuous watertight joint. During first 3 days of curing, no traffic and no depositing of materials shall be permitted on curing blankets. After 3 days, any traffic or material deposits shall only occur on top of ⅝" minimum plywood sheets laid over curing blankets. Leave curing blankets in place for 14 days. Add water under curing blanket as often as necessary to maintain damp concrete surfaces. Do not remove curing blankets until after concrete for adjacent work has been placed. Should curing blankets tear or become damaged, replace damaged sections.
Surfaces with Forms Removed & Slabs not on Grade	Keep concrete continuously wet by applying water for at least 14 consecutive days beginning immediately after concrete reaches final set or after forms are removed. Before curing medium is applied, keep entire surface damp using nozzles that atomize flow so surface is not marred or washed. Use heavy curing mats secured in place with weights along all edges to continuously retain moisture during curing period. Use sprinklers or other means to maintain moist surface condition during and after normal working hours. At end of curing period, remove curing medium. Rewet any dry spots and apply curing compound in accordance with Method 4 above.

S. Excess curing water shall be disposed of in manner that avoids damage to Work.

T. Cold weather curing shall proceed as follows:

1. Water curing of concrete may be reduced to 6 days during periods when mean daily temperature at site is less than 40°F, provided water curing shall be temporarily discontinued during prescribed period when temperatures are such that concrete surfaces may freeze.

2. Concrete cured using applied curing compounds shall be maintained at least 40°F for 72 hours following placement. Use approved insulation in contact with forms or concrete surfaces if necessary to maintain temperatures. Following this initial 72-hour period, protect water-cured concrete from freezing for an additional 72 hours.

3. Artificial heaters used to maintain concrete temperatures shall not dry out concrete. Do not use unvented heaters unless unformed concrete surface is protected from excessive carbon dioxide by an approved curing compound.

U. Dampproofing of exterior surfaces of all buried roof slabs shall proceed as follows:

1. Immediately after curing, spray surface with dampproofing agent consisting of asphalt emulsion. Application shall be in 2 coats.

2. First coat shall be diluted to half-strength by adding water and shall be sprayed on to provide coverage rate no thinner than 100 square feet per gallon of dilute solution.

3. Second coat shall consist of application of specified material, undiluted, and shall be sprayed on to provide coverage rate no thinner than 100 square feet per gallon.

4. As soon as asphalt emulsion has taken initial set, coat entire area thus coated with whitewash. Any formula for mixing whitewash may be used which produces uniformly coated white surface and which so remains until backfill is placed. Should

whitewash fail to remain on surface until backfill is placed, apply additional whitewash.

V. Concrete finishing of formed surfaces shall proceed as follows:

1. Repair surface defects.

2. Immediately after stripping forms, inspect concrete surface. Repair all poor joints, voids, rock pockets and other defective areas.

3. Fill form tie holes as directed in Section 03 10 00.

4. Allow concrete to cure at least 14 days before applying architectural finishes.

5. All architectural finishes shall conform to accepted sample required herein in texture, color and quality. Sample for smooth concrete finish shall be 200 square foot panel prepared as described below. Sample for sandblasted finish shall be 3-square foot sample.

6. Classes of architectural finishes shall be as follows:

FINISH	LOCATION	DESCRIPTION
Smooth Concrete Finish	All exposed formed surfaces of buildings except where otherwise shown	Concrete surface shall be wetted and smooth concrete finish grout described above shall be brush applied. Vigorously rub grout into concrete surface with wood float to fill all small air holes. Then remove surface grout with steel trowel. Allow to dry, then vigorously rub surface with burlap to remove remaining surface grout so no visible paint-like film remains. (Complete all work on same panel within one 8-hour day. Do not leave grout on surface overnight.) Finished surface should be light-colored concrete surface of uniform color and texture with no appearance of paint or grout film. If procedures above result in inferior finish, rub inferior areas with carborundum bricks.
Sandblasted Concrete Finish	As shown on Plans	Remove laitance and produce uniform fine aggregate surface texture with approximately 1/32 to 1/16" of surface sandblasted off. Corners, patches, form panel joints and soft spots shall be sandblasted with care. Finished surface should match 3 square foot sample panel. Protect adjacent finishes and surfaces from damage. After sandblasting, wash concrete surfaces with clean water and remove excess sand.

3.3 Field Quality Control

A. Field testing and inspection of formwork shall be per Section 03 10 00.

B. Field testing and inspection of concrete accessories, waterstops and joints shall be per Section 03 15 00.

C. Field testing and inspection of steel reinforcement shall be per Section 03 20 00.

D. Field testing and inspection of embedded steel bolts shall be per Section 05 12 00.

E. CBC Chapter 17 special inspection shall only be required for Class AA "premium" concrete, Class A "structural" concrete and concrete having specified compressive strength f'_c exceeding 2500 psi.

F. Maintain placing record on-site showing time and date of placement of all concrete having specified compressive strength f'_c exceeding 2500 psi as required in CBC Section 1704.4.2.

G. Special inspection and field testing of Class AA and Class A concrete required by Chapter 17 of CBC (Table 1704.4) shall be completed by ICBO-certified special inspector selected by Owner and shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Class AA Concrete, Class A Concrete and Concrete having f'_c exceeding 2500 psi	Design Mix Verification	ACI 318, Ch 4 & 5.2-5.4, CBC 1904.25.25, 1913.2, & 1913.3	Periodic per CBC Table 1704.4	Owner	Contractor to reimburse Owner for costs of first deputy inspector if re-inspection is required
	Slump	ACI 318 Sec. 5.6& 5.8, ASTM C31, ASTM C172 & CBC 1913.10 Slump per ASTM C143	Continuous per CBC Table 1704.4 taken at at ¼ point and ¾ point of batch and at time fresh concrete is sampled to fabricate cylinders for strength tests		
	Air Content	ACI 318 Sec. 5.6& 5.8, ASTM C31, ASTM C172 & CBC 1913.10 Air content per ASTM C173 or C231			
	Temperature	ACI 318 Sec. 5.6& 5.8, ASTM C31, ASTM C172 & CBC 1913.10			
	Proper Placement of Concrete	ACI 318 Sec. 5.9-5.10, CBC 1913.6, 1913.7,& 1913.8	Continuous per CBC Table 1704.4		
	Verification of in-situ Concrete Strength Prior to Removal of Shores and Forms	ACI 318, Sec. 6.2 See below for concrete strength test requirements	Periodic per CBC Table 1704.4		
	Curing Temperature and Techniques	ACI 318, Sec. 5.11-5.13, & CBC 1913.9	Periodic per CBC Table 1704.4		
Prestressed Concrete	Prestressed Concrete Application of Prestress	ACI 318, Sec. 18.20	Continuous per CBC Table 1704.4 (Applies to reservoir only)		
	Prestressed Concrete Grouting of Bonded Prestressed Tendons	ACI 318, Sec. 18.18.4			
Post-Tensioned Concrete	Verification of in-situ Concrete Strength Prior to Stressing Tendons in Posttensioned Concrete	ACI 318, Sec. 6.2 See below for concrete strength test requirements.	Periodic per CBC Table 1704.4 (Applies to reservoir only)		
Precast Concrete Members	Erection	Contract Documents, ACI 318, Ch. 16	Periodic per CBC Table 1704.4		

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Shotcrete	Proper Application	ACI 318 Sec. 5.9-5.10, CBC 1913.6, 1913.7,& 1913.8	Continuous per CBC Table 1704.4 (Applies to reservoir only)		

H. Additional field testing of concrete shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Concrete Compressive Strength f'_c	Trial Batch	1st 3 cylinder tests at 7 days 2nd 3 cylinder tests at 28 days average compressive strength at 28 days shall exceed 125% of specified compressive strength f'_c	3 drying shrinkage samples and 6 compression test cylinders for each class or mix of concrete used	Contractor	Contractor
	Cylinder Sampling	ASTM C172	Sample each 100 cy concrete and each separate mix design placed on any day	Contractor	Contractor
	Cylinder Testing of Compressive Strength f'_c	Field Cylinders per ASTM C31 Section 9.2 Laboratory Cylinders per ASTM C192 Testing per ASTM C39 Average of two cylinders Evaluation per ACI 214 & ACI 318 Chapter 5 "Concrete Quality" Standard deviation of test results shall not exceed 640 psi.	Make six 6" diameter x 12" high cylinders per 100 cy concrete and separate mix design placed on any day 1st test at 7 days 2nd test at 28 days Save remaining cylinders to verify test results as directed.	Owner	Contractor
	Test Core Testing of Compressive Strength f'_c	Take test cores per ASTM C42 if minimum strengths fall below those specified. Concrete tested by coring shall be acceptable if average f'_c of 3 cores equals 85% of specified f'_c and no single core strength is less than 75% of specified f'_c	3 cores per test as directed	Contractor	Contractor
Concrete	Flexural Strength	ASTM C78	As directed	Contractor	Contractor
	Unit Weight Yield	ASTM C138	As directed	Contractor	Contractor
	Drying Shrinkage	California Test 530	As directed	Contractor	Contractor
Mortar	Setting of Mortar	ASTM C191 or C266	As directed	Contractor	Contractor
	Mortar Cube Test	California Test 515	As directed	Contractor	Contractor
Concrete Finishing	Dimensional Tolerance	ACI 117 and Section 03 10 00	Inspection at Owner's discretion	Owner	Owner

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
	Surface Defects	Holes larger than ½" diameter or greater than ¼" deep are defined as surface defects. More stringent requirements exist for some specified finishes.	As directed	Owner	Owner
	Permeability and Cracking in Water-Bearing Structures	Section 03 08 50	As directed	Owner	Owner
	Cracking in Flatwork and Non-Water-bearing Structures	No cracks wide enough to stick a dime in except at expansion or contraction joints.	As directed	Owner	Owner
Concrete	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

I. Concrete samples for batch testing shall be furnished in steel drums at no cost to Owner.

J. In lieu of trial batch testing, Contractor may submit previously designed, tested and successfully used concrete mixes using materials similar to those intended for this project, together with at least 3 certified test reports of 28-day strength of proposed concrete mix.

K. Laboratory used for field testing shall meet or exceed requirements of ASTM C1077.

L. Contractor shall provide concrete for testing at no charge to Owner, and shall assist Owner's Representative and laboratory personnel in obtaining samples, and disposal and cleanup of excess material.

M. Statistical analysis of compression test results will be performed according to ACI 214. Standard deviation of test results shall not exceed 640 psi when ordered at equivalent water content as estimated by slump. When said standard deviation exceeds 640 psi, increase average strength for which mix is designed as needed to satisfy statistical requirement that

1. Probability of any test being more than 500 psi below specified strength < 1%.
2. Probability of average of any 3 consecutive tests being below specified strength <1%.

Required average strength shall be calculated using Criterion Number 3 of ACI 214 using actual standard deviation.

N. All concrete which fails to meet ACI requirements and these Specifications is subject to removal and replacement at no increase in cost to Owner.

O. In lieu of removing and replacing slightly deficient concrete having 85% or more of specified strength, Owner may, at their sole discretion, elect to reduce payment due to Contractor for substandard concrete as described in Caltrans Standard Specification Section 90-9 "Compressive Strength."

3.4 Cleaning

A. Wash out chutes, shovels, finishing trowels and all other equipment that has been in contact with wet concrete at a designated concrete washout area.

B. Do not discharge or deposit wet concrete, debris, or other concrete washout effluent on bare ground, on area tributary to storm drain or natural channel or in any storm drain facility.

C. Dispose of concrete and concrete waste in accordance with all pollution prevention laws and regulations.

D. Refer to Section 01 74 00 / 02 05 00 for cleanup and disposal requirements.

3.5 Protection

A. Protect all concrete against injury until final acceptance by Owner.

B. Fresh concrete shall be protected from damage due to impact, overstress, vandalism and weather, including precipitation or extremes in temperature or humidity until final acceptance.

C. Any new concrete not complying with these specifications shall be repaired or removed and replaced prior to final acceptance except where Owner agrees to reduce payment as described above.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 05 51 00
STAIRS AND LADDERS

PART 1 - GENERAL

1.1 Work Included

A. This section includes materials, testing, and installation of stairs and ladders.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution

1.3 System Description

A. Furnish and install complete stairs and ladders where shown including appurtenant mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 References

A. ANSI / ASC A14.3 Ladders - Fixed - Safety Requirements
B. ASTM A36 Carbon Structural Steel
C. ASTM A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
D. ASTM B6 Zinc
E. California Mechanical Code (CMC) Section 904.10
F. OSHA Standard 29 CFR1910.24 Fixed Industrial Stairs
G. OSHA Standard 29 CFR1910.27 Fixed Ladders

1.6 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required for fabricated stairs and ladders per structural shop drawing requirements	.
Catalog Data	Required for all manufactured products per catalog data requirements.	
Installation Instructions	Required per installation instruction requirements	
Certificate of Compliance	Submit coating system and application certification per certificate of compliance requirements.	
Foundry or Test Record Transcripts	Submit for factory tests upon request per foundry or test record transcript requirements.	
Material Samples	Required on request	
Welder Qualification Certificates	Required for all welders performing work on this project. Also submit certifications of procedure qualifications for each welding procedure used.	

SUBMITTAL	DESCRIPTION	
Warranty	Furnish one-year warranty from date of final acceptance	

B. Refer to Section 01 33 00 for definition of requirements for shop drawings, catalog data, installation instructions, certificates of compliance, foundry or test records and material samples.

1.7 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 for delivery, storage, and handling requirements.

B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of stairs and ladders shall be strictly followed.

1.8 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. Acceptable manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Fall Prevention System	Capital Safety Group DBI Sala "Lad-Saf"	Red Wing, MN
	Inwesco "Safety Ladder Assistant"	Azusa, CA
	Miller Equipment "Sure Track"	Porterville
	North Safety Products Div Honeywell "Saf-T-Climb"	Cranston, RI
	Accepted equal	
Ladders - Aluminum	Alaco Ladder Co.	Chino, CA
	Accepted equal	
Ladder - Fiberglass	R D Werner Co. Inc.	Greenville, PA
	Ultra Fiberglass Systems	Milwaukee, WI
	Accepted equal	
Ladder – Galvanized Steel	Alhambra Foundry A3400	Alhambra, CA
	Pipeline Products VL100	San Marcos, CA
	Accepted equal	
Ladder – Stainless Steel	Inwesco	Azusa, CA
	Pipeline Products VL100	San Marcos, CA
	Accepted equal	
Ladders – Coating on Rungs	McMaster-Carr Supply Company (6901-T18)	Los Angeles, CA
	Accepted equal	
Ladder Safety Post	Bilco Company "Ladder Up"	New Haven, CT
	Inwesco "Safety Ladder Assistant"	Azusa, CA
	Accepted equal	
Stair Treads	McNichols Company	Tampa, FL
	Keene Building Products	Libertyville, IL
	SlipNOT Div. W S Molnar Co.	Detroit, MI
	Accepted equal	

2.2 Materials

A. Refer to Section 01 61 00 for basic requirements for products and materials.

B. Ladders shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION	
Exterior Ladders – Steel	Welded Steel	Dimensions	See plans and OSHA Std CFR1910.27
		Stringer	2½" x ¼" steel bar
		Rung Diameter	¾" minimum
		Clear Length of Rung or Cleat	16" minimum
		Distance Between Rungs	12" maximum
		Clearance Between Rungs and Walls or Obstructions Behind Ladder	7" minimum
		Exterior Cage	Required – See Plans
	Stainless Steel	Type	SAE Type 316 / SAE Type 304
		Dimensions	See plans and OSHA Std CFR1910.27
		Stringer	2½" x ¼" steel bar
		Rung Diameter	¾" minimum
		Clear Length of Rung or Cleat	16" minimum
		Distance Between Rungs	12" maximum
		Clearance Between Rungs and Walls or Obstructions Behind Ladder	7" minimum
		Exterior Cage	Required – See Plans
	Galvanized Coating	ASTM A123 - 3.4 mil thickness - 2.00 ounce/ft^2	
	Powder-Coated Epoxy Coating	Section 09 96 56	
	Coating on Rungs	Coarse grain epoxy Color - gray	
Fall Prevention System (Required on all ladders more than 8' high)	Stainless Steel	SAE Type 316	
		Standards	ANSI / ASC A14.3
		Cable Size	5/16" / ⅜"
		Rated User Weight	300 lbs
Ladder-Top Safety Post (Interior Ladders)	Stainless Steel	SAE Type 316 / SAE Type 304 Removable	
Ladder-Top Handrail Extensions (Exterior Ladders)	Stainless Steel	SAE Type 316 / SAE Type 304	

C. Stairs shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION	
Exterior Stairs – Steel	Welded Steel	Dimensions	See plans and OSHA Std CFR1910.24
		Minimum Width	As shown / 22" minimum required by OSHA Std CFR1910.24

ITEM	MATERIAL	SPECIFICATION	
		Allowable Slope	As shown / 30º to 50º above horizontal required by OSHA Std CFR1910.24
		Tread	As shown / 8" minimum slip-resistant tread required by OSHA Std CFR1910.24
		Vertical Clearance	As shown / 7' minimum required by OSHA Std CFR1910.24
		Platforms or Landings	As shown / 30" minimum on one side required by OSHA Std CFR1910.24
		Railings	As shown / 30"-34" high required by OSHA Std CFR1910.24
	Galvanized Coating	ASTM A123 - 3.4 mil thickness - 2.00 ounce/ft^2	
	Coating on Rungs	Coarse grain epoxy Color - gray	

D. Zinc coatings shall be applied by hot-dipped or electro-depositing process. Zinc shall comply with ASTM B6.

E. Before leaving shop, all steel not shown or specified to be galvanized or stainless shall receive one coat of pigmented primer recommended by Manufacturer of final paint system. Parts inaccessible after assembly shall be given second coat of same primer.

PART 3 - EXECUTION

3.1 Preparation

A. Make field measurements needed to fabricate and install stairs and ladders before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

B. Clean surfaces of work to be in contact with concrete, removing all rust, dirt, grease and other foreign substances before concrete is placed.

C. Aluminum surfaces to contact concrete shall be coated with heavy alkali-resistant bituminous paint or one coat of zinc chromate.

D. Aluminum surfaces to contact dissimilar metals shall be insulated from dissimilar metals using neoprene gaskets or washers.

E. All embedded metalwork shall be secured accurately in position when concrete is placed to prevent displacement or undue vibration during or after placement of concrete.

F. Where work is to be installed in recesses in formed concrete, said recesses shall be made, work installed, and recesses filled with dry-pack mortar in conformance with Division 3 Concrete.

3.2 Installation

A. Refer to Section 01 73 00 for basic execution and installation requirements.

B. Furnish and install stairs and ladders at locations shown on Plans and Submittals.

C. The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements

2. Applicable OSHA and Cal OSHA regulations.

3. Applicable building and fire code requirements

D. Refer variances between above documents and Contract Documents to Owner's Representative.

E. Install stairs and ladders to tolerances recommended by Manufacturer. Unless otherwise shown, install stairs and ladders true, plumb and level using precision gauges and levels.

F. Welding shall comply with Section 05 12 00. Permanent connections shall be continuously welded along entire area of contact.

G. Bolting shall comply with Section 05 12 00. Conceal fastenings whenever possible.

H. Joints shall have a close fit with corner joints coped or mitered and in true alignment.

I. Built-up parts shall be free of warp.

J. Exposed ends and edges of work shall be slightly rounded.

K. Mount ladders so clearance from back of ladder to wall behind ladder at all times exceeds 7".

3.3 Field Quality Control

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Stairs and Ladders	No bends, twists or open joints No projecting edges or corners at intersections	Visual inspection	All work	Owner	Owner
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 10 73 16
CANOPIES

PART 1 - GENERAL

1.1 Work Included

A. This section includes materials, testing, and installation of canopies.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution

1.3 System Description

A. Furnish and install complete operating canopy including appurtenant structural, mechanical and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

B. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Fabricated Steel	Off-jobsite Welding Special Inspection	ICBO Certified Special Inspector selected by Building Official	Continuous	Contractor	Contractor
	Surface Imperfections	ASTM A6	At Owner's Discretion during Owner instigated shop inspection	Owner	Contractor
	Visual and Dimensional Inspection	Contract Documents			
	Inspection of High Strength Bolted Connections	ASTM A325 or ASTM A490			
	Welding Procedures	AWS D1.1			
	Chemical and Physical Properties	Varies with steel	Submit certificate of compliance	Contractor	Contractor

1.5 References

A. AISC M011 Manual of Steel Construction for Shop and Field Welding
B. AISI Specifications for Design of Cold-Formed Steel Structural Members

C. ASTM A36 Carbon Structural Steel
D. ASTM A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
E. ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
F. ASTM A325 Structural Bolts, Steel, Heat Treated 120/105 ksi Minimum Tensile Strength
G. ASTM A490 Heat-Treated Steel Structural Bolts 150ksi Minimum Strength
H. ASTM A500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
I. ASTM A653 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated
J. ASTM A924 Steel Sheet, Metallic Coated by Hot-Dip Process
K. ASTM F436 Hardened Steel Washers
L. RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts.

1.6 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required per structural and architectural shop drawing requirements.. Plans shall bear seal of Professional Engineer licensed in State of California.	.
Catalog Data (Shop Painting)	Submit product list with product data sheets of intended shop coats per catalog data requirements. For compatibility, these products shall be primers recommended by Manufacturer of finished paint system.	
Engineering Calculations	Required for canopy per engineering calculations requirements.	
Welder Qualification Certificates	Required for all welders performing work on this project. Also submit certifications of procedure qualifications for each welding procedure used.	
Warranty	Furnish one-year warranty from date of final acceptance.	

B. Refer to Section 01 33 00 definition of requirements for shop drawings, catalog data, and engineering calculations.

1.7 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 for delivery storage and handling requirements.

B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of canopies shall be strictly followed.

1.8 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Steel Deck Canopy	Above All Awinings Quality Shade	Santa Ana, CA
	Accent Awning Company	Santa Ana, CA
	Martin Steel & Iron, Inc.	West Jordan, UT
	Steeltec LLC.	Dallas, GA
	Superior Awnings	Panorama City, CA
	Accepted equal	

2.2 Materials

A. Refer to Section 01 61 00 / 02 05 00 for basic requirements for products and materials.

B. Canopies shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Structural Steel Rolled Plates, Shapes and Bars	Carbon Structural Steel - Galvanized and Primed	ASTM A36 Finish coating per Section 09 90 00
	Zinc Coating	ASTM A123 - 3.4-mil thickness – 2.00 ounce/ft^2
Structural Steel Tubing	Carbon Steel – Galvanized and Primed	ASTM A500 Grade B Finish coating per Section 09 90 00
	Zinc coating	ASTM A123 - 3.4-mil thickness - 2.00 ounce/ft^2
Structural Steel Bolts (Connection Bolts and Anchor Bolts	High-Strength Carbon Steel – Galvanized	ASTM A325 or ASTM A490
	Zinc Coating	ASTM A153 - 2.1-mil thickness - 1.30 ounce/ft^2
Washers	Carbon Steel – Galvanized	ASTM F436 – Square or rectangular smooth beveled washers, tapered in thickness
	Zinc Coating	ASTM A153 - 2.1-mil thickness - 1.30 ounce/ft^2
Steel Deck	Galvanized Steel	See Section 05 31 23 / ASTM A663 Grade 40
Steel Gutter	Galvanized Steel	See Section 07 71 23 / ASTM A663 Grade 40
Finish on Deck and Gutter	Galvanized and Primed	ASTM A924 G60 Commercial Finish base Finish coating per Section 09 90 00
Welding Electrodes	Steel Electrodes	AWS D1.1 E70xx except E7024 rods or electrodes shall not be used
Sealants for Exposed Joints	High Quality Silicone Caulk	
Sealants for Non-exposed Joints	White or Bronze Polyurethane Sealant	

C. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Steel Fabrications	Comply with CBC and AISC S32	
	Minimum Design Strength	36 ksi
Roof Deck Design Criteria		See Section 05 31 23
	Depth	1½"
	Thickness	16 gage
	Section Modulus	S=0.411in^3/ft
	Moment of Inertia	I=0.377in^4/ft

PART 3 - EXECUTION

3.1 Preparation

A. Make field measurements needed to install canopies before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

B. Backfill and thoroughly compact trenches and excavations within 25' of work before beginning work.

C. Anchor bolts and templates shall be delivered to jobsite prior to pouring of footings or anchor slabs.

D. After anchor bolts are placed in footings, protect anchor bolts and threads from damage to allow proper column erection and nut tightening. Nuts and washers for anchor bolts shall be stored on site.

3.2 Installation

A. Refer to Section 01 73 00 for basic execution and installation requirements.

B. Furnish and install canopies at locations shown on Plans and Submittals.

C. The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements
2. Applicable OSHA and Cal OSHA regulations
3. Applicable building and fire code requirements

D. Refer variances between above documents and Contract Documents to Owner's Representative.

E. Unless otherwise shown, install canopy components plumb, square and level in accordance with shop drawings using precision gauges and levels.

F. Fabricate steel framing as described in Section 05 12 00.

G. Fabricate steel deck as described in Section 05 31 23.

H. Tighten bolts by turn-of-the-nut method as described in RCSC Specification for Structural Joints using ASTM A325 or A490 Bolts.

3.3 Field Quality Control

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Removable Panels	Ease or Removal and Replacement	Remove panels and replace panels as directed by Owner's Representative	As directed	Contractor	Contractor
	Watertightness at Overlapping Seams	Leakage	1-hour hose or rainbird test to simulate rain	As directed	Contractor
Canopies	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 31 05 16
AGGREGATE AND ROCK PRODUCTS FOR EARTHWORK

PART 1 - GENERAL

1.1 Work Included

A. Materials and installation of rock, stone, crushed rock, rock dust, gravel and sand.

B. Materials used for asphalt concrete are specified in Section 32 12 16.

C. Except as modified herein, aggregate and rock products shall conform to Standard Specifications for Public Works Construction (Greenbook) Section 200.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 02 05 00: Basic Civil Engineering Requirements
H. Section 02 41 14: Paving Removal and Resurfacing
I. Section 03 30 00: Cast-in-Place Concrete
J. Section 31 23 00: Excavation and Fill
K. Section 31 23 33: Trenching and Backfilling
L. Section 32 12 16: Asphalt Paving
M. Section 32 13 13: Concrete Paving

1.4 Quality Assurance

A. Rock products shall be clean, hard, sound, durable, uniform in quality, and free of any detrimental quality of soft, friable, thin, elongated or laminated pieces, disintegrated material, organic matter, oil, alkali, or other deleterious substance.

B. Plant testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Crushed Rock and Rock Dust	Sieve Analysis	California Test Method 202 Meet requirements below in Part 2	1 each source for each gradation used	Contractor	Contractor
	Fractured Faces	Meet requirements below in Part 2	1 each sieve test	Contractor	Contractor
	Gravel	Meet requirements below in Part 2	1 each sieve test	Contractor	Contractor
Crushed Rock	Percentage Wear	ASTM C131 Meet requirements below in Part 2	1 each sieve test	Contractor	Contractor
Caltrans Class 2 Aggregate Base	Sieve Analysis	California Test Method 202 Meet requirements below in Part 2	1 each source for each gradation used	Contractor	Contractor
Screenings for Use in	Sieve Analysis	California Test Method 202 Meet requirements below in	1 each gradation used on site for	Contractor	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Chip Seal Cover Aggregate		Part 2	each source pile		
	Percentage Wear	ASTM C131 Meet requirements below in Part 2	1 each sieve test	Contractor	Contractor
	Film Stripping	California Test Method 302 Meet requirements below in Part 2	1 each sieve test	Contractor	Contractor
	Cleanness Value	California Test Method 227 Meet requirements below in Part 2	1 each sieve test	Contractor	Contractor
	Durability	California Test Method 229 Meet requirements below in Part 2	1 each sieve test	Contractor	Contractor

C. All percentages referred to herein shall be by weight.

1.5 References

A. ASTM C127 Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
B. ASTM C131 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in Los Angeles Machine
C. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates
D. ASTM D1556 Density and Unit Weight of Soil in Place by SandCone Method
E. ASTM D4253 Maximum Index Density and Unit Weight of Soils Using Vibratory Table
F. ASTM D4254 Maximum Index Density and Unit Weight of Soils and Calculation of Relative Density
G. ASTM D6938 In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
H. California Test Method 202 Sieve Analysis of Fine and Coarse Aggregates
I. California Test Method 216 Relative Compaction of Untreated and Treated Soils and Aggregates
J. California Test Method 217 Sand Equivalent
K. California Test Method 227 Cleanness Value
L. California Test Method 229 Durability Index
M. California Test Method 301 Resistance "R" Value of Treated and Untreated Bases, Subbases and Basement Soils by Stabilometer
N. California Test Method 302 Film Stripping
O. California Test Method 548 Evaluation of Aggregate for Lean Concrete Base (LCB)
P. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 200 “Rock Materials”

1.6 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Test Results	Required for all rock products	

B. Refer to Section 01 33 00 for definition of requirements for catalog data and certificates of compliance.

1.7 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 for delivery storage and handling requirements.

1.8 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Materials

A. Refer to Section 01 61 00 for basic requirements for products and materials.

B. Rock products shall be clean, hard, sound, durable, uniform in quality and free of any detrimental quantity of soft, friable, thin, elongated, or laminated pieces, disintegrated material, organic matter, oil, alkali, or other deleterious substance. Unless otherwise specified, products shall meet requirements of Section 200 of Standard Specifications for Public Works Construction (Greenbook) and the following:

ITEM	DESCRIPTION	
Crushed Rock and Rock Materials (See Standard Specifications for Public Works Construction (Greenbook) Table 200-1.2 (B)	Percentage Wear per ASTM C131	Abrasion loss < 15% after 100 revolutions Abrasion loss < 52% after 500 revolutions
	Fractured Faces	At least 50% of particles retained on ⅜" sieve shall have 3 or more fractured faces Less than 5% shall show no fractured faces
	Gravel	Less than 10% of particles passing ⅜" sieve but retained on No 4 sieve shall be gravel
Crushed Aggregate Base (See Standard Specifications for Public Works Construction (Greenbook) Table 200-2.2.3 (A)	R-Value per California Test Method 301	80 minimum
	Sand Equivalent per California Test Method 217	50 minimum
	Percentage Wear per ASTM C131	Abrasion loss < 15% after 100 revolutions Abrasion loss < 52% after 500 revolutions
	Durability Index per California Test Method 229	40 minimum
	Specific Gravity Per ASTM C127	2.58 minimum
Crushed Miscellaneous Base (See Standard Specifications for Public Works Construction (Greenbook) Table 200-2.4.3 (A)	R-Value per California Test Method 301	78 mInimum
	Sand Equivalent per California Test Method 217	35 minimum
	Percentage Wear per ASTM C131	Abrasion loss < 15% after 100 revolutions Abrasion loss < 52% after 500 revolutions
	Durability Index per California Test Method 229	40 minimum
	Gravel	Less than 15% of particles passing ⅜" sieve but retained on No 4 sieve shall be gravel
	Brick Per California Test Method 202	Less than 3% brick by weight No brick particles shall be retained on No. 4 sieve
Processed Miscellaneous Base (See Standard Specifications for Public Works Construction (Greenbook) Table 200-2.4.3 (A)	R-Value per California Test Method 301	78 mInimum
	Sand Equivalent per California Test Method 217	35 minimum
	Percentage Wear per ASTM C131	Abrasion loss < 15% after 100 revolutions Abrasion loss < 52% after 500 revolutions
	Durability Index per California Test Method 229	35 minimum
	Gravel	Less than 75% of particles passing ⅜" sieve but retained on No 4 sieve shall be gravel
	Brick	Less than 3% brick by weight

ITEM	DESCRIPTION	
	Per California Test Method 202	No brick particles shall be retained on No. 4 sieve
Select Subbase (See Standard Specifications for Public Works Construction (Greenbook) Table 200-2.6.3 (A)	R-Value per California Test Method 301	60 mInimum
	Sand Equivalent per California Test Method 217	20 minimum
Disintegrated Granite (See Standard Specifications for Public Works Construction (Greenbook) Table 200-2.7.3 (A)	R-Value per California Test Method 301	73 mInimum
	Sand Equivalent per California Test Method 217	30 minimum
Pulverized Miscellaneous Base (See Standard Specifications for Public Works Construction (Greenbook) Table 200-2.8.3 (A)	R-Value per California Test Method 301	40 mInimum
	Sand Equivalent per California Test Method 217	40 minimum
	Percentage Wear per ASTM C131	Abrasion loss < 15% after 100 revolutions Abrasion loss < 52% after 500 revolutions
	Durability Index per California Test Method 229	40 minimum
Lean Concrete Base (See Standard Specifications for Public Works Construction (Greenbook) 200-4)	Portland Cement	Type II/V Do not substitute supplementary cementitious materials (SCM's)
	Cement Content	270 lbm/cy minimum 300 lbm/cy maximum
	Compressive Strength f'_c per California Test Method 548	700 psi at 7 days
	Aggregate Sand Equivalent per California Test Method 217	30 minimum moving average 27 minimum single test result
	Water Reducing Admixtures	Standard Specifications for Public Works Construction (Greenbook) Type A or Type F
	Air Content	4% maximum
Screenings for Use in Chip Seal Cover Aggregate (See Standard Specifications for Public Works Construction (Greenbook) Table 200-1.2.1 (B)	Percentage Wear per ASTM C131	Abrasion loss < 12% after 100 revolutions Abrasion loss < 35% after 500 revolutions
	Film Stripping per California Test Method 302	25 maximum
	Cleanness Value per California Test Method 227	80 minimum
	California Durability per California Test Method 229	52 minimum
Gravel	Fractured Faces.	No particles shall have more than one fractured face.
Sand	Composition	Natural or manufactured granular material or combination thereof, free of deleterious amounts of inorganic material, mica, loam, clay and other substances unsuitable for sand's intended purpose.
Aggregate for Portland Cement Concrete	See Section 03 30 00	
Aggregate for Mortar Sand	See Section 04 05 00	

C. Owner's Representative may waive percentage wear requirements in table above provided durability index requirements shown are met.

D. Crushed rock and rock materials shall meet the following gradations: (from Standard Specifications for Public Works (Greenbook) Table 200-1.2.(A))

PERCENTAGE PASSING SIEVES BY WEIGHT							
SIEVE	1" CRUSHED	¾" CRUSHED	½" CRUSHED	⅜" CRUSHED	¼" CRUSHED	3/16" CRUSHED	ROCK

SIZE	ROCK	ROCK	ROCK	ROCK	ROCK	ROCK	DUST
1½"	100%						
1"	90-100%	100%					
¾"	30-60%	90-100%	100%				
½"	0-20%	30-60%	90-100%	100%			
⅜"		0*20%	20-60%	90-100%			100%
¼"					100%		
No. 4	0-5%	0-5%	0-15%	30-60%	75-100%	100%	90-100%
No. 8			0-5%	0-10%	0-25%	40-75%	
No. 16					0-5%	0-10%	
No. 30							20-60%
No. 200					0-2%	0-2%	5-20%
ASTM C131 Test Grading	A	B	B	C	D	D	

E. Where called for on Plans, "Caltrans Class 2 Aggregate Base" shall conform to gradation below. Contractor may choose from either 1½"-Maximum or ¾"-Maximum grading, but once a grading is selected, it shall not be changed without written authorization from Owner's Representative. If on any day, material furnished meets contract compliance requirements but falls outside of operating range, material placement may continue for remainder of that day, after which substitute material shall be furnished complying with requirements for "Operating Range" to Owner's Representative's satisfaction.

PERCENTAGE PASSING SIEVES BY WEIGHT				
SIEVE SIZE	1½" MAXIMUM CLASS 2 AGGREGATE BASE		¾" MAXIMUM CLASS 2 AGGREGATE BASE	
	OPERATING RANGE (MOVING AVERAGE)	CONTRACT COMPLIANCE (SINGLE TEST)	OPERATING RANGE (MOVING AVERAGE)	CONTRACT COMPLIANCE (SINGLE TEST)
2"	100%	100%		
1½"	90-100%	87-100%		
1"			100%	100%
¾"	50-85%	45-90%	90-100%	87-100%
No. 4	25-45%	20-50%	35-60%	30-65%
No. 30	10-25%	6-29%	10-30%	5-35%
No. 200	2-9%	0-12%	2-9%	0-12%

F. Where called for on Plans, Greenbook Crushed Aggregate Base shall conform to gradation below: (from Standard Specifications for Public Works (Greenbook) Table 200-2.2.2)

PERCENTAGE PASSING SIEVES BY WEIGHT	
SIEVE SIZE	CRUSHED AGGREGATE BASE GRADATION
1½"	100%
¾"	90-100%
⅜"	50-80%
No. 4	35-55%
No. 30	10-30%
No. 200	2-9%
ASTM C131 Test Grading	B

G. Where called for on Plans, "Crushed Miscellaneous Base" or "Processed Miscellaneous Base" shall conform to gradation below: (from Standard Specifications for Public Works (Greenbook) Table 200-2.4.2 (A))

PERCENTAGE PASSING SIEVES BY WEIGHT		
SIEVE SIZE	"COARSE" CRUSHED MISCELLANEOUS	"FINE" CRUSHED MISCELLANEOUS

	BASE GRADATION	BASE GRADATION
2"	100%	
1½"	85-100%	100%
¾"	50-85%	85-100%
⅜"		55-75%
No. 4	25-45%	35-60%
No. 30	10-25%	10-30%
No. 200	2-9%	2-9%
ASTM C131 Test Grading	A	B

H. Where called for on Plans, "Select Subbase" shall conform to gradation below: (from Standard Specifications for Public Works (Greenbook) Table 200-2.6.2 (A))

PERCENTAGE PASSING SIEVES BY WEIGHT		
SIEVE SIZE	"COARSE" SELECT SUBBASE GRADATION	"FINE" SELECT SUBBASE GRADATION
1½"	100%	
1"		100%
No. 4	55-75%	70-100%
No.16	30-75%	40-90%
No. 30	15-40%	20-60%
No. 200	0-25%	0-30%
ASTM C131 Test Grading	A	B

I. Where called for on Plans, disintegrated granite shall conform to gradation below: (from Standard Specifications for Public Works (Greenbook) Table 200-2.7.2 (A))

PERCENTAGE PASSING SIEVES BY WEIGHT	
SIEVE SIZE	CRUSHED AGGREGATE BASE GRADATION
1½"	100%
1"	90-100%
No. 4	50-100%
No. 30	25-55%
No. 200	5-18%

J. Screenings used for cover aggregate for asphalt-emulsion chip seals conform to gradations below: (from Standard Specifications for Public Works (Greenbook) Table 200-1.2.1(A))

PERCENTAGE PASSING SIEVES BY WEIGHT				
SIEVE SIZE	COARSE ½"x NO. 4	MEDIUM ⅜"x NO. 6	MEDIUM-FINE 5/16" x NO, 8	FINE ¼"x NO. 10
¾"	100%			
½"	90-100%	100%		
⅜"	50-80%	90-100%	100%	100%
No. 4	0-15%	5-30%	30-60%	60-85%
No. 8	0-5%	0-10%	0-15%	0-25%
No. 16		0-5%	0-5%	0-5%
No. 30			0-3%	0-3%
No. 200	0-2%	0-2%	0-2%	0-2%

K. Where called for on Plans, "Pulverized Miscellaneous Base" shall conform to gradation below: (from Standard Specifications for Public Works (Greenbook) Table 200-2.8.2 (A))

PERCENTAGE PASSING SIEVES BY WEIGHT	
SIEVE SIZE	CRUSHED AGGREGATE BASE GRADATION
2"	100%
¾"	85-100%
⅜"	55-80%

No. 4	35-60%
No. 30	10-30%
No. 200	2-9%
ASTM C131 Test Grading	B

L. Where called for on Plans, aggregate for "Lean Concrete Base" shall conform to gradation below: (from Standard Specifications for Public Works (Greenbook) Table 200-4.2.2.1 (A))

PERCENTAGE PASSING SIEVES BY WEIGHT				
SIEVE SIZE	**1½" MAXIMUM CLASS 2 AGGREGATE BASE**		**¾" MAXIMUM CLASS 2 AGGREGATE BASE**	
	OPERATING RANGE (MOVING AVERAGE)	**CONTRACT COMPLIANCE (SINGLE TEST)**	**OPERATING RANGE (MOVING AVERAGE)**	**CONTRACT COMPLIANCE (SINGLE TEST)**
2"	100%	100%		
1½"	90-100%	87-100%	100%	100%
1"			90-100%	87-100%
¾"	50-85%	45-90%	50-100%	45-100%
⅜"	40-75%	35-80%	40-75%	35-80%
No. 4	25-60%	20-65%	35-60%	30-65%
No. 30	10-30%	6-34%	10-30%	6-34%
No. 200	0-12%	0-15%	0-12%	0-15%

PART 3 - EXECUTION

3.1 Installation

A. Refer to Section 01 73 00 execution and installation requirements.

B. Furnish and install aggregate and rock products at locations shown on Plans and Submittals.

C. The following installation standards shall be followed:

1. Requirements of contract-referenced soils reports and investigations.
2. Applicable OSHA and Cal OSHA regulations
3. Other applicable building code requirements

D. Refer variances between above documents and Contract Documents to Owner's Representative.

3.2 Field Quality Control

A. Owner's Representative will / Owner-accepted soils-testing firm hired by Contractor shall provide continuous inspection of rock products as placed and compacted.

B. Owner's Representative will observe and test fills and based on laboratory results will determine whether fills have been placed in accordance with Contract Documents.

C. Owner-approved soils-testing firm hired by Contractor shall provide laboratory results to Owner's Representative who will determine whether fills have been placed in accordance with Contract Documents.

D. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Backfill or Soil Prepared in Place	Sampling	ASTM D75	As directed	Contractor	Contractor
	Sieve Analysis	ASTM C136 or California Test Method 202	As directed	/ Contractor	Contractor
	Sand Equivalence	California Test Method 217	As directed	Contractor	Contractor

E. Allow sufficient time for testing and evaluation of results before material is needed. Owner's Representative will be sole and final judge of suitability of all materials.

F. Do not use materials in question pending test results.

G. Contractor shall remove unsatisfactory material, recompact, adjust moisture or compaction methods, place new material, and perform other operations necessary to meet Contract requirements as directed by Owner's Representative.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 31 05 50
PROTECTING EXISTING UTILITIES

PART 1 - GENERAL

1.1 Work Included

A. Materials and procedures to protect existing underground utilities.

B. Materials and procedures to connect to existing underground utilities.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 73 00: Execution

1.3 References

A. ASCE 38 Standard Guidelines for the Collection and Depiction of Existing Subsurface Data
B. ASTM C143 Slump of Hydraulic Cement Concrete
C. ASTM C425 Compression Joints for Vitrified Clay Pipe and Fittings
D. ASTM C700 Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated
E. California Administrative Code Title 22 Section 64572
F. California Government Code Section 4215-4216

1.4 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings for Supporting Pipe and Utilities Crossing Trenches	Required when utilities to be supported exceed 16" diameter or any transverse dimension.	
	Required when requested in writing by Owner's Representative	
Engineering Calculations	Submit for pipe supports for existing utilities greater than 24" in any dimension. If concrete beams are used as supports, calculations shall take into account concrete strength based on days elapsing between placing concrete and trenching beneath concrete beams. Do not use 28-day strength unless concrete will be at least 28 days old when beam is placed in service.	

B. Refer to Section 01 33 00 for definition of requirements for shop drawings and engineering calculations.

1.5 Project Conditions

A. Design Engineer has attempted to show approximate location of buried utilities on Plans pursuant to Utility Quality Level D (QLD) as defined in ASCE 38. These approximate locations are based on:

1. Record maps requested and received during design from utilities identified through an inquiry to Underground Service Alert and utilities.

2. Comments received from Utilities after their review of preliminary plans showing record drawing information.

3. Field reconnaissance and plotting of approximate locations of readily visible surface features including manhole covers, valve covers, utility boxes, marking posts, pavement repair strips, and culvert end sections which might indicate presence of buried utilities.

4. Design Engineer's professional judgment in correlating record map information to observed surface features

or

B. Design Engineer has attempted to show approximate location of buried utilities on drawings pursuant to Utility Quality Level C (QLC) as defined in ASCE 38. These approximate locations are based on:

1. Record maps requested and received during design from utilities identified through an inquiry to Underground Service Alert and utilities.

2. Comments received from Utilities after their review of preliminary plans showing record drawing information.

3. Field surveying and plotting of locations of readily visible surface features including manhole covers, valve covers, utility boxes, marking posts, pavement repair strips, and culvert end sections which might indicate presence of buried utilities.

4. Design Engineer's professional judgment in correlating record map information to surveyed surface features

or

C. Design Engineer has attempted to show approximate location of buried utilities on drawings pursuant to Utility Quality Level B (QLC) as defined in ASCE 38. These approximate locations are based on:

1. Record maps requested and received during design from utilities identified through an inquiry to Underground Service Alert and utilities.

2. Comments received from Utilities after their review of preliminary plans showing record drawing information.

3. Field surveying and plotting of locations of readily visible surface features including manhole covers, valve covers, utility boxes, marking posts, pavement repair strips, and culvert end sections which might indicate presence of buried utilities.

4. Field surveying and plotting of locations of utilities and buried structures marked on the ground using ground penetrating radar and/or electromagnetic induction methods.

5. Design Engineer's professional judgment in correlating record map information to surveyed surface features

D. Where potholing has been done at spot locations to measure utility depths at those locations, pothole location and elevation is expressly noted on Plans, and shall be construed as accurate to within ±0.5' at point of potholing.

E. Utility locations on Plans are based solely on the above. Plotted locations may not accurately reflect subsurface conditions.

F. Prior to excavation, and prior to submittal of cut sheets for pre-engineered pipe, Contractor shall pothole and determine precise locations of all utilities which are:

1. Shown on plans

2. Identified by Underground Service Alert

3. Evident from readily visible surface features including manhole covers, valve covers, utility boxes, marking posts, pavement repair strips, and culvert end sections which might indicate presence of buried utilities.

4. Identified by Contractor by walking alignment using a reliable electronic pipe finder.

G. When performing Work within Caltrans or railroad right-of-way, Contractor is advised neither Caltrans, Burlington Northern Santa Fe (BNSF), Union Pacific Railroad, nor other railroads subscribe to Underground Service Alert. Contractor shall directly contact and make appropriate arrangements with Underground Service Alert nonmember agencies to field-locate utilities prior to excavation.

H. Power trench excavating equipment may only be used when and where all the following conditions exist.

1. Contractor has notified Underground Service Alert and all known Utility Owners at least 2 working days before excavating.

2. Contractor has thoroughly searched entire excavation route using a reliable electronic pipe finder and has pre-marked horizontal locations of conflicts.

3. Utilities shown on Plans have been potholed 1,300’ in advance of excavation as needed to verify locations.

4. No pipelines carrying gas, petroleum, explosives, hazardous materials, or other regulated contaminants are believed to be within 5’ of area to be excavated.

5. Owner's Representative is continuously present during excavation.

I. Pursuant to 49 CFR Part 192, Contractor shall coordinate with operators of high-pressure gas lines who are required by law to have a representative on-site at all times during excavation in the vicinity of their pipelines.

J. Power equipment specifically designed and manufactured for potholing existing utilities is exempt from the above restrictions.

K. Hand excavation shall be used

1. In areas where buried gas, petroleum, explosives or hazardous material piping is known to be present

2. In areas where electrical, fiber optic or communications conduit is known to be present.

3. In first 5’ below existing grade where drilling or auguring equipment is used.

L. Pursuant to Section 4215 of California Government Code,

1. Owner will be responsible *"for timely removal, relocation, or protection of existing main or trunk line utility facilities located on the site"* if such utilities are not identified by Owner in Contract Documents.

2. Owner will compensate Contractor for documented *"costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, and removing or relocating such utility facilities not indicated in the plans and specifications with reasonable accuracy, and for equipment on the project necessarily idled during such work."*

3. *"Contractor shall not be assessed liquidated damages for delay in completion of the project when such dlay was caused by the failure of the public agency or the owner of the utility to provide for removal or relocation of such utility facilities."*

M. Pursuant to Section 4216 of California Government Code, Owner's liability shall be limited to reimbursement of costs due to utility facilities either not shown on Contract Documents, or shown on Contract Documents at locations more than 2' vertically or 5' horizontally in error from field locations, except where location of said utilities are evident from surface features or staked correctly by Underground Service Alert.

N. Owner will not indicate presence of existing service laterals or appurtenances when presence of utilities on Project site can be inferred from presence of other visible facilities, such as buildings, meters and junction boxes, on or adjacent to Work site. Owner will identify main or trunk lines in Contract Documents. Contractor shall make their own investigations, including exploratory investigations, to determine or verify locations and type of existing service laterals or appurtenances when their presence can be inferred from presence of other visible facilities.

O. Immediately notify Owner and Utility in writing if Contractor discovers:

1. Utility facilities not shown on Plans

2. Utility facilities in field locations different than shown on plans.

P. Pursuant to California Administrative Code Title 22 Section 64572 and intent of Plans, separations shall be maintained between new and existing utilities as follows:

REQUIRED WALL-TO-WALL SEPARATIONS FOR PARALLEL PIPELINES			
NEW UTILITY	**SEPARATION FROM EXISTING**	**HORIZONTAL SEPARATION**	**VERTICAL SEPARATION (not required if horizontal separation** > 10')
Water Mains	Sewers	≥ 10' horizontal	New invert 12" above top of sewer
	Fuel and Oil Lines	≥ 10' horizontal	New invert 12" above top of pipe
	Recycled Water Mains (Secondary Treatment + Disinfection)	≥ 10' horizontal	New invert 12" above top of pipe
	Recycled Water Mains (Tertiary Treatment + Disinfection)	≥ 4' horizontal	New invert 12" above top of pipe
	Raw Water Lines	≥ 4' horizontal	New invert 12" above top of pipe
	Storm Drains	≥ 4' horizontal	New invert 12" above top of pipe
	Cesspools, Septic Tanks, Sewage Leach Fields, Seepage Pits or Groundwater Recharge Sites	≥ 25' horizontal	
	Sanitary Landfills, Wastewater Disposal Ponds, or Hazardous Waste Disposal Sites	≥ 100' horizontal	
Sewers or Nonpotable Pipelines	Potable or Raw Water Mains at pressures < 5 psi	≥ 25' horizontal	New soffit 12" below pipe invert
	Potable or Raw Water Mains	≥ 10' horizontal	New soffit 12" below pipe invert

	Recycled Water Mains (Secondary Treatment + Disinfection)	≥ 10' horizontal	New soffit 12" below pipe invert
	Recycled Water Mains (Tertiary Treatment + Disinfection)	≥ 4' horizontal	New soffit 12" below pipe invert
	Storm Drains	≥ 4' horizontal	New soffit 12" below pipe invert
REQUIRED WALL-TO-WALL SEPARATIONS FOR WATER MAINS CROSSING BELOW PIPES			
Water Mains	Sewers	No joints on 8' either side	≥ 12" vertical separation
	Fuel and Oil Lines	No joints on 8' either side	≥ 12" vertical separation
	Recycled Water Mains (Secondary Treatment + Disinfection)	No joints on 8' either side	≥ 12" vertical separation
	Recycled Water Mains (Tertiary Treatment + Disinfection)	No joints on 8' either side	≥ 12" vertical separation
	Raw Water Lines	No joints on 8' either side	≥ 12" vertical separation
	Storm Drains	No joints on 8' either side	≥ 12" vertical separation
Sewers or Nonpotable Pipelines	Potable Water Mains	No joints on 8' either side	≥ 12" vertical separation
REQUIRED WALL-TO-WALL SEPARATIONS FOR WATER MAINS CROSSING ABOVE PIPES			
Water Mains	Sewers	No joints on 8' either side	≥ 12" vertical separation
	Fuel and Oil Lines	No joints on 8' either side	≥ 12" vertical separation
	Recycled Water Mains (Secondary Treatment + Disinfection)	No joints on 8' either side	≥ 12" vertical separation
	Recycled Water Mains (Tertiary Treatment + Disinfection)	No joints on 8' either side	≥ 12" vertical separation
	Raw Water Lines	No joints on 8' either side	≥ 12" vertical separation
	Storm Drains	No joints on 8' either side	≥ 12" vertical separation
Sewers or Nonpotable Pipelines	Potable Water Mains	No joints on 8' either side	≥ 12" vertical separation

Q. Lesser separations may be used under California Administrative Code Title 22 Section 64551(c) when Separations required under Section 64572 are not feasible, when inverts of potable water mains are above soffits of parallel sewers and nonpotable pipelines, and when:

1. Sewers or storm drains are not under pressure or used as force mains, and are constructed of :
    a. ASTM F894 spirally-reinforced HDPE pipe with gasketed joints,
    b. ASTM C700 VCP sewer with compression joints
    c. ASTM C428 ACP sewer pipe Class 4000 Type II with rubber gasket joints
    d. ASTM D3064 PVC sewer pipe with rubber gasket joints
    e. AWWA C151 DIP pipe with compression joints
    f. AWWA C302 RCP pipe with compression joints or
    g. AWWA C906 fusion-bonded HDPE pipe with fusion-welded joints,

or

2. Fuel and oil lines are constructed of:
    a. AWWA C151 DIP pipe with compression joints or
    b. AWWA C200 ¼"-wall welded steel water pipe dipped and wrapped

or

3. Water, raw water, or recycled water mains operate at pressures >5 psi and are constructed of:
    a. AWWA C151 DIP water pipe with compression joints and hot-dip bituminous coating
    b. AWWA C200 ¼"-wall welded steel water pipe dipped and wrapped
    c. AWWA C300, C302, or C303 reinforced concrete pressure pipe
    d. AWWA C400 Class 200 ACP Type II water pipe
    e. AWWA C900 or C905 PVC DR14 water pipe with compression joints or

f. AWWA C906 fusion-bonded HDPE water pipe with fusion-welded joints,

4. In which case separations shall be maintained between constructed and existing utilities as follows:

REQUIRED WALL-TO-WALL SEPARATIONS FOR PARALLEL PIPELINES			
NEW UTILITY	**SEPARATION FROM EXISTING**	**HORIZONTAL SEPARATION**	**VERTICAL SEPARATION**
Water Mains	Sewers	≥ 4' horizontal	New invert 12" above top of sewer
	Fuel and Oil Lines	≥ 4' horizontal	New invert 12" above top of pipe
	Recycled Water Mains (Secondary Treatment + Disinfection)	≥ 4' horizontal	New invert 12" above top of pipe
Sewers or Nonpotable Pipelines	Potable or Raw Water Mains	≥ 4' horizontal	New soffit 12" below pipe invert
	Recycled Water Mains (Secondary Treatment + Disinfection)	≥ 4' horizontal	New soffit 12" below pipe invert
REQUIRED WALL-TO-WALL SEPARATIONS FOR WATER MAINS CROSSING BELOW PIPES			
Water Mains	Sewers	No joints on 10' either side	≥ 4" vertical separation
	Fuel and Oil Lines	No joints on 10' either side	≥ 4" vertical separation
	Recycled Water Mains (Secondary Treatment + Disinfection)	No joints on 10' either side	≥ 4" vertical separation
	Recycled Water Mains (Tertiary Treatment + Disinfection)	No joints on 10' either side	≥ 4" vertical separation
	Raw Water Lines	No joints on 10' either side	≥ 4" vertical separation
	Storm Drains	No joints on 10' either side	≥ 4" vertical separation
Sewers or Nonpotable Pipelines	Potable Water Mains, Raw Water Mains, or Recycled Water Mains	No joints on 10' either side	≥ 4" vertical separation
REQUIRED WALL-TO-WALL SEPARATIONS FOR WATER MAINS CROSSING ABOVE PIPES			
Water Mains	Sewers	No joints on 8' either side	≥ 4" vertical separation
	Fuel and Oil Lines	No joints on 8' either side	≥ 4" vertical separation
	Recycled Water Mains (Secondary Treatment + Disinfection)	No joints on 8' either side	≥ 4" vertical separation
	Recycled Water Mains (Tertiary Treatment + Disinfection)	No joints on 8' either side	≥ 4" vertical separation
	Raw Water Lines	No joints on 8' either side	≥ 4" vertical separation
	Storm Drains	No joints on 8' either side	≥ 4" vertical separation
Sewers or Nonpotable Pipelines	Potable Water Mains, Raw Water Mains, or Recycled Water Mains	No joints on 8' either side	≥ 4" vertical separation

R. Costs, and Work to be done by Contractor in locating, removing, relocating, protecting or temporarily maintaining such utility facilities shall be covered by written change order conforming to provisions herein pertaining to changes in Work. Owner may make changes in alignment and grade of Work to obviate need to remove, relocate, protect or temporarily maintain utility facilities or to reduce costs of Work involved in removing, relocating, protecting or temporarily maintaining such utility facilities. Changes in alignment and grade will be ordered in accordance with provisions pertaining to changes in Work.

S. Damage to underground utilities, pipelines or other facilities shown on Plans or identified by field staking or markings shall be immediately brought to attention of Owner's Representative and affected Utility, and repaired at Contractor's expense. Exact determination of location of these utilities, pipelines or other facilities shall be Contractor's responsibility. Contractor shall be solely and directly responsible for damage, injury, expense, loss, inconvenience, delay, suits, actions or damage that may result from Contractor's failure to verify or locate utilities whose existence is indicated. Costs incurred for protection of these lines or costs incurred due to presence of lines, whether or not they lie within trench prism, shall be borne in full by Contractor.

T. When it is necessary to remove, relocate, protect or temporarily maintain a utility other than

1. existing mains or trunk-line facilities not originally shown on Plans with sufficient accuracy to allow Work to proceed according to Contract Documents or;

2. existing service laterals or appurtenances whose presence cannot be inferred from presence of other visible facilities, such as buildings, meters and junction boxes, on or adjacent to Work site;

Contractor shall bear all expenses incidental to Work on utility or damage thereto. Work on utility shall be done in manner satisfactory to Utility Owner. Utility Owner will have option of doing such Work with their own forces, or permitting Work to be done by Contractor.

U. No representations are made that obligations to remove, relocate, protect or temporarily maintain a utility and to pay cost thereof is not required to be borne by utility. Contractor shall investigate, to find out whether or not said cost is required to be borne by Utility Owner.

V. Liquidated damages will not be assessed for damages in delay in completion of Work, when such delay was caused by failure of Owner, Owner's Representative, Design Engineer and Utility Owner to provide for removal or relocation of utility facilities. Right is reserved to governmental agencies and to Utility Owners to enter at any time upon any street, alley, right of way or easement for purpose of making changes in their property made necessary by Work and to maintain and make repairs to their property.

1.6 Unit Prices

A. Payment for locating, potholing, exposing, and protecting existing utilities will be included in price bid for Work items for which such Work is appurtenant.

B. Payment for abandoning or removing existing utilities will be included in the price bid for Work items for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Replacement Materials

A. Unless otherwise shown or specifically authorized in writing by Owner's Representative, reconstruct damaged utilities with new materials of same size, type and quality as that removed.

B. Vitrified clay pipe sewer crossings 8" in diameter and under shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Replacement of Vitrified Clay Sewer Pipe 8" Diameter or Less	Plain-End VCP	ASTM C700 (At least two lengths of sewer pipe shall be used to cross trench section.)
Replacement of Vitrified Clay Sewer Pipe Couplings 8" Diameter or Less	Compression Coupling	ASTM C425; Band seal couplings or accepted equal

PART 3 – EXECUTION

3.1 Preparation

A. Section 4216 of California Government Code states Contractors *"planning to conduct any excavation shall contact the appropriate regional notification center at least two working days but not more than 14 calendar days, prior to commencing excavation."*

B. In Southern California, the appropriate regional notification center is Underground Service Alert of Southern California (DigAlert) (1-800-422-4133) or 811.

C. In Northern and Central California, the appropriate regional notification center is Underground Service Alert North (1-800-227-2600) or 811.

D. In South Lake Tahoe, the appropriate regional notification center is South Shore Utility Coordinating Council (530) 541-3447.

E. Contractor shall be responsible for damage done to public or private property shown on Plans or marked or staked in field.

F. Construction Plans will be provided to Utilities by Owner.

G. Construction schedule shall be provided to Utilities by Contractor. Coordinate construction schedule with Utility Owner's requirements.

H. Notify Utility Owner 2 working days in advance of utility crossing construction. Coordinate construction schedule with utility service requirements.

I. Expose all utilities 1,300' ahead of pipe and conduit laying operations to allow for adjustment in alignment or grade line, to verify pipe and utility location and depths, types materials, conditions and sizes for ordering proper transition and/or tie-in fittings, and so Owner's Representative may verify that no buried utilities interfere with proposed construction. Identify true location and depth, type, material, condition and size of utilities and service connections. Where potholing or exposure is not done, repair or replacement of damaged utilities and necessary horizontal and vertical realignments shall be paid for entirely by Contractor.

J. Electrical utilities may maintain energized underground electrical power lines in immediate vicinity of Work. These power lines represent an extreme hazard from electrical shock to construction personnel or equipment coming in contact with them. State law requires parties planning excavations in public right of way to contact Utilities for locations of their underground facilities. Contractors, their employees, and other personnel working near underground power lines must be warned to take adequate protective measures. (See: OSHA Std. 1926-651(A)). Notify electrical Utility to arrange, if possible, to have these lines de-energized when Work reaches their immediate vicinity. Cost of such temporary arrangements shall be borne by Contractor.

K. Electrical utility companies may maintain energized aerial electrical power lines in immediate vicinity of Work. Do not consider these lines to be insulated. Construction personnel working near these lines are exposed to an extreme hazard from electrical shock. Contractors, their employees and construction personnel working on this project must be warned of the danger and instructed to take adequate protective measures, including maintaining a minimum of 10' clearance between lines and construction equipment and personnel. (See OSHA Std. 1926.550(A)15). As an additional safety precaution, call electrical utility company to arrange, if possible, to have these lines de-energized or relocated when Work reaches their immediate vicinity. Cost of such temporary arrangements shall be borne by Contractor.

L. It shall not be the responsibility of either Owner or their Representative to verify need for electrical Utility shutdowns, nor to verify shutdowns have taken place.

M. Before hot-tapping asbestos-cement pipe, the following items shall be on-hand:

1. Hot-tapping equipment of appropriate size

2. Water source and means of application sufficient to maintain continuously wetted cutting area

3. Waste disposal bags

4. OSHA-required safety equipment including, but not limited to disposable coveralls, full-face air-supplied respirators, rubber boots, hard hats, eye protection, and gloves.

3.2 Protection

A. Protect existing active services and utilities in place against damage from construction.

B. Maintain existing services and utilities in service. Do not shut down active services or utilities except where previous written authorization has been obtained from Owner's Representative and Utility.

C. Use pipe and duct supports as needed to protect utilities.

D. Notify Utilities in writing at least 3 working days before authorized shutdown.

E. Unauthorized shutdowns shall only be made where necessary, as an emergency measure, to protect property or human life until proper authorization can be obtained.

3.3 Removal and Reconstruction

A. Utilities relocated or rebuilt for Contractor's convenience, shall be relocated or rebuilt at Contractor's expense. Repair, replacement or relocation of buried utilities shall be completed at Contractor's expense by either Utility's forces, or by a contractor accepted by Utility in writing and properly licensed to perform Work.

B. Utility relocation or reconstruction shall conform to applicable Standard Details and Specifications. Provide temporary service for disconnected Utility.

C. Replace damaged or removed utilities in kind, except as otherwise shown or authorized by Owner's Representative. Reconstruct utilities with new material of same size, type and quality as that removed.

3.4 Backfill and Compaction

A. Backfill and compact under and around utilities so no voids are left.

B. Before replacing a utility, backfill trench and compact to elevation 1 foot above top of ends of utility. Excavate cross trench of proper width for utility.

C. Sand-cement slurry may be used as backfill to ease compaction. Sand-cement slurry shall consist of one sack (94 pounds) Portland cement per cubic yard of slurry. Add sufficient moisture for workability without exceeding 6” slump. Submit specific methods and procedures to Owner's Representative prior to construction.

3.5 Servicing Electrical Utilities

A. Protect and interface with servicing Electrical Utility per Section 26 05 10.

3.6 Connecting to Existing Water Mains

A. Contact Water Utility Owner 72-hours before connecting to existing mains.

B. Comply with all Utility requirements for tapping existing lines, including field directives from Utility inspectors.

C. Wet connections (hot taps) shall be made as follows:

1. Tap existing lines while under pressure.

2. Schedule tapping procedure with Water Utility so as not to interfere with normal operation of existing pipe line.

3. Cut tapped pipe in presence of Water-Utility-designated inspector to full nominal diameter of tapping valve.

D. Wet connections (hot-taps) to asbestos cement pipe shall proceed as follows:

1. Tap existing lines while under pressure.

2. Schedule tapping procedure with Water Utility so as not to interfere with normal operation of existing pipe line.

3. Excavate around asbestos-cement pipe sufficient distance to assure adequate tool clearance in area to be tapped. Take care to avoid abrading or chipping pipe.

4. Clean and wash pipe surface with water in area to be cut.

5. Attach tapping equipment around asbestos-cement pipe.

6. Apply water to area being cut until tapping is complete.

7. Cut tapped pipe in presence of Water-Utility-designated inspector to full nominal diameter of tapping valve.

8. Tap pipe, keeping entire exposed area of pipe in vicinity of tap wet during operation so no friable asbestos cement dust is created.

9. Detach tapping equipment and move to next location, repeating above procedure.

10. Upon completion of final tap, thoroughly wash tapping equipment with clean water to remove all asbestos-cement debris. Drain was wash water into trench bottom. Remove washed tapping equipment from trench.

11. Install other pipe and fittings as needed to complete Work taking care to avoid abrasion or chipping of asbestos-cement pipe.

12. When all pipe Work is complete, thoroughly wash hands, boots, and any small tools with clean water to remove all asbestos-cement debris. Drain wash water to trench bottom.

13. Remove disposable protective clothing, HEPA filters, tapping coupons, and other asbestos-contaminated materials, debris or containers and legally dispose of them in sealed impermeable bags or other closed impermeable containers delivered to a landfill accepting encapsulated asbestos.

14. Exit ditch in manner that no asbestos-cement debris will contaminate clothing, boots, tools or other clothing.

15. Backfill trench.

E. Dry connections shall be made as follows:

1. Schedule tapping procedure with Water Utility so as not to interfere with normal operation of existing pipe line.

2. Coordinate with Water Utility to minimize downtime.

3. Arrange for presence of Water Utility inspector.

4. Water Utility shall operate valves to isolate main.

5. Verify Water Utility pipeline is isolated and relieved of pressure before cutting main.

6. Cut tapped pipe in presence of Water-Utility-designated inspector to full nominal diameter of tapping valve.

7. Place 2 ounces of HTH in pipe at each point where existing main is cut.

8. Swab new pipe and fittings internally with an accepted chlorine solution.

F. Make perpendicular connections to asbestos-cement pipe by making wet connection (hot tap). Make longitudinal connections to asbestos-cement pipe by removing entire pipe piece or snap-cutting per Section 02 41 15. Replace removed segment with AWWA C900 Class 200 PVC pipe, AWWA C151 Class 350 ductile iron pipe, or other material accepted by Water Utility in presence of Water-Utility-designated inspector. Swab new pipe and fittings internally with an accepted chlorine solution.

3.7 Field Quality Control

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Cement-Sand Slurry Backfill	Slump (6" Maximum)	ASTM C143	1 each batch	Owner	Contractor
Connection to Existing Water Line	Verification of Proper Connection	Make cut in presence of Owner's Representative and present coupon to Owner's Representative Coupon shall match full valve nominal size.	1 each connection	Contractor	Contractor

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 31 10 00
SITE CLEARING

PART 1 - GENERAL

1.1 Work Included

A. Clearing, grubbing, stripping, and preparing site for construction operations.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 31 23 00: Excavation and Fill

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 References

A. California Building Code (CBC)
B. California Fire Code (CFC)

1.6 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 Preparation

A. Inspect site as to nature, location, size and extent of vegetative material to be removed.

B. Before beginning work, consult with Owner's Representative, Identify limits of clearing, grubbing and stripping and mark in field with, fencing, stakes and string, paint, chalk or other method acceptable to Owner's Representative.

C. Limits of clearing, grubbing and stripping shall include excavation and embankment areas required to be disturbed to construct improvements shown on Plans. Limits shall also include stockpile areas accepted by Owner's Representative.

D. Provide clearing, grubbing and stripping at locations shown on Plans and submittals and as required to accommodate Work.

E. Preservation of trees, shrubs and other plant material shall occur as follows:

1. Locate and tag trees and shrubs shown on Plans to be preserved.

2. Save and protect tagged plant materials and trees, shrubbery and plants beyond limits of clearing, grubbing and stripping from damage resulting from Work.

3. Do not fill, excavate, trench or stockpile materials within drip-line of plant materials required to be preserved.

4. Drip-line is defined as vertical projection to ground from outermost branches of plant or group of plants, or the shadow a plant would cast were sun directly overhead.

5. To prevent soil compaction within drip-line area. Do not move or store equipment within this area.

6. When trees are close together, restrict entry to area within drip line by fencing.

7. Where no fence is erected, protect trunks of trees 2 inches or greater in diameter by encircling tree trunk with boards held securely with 12-gauge wire and staples. This protection shall extend to 6 feet above ground.

8. Cutting and removal of tree branches where such cutting is necessary to permit construction operation shall be done by a certified arborist. Arborist shall remove branches other than those required to accomplish work if required to provide a balanced appearance of any tree.

9. Treat sears resulting from removal of branches with a tree sealant.

3.2 Installation

A. Refer to Section 01 73 00 for basic execution and installation requirements.

B. The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements

2. Applicable OSHA and Cal OSHA regulations

3. Other applicable building and fire code requirements.

C. Clearing shall proceed as follows:

1. Remove and legally dispose of trees, snags, stumps, shrubs, brush, limbs, and other vegetative growth.

2. Remove all evidence of their presence from surface including sticks and branches greater than 1-inch diameter or thickness.

3. Remove and legally dispose of trash piles and rubbish.

4. Protect structures, piping and equipment above and below ground, trees, shrubs, vegetative growth and fencing not designated for removal.

D. Grubbing shall proceed as follows:

1. Remove and legally dispose of wood or root matter below ground remaining after clearing, including stumps, trunks, roots, or root systems greater than 1-inch diameter or thickness to a depth 12 inches below existing or finished grade, whichever is lower.

E. Stripping shall proceed as follows:

1. Remove and legally dispose of all organic sod, topsoil, grass and grass roots and other objectionable material remaining after clearing and grubbing from areas designated to be stripped.

2. Stockpile and retain topsoil material onsite for dressing backfill areas before planting.

F. Do not burn combustible materials. Remove cleared, grubbed and stripped material from site (excluding topsoil) and dispose of in accordance with local laws, codes and ordinances.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 31 23 00
EXCAVATION AND FILL

PART 1 - GENERAL

1.1 Work Included

A. Structural and trenching excavation activities as required to complete Work under wet and dry conditions in whatever material or class of material is encountered, including:

1. Contacting and notifying underground utilities, no less than 48-hours before excavating in accordance with Section 31 05 50.
2. Compliance with State and Federal safety regulations.
3. Designing, furnishing, placing, and removing all sheeting, shoring and bracing needed to safely support sides of excavations.
4. Compliance with applicable agencies' permit conditions for work in public or railroad right-of-way, and for work on private property.
5. Loosening, excavating, removing, loading, and transporting excess soil from excavations.
6. Stockpiling, exporting and importing material.
7. Pumping, ditching, draining, and other required measures to remove or exclude water.
8. Supporting and protecting structures above and below ground.
9. Maintaining trees which are not permitted to be removed.
10. Preparing and stabilizing subgrade for pipe, paving and structures.
11. Backfilling around structures and all backfilling of trenches and pits.
12. Transporting, depositing, and compacting fill where required.
13. Compaction testing (where stipulated as a Contractor responsibility in Section 3.3).
14. Rough and fine grading, and preparation of right-of-way.
15. Soil sterilant application.
16. Legal disposal of cleared, grubbed and excess excavated materials.
17. Cleaning up debris, papers and loose rocks.
18. Restoring fences and other disturbed property.
19. All other incidental earthwork and supplementary operations needed to complete Work.

B. Excavations for appurtenant structures including manholes, transition structures, junction structures, vaults, valve boxes, catch basins shall be considered as trench excavation.

C. Excavation shall include removal of all water and materials of any nature which interfere with construction work. Removal of water to levels below structure subgrade will be necessary only where required by Contract Documents.

D. Excavation for pipe and conduit work shall be by open trench unless otherwise shown. Should Contractor elect to tunnel or jack any portion not so specified, they shall first obtain acceptance from Owner's Representative, and payment will be limited to prices bid for open trench work.

E. Except as modified herein, earthwork shall conform to Standard Specifications for Public Works Construction (Greenbook) Section 300.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 01 73 24: Seismic Restraint
H. Section 01 73 33: Mechanical Identification
I. Section 31 05 16: Aggregate and Rock Products for Earthwork
J. Section 31 10 00: Site Clearing
K. Section 31 05 50: Protecting Existing Utilities
L. Section 31 10 00: Site Clearing
M. Section 32 12 16: Asphalt Paving
N. Section 32 13 13: Concrete Paving

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 References

A. ASTM C143 Slump of Hydraulic Cement Concrete
B. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates
C. ASTM C1479 Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe
D. ASTM D1556 Density and Unit Weight of Soil in Place by SandCone Method
E. ASTM D1557 Laboratory Compaction Characteristics of Soil Using Modified Effort
F. ASTM D4253 Maximum Index Density and Unit Weight of Soils Using Vibratory Table
G. ASTM D4254 Maximum Index Density and Unit Weight of Soils and Calculation of Relative Density
H. ASTM D6938 In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
I. AWWA C604 Installation of Steel Water Pipe – 4" and Larger
J. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
K. AWWA M9 Concrete Pressure Pipe
L. AWWA M11 Steel Pipe – A Guide for Design and Installation
M. AWWA M23 PVC Pipe – Design and Installation
N. AWWA M41 Ductile Iron Pipe and Fittings
O. AWWA M55 PE Pipe – Design and Installation
P. California Test Method 202 Sieve Analysis of Fine and Coarse Aggregates

Q. California Test Method 216 Relative Compaction of Untreated and Treated Soils and Aggregates
R. California Test Method 217 Sand Equivalent
S. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 300 "Earthwork"
T. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 306-1 "Open-Trench Excavations"

1.6 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Catalog Data	Required for soil sterilants per catalog data requirements.	
Permits	Copies of permits obtained for excavation, grading, etc. required by state and local governing authorities	
Certificate of Compliance	Submit affidavit of compliance with California Construction Safety Order requirements prior to beginning excavation on any trench or excavation. Affidavit shall certify compliance with all shoring, bracing, sloping or other protective system provisions required by California Construction Safety Orders for worker protection from hazard of caving ground during excavation.	

B. Refer to Section 01 33 00 for definition of requirements for catalog data and certificates of compliance.

1.7 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 for delivery storage and handling requirements.

1.8 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

B. Volumes of excavation and backfill used to compute additional payments or deductions shall be as follows:

1. Trench widths for pipe: Use maximum width specified, measured at top of pipe.

2. Trench widths for cast-in-place structures or cast-in-place foundations for precast structures: Use outside width of structure or foundation plus 3'.

C. In absence of pay items for contaminated soils, Contractor shall be entitled to payment as Extra Work for documented costs incurred by Contractor for removing, segregating, covering, and legally disposing of contaminated soils. Contractor shall not be entitled to payment for imported material to replace contaminated soils.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Soil Sterilant	Elanco "Surflan"	Greenfield, IN

ITEM	MANUFACTURER	MANUFACTURER LOCATION
	Bayer Aventis Crop Science (formerly Rhône-Poulenc) "Ronstar G 50 WP"	Leverkusen, NRW, GE
	Rainbow Technology "Weedkiller"	Pelham, AL
	Accepted equal	
Buried Pipe Warning-Locating and Identification Tape	See Section 33 05 26	

2.2 Materials

A. Refer to Section 01 61 00 for basic requirements for products and materials.

B. Refer to Section 31 05 16 for basic requirements for aggregate and rock products.

C. The following definitions shall apply to soil and backfill:

ITEM	MATERIAL	SPECIFICATION
Granular Material	Sand or Gravel	California Test Method 217 minimum sand equivalence of 30 Not more than 20% of material shall pass through 200-mesh sieve.
Imported Sand	Sand	California Test Method 217 minimum sand equivalence of 30
Pervious Backfill (per Greenbook 300-3.5.2)	Gravel, Crushed Gravel, Crushed Rock, Natural Sands, and/or Manufactured Sands	California Test Method 217 minimum sand equivalence of 60 100% passing ¾" sieve 80-100% passing ⅜" sieve 0-8% passing No 100 sieve 0-3% passing No 200 sieve
Suitable Structural Backfill Material (per Greenbook 300-3.5)	Imported or Excavated Material Meeting Specification	California Test Method 217 minimum sand equivalence of 20 35-100% passing No 4 sieve 20-100% passing No 30 sieve Material free from shale, sod, stones, concrete and clods over 4" diameter, roots, trash, lumber, organic material, ashes and other debris considered unsuitable by Owner. Material shall have no unusual color or sulfide odor. Compact to specified densities.
Suitable Soil Material	Imported or Excavated Material Meeting Specification	Material free from shale, sod, stones, concrete and clods over 4" diameter, roots, trash, lumber, organic material, ashes and other debris considered unsuitable by Owner. Material shall have no unusual color or sulfide odor. Compact to specified densities.
Unclassified Fill	Imported or Excavated Material Meeting Specification	Material free from shale, sod, stones, concrete and clods over 6" diameter, roots, trash, lumber, organic material, ashes and other debris considered unsuitable by Owner. Material shall have no unusual color or sulfide odor. Compact to specified densities.
Cement-Sand Slurry	Cement (94-lb sacks per cubic yard of mix)	1 sacks per cubic yard minimum, and not less than that required by applicable agency encroachment permits
	Maximum Slump	Maximum 6" per ASTM C143
Native Material	Material obtained from required site excavations When native material is unsuitable for use in backfill, it shall be disposed of off-site and suitable material capable of being compacted to required relative density shall be furnished by Contractor at their expense.	
Import Material	Owner-accepted material obtained from off-site borrow areas.	
Buried Pipe Warning-Locating and Identification Tape	See Section 33 05 26. See section on appropriate utility pipe or conduit material for required message	
Soil Sterilant	Combination of sodium chlorate and borates	

D. Soil and backfill materials for pipelines and utilities shall be prepared to the following specifications:

ITEM	MATERIAL	SPECIFICATION
Backfill for Over-Excavation Beneath Pipes	Cement-Sand Slurry	Cement-sand slurry mix specified above
	Suitable Soil Material (where cement-sand slurry not required)	90% compaction per ASTM D1557 or California Test Method 216
Backfill of Tunnels beneath Concrete Flatwork	Sand	90% compaction per ASTM D1557 or California Test Method 216
Pipe Zone Material (Material from 4"-6" below pipe to plane 12" above top of pipe)	Native or Imported Granular Material	Place buried identification tape where specified 90% compaction per ASTM D1557 or California Test Method 216 or California Test Method 217 Minimum sand equivalence of 30 Material shall also be suitable soil material as defined above. Maximum lifts vary with equipment. See below.
Trench Zone Material (Material in Pipe Trench above Pipe Zone and below any Street Zone)	Cement-Sand Slurry	Cement-sand slurry mix specified above
	Suitable Soil Material (where cement-sand slurry not required)	90% compaction per ASTM D1557 or California Test Method 216 Maximum lifts vary with equipment. See below. May contain stones, asphalt pavement or concrete of up to 6" in largest dimension so long as such solids are completely surrounded by fines so no voids are present in backfill as placed. No material >2" in any dimension shall be placed within one foot of any pipe, valve, or structure. All backfill within 24" of ductile-iron fittings or valves shall be clean, washed sand. Provide buried pipe warning and locator tape in pipe trench 18" above pipe.
Street Zone Material (Base material in pipe trench below pavement subgrade to depth of 30" below finished road surface.	Crushed Aggregate Base Material	95% compaction per ASTM D1557 or California Test Method 216 Conform to Section 200-2.2, crushed aggregate base of SSPWC Contractor may substitute on-site materials conforming to Section 200-2.5, Processed Miscellaneous Base of SSPWC Maximum lifts vary with equipment. See below. Material shall also be suitable soil material as defined above. Stones concrete and clods smaller than specified limit may not exceed 20% of backfill volume over any pipe segment. Place in 8" maximum lifts.
Surface Zone Material (upper 12" of trench to finish surface in unimproved or landscaped areas)	Topsoil per Section 32 90 00	80% compaction per ASTM D1557 or California Test Method 216 Maximum lifts vary with equipment. See below.

E. Soil and backfill materials for site grading and general excavation shall be prepared to the following specifications:

ITEM	MATERIAL	SPECIFICATION
Backfill for Over-Excavation Beneath General Excavation	Suitable Soil Material	90% compaction per ASTM D1557 or California Test Method 216
Loose Ground Remaining After Stripping	Suitable Soil Material	90% compaction per ASTM D1557 or California Test Method 216

ITEM	MATERIAL	SPECIFICATION
Fills Below Ground	Suitable Soil Material	90% / 95% compaction per ASTM D1557 or California Test Method 216 Place in 4' maximum lifts
Embankments	Suitable Soil Material	90% compaction per ASTM D1557 or California Test Method 216 Place in 8" maximum lifts 2:1 maximum embankment slope
Surface Zone Material (upper 12" below finish surface in unimproved or landscaped areas)	Topsoil per Section 32 90 00	80% compaction per ASTM D1557 or California Test Method 216 Maximum lifts vary with equipment. See below.

F. Soil and backfill materials for paving shall be prepared to the following specifications:

ITEM	MATERIAL	SPECIFICATION
Backfill for Over-Excavation Beneath Paving	Cement-Sand Slurry	Cement-sand slurry mix specified above
	Suitable Soil Material (where concrete slurry not required)	90% compaction per ASTM D1557 or California Test Method 216
Roadway/Paving Fills > 3' Below Base	Suitable Soil Material	90% / 95% compaction per ASTM D1557 or California Test Method 216 Place in 4' maximum lifts
Top 3' of Roadway/Paving Fills Below Base	Suitable Soil Material	90% / 95% compaction per ASTM D1557 or California Test Method 216 Place in 8" maximum lifts
Roadway/Paving Base	Crushed Aggregate Base Material	95% compaction per ASTM D1557 or California Test Method 216 Conform to Section 200-2.2, crushed aggregate base of SSPWC Contractor may substitute on-site materials conforming to Section 200-2.5, Processed Miscellaneous Base of SSPWC Maximum lifts vary with equipment. See Section 32 12 16 for asphalt-concrete paving or 32 13 13 for concrete paving

G. Soil and backfill materials for structures shall be prepared to the following specifications:

ITEM	MATERIAL	SPECIFICATION
Backfill for Over-Excavation Beneath Structures	Concrete	Section 03 30 00 Class A
Backfill of Tunnels Beneath Concrete Flatwork	Sand	90% / 95% compaction per ASTM D1557 or California Test Method 216
Structural Fills > 5' Below Foundation	Suitable Structural Backfill Material (per Greenbook 300-3.5)	90% compaction per ASTM D1557 or California Test Method 216 Place in / 4' maximum lifts
Top 5' of Structural Fill	Suitable Structural Backfill Material (per Greenbook 300-3.5)	95% compaction per ASTM D1557 or California Test Method 216 Place in 8" maximum lifts
Structural Bedding Beneath Footings, Slabs and Sand Blanket	Crushed Aggregate Base Material	95% compaction per ASTM D1557 or California Test Method 216 Conform to Section 200-2.2, crushed aggregate base of SSPWC Contractor may substitute on-site materials conforming to Section 200-2.5, Processed Miscellaneous Base of SSPWC If plans are silent regarding thickness, provide 8" layer of aggregate beneath 4" sand layer

ITEM	MATERIAL	SPECIFICATION
Sand Blanket Beneath Slabs	Sand	90% compaction per ASTM D1557 or California Test Method 216 If plans are silent regarding thickness, provide 4" sand layer with10-mil PVC vapor barrier with sealed laps in center of sand layer.

PART 3 - EXECUTION

3.1 Preparation

A. Contractor's attention is directed to possible existence of pipe and other underground improvements which may or may not be shown on Plans. Preserve and protect any such improvements whether shown or not. Where necessary to remove and replace or to relocate such improvements to prosecute Work, improvements shall be removed, maintained, and permanently replaced by Contractor at their expense, except as otherwise provided in Contract Documents.

B. Section 4216 of the California Government Code states Contractors *"planning to conduct any excavation shall contact the appropriate regional notification center at least two working days but not more than 14 calendar days, prior to commencing excavation."*

C. Preparation for fill shall proceed as follows:

1. Areas to receive fill shall first be cleared and grubbed per Section 31 10 00.

2. Areas shall then be scarified to provide a bond between existing ground and fill material to be deposited thereon.

3. When fills are to be placed over existing surface improvements to remain in place cut 4" drainage holes through structure or paving at 5' centers each way, or break or saw-cut pavement in grid pattern of 5' each way with minimum ¼" gap between broken sections.

D. Control of runoff and groundwater shall comply with the following:

1. Control grading to prevent water running into excavations. Do not obstruct surface drainage. Provide swales, gutters temporary drains or other means of channeling flow without interruption around excavations.

2. Preserve existing drainage patterns except as otherwise shown. Where construction methods cause temporary obstruction of drainage patterns, provide temporary facilities adequate for expected flows and a means of emergency removal of obstruction.

3. Procure permit from appropriate Regional Water Quality Control Board for all groundwater dewatering operations.

4. Provide and maintain ample means and devices and promptly remove and properly dispose of all water from any source entering excavation or other parts of Work. Dewatering methods shall ensure preservation of final lines and grades of bottoms of excavations. Said methods may include well points, sump points, suitable rock or gravel placed below required bedding for drainage and pumping purposes, temporary pipelines, and other means that will not be detrimental to proposed construction. Contractor is responsible for obtaining all water discharge permits required.

5. Dewatering for structures and pipelines shall commence when groundwater is first encountered and shall continue until water can be allowed to rise in accordance with provisions of this section.

6. Jetting, where permitted shall be performed without softening embankments and in manner not impounding excess water.

7. Do not place concrete footings or floors in water. Do not allow water to rise over Work until concrete or mortar has set at least 8 hours. Do not allow water to rise unequally against walls for 28 days. Do not allow groundwater to rise around pipe until jointing compound in joints has set hard.

8. Dispose of water in suitable manner without damage to adjacent property. Do not drain water into Work built or under construction without prior consent of Owner's Representative. Dispose of water according to permits and in such manner as not to be a menace to public health and public or private property.

E. Remove and reconstruct asphalt paving improvements per Section 32 12 16.

F. Remove and reconstruct concrete paving improvements per Section 32 13 13.

G. Obtain written permission from Owner prior to any blasting or use of explosives. Explosives, if used, shall be of such quantity and power and shall be used in such locations as to minimize opening of seams and disturbing of material outside prescribed excavation limits. As excavation approaches its final limits, reduce depths of holes for blasting and quantity of explosives used for each hole so to minimize disturbance of underlying or adjacent material.

H. Protection open excavations, complying with latest revision of rules, orders and regulations of Division of Industrial Safety of State of California. Nothing contained in these Contract Documents shall be construed as relieving Contractor of full responsibility for providing shoring, bracing, sloping or other provisions adequate to guarantee worker protection and safety.

1. Vertical supports including steel H-beams and piles shall be drilled into place, except final 4' may be driven.

2. Where drilling is impracticable because of rocks or running sand, Owner's Representative may accept placing of vertical supports by means other than drilling, provided Contractor assumes sole responsibility to protect existing surface and subsurface improvements in place.

3. If sheeting is used for trench support, no sheeting shall remain in trench upon project completion except where removal of portions of said sheeting is impracticable in opinion of Owner's Representative.

4. Access ladders shall be provided within 25 feet of all workers as required by OSHA regulations.

I. No material shall cause undue interference with public travel. Provide free access to all fire hydrants, water valves, meters, and private drives, or other property or facilities that may have routine or emergency use.

J. Do not deposit backfill against new concrete structures until concrete has developed specified 28-day compressive strength.

3.2 Installation

A. Refer to Sections 01 73 00 and 01 73 33 for basic execution and installation requirements.

B. Furnish and install excavation and fill at locations shown on Plans and Submittals.

C. The following installation standards shall be followed:

1. Requirements of contract-referenced soils reports and investigations.

2. Manufacturer's installation and warranty requirements

3. Applicable OSHA and Cal OSHA regulations

4. California Building Code Chapter 18 "Soils and Foundations."

5. Standard Specifications for Public Works Construction (Greenbook) Section 300 "Earthwork"

6. Standard Specifications for Public Works Construction (Greenbook) Section 306-1 "Open Trench Excavations"

7. Other applicable building code requirements

D. Refer variances between above documents and Contract Documents to Owner's Representative.

E. Earthwork within public rights-of-way controlled by a state, county or city, or earthwork within railroad rights-of-way shall be in accordance with requirements and provisions of permits issued by those agencies for construction within their respective rights-of-way. Such permit requirements and provisions which are more restrictive than those specified herein, shall take precedence and supersede provisions of Contract Documents.

F. Should contaminated soil be encountered, Contractor shall perform the following activities:

1. Promptly notify Owner's Representative contaminated or potentially contaminated soil has been encountered so Owner may identify party legally responsible for disposal of contaminated soil and properly direct Contractor how to proceed.

2. Conduct work in contaminated areas in accordance with applicable OSHA and Cal OSHA regulations.

3. Segregate and cover contaminated soils prior to removal from site.

4. Dispose of contaminated soils as directed by Owner and as required by law.

G. Should excavation be carried below lines and grades shown, refill excavated space to proper elevation with material as specified in Part 2 above for correction of faulty grades after overexcavation.

H. Site grading and general excavation shall proceed as follows:

1. Stripping: Strip all vegetation such as roots, brush, heavy sods, heavy growth or grass, and all decayed vegetable matter, rubbish, and other unsuitable materials within area of Work prior to starting excavation or embankment. Trees and other natural growths outside actual lines of construction operations shall not be destroyed and such

measures as are necessary shall be taken by Contractor, at their own expense, for protection thereof.

2. Excavation: After stripping, excavation of whatever substances are encountered within grading limits of Work shall be carried to lines and grades shown. All suitable excavated material shall be used to meet embankment requirements of Work. Material in excess or not suitable for embankment shall be disposed of as specified herein.

3. Embankment: After stripping, areas to receive embankment or fill shall be benched, if sloping, and scarified to a depth of 6“, then compacted as specified.

4. If ground is in loose, uncompacted condition after stripping, it shall be compacted as specified. Do not deposit unsuitable material in fill areas where compaction is required.

5. Unless special material is required, material for embankments or roadway fills may consist of excavated material from structures or a mixture of excavated materials and materials borrowed off-site. Leaves, grass, roots, stumps, sludge, and other organic matter shall not be deposited in any embankment or fill. Off-site sources of fill must be designated and are subject to evaluation and approval by Owner’s Representative.

6. Do not place material beyond sloping lines of embankment unless so ordered by Owner’s Representative. Material allowed to be placed beyond embankment lines shown shall be compacted as required above unless otherwise authorized by Owner’s Representative.

7. Compact material for embankments or roadway fills by rolling with power rollers weighing at least ten tons, with sheepsfoot rollers, with vibrating rollers, or with pneumatic tire rollers, as appropriate for soil type being compacted, and as required to accomplish Work. As each layer is deposited, apply water in sufficient amounts to ensure optimum moisture to secure compaction specified. If excess moisture is encountered in fill, manipulate each layer so as to dry out excess moisture. Water shall be uniformly incorporated with fill material in amount sufficient to ensure required density after compaction.

8. Use of trucks, carryalls, scrapers, tractors, or other heavy hauling equipment shall not be considered as rolling in lieu of rollers, but traffic of such equipment shall be distributed over fill in such manner as to use compaction afforded thereby as an addition to compaction by rollers.

9. Excavate and fill to lines and grades shown with maximum slope not exceeding that shown.

10. Plan haul routes to avoid passing heavy off-highway equipment over pipelines with less than 4’ cover. Where crossings must be made, provide concrete encasement or accepted bridging.

11. Finish: All areas covered by Work, including excavated and filled sections and transition areas, shall be uniformly graded to elevations shown. Finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. Round edges of spoil and borrow areas to blend into natural contours. Degree of finish ordinarily obtainable from a blade grader will be satisfactory for open areas, but hand grading and raking will be required around structures and walkways. Finished surface shall be not more than 0.1-foot above or below established grade and sloped to prevent ponding.

I. Structural excavation shall proceed as follows:

1. Excavation of all material of whatever nature necessary for construction of structures and foundations shall be carried out to lines and grades shown, and as required to provide working clearance and safe construction slopes and to emplace shoring, sheeting, bracing, and other Work required.

2. Except when concrete is authorized to be placed directly against excavated surfaces, establish clear space at sides of excavation to facilitate form construction and removal and provide for excavation protective support system.

3. Where concrete is to be placed on original ground without subgrade preparation, do not use machinery using teeth nearer than 3" from any finished subgrade. Remove last 3" without disturbing subgrade.

4. Do not place backfill until structure footings or other portions of structure or facility have been inspected by Owner's Representative and accepted for backfilling.

5. Place backfill in horizontal layers, moistened and tamped, rolled or otherwise compacted.

6. Water settling will not be permitted. Place backfill so no additional unbalanced loading occurs during placing.

7. Take care when backfilling to obtain adequate compaction beneath pipes and to avoid injury or displacement of such pipes.

J. Pervious material shall be placed as follows:

1. Place pervious material in layers following specifications for structural backfill.

2. Pervious material at any location shall come from the same plant and conform to the same grading.

3. Where pervous material would be exposed to erosion, cover with 12 layer of topsoil or other earthy material accepted by Owner's Representative.

K. Weep holes shall be backed with 2 cubic feet of coarse aggregate conforming to No 3 coarse aggregate or Grading C as described in Section 03 30 00.

1. Before placing aggregate, attach 8" square of ¼" galvanized or aluminum screen having minimum wire diameter of 0.03" to back of weep hole.

2. Securely tie aggregate in burlap sack.

3. Place so backing covers weep holes and extends at least 12" above bottom of opening.

L. Trench excavation and backfill for pipelines, pipeline structures, box culverts, and conduits shall proceed as follows:

1. Alignment and grade for pipe shall be as shown. When flow line is shown, it shall be invert or interior bottom of pipe. When top of pipe is shown, it shall be exterior of pipe barrel. In absence of such profile grade, pipe shall be laid on straight grade to permit complete drainage and to provide at least 36" of cover to finish ground or street subgrade unless otherwise shown.

2. Where natural ground above pipeline trench has been overexcavated and/or pipeline is to be placed in new embankment, place and compact embankment material to elevation at least 12" above top of pipe prior to trench excavation.

3. Except where specified otherwise in Contract Documents or permits or where documented acceptance is obtained from Owner's Representative; maximum length of open trench shall be 500' , or distance necessary to accommodate amount of pipe installed in one day, whichever is greater. Distance is collective length at any location, including open excavation, pipe laying, and appurtenance construction and backfill which has not been temporarily resurfaced.

4. Except where documented acceptance is obtained from Owner's Representative, maximum length of open trench in any location where concrete structures are cast in place shall be that necessary to permit uninterrupted progress. Pursue construction as follows:

    a. Excavate

    b. Set steel reinforcement

    c. Place floor slab,

    d. Place walls,

    e. Place cover slab, roof or arch.

    f. Allow concrete to cure.

    g. Backfill

    Each operation shall follow in sequence, and no operation shall precede a subsequent operation by more than 200'.

5. Failure of Contractor to comply with specified limitations may result in order to halt work until such time as compliance is achieved.

M. Unless otherwise shown, minimum and maximum pipe trench width measured at top of pipe zone (12" above pipe crown) shall be as shown below, where D=nominal pipe diameter.

GRAVITY PIPE MATERIAL	**APPLICABLE SPECIFICATION**	**NOMINAL PIPE SIZE (INCHES)**	**SIDE CLEARANCE (INCHES)**	
			MINIMUM	**MAXIMUM**
Vitrified Clay Pipe	ASTM C12 Section 6	All sizes	6" or as shown on Plans	as shown on Plans
Prefabricated Concrete Pipe	ASTM C1479	≤ 36"	6" or as shown on Plans	D or as shown on Plans
		> 36"	D/6 or as shown on Plans	as shown on plans
Corrugated Metal Pipe	SSPWC 306-7.6	All sizes	8"	As shown on plans
Plastic Pipe	ASTM D2321 Paragraph 6.3	≤ 16"	8"	12"
		18"-30"	6"+D/8	18"
		> 30	As shown on plans	
PRESSURE PIPE MATERIAL	**APPLICABLE SPECIFICATION**	**NOMINAL PIPE SIZE (INCHES)**	**SIDE CLEARANCE (INCHES)**	
			MINIMUM	**MAXIMUM**
Ductile Iron	AWWA C600	All sizes	12"	as shown on plans

Pipe	Section 4.3.2.3 and AWWA M41			
Steel Pipe	AWWA C604 Section 4.4.2.3 and AWWA M11	All sizes	6" or as shown on plans	as shown on plans
Concrete Pressure Pipe	AWWA C604 Section 4.4.2.3 and AWWA M9	All sizes	6" or as shown on plans	as shown on plans
PVC Pressure Pipe	AWWA C605 AWWA M23	≤ 16"	8"	12"
		18"-30"	6"+D/8	18"
		> 30"	As shown on plans	
HDPE Pressure Pipe	AWWA M55	≤ 16"	8"	12"
		18"-30"	6"+D/8	18"
		> 30"	As shown on plans	
Fiberglass Pressure Pipe	AWWA M45 Section 6.6	≤ 16"	8"	12"
		18"-30"	6"+D/8	18"
		> 30"	As shown on plans	

N. If maximum trench width is exceeded on either side of pipe, provide one of the following remedial measures at no additional cost to Owner.

1. Backfill trench with material specified for "Backfill for Over-Excavation" in Part 2 above to cradle pipe to spring line, or

2. Modify bedding based on calculations accepted by Owner's Representative to accommodate wider trench width, or

3. Substitute higher-strength pipe based on calculations accepted by Owner's Representative to accommodate wider trench width.

O. Trench bottom preparation shall proceed as follows:

1. Grade trench bottom to provide smooth, firm, and stable foundation at every point throughout length of pipe. Transfer construction stake grades into trench as needed to ensure trench bottom is accurately graded. Place any special bedding required by Contract Documents.

4. Prepare pipe subgrade at trench bottom for specific type of pipe material being installed in accordance with Specifications for said pipe.

5. Should large gravel and cobbles be encountered at trench bottom or pipe subgrade, remove such items from beneath pipe and replace with granular material compacted to provide uniform support and a firm foundation.

6. Whenever trench bottom does not afford a sufficiently solid and stable base to support pipe or appurtenances, excavate below normal trench bottom and replace it with crushed rock or gravel of sufficient thickness to form an unyielding foundation.

7. If excessively wet, soft, spongy, unstable, or similarly unsuitable material is encountered at subgrade, remove unsuitable material and replace with crushed rock or gravel of sufficient thickness to form an unyielding foundation.

8. Accurately shape pipe subgrade to fit pipe bottom using drag template or other suitable method. At each pipe joint, recess trench bottom to relieve pipe bells, couplings or flanges of all load.

9. Payment for removal of material and additional backfill required shall be in accordance with Contract Documents. However, if necessity for such additional bedding material has been occasioned by an act or failure to act on part of Contractor, Contractor shall bear expense of additional excavation and backfill to required depth.

10. Contractor's attention is called to their responsibilities in maintaining adequate dewatering procedures to ensure an otherwise stable foundation will not be rendered unfit due to accumulation of water in trench.

11. Where rock is found, removed rock below grade and backfill trench with clean imported sand to provide a compacted foundation cushion with a minimum allowable thickness of 6" under outside diameter of pipe barrel and a clear space of 4" under pipe bell. Payment for removal of rock and additional backfill shall be in accordance with Contract Documents.

P. Backfill over pipe shall proceed as follows:

1. After pipe has been properly laid, exterior joints grouted and inspected, begin backfilling operations using material as specified above.

2. Contractor will be held responsible for any displacements of pipes or other structures, any damage to them or any instability caused by improper depositing of backfill material or improper use or handling of tools or equipment.

3. Backfill pipe located in public traveled right-of-way at end of each day's operations in accordance with applicable permit requirements. Remove spoil piles from traffic lanes by end of working day.

4. Mechanical densification or compaction of backfill shall use rolling, vibrating or impact means, or a combination thereof. Method or methods used shall result in obtaining compaction of backfill in various specified zones and within maximum lifts specified. Densification or compaction method or methods used shall not damage pipe, adjacent ground, existing improvements, or improvements installed as part of Work.

5. Place material for mechanically compacted backfill in lifts which, prior to compaction, shall not exceed depths specified for various types of equipment.

TYPE OF COMPACTION EQUIPMENT	MAXIMUM LIFT DEPTH
Hand-directed mechanical tampers	≤ 6" in pipe zone, ≤ 8" elsewhere.
Impact, free-fall, or "stomping" equipment	≤ 36" (Do not use over concrete pipe, cement-mortar lined pipe or PVC.
Vibratory equipment with smooth contact surface	≤ 24"
Rolling equipment, including, vibratory-interrupted surface equipment	≤ 12"

6. Contractor is advised water settling in pipe zone triggers requirement under AWWA C651 paragraph 5.1.2 to perform bacteriologic testing at 200-foot intervals instead of 1200-foot intervals. Should Contractor elect to use water settling for potable water pipelines, Contractor shall perform additional disinfection required under AWWA C651 at no additional cost to Owner.

7. Water settling may be used in pipe zone and trench zone in lieu of mechanical compaction, only where material being backfilled is sufficiently sandy and permeable so specified compaction is achieved. Densification by saturation shall be accomplished by inserting a pipe, through which water is being supplied under pressure, to bottom of lift of material to be consolidated, and applying to each square

yard or lesser surface area in this manner sufficient water to completely saturate overlying backfill and cause obvious settlement. Where water settling is used, exercise care to prevent pipe from floating. Do not use water settling in street zone.

8. Contractor may use densification by saturation only when it has been determined it will not result in damage to adjacent ground, existing improvements or improvements installed for Work, and that it is appropriate to obtain specified compaction. Some encroachment permits limit methods of densification or compaction. In addition, use of densification by saturation is subject to all the following requirements.

    a. Apply water in manner, quantity and rate sufficient to saturate thickness of lift being densified.

    b. Vibrating compacting equipment may be necessary to supplement water saturation process where required densities cannot be attained by saturation alone.

    c. Lift thickness of backfill shall not exceed that which can be readily densified by saturation procedure. In no case shall undensified lift exceed 5-feet.

    d. Character of material excavated from trench may be generally, or in zones, unsuitable or densification with water. In this case, Contractor may, at no additional cost to Owner, import suitable material for saturation, or densify excavated material by mechanical compaction. If water does not readily drain from trench, it shall be removed by sump pump.

9. Control of Trench Backfill by Zones: Whether mechanical compaction or densification by water saturation is employed, backfill shall be constructed by zones, and compaction requirement for each zone followed unless otherwise specified.

Q. Backfill in pipe zone shall occur as follows:

1. Hand-place backfill simultaneously on each side of pipe for full trench width, moistened as required to achieve specified compaction.

2. In placing and compacting backfill, give particular attention to underside of pipe and fittings to provide firm support along full pipe length.

3. Place warning and locator tape at distance above top of pipe specified above.

4. Take care in backfilling to avoid damage to pipe coating, locating tape and any conduits that may be installed in pipe zone. Complete pipe zone compaction before covering it with trench zone material.

R. Backfill in trench zone shall use either mechanical compaction or water settling, depending on nature of material. Complete trench zone compaction before covering it with street zone material.

S. Backfill in street zone shall occur as follows:

1. Backfill in traveled ways and public streets shall be in accordance with right-of-way agreement, encroachment permit or applicable regulations of agency having jurisdiction over traveled way. In absence of such provisions, compact soil by accepted hand-, pneumatic or mechanical-type tampers.

2. Water consolidation will not be permitted.

3. Construct pavement section in accordance with Contract Documents.

T. Soil sterilant shall be applied as follows:

1. Treat finished subgrade of specified areas with accepted soil sterilant. Apply sterilant in liquid or dry form at uniform rate of not less than 8 ounces of dry sterilant per square yard in accordance with Manufacturer's directions. At option of Owner's Representative, area shall then be lightly sprinkled with water to prevent loss of sterilant or scuffing.

2. Areas to receive soil sterilant include all areas to receive asphalt concrete or Portland cement concrete structures and pavement, including embankments, walkways, slabs, drainage structures, parking, and road areas.

3. Other areas requiring soil sterilant are storage reservoir or pond surfaces to receive any lining material of less than 3" in thickness and lining perimeter areas to distance of 5' from edge of lining material.

4. Install soil sterilant and other products according to manufacturer's installation and warranty requirements. Manufacturers requirements for installation, application, and use of products shall be strictly followed.

5. Refer variances between Manufacturer's application instructions and Contract Documents to Owner's Representative.

3.3 Field Quality Control

A. An Owner-approved soils-testing firm hired by Contractor shall provide continuous inspection of fill and will field test fill and earth backfill as placed and compacted, and inspect excavations and subgrade before concrete is placed and provide periodic inspection of open excavations, embankments, and other cuts or vertical surfaces of earth.

B. Owner-approved soils-testing firm hired by Contractor shall provide laboratory results to Owner's Representative who will determine whether fills have been placed in accordance with Contract Documents.

C. Owner's Representative may require deepening of footings and order such deepening based on uncovered soil conditions.

D. Whenever excavated material is not suitable for backfill, Contractor shall at their expense arrange for and furnish suitable imported backfill material which is capable of attaining specified relative density. Contractor shall also arrange for removal and off-site disposal of unsuitable excavated material at their own expense.

E. Special inspection and field testing required by Chapter 17 of CBC (Table 1704.7) for controlled fill shall be completed by an ICBO-certified special inspector selected by Owner and shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Subgrade Beneath Controlled Fill	Preparation of Site Beneath Fill	CBC Section 1704.7 and Soils Report	Periodic per CBC Table 1704.7	Owner	Contractor to reimburse Owner for costs of first

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Controlled Fill	Classification and Testing of Controlled Fill Materials				deputy inspector if re-inspection is required
	Materials, Densities and Lift Thicknesses		Continuous per CBC Table 1704.7		

F. Special inspection and field testing required by Chapter 17 of CBC (Table 1704.7) for subgrade beneath structures, footings and foundations shall be completed by an ICBO-certified special inspector selected by Owner and shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Subgrade Beneath Structures and Footings	Material and Bearing Capacity Verification	CBC Section 1704.7 and Soils Report	Periodic per CBC Table 1704.7	Owner	Contractor to reimburse Owner for costs of first deputy inspector if re-inspection is required
	Excavation Depth and Material Verification				

G. Additional field testing of earthwork shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Backfill or Soil Prepared in Place	Sampling	ASTM D75	As directed	/ Contractor	Contractor
	Sieve Analysis	ASTM C136 or California Test Method 202	As directed	Contractor	Contractor
	Sand Equivalence	California Test Method 217	As directed	Contractor	Contractor
	Trench Width	Width specified in Part 2 above	As directed	Owner	Contractor
	Bedding Thickness	Depth specified in Part 2 above	As directed	Owner	Contractor
	Rock Size in Backfill	Size specified in Part 2 above	As directed	Owner	Contractor
	Compaction (Laboratory Density Relations)	ASTM D1557 or California Test Method 216	As directed	Contractor	Contractor
	Field Density of Soil in Place	ASTM D1556 or ASTM D6938	As directed 300-foot maximum interval in trenches	Contractor	Contractor
	Field Density of Cohesionless Soils	ASTM D4253 and D4254	As directed	Contractor	Contractor
	11-Month Warranty Inspection	Demonstrate no visible pavement sags above pavement cut	1 inspection	Owner	Contractor
Concrete Slurry	Slump (6" maximum)	ASTM C143	1 each batch	Owner	Contractor

H. For testing purposes, percentages shall be determined by weight.

I. Make all necessary excavations for compaction and other soils tests as directed by Owner's Representative.

F. "Relative compaction" is ratio, expressed as percentage, of in-place dry density to laboratory maximum dry density.

G. Compaction shall be deemed to comply with Contract Documents when no more than one test of any 3 consecutive tests falls below specified relative compaction. Failing test shall be no more than 3 percentage points below specified compaction. Contractor shall pay costs of any retesting of Work not conforming to Contract Documents.

J. Allow sufficient time for testing and evaluation of results before material is needed. Owner's Representative will be sole and final judge of suitability of all materials.

K. Do not use materials in question pending test results.

L. Contractor shall remove unsatisfactory material, recompact, adjust moisture or compaction methods, place new material, and perform other operations necessary to meet Contract requirements as directed by Owner's Representative whose decisions and directions will be considered final on these matters.

M. Owner's Representative will not provide and is not being paid to provide directions or submittal review regarding Contractor's excavation safety procedures. Any questions or concerns of Owner's Representative will be referred to CAL/OSHA whose decisions or directions shall be considered final.

3.9 Adjusting and Cleaning

A. Make necessary arrangements for and remove and dispose of all surplus excavated material off-site, unless otherwise provided for in Contract Documents. All costs for disposal of surplus waste material shall be borne by Contractor.

B. Dispose of all surplus material not required for backfill or fill. Disposal shall occur outside limits of public rights-of-way and/or easements. Disposal shall comply with applicable ordinances and regulations of governmental agencies having jurisdiction and shall be done at no cost or liability to Owner.

C. Do not deposit excavated material on private property unless written permission from property owner is secured by Contractor. Before Owner will accept Work as being completed, Contractor shall file written release signed by all property owners with whom they have entered into agreements for disposal of surplus excavated material absolving Owner from any liability connected therewith.

D. Do not deposit excess material in water courses or other locations where disposed material will interfere with natural drainage.

E. After backfill is completed, dress site smooth and leave site in neat and presentable condition, free of all cleared vegetation, rubbish and other construction wastes. Haul away and legally dispose of surplus rock or other excavated material which cannot be used for backfill. Areas next to structures where blade-type equipment cannot reach shall be hand raked.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 31 23 33
TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 Work Included

A. Where both structural and trench excavation are expected on a project, use Section 31 23 00 “Excavation and Fill” instead of this section.

B. Trench excavation activities as required to complete Work under wet and dry conditions in whatever material or class of material is encountered, including:

1. Contacting and notifying underground utilities, no less than 48-hours before excavating in accordance with Section 31 05 50.

2. Compliance with State and Federal safety regulations.

3. Designing, furnishing, placing, and removing all sheeting, shoring and bracing needed to safely support sides of excavations.

4. Compliance with applicable agencies’ permit conditions for Work in public or railroad right-of-way, and for Work on private property.

5. Loosening, excavating, removing, loading, and transporting excess soil from excavations.

6. Stockpiling, exporting and importing material.

7. Pumping, ditching, draining, and other required measures to remove or exclude water.

8. Supporting and protecting structures above and below ground.

9. Maintaining trees not permitted to be removed.

10. Preparing and stabilizing subgrade for pipe, paving and structures.

11. Backfilling around structures and all backfilling of trenches and pits.

12. Transporting, depositing, and compacting fill where required.

13. Compaction testing (where stipulated as a Contractor responsibility in Section 3.3 paragraph E.)

14. Legal disposal of cleared, grubbed and excess excavated materials.

15. Cleaning up debris, papers and loose rocks.

16. Restoring fences and other disturbed property.

17. All other incidental earthwork and supplementary operations needed to complete Work.

C. Excavations for appurtenant structures including manholes, transition structures, junction structures, vaults, valve boxes, catch basins, thrust blocks, and boring pits shall be considered as trench excavation.

D. Excavation shall include removal of all water and materials of any nature which interfere with construction work. Removal of water to levels below structure subgrade will be necessary only where required by Contract Documents.

E. Excavation for pipe and conduit work shall be by open trench unless otherwise shown. Should Contractor elect to tunnel or jack any portion not so specified, they shall first obtain acceptance from Owner's Representative, and payment will be limited to prices bid for open

F. Except as modified herein, earthwork shall conform to Standard Specifications for Public Works Construction (Greenbook) Section 300.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 01 73 24: Seismic Restraint
H. Section 01 73 33: Mechanical Identification
I. Section 31 05 16: Aggregate and Rock Products for Earthwork
J. Section 31 10 00: Site Clearing
K. Section 31 05 50: Protecting Existing Utilities
L. Section 31 23 00: Excavation and Fill
M. Section 32 12 16: Asphalt Paving
N. Section 32 13 13: Concrete Paving

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 References

A. ASTM C12 Installing Vitrified Clay Pipe Lines
B. ASTM C143 Slump of Hydraulic Cement Concrete
C. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates
D. ASTM C1479 Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe
E. ASTM D1556 Density and Unit Weight of Soil in Place by SandCone Method
F. ASTM D1557 Laboratory Compaction Characteristics of Soil Using Modified Effort
G. ASTM D2321 Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Application
H. ASTM D4253 Maximum Index Density and Unit Weight of Soils Using Vibratory Table
I. ASTM D4254 Maximum Index Density and Unit Weight of Soils and Calculation of Relative Density
J. ASTM D6938 In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
K. AWWA C600 Installation of Ductile Iron Water Mains and Their Appurtenances
L. AWWA C604 Installation of Steel Water Pipe – 4" and Larger
M. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
N. AWWA M9 Concrete Pressure Pipe
O. AWWA M11 Steel Pipe – A Guide for Design and Installation
P. AWWA M23 PVC Pipe – Design and Installation

Q. AWWA M41 Ductile Iron Pipe and Fittings
R. AWWA M55 PE Pipe – Design and Installation
S. California Test Method 202 Sieve Analysis of Fine and Coarse Aggregates
T. California Test Method 216 Relative Compaction of Untreated and Treated Soils and Aggregates
U. California Test Method 217 Sand Equivalent
V. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 306 "Open-Trench Excavations"

1.6 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Permits	Copies of permits obtained for excavation, grading, etc. required by state and local governing authorities	
Certificate of Compliance	Submit affidavit of compliance with California Construction Safety Order requirements prior to beginning excavation on any trench or excavation. Affidavit shall certify compliance with all shoring, bracing, sloping or other protective system provisions required by California Construction Safety Orders for worker protection from hazard of caving ground during excavation.	

B. Refer to Section 01 33 00 / 02 05 00 for definition of requirements for catalog data and certificates of compliance.

1.7 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 / 02 05 00 for delivery storage and handling requirements.

1.8 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

B. Volumes of excavation and backfill used to compute additional payments or deductions shall be as follows:

1. Trench widths for pipe: Use maximum width specified, measured at top of pipe.

2. Trench widths for cast-in-place structures or cast-in-place foundations for precast structures: Use outside width of structure or foundation plus 3'.

C. In absence of pay items for contaminated soils, Contractor shall be entitled to payment as Extra Work for documented costs incurred by Contractor for removing, segregating, covering, and legally disposing of contaminated soils. Contractor shall not be entitled to payment for imported material to replace contaminated soils.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Buried Pipe Warning-Locating and Identification Tape	See Section 33 05 26	

2.2 Materials

A. Refer to Section 01 61 00 for basic requirements for products and materials.

B. Refer to Section 31 05 16 for basic requirements for aggregate and rock products.

C. The following definitions shall apply to soil and backfill:

ITEM	MATERIAL	SPECIFICATION
Granular Material	Sand or Gravel	California Test Method 217 minimum sand equivalence of 30 Not more than 20% of material shall pass through 200-mesh sieve.
Imported Sand	Sand	California Test Method 217 minimum sand equivalence of 30
Suitable Soil Material	Imported or Excavated Material Meeting Specification	Material free from shale, sod, stones, concrete and clods over 2" / 4" / 6" diameter, roots, trash, lumber, organic material, ashes and other debris considered unsuitable by Owner. Material shall have no unusual color or sulfide odor. Compact to specified densities.
Cement-Sand Slurry	Cement (94-lb sacks per cubic yard of mix)	1 / 2 sacks per cubic yard minimum, and not less than that required by applicable agency encroachment permits
	Maximum Slump	5" / 6" maximum per ASTM C143
Native Material	Material obtained from required site excavations When native material is unsuitable for use in backfill, it shall be disposed of off-site and suitable material capable of being compacted to required relative density shall be furnished by Contractor at their expense.	
Import Material	Owner-accepted material obtained from off-site borrow areas.	
Buried Pipe Warning-Locating and Identification Tape	See Section 33 05 26. See section on appropriate utility pipe or conduit material for required message	

D. Soil and backfill materials for pipelines and utilities shall be prepared to the following specifications:

ITEM	MATERIAL	SPECIFICATION
Backfill for Over-Excavation Beneath Pipes	Cement-Sand Slurry	Cement-sand slurry mix specified above
	Suitable Soil Material (where cement-sand slurry not required)	90% compaction per ASTM D1557 or California Test Method 216
Backfill of Tunnels beneath Concrete Flatwork	Sand	90% compaction per ASTM D1557 or California Test Method 216
Pipe Zone Material (Material from 4" / 6" below pipe to plane 12" above top of pipe)	Native or Imported Granular Material	Place buried identification tape where specified 90% / 95% compaction per ASTM D1557 or California Test Method 216 or California Test Method 217 Minimum sand equivalence of 30 Material shall also be suitable soil material as defined above. Maximum lifts vary with equipment. See below.
Trench Zone Material (Material	Cement-Sand Slurry	Cement-sand slurry mix specified above

ITEM	MATERIAL	SPECIFICATION
in Pipe Trench above Pipe Zone and below any Street Zone)	Suitable Soil Material (where cement-sand slurry not required)	90% / 95% compaction per ASTM D1557 or California Test Method 216 Maximum lifts vary with equipment. See below. May contain stones, asphalt pavement or concrete of up to 6" in largest dimension so long as such solids are completely surrounded by fines so no voids are present in backfill as placed. No material >2" in any dimension shall be placed within one foot of any pipe, valve, or structure. All backfill within 24" of ductile-iron fittings or valves shall be clean, washed sand. Provide buried pipe warning and locator tape in pipe trench 6"-12" / 18" above pipe.
Street Zone Material (Base material in pipe trench below pavement subgrade to depth of 30" below finished road surface.	Crushed Aggregate Base Material	95% compaction per ASTM D1557 or California Test Method 216 Conform to Section 200-2.2, crushed aggregate base of SSPWC Contractor may substitute on-site materials conforming to Section 200-2.5, Processed Miscellaneous Base of SSPWC Maximum lifts vary with equipment. See below. Material shall also be suitable soil material as defined above. Stones concrete and clods smaller than specified limit may not exceed 20% of backfill volume over any pipe segment. Place in 8" maximum lifts.
Surface Zone Material (upper 12" below finish surface in unimproved or landscaped areas)	Topsoil per Section 32 90 00	80% compaction per ASTM D1557 or California Test Method 216 Maximum lifts vary with equipment. See below.

PART 3 - EXECUTION

3.1 Preparation

A. Contractor's attention is directed to possible existence of pipe and other underground improvements which may or may not be shown on Plans. Preserve and protect any such improvements whether shown or not. Where necessary to remove and replace or to relocate such improvements to prosecute Work, improvements shall be removed, maintained, and permanently replaced by Contractor at their expense, except as otherwise provided in Contract Documents.

B. Section 4216 of California Government Code states Contractors *"planning to conduct any excavation shall contact the appropriate regional notification center at least two working days but not more than 14 calendar days, prior to commencing excavation."*

C. Control of runoff and groundwater shall comply with the following:

1. Control grading to prevent water running into excavations. Do not obstruct surface drainage. Provide swales, gutters temporary drains or other means of channeling flow without interruption around excavations.

2. Preserve existing drainage patterns except as otherwise shown. Where construction methods cause temporary obstruction of drainage patterns, provide temporary facilities adequate for expected flows and a means of emergency removal of obstruction.

3. Procure permit from appropriate Regional Water Quality Control Board for all groundwater dewatering operations.

4. Provide and maintain ample means and devices and promptly remove and properly dispose of all water from any source entering excavation or other parts of Work. Dewatering methods shall ensure preservation of final lines and grades of bottoms of excavations. Said methods may include well points, sump points, suitable rock or gravel placed below required bedding for drainage and pumping purposes, temporary pipelines, and other means that will not be detrimental to proposed construction. Contractor is responsible for obtaining all water discharge permits required.

5. Dewatering for structures and pipelines shall commence when groundwater is first encountered and shall continue until water can be allowed to rise in accordance with provisions of this section.

6. Do not place concrete footings or floors in water. Do not allow water to rise over Work until concrete or mortar has set at least 8 hours. Do not allow water to rise unequally against walls for 28 days. Do not allow groundwater to rise around pipe until jointing compound in joints has set hard.

7. Dispose of water in suitable manner without damage to adjacent property. Do not drain water into Work built or under construction without prior consent of Owner's Representative. Dispose of water according to permits and in such manner as not to be a menace to public health and public or private property.

D. Remove and replace asphalt paving improvements per Section 32 12 16.

E. Remove and replace concrete paving improvements per Section 32 13 13.

F. Obtain written permission from Owner prior to any blasting or use of explosives. Explosives, if used, shall be of such quantity and power and shall be used in such locations as to minimize opening of seams and disturbing of material outside prescribed excavation limits. As excavation approaches its final limits, reduce depths of holes for blasting and quantity of explosives used for each hole so to minimize disturbance of underlying or adjacent material.

G. Protection open excavations, complying with latest revision of rules, orders and regulations of Division of Industrial Safety of State of California. Nothing contained in these Contract Documents shall be construed as relieving Contractor of full responsibility for providing shoring, bracing, sloping or other provisions adequate to guarantee worker protection and safety.

    1. Vertical supports including steel H-beams and piles shall be drilled into place, except final 4' may be driven.

    2. Where drilling is impracticable because of rocks or running sand, Owner's Representative may accept placing of vertical supports by means other than drilling, provided Contractor assumes sole responsibility to protect existing surface and subsurface improvements in place.

    3. If sheeting is used for trench support, no sheeting shall remain in trench upon project completion except where removal of portions of said sheeting is impracticable in opinion of Owner's Representative.

    4. Access ladders shall be provided within 25 feet of all workers as required by OSHA regulations.

H. No material shall cause undue interference with public travel. Provide free access to all fire hydrants, water valves, meters, and private drives, or other property or facilities that may have routine or emergency use.

I. Obtain written permission from Owner prior to any blasting or use of explosives. Explosives, if used, shall be of such quantity and power and shall be used in such locations so as to minimize opening of seams and disturbing of material outside prescribed excavation limits. As excavation approaches its final limits, reduce depths of holes for blasting and quantity of explosives used for each hole so to minimize disturbance of underlying or adjacent material.

J. Do not deposit backfill against new concrete structures until concrete has developed specified 28-day compressive strength.

3.2 Installation

A. Refer to Sections 01 73 00 and 01 73 33 for basic execution and installation requirements.

B. Furnish and install excavation and fill work at locations shown on Plans and Submittals.

C. The following installation standards shall be followed:

1. Requirements of contract-referenced soils reports and investigations.

2. Manufacturer's installation and warranty requirements

3. Applicable OSHA and Cal OSHA regulations

4. California Building Code Chapter 18 "Soils and Foundations."

5. Standard Specifications for Public Works Construction (Greenbook) Section 306-1 "Open Trench Excavations"

6. Other applicable building code requirements

D. Refer variances between above documents and Contract Documents to Owner's Representative.

E. Earthwork within public rights-of-way controlled by a state, county or city, or earthwork within railroad rights-of-way shall be in accordance with requirements and provisions of permits issued by those agencies for construction within their respective rights-of-way. Such permit requirements and provisions which are more restrictive than those specified herein, shall take precedence and supersede provisions of Contract Documents.

F. Should contaminated soil be encountered, Contractor shall perform the following activities:

1. Promptly notify Owner's Representative contaminated or potentially contaminated soil has been encountered so Owner may identify party legally responsible for disposal of contaminated soil and properly direct Contractor how to proceed.

2. Conduct work in contaminated areas in accordance with applicable OSHA and Cal OSHA regulations.

3. Segregate and cover contaminated soils prior to removal from site.

4. Dispose of contaminated soils as directed by Owner and as required by law.

G. Should excavation be carried below lines and grades shown, refill excavated space to proper elevation with material as specified in Part 2 above for correction of faulty grades after over-excavation.

H. Trench excavation and backfill for pipelines, pipeline structures, box culverts, and conduits shall proceed as follows:

1. Alignment and grade for pipe shall be as shown. When flow line is shown, it shall be invert or interior bottom of pipe. When top of pipe is shown, it shall be exterior of pipe barrel. In absence of such profile grade, pipe shall be laid on straight grade to permit complete drainage and to provide at least 36" cover to finish ground or street subgrade unless otherwise shown.

2. Where natural ground above pipeline trench has been over-excavated and/or pipeline is to be placed in new embankment, place and compact embankment material to elevation at least 12" above top of pipe prior to trench excavation.

3. Except where specified otherwise in Contract Documents or permits or where documented acceptance is obtained from Owner's Representative; maximum length of open trench shall be 300' , or distance necessary to accommodate amount of pipe installed in one day, whichever is greater. Distance is collective length at any location, including open excavation, pipe laying, and appurtenance construction and backfill which has not been temporarily resurfaced.

4. Except where documented acceptance is obtained from Owner's Representative, maximum length of open trench in any location where concrete structures are cast in place shall be that necessary to permit uninterrupted progress. Pursue construction as follows:

    a. Excavate

    b. Set steel reinforcement

    c. Place floor slab,

    d. Place walls,

    e. Place cover slab, roof or arch.

    f. Allow concrete to cure.

    g. Backfill

    Each operation shall follow in sequence, and no operation shall precede the subsequent operation by more than 200'.

5. Failure of Contractor to comply with specified limitations may result in order to halt work until such time as compliance is achieved.

E. Unless otherwise shown, minimum and maximum pipe trench width measured at top of pipe zone (12" above pipe crown) shall be as shown below, where D=nominal pipe diameter.

GRAVITY PIPE MATERIAL	APPLICABLE SPECIFICATION	NOMINAL PIPE SIZE (INCHES)	SIDE CLEARANCE (INCHES)	
			MINIMUM	MAXIMUM
Vitrified Clay	ASTM C12 Section	All sizes	6" or as shown on Plans	as shown on Plans

Pipe	6			
Prefabricated Concrete Pipe	ASTM C1479	≤ 36”	6” or as shown on Plans	D or as shown on Plans
		> 36”	D/6 or as shown on Plans	as shown on plans
Corrugated Metal Pipe	SSPWC 306-7.6	All sizes	8”	As shown on plans
Plastic Pipe	ASTM D2321 Paragraph 6.3	≤ 16”	8”	12”
		18”-30”	6”+D/8	18”
		> 30	As shown on plans	
PRESSURE PIPE MATERIAL	**APPLICABLE SPECIFICATION**	**NOMINAL PIPE SIZE (INCHES)**	**SIDE CLEARANCE (INCHES)**	
			MINIMUM	**MAXIMUM**
Ductile Iron Pipe	AWWA C600 Section 4.3.2.3 and AWWA M41	All sizes	12”	as shown on plans
Steel Pipe	AWWA C604 Section 4.4.2.3 and AWWA M11	All sizes	6” or as shown on plans	as shown on plans
Concrete Pressure Pipe	AWWA C604 Section 4.4.2.3 and AWWA M9	All sizes	6” or as shown on plans	as shown on plans
PVC Pressure Pipe	AWWA C605 AWWA M23	≤ 16”	8”	12”
		18”-30”	6”+D/8	18”
		> 30”	As shown on plans	
HDPE Pressure Pipe	AWWA M55	≤ 16”	8”	12”
		18”-30”	6”+D/8	18”
		> 30”	As shown on plans	
Fiberglass Pressure Pipe	AWWA M45 Section 6.6	≤ 16“	8”	12”
		18”-30”	6”+D/8	18”
		> 30”	As shown on plans	

F. If maximum trench width is exceeded on either side of pipe, provide one of the following remedial measures at no additional cost to Owner.

1. Backfill trench with material specified for “Backfill for Over-Excavation” in Part 2 above to cradle pipe to spring line, or

2. Modify bedding based on calculations accepted by Owner’s Representative to accommodate wider trench width, or

3. Substitute higher-strength pipe based on calculations accepted by Owner’s Representative to accommodate wider trench width.

I. Trench bottom preparation shall proceed as follows:

1. Grade trench bottom to provide smooth, firm, and stable foundation at every point throughout length of pipe. Transfer construction stake grades into trench as needed to ensure trench bottom is accurately graded. Place any special bedding required by Contract Documents.

2. Prepare pipe subgrade at trench bottom for specific type of pipe material being installed in accordance with Specifications for said pipe.

3. Should large gravel and cobbles be encountered at trench bottom or pipe subgrade, remove such items from beneath pipe and replace with granular material compacted to provide uniform support and a firm foundation.

4. Whenever trench bottom does not afford a sufficiently solid and stable base to support pipe or appurtenances, excavate below normal trench bottom and replace it with crushed rock or gravel of sufficient thickness to form an unyielding foundation.

5. If excessively wet, soft, spongy, unstable, or similarly unsuitable material is encountered at subgrade, remove unsuitable material and replace with crushed rock or gravel of sufficient thickness to form an unyielding foundation.

6. Accurately shape pipe subgrade to fit pipe bottom using drag template or other suitable method. At each pipe joint, recess trench bottom to relieve pipe bells, couplings or flanges of all load.

7. Payment for removal of material and additional backfill required shall be in accordance with Contract Documents. However, if necessity for such additional bedding material has been occasioned by an act or failure to act on part of Contractor, Contractor shall bear expense of additional excavation and backfill to required depth.

8. Contractor's attention is called to their responsibilities in maintaining adequate dewatering procedures to ensure an otherwise stable foundation will not be rendered unfit due to water accumulation in trench.

9. Where rock is found, removed rock below grade and backfill trench with clean imported sand to provide a compacted foundation cushion with a minimum allowable thickness of 6" under outside diameter of pipe barrel and a clear space of 4" under pipe bell. Payment for removal of rock and additional backfill shall be in accordance with Contract Documents.

J. Backfill over pipe shall proceed as follows:

1. After pipe has been properly laid, exterior joints grouted and inspected, begin backfilling operations using material as specified above.

2. Contractor will be held responsible for any displacements of pipes or other structures, any damage to them or any instability caused by improper depositing of backfill material or improper use or handling of tools or equipment.

3. Backfill pipe located in public traveled right-of-way at end of each day's operations in accordance with applicable permit requirements. Remove spoil piles from traffic lanes by end of working day.

4. Mechanical densification or compaction of backfill shall use rolling, vibrating or impact means, or combination thereof. Method or methods used shall result in obtaining compaction of backfill in various specified zones and within maximum lifts specified. Densification or compaction method or methods used shall not damage pipe, adjacent ground, existing improvements, or improvements installed as part of Work.

5. Place material for mechanically compacted backfill in lifts which, prior to compaction, shall not exceed depths specified for various types of equipment.

TYPE OF COMPACTION EQUIPMENT	MAXIMUM LIFT DEPTH
Hand-directed mechanical tampers	≤ 6" in pipe zone, ≤ 8" elsewhere.
Impact, free-fall, or "stomping" equipment	≤ 36" (Do not use over concrete pipe, cement-mortar lined pipe or PVC.

Vibratory equipment with smooth contact surface	≤ 24”
Rolling equipment, including, vibratory-interrupted surface equipment	≤ 12”

6. Contractor is advised water settling in pipe zone triggers requirement under AWWA C651 paragraph 5.1.2 to perform bacteriologic testing at 200’ intervals instead of 1200’ intervals. Should Contractor elect to use water settling for potable water pipelines, Contractor shall perform additional disinfection required under AWWA C651 at no additional cost to Owner.

7. Water settling may be used in pipe zone and trench zone in lieu of mechanical compaction, only where material being backfilled is sufficiently sandy and permeable so specified compaction is achieved. Densification by saturation shall be accomplished by inserting a pipe, through which water is being supplied under pressure, to bottom of lift of material to be consolidated, and applying to each square yard or lesser surface area in this manner sufficient water to completely saturate overlying backfill and cause obvious settlement. Where water settling is used, exercise care to prevent pipe from floating. Do not use water settling in street zone.

8. Contractor may use densification by saturation only when it has been determined it will not result in damage to adjacent ground, existing improvements or improvements installed for Work, and that it is appropriate to obtain specified compaction. Some encroachment permits limit methods of densification or compaction. In addition, use of densification by saturation is subject to all the following requirements.

    a. Apply water in manner, quantity and rate sufficient to saturate thickness of lift being densified.

    b. Vibrating compacting equipment may be necessary to supplement water saturation process where required densities cannot be attained by saturation alone.

    c. Lift thickness of backfill shall not exceed that which can be readily densified by saturation procedure. In no case shall undensified lift exceed 5’.

    d. Character of material excavated from trench may be generally, or in zones, unsuitable or densification with water. In this case, Contractor may, at no additional cost to Owner, import suitable material for saturation, or densify excavated material by mechanical compaction. If water does not readily drain from trench, it shall be removed by sump pump.

9. Control of Trench Backfill by Zones: Whether mechanical compaction or densification by water saturation is employed, backfill shall be constructed by zones, and compaction requirement for each zone followed unless otherwise specified.

K. Backfill in pipe zone shall occur as follows:

1. Hand-place backfill simultaneously on each side of pipe for full trench width, moistened as required to achieve specified compaction.

2. In placing and compacting backfill, give particular attention to underside of pipe and fittings to provide firm support along full pipe length.

3. Place warning and locator tape at distance above top of pipe specified above.

4. Take care in backfilling to avoid damage to pipe coating, locating tape and any conduits that may be installed in pipe zone. Complete pipe zone compaction before covering it with trench zone material.

L. Backfill in trench zone shall use either mechanical compaction or water settling, depending on nature of material. Complete trench zone compaction before covering it with street zone material.

M. Backfill in street zone shall occur as follows:

1. Backfill in traveled ways and public streets shall be in accordance with right-of-way agreement, encroachment permit or applicable regulations of agency having jurisdiction over traveled way. In absence of such provisions, compact soil by accepted hand-, pneumatic or mechanical-type tampers.

2. Water consolidation will not be permitted.

3. Construct pavement section in accordance with Contract Documents.

3.3 Field Quality Control

A. An Owner-approved soils-testing firm hired by Contractor shall provide continuous inspection of fill and will field test fill and earth backfill as placed and compacted, and inspect excavations and subgrade before concrete is placed and provide periodic inspection of open excavations, embankments, and other cuts or vertical surfaces of earth.

B. Owner's Representative will observe and test fills and based on laboratory results will determine whether fills have been placed in accordance with Contract Documents.

C. Whenever excavated material is not suitable for backfill, Contractor shall at their expense arrange for and furnish suitable imported backfill material which is capable of attaining specified relative density. Contractor shall also arrange for removal and off-site disposal of unsuitable excavated material at their own expense.

D. Field testing of trenching and backfilling shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Backfill or Soil Prepared in Place	Sampling	ASTM D75	As directed	Contractor	Contractor
	Sieve Analysis	ASTM C136 or California Test Method 202	As directed	Contractor	Contractor
	Sand Equivalence	California Test Method 217	As directed	Contractor	Contractor
	Trench Width	Width specified in Part 2 above	As directed	Owner	Contractor
	Bedding Thickness	Depth specified in Part 2 above	As directed	Owner	Contractor
	Rock Size in Backfill	Size specified in Part 2 above	As directed	Owner	Contractor
	Compaction (Laboratory Density Relations)	ASTM D1557 or California Test Method 216	As directed	Contractor	Contractor
	Field Density of Soil in Place	ASTM D1556 or ASTM D6938	As directed 300-foot maximum interval in trenches	Contractor	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
	Field Density of Cohesionless Soils	ASTM D4253 and D4254	As directed	Contractor	Contractor
	11-Month Warranty Inspection	Demonstrate no visible pavement sags above pavement cut	1 inspection	Owner	Contractor
Cement-Sand Slurry	Slump (5" maximum)	ASTM C143	1 each batch	Owner	Contractor

E. For testing purposes, percentages shall be determined by weight.

F. Make all necessary excavations for compaction and other soils tests as directed by Owner's Representative.

F. "Relative compaction" is ratio, expressed as percentage, of in-place dry density to laboratory maximum dry density.

G. Compaction shall be deemed to comply with Contract Documents when no more than one of any 3 consecutive tests falls below specified relative compaction. Failing test shall be no more than 3 percentage points below specified compaction. Contractor shall pay costs of any retesting of Work not conforming to Contract Documents.

G. Allow sufficient time for testing and evaluation of results before material is needed. Owner's Representative will be sole and final judge of suitability of all materials.

H. Do not use materials in question pending test results.

I. Contractor shall remove unsatisfactory material, re-compact, adjust moisture or compaction methods, place new material, and perform other operations necessary to meet Contract requirements as directed by Owner's Representative whose decisions and directions will be considered final on these matters.

J. Owner's Representative will not provide and is not being paid to provide directions or submittal review regarding Contractor's excavation safety procedures. Any questions or concerns of Owner's Representative will be referred to Cal/OSHA whose decisions or directions shall be considered final.

3.9 Adjusting and Cleaning

A. Make necessary arrangements for and remove and dispose of all surplus excavated material off-site, unless otherwise provided for in Contract Documents. All costs for disposal of surplus waste material shall be borne by Contractor.

B. Dispose of all surplus material not required for backfill or fill. Disposal shall occur outside limits of public rights-of-way and/or easements. Disposal shall comply with applicable ordinances and regulations of governmental agencies having jurisdiction and shall be done at no cost or liability to Owner.

C. Do not deposit excavated material on private property unless written permission from property owner is secured by Contractor. Before Owner will accept Work as being completed, Contractor shall file written release signed by all property owners with whom they have entered into agreements for disposal of surplus excavated material absolving Owner from any liability connected therewith.

D. Do not deposit excess material in water courses or other locations where disposed material will interfere with natural drainage.

E. After backfill is completed, dress site smooth and leave site in neat and presentable condition, free of all cleared vegetation, rubbish and other construction wastes. Haul away and legally dispose of surplus rock or other excavated material which cannot be used for backfill. Areas next to structures where blade-type equipment cannot reach shall be hand raked.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 32 13 13
CONCRETE PAVING

PART 1 - GENERAL

1.1 Work Included

A. Portland cement concrete pavements for roads, parking areas, aprons, sidewalks, and other Work involving concrete paving, as shown, and in accordance with Standard Specifications for Public Works Construction (SSPWC) and requirements herein.

B. Fly ash will not be permitted in Portland cement concrete pavements.

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements
E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 02 41 14: Paving Removal and Resurfacing
H. Section 31 23 00: Excavation and Fill
I. Section 32 12 16: Asphalt Concrete Paving

1.3 System Description

A. Furnish and install complete Portland cement concrete paving system including subgrade preparation, aggregate base, prime coat, Portland cement concrete paving, seal coat, striping and all appurtenant work.

B. Completed Portland cement concrete paving system shall meet all permit requirements and requirements of city or agency having jurisdiction over paving and right of way.

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

B. Factory (batch plant) testing of aggregate shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Aggregate	Ratio of Silica Released to Reduction in Alkalinity	ASTM C33	As directed	Owner	Contractor
	Loss with Sodium Sulfate	ASTM C33	As directed	Owner	Contractor
	Sieve Analysis	ASTM C136	1 each trial batch	Owner	Contractor
Coarse Aggregate	Abrasion Loss	ASTM C33	As directed	Owner	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Fine Aggregate	Sand Equivalent	ASTM D2419	As directed	Owner	Contractor
	Organic Impurities	ASTM C40	As directed	Owner	Contractor
	Color of Supernatant on Washing	ASTM C33	As directed	Owner	Contractor

C. Factory (batch plant) testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Concrete	Certification of Mix Design	ACI 301 certified by independent testing laboratory	1 per mix	Contractor	Contractor
Portland Cement Concrete	Portland Cement Concrete Properties	See Section 03 30 00.	Once for each supplier and each type (grade) of Portland cement concrete	Contractor	Contractor

1.5 References

A. ASTM A820 Steel Fibers for Fiber-Reinforced Concrete
B. ASTM C136 Sieve Analysis of Fine and Course Aggregates
C. ASTM C1116 Fiber-Reinforced Concrete
D. ASTM D2041 Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
E. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 200 "Rock Materials"
F. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 201 "Concrete, Mortar, and Related Materials"
G. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 301 "Treated Soil, Subgrade Preparation, and Placement of Base Materials"
H. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 302 "Roadway Surfacing"
I. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 303 "Concrete and Masonry Construction."

1.6 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Catalog Data	Required for all soil sterilants per catalog data requirements	
Certificate of Compliance	Submit report from testing laboratory certifying that aggregate material is asbestos-free and conforms to specified gradations or characteristics.	
Mix Design	Required for concrete mix design per engineering calculations requirements sealed by California-licensed Civil Engineer.	
	In addition to original mix design, provide new mix design if change in brand or type of cement or change in source or gradation of aggregates is permitted or if defective concrete occurs.	
Brand and Type of Cement/Source of Aggregate	Submit brand and type of cement and source of aggregates to allow sampling and testing by Owner's Representative.	

SUBMITTAL	DESCRIPTION	
Test Record Transcripts	Submit certified materials test reports for liquid Portland cement concrete and uniformity of distribution of binder per test record transcript requirements.	
Delivery Tickets	Required for ready-mix concrete as needed to document delivery quantities. In accordance with ASTM C94 Sections 16.1 and 16.2, each ticket shall show • Name of ready-mix batch plant, • Serial number of ticket, • State certified equipment used in preparing mix, • Truck number.	
Warranty	Furnish one-year warranty from date of final acceptance	

B. Refer to Section 01 33 00 for definition of requirements for Catalog Data, Certificates of Compliance and Test Record Transcripts.

1.7 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 for delivery, storage, and handling requirements.

B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of Portland cement concrete and related products shall be strictly followed.

C. Storage of materials shall conform to requirements of ACI 301 or SSPWC.

D. Do not use any aluminum materials for handling concrete.

1.8 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Detectable Warning Surfaces on Curbs and Curb Access Ramps	ADA Solutions, Inc.	North Billerica, MA
	Accepted equal	
Joint Filler	DFC "Denver Foam"	
	Sonneborn Building Producte, Inc. "Sonofoam"	
	Accepted equal	

B. Use only one brand of cement.

C. All admixtures shall be compatible and by one Manufacturer capable of providing qualified field service representation.

2.2 Materials

A. Refer to Section 01 61 00 for basic requirements for products and materials.

B. Portland cement concrete paving products shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Aggregate Base Course	Crushed Aggregate Base	Conform to Section 200-2.2, crushed aggregate base of SSPWC Contractor may substitute on-site materials conforming to Section 200-2.5, Processed Miscellaneous Base of SSPWC
Portland Cement Concrete Pavement	Materials for "Class B" Street Paving and Site Paving	See Section 03 30 00.
Fiber-Reinforced Concrete (Provide in Class AA, A, A2 and B concrete mixes to limit microcracking and shrinkage cracks)	Synthetic Fibers	ASTM C1116 Add 0.1% by volume.
	Steel Fibers	ASTM A820 Add 0.1% by volume.

C. Portland cement concrete paving within public (City, County or State) rights-of-way, railroad rights-of-way, or on private property shall comply with permit requirements and other stipulations of applicable property owners.

D. Install redwood header along all edges of Portland cement concrete paving not otherwise abutting hardscape surfaces such as gutters, buildings, concrete pads, vaults, asphalt concrete pavement, Portland cement concrete pavement, paved sidewalk, paved driveway approach, etc.

PART 3 - EXECUTION

3.1 Preparation

A. Scarify 6" below subgrade, bring to optimum moisture content, and compact to relative dry density of 90%.

B. Spread soil sterilant uniformly on prepared subgrade at rate of 4-pounds of chemical per 100-square feet, subject to Manufacturer's recommendations, from outside of curb to opposite outside of curb for full width of roadways or parking area to be paved or surfaced.

3.2 Installation

A. Refer to Section 01 73 00 / 02 05 00 for basic execution and installation requirements.

B. Apply soil sterilant per Section 31 23 00 before paving.

C. Products shall be furnished and installed by Contractor at location shown on Plans and Submittals.

D. The following installation standards shall be followed:

1. Permit requirements of agencies having jurisdiction over streets.

2. Applicable OSHA and Cal OSHA regulations

3. Standard Specifications for Public Works Construction Section 301 "Treated Soil, Subgrade Preparation, and Placement of Base Materials"

4. Standard Specifications for Public Works Construction Section 302 "Roadway Surfacing"

5. Standard Specifications for Public Works Construction Section 303 “Concrete and Masonry Construction.”

E. Refer variances between above documents and Contract Documents to Owner’s Representative.

F. Aggregate base material shall be furnished, placed and compacted for Portland cement concrete pavements as shown. Spread and compact per SSPWC Section 301-2.

G. Adjust all valve box rings and covers to grade within 30 days after final paving of each street in which pipelines are installed.

3.3 Field Quality Control

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Subgrade	Compaction	Section 31 23 00 / 31 23 33	As directed	Contractor	Contractor
Roadway/ Paving Base	Compaction	Section 31 23 00 / 31 23 33	As directed	Contractor	Contractor
Portland Cement Concrete	Slump	Section 03 30 00	As directed	Owner	Contractor
	28-day strength	Section 03 30 00	As directed	Owner	Contractor
Finished Pavement	Rolling	When straight edge is laid on finished surface parallel to centerline, surface shall vary <⅛” in 10’.	As directed	Owner	Contractor
	Drainage	Flood paved areas sufficiently to demonstrate absence of ponding and “bird-baths”	As directed	Owner	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer’s printed literature	1 test	Owner	Contractor

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 33 56 13
ABOVE-GROUND FUEL-STORAGE TANKS

PART 1 - GENERAL

1.1 Work Included

A. Materials, testing, and installation of above-ground fuel-storage tanks.

B. Recommended metals for valve bodies and trim materials are as follows:

CHEMICAL	ALUMINUM	BRONZE	COPPER	CAST IRON DUCTILE IRON	CARBON STEEL	304 SS	316 SS	HASTELLOY C	TITANIUM
ORGANIC CHEMICALS									
Diesel Exhaust Fluid (CH_4N_2O)							Good		
Ethylene Glycol (CH_2OHCH_2OH)	Good	Good	Good	Good	OK	OK	OK	OK	Good
Gasoline/Kerosene/Diesel	Good	Good	Good	Good	OK	Good	Good	Good	Good
Lubricating Oil	Good	Good	Good	Good	Good	Good	Good	Good	Good
ENVIRONMENTS									
Direct Sunlight	Good	Good	Good	Good	Good	Good	Good	Good	Good

C. Recommended plastics for valve bodies, lining and trim materials are as follows:

CHEMICAL	PVC	CPVC	PE	XLPE	PVDF (KYNAR)	POLY-PROPYLENE	POLY-URETHANE	ABS	POLY-CARBONATE	DELRIN	TEFLON	EPOXY
ORGANIC CHEMICALS												
Diesel Exhaust Fluid (CH_4N_2O)				OK	OK	OK			OK	OK	OK	Good
Ethylene Glycol (CH_2OHCH_2OH)	Good	Good	Good	Good	Good	Good		OK	OK	OK	Good	Good
Gasoline/Kerosene/Diesel					Good				Good	Good	OK	Good
Lubricating Oil	OK				Good		OK		Good	Good	Good	Good
ENVIRONMENTS												
Direct Sunlight			OK	OK			OK	OK				Good

D. Recommended elastomers for valve bodies, lining and trim materials are as follows:

CHEMICAL	NR GUM RUBBER	CR NEOPRENE	CSM HYPALON	EPDM ETHYLENE PROPYLENE DIENE	IIR BUTYL RUBBER	NBR BUNA N	SBR STYRENE BUTADIENE RUBBER	FKM VITON	PTFE TEFLON	PVDF KYNAR	SI SILANASTIC
ORGANIC CHEMICALS											
Diesel Exhaust Fluid (CH_4N_2O)			OK	OK				Good			
Ethylene Glycol (CH_2OHCH_2OH)	Good	Good	Good	Good		Good	Good	Good	Good	Good	Good
Gasoline/Kerosene/Diesel			Good			OK		Good	Good	Good	
Lubricating Oil			Good					Good	Good	Good	
ENVIRONMENTS											
Direct Sunlight	Bad	OK	Good	Good	OK	Bad	Bad	Good	Good	OK	Good

1.2 Related Work

A. Section 01 33 00: Submittal Procedures
B. Section 01 40 00: Quality Requirements
C. Section 01 61 00: Common Product Requirements
D. Section 01 65 00: Product Delivery Requirements

E. Section 01 66 00: Product Storage and Handling Requirements
F. Section 01 73 00: Execution
G. Section 01 73 33: Mechanical Identification
H. Section 03 30 00: Cast-in-Place Concrete
I. Section 26 05 10: Common Work Results for Electrical
J. Section 31 05 23: Cement and Concrete for Earthwork
K. Section 31 23 00: Excavation and Fill

1.3 System Description

A. Furnish and install complete operating above-ground fuel-storage tank including tank, piping, valves, controls, instrumentation, and appurtenant structural, mechanical and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and applicable building, fire, mechanical, and plumbing codes and standards.

B. Above-ground fuel-storage tank control system output variables shall include the following:

ITEM	VARIABLE	DESCRIPTION
Output Signals (Analog)	Level	4-20ma level signal fromn tank.
Output Signals (Discrete)	Alarms 1 alarm per cell (Red lamp or LED)	1 alarm for low level 1 alarm for tank leak

1.4 Quality Assurance

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

B. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Above-Ground Fuel-Storage Tanks	Primary Steel Tank Pressure Test	Tested at 5 psig for 24 hours minimum	1 test each unit	Contractor	Contractor
	Fire Test	Two-hour furnace fire test and two hour simulated pool fire test (UL-2085)	As required for each vessel	Contractor	Contractor
	Vapor Recovery	CARB for Balanced Phase I and II Vapor Recovery including methanol and ethanol	As required for each vessel	Contractor	Contractor

A. Double-wall fuel storage tank shall have been in use for at least 10 years with no reportable containment system failure in over 10,000 units produced.

1.5 References

A. API 650 Welded Steel Tanks for Oil Storage
B. ASME/ANSI B16.3 Malleable Iron Threaded Fittings
C. ASME/ANSI B16.9 Factory-Made Wrought Steel Buttwelding Fittings
D. ASME/ANSI B16.11 Forged Steel Fittings, Socket-Welding and Threaded
E. ASME/ANSI B16.25 Buttwelding Ends
F. ASME/ANSI B16.39 Malleable Iron Threaded Pipe Unions
G. ASME/ANSI B16.40 Manually Operated Thermoplastic Gas Valves

H. ASME/ANSIB16.44 Manually Operated Metallic Gas Valves for Use in House Piping Systems
I. AWS/ANSI D1.1 Structural Welding Code – Steel
J. AWS/ANSI D1.3 Structural Welding Code - Sheet Steel
K. California Building Code (CBC)
L. California Electrical Code (CEC)
M. California Energy Code (CEnC)
N. California Fire Code (CFC)
O. California Green Building Code (CALGreen Code)
P. California Mechanical Code (CMC)
Q. California Plumbing Code (CPC)
R. NEMA/ANSI 250 Enclosures for Electrical Equipment
S. NFPA 30 Flammable and Combustible Liquids Code
T. NFPA 30A Motor Fuel Dispensing Facilities and Repair Garages
U. NFPA 31 Installation of Oil Burning Equipment
V. NFPA 70 National Electric Code (NEC)
W. NFPA 780 Installation of Lightning Protection
X. UL142 Steel Above-Ground Tanks for Flammable and Combustible Liquids
Y. UL 2080 Fire Resistant Tanks for Flammable and Combustible Liquids
Z. UL 2085 Protected Aboveground Tanks for Flammable and Combustible Liquids

1.6 Submittals

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required per equipment shop drawing requirements.	.
	If tank support spacing varies from spacing shown on concrete foundation plans, submit shop drawings for modified concrete foundation with tank shop drawings.	
Catalog Data	Required per catalog data requirements for tank, gages, valves, vents, piping connections, and control panel.	
Installation Instructions	Required per installation instruction requirements.	
O & M Instructions	Required per operation and maintenance instruction requirements	
Certificate of Compliance	Submit coating system and application certification per certificate of compliance requirements.	
Engineering Calculations	Required for seismic anchorage per Section 01 73 24.	
Test Record Transcripts	Submit for factory tests per foundry or test record transcript requirements.	
Warranty	Furnish one / 3 -year warranty from date of final acceptance.	

B. Refer to Section 01 33 00 for definition of requirements for shop drawings, catalog data, installation instructions, O&M instructions, certificates of compliance, engineering calculations, test record transcripts, and material samples.

1.7 Delivery, Storage and Handling

A. Refer to Sections 01 65 00 and 01 66 00 for delivery, storage, and handling requirements.

B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of above-ground fuel-storage tanks shall be strictly followed.

1.8 Unit Prices

A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Above-Ground Concrete-Steel Composite Fuel-Storage Tanks		
	United Concrete Products "Convault"	Yatesville, CT
	Accepted equal	
Above-Ground Steel Fuel-Storage Tanks	Advance Fuel Systems	Encinitas, CA
	Containment Solutions "Hoover Vault"	Yatesville, CT
	Envirosafe	Clermont, FL
	Highland Tank	Stoystown, PA
	Accepted equal	
Diesel Fuel System and Accessories	ACS Manufacturing	Denison, TX
	SEC - Systems Engineering	Long Beach, CA
	Accepted equal	

2.2 Materials

A. Refer to Section 01 61 00 for basic requirements for products and materials.

B. The following is being stored:

FLUID	VISCOSITY (77°F)	SPECIFIC GRAVITY	TEMP	FREEZING POINT	BOILING POINT	VAPOR PRESS (77°F)	pH	SOLIDS CONTENT
Diesel Fuel								
Gasoline								

C. Concrete above-ground fuel-storage tanks shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION

D. Tanks shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Primary Steel Tank	Steel	3/16" thick walls of ASTM A36 steel plate
		Rectangular in shape with continuous welds on all exterior seams per UL Standard 142
Insulation Panels	Styrofoam	¼" minimum thickness covering steel tank outer surface
Secondary Containment	HDPE	30-mil minimum thickness
Encasement	Reinforced Concrete	Encase primary steel tank and secondary containment in 6" of monolithic reinforced concrete per UL2085 4000-psi 28-day f'_c strength Do not use encasement seams.
Exterior Coating		Coat to resist weather and reflect sunlight
Tank Support and Restraint System	Stainless Steel	Minimum of four 3/16"-thick plates Size bolts and plates based on submitted Engineering Calculations

E. Steel above-ground fuel-storage tanks shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION

ITEM	MATERIAL	SPECIFICATION

F. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
	Fluid Stored	xxx
	Fluid Temperature	33°F-120°F
Size (Dual-Wall Tanks)		
	10,000-gallon	28'7" x 8'10" x 8'0" – 91,000 lbf
Wall Thickness		6"
Wall Design		Dual Wall

A. The following product design criteria, options and accessories are required for diesel storage tanks:

ITEM	DESCRIPTION	
Diesel Tank Accessories	Leak Detection	Through tank leak detector tube to allow physical checkup and monitoring capability between primary and secondary containment.
	Emergency Pressure Relief Vent System	Meet NFPA 30 code requirements
	Spare Fittings	Two 2" spare fittings with cap
	Integral Spill Container	7 or 15 gallon stainless steel, UL listed
		1½" drain valve
		2" nipple stick port with brass cap
		4" fill pipe
	Grounding Cable	Required for lightning protection
Diesel Fuel System and Accessories	Low Fuel Switch Assembly (35%)	
	High Fuel Switch Assembly (90%)	
	Critical High Fuel Switch Assembly (95%)	
	Leak detection switch assembly	
	Engine fuel supply dip tube connection	
	Engine fuel return dip tube connection	
	Foot valve with extractor	
	Morrison 2" clock gauge assembly	
	Fuel fill 2" camlock fuel fill with OPV float assembly – 4" fitting	
	Fuel fill drop tube and flange – Stainless Steel	
	Fuel measuring stick	
	Omega Series LVU2700 ultrasonic level transmitter, or equal	
	24 VDC motorized ball valve (stainless steel), Viton (Shipped loose)	
	Signage per plans	
Fuel Fill Station and Fuel Tank Annunciator Panel (FTA)	Fill / spill containment cabinet, lockable with 2-inch dry connect, manual hand pump, ball valves, piping & stainless steel FTA. Audible and visual alarm for High, Critical High, Low & Leak w/ On/Off switch, silence switch for alarm and dry contacts for each alarm. Cabinet shall have a hinged door to access components inside.	
	Audible and visual alarm for High, Critical High, Low & Leak w/ On/Off switch, silence switch for alarm and dry contacts for each alarm.	
	Cabinet shall have a hinged door to access components inside.	
Fuel Piping	Stainless steel pipe (Size per plan) per Section 33 11 15	
Painting	All carbon steel surfaces commercial blasted per SSPCW6 and painted as follows: Primer – 1 coat of Ameron 370 (3-5 mils DFT) Intermediate – One coat of Ameron 370 (3-5 mils DFT) Finish – One coat of Ameron PSX 700 Polyurethane texture (2-3 mils DFT)	
	Color white	

G. The following electrical design criteria are required for equipment specified in this section:

ITEM	DESCRIPTION	
Electrical Work	NEC Article 505 Classification	Nonhazardous Class I Division 1 (wet well) Class I Division 2 (dry well)
Enclosures – Indoor Dry Locations	NEMA 250 Enclosure Rating	NEMA 12 – Industrial Use
Enclosures – Outdoor or Wet Locations	NEMA 250 Enclosure Rating	NEMA 4X – Watertight, Corrosion-Resistant, Stainless steel
Enclosures – Class 1 Division 1 Wet Well Locations	NEMA 250 Enclosure Rating	NEMA 7 – Explosion Proof, Rated for Class I Locations
Enclosures – Class 1 Division 2 Dry Well Locations	NEMA 250 Enclosure Rating	NEMA 9 – Explosion Proof, Rated for Class II Locations
Other Enclosures	NEMA 250 Enclosure Rating	NEMA 3 – Dust-tight, Rain-tight NEMA 4 – Watertight NEMA 13 – Oil-tight, Dust-tight
All Enclosures	Construction	Lockable With powdercoat epoxy finish on steel surfaces
	IEC 60529 Enclosure Rating for Underground Equipment	IP 65 water jet
Enclosure or Instrument Mounting	Local Mount	Panel-mount Surface-mount on wall / instrument board Pipe-mount Skid-mount See plans
	Remote Mount	MCC Telemetry cabinet See plans
Power Supply	Power Backup	Tied to Emergency Generator
	Heating Circuit	460VAC – 3-phase – 60Hz
	Instruments	24 VDC at control panel 120VAC – 1 phase – 60Hz 230VAC – 1 phase – 60Hz

PART 3 - EXECUTION

3.1 Preparation

A. Make field measurements needed to install above-ground fuel-storage tanks before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

B. Examine areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of Work.

3.2 Installation

A. Refer to Sections 01 73 00, 01 73 24, and 01 73 33 for basic execution and installation requirements.

B. Refer to Section 31 23 00 / 31 23 33 for open trench requirements.

C. Furnish and install above-ground fuel-storage tanks at locations shown on Plans and Submittals.

D. The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements

2. Applicable OSHA and Cal OSHA regulations

3. California xxx Code Chapter xxx “Title” Section xxx “Subtitle.”

4. Other applicable building, fire, plumbing, mechanical and electrical code requirements

E. Refer variances between above documents and Contract Documents to Owner’s Representative.

F. Install above-ground fuel-storage tanks to tolerances recommended by Manufacturer. Unless otherwise shown, install above-ground fuel-storage tanks true, plumb, and level using precision gauges and levels.

G. Installation of above-ground fuel-storage tanks shall pay particular attention to the following:

1. Excavate area to receive aggregate field making sure surface below aggregate is level and compacted to 95% density.

3.3 Field Quality Control

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Above-Ground Fuel-Storage Tanks	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Owner
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer’s printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer’s printed literature	1 test	Owner	Contractor

B. Provide services of factory-authorized representative on-site to provide:

1. Installation assistance, inspection and startup of complete above-ground fuel-storage tank system.

2. Field testing and adjustment.

3. Instruction of Owner’s personnel in operation and maintenance.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK