CITY OF COLFAX
LIFT STATION 5
FORCE MAIN IMPROVEMENTS

PROJECT NO. XXXXX

TECHNICAL SPECIFICATIONS: DIVISIONS 1 - 15

SEPTEMBER 2021

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SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 LOCATION AND DESCRIPTION OF WORK

A. The Work for Lift Station 5 includes:
   1. Installation of three pre-fabricated inspection vaults at the locations designated in the construction documents.
   2. Installation of force main isolation valves, inspection ports, replacement of one (1) sewage combination air release valve and installation of one (1) new sewage combination air release valve with access vault.
   3. Piping, fittings, and related appurtenances for completion of the Work.

B. The Work will be constructed under one contract. The Contract Documents include the following volumes:
   1. Volume 1 – Contract Documents & General Conditions (Division 0)
   2. Volume 2 – Technical Specifications (Divisions 1-15)
   3. Volume 3 – Design Plans

1.2 CONTRACTS

A. The Work shall be constructed under one prime contract.

1.3 WORK BY OTHERS

A. OWNER will perform the following work:
   1. Operation of all existing system valves and equipment, unless specified otherwise.
   2. Any required programming work.

1.4 SEQUENCE AND PROGRESS OF WORK

A. Submit a Construction Schedule that outlines the duration and sequence of the Work to be performed.

1.5 SPECIFICATION LANGUAGE

A. These Project Specifications are written in imperative mood and are in abbreviated or streamlined form and include incomplete sentences. This imperative language is directed to CONTRACTOR, unless specifically noted otherwise. Omission of words or phrases such as "CONTRACTOR shall", "shall be", "a", "the", and "all" are intentional. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the Drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 GENERAL

A. The Contractor shall include fees for the completion of the Work based on the description of work provided by the Engineer. The Contractor shall include fees for all work necessary to provide a complete project whether or not specifically listed in the description of work. No separate payment will be made for items outside the description of work. Compensation for all such services, items, and materials shall be included in the prices listed in the description of work.

B. Each work unit bid price shall be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead, profit, bonds, insurance, taxes, and management services for each item.

C. Fifteen percent (15%) of the total cost of each item is allotted to the cost of Shop Drawing preparation, Operation and Maintenance Manuals, Testing and Training. This amount will be released upon approval, by the Owner, three percent (3%) is apportioned to Testing and four percent (4%) for the remaining items.

1.2 ESTIMATED QUANTITIES

A. Engineer's estimated quantities for extra work unit price pay items, if any, as listed in the description of work, are approximate only and are included solely for the purpose of comparison of Bids.

B. Owner does not expressly or by implication agree that the nature of the materials encountered below the surface of the ground or the actual quantities of material encountered or required, shall correspond therewith and reserves the right to increase or decrease any quantity or to eliminate any quantity as Owner may deem necessary.

C. Contractor shall not be entitled to any adjustment in a unit bid price as a result of any change in an estimated quantity and agrees to accept the aforesaid unit bid prices as complete and total compensation for any additions or deductions caused by changes or alterations in the Work directed by Owner.

1.3 RELATED PROVISIONS

A. Payments to Contractor: Refer to Contract General Conditions.

B. Changes in Contract Price: Refer to Contract General Conditions.

1.4 QUALITY ASSURANCE

A. Referenced Standards:

1. State of California, Placer County Design Plates and Standard Specifications for public works construction.

1.5 SCOPE OF PAYMENT

A. The Contractor will submit a verified application for payment and schedule of values to the Engineer supported by a statement showing all materials actually installed during the preceding month and the cost of labor actually expended in the performance of the Work. Unless otherwise provided in the Contract Documents, no allowances or payments will be made for material or equipment not placed at the Work site

B. Dimensions used to determine quantities for payment shall be reviewed and approved by the City.

1.6 PROGRESS PAYMENTS

A. Progress payments shall be made monthly for percentage of work completed for each bid item.

B. Prepare both monthly and final contract progress payments and submit to the Owner Contract Administrator for approval. Payment shall be based on data received from Contractor, subject to evaluation and concurrence of the Owner.

C. Transmit application for payment to the Owner Contract Administrator on a draft Application for Payment Form provided by the Owner.

D. Attach one Schedule of Value form with each draft application for payment for each lump sum item of work and include a request for payment of materials and equipment on hand as applicable.
   1. Execute certification by authorized officer of Contractor.

E. Preparation:
   1. Round values to the nearest dollar.
   2. List each Change Order and Written Amendment executed prior to date of submission as separate line item.
   3. Totals to equal those shown on the Transmittal Summary Form for each schedule as applicable.

1.7 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

A. Payment will not be made for the following:
   1. Loading, hauling, and disposing of rejected material.
   2. Quantities of material wasted or disposed of in manner not called for under Contract Documents.
   3. Rejected loads of material, including material rejected after it has been placed by reason of failure of Contractor to conform to provisions of Contract Documents.
   4. Materials not unloaded from transporting vehicle.
   5. Defective work not accepted by the Owner.
   6. Material remaining on hand after completion of work.

1.8 PARTIAL PAYMENT FOR STORED MATERIAL AND EQUIPMENT

A. No payment will be made for stored equipment unless otherwise approved by the Owner.

1.9 SCHEDULE OF VALUES

A. A schedule of values will be submitted by the Engineer and approved by the City prior to sharing with the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01570

MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 - GENERAL

1.1 DESCRIPTION

A. All streets, traffic ways and fire truck access roads shall be kept open for the passage of traffic, fire trucks, City personnel and pedestrians during the construction period, unless otherwise approved by the Owner, in writing, or authority having jurisdiction over same.

B. When required to cross or obstruct a street or traffic way, Contractor shall provide and maintain suitable detours or other approved temporary expedient for the accommodation of traffic. Traffic impacts shall be for the shortest time practical, and passage shall be restored immediately after completion of backfill and temporary paving.

C. Give the required advance notice to the fire and police departments of proposed operations.

D. Give reasonable notice to owners, tenants and nearby businesses and residents who may be affected by operations. Upon request, the Owner will furnish the Contractor with the names and addresses of the nearby residents.

E. Provide signs, signals, barricades, lights and all other equipment, service and personnel required to regulate and protect all traffic and warn of hazards. All such work shall conform to requirements of the Owner or authority having jurisdiction. Remove temporary equipment and facilities when no longer required and restore grounds to original or to specified conditions.

F. Provide all barricades, signs, lights, flagmen, etc. needed to keep traffic moving using one minimum lane with a width defined by the City through the work site.

G. Provide vehicular access to and adjacent to the site at all times.

H. All traffic control signing, haul routes and barricading plans will be submitted to the Owner for approval prior to starting the work and all Contractor changes to the plans will be approved by the Owner prior to implementation.

I. The Owner shall approve any noncompliance with these requirements in writing. The Contractor shall not disturb traffic at any time without written approval by the Owner.

J. All traffic control signing, haul routes, and barricading plans will be submitted to the Inspector for approval prior to starting the work and all Contractor changes to the plans will be approved by the Owner prior to implementation. The Contractor shall perform all construction activities in accordance with the requirements listed above.

K. Notify the Owner seven days in advance of the time work will be started in areas requiring traffic impacts.

L. Should the Contractor appear to be neglectful or negligent in furnishing adequate warning and protection measures, the Owner may direct attention to the existence of a hazard and the

necessary warning and protective measures shall be furnished and installed by the Contractor without additional cost to the Owner.

M. Should the Owner point out the inadequacy of a warning and protective measure, such action of the Inspector shall not relieve the Contractor from any responsibility for public safety or abrogate his obligation to furnish any pay for those devices. The installation of any general illumination shall not relieve the Contractor of his responsibility for furnishing and maintaining any protective facility at the end of each shift to the satisfaction of the Owner. The Owner has the right to shut down operations until the site's traffic control measures are in compliance.

1.2 GENERAL TRAFFIC REGULATIONS

A. All traffic lanes to be considered satisfactorily open, shall be paved with a minimum of two inches of asphaltic concrete pavement.

B. Approach speed limits and speed limits within the construction area shall be determined by the OWNER.

1.3 TRAFFIC SIGNALS AND SIGNS

A. Provide and operate traffic control required to direct and maintain an orderly flow of traffic in all areas under Contractor's control or affected by Contractor's operations.

B. Provide traffic control and directional signs, mounted on barricades or standard posts at the following locations:
   1. Each change of direction of a roadway and at each crossroad.
   2. Detours and hazardous areas.
   3. Parking areas.

C. All existing signs in conflict with the construction signs shall be removed, covered with plywood, or relocated.

D. Existing traffic signals shall be covered, relocated or disconnected any time that they are non-functional or in conflict with construction signs. Sign mounting height shall be 7 feet. The measurement shall be from the bottom of the sign to the top of curb.

E. All regulatory and warning signs shall have flags and lights displayed.

F. All Type II Barricades, Type III Barricades, and vertical panels shall be equipped with steady burning lights.

G. All orange construction signs shall use high reflectivity sheeting. All other signs shall use standard reflective sheeting. All signs to be used on the job during periods of darkness shall be reflectorized.

H. Pavement marking for temporary lane striping shall match or exceed existing markings. The pavement temperature must be 60 degrees Fahrenheit or above when tape is applied.

I. Obliterate temporary lane striping by sealing or other approved method. Sand blasting will not be allowed.

1.4 FLAGMEN

A. Provide qualified and suitably equipped flagmen when construction operations encroach on traffic lanes, as required for regulation of traffic and in accordance with the requirements of the authority having jurisdiction.

1.5 FLARES AND LIGHTS

A. If used, must be approved by Owner.

B. Provide flares and lights during periods of low visibility:
   1. To clearly delineate traffic lanes, to guide traffic and to warn of hazardous areas.
   2. For use by flagmen in directing traffic.

C. Provide illumination of critical traffic and parking areas.

1.6 PARKING CONTROL

A. Control all Contractor related vehicular parking within the limits of the Work in accordance with City and County regulations.

1.7 HAUL ROUTES

A. Develop routes for haul trucks on streets which will be submitted in writing through the Owner for review and approval. The submittal shall include, but not be limited to, the proposed travel direction, turn movements, hours of use, street sweeping, watering and clean-up. Presently established truck routes must be used.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to expedite traffic flow, and to minimize interference with normal public traffic.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 02050

DEMOLITION, REMOVAL AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolitions, removal and disposal.

1.2 SYSTEM DESCRIPTION

A. Provide all labor, materials, equipment and incidentals as shown, specified and required for demolitions, removal and disposal Work, including but not limited to landfill disposal fees and transportation fees. Repair all structures identified to remain and structures on surrounding properties damaged during demolition Work.

B. Demolition includes PVC piping, appurtenances, paving, and similar existing facilities as required for the Work. Dispose of all demolished materials and equipment in accordance to the Placer County's standard specifications.

1.3 COORDINATION

A. Coordinate salvageable items with Owner.

B. At least 48 hours prior to commencement of a demolition or removal, notify Owner in writing of proposed schedule. Owner will inspect the existing equipment and mark for identification those items to remain the property of the Owner.

C. Coordinate operations to avoid interference with Owner's operations and work in the existing facilities.

D. Remove all soils around and within demolition areas that do not meet the requirements of the accepted soil conditions and dispose them at acceptable landfills.

E. Coordinate utility and service interruptions with Owner.

F. Coordinate work to ensure life safety systems remain in full operation in occupied and operational areas.

G. Do not start removals without the approval of the Owner.

H. Coordinate demolition work with the City Staff and Utilities who access the communication enclosures as required by the Owner. This is not expected to include public meetings, door hangers, and scheduling of Work, only if found necessary by the Owner.

1.4 SUBMITTALS

A. Demolition and Removal Work Plan: Submit for approval proposed methods, equipment, operating sequences, and health and safety procedures. Include identification of fluids in piping and equipment, identification, elimination and lock out/tag out of hazardous energy, fluid draining and containment procedures, coordination for shut-off, capping, temporary services, continuation of utility services, temporary supports and connections, and other applicable items to ensure no interruption of Owner 's operations. Indicate sequence of demolition, monitoring plan, removal and disposal, site access & haul routes, and location and construction of temporary work.

B. Provide photographs to document the existing conditions on the project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. All materials and equipment designated for removal shall become the property of Contractor, except for materials and equipment the Owner has identified and marked for salvage. If items are marked for salvage, the Contractor shall deliver said materials to the Owner's preferred location.

B. Request a list of materials and equipment to be salvaged, from the Owner, before any demolition occurs. Tag components and equipment Owner designates for salvage.

C. All materials and equipment identified by the Owner to remain shall be carefully removed or protected in place, so as not to be damaged.

D. Salvaged material designated by Owner shall be cleaned and delivered to a location specified by the Owner.

E. Dispose of all demolition materials, equipment, debris, and all other items not marked by the Owner to remain, off the sites and in conformance with all existing applicable laws and regulations.

F. Reuse materials must be approved by Owner in new construction.

G. Implement an approved dust control plan where applicable.

H. Comply with governing regulations pertaining to environmental protection.

I. Do not use water when it may create hazardous or objectionable conditions such as flooding and pollution.

J. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to permit continued Owner occupancy and to prevent impacts to adjacent property owners.

K. Clean adjacent structures, facilities, and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to conditions existing prior to the start of the Work.

L. Pavement Demolition: All asphalt and concrete pavement demolition shall terminate at cut edges. All edges shall be linear and have a vertical cut face.

M. Prevent movement of structures to remain and structures located on adjacent properties; provide bracing, shoring, and monitoring equipment as required. All bracing and shoring will be part of an engineered system or designed and sealed by a registered professional engineer.

N. Cease operations immediately if adjacent structures appear to be in danger. Notify authority having jurisdiction and Engineer. Do not resume operations until directed.

O. Conduct operations with minimum interference to public or private accesses. Maintain egress and access at all times.

P. Erect and maintain barriers, lights, access sheds, and other necessary protective devices.

Q. Notify Owner, Fire Department and affected utility companies before starting work and comply with their requirements.

R. Notify affected properties owners before starting work and comply with Owner requirements.

S. Mark location and termination of utilities.

T. Provide appropriate temporary signage including signage for exit or building egress.

U. Identify all fluids in piping and equipment to be removed.

V. Isolate and lock out/tag out all potential hazardous energy prior to commencing demolition.

W. Annotate record drawings indicating location and type of service for structures and capped utilities remaining after demolition.

3.2 STRUCTURAL REMOVALS

A. Remove structures to the lines and grades shown, unless otherwise directed by the Owner.

B. All structural or miscellaneous metals and other items contained in or upon the structure shall be removed and taken from the sites, unless otherwise approved by the Owner.

C. After removal of parts or all of like work that tie into the Work or existing work, the point of junction shall be neatly repaired so as to leave only finished edges and surface exposed.

D. Disassemble as required to permit safe removal from structure.

E. The openings cut into the Work or existing work, shall be finished to provide a smooth, finished appearance.

3.3 MECHANICAL REMOVALS

A. Dismantle and remove equipment and other appurtenances as specified, shown, or required for the completion of the Work. Include cutting, capping, and plugging as required, except that the cutting of existing piping for the purpose of making connections thereto.

B. Drain and contain existing sewage prior to demolition of force main piping.

C. Remove existing piping not required for the Work.

3.4 ELECTRICAL SHUT DOWN

A. Disconnect all power sources from electrical equipment and confirm power disconnection prior to shutting down electrical equipment.

B. Lock out/tag out potential hazardous energy prior to commencement of removals and demolition.

3.5 CLEAN-UP

A. Remove from the site all debris resulting from the demolition operations as it accumulates.

B. Remove temporary work.

C. Upon completion of the Work, remove and dispose of all materials, equipment, waste, and all debris and leave premises clean, neat and orderly.

+ + END OF SECTION + +

SECTION 02145

SEWER FLOW BYPASSING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contractor shall be responsible for keeping the existing sewer lift station and piping in service at all times, and provide temporary bypass pumping as needed until the new sewer lift station and piping are fully operable and accepted by the City. This includes providing all labor, materials, temporary piping, temporary electrical power, control, and equipment to provide bypass pumping, as needed throughout the entire construction period. This also includes disposal of sewage in existing pipelines and facilities when removed from service.

B. Requirements: The Contractor shall
   1. Provide labor, materials, and supervision to temporarily bypass flow around the Contractor's work.
   2. Notify the City prior to bypassing sewage flow.
   3. Have the entire bypassing system in place and tested before bypassing any sewage.
   4. Notify the City of any sewage spills immediately upon discovering the spill.

C. The use of bypass pumping systems shall be minimized to the maximum possible extent through phasing of the work. The existing pump station is to remain on-line and in service until the bypass work has been completed and has successfully passed the demonstration period.

1.2 SUBMITTALS

D. The Contractor shall submit drawings and complete design data showing methods and equipment proposed for use in the sewer bypass operation for approval by the Engineer. The submittal shall include the following information:
   1. Drawings indicating the location of temporary sewer plugs and bypass discharge lines.
   2. Electrical controls and instrumentation details.
   3. Layout of proposed electrical equipment.
   4. Layout of proposed mechanical equipment, pumps, pipe material, and fittings.

5. Staffing plan for maintaining equipment for 24-hour continuous, reliable operation on weekdays, and/or weekend days, including response times.
6. Traffic control plan.
7. Emergency dialer system and emergency response list.
8. Plan showing the existing sewer line and the proposed points of flow interruption and/or flow diversion.
9. Construction schedule showing anticipated time duration of flow interruption and/or flow diversion. A description of the equipment to be used including:
    a. Size of discharge pipe diameter and pipe material.
    b. Bury depth, backfill material, pipe material, temporary surface restoration, and permanent surface restoration material for portions of bypass pipe to be buried.
    c. Security and protection of bypass system.
    d. Standby equipment provided on-site in case of emergency.
10. Spill contingency plan detailing precautions to be implemented to prevent sewage spills including specific responses and control measures to follow during an overflow resulting from breakage or blockage and maintenance and inspection schedules to detect potential problems to mitigate the potential release resulting from overflows, bypass pipe ruptures, and blockages.
11. Pumping head calculations.

1.3 JOB CONDITIONS

A. Protection: In areas where flows are bypassed, all bypass flow shall be discharged as approved by the City. No bypassing to the ground surface, receiving waters, storm drains, or bypassing which results in groundwater contamination or potential health hazards shall be permitted.

B. Scheduling: The bypassing system shall not be shut down between shifts, on holidays or weekends, or during work stoppages without written permission from the City. Contractor shall notify all parties whose service laterals will be out of service and to advise against water usage until the main line is back in service. In no case will the Contractor remove the bypass without informing the City.

1.4 SEWER FLOWS

A. Existing sewer flows are estimated as follows:
    1. Average Flow – 100GPM

PART 2 - PRODUCTS

2.2 MATERIALS

A. The Contractor shall provide equipment to bypass the sewer flow. Contractor shall furnish the necessary labor and supervision to set up and operate the bypass system. Bypass lines shall be of adequate capacity and size to handle the flows.

A. The Contractor shall maintain sufficient equipment and materials onsite to ensure continuous and successful operation of the bypass system. The Contractor shall maintain a sufficient

number of valves, tees, elbows, connections, tools, sewer plugs, piping, and other parts or system hardware on site to ensure immediate repair or modification of any part of the system as necessary.

B. All piping, joints, and accessories shall be designed to withstand at least twice the maximum system pressure, or 50 psi, whichever is greater.

2.3 BYPASS PUMPING SYSTEM

A. The bypass pumping system shall include as a minimum, but not limited to, three (3) bypass pumping units (prime, standby, and spare) each unit rated at 100 gallons per minute (gpm), floats, auto dialer, and all necessary bypass piping and connections to PG&E temporary power. Pumping head shall be determined by the Contractor based upon the piping arrangement proposed. Calculations shall be submitted for review substantiating the required pumping head. Bypass pumping units shall be electrically driven submersible type or suction lift type with a critically silenced sound attenuated enclosure. The Contractor shall provide a standby generator for emergency use only (critically silenced in a sound attenuated enclosure) for electric power. The Contractor will provide adequate fuel at all times. Standby generator shall be used to power pumps during power failures only.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall have equipment and machinery in good working condition on hand for emergencies and shall have workmen available for its operation.

B. During bypass, sewage shall not be leaked, dumped, or spilled onto any area outside the sewer system. When bypass operations are complete, all piping shall be drained into the sanitary sewer prior to disassembly. In the event that sewage accidentally drains into the storm drainage system or the street, the Contractor shall immediately stop the overflow, notify the City, and take the necessary action to clean up and disinfect the spillage to the satisfaction of the City. If sewage is spilled onto public or private property, the Contractor shall wash down, clean up, and disinfect the spillage to the satisfaction of the City and the property owner.

C. The Contractor shall take all necessary precautions, including constant monitoring of bypass to prevent sewage spills due to back-up and/or overflow resulting from breakage or blockage of the bypass system. The Contractor shall provide experienced personnel knowledgeable in the operation of the bypass equipment to monitor each bypass when the bypass is installed and operating. At no time shall the bypass system be left unattended during operation by the designated personnel. The Contractor shall be liable for all cleanup, damages, and resultant fines in the event of a spill.

D. The piping shall be protected from damage, vandalism, and/or theft to the maximum extent possible and as shown on the drawings.

E. The bypass system (all equipment) shall be fully tested prior to commencing bypass operation including the following as a minimum:

1. Pressure test the piping to at least 50 psi with potable water prior to introducing sewage to the line.
2. Inspect the piping for leaks and repair or replace leaking sections and joints.

F. All material and equipment identified in the spill contingency plan, including control measures in the event of a spill shall be on-site prior to commencing bypass operation.

G. After the work is completed the temporary bypass system shall be removed and the surrounding area including all hardscape and landscape shall be returned to pre-construction condition.

H. All labor, materials, equipment, and incidentals associated with the temporary controls and diversions required to maintain uninterrupted flow in all existing sewer lines associated with this project shall be borne by the Contractor.

3.2 DAMAGES

A. The Contractor shall repair without cost to the City any damage that may result from the Contractor's negligence, inadequate or improper installation, maintenance and operation of bypassing system including mechanical or electrical failures.

B. The Contractor is responsible for all cleanup in the event of a bypass sewer system failure. The Contractor is responsible for all fines from state regulatory agency resulting from a sewage spill during sewer bypass operations.

++ END OF SECTION ++

SECTION 02220

EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavating
   2. Backfilling and filling
   3. Grading
   4. Foundation base course
   5. Pavement replacement
   6. Testing

B. Related Requirements:
   1. Section 02050, Demolition, Removal and Disposal
   2. Section 02740, Asphalt Paving
   3. Section 15051, Buried Pipe Installation

1.2 SUBMITTALS

A. Excavation Plan: Prior to start of excavation operations, submit a written plan to demonstrate compliance with OSHA Standard 29 CFR Part 1926.650. As a minimum, excavation plan shall include:
   1. Name of competent person.
   2. Excavation method(s) or protective system(s) to be used.
   3. Copies of "manufacturer's data" or other tabulated data if protective system(s) are designed on the basis of such data.
   4. Sequencing and scheduling of excavation and backfilling.
   5. Sequencing and scheduling of stockpiling operations.
   6. Utilities to be rerouted, protected or removed.
   7. List of equipment that will be used on site.

B. Prepare drawings for the following items, if required for performance of Works:
   1. Sheeting and bracing, or other protective system(s).

C. Drawings and calculations shall be prepared by a Registered Professional Engineer licensed in the State of California and recognized as expert in the specialty involved. Drawings and calculations shall be submitted to Owner for record purposes only. Drawing and calculation submittal will not be checked and will not imply approval by Owner of the Work involved. Contractor shall be solely responsible for designing, installing, operating and maintaining whatever system is necessary to satisfactorily and safely accomplish all necessary sheeting, bracing, protection, underpinning and dewatering.

D. Laboratory Test Reports:
   1. Owner’s testing laboratory will submit copies of the following reports directly to Owner, with one copy to Contractor:
      a. Tests on borrow material.

b. Field density and moisture tests.
c. Optimum moisture - maximum density curve for each soil used for backfill.
d. Reports of observations for conformance of material to the Project Specifications.

E. Samples of all materials, including select backfill, general backfill, granular embedment, crushed stone, and sand shall be submitted to the Owner and the testing laboratory at least fourteen (14) days in advance of its anticipated use.

1.3 QUALITY ASSURANCE

A. Standard Specification and Details:
1. Conform to all applicable requirements of the standard specifications and standard details for Placer County.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. ASTM A328, Specification for Steel Sheet Piling.
2. ASTM D422, Method for Particle-Size Analysis of Soils.
3. ASTM D423, Liquid Limit of Soils.
4. ASTM D427, Shrinkage Factors of Soils.
5. ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil.
6. ASTM D 1556, Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
7. ASTM D2922, Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
8. AISC Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings.
9. OSHA Standard, Title 29, Code of Federal Regulations, Part 1926, Section .650 (Subpart P - Excavations).
10. ASTM D2166, unconfined compressive strength of soils.

C. Testing Services:
1. General: The Owner shall determine what testing is required for the backfill.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Trench Backfill: As specified in Placer County Standard Plate 433.

B. Backfill and Fill Materials – Foundations:
1. Fill adjacent to structures is classified as backfill to a distance measured horizontally from the structure that is equal to the depth from the finished grade. Outside these limits the fill is classified as embankments, unless otherwise specified.
2. All materials for use as backfill and fill material shall be tested by the laboratory and approved by the Owner.
3. If on-site material is unsuitable as determined by the Owner, the Owner will provide determine if Select Backfill or an approved import fill shall be used.

C. Select Backfill and Fill: Select Backfill and Fill for use beneath concrete slabs, concrete footings, and asphaltic pavements shall be well graded sand and gravel materials conforming to the requirements of Aggregate Base Course (ABC) as specified in the County's General Specifications.

D. Embankments:
   1. Fill materials for use in embankments, as fill under paved areas, and as miscellaneous landscaping materials exterior to plant facilities.
   2. Obtained from on-site excavations or import sources that are uniformly mixed.
   3. Tested by the laboratory and approved by the Owner.

E. Sand:
   1. Natural or manufactured granular material.
   2. Contain no organic material.
   3. Non-plastic, when tested in accordance with ASTM D 4318.
   4. 100 percent passing a ½-inch screen.
   5. Less than 20 percent passing a No. 200 screen.
   6. Tested and approved by Owner.
   7. No sand shall be placed without the approval of the Owner.

F. Granular Embedment:
   1. Granular embedment material shall be well graded sand and gravel materials.

G. Controlled Low Strength Material (CLSM): Submit mix design to the Engineer for review and approval.

PART 3 - EXECUTION

3.1 INSPECTION

A. Provide Owner with sufficient notice and with means to examine the areas and conditions under which excavating, filling, and grading are to be performed.

B. Owner will notify Contractor if conditions are found that may be detrimental to the proper and timely completion of the Work.

C. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Owner.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Arrange for utility company to identify utilities.

C. Locate, identify, and protect utilities that remain from damage.

D. Confirm locations of buried utilities and structures by careful test excavations or other suitable means. Excavate and backfill test pits, in advance of construction, to determine conditions or location of existing utilities and structures. Perform all Work required in connection with excavating, stockpiling, maintaining, sheeting, shoring, backfilling and replacing pavement for the test pits.

E. Ensure location of each existing utility and/or facility is defined within the area of excavation. Avoid damaging and disrupting the affected utility and/or facility. Repair damage to any structure, piping, or utility caused by Contractor's Work.

F. Maintain and protect above and below grade utilities and/or facilities designated to remain.

G. Protect existing surface features which may be affected during progress of work.

H. Obtain direction from Owner before moving or otherwise disturbing utilities or structures.

I. Implement an approved dust control plan.

3.3 EXCAVATION

A. Includes earth, sand, clay, gravel, hardpan, caliche, boulders, rock, pavements, rubbish and all other materials within the excavation limits.

B. Excavations for structures and pipelines shall be open excavations.

C. Provide excavation protection systems required by ordinances, codes, law and regulations to prevent injury to workmen and to prevent damage to new and existing structures, utilities or pipelines.

D. Where the structure or pipeline is to be placed below the ground water table, well points, cofferdams or other, acceptable methods shall be used to permit construction under dry conditions. Maintain dry conditions until concrete has reached sufficient strength to withstand earth and hydrostatic loads and until the pipelines are properly jointed, tested and backfilled.

E. Protect excavations from flooding until all walls and floor framing up to and including grade level floors are in place and backfilling has begun. Maintain water level below top of backfill at all times.

F. Pump water from excavations to prevent the carrying away of unsolidified concrete materials and to prevent damage to the existing subgrade.

G. Elevation of the bottom of footings shown as approximate only. Owner may specify changes in dimensions and elevations as required to secure a satisfactory footing.

H. Hand-trim all structure excavations to permit the placing of full widths and lengths of footings on horizontal beds. Rounded and undercut edges will not be permitted.

I. When excavations are made below the required grades without the written approval of Owner, they shall be backfilled with compacted select backfill or concrete, as directed by Owner, at no cost to Owner.

J. Extend excavations sufficiently on each side of structures, footings, etc., to permit setting of forms, installation of shoring or bracing or the safe sloping of banks.

K. Maintain subgrades for roadways, structures and trench bottoms firm, dense, and thoroughly compacted and consolidated under all construction operations; and free from mud, muck, and other soft or unsuitable materials. Subgrades which become soft or mucky on top due to construction

operations, shall be excavated, replaced with select backfill, and compacted to specified density. The finished elevation of stabilized subgrades shall not be above subgrade elevations.

L. Pipe Trench Excavation:
   1. In accordance with Placer County Standard Plate 433 and Plate 434.

M. Temporary Stockpiling:
   1. Stockpile excavated materials in approved areas, until required for backfill or fill.
   2. Place, grade and shape stockpiles for proper drainage.
   3. Locate and retain soil materials away from edge of excavations.
   4. Dispose of excess soil material and waste materials as specified hereinafter.
   5. Stockpiled excavated soils for use as subsequent fill shall be classified by laboratory as on- site granular or sandy soils.
   6. Dispose of excess soil off-site in accordance with state and local regulatory requirements.

N. Where Owner considers the existing material beneath the bedding material to be unsuitable, Contractor shall remove same and replace it with Select Backfill.

O. Replacement of Unacceptable Excavated Materials: In cases where over-excavation for the replacement of unacceptable soil materials is required, the excavation shall be backfilled to the required subgrade with select backfill material and thoroughly compacted as specified in Paragraph 3.15. Sides of the excavation shall be sloped in accordance to the maximum inclinations specified for each structure location.

3.4 UNAUTHORIZED EXCAVATION

A. All excavation outside the lines and grades shown, and which is not approved by Owner, including removal and disposal of the associated material shall be at Contractor's sole expense.

B. Backfill and compact excavations with select backfill at Contractor's sole expense.

3.5 EROSION CONTROL AND DEWATERING

A. Erosion Control:
   1. Utilize means and methods to assure minimum damage to the environment during construction.
   2. Protect all vegetation during construction.
   3. Implement Erosion Control and Storm Water Pollution Prevention best management practices where applicable, including installation of erosion control devices, to prevent erosion and sediment/pollution transport to offsite properties and washes.
   4. Install erosion and sediment control practices where required and according to applicable standards, codes and specifications. The practices shall be maintained in effective working condition during construction and until the drainage area has been permanently stabilized.
   5. Mulching to be used for temporary stabilization.
      a. Suitable Materials for Mulching:
         1) Unrotted straw or salt hay - 1-1/2 to 2 tons/acre.
         2) Asphalt emulsion or cutback asphalt - 600 to 1200 gal./ acre.
         3) Wood-fiber or paper-fiber (hydroseeding) - 1500 lbs./ acre.
         4) Mulch netting (paper, jute, excelsior, cotton or plastic).

b. Straw or salt hay mulches should be immediately anchored using peg and twine netting or a mulch anchoring tool or liquid mulch binders.

6. After stabilization, remove all straw bale dikes, debris, etc., from the site.
7. In the event of any temporary Work stoppage, take steps to avoid any environmental damage to the area undergoing construction.
8. In the event Contractor repeatedly fails to satisfactorily control erosion and siltation, the Owner reserves the right to employ outside assistance or to use its own forces to provide the corrective measures indicated. The cost of such work, plus engineering costs, will be deducted from monies due Contractor.

B. Dewatering:
1. Provide and maintain adequate dewatering equipment to remove and dispose of all surface water and ground water entering excavations, trenches, or other parts of the Work.
2. Maintain excavations dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein is inspected by the Owner and backfill operations have been completed and approved.
3. Maintain the different working areas on the site free of surface water at all times. Install drainage ditches and dikes and perform all pumping and other Work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations and fill areas.
4. Perform the diversion and removal of surface water in a manner that will prevent the accumulation of water behind temporary structures or at any other locations within the construction area where it may be detrimental.
5. Water used for working or processing, resulting from dewatering operations, or containing oils or sediments that will reduce the quality of the water downstream of the point of discharge, shall not be directly discharged. Such waters shall be diverted through a settling basin or filter before being discharged.
6. Contractor will be held responsible for the condition of any pipe, conduit or channel used for drainage purposes and all such pipes, conduits or channels shall be left clean and free of sediment.

C. Disposal of Water Removed by Dewatering System:
1. Dispose of all water removed from the excavation in such a manner as not to endanger public health, property, or any portion of the Work under construction or completed.
2. Dispose of water in such a manner as to cause no inconvenience to Owner, or others involved in Work about the site.
3. Convey water from the construction site in a closed conduit. Do not use trench excavations as temporary drainage ditches.
4. Dewatering System shall discharge to an appropriate location, in accordance with State and Federal regulations.

3.6 SHEETING, SHORING AND BRACING

A. General:
1. Used material shall be in good condition, not damaged or excessively pitted. All steel or wood sheeting designated to remain in place shall be new. New or used sheeting may be used for temporary Work.
2. All timber used for breast boards (lagging) shall be new or used, meeting the requirements for Douglas Fir Dense Construction grade with a bending strength not less than 1500 psi or Southern Pine No. 2 Dense.

3. All steel Work for sheeting, shoring, bracing, cofferdams etc., shall be designed in accordance with the provisions of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" of the AISC, except that field welding will be permitted.
4. Steel sheet piling shall be manufactured from steel conforming to ASTM A 328. Steel for soldier piles, wales and braces shall be new or used and shall conform to ASTM A 36.
5. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
6. Unless otherwise shown, specified, or ordered, all materials used for temporary construction shall be removed when Work is completed. Such removal shall be made in a manner not injurious to the structure or its appearance or to adjacent Work.
7. Provide permanent steel sheet piling as shown or required. Cut off tops, as required, but at least 3 feet below grade.
8. The clearances and types of the temporary structures, insofar as they affect the character of the finished Work and the design of sheeting to be left in place, shall be subject to the approval of Owner; but Contractor shall be responsible for the adequacy of all sheeting, shoring, bracing, cofferdamming, etc.
9. Safe and satisfactory sheeting, shoring and bracing shall be the entire responsibility of Contractor.
10. All municipal, county, state and federal ordinances, codes, regulations and laws shall be observed.

B. Sheeting Left in Place:
11. Steel sheet piling to be left in place shall consist of rolled sections of the continuous interlocking type, unless otherwise approved. The type and design of the sheeting and bracing shall conform to the above specifications for all sheeting and bracing steel Work. Steel sheeting left in place shall be new.
12. Steel sheet piling to be left in place shall be driven straight to the lines and grades as shown or directed. The piles shall penetrate into firm materials with secure interlocking throughout the entire length of the pile. Damaged piling having faulty alignment shall be pulled and replaced by new piling.
13. The type of guide structure used and method of driving for steel sheet piling to be left in place shall be subject to the approval of Owner. Jetting will not be permitted.
14. Cut-off piling left in place to the grades shown or ordered by Owner and remove the cut-offs from the site.
15. Clean wales, braces and all other items to be embedded in the permanent structure, and ensure that the concrete surrounding the embedded element is sound and free from air pockets or harmful inclusions. Provisions shall include the cutting of holes in the webs and flanges of wale and bracing members and the welding of steel diaphragm waterstops perpendicular to the centerline of brace ends which are to be embedded.
16. Subsequent to removal of the inside face forms, and when removal of bracing is permitted, cut back steel at least 2-inches inside the wall face and patch opening with cement mortar. Concrete shall be thoroughly worked beneath wales and braces, around stiffeners and in any other place where voids may be formed.
17. Portions of sheeting or soldier piles and breast boards, which are in contact with the foundation concrete, shall be left in place together with wales and bracing members cast into foundation or superstructure concrete.

B. Removal of Sheeting and Bracing:
1. Remove sheeting and bracing from excavations, unless otherwise directed in writing by Owner.
2. Remove sheeting so as to not cause injury to the Work.

3. Removal shall be equal on both sides of excavation to ensure that no unequal loads are placed on pipe or structure.
4. Defer removal of sheeting and bracing where removal may cause soil to come into contact with concrete until the following conditions are satisfied:
   a. Wall and floor framing, up to and including, grade level floors are in place.

3.7 TRENCH SHIELDS

A. Excavation of earth material below the bottom of a shield shall not exceed the limits established by ordinances, codes, laws and regulations.

B. When using a shield for pipe installation:
   1. Any portion of the shield that extends below the mid-diameter of an installed rigid pipe (e.g., PCCP, etc.) shall be raised above this point prior to moving the shield ahead for the installation of the next length of pipe.
   2. The bottom of the shield shall not extend below the mid-diameter of installed flexible pipe (e.g., Ductile Iron, PVC, etc.) at any time.

B. When using a shield for the installation of structures, the bottom of the shield shall not extend below the top of the bedding for the structures.

C. When a shield is removed or moved ahead, extreme care shall be taken to prevent the movement of pipe or structures or the disturbance of the bedding for pipe or structures. Pipe or structures that are disturbed shall be removed and reinstalled as specified.

3.8 FILL AND BACKFILL

A. General:
   1. Backfill excavations as promptly as Work permits, but not until completion of the following:
      a. Acceptance by the Owner of construction below finish grade.
      b. Inspection, testing, approval, and recording of locations of underground piping and ductwork.
      c. Removal of concrete formwork.
      d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
      e. Removal of trash and debris.
   2. Remove fill containing organic materials or other unacceptable material and replace with approved fill material as specified.

D. Placement of Select Backfill, Backfill and Fill:
   Refer to the project specific geotechnical engineering instructions and supplement with the following as needed.
   1. Select backfill shall be placed to the grades shown on the Drawings. The lift thickness and compaction moisture content range given herein are approximate. These values shall be finally determined from the laboratory test results on the fill materials.
   2. Place select backfill in horizontal loose lifts, not exceeding 8-inches in thickness. Mix and spread in a manner assuring uniform lift thickness after placing. Compact each lift by appropriate mechanical methods to 95 percent relative compaction by ASTM D 698 and at a relative moisture content above its optimum moisture. Place select backfill to the underside of

all concrete slabs. Extend select backfill a minimum of two feet horizontally beyond the foundation footprint.

3. Backfill and fill around and outside of structures and over select backfill shall be deposited in layers not to exceed 8-inches in non-compacted thickness and mechanically compacted, using platform type tampers. Compaction of structures backfilled by rolling will be permitted provided the desired compaction is obtained and damage to the structure is prevented. Compaction of select backfill or backfill by inundation with water will not be permitted. All materials shall be deposited as specified and as shown on the Drawings.
4. The material shall be placed at a moisture content and density as specified under Paragraph 3.15. Contractor shall provide equipment capable of adding measured amounts of water to the backfill or select backfill material to bring it to a condition within the range of the required moisture content. Contractor shall provide equipment capable of discing, aerating, and mixing the soil to ensure reasonable uniformity of moisture content throughout the fill material and to reduce the moisture content of the borrow material by air drying, if necessary. If the subgrade or lift of earth material must be moisture conditioned before compaction, the fill material shall be sufficiently mixed or worked on the subgrade to ensure a uniform moisture content throughout the lift of material to be compacted. Materials at moisture content in excess of the specified limit shall be dried by aeration or stockpiled for drying.
5. No backfill or fill material shall be placed when free water is standing on the surface of the area where the fill is to be placed. No compaction of fill will be permitted with free water on any portion of the fill to be compacted. No fill shall be placed or compacted in a frozen condition or on top of frozen material. Any fill containing organic materials or other unacceptable material previously described shall be removed and replaced with approved fill material prior to compaction.
6. Compact with equipment suitable for the type of fill material being placed. Select equipment capable of providing the minimum density required by these Specifications. Hand operated compacting equipment shall be used within a distance of 10 feet from the wall of any completed below grade structure. Equipment shall be provided capable of compacting in restricted areas next to structures and around piping. The effectiveness of the equipment selected by Contractor shall be tested at the commencement of compacted fill Work by construction of a small section of fill within the area where fill is to be placed. If tests on this section of fill show that the specified compaction is not obtained, increase the amount of coverages, decrease the lift thicknesses and/or obtain a different type of compactor.
7. Levels of backfill against concrete walls shall not differ by more than two (2) feet on either side of walls, unless walls are adequately braced or all floor framing is in place up to and including grade level slabs. Particular care shall be taken to compact structure backfill beneath pipes, roads, or other surface construction or structures. In addition, wherever a trench passes through structure backfill, the structure backfill shall be placed and compacted to an elevation 12-inches above the top of the pipe before the trench is excavated. Compacted areas, in each case, shall be adequate to support the item to be constructed or placed thereon.
8. The compaction requirements specified are predicated on the use of normal materials and compaction equipment. In order to establish criteria for the placement of a controlled fill so that it will have compressibility and strength characteristics compatible with the proposed structural loadings, a series of laboratory compaction and compressive strength tests shall be performed on the samples of materials submitted by Contractor. From the results of the laboratory tests, the final values of the required percent compaction, the acceptable compaction moisture content range, and the maximum permissible lift thickness will be established for the fill material and construction equipment proposed.

E. Backfill in Pipe Trenches:
   1. Backfill in accordance with Placer County Standard Plates 433 and Plate 434.

F. Backfill in Electrical Ductbank Trenches:
   1. Compact backfill to the full depth of the trench above the electrical ductbank.
   2. Where the trench for one ductbank passes beneath the trench for another pipe or ductbank, Select Backfill shall be placed to the level of the bottom of the upper trench.
   3. Placement and compaction of backfill in electrical ductbank trenches shall conform to the requirements of Paragraph 3.14.

G. Sand Placement:
   1. Pipe Surround: Place and compact minimum 6-inches of sand all around PVC and CPVC pipes and all pipe 2-inches and smaller, in 6-inch lifts, to a level 6-inches above the top of pipe.
   2. Other Areas: Place in uniform layers not to exceed 6-inches in uncompacted thickness.
   3. Compacted to not less than 95 percent of laboratory maximum density as determined by ASTM D 698.

3.9 EMBANKMENTS

A. Refer to the project specific geotechnical engineering instructions and supplement with the following as needed. The most conservative instruction will govern.

B. To the maximum extent available, use excess earth obtained from structure and trench excavations for construction of embankments. Obtain additional material from off-site sources, as necessary.

C. After preparation of the embankment area, level and roll the subgrade so that surface materials of the subgrade will be compact and well bonded with the first layer of the embankment.

D. All material deposited in embankments shall be free from rocks or stones, brush, stumps, logs, roots, debris, and organic or other objectionable materials.

E. Construct embankments in horizontal layers not exceeding 8-inches in uncompacted thickness.

F. Spread and level material deposited by excavating and hauling prior to compaction.

G. Thoroughly compact each layer by rolling, or other method acceptable to the Owner, to 95 percent of the maximum density at optimum moisture content, as determined by ASTM D 698.

H. If the material fails to meet the density specified, compaction methods shall be altered.

3.10 GRADING

A. Uniformly grade areas within limits of grading, including adjacent transition areas.

B. Smooth subgrade surfaces within specified tolerances, and compact with uniform levels or slopes between points where elevations are shown or between such points and existing grades.

C. Graded areas shall drain away from structures and prevent ponding.

3.11 BASE COURSE

A. Place and compact as specified per Placer County Standards.

3.12 DISPOSAL OF EXCESS EXCAVATED MATERIALS

A. Material removed from the excavations, which does not conform to the requirements for fill or is in excess of that required for backfill, shall be hauled away from the Work site and disposed of in compliance with ordinances, codes, laws and regulations at no additional cost to the Owner.

3.13 RESTORING AND RESURFACING EXISTING ROADWAYS AND FACILITIES

A. Pavement, gutters, curbs, sidewalks and roadways disturbed or damaged by Contractor's operations shall be restored by Contractor at their own expense to as good condition as was previous to the commencement of the Work and in accordance with applicable local and state highway specifications.

3.14 COMPACTION DENSITY REQUIREMENTS

A. The degree of compaction required for all types of fills shall be as listed below. Material shall be moistened or aerated as necessary to provide the moisture content that will facilitate obtaining the specified compaction.

Material Thick (in)	Required Minimum Density-Percent Compaction (ASTM D-698)	*Maximum Uncompacted Lift (inches)
Subgrade and Subbase Fill:		
Below concrete slabs on grade	95	8
Below Base of footings or mats, structural slabs and tank floors	95	8
Below asphalt concrete paving	95	12
Aggregate Base Course:		
Below concrete slabs or mats	95	8
Below asphalt, gravel and decomposed granite paving	100	8
Trench Backfill above pipe	95	12
Granular Pipe Embedment material	95	6
Sand Embedment Material	95	6

All fill must be wetted and thoroughly mixed to achieve optimum moisture content, ± 3 percent, with the following exceptions: On site clayey soils optimum to plus 3 percent.

Natural undisturbed soils or compacted soil subsequently disturbed or removed by construction operations shall be replaced with materials compacted as specified above.

C. Owner's testing service shall perform tests necessary to provide data for selection of fill material and control of placement water content.

D. Owner's testing service shall perform field density tests, to ensure that the specified density is being obtained.

E. If the tests indicate unsatisfactory compaction, Contractor shall provide the additional compaction necessary to obtain the specified degree of compaction. All additional compaction Work shall be performed by Contractor, at no additional cost to the Owner, until the specified compaction is obtained. This Work shall include complete removal of unacceptable (as determined by the Owner) fill areas and replacement and recompaction until acceptable fill is provided.

3.15 TEMPORARY FENCING

A. Furnish and install an 8-foot tall temporary fence surrounding excavations and the complete work area, including the stockpile and storage areas.

B. Provide openings only at vehicular, equipment and worker access points.

3.16 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Owner will inspect, test and approve subgrades and fill layers before construction Work is performed thereon. Tests of subgrades and fill layers by Owner's testing laboratory will be as follows:

1. Trench Backfill: At least one (1) test per 100 CY of backfill placed, and at least one test for each day that backfill is placed and compacted, for each type of trench backfill material.
2. Paved Areas: Make at least one (1) field density test of subgrade for every 500 square feet of paved area, but in no case less than three (3) tests. In each compacted fill layer, make one field density test for every 2000 square feet of paved area, but in no case less than three (3) tests.
3. If testing service reports or inspections show subgrade or fills are below specified density, provide additional compaction, moisture conditioning and testing at no additional expense to Owner. This Work shall include complete removal of unacceptable fill areas (as determined by the Owner), and replacement and re-compaction until acceptable compaction is provided.

+ + END OF SECTION + +

SECTION 02740

ASPHALT PAVING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This section covers the paving requirements for the Work.

B. Section Includes:
   1. Asphalt materials
   2. Aggregate materials
   3. Aggregate subbase

1.2 REFERENCES

A. General:
   1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
   2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
   3. California Department of Transportation standards shall also be referenced where county standards cannot be used.
   4. Refer to Division 01 for a list of applicable regulatory requirements.

1.3 SUBMITTALS

A. At no additional cost to the Owner, submit such quantities of construction materials as may be required by the Owner for test purposes.

B. Submit signed verification from the source of supply for each material used on the Work indicating that the materials meet specified requirements.

C. Submit mix designs of asphaltic concrete to be used in the Project for approval by the Owner.

1.4 QUALITY ASSURANCE

A. Qualifications of Workers: Provide sufficient skilled workers and supervisors who shall be present at all times during execution of this work and who shall be thoroughly familiar with the type of construction involved and the materials and technique specified.

B. Obtain materials specified in this section from the same sources throughout the Work.

C. Maintain one copy of the Drawings and Specifications on site.

D. Work shall conform to Placer County Standard Specifications and Design Guidelines.

1.5 PROJECT CONDITIONS

A. Environmental Requirements
   1. Liquid asphalt shall be prevented from spraying upon adjacent pavements, that portion of the traveled way being used by traffic, structures, railings and barriers, markers, trees and shrubbery that are not to be removed, adjacent property and improvements, and other roadway improvements or facilities not mentioned herein.

PART 2 – PRODUCTS

2.1 ASPHALT MATERIALS:

A. Performance / Design Criteria:
   1. Paving: Design for light duty commercial vehicles.

B. Asphalt Materials:
   1. Asphalt Cement: ASTM D94 6 and penetration grade per Placer County standards.
   2. Primer: ASTM D2027, or in accordance with Placer County standards.
   3. Tack Coat: In accordance with Placer County standards.

C. Aggregate Materials:
   1. Coarse Aggregate: ASTM D692; crushed stone, gravel, or blast furnace slag.
   2. Fine Aggregate: ASTM D1073; natural sand or sand manufactured from stone, gravel, or blast furnace slag.
   3. Aggregate Subbase: Specified in City standard.

2.2 MIXES

A. All streets shall have an asphaltic-concrete plant mixed surface.

B. Use dry material to avoid foaming. Mix uniformly.

C. Asphalt Paving Mixtures: ASTM D3515; designed in accordance with Placer County standard.

2.3 SOURCE QUALITY CONTROL

A. Submit proposed mix design for review prior to beginning of Work.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that compacted granular base is dry and ready to support paving and imposed loads.

B. Verify that gradients and elevations of base are correct.

3.2 PREPARATION

A. Prime coat and tack coat

1. Prepare subbase in accordance with county standards.
2. Apply primer to contact surfaces of curbs, gutters and exposed vertical surfaces.
3. Coat surfaces of manhole, catch basin, or other covers or encumbrances scheduled to remain with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.
4. Use clean sand to blot excess primer.

3.3 INSTALLATION

A. Placing asphalt pavement
   1. Asphalt concrete surfacing shall conform to Placer County Standard Specifications. Paving shall be done under suitable weather conditions for such operations. Rain or other inclement weather will be cause for discontinuing paving work.
   2. The completed surface of the top course shall be of uniform texture, smooth, of uniform grade, and free from defects.
   3. Compact pavement by rolling. Do not displace or extrude pavement from position. Compaction by vehicular traffic is not permitted. Hand compact in areas inaccessible to rolling equipment.
   4. Develop rolling with consecutive passes to achieve an even and smooth finish without roller marks.

3.4 TOLERANCES

A. Paving asphalt shall be applied at a temperature of not less than 250 degree F**,** and not more than 375 degree F. The exact temperature will be determined by the on-site City Inspector. 24 hour notice to the City is to be provided before paving operations are to be started.

B. The completed surfacing shall be thoroughly compacted, smooth, and true to grade and cross-section, within the tolerances specified herein, and free from ruts, humps, depressions, or irregularities. An acceptable surface shall not vary more than 1/4-inch from the lower edge of 12-foot straightedge when the straightedge is placed parallel or perpendicular to the centerline of the roadway. The straightedge will be furnished by the Contractor and shall be acceptable to the City.

C. In addition to the smoothness requirements specified above, asphalt concrete pavement shall be true to the grades shown or indicated on the plans and shall not vary more than 1/4-inch from the plan elevations. Finish pavement grades adjacent to curbs shall be within 1/4-inch of the design elevation but in no case be below the lip of the gutter. When replacing existing paving, Contractor shall survey the existing roadway in a 10’ grid. The new paving will match existing grades after the grading is reviewed and approved by the City.

D. When deviations in excess of the above tolerances are found, the pavement surface shall be corrected by the addition of asphalt concrete mixture of an appropriate class to low places or the removal of material from high places by methods satisfactory to the City or by removal and replacement of the course of asphalt concrete. Corrections of defects shall be carried out until there are no deviations anywhere greater than the allowable tolerances.

E. Areas in which the surface of the completed pavement deviates more than twice the allowable tolerances described above shall be removed and replaced to the satisfaction of the City.

F. Costs involved in making the corrections of defects described above shall be borne by the Contractor and no compensation will be made for this work.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under Placer County and California Department of Transportation standards.

3.6 PROTECTION

A. Immediately after placement, protect paving from mechanical injury for 3 hours or until surface temperature is less than 140 degrees F.

B. Protection of Existing Street Surface: During the entire construction period, protect existing pavement or sealed surfaces. Backhoes and trenchers must have street pads as grousers, metal tipped pads will not be allowed. Repair surfaces scarred by cleanup or excavation equipment in a manner satisfactory to the City. Repair damage caused by any Contractor's operations to existing roads and streets, including striping and raised pavement markers to the satisfaction of and at no additional cost to the Owner.

3.7 CONSTRUCTION WASTE MANAGEMENT

A. Separate materials in accordance with the Waste Management Plan and place in designated areas for recycling.

+ + END OF SECTION + +

SECTION 02800

EXISTING UTILITIES AND UNDERGROUND STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Materials and procedures to protect existing underground utilities.

B. Related Sections and References:
   1. Section 01570, Maintenance and Protection of Traffic

1.2 SYSTEM DESCRIPTION

A. The Engineer has attempted to show the approximate location of buried utilities on the drawings. These approximate locations are based on the following.
   1. Record maps of the existing force main and lift station received by the client at the beginning of the project.
   2. Google Earth images to plot locations of readily visible surface features including manhole covers, overhead utilities, utility boxes, and culverts.

B. Utility locations are based solely on the above. Plotted locations may not accurately reflect subsurface conditions. Prior to excavation, Contractor shall pothole and determine precise locations of all utilities shown on the plans.

C. Repair all structures identified to remain and structures on surrounding properties damaged during demolition Work.

1.3 PROJECT CONDITIONS

A. Power trench excavating equipment may only be used when and where all of the following conditions exist.
   1. Contractor has notified Underground Service Alert and all known utility owners at least 3 working days before excavating.
   2. Contractor has thoroughly searched the entire excavation route using a reliable electronic pipe finder and has pre-marked horizontal locations of conflicts.
   3. Utilities shown on the plans have been potholed 1,300 feet 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 10 feet of the area to be excavated.
   5. Owner's Representative is continuously present during excavation.

B. Power equipment specifically designed and manufactured for potholing existing utilities is exempt from the above restrictions.

C. 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 the first five feet below existing grade where drilling or auguring equipment is used.

D. Pursuant to Section 4215 of the California Government Code, Owner will be responsible for timely removal, relocation or protection of existing main or trunk line utility facilities located on Project site, if such utilities are not identified by Owner in Contract Documents.

E. Owner will compensate Contractor for costs of locating and repairing damage not due to failure of Contractor to exercise reasonable care.

F. Owner will compensate Contractor for documented costs of removing or relocating utility facilities either not shown on Contract Documents or shown on Contract Documents at locations more than two feet vertically or five feet horizontally in error from field locations except where location of said utilities are evident from surface features or staked correctly by Underground Service Alert.

G. Owner will not indicate presence of existing service laterals or appurtenances when presence of utilities on the Project site can be inferred from the presence of other visible facilities, such as buildings, meters and junction boxes, on or adjacent to the Project 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.

H. If Contractor discovers Utility facilities not identified by Owner in Contract Documents, Contractor shall immediately notify Owner and Utility in writing.

J. Utilities not shown on plans or shown on plans in a position different from field location shall, upon discovery, be immediately brought to attention of Owner's Representative and affected Utility in writing. Owner will be responsible for timely removal, relocating, protecting and temporary maintenance of existing main or trunk-line utility facilities not originally shown on Contract Documents with sufficient accuracy to allow Work to proceed according to Contract Documents. If necessary to remove, relocate, protect, or temporarily maintain an existing main or trunk-line utility not shown on Drawings with sufficient accuracy, to allow Work to proceed according to the Contract Documents, Owner will compensate Contractor for costs of locating, repairing damage not due to Contractor's failure to exercise reasonable care, removing, relocating, protecting or temporarily maintaining such utility facilities, and for costs for equipment on the jobsite necessarily idled during such work. These costs, and work to be done by the Contractor in locating, removing, relocating, protecting or temporarily maintaining such utility facilities shall be covered by a written change order conforming to the provisions herein pertaining to changes in the work. Owner may make changes in the alignment and grade of the work to obviate the necessity to remove, relocate, protect or temporarily maintain utility facilities or to reduce costs of the 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.

K. Damage to underground utilities, pipelines or other facilities whose existence is shown on Plans or identified by field staking or markings shall be immediately brought to attention of Owner's Representative and the 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 the lines, whether or not they lie within the trench prism, shall be borne in full by the Contractor.

L. 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 the 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 the Work site

M. No representations are made that the obligations to remove, relocate, protect or temporarily maintain a utility and to pay the cost thereof is not required to be borne by the utility. Contractor shall investigate, to find out whether or not said cost is required to be borne by the utility owner.

N. 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, Engineer and the utility owner to provide for removal or relocation of utility facilities. The 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 the purpose of making changes in their property made necessary by the work and the purpose of maintaining and making repairs to their property.

1.4 COORDINATION

A. Contractor shall notify the Owner and the utility company if any utility is damaged or destroyed during the course of construction. The Contractor shall be resposible for repairs or financial compensation should utilities be damaged at the fault of the Contractor. Utility owner will have the option of doing such work with their own forces, or permitting the work to be done by the Contractor.

B. Coordinate utility and service interruptions with Owner.

C. Coordinate demolition work with the City Staff and Utilities who access the communication enclosures as required by the Owner. This is not expected to include public meetings, door hangers, and scheduling of Work, only if found necessary by the Owner.

D. Notify the Owner and Utilities at least three working days before excavating. Contractor shall be responsible for damage done to public or private property shown on plans or marked or staked in field.

E. Construction plans will be provided to utilities by Owner.

1.5 SUBMITTALS

A. The Contractor shall submit a trench and excavation plan to the Engineer and Owner for review and approval. The Contractor must specify which utilities will be protected in place and coordinate with City staff if a relocation is required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. Expose all utilities within the vicinity of the access vaults to verify pipe and utility location and depths, types and 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.

B. Electrical Utilities may maintain energized underground electrical power lines in the immediate vicinity of this project. 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 the electrical Utility to arrange, if possible, to have these lines de energized when the work reaches their immediate vicinity. The cost of such temporary arrangements shall be borne by the Contractor.

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 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 feet 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.

D. It shall not be the responsibility of either Owner or their Representative to verify the need for electrical Utility shutdowns, nor to verify that shutdowns have taken place.

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 three 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 the Contractor's convenience, shall be relocated or rebuilt at the Contractor's expense. Repair, replacement or relocation of buried utilities shall be completed at the Contractor's expense by either Utility's forces, or by a contractor accepted by the Utility in writing and properly licensed to perform the work.

B. Utility relocation or reconstruction shall conform to applicable Standard Details and Specifications. Provide temporary service for the 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 the same size, type and quality as that removed.

3.4 BACKFILL AND COMPACTION

A. Backfill and compact under and around utilities so that no voids are left.

B. Before replacing a Utility, backfill the trench and compact to an elevation 1 foot above the top of the ends of the Utility. Excavate a cross trench of the proper width for the 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 a 6-inch slump. Submit specific methods and procedures to Owner's Representative prior to construction.

3.5 ABANDON UTILITY LINES

A. Abandoned utilities within the trench shall be removed and disposed of. Cut abandoned Utilities and plug ends with brick and mortar, unless otherwise shown. Plug storm drains and sewers with 8-inch thick wall of brick and mortar. Cap waterlines with a cast-iron cap. Dispose of removed pipe segments as unsuitable material in accordance with requirements of State and Federal law.

+ + END OF SECTION + +

SECTION 02900

PIPELINE CLEANING AND VIDEO INSPECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. High pressure water to clean the interior surfaces of the pipe.
   2. Closed-circuit television (CCTV) pipeline inspection

1.2 SYSTEM DESCRIPTION

A. The Work of this section applies to the removal and disposal of sediment and debris from the sewer force main, and CCTV pipeline inspection.

B. The scope of work includes sediment removal and sediment disposal. Cleaning shall include removing solids, roots, soil, sand, grit and other debris from the sewer force main. The sediment shall not be allowed to escape downstream into the gravity fed manhole south of Iowa Hill Road and Canyon Way during the cleaning operation. Amount of debris is estimated at fifteen percent (15%) of the cross sectional area of the existing force mains for their entire length. Drapes, tarps or other material shall be utilized to contain all debris.

1.3 COORDINATION

A. Coordinate shall submit the following items to the Owner:
   1. Submit a preliminary work schedule stating work hours, setup locations, and tasks to be completed on a daily basis.
   2. Submit sediment disposal plan including location of disposal site, sediment chemical analysis requirements.
   3. Submit written letter stating the specific type of equipment to be used.

B. The Contractor shall provide a full time Supervisor at the Work site during working hours for the duration of the project. The supervisor shall have the authority to sign change orders, coordinate Work, and make decisions pertaining to the fulfillment of the contract.

C. Prior to the start of any Work, the Contractor shall establish with the Inspector, schedules and notification procedures to ensure all pipe surfaces have been cleaned adequately. Remobilization to another location shall not occur until the Inspector or the Owner's representative has approved the cleanliness of the interior pipe surfaces.

1.4 REFERENCES

A. Except as otherwise noted, the current editions of the codes, specifications, and regulations, and standards listed below, apply to the Work of this section.

B. 29 CFR Code of Federal Regulations Title 29, Occupational Safety and Health Administration (OSHA), U.S. Department of Labor
   1. 1926.502 - Fall protection systems criteria and practices

2. 1910 - Occupational safety and health standards
3. 1910.146 - Permit required confined spaces
4. 1910.45 - Occupational noise exposure

1.5 SUBMITTALS

A. A written procedure for the sediment collection, removal, dewatering and sediment disposal. The procedure shall state the volume, specifications, and dimensions of any tanks or pumps to be used in the field. The procedure shall state the methods to be employed to prevent spills of the washing fluids.

B. Submit a preliminary work schedule stating work hours, traffic control plans with setup locations, and tasks to be completed on a daily basis.

C. Confined space certificates for all persons entering the confined space shall be submitted as part of the submittal process.
   1. If the local agency does not have its own confined space program, the Contractor must submit confined space guidelines to agency for review

1.6 HEALTH AND SAFETY

A. The Contractor will be responsible for all jobsite safety including but not limited to compliance with all health and safety laws, regulation, codes, permits and standard operating procedures, etc. Failure to comply with health and safety laws, regulations, codes, permits, and standard operation procedures will be grounds for shutting down the Work. All costs resulting from a shutdown of the Work that are due to the Contractor's negligence or failure to comply with applicable safety requirements shall be borne by the Contractor. After a shutdown of the Work, the Work will not be permitted to begin again until the Inspector is satisfied that all necessary health and safety precautions are being taken.

B. In confined space environments, as defined in 29 CFR 1910.146, Work shall comply with the requirements set forth by OSHA applicable to the construction industry. The Contractor shall provide and require use of safety and personnel life-saving equipment for persons working in Confined Space areas, including but not limited to, adequate forced ventilation, body harnesses, and gas detection meter(s) that continually monitors for levels of oxygen, hydrogen sulfide, carbon monoxide (CO), and Lower Explosive Limit (LEL).

C. Fall Protection shall be in accordance with 29 CFR 1926.502.

D. The Contractor shall provide all head and face protection equipment and respiratory devices required to safely perform this Work. Equipment shall include any applicable masks recommended by the manufacturer while performing blasting or application of the coating materials.

E. Use of ear protection devices shall be provided and required by the Contractor whenever the occupational noise exposure exceeds 29 CFR 1910.95 limits.

1.7 RECORDS

A. The Contractor shall maintain an accurate, written record of the length of pipe cleaned, the manhole or access pit identification numbers, and the amount of solids and liquids that have been

removed from the sewer force pipe. The Contractor shall furnish a signed copy of said record to the Inspector at the beginning of the next working day. These quantities shall be independently verified by the Inspector and reported on the Inspector's log. The Inspector shall immediately investigate and resolve any discrepancies between these reported quantities

B. The Contractor shall submit the landfill's weight master receipt stating the weight of the truck used to transport the debris before and after disposal.

PART 2 - PRODUCTS

2.1 GENERAL

A. Combination cleaning/vacuum truck (Vactor truck) refers to a truck constructed with a holding tank and a suction pump used to collect both solids and liquids. Water from a built-in water storage tank, is used to dislodge and flush out debris, solids, and sediment from pipelines. The water tank would have to be filled with potable water from a hydrant. A large hydro-jet (at 2,000 psi and 80 gpm) is released away from the initial access pit and used to drag the sediment to the next access pit where a truck-mounted vacuum pump would remove both water and the solids from the pipe.

2.2 CCTV EQUIPMENT

A. Camera
   1. Camera shall be nationally-recognized testing laboratory (NRTL) certified for a normal sewer environment when gas meter readings of the manhole airspace indicate an LEL less than 10% and shall be explosion proof certified for hazardous environment when gas meter readings of the manhole environment indicate an LEL greater than 10%;
   2. Resolution: 350 lines per inch, minimum, color image;
   3. Pan and tilt unit, with adjustable supports specifically designed and constructed for operation in connection with pipe inspection;
   4. 65-degree viewing angle, minimum and automatic or remote focus and iris controls;
   5. Skid mounts, sized for each pipe diameter, or self-propelled;
   6. Equipped with tag line suitable for pulling camera backwards; and
   7. Automatic or remote-controlled tint and brightness balance adjustments

B. Lighting
   1. Minimize reflection;
   2. Sufficient for diameters from 15 to 48 inches;
   3. Provide clear view of entire inside periphery of pipe; and
   4. Adjustable through range from 4 inches to infinity.

C. Remote Reading Footage Counter
   1. Calibration: each day prior to start of work using walking meter, roll-a-tape, or other suitable device; and Accurate to plus or minus 2/10ths of a foot over 1,000 feet of pipe inspected.

PART 3 - EXECUTION

3.1 GENERAL

A. The cleaning method shall be capable of removing loose pipe wall material, solids, sand, and grit.

B. Special precautions shall be implemented to ensure that the equipment does not flood any public or private property including but not limited to storm drains and lateral connections.

3.2 CLEANING AND SEDIMENT REMOVAL

A. The Contractor shall be responsible for conducting a site inspection of each pipeline segment prior to cleaning in order to determine which method shall be used. One of the following methods may be used for the dewatering, collection, and disposal of the solids according to the Environmental Requirements of this Specification.
   1. Combination Cleaner/Vacuum Truck
   2. Hydraulically Propelled Equipment

B. The cleaning method shall start at the initial access pit and proceed to the next access pit.

C. At no time will any material be allowed to escape downstream out of the project area.

D. At the end access pit the Contractor shall clean and remove all sediment from the force main pipeline.

E. Any sediment/debris settling tanks shall be placed so that traffic disruption is kept to a minimum.

F. A minimum of two passes shall be made along the entire contract segment regardless of the cleaning method. If cleaning of entire section cannot be successfully performed from one end of the sewer force main, the Contractor shall set up equipment at the other end and attempt cleaning again.

G. Immediately after the cleaning, the pipeline shall be televised to determine the quality of the cleaning work and the condition of the pipe. The Inspector shall approve the observed pipe surfaces or request another cleaning of the entire segment of pipe or a portion thereof, based on the observations made during the CCTV inspection. The re-cleaning and re-inspection shall be made at no additional cost to the Owner. If after two cleaning passes the pipe is still not clean, additional cleaning will be requested by the Inspector and paid for on a unit cost basis.

H. Acceptance
   1. Acceptance of sewer force main cleaning shall be made upon the successful completion of the video inspection to the satisfaction of the Engineer. If TV inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to re-clean and re-inspect the sewer line until the cleaning has been shown to be satisfactory.

I. If successful cleaning cannot be performed or equipment fails to traverse entire sewer line section, it will be assumed that major blockage exists. Temporarily suspend cleaning effort and immediately notify the Engineer. Upon removal of obstruction, complete cleaning operation.

J. Removal of Debris: Flush debris to the nearest access point for removal and proper offsite disposal. Do not discharge fluids or solids removed from the cleaning operation onto the ground or into ditches, catch basins or storm drains.

3.3 CCTV INSPECTION

A. The speed that the camera or survey unit is conveyed through the sewer force main while performing general inspections shall be uniform and shall be limited to a maximum of 30-feet per

minute. The survey unit shall be slowed, stopped, or backed-up to perform detailed inspections of significant features. The camera shall be stopped at all defects, changes in material, size, side connections, junctions, or other unusual areas. When stopped at the defect or feature, the operator shall pan the camera to the area and along the circumference of the pipe. The operator shall also record audio of the type of defect or feature, clock position, footage, extent or other pertinent data. Still photographs or screen captures shall be taken at all defects and general line condition photographs should be taken at least every 200 feet.

B. During period of camera advancement along the reach, the operator should pan to view the flow line conditions along both sides of the pipe and the crown at regular intervals. This may be done while the camera is moving forward as long as the recorded picture quality is not adversely affected.

C. At the Contractor's discretion or direction of the Engineer, the camera shall be stopped or backed up (when conditions allow) to view and analyze conditions that appear to be unusual or uncommon for a sound sewer force main. The lens and lighting shall be readjusted, if need be, in order to ensure a clear, distinct, and properly lighted feature. The video recorder shall be paused if the camera progress is stopped for a period longer than 30 seconds due to breakdown of the equipment, or any purpose other than analyzing conditions of the water main. The operator shall document the delay on the recording when progress resumes.

D. The Contractor shall be responsible for all traffic control measures required.

E. Linear Measurement
   1. The Contractor shall measure the camera progress along the full length of each reach. The length counter shall be zeroed at the beginning of each inspection. In the case of resuming an inspection at an intermediate point along the pipeline, the length counter shall start at the last point recorded. The Contractor shall ensure that the counter starts to register immediately when camera progress starts. The device shall be observable at ground level. Markings on the cable is not acceptable.
   2. Prior to commencing inspections, the Contractor shall demonstrate compliance with the linear measurement tolerance specified below:
      a. The equipment shall measure the location of the camera unit in 1-foot increments from the beginning of each continuous section. This footage location must be displayed on the CCTV monitor and recorded.
      b. The accuracy of the measured location shall be within + 0.5% of the actual length of the water main being surveyed, or 1 foot, whichever is greater.

F. CCTV Monitor Display
   1. The camera lighting shall be fixed in intensity prior to commencing the survey and the white balance set to the color temperature emitted. In order to ensure color constancy, ideally no variation in illumination shall take place during the survey.

G. Data Display
   1. The CCTV images shall include an initial data display that identifies the water main being surveyed and a survey status display that provides continuously updated information on the location of the survey unit as the survey is being performed. These data displays shall be in alphanumeric form. The size and position of the data shall not interfere with the main subject of the monitor picture.
   2. The on-screen display should be white during inspections where the background behind the display is dark and, conversely, black where the background is light.

3. At the beginning of each reach of forcemain being inspected, the following information shall be electronically generated and displayed on the CCTV monitors as well as included in the audio track:
    a. Date of survey
    b. Interceptor name/location
    c. Access location ID
    d. Direction of survey
    e. Time of start of survey.
4. During inspections, the following information shall be electronically generated, automatically updated, and displayed on the CCTV monitors:
    a. Survey unit location in the forcemain in feet and tenths of feet from adjusted zero.
    b. Forcemain diameter
    c. Access location ID.

H. Report
1. Two copies of the pre-rehabilitation and post-rehabilitation (4 copies total) inspection videos saved in mpeg format on DVDs; electronic version (.jpg) of still photographs saved on DVDs; a digital Microsoft Access database populated with all inspection and defect information; and hard copies and electronic pdf files of the inspection logs shall be submitted to the Owner for review and approval. DVDs or sections thereof that do not conform to the specifications shall be re-recorded in the field at the Contractor's expense. Original DVDs and re-recorded runs shall be edited to provide a record with all inspections in sequential order. DVDs not in sequential order are unacceptable.
2. The TV inspection report shall include video recordings, pictures and any Owner required inspection forms and defect codes. Contractor shall provide equal documentation on both the videos and forms. Contractor shall maintain a copy of all report material. The Contractor shall provide comments as necessary to fully describe the existing condition of the water main, both through the voice over on the videos and on the inspection forms. Photographs shall further document both typical water main features, and defects. The photographs shall be copied to a DVD and submitted to the Owner along with the videos and logs.

I. DVDs
1. TV inspections shall be recorded in DVD format.
    a. Each recording shall continuously display the following:
    b. Name of the sewer force main.
    c. IEUA project number.
    d. Starting Access Pit ID.
    e. Access Pit ID to which the camera is traveling.
    f. Distance measurements (within 1 percent accuracy)
    g. Date of recording and inspector.
    h. Pipe diameter.
    i. Pipe material.
2. DVD recordings shall include an audio track recorded by the inspection technician during the actual inspection work describing the parameters of the line being inspected (i.e., location, depth, diameter, pipe type), as well as describing connections, defects and unusual conditions observed during inspection.
3. DVDs shall be professionally labeled showing the project name, the lines recorded on the tape, date, and name of Contractor/Inspector.

3.4 CLEAN UP

A. Upon completion of the Work, all equipment, trash, and sanitary sewer debris shall be removed from the site to the satisfaction of the Owner or Owner's representative. The Contractor shall remove any debris or solids on the street within the work site area around the access pits at the end of each day.

B. All equipment shall be decontaminated prior to leaving the job site each day.

3.5 MEASUREMENT AND PAYMENT

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.

+ + END OF SECTION + +

SECTION 03301

PRECAST CONCRETE UTILITY STRUCTURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment and incidentals required to furnish and install pre-cast conrete utility vaults as indicated on the construction plans.
   2. Pre-cast inspection vaults shall be installed to increase the level of monitoring, cleaning, and inspection capabilities for the existing force main system.

B. Related Sections:
   1. Section 01600, General Equipment Provisions.
   2. Section 02220, Excavation and Backfill
   3. Section 03300, Cast-In-Place Concrete

1.2 DESIGN

A. Manufacture's Qualifications:
   1. Manufacturer shall have a minimum of five (5) years of experience in the production of substantially similar equipment, and shall show evidence of satisfactory service in at least five (5) installations.

B. All vaults shall be designed by a licensed professional engineer registered in the State of California, and engaged by the manufacturer. All dead loads, live loads, flotation, erection, temperature and anchorage stresses shall be considered.

C. The calculations and drawings shall be prepared in a neat and legible manner, sealed by the licensed Professional Engineer performing the calculations.

D. All vaults with a top slab less than 1 foot above grade shall be designed for H-20 wheel load on top slab and hatches. An H-20 surcharge load, applied at grade around all sides, shall be considered at all vaults.

E. Reference Standards: Comply with the latest versions of applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. ACI American Concrete Institute
   2. ANSI American National Standards Institute
   3. ASTM American Society for Testing and Materials
   4. BOCA Building Officials & Code Administrators
   5. CRSI Concrete Reinforcing Steel Institute
   6. IBC International Building Code
   7. ICEA Insulated Cable Engineers Association
   8. ISO International Standards Organization
   9. NEC National Electric Code
   10. NEMA National Electrical Manufacturers Association
   11. NFPA National Fire Protection Association
   12. OSHA Occupational Safety and Health Administration

1.3 SUBMITTAL

A. Shop Drawings: Submit for approval the following:
   1. Outline Plan View – Contractor shall submit manufacturer's plan sheet including general arrangement, center of gravity, weight, floor opening size and locations to the Engineer and City for review.
   2. Outline Elevation – Contractor shall submit manufacturer's elevation sheet including general arrangement in elevation, recommended pier and tie down locations, wall opening sizes and locations
   3. Outline Legend/Design Criteria – Contractor shall submit manufacturer's design criteria, drawing legend, and bill of material.
   4. After approval drawings are returned, manufacturer shall prepare and submit structural fabrication detail drawings.
   5. Professional Engineer stamped calculations and as-built drawings shall be provided.
   6. A structural analysis report prepared by a Professional Engineer shall be provided.
   7. Submit shop drawings of wall sections and bases proposed for this project; include joint design and related details for field assembly as applicable.
   8. Submit certification of conformance with Contract Documents and ASTM C478, C858, and C913.
   9. Submit catalog cut for waterproofing system used on exterior surfaces.

B. Operation and Maintenance Data: Submit complete manuals including:
   1. Copies of all approved shop drawings and test reports.

C. Shop Tests:
   1. After the Unit is fabricated and installed, the manufacturer will perform a wet spray test and a quality inspection. Copies of completed test reports will submitted as required for Operation and Maintenance Data.

D. Certifications: Submit written "Certificate of design and manufacturing conformance" prepared and signed by a Professional Engineer, verifying that the structure design meets indicated loading requirements and codes of authorities having jurisdiction.
   1. Certification shall reference specific dead loads, live loads, concentrated loads, traffic loads, collateral loads, seismic loads, end-use categories, governing code bodies, including year, and load applications.
   2. Submit certification on the pre-cast structure manufacturer's letterhead.

E. Warranty Documentation: Submit manufacturer's standard warranty.

1.4 PRODUCT DELIVERY. STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the Work. Deliver anchoring devices, which are to be embedded in cast-in-place concrete, in ample time to not delay the Work.
B. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
C. Storage and Handling Requirements:
   1. Store and handle materials in accordance with manufacturer's instructions.
   2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
   3. Do not store materials directly on ground.

4. Store materials on flat, level surface, raised above ground, with adequate support to prevent sagging.
5. Protect materials and finish during storage, handling, and installation to prevent damage.

1.5 QUALITY CONTROL INSPECTION

A. The quality of all materials, the process of manufacture and the finished sections shall be subject to inspection by Engineer. Such inspection may be made at the place of manufacture and/or at the Site after delivery.
B. All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close-textured and free of honeycomb, cracks, roughness, exposure of reinforcement, damaged joints, or other irregularities.
C. All sections which have been damaged after delivery will be rejected, or if already installed, shall be repaired or removed and replaced entirely at Contractor's expense.

1.6 WARRANTY

A. Unit manufacturer shall provide a written weathertightness warranty for a maximum of 10 years against leaks in roof panels, arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions.
   1. Warranty shall be signed by both the Unit manufacturer and the installer.
   2. Maximum liability of warranty shall be equal to the replacement cost of the roof.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General:
   1. Construction of the Unit shall be performed in the highest manner of workmanship using only new and unused, top quality materials. The unit shall be guaranteed against defects in materials and workmanship for one (1) year from the date of shipment.
   2. For seismic requirements, the structure of the building shall be designed and constructed to safely support the seismic loads specified in International Building Code.
   3. Minimum 28-Day Compressive Strength - 4500 psi.
   4. The Unit shall be designed and fabricated so the fieldwork at the installation site is minimized.
   5. Reinforcement shall be per Section 03200, Concrete Reinforcement

B. Precast Or Cast-In-Place Concrete Bases
   1. Design and manufacture of precast concrete bases shall conform to the requirements of this section and ASTM C478, C858, and C913. Cast-in-place concrete sumps shall conform to Section 03100, Concrete Formwork; Section 03200, Concrete Reinforcement; and Section 03300, Cast-in-Place Concrete.
   2. Bases shall conform to the dimensions indicated on the Drawings or as required by design. The horizontal joint at the top of the base shall be compatible with that of the precast wall section.
   3. Sump shall be precast or field constructed where shown on the Drawings. Use watertight gasket material between sump and base of precast vault.
   4. Concrete topping walking surface shall be sloped to the sump, have a non-slip broom finish, and be sealed with a penetrating concrete sealer. Minimum concrete topping thickness at sumps shall be two inches.

C. Precast Concrete Walls
   1. Design and manufacture of precast concrete walls shall conform to the requirements of this section and ASTM C478, C858, and C913.
   2. All tongue-and-groove joints in the precast wall, including the joint at the top of the base, shall be made up using gaskets.
   3. The precast sections shall be provided with a special groove to receive and hold the gasket in position during joint assembly.
   4. After joint assembly, the gap between sections shall be packed on the inside and outside with "Masterflow 713" by Master Builder; "Five Star Grout" by U.S. Grout Corp.; or equal, and shall be troweled smooth so that no projections remain on the inside. There shall be concrete to concrete bearing between the various sections. The gasket shall not support the weight of the section.

D. Precast Concrete Slab Tops
   1. Precast reinforced concrete slab tops shall be manufactured in accordance with ASTM C478, C858, and C913. Openings and frames shall be provided for hatches and grating where shown on the Drawings. Slab tops shall be set in a full bed of mortar.
   2. Slab tops shall be crowned or sloped to drain, minimum 1/4 inch per foot.
   3. Concrete slab tops shall receive a non-slip broom finish and a penetrating concrete sealer.

E. Pipe Seals
   1. The annular space around the pipe wall or sleeve shall be packed with "Masterflow 713" by Master Builders, "Five Star Grout" by U.S. Grout Corp.; or equal. Before the grout has set, Contractor shall recheck invert elevations of the pipe.
   2. For ductile iron pipe, provide a pipe sleeve sized to accept the pipe plus a modular mechanical seal such as Link Seal or equal.

F. Hatches
   1. Hatches shall be of the size shown on the Drawings.
   2. A 1-inch drain coupling shall be provided in hatch frames. Contractor to extend drain to sump pit at vaults intended to remain dry.
   3. At all hatches, provide a hinged aluminum grate fall-through protection system.
   4. Precast vault shall be complete with an H-20 rated cover.

G. Openings and Inserts
   1. All openings required in the concrete shall be reinforced with additional diagonal bars tied to each layer of wall or slab reinforcement.
   2. Any required pipe sleeves, inserts, and wall openings shall be coordinated with mechanical requirements prior to casting the units.

H. Waterproofing
   1. Around the exterior of all wall joints, apply the "Bituthene" primer and membrane waterproofing system by W.R. Grace Company, or equal.
   2. Exterior wall surfaces shall be waterproofed using manufacturer's standard two-coat system, specifically designed to waterproof the exterior of concrete surfaces in a below-grade submerged condition.

   3. For the top slab and above-grade exposed side walls, the concrete shall be sealed with two coats of a Type E finish.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine area to receive Unit.

B. Verify that sizes and tolerances are acceptable.

C. Notify Engineer of conditions that would adversely affect installation or subsequent use.

D. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

A. Unit shall be installed as indicated on the Drawings, and according to manufacturer's instructions.

B. Provide foundation mat of run-of-crusher stone to support base. Mat shall be 6 inches minimum depth and shall bear on sound undisturbed earth; excavate and remove subgrade material as necessary to reach sound subgrade.

C. Stone foundation mat shall be a minimum of 1 foot greater than the footprint of the vault base, and shall be compacted to a uniform, level surface.

D. All exterior below-grade wall joints shall be sealed using a membrane waterproofing system. Next, all below-grade wall surfaces shall be waterproofed per manufacturer’s instructions.

E. After installation is complete, the cover slab and interior walking surfaces shall be sealed.

F. After installation of mechanical equipment, provide touch-up painting of epoxy wall finish.

G. Backfill using well compacted structural fill material, being careful to not damage exterior waterproof coating while providing full support under connecting pipes using compacted bedding material.

H. During the one year warranty period, all visible leaks shall be sealed in an approved manner.

+ + END OF SECTION + +

SECTION 03600

GROUT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-shrink cementitious grout
   2. Epoxy grout.

1.2 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and installation instructions for all proprietary materials.
   2. Manufacturer’s certification of compliance with the specified properties for all proprietary materials.
   3. Submit certifications that all grouts used on the project are free of chlorides or other chemicals causing corrosion.

1.3 QUALITY ASSURANCE

A. Reference Standards:
   1. ASTM C 33 - Specification for Concrete Aggregates.
   2. ASTM C 40 - Test Method for Organic Impurities in Fine Aggregates for Concrete.
   3. ASTM C 109 - Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
   4. ASTM C 531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   5. ASTM C 579 - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes.
   6. ASTM C 827 - Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
   7. ASTM C 882, Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
   8. ASTM C 1107 - Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
   9. ASTM C 1181, Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.
   10. U. S. Army Corps of Engineers Concrete Research Division, CRD C621 - Non-Shrink Grout.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver grout in manufacturer's unopened containers with proper labels intact.

B. Store grout in a dry shelter and protect from moisture.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Water:
   1. Potable.
   2. Containing no impurities, suspended particles, algae or dissolved natural salts in quantities capable of causing:
      a. Corrosion of steel.
      b. Volume change increasing shrinkage cracking.
      c. Efflorescence.
      d. Excess air entraining.

B. Fine Aggregate:
   1. Washed natural sand; hard, durable, and oven dry.
   2. Gradation in accordance with ASTM C 33 and represented by smooth granulometric curve within required limits.
   3. Free from injurious amounts of organic impurities as determined by ASTM C 40.

2.2 NON-SHRINK CEMENTITIOUS GROUT

A. Prepackaged, inorganic, flowable, non-metallic, cement-based grout requiring only the addition of water: Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged.
   1. Minimum 28 day compressive strength of 7000 psi.
   2. Conforms to the requirements of ASTM C 1107.
   3. The length change from placement to time of final set shall not have shrinkage greater than the amount of expansion measured at 3 or 14 days. The expansion at 3 or 14 days shall not exceed the 28-day expansion.
   4. Fluid grout shall pass through the flow cone, with a continuous flow, one hour after mixing.
   5. Non-shrink grout shall conform to CRD-C 621 and ASTM C1107, Grade B or C when tested at a maximum fluid consistency of 30 seconds per ASTM C939 at temperature extremes of 45°F and 90°F and an extended working time of 15 minutes.

B. Approved Product and Manufacturer:
   1. BASF, “Masterflow 928”.
   2. Euclid Chemical Company, “Hi-Flow Grout”.
   3. Five Star Products, Inc., “Five Star Grout”.
   4. Sika Corporation, “SikaGrout 212”.
   5. Or approved equal

2.3 EPOXY GROUT

A. Pourable, non-shrink, 100 percent solids system:
   1. The epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all premeasured and prepackaged.
   2. The resin component shall not contain any non-reactive diluents.
   3. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable.
   4. Variation of component ratios is not permitted, unless specifically recommended by the

manufacturer.

5. Compressive creep at one year shall be less than 0.001-inch per inch when tested under a 400-psi constant load at 140°F in accordance with ASTM C1181.
6. Minimum 7-day compressive strength shall be 14,000-psi when tested in accordance with ASTM C579
7. Manufacturer's instructions shall be printed on each container in which the materials are packaged.

B. Approved Product and Manufacturer:
   1. BASF, “Masterflow 648”.
   2. Euclid Chemical Company, “E3-G”.
   3. Sika Corporation, “Sikadur 42”.
   4. Or approved equal

2.4 CURING MATERIALS

A. Curing materials shall be as recommended by the grout manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean grout contact surfaces of oil, grease, and other foreign matter. Chip away unsound concrete leaving surface level but rough.

B. Underside of base plates of machinery, rails, and bolts shall be free of grease, oil, or dirt.

C. Examine the substrate and conditions under which grout is to be placed and notify Engineer of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

3.2 INSTALLATION

A. Place and cure grout in accordance with manufacturer's instructions.

B. Manufacturers of proprietary products shall make available upon 72 hours notification the services of a qualified, full time employee to aid in assuring proper use of the product under job conditions.

C. After shimming columns, beams, and equipment to proper grade, securely tighten anchor bolts.

D. Properly form around the base plates allowing sufficient room around the edges for placing the grout. Adequate depth between the bottom of the base plate and the top of concrete base must be provided to assure that the void is completely filled with grout.

3.3 FIELD QUALITY CONTROL

A. The Owner will employ a testing agency to perform field and laboratory quality control testing and prepare testing reports.

B. The testing agency shall take samples and perform field testing if requested by the Owner.

C. Field Testing:
   1. Compression test specimens will be taken during construction from the first placement of each type of grout, and at intervals thereafter as selected by the Engineer to ensure continued compliance with these specifications.
   2. Compression tests and fabrication of specimens for non-shrink grout will be performed as specified in ASTM C 109 at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days, 28 days, and each additional time period as appropriate.
   3. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days, and each earlier time period as appropriate.
   4. The cost of all laboratory tests on grout will be borne by the Owner, but the Contractor will assist the Engineer in obtaining specimens for testing. However, the cost of any additional tests and investigation on work performed which does not conform to the requirements of the specifications shall be borne by Contractor.
   5. Contractor shall supply all materials necessary for fabricating the test specimens.

+ + END OF SECTION + +

SECTION 15051

BURIED PIPING INSTALLATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Installation of buried piping, fittings, and specials.
   2. Supports and restraints.
   3. Work on or affecting existing piping.
   4. Testing.
   5. Cleaning and disinfecting.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate with the Work that is related to this Section.
   2. Section 15051, Buried Pipe Installation, specifies the installation of all buried piping buried in Sections of Division 15, Mechanical. Coordinate with these Sections.

C. Related Sections:
   1. Section 02220, Excavation and Backfill.
   2. Section 03300, Cast-in-Place Concrete.
   3. Division 15, Sections on Piping, Valves and Appurtenances.

1.2 SUBMITTAL

A. Shop Drawings:
   1. Laying schedules for all piping.
   2. Full details of piping, specials, manholes, joints, harnessing and connections to existing piping, structures, equipment and appurtenances.

B. Tests:
   1. Description of proposed testing methods, procedures and apparatus.
   2. Report for each test.

C. Certificates: Submit certificates of compliance with referenced standards.

D. Record Drawings:
   1. Submit prior to the time of Substantial Completion.

1.3 QUALITY ASSURANCE

A. Conform to the Placer County Standard Specifications and Design Guidelines.

B. Requirements of Regulatory Agencies:
   1. UL and other jurisdictional authorities, where applicable.
   2. Applicable building codes.

C. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. ASTM D2321, Practice for Underground Installation of Flexible Thermoplastic Pipe.
   2. ASTM D2774, Practice for Underground Installation of Thermoplastic Pressure Piping.
   3. AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   4. AWWA C600, Installation of Ductile-Iron and Their Appurtenances.
   5. AWWA C606, Grooved and Shouldered Joints.
   6. AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe.
   7. AWWA M23, PVC - Design and Installation.
   8. ASCE MOP No. 37, Design and Construction of Sanitary and Storm Sewers.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the Work.

B. Handle all pipe, fittings, specials and accessories carefully with approved handling devices. Do not drop or roll material off trucks. Do not otherwise drop, roll or skid piping.

C. Store pipes and fittings on heavy wood blocking or platforms so they are not in contact with the ground.

D. Unload pipe, fittings and specials opposite to or as close to the place where they are to be installed as is practical to avoid unnecessary handling. Keep pipe interiors completely free from dirt and foreign matter.

E. Inspect delivered pipe for cracked, gouged, chipped, dented or other damaged material and immediately remove defective pipe from site.

F. The City Inspector may reject piping during or after its deliver based on aesthetics alone.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Required pipe materials are listed Paragraph 3.8, Piping Schedule.

B. Refer to applicable Sections for material specifications.

C. Marking Piping:
   1. Clearly mark each piece of pipe or fitting with a designation conforming to those shown on the laying schedule and/or Shop Drawings.
   2. Cast or paint material, type and pressure designation on each piece of pipe or fitting 4-inches in diameter and larger.
   3. Pipe and fittings smaller than 4-inches in diameter shall be clearly marked by manufacturer as to material, type and rating.

D. CONTRACTOR shall be responsible to coordinate compatible materials of construction for all elastomer components for all seats, seals, gaskets, etc., for each process application.

2.2 DETECTABLE PIPE LOCATING TAPE

A. Detectible tape shall be buried adjacent to the newly installed piping.

B. Approved Product and Manufacturer:
   1. Reef Industries, Inc.
   2. Alarmatape
   3. Linetec, Inc.
   4. Trumbull
   5. Or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Unless otherwise specifically shown, specified, or included under other Sections, all buried piping Work required begins at the outside face of structures or structure foundations and extending away from structure.
   2. Installation of all pipe, fittings, valves, specials and appurtenances shall be subject to the review and/or approval of the Owner.
   3. Install piping as shown, specified and as recommended by the manufacturer and in conformance with referenced standards, and approved Shop Drawings.
   4. Request instructions from Owner before proceeding if there is a conflict between the manufacturer's recommendations and the Contract Documents.
   5. All piping shall be inspected by the City inspector prior to installation. Inspector's observations will not relieve Contractor or manufacturer from responsibility for damaged products.
   6. All piping shall be carefully examined for cracks, damage or other defects before installation. Any piping that is defective, including but not limited to, cracked, damaged, in poor condition, or with damaged linings or improper markings shall be rejected unless the product can be repaired in a manner acceptable to the manufacturer and Owner. Any piping found to be broken or defective after it has been installed shall be removed, replaced or repaired at Contractor's expense.
   7. Minimum earth cover over the piping shall be as shown on the Drawings, specified or directed by the Owner, but in no case shall the earth cover be less than depth necessary to connect to existing piping or 4-feet-0-inches, except drains.
   8. Required earthwork shall be as specified in applicable Sections of Division 2, Site Work.
   9. Pothole all existing utility crossings and present solutions to all conflicts between piping systems and equipment, structures or facilities to Owner for determination of corrective measures before proceeding.
   10. Take field measurements, where required, prior to installation to ensure proper fitting of Work. The Contractor shall uncover the existing pipelines sufficiently in advance of the proposed Work in order that the type and location of the existing pipes and joints and other information required to fabricate the proposed piping can be determined. It shall be the responsibility of the Contractor to obtain whatever information is required to complete the connections of the proposed pipelines to the existing pipelines. Refer to Paragraph 3.3 of this Section, as applicable.
   11. Interior of all piping and mating surfaces shall be inspected and all dirt, gravel, sand, debris or other foreign material shall be completely removed from the interior and mating surfaces before installation. Measures shall be taken to maintain the interior of all piping clean until acceptance of the completed Work. Care shall be taken to prevent foreign matter from entering joint space. Bell and spigot mating surfaces shall be wiped clean immediately before

piping is laid. For ductile-iron pipe, the bell and spigot mating surfaces shall be thoroughly cleaned with a wire brush.

12. Install piping accurately to line and grade shown, specified or directed, unless otherwise approved by the Owner. Accurate means of determining and checking the alignment and grade shall be used, which shall be subject to the approval of the Owner. Any modifications to the Contract Documents to suit the pipe manufacturer's standard shall be approved by the Owner. Remove and relay piping that is incorrectly installed, at Contractor's expense.
13. Do not lay piping in fluids, unless otherwise specified in these Specifications, or approved by the Owner. Do not dewater in the pipe trench. Ensure that the water level in the trench is at least 6-inches below the bottom of piping. Maintain a dry trench until jointing and backfilling are complete, unless otherwise specified in these Specifications or approved by the Owner.
14. Where unforeseen conditions will not permit the installation of piping as shown or specified, no piping shall be installed without approval of the Owner. Do not modify structures or facilities without approval of the Owner.
15. Start laying piping at lowest point and proceed toward the higher elevations, unless otherwise approved by the Owner. Slope piping uniformly between elevations shown on the Drawings or as otherwise directed by the Owner.
16. Place bell and spigot piping so that the bells face the direction of laying, unless otherwise approved by the Owner.
17. Piping shall be installed so that the barrel of the piping, and not the joints, receives the bearing pressure from the trench bottom or other bedding condition.
18. No piping shall be brought into position until the preceding length, valve, fitting, or special has been bedded and secured in place.
19. Whenever pipe laying is not actively in progress, the open ends of the piping shall be closed by a temporary plug or cap to prevent soil, water and other foreign matter from entering the piping.
20. Field cutting of metallic piping, where required for inserting valves, fittings, specials, and closures, shall be made with a machine specially designed for cutting piping and in accordance with the manufacturer's instructions. Cuts shall be carefully done, without damage to piping, so as to leave a smooth end at right angles to the axis of the piping. Cut end shall be tapered and sharp edges filed off smooth. Flame cutting shall not be permitted. Piping damaged by Contractor by improper or careless methods of cutting shall be replaced or repaired at his expense.
21. Blocking under piping shall not be permitted unless specifically approved by Owner for special conditions.
22. Protective linings and coatings shall be touched up prior to installation, where required.
23. Except where bends, wyes or similar fittings are used, changes in alignment and grade of the piping shall be made by deflecting joints or with beveled pipe. Permissible joint deflection shall not exceed 50 percent of the amount allowed by the manufacturer.
24. All joints shall be made in the presence of the Owner or his duly authorized representative, except as otherwise approved.
25. Special care shall be taken to ensure that each section of piping abuts against the next in such a manner that there will be not shoulder or unevenness of any kind along the piping invert.
26. Piping shall be rotated as required to place outlets in proper position.
27. Blind flanges and cleanouts shall be provided at locations shown on the Drawings, specified or required. Cleanouts on buried piping shall include all pipe, fittings and appurtenances required to bring cleanout to finished grade and terminate in a flange and blind flange or suitably capped piping as shown. Cleanout piping shall be same as that specified for the main run.
28. All gravity lines shall pitch uniformly at the grade shown or as specified or approved.

29. Short pipe stubs, 5-feet-0-inch in length, shall be used at all vaults and other wall faces, except as otherwise specified.
30. Field wrapping shall be accomplished after joints are made.
31. All piping shall be plugged watertight with a suitable cap or plug securely fastened to the end of the piping at all contact interfaces.
32. Contractor shall notify Owner in advance of backfilling operations.
33. On steep slopes, take measures acceptable to Owner to prevent movement of the pipe during installation.
34. Exercise care to avoid flotation when installing pipe in cast-in-place concrete and CLSM.

B. Manufacturer's Installation Specialist:
   1. Provide the services of a competent installation specialist of the pipe manufacturer when pipe laying begins if Contractor is not experienced in laying and jointing a particular type of pipe.
   2. Retain installation specialist at the site for a minimum of two days or until competency of the pipe laying crew has been satisfactorily demonstrated.

C. Plugs:
   1. Temporarily plug installed pipe at the end of each day's work or other interruption to the installation of any pipe line. Plugging shall prevent the entry of animals, liquids or persons into the pipe or the entrance or insertion of deleterious materials.
   2. Install standard plugs into all bells at dead ends, tees or crosses. Cap all spigot ends.
   3. Fully secure and block all plugs and caps installed for pressure testing to withstand the specified test pressure.
   4. Where plugging is required for phasing of the Work or for subsequent connection of piping, install watertight, permanent type plugs.

D. Bedding Pipe: Bed pipe as specified below and in accordance with the Drawings.
   1. Trench excavation and backfill and bedding materials shall conform to the requirements of Section 02220, Excavation and Backfill, as applicable.
   2. Where the existing bedding material is deemed unsuitable by Owner, remove and replace it with approved granular materials. Pea gravel or chips for bedding and backfill materials is not acceptable.
   3. Excavate trenches below the pipe bottom by an amount specified. Remove all loose and unsuitable material from the trench bottom.
   4. Carefully and thoroughly compact all pipe bedding with hand held pneumatic compactors.
   5. Do not lay pipe until the Owner approves the bedding condition. If a conflict exists, obtain clarification from Owner before proceeding.
   6. No pipe shall be brought into position until the preceding length has been bedded and secured in its final position.

E. Laying Pipe:
   1. Conform to manufacturer's instructions and requirements of the standards listed below, where applicable:
      a. Ductile-Iron Pipe: AWWA C111, AWWA C600, or other applicable supplements.
      b. PVC: AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe, or other applicable supplements.
      c. ASCE Manual of Practice No. 37.

F. Jointing Pipe:
   1. Ductile-Iron Mechanical Joint Pipe:

a. Wipe clean the socket, plain end and adjacent areas immediately before making joint. Make certain that cut ends are tapered and sharp edges are filed off smooth.
b. Lubricate the plain ends and gasket with soapy water or an approved pipe lubricant, in accordance with AWWA C 111, just prior to slipping the gasket onto the plain end of the joint assembly.
c. Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end.
d. Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.
e. Push gland toward socket and center it around pipe with the gland lip against the gasket.
f. Insert bolts and hand tighten nuts.
g. Make deflection after joint assembly, if required, but prior to tightening bolts. Alternately, tighten bolts 180 degrees apart to seat the gasket evenly. The bolt torque shall be as follows:

Pipe Size (inches)	Bolt Size (inches)	Range of Torque (ft-lbs)
3	5/8	45-60
4-24	3/4	75-90
30-36	1	100-120
42-48	1-1/4	120-150

h. All below ground nuts and bolts shall be 304 stainless steel with isolation kits.
i. Restrained mechanical joints shall be in accordance with Section 15061, Ductile-Iron Pipe.

2. Proprietary Joints:
   a. Pipe which utilizes proprietary joints such as Fastite, by American Cast Iron Pipe Company, Tyton by U.S. Pipe Incorporated, restrained joints, or other such joints shall be installed in strict accordance with the manufacturer's instrucitons.
3. Mechanical Coupling Joints:
   a. Prior to the installation and assembly of mechanical couplings, the joint ends shall be cleaned thoroughly with a wire brush to remove foreign matter. Following this cleaning, lubricant shall be applied to the rubber gasket or inside of the coupling housing and to the joint ends. After lubrication, the gasket shall be installed around the joint end of the previously installed piece and the joint end of the subsequent piece shall be mated to the installed piece. The gasket shall be positioned and the coupling housing placed around the gasket and over the grooved or shouldered joint ends. The bolts shall be inserted and the nuts screwed up tightly by hand. The bolts shall then be tightened uniformly in order to produce an equal pressure on all parts of the housing. When the housing clamps meet metal to metal, the joint is complete and further tightening is not required.

G. Backfilling:
1. Conform to the applicable requirements of Section 02220, Excavation and
2. Backfill.
3. Place backfill as construction progresses. Backfill by hand and use power tampers until pipe is covered by at least one foot of fill.

H. Connections to Valves:
1. Install valves and hydrants as shown.
2. Provide suitable adapters when valves or hydrants and piping have different
3. joint types.

I. Transitions from One Type of Pipe to Another:
   1. Provide all necessary adapters, specials and connection pieces required when
   2. connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

J. Closures:
   1. Provide all closure pieces shown or required to complete the Work.

3.2 WORK AFFECTING EXISTING PIPING

A. Location of Existing Piping:
   1. Locations of existing piping shown should be considered approximate.
   2. Contractor shall determine the true locations of existing piping to which connections are to be made, and locations of other facilities which could be disturbed during earthwork operations, or which may be affected by Contractor's Work already installed.
   3. Conform to applicable requirements of Division 1, General Requirements, pertaining to cutting and patching and connections to existing facilities.

B. Work on Existing Pipelines:
   1. Cut or tap pipes as shown or required with machines specifically designed for this Work.
   2. Install temporary plugs to prevent entry of mud, dirt, water and debris.
   3. Provide all necessary adapters, fittings, pipe and appurtenances required to complete the Work.

3.3 TESTING OF PIPING

A. General:
   1. Test all piping, except as otherwise authorized by Owner.
   2. Notify Owner 48 hours in advance of testing.
   3. Provide all testing apparatus, including pumps, hoses, gages, and fittings.
   4. Unless otherwise noted within the Placer County Standard Specifications, pipelines shall hold an approved test pressure for two hours. Retests will be called for by the Owner if the Contractor does not follow the correct testing procedure or plan.
   5. Repair and retest pipelines that fail to hold specified test pressure or which leak.
   6. Unless otherwise specified, test pressures required are at the lowest elevation of the pipeline section being tested.
   7. Conduct all tests in the presence of Owner.
   8. Advise local authorities having jurisdiction if their presence is required during testing.

B. Schedule of Pipeline Tests:
   1. All piping shall be water tested after installation, except as otherwise specified or directed by Owner.

C. Pressure Test Procedure:
   1. Complete backfill and compaction at least to the pipe centerline before testing, unless otherwise required or approved by OWNER.
   2. Fill section to be tested slowly with water and expel all air. Install corporation cocks, if necessary, to remove all air.
   3. Test only one section of pipe at a time.

4. Apply specified test pressure for two hours and observe pressure gage. Check carefully for leaks while test pressure is being maintained.

D. Leakage Testing:
   1. Conduct leakage test for all liquid piping after satisfactory completion of pressure test.
   2. Allow concrete lined pipe to stand full of water at least 12 hours prior to starting leakage test.
   3. Maintain test pressure constantly for the minimum test period and accurately measure the amount of water which must be added to maintain the test pressure.
   4. Allowable Leakage Rates (in gallons per hour per 1,000 feet per inch diameter):
      a. DIP Mechanical Joints: 0.075
      b. Copper, Steel, FRP, and Thermoplastic: None
   5. Leakage Test Procedure:
      a. Examine exposed pipe, joints, fittings and valves. Repair visible leakage or replace the defective pipe, fitting or valve.
      b. Refill the line under test to reach the required test pressure.
      c. Provide a test container filled with a known quantity of water at the start of the test. Attach the test pump suction to the test container.
      d. Pump water from the test container into the line with the test pump to hold the specified test pressure for the test period. Water remaining in the container shall be measured and the amount used during the test shall be recorded on the test report.
      e. Perform all repair, replacement, and retesting as directed by the Owner because of failure to meet testing requirements.
      f. Leakage shall be less than rate specified above.

3.4 DISPOSAL OF WATER

A. Contractor shall provide suitable means for disposal of test and flushing water so that no damage results to facilities or waterways.

B. Means of disposal of test and flushing water shall be subject to the approval of Owner, local governing authorities and regulatory agencies.

C. Contractor shall be responsible for any damage caused by his water disposal operations.

3.5 CLEANING

A. Cleaning:
   1. Thoroughly clean all piping and flush prior to placing in service in a manner approved by the Owner.
   2. Mechanical cleaning of piping shall be in accordance with Section 02900, Pipeline Cleaning and Video Inspection.

3.6 PIPING SCHEDULE

A. The following abbreviations are used in the Buried Piping Schedule included at the end of the Section.

B. Material Type Abbreviations

Cast Iron	CI	Double Containment	
Copper	C	Fiberglass Reinforce	
Carbon Steel	CS	Plastic	DCFRP
Polyvinyl Chloride	PVC	Ductile-Iron	DI
Double Containment		Fiberglass Reinforced	
High Density		Plastic	FRP
Polyethylene	DCHDPE	High Dencity Polyethylene	HDPE
Double Containment		Reinforced Concrete Pipe	RCP
Chlorinated Polyvinyl		Polyvinyl Chloride	PVC
Chloride	DCCPVC	Polyethylene	PE
Prestressed Concrete	PCCP	Stainless Steel	SS

C. Lining and Coating Abbreviations

Cement Mortar Coated	CC	Tape Wrap	TW
Cement Mortar Lined	CL	Galvanized	Galv
Glass Lined	GL	Plastic Lined	PL
Bituminous Coated	BC	Painted	P
Polyethylene		Epoxy Lined (Potecto 401)	EL
Encasement	PE		
CLSM Encasement	CLSM		

D. Joint Abbreviations

Bell and Spigot	BS	Screwed Fittings	S
Flanged	Flg	Compression Sleeve	
Butt Weld	BW	Coupling	CSC
Solvent Welded	SW	Compression Flange	
Soldered	Sd	Adaptor	CFA
Mechanical Joint or		Grooved or Shouldered End	
Push-on Joint	MJ	Couplings	GSEC
Brazed	Bz		

BURIED PIPING SCHEDULE

Pipes	Type	Interior Lining	Exterior Coating	Thickness / Class	Joint	Pressure Test (psig)
6”	DI	EL	TW	350 psi	MJ, Flg	150
6”	PVC	-	TW	C900/ DR 14	MJ	150

+ + END OF SECTION + +

SECTION 15061

DUCTILE-IRON PIPE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Ductile-iron pipe and fittings.

B. Related Requirements:
   1. Section 02220, Excavation and Backfill.
   2. Section 03300, Cast-In-Place Concrete.
   3. Division 15, Sections on Piping, Valves and Appurtenances.

1.2 SUBMITTALS

A. Manufacturers Qualifications.

B. Shop Drawings: Submit for approval the following:
   1. Detailed drawings and data on pipe, fittings, gaskets and appurtenances.
   2. Dimensions and other data required for transition pieces.
   3. Compatibility of all pipe, fittings and coatings
   4. Submit with Shop Drawings required under Section 15051.

C. Certificates: Submit certificates of compliance with referenced standards.

1.3 QUALITY ASSURANCE

A. Reference Standards:
   1. AWWA C 111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   2. AWWA C 115, Flanged Ductile-Iron Pipe with Threaded Flanges.
   3. AWWA C 150, Thickness Design of Ductile-Iron Pipe.
   4. ANSI B 18.2.1, Square and Hex Bolts and Screws Inch Series, Including Hex Cap Screws and Lag Screws.
   5. ANSI B 18.2.2, Square and Hex Nuts.
   6. ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
   7. ASTM A 354, Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.
   8. AWWA C600, Installation of Ductile-Iron and Their Appurtenances.
   9. AWWA C606, Grooved and Shouldered Type Joints.

1.4 QUALIFICATIONS

A. Manufacturer's Qualifications:
   1. Minimum of five (5) years of experience producing ductile-iron pipe and fittings, and at least five (5) installations with satisfactory operation.
   2. All pipe and fittings shall be the product of one (1) manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 15051, Buried Piping Installation, and Section 15052, Exposed Piping Installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Ductile-Iron Pipe and Fittings:
   1. Flanged Pipe:
      a. Fabricate in accordance with requirements of AWWA C115.
      b. Pressure Class 350 psi minimum.
   2. Non-Flanged Pipe:
      a. Conform to AWWA C151 for material, pressure, dimensions, tolerances, tests, markings and other requirements.
      b. Pressure Class 350 psi minimum.
   3. Joints:
      a. As specified in piping schedules in Section 15051, Buried Piping Installation.
      b. If not specified, provide flanged joints for exposed piping, and restrained push-on or mechanical joints for buried piping.
      c. Flanged Joints:
         1) Conform to AWWA C110 and C115 capable of meeting working and test pressure specified in Section 15051, Buried Piping Installation.
         2) Gaskets:
            a) High temperature resistant sealing compounds (Loctite PST 592) or equivalent with Dimethacrylate ester base and teflon can be used.
            b) Gasket stock: synthetic rubber, 1/8-inch thick, full face, compound in which the elastomer is nitrile or neoprene, unless otherwise specified. The compound shall contain not less than 50 percent by volume nitrile or neoprene and shall be free from factice, reclaimed rubber, and other deleterious substances.
            c) Comply with AWWA C111 for push on and mechanical joints.
         3) Bolts and Nuts:
            a) Conform to ANSI B18.2.1 and ANSI B18.2.2, respectively.
            b) Exposed bolts and nuts: ASTM A 307, Grade B.
            c) Buried or submerged bolts, nuts, and washers: Type 304 stainless steel.
      d. Mechanical Joints:
         1) Conform to AWWA C110, AWWA C111 and AWWA C153.
         2) Glands: Ductile iron.
         3) Gaskets: Vulcanized Styrene Butadiene Rubber (SBR)
         4) Bolts, Nuts, and Washers: Type 304 stainless steel.
      e. Restrained Joints:
         1) Restrained push-on joints: Capable of being deflected after full assembly.
         2) Joint assembly: In strict conformance with AWWA C600 and manufacturer's recommendations.
         3) No field cuts of restrained pipe are permitted without prior approval of the OWNER.
      f. Restrained Joint Manufacturers for Mechanical Joint or Push-on Joint Piping:
         1) Megalug as manufactured by EBBA Iron Sales, Inc.

2) Fastite joint pipe with Fast-Grip gasket as manufactured by American Cast Iron Pipe Company
3) Star Pipe.
4) Or approved equal.

4. Flanged fittings:
   a. Conform to AWWA C110 and C115.
   b. Pressure Rating: 350 psi minimum.
   c. Material: Ductile-iron.
   d. Gaskets: As specified above for joints.
   e. Bolts and Nuts: As specified above for joints.
5. Mechanical Joint Fittings:
   a. Conform to AWWA C110 and AWWA C153.
   b. Pressure Rating: 350 psi minimum
   c. Material: Ductile-iron.
   d. Glands: Use ductile-iron glands only. Cast iron glands are not allowed.
   e. Gaskets: As specified above for joints.
   f. Bolts and Nuts: As specified above for joints.
6. Coatings and Linings for Pipe and Fittings:
   a. All ductile iron pipe interior will be epoxy lined with Protecto 401, accepted for use with waste water applications.
      1) Interior lining thickness will be in accordance with the manufacturer's recommendations.

B. Couplings:
   1. Refer to Section 15212, Piping Specialties and Accessories.
   2. Provide couplings on pipe with plain or grooved ends, where shown or where approved by Owner.

C. Specials:
   1. Transition Pieces:
      a. Furnish suitable transition pieces (adapters) for connections to existing piping.
      b. Expose existing piping to determine material, dimensions and other data required for transition pieces, unless shown on Drawings.
   2. Taps:
      a. Provide taps, where shown or required, for small diameter pipe connections.
      b. Provide corporation stops where shown or required.
      c. Where pipe wall thickness or tap diameter will not permit the engagement of two full threads, provide a tapping saddle.

2.2 MARKING FOR IDENTIFICATION

A. Stamp, mark or identify all pipeline materials with the following:
   1. Name or trade mark of the manufacturer.
   2. Pipe class.
   3. Size and length dimensions.
   4. Date and place of manufacture.

PART 3 - EXECUTION

3.1 INSTALLATION

A. For buried piping installation, refer to Section 15051, Buried Piping Installation.

B. Expose existing piping to determine material, dimensions and other data required for transition pieces, unless shown on Drawings.

3.2 INSPECTION

A. Fit all piping to assure that piping is free from defects in material and workmanship.

B. Verify the compatibility of all pipe, fittings and coatings.

+ + END OF SECTION + +

SECTION 15067

PVC PRESSURE PIPE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Polyvinyl chloride (PVC) piping for waste water usage
   2. PVC fittings and specials

B. Related Requirements:
   1. Section 02220, Excavation and Backfill.
   2. Section 15051, Buried Piping Installation.

1.2 SUBMITTAL

A. Shop Drawings: Submit for approval the following:
   1. Detailed procedures to be used in jointing and installing piping system including manufacturer's recommendations.
   2. Interfacing of piping system to equipment and appurtenances.
   3. Detail requirements for burial, supports, anchors, guides, expansion joints, and all accessories required for a satisfactory piping system.
   4. Bill of materials, indicating material composition of pipe and solvent, pressure rating, nominal size and its location on the piping installation drawings.
   5. Certifications letter from pipe manufacturer confirming that the materials to be used are suitable for the intended service.

B. Certificates: Submit certificates of compliance with above referenced standards.

C. Manufacturers qualifications.

1.3 QUALITY ASSURANCE

A. Thermoplastic pipe and fittings shall be the product of one (1) manufacturer.

B. Reference Standards:
   1. ASTM D1598, Test for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.
   2. ASTM D1599, Test for Short-Time Rupture Strength of Plastic Pipe, Tubing and Fittings.
   3. ASTM D2122, Determining Dimensions of Thermoplastic Pipe and Fittings.
   4. ASTM D1784, Rigid Poly (Vinyl Chloride) PVC Compounds and Chlorinated Poly (Vinyl Chloride) CPVC Compounds.
   5. ASTM D1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
   6. ASTM D2467, Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings.
   7. ASTM D2564, Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
   8. ASTM D2774, Underground Installation of Thermoplastic Pressure Piping.
   9. ASTM D3034, Type PSM Poly (Vinyl Chloride)(PVC) Sewer Pipe and Fittings.
   10. ASTM F477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

11. Standard No. 14, National Sanitation Foundation.
12. American National Standards Institute.

C. Shop Tests:
   1. Piping manufacturer shall maintain a continuous quality control program. All PVC plastic molding materials used to manufacture pipe and fittings under this Section shall be tested for conformance to the requirements of ASTM D 1784 and ASTM D 1785.

1.4 QUALIFICATIONS

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five (5) years of experience in the production of thermoplastic pipe and fittings, and shall show evidence of satisfactory service in at least five (5) installations.

1.5 DELIVERY, HANDLING AND STORAGE

A. Delivery: Take all necessary precautions to prevent damage to pipe fittings and other materials during shipment and delivery. Securly fasten all materials to truck or rail car to prevent movement or damage during shipment. OWNER will examine all materials before unloading.

B. Handling: Handle all pipe materials to prevent damage. Pipe and fittings shall not be dropped, rolled, or pushed off from any height on delivery, storage or installation. Any pipe that has been dropped shall be removed from the site.

C. Storage: Store all pipe materials off the ground, under cover, and in a dry location. Secure pipe ends by caps or plugs. Do not store pipe or fittings in sunlight. Store pipe to prevent sagging or bending.

PART 2 - PRODUCTS

2.1 MATERIALS

A. PVC Sewer Force Main:
   1. Pipe and fittings: C900, SDR 14. Conform to requirements listed under ASTM D3034, ASTM D1784, and ASTM D 1785.
   2. Elastomeric gaskets for joints: Conform to requirements of ASTM F477.

B. PVC Gravity Sewer Pipe:
   1. Pipe and fittings: Conform to requirements ASTM D3034, SDR 35.
   2. Elastomeric gaskets for joints: Conform to requirements of ASTM F477.

C. Supply type, grade and strength of pipe required to meet the specified service conditions. Submit to Owner for approval.

2.2 DETAILED REQUIREMENTS

A. Workmanship: The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions or other defects. The pipe shall be uniform in color, opacity, density, and other physical properties.

B. Dimensions and Tolerances: Measure in accordance with ASTM D 2122. The eccentricity of the inside and outside circumferences of the pipe walls shall not exceed 12 percent.

C. Sustained Pressure: The pipe shall not fail, balloon, burst, or weep as defined in ASTM D 1598.

D. Burst Pressure: The minimum burst pressure shall be determined in accordance with ASTM D 1599.

E. Marking: Marking on the pipe shall include the following, spaced at intervals of not more than 5-feet.
   1. Pipe nominal size.
   2. Pipe schedule.
   3. Specification of plastic material.
   4. Type and grade of plastic.
   5. Date and place of manufacture.

2.3 ADAPTERS

A. Where required to join piping of different materials, provide the necessary adapters, as recommended by the thermoplastic pipe manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Refer to Section 15051, Buried Piping Installation for piping installation, testing, cleaning and acceptance.
   2. Request instructions from Owner before proceeding if there is a conflict between Contract Documents and manufacturer's recommendations.
   3. Pipe, fittings and accessories that are cracked, damaged, not identified or in poor condition will be rejected.

+ + END OF SECTION + +

SECTION 15112

ECCENTRIC PLUG VALVES, OPERATORS AND APPURTENANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Isolation valves installed between inspection vaults

B. Related Requirements:
   1. Section 02220, Excavation and Backfill.
   2. Section 03300, Cast-In-Place Concrete.
   3. Division 15, Sections on Piping, Valves and Appurtenances.
   4. Placer County Standard Plate 430

C. Scope:
   1. Provide all labor, materials, equipment and incidentals required to furnish and install all eccentric plug valves, operators and appurtenances complete and operational as shown on the Drawings and as specified.

1.2 SUBMITTALS

A. Certificate of Unit Responsibility attesting that Contractor has assigned, and the supplier accepts unit responsibility. No other Submittal material will be reviewed until the certificate has been received and conforms to the specified requirements.

B. Shop Drawings: Submit for approval the following:
   1. Manufacturer's literature, illustrations, paint certifications, specifications, detailed drawings, data and descriptive literature on all eccentric plug valves and appurtenances.
   2. Deviations from Contract Documents
   3. Engineering data including dimensions, materials, size and weight.
   4. Fabrication, assembly and installation drawings.
   5. Certificates of compliance with AWWA Standards, where applicable.
   6. Corrosion resistance information to confirm suitability of the eccentric plug valve materials for the application. Information on chemical resistance of elastomers shall be furnished from the elastomer manufacturers.
   7. Complete manufacturer’s nameplate data of eccentric plug valves.
   8. Special tools list.
   9. C_V values and headloss curves. K-Value if available.
   10. Calculations:
      a. Sizing of operating mechanism with extension stems.
      b. Sizing of gear actuators.
      c. Sizing of anchor bolts.

C. Operation and Maintenance Manuals:
   1. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation and spare parts information.

D. Shop Tests:
   1. Hydrostatic tests shall be performed, when required by the valve specifications included herein.

E. Certificates: Where specified or otherwise required by Engineer, submit test certificates.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five years experience of producing substantially similar equipment, and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.
   2. Each eccentric plug valve shall be the product of one manufacturer.

B. Unit Responsibility:
   1. Unit Responsibility shall assigned by Contractor to the individual gate suppliers for the entire gate assembly, including both the equipment provided under this Section. A Certificate of Unit Responsibility shall be provided.

C. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings.
   2. ANSI B16.4, Cast Iron Fittings.
   3. ASTM A 48/A 48M, Specification for Gray Iron Castings.
   4. ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.
   5. ASTM A 126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
   6. ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
   7. ASTM A 354, Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.
   8. ASTM A 436, Specification for Austenitic Gray Iron Castings.
   9. ASTM A 536, Specification for Ductile Iron Castings.
   10. ASTM A 743/A 743M, Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
   11. ASTM A 2472, Specification for Nickel-Copper Alloy Plate, Sheet and Strip.
   12. ASTM B 98/B 98M, Specification for Copper-Silicon Alloy Rod, Bar and Shapes.
   13. ASTM B 127, Specification for Nickel-Copper Alloy Plate, Sheet and Strip.
   14. AWWA C540, Power Actuating Devices for Valves and Sluice Gates.
   15. AGMA Standards.
   16. NEMA, National Electrical Manufacturer's Association.
   17. National Electrical Code (NEC) current adoption.

1.4 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 15051, Buried Piping Installation

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

1. Eccentric plug valves shall have manufacturer's name and working pressure cast in raised letters on valve body.
2. Manual eccentric plug valve operators shall turn clockwise to close, unless otherwise specified. Valves shall indicate the direction of operation.
3. Manually operated eccentric plug valves, with or without extension stems, shall require not more than a 40-pound pull on the manual operator to open or close a valve against the specified criteria. The gear actuator and the eccentric plug valve components shall be able to withstand a minimum pull of 200-pounds on the manual operator and an input torque of 300-foot pounds to an actuator nut. Manual operators include handwheel, chain, crank, lever and a T-handle wrench.
4. Unless otherwise specified, all flanged eccentric plug valves shall have ends conforming to ANSI B16.1. The pressure class of the flanges shall be equal to or greater than the specified pressure rating of the valves.
5. Buried eccentric plug valves shall have flanged ends with mechanical joint adapters and installed with a flanged adapter or have grooved mechanical couplings. All bolts shall be Type 316 stainless steel.
6. Buried eccentric plug valves shall be provided with adjustable two piece valve boxes and provided with extension stems, operating nuts and covers, unless otherwise shown on the Drawings or specified. Extension stems shall terminate 12-inches below finished grade.
7. All bolts, nuts and studs on or required to connect buried or submerged valves shall be Type 316 stainless steel.
8. All bolts and studs embedded in concrete and studs required for wall pipe shall be of Type 316 stainless steel.
9. For stainless steel bolting, except where Nitronic-60 nuts are required, use anti-seize compound, graphite free, to prevent galling. Strength of the joint shall not be affected by the use of anti-seize compound.
10. All other bolts, nuts and studs shall, unless otherwise approved, conform to ASTM A 307, Grade B; or ASTM A 354, or as indicated on Drawings.
11. Bolts and nuts shall have hexagon heads and nuts.
12. All materials of construction of the eccentric plug valves shall be suitable for the service identified shown on the Drawings.
13. Protect wetted parts from galvanic corrosion due to contact of two different metals.
14. Gasket material and installation shall conform to manufacturer's recommendations.
15. Identification: Identify each eccentric plug valve 4-inches and larger with a stainless steel manufacturer’s nameplate stamped with the approved designation. Manufacturer’s nameplate shall be permanently fastened to valve body at the factory. Stenciled designations are acceptable for buried valves.
17. Buried or submerged service eccentric plug valves shall be provided with greased filled actuators with position indicators.

B. Eccentric Plug Valves:
   1. General:
      a. Non-lubricated eccentric type plug valves shall be installed where flow through the valve will be in only one direction.
      b. Buried eccentric plug valve shall have mechanical joint ends.
   2. Eccentric Plug Valves:
      a. Valves shall be provided with a port area of 100 percent of full pipe area as shown on the Drawings.
      b. Valves shall be rated for a minimum working pressure of 150 psig.
      c. Buried valves shall be provided with flange ends with mechanical joint adapters.

d. Valve bodies shall be of cast iron conforming to ASTM A 126, Class B. Valve seats shall be of welded-in 90 percent nickel alloy, or Monel, a minimum of 1/8-inch thick conforming to ASTM B 127.
e. Valves shall be furnished with replaceable stainless steel sleeve-type bearings in the upper and lower journals. These bearings shall comply with the applicable sections of AWWA C507 and AWWA C504. Bearings shall be of sintered, oil impregnated permanently lubricated Type 316 stainless steel for valves 12-inch and smaller. Bearings shall be ASTM A 743/A 743M Grade CF-8M, ANSI Type 316 stainless steel for Teflon coated Type 316 stainless steel for valves 14-inches and larger.
f. Shaft seals shall be of the multiple V-ring type, externally adjustable, replaceable without removing the bonnet or actuator from the valve, repackable under pressure and shall comply with the applicable sections of AWWA C504 and AWWA C507. Packing shall be adjustable chevron type replaceable without disassembling the valve for aboveground valves. Buried or submerged service valves shall have a self adjusting, multi-V-ring type packing in a suitable sealed enclosure.
g. Eccentric plug valves for liquid service shall have a balanced plug coated with a vulcanized resilient isobutene-isoprene solidly bonded to a semi-steel core, as required, to assure low torque and drip-tight shutoff, suitable for bi-directional shutoff, with sewage, grit, sludge, potable and non-potable water operating at a temperature of 250°F.
h. Products and Manufacturers: Provide one of the following:
    1) PEC, F1, DI, NBR, CR with Handwheel, as manufactured by DeZurik Corporation.
    2) Or Engineer reviewed and approved equal.

3. All Eccentric Plug Valves:
    a. Manually operated valves smaller than 6-inches diameter installed five feet or less above the operating floor shall be lever wrench operated.
    b. Size gear actuators for valves 8-inch and smaller for 175 psig differential pressure.
    c. Design the actuators to hold the valves in any intermediate position without creeping or vibrating.
    d. Provide a valve position indicator on each actuator. Provide stop-limiting devices for open and closed position.
    e. Provide an adjustable stop to adjust the seating pressure.
    f. Make packing accessible for adjustment without requiring the removal of actuator from the valve.
    g. The diameter ratio of the handwheel or the chainwheel and the gear sector shall be less than two.
    h. For buried or submerged valves, the gear actuator shall be grease-packed and designed to withstand submersion and be driptight in water to 20 feet submergence.
    i. Provide each actuator with gearing totally enclosed.
    j. The operator shaft and the gear sector shall be supported on permanently lubricated bronze bearings.
    k. Provide metal encased spring loaded seals in top and bottom covers of the gear housing.
    l. Actuators shall be designed to produce the indicated torque with a maximum pull of 40-pounds on the handwheel or chainwheel and a maximum input of 150-foot pounds on operating nuts, both for seating and unseating heads equal to the maximum differential pressure.
    m. All actuator components between the input and the stops shall be designed to withstand, without damage, a pull of 200-pound for handwheel or chainwheel actuators and an input torque of 300-foot pound for operating nuts when operating against the stops.

o. Materials of Construction:
    1) Housing: Cast Iron, ASTM A 126, Class B.
    2) Gear Sector: Ductile Iron, ASTM A 536.
    3) Worm Gear: Steel, AISI 1144, hardened and tempered to an average Rc 40 and within range of Rc 35 to 45.
    4) All Bearings: Bronze oil impregnated.
    5) All Hardware including Bolts, Nuts, Washers, Set Screws and Pins: Type 316 stainless steel.

p. Valves higher than five feet above the operating floor:
    1) Chainwheels, sprockets and Type 304 stainless steel chain shall be provided for gear operated valves mounted more than five feet above the operating floor.
    2) Chain shall extend to three feet above the operating floor.
    3) Gearing shall be enclosed in a semi-steel housing and shall be suitable for running in a lubricant, with seals provided on all shafts to prevent entry of dirt and water into the operator.
    4) Operator shaft and the gear quadrant shall be supported on permanently lubricated stainless steel bearings.
    5) Operator shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque.
    6) Exposed nuts, bolts and washers shall be zinc plated.

q. Where lever wrench operated valves are required, each valve shall be furnished with its own lever wrench operator.

r. Extension Bonnets: Where required, extension bonnets shall be provided. Extension bonnet shall be of steel or cast iron, with carbon steel stems, constructed so that when connected to the valve the extension bonnet shall be vertical, and designed to fully support the operator and stem extension. Exposed extension stems shall be of Type 316 stainless steel. Intermediate bearings shall be provided on the extension bonnet, as required.

s. Valve packing adjustment on non-submerged valves shall be accessible without removing the actuator from the valve.

t. Shop Painting:
    1) Interior ferrous metal surfaces of the valve except finished or bearing surfaces and the plug, shall be shop painted with two coats of an approved two component coal tar epoxy coating applied in accordance with the manufacturer's recommendations.
    2) Exterior surfaces of the valve and operator shall be shop painted as specified hereinafter under Article 2.4, below.

2.2 APPURTENANCES FOR VALVES

A. General:

1. For valves located at 5 feet-0 inches or more above the operating floor, provide chain operators.
2. Where shown on the Drawings, provide extension stems and floorstands.

B. Crank Operator:
1. Crank operator shall be removable and fitted with a rotating handle.
2. Maximum Radius of Crank: 15-inches.
3. Materials:

a. Crank: Cast iron or ductile iron.
b. Handle: Type 304 stainless steel.
c. Hardware: Type 304 stainless steel.

C. Extension Stems and Floorstands for Valves:
1. Conform to the applicable requirements of AWWA C501 for sizing of the complete lifting mechanism.
2. Bench and Pedestal Floorstands:
a. For valves requiring extension stems, provide bench or pedestal floorstands with handwheel or crank as indicated. Make provisions for use of portable electric actuator for opening and closing of the valves.
b. Type: Heavy-duty with tapered roller bearings enclosed in a weatherproof housing, provided with positive mechanical seals around lift nut and pinion shaft to prevent loss of lubrication and to prevent moisture from entering the housing. A lubrication fitting shall be provided for grease. The base shall be machined.
c. Materials of Construction:
1) Housing: Cast-iron, ASTM A 126, Class B, or steel.
2) Lift Nut: Cast bronze, ASTM B 98/B 98M.
3) Grease Fitting: Stainless steel.
4) All Bolting: Type 316 stainless steel.
3. Wall brackets for floorstands shall be of Type 316L stainless steel construction.
4. Extension Stems:
a. Materials of Stems and Stem Couplings: Type 316 stainless steel.
b. Maximum Slenderness Ratio (L/R): 100.
c. Minimum Diameter: 1.5-inch.
d. Threads: ACME.
e. Stem couplings shall be provided where stems are furnished in more than one piece. The couplings shall be threaded and keyed or threaded and bolted and shall be of greater strength than the stem.
f. A Type 316 stainless steel cap suitable for the square end of the valve stem shall be welded to the bottom of the extension stem.
5. Bottom Couplings: Ductile iron with Type 316 stainless steel pin and set screw.
6. Stem Guides:
a. Material: Type 316 cast stainless steel with bronze bushing for stem.
b. Maximum Stem Length between Guides: Seven feet.
c. Stem guides shall be adjustable in two directions.

D. Floor Boxes: Provide cast-iron floor boxes for all valves which are to be operated from floor above valve. Boxes shall be equal in depth to floor slab. Boxes shall have cast-iron covers and be fitted with bronze bushing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. For buried piping installation, refer to Section 15051, Buried Piping Installation.

B. Expose existing piping to determine material, dimensions and other data required for transition pieces, unless shown on Drawings.

3.2 INSPECTION

A. Fit all piping to assure that piping is free from defects in material and workmanship.

B. Verify the compatibility of all pipe, fittings and coatings.

+ + END OF SECTION + +

SECTION 15123

COUPLINGS, FLANGED COUPLING ADAPTERS, AND SERVICE SADDLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Couplings, flanged coupling adapters, and service saddles required for sewer force main piping connections.

1.2 SUBMITTALS

A. Submit information for products that vary from specified requirements regardless of manufacturer name.

PART 2 - PRODUCTS

2.1 BURIED RESTRAINED COUPLING

A. Materials for coupling restraint systems for bolted-sleeve-type couplings or flanged coupling adaptors installed on ductile iron or PVC pipe shall be:

ITEM	MATERIAL	SPECIFICATION
Follower Gland	Ductile Iron	Conform to ASTM A536 65-45-12
Wedges	Ductile Iron	Single tooth, heat-treated for ductile iron applications
Actuating Bolts	Ductile Iron	Conform to ASTM A536 65-45-18
Breakaway Nuts	Carbon Steel	
	Cast Iron	
Tie Rods – Stainless Steel	Stainless Steel	Conform to NFPA 24 SAE Type 316
Coating for New Bolts and Nuts	Nickel-phosphate Undercoating Blue Teflon or Xylan Fluoropolymer Coating	
Coating for Existing Bolts and Nuts	Antiseize Lubricant	
Lubrication for Above-Ground or Vault-Enclosed Steel Tie-Rod or Bolt Threads	Oil and Graphite, Blue Fluoropolymer Coating or Accepted Valve Manufacturer's Anti-seize Coating	

ITEM	MATERIAL	SPECIFICATION
Gland Exterior Finish Coat	Fusion-Bonded Epoxy	
Coating on Buried Bolts and Nuts	Mastic	
Polyethylene Encasement for Buried Couplings and Appurtenances	Polyethylene Sheet	Conform to AWWA C105 2 layers, 8 mils each

2.2 NUTS AND BOLTS

A. Pressure rating shall be greater than test pressure of piping system.

B. Materials:
   1. Bolts and Nuts: Manufacturer's standard.

2.3 SERVICE SADDLES

A. Service saddles for tapping pipe sizes 18 in. and smaller shall be double strap design.

For PVC:

1. Jones J-995
2. Jones J-996
3. Mueller H-13000 Series

For Ductile Iron Pipe:

1. Ford 202B
2. Jones J-979
3. Mueller BR2B Series
4. Mueller BR2S Series

2.4 ANCHORS

A. Provide anchors including, but not limited to, tie rods, lugs, harness assemblies, flanged spool pieces, friction collars and hardware for each coupling, and flanged coupling adapter. Anchors shall restrain pipe to prevent movement out of each coupling and flanged coupling adapter.

B. Design each anchor to sustain the force developed by test pressure of piping system.

C. Anchor studs placed perpendicular to longitudinal axis of pipe is unacceptable.

D. Anchorage with welded attachments to ductile iron piping is unacceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

+ + END OF SECTION + +

SECTION 15125

BALL VALVES, OPERATORS AND APPURTENANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Ball valves, operators and appurtenances.

B. Related Requirements:
   1. Section 03300, Cast-In-Place Concrete.
   2. Division 15, Sections on Piping, Valves and Appurtenances.

1.2 SUBMITTAL

A. Shop Drawings: Submit for approval the following:
   1. Manufacturer's literature, illustrations, paint certifications, specifications, detailed drawings, data and descriptive literature on all valves and appurtenances.
   2. Deviations from Contract Documents.
   3. Engineering data including dimensions, materials, size and weight.
   4. Fabrication, assembly, installation and wiring diagrams.

B. Shop Tests:
   1. Test motor operated valves before shipment to ensure that the mechanisms can close the valves in the specified time limit, and for proper seating.
   2. Hydrostatic tests shall be performed, when required by the valve specifications included herein.

C. Certificates: Where specified or otherwise required by Owner, submit test certificates.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit complete manuals including:
   1. Copies of all approved Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five (5) years of experience in the production of substantially similar equipment, and shall show evidence of satisfactory service in at least five (5) installations.
   2. Each type of valve shall be the product of one (1) manufacturer.

B. Reference Standards:
   1. AGMA Standards.
   2. ANSI B 16.1, Cast Iron Pipe Flanges and Flanged Fittings.
   3. ANSI B 16.4, Cast Iron Fittings.

4. API 6D, American Petroleum Institute, Specifications for Pipeline Valves.
5. ASTM A48, Standard Specification for Gray Iron Castings.
6. ASTM A105, Standard Specification for Carbon Steel Forgings for Piping Applications.
7. ASTM A126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
8. ASTM A354, Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.
9. ASTM A436, Standard Specification for Austenitic Gray Iron Castings.
10. ASTM A536, Standard Specification for Ductile Iron Castings.
11. ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
12. AWWA C 111, Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
13. NEC, National Electric Code.
14. NEMA, National Electrical Manufacturer's Association.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the Work.
   1. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay the Work.

B. Handle all valves and appurtenances very carefully. Valves which are cracked, dented or otherwise damaged or dropped will not be acceptable.

C. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. Store all mechanical equipment in covered storage off the ground and prevent condensation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. Valves shall have manufacturer's name and working pressure cast in raised letters on valve body.
   2. Manual valve operators shall turn clockwise to close, unless otherwise specified. Valves shall indicate the direction of operation.
   3. Valve body shall be rated for 250 psi.
   4. Unless otherwise specified, all flanged valves shall have ends conforming to ANSI B 16.1, Class 150.
   5. Buried valves shall have flanged ends with mechanical joint adapters and installed with a flanged adapter or have grooved mechanical couplings. All bolts shall be Type 304 stainless steel.
   6. Buried valves shall be provided with adjustable two piece valve boxes and provided with extension stems, operating nuts and covers unless otherwise shown or specified. Extension stems shall terminate 12-inches below finished grade.
   7. All bolts, nuts and studs on or required to connect buried or submerged valves shall be Type 304 stainless steel.

8. All bolts and studs embedded in concrete and studs required for wall pipe shall be of Type 316 stainless steel.
9. All other bolts, nuts and studs shall, unless otherwise approved, conform to ASTM A 307, Grade B; or ASTM A 354.
10. Bolts and nuts shall have hexagon heads and nuts.
11. Gasket material and installation shall conform to manufacturer's recommendations for waste water.
12. Identification: Identify each valve 4-inches and larger with a stainless steel nameplate stamped with the approved designation. Nameplate shall be pen-nanently fastened to valve body at the factory. Stenciled designations are acceptable for buried valves.

B. Ball Valves:
1. Valve shall have a cast iron body. Body shall have stainless steel conical seating surfaces to provide abrasion-free, corrosion free surfaces for mating with the resilient seat on the rotor.
2. Shaft seal shall be of bronze, provided with "O" ring seals.
3. Shaft bearings shall be of bronze, permanently lubricated, sealed with "O"-ring seals.
4. Seats shall be of rubber suitable for wastewater service, secured to the rotor by means of ductile Ni-Resist adjusting segments.
5. Rotor shall be of cast iron, secured to stub shafts with stainless steel taper pins.
6. Stub shafts shall be of stainless steel.
7. Provide adjustable thrust bearings for alignment of the rotor in the body.
8. Approved Product and Manufacturer:
   a. Henry Pratt Company.
   b. Or equal.

C. Valve Operator - Manual:
1. Valves shall be equipped with an enclosed worm gear drive and nut, handwheel or chain wheel operator.
2. Enclosed worm gear operators shall have a gear ratio designed not to exceed 80 pounds pull to meet the required operator torque.
3. Gears shall be permanently lubricated and totally enclosed.
4. Operators shall be designed to hold the valve disc in any intermediate position without creeping or fluttering.
5. Provide adjustable stops to prevent over travel in either position, to withstand a pull of 200 pounds.
6. Stops shall be enclosed within the operator housing and shall be capable of absorbing the fall operator torque with minimum safety factor of 5.
7. Operators shall be equipped with a direct coupled indicator.
8. Valves regardless of size, if installed with the operating wheel more than five feet above the operating floor, shall be provided with a chainwheel, sprocket and aluminum chain. Chain shall extend to three feet above the operating floor.
9. Valve operator shall be designed to fully close or fully open the valve in a minimum of 30 turns. Valves shall open counter-clockwise, and shall have a position indicator.
10. Approved Product and Manufacturer:
    a. Philadelphia Gear Corporation.
    b. Or equal.
11. Shop Painting:
    a. Interior and exterior ferrous metal surfaces of the valve except finished or bearing surfaces shall be shop painted with NSF approved two (2) coats of an approved two (2) component coal tar epoxy coating applied in accordance with the manufacturer's recommendations.

b. Exterior surfaces shall be shop epoxy coated per manufacturer's recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be as specified herein. Valve operators shall be located so that they are readily accessible for operation and maintenance. Valve operators shall be mounted for unobstructed access, but mounting shall not obstruct walkways. Valve operators shall not be mounted where shock or vibration will impair their operation. Support systems shall not be attached to handrails, process piping or mechanical equipment.

B. Identification tags shall be securely attached to the operator in a readily visible location using stainless steel screws or wire.

C. Install all valves and appurtenances in accordance with manufacturer's instructions.

D. Install all valves so that operating wrenches may be conveniently turned from operating floor but without interfering with access, and as approved by Owner.

E. Unless otherwise approved, install all valves plumb and level. Install valves free from distortion and strain caused by misaligned piping, equipment or other causes.

F. Set valve boxes plumb, and centered with the bodies directly over the valves. Carefully tamp earthfill around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face, if less than 4 feet.

3.2 FIELD TESTS AND ADJUSTMENTS

A. Adjust all parts and components as required to provide correct operation.

B. Conduct functional field test of each valve in presence of Owner to demonstrate that each part and all components together function correctly.

+ + END OF SECTION + +

SECTION 15150

SPECIALTY VALVES AND APPURTENANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pressure gauges
   2. Air release/vacuum valves

B. Related Requirements:
   1. Section 15051, Buried Piping Installation.
   2. Section 15061, Ductile-Iron Pipe.
   3. Section 15067, PVC Pressure Pipe.
   4. Division 15, Mechanical Pipe, Valves, and Appurtenances.

1.2 SUBMITTALS

A. Shop Drawings: Submit for approval the following:
   1. Manufacturer's literature, illustrations, paint certifications, specifications, detailed drawings, data and descriptive literature on all valves and appurtenances.
   2. Deviations from Contract Documents.
   3. Provie installation instructions.
   4. Engineering data including dimensions, materials, size and weight.
   5. Fabrication, assembly, installation and wiring diagrams.
   6. Furnish one year warranty from date of final acceptance.

B. Operation and Maintenance Data: Submit complete manuals including:
   1. Copies of all approved Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.

C. Shop Tests:
   1. Test motor operated valves before shipment to ensure that the mechanisms can close the valves in the specified time limit, and for proper seating.
   2. Hydrostatic tests shall be performed, when required by the valve specifications included herein.

D. Certificates: Where specified or otherwise required by Owner, submit test certificates.

E. Field test and inspection reports.

1.3 QUALITY ASSURANCE

A. Reference Standards:
   1. ANSI B 16.1, Cast Iron Pipe Flanges and Flanged Fittings.
   2. ANSI B 16.4, Cast Iron Fittings.
   3. ASTM A 48, Standard Specification for Gray Iron Castings.
   4. ASTM B 62, Standard Specification for Composition Bronze or Ounce Metal Castings.

5. ASTM A 126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
6. ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
7. ASTM A 354, Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.
8. ASTM A 436, Standard Specification for Austenitic Gray Iron Castings.
9. ASTM A 536, Standard Specification for Ductile Iron Castings.
10. ASTM D 1784, Rigid Poly (Vinyl Chloride) PVC Compounds and Chlorinated Poly (Vinyl Chloride) CPVC compounds.
11. ASTM D 1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedulers 40, 80 and 120.
12. AWWA C111, Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
13. AWWA C500, Valves for Water and Sewerage Systems.
14. AGMA Standards.
15. NEMA, National Electrical Manufacturer's Association.

B. Each type of specialty valve shall be the product of one (1) manufacturer.

1.4 QUALIFICATIONS

A. Manufacture's Qualifications:
   1. Manufacturer shall have a minimum of five (5) years of experience in the production of substantially similar equipment, and shall show evidence of satisfactory service in at least five (5) installations.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay the Work.

B. Handle all valves and appurtenances very carefully. Valves which are cracked, dented or otherwise damaged or dropped will not be accepted.

C. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. Store all mechanical equipment in covered storage off the ground and prevent condensation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. Valves shall have manufacturer's name and working pressure cast in raised letters on valve body.
   2. Manual valve operators shall turn clockwise to close, unless otherwise specified. Valves shall indicate the direction of operation.

3. Unless otherwise specified, all flanged valves shall have ends conforming to ANSI B16., Class 150 or AWWA C207 Class E.
4. Buried valves shall have flanged ends with mechanical joint adapters. All bolts shall be Type 304 stainless steel.
5. Buried valves shall be provided with adjustable two piece valve boxes and provided with extension stems, operating nuts and covers unless otherwise shown or specified. Extension stems shall terminate 12-inches below furnished grade.
6. All bolts, nuts and studs on or required to connect buried or submerged valves shall be Type 304 stainless steel.
7. All bolts and studs embedded in concrete and studs required for wall pipe shall be of Type 316 stainless steel.
8. All other bolts, nuts and studs shall, unless otherwise approved, conform to ASTM A 307, Grade B; or ASTM A 354.
9. Bolts and nuts shall have hexagon heads and nuts.
10. Gasket material and installation shall conform to manufacturer's recommendations.

B. Pressure Gauges:
   1. Type: Direct mounted, dial type pressure gauge.
      a. Construction:
         1) Case: 3.5-inch diameter cast aluminum, flangeless with black finish and bottom 1/4-inch N.P.T.
         2) Ring: Chrome plated close type.
         3) Dial: White face, black numbers and graduations.
         4) Window: Glass or clear acrylic plastic.
         5) Pointer: Micrometer type, black finish, red tip.
         6) Movement: Stainless steel, rotary type, delrin sector and bushings.
         7) Bourdon Tube: Seamless phosphor bronze, Grade A over-pressured and stress relieved.
         8) Socket and Tip: Forged brass, alloy steel and Type 316 stainless steel.
      b. Accuracy: 1 percent minimum.
   2. Gauge Cocks: Provide brass tee handle cock before each gauge.
   3. Reference ANSI B40.1 for Grade AA gauges.
   4. All pressure gauges shall be provided with an approved pressure snubber.
   5. Approved Product and Manufacturer:
      a. Ashcroft.
      b. Ametek.
      c. Or equal.

C. Air Release and Vacuum Relief Valves:
   1. Air Release Valves: Air release/vacuum relief valves (ARV) shall have an orifice to vent the accumulation of air and other gases with the line or system under pressure and a means to relieve system vacuum by introducing outside air. Provide an isolation ball valve for each air release and vacuum relief valve.
   2. Construction:
      a. Shell: Stainless Steel
      b. Body: Reinforced Nylon
      c. Float: Foamed Polypropylene
      d. All other materials of construction compatible with waste water and as approved by the Owner.
   3. Air release valves: Float operated, compound lever type.
   4. Valves shall be suitable for pressures up to 150 psi.

5. Air release valves shall incorporate an isolation valve to allow removal of the valve without shutting down the equipment.
6. Approved Product and Manufacturer:
    a. ARI
    b. Or approved equal.

D. Combination Valves:
1. Combination Valves: Combination valves shall have an orifice to vent the accumulation of air and other gases with the line or system under pressure and a means to relieve system vacuum by introducing outside air. Provide an isolation ball valve for each combination valve.
2. Construction:
    a. Shell: Stainless Steel
    b. Body: Reinforced Nylon
    c. Float: Polycarbonate / Stainless Steel
    d. All other materials of construction compatible with waste water and as approved by the Owner.
    e. Approved Product and Manufacturer:
        1) ARI
        2) Or approved equal.
3. Air release valves: Float operated, compound lever type.
4. Valves shall be suitable for pressures up to 150 psi.
5. Air release valves shall incorporate an isolation valve to allow removal of the valve without shutting down the equipment.
6. Non-slam (NS) option as identified on the project drawings.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Test each pressure pressure gauge assembly according to authorities having jurisdiction and the device's reference standard. The Engineer will share the pressure ranges with the Contractor prior to start of construction.

B. Prepare test and inspection reports.

+ + END OF SECTION + +