GROVELAND COMMUNITY SERVICES DISTRICT

SEWER COLLECTION SYSTEM IMPROVEMENTS

TECHNICAL SPECIFICATIONS

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FUNDED BY:

California Water Boards

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SECTION 011100
COORDINATION OF WORK, PERMITS, AND REGULATIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes the project and includes work by others, work sequence and schedule, Contractor's use of premises, Owner occupancy, maintenance, and operation of existing facilities, permits, and regulations.

1.02 GENERAL NATURE OF WORK

A. The major work consists of the rehabilitation or replacement of approximately 11,500 linear feet of existing sewer main, performing spot repairs as shown on the plans, construction of 19 new sanitary sewer manholes, rehabilitation of 39 existing sanitary sewer manholes and the installation on 1 new flushing branch within the Groveland Community Services District (Groveland CSD or GCSD) sewer collection system.

B. The work to be done includes but is not limited to the following:

1. Big Oak Flat (See Sheet C00-02):
   - Gravity sanitary sewer main replacement.
   - Gravity sanitary sewer main rehabilitation.
   - Spot repairs to gravity sanitary sewer mains.
   - Installation of new sanitary sewer manholes.
   - Installation of new sealed manhole lids.
   - Bring existing manholes above grade.
   - Installation of a new flushing branch.
2. Groveland (See Sheet C00-03):
   - Gravity sanitary sewer main replacement.
   - Gravity sanitary sewer main rehabilitation.
   - Installation of new sanitary sewer manholes.
   - Installation of new locking manhole lids.
   - Rehabilitation of existing sanitary sewer manholes.
3. Pine Mountain Lake (See Sheet C00-04 and C00-05):
   - Gravity sanitary sewer main replacement.
   - Sanitary sewer force main replacement.
   - Spot repairs to gravity sanitary sewer mains.
   - Gravity sanitary sewer main replacement by means of bore and jack.
   - Installation of new sanitary sewer manholes.

C. The contractor must install and maintain by-pass systems to ensure the proper use of every sewer sections while the designed improvement is taking place. No wastewater discharge will be allowed due to any of the works related to the project, and it will be under the Constructor’s responsibility the use of adequate construction procedures to avoid this from happening.

1.03 LOCATION OF PROJECT SITE

A. The project site is located throughout the Groveland Community Services District:

1. Big Oak Flat
2. Groveland
3. Pine Mountain Lake.

1.04 REFERENCE INFORMATION

A. GCSD conducted a closed-circuit television (CCTV) survey of Groveland Community Services District sanitary sewer collection system. The survey was performed between the years of 2016 and 2020. A report was generated as part of the survey. GCSD encourages all bidders to review the information in the survey report as well as pictures and videos recorded during the inspection.

B. The CCTV inspection videos, photos and reports can be accessed through the following links:

Link 1: https://www.dropbox.com/sh/jd6gbc00zx0cj7w/AACUNOIRYtVtvK959zSqb54Ia?dl=0

Link 2: https://www.dropbox.com/sh/siuts3skmhzhpcs/AAC9v2TqeoxoDoxUL-LgnH7Qa?dl=0

1.05 WORK SEQUENCE AND SCHEDULE

A. Contractor shall develop a Project schedule prior to breaking ground. The Project schedule shall be reviewed and approved by the Owner and/or the Project Engineer prior to the initiation of work.

1.06 CONTRACTOR'S USE OF PREMISES

A. Contractor use of premises shall be for activities related to construction of improvements only.

B. Contractor may choose to store equipment and/or materials related to the Project at the Groveland CSD District Office. All equipment and/or materials stored at the Groveland CSD District Office are being stored at the Contractors risk. The Groveland CSD is not responsible for any damaged, stolen or vandalized equipment and/or materials.

1.07 OWNER OCCUPANCY, MAINTENANCE AND OPERATION OF EXISTING FACILITIES

A. The owner will need to operate Groveland CSD sanitary sewer collection systems indefinitely throughout the proposed Project.

B. It is the responsibility of the Contractor to provide means of bypass while the proposed work is being completed.

1.08 PERMITS

A. The following permits for the permanent work will be obtained by the Owner:

1. Encroachment permits with the Tuolumne County.
2. Encroachment permits with the California Department of Transportation.

1.09 LICENSES

A. Contractor shall hold an active Class A California State Contractor’s License.

PART 2 - MATERIALS

A. NOT USED

PART 3 - EXECUTION

A. NOT USED

END OF SECTION

SECTION 012000
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 WORK LISTED IN THE SCHEDULE OF WORK ITEMS

A. Work under this contract will be paid on a lump-sum basis as outlined on the Bid Form for the quantity of work installed.

B. The lump-sum prices include full compensation for furnishing the labor, materials, tools, and equipment and doing all the work involved to complete the work included in the contract documents.

C. The application for payment will be for a specific item based on the percentage completed or quantity installed. The percentage complete will be based on the value of the partially completed work relative to the value of the item when entirely completed and ready for service.

1.02 WORK NOT LISTED IN THE SCHEDULE OF WORK ITEMS

A. The General Conditions and items in the Special Provisions, general requirements, and specifications which are not listed in the schedule of work items of the Bid Form are, in general, applicable to more than one listed work item, and no separate work item is provided therefor. Include the cost of work not listed but necessary to complete the project designated in the contract documents in the various listed work items of the Bid Form.

B. The bids for the work are intended to establish a total cost for the work in its entirety. Should the Contractor feel that the cost for the work has not been established by specific items in the Bid Form, include the cost for that work in some related bid item so that the Proposal for the project reflects the total cost for completing the work in its entirety.

1.03 MOBILIZATION

A. Payment for mobilization shall be made at the time of the first progress payment after the Contractor has purchased bonds and insurance and established a Contractor's site office.

1.04 DEMOBILIZATION

A. Payment for demobilization shall be made with the final payment estimate and shall be equal to 20% of the bid amount shown for mobilization.

1.05 SHEETING, SHORING, AND BRACING

A. Payment for sheeting, shoring, and bracing for the protection of life and limb, in conformance with the applicable safety orders, shall be included in the contract lump-sum bid price. Sheeting, shoring, and bracing will not be paid as a separate bid item.

PART 2 - MATERIALS

A. NOT USED

PART 3 - EXECUTION

A. NOT USED

END OF SECTION

SECTION 012200
BID ITEM DESCRIPTIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The major work consists of the rehabilitation or replacement of approximately 11,500 linear feet of existing sewer main, performing spot repairs as shown on the plans, construction of 19 new sanitary sewer manholes, rehabilitation of 39 existing sanitary sewer manholes and the installation on 1 new flushing branch within the Groveland CSD sewer collection system.

1.02 BID ITEM # 1 – MOBILIZATION/DEMOBILIZATION

A. This item is a lump sum item for preparatory work and operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to the project sites; for obtaining bonds, and insurance; and for all other work and operations which must be performed, or costs incurred prior to beginning work on the various contract items on the project site. This item also includes demobilization, including removal of all equipment supplies, personnel, and incidentals from the project at the end of construction.

1.03 BID ITEM # 2 – BIG OAK FLAT SEWER COLLECTION SYSTEM IMPROVEMENTS

A. This is a lump sum bid item for the base bid improvements to the Big Oak Flat sanitary sewer collection system as shown on the plans.

B. Improvements to the Big Oak Flat sanitary sewer collection system including, but not limited to, the replacement of approximately 610 linear feet (LF) of gravity sewer mains, rehabilitation of approximately 968 LF of gravity sewer main, performing spot repairs as shown on the plans and installation of four new sanitary sewer manholes and one rubber sanitary sewer manhole lid sealing gasket.

C. This bid item also includes all personnel, equipment, bypass facilities, supplies and incidentals required to perform the work as specified in the plans.

1.04 BID ITEM # 3 – GROVELAND SEWER COLLECTION SYSTEM IMPROVEMENTS

A. This is a lump sum bid item for the base bid improvements to the Groveland sanitary sewer collection system as shown on the plans.

B. Improvements to the Groveland sanitary sewer collection system including, but not limited to, the replacement of approximately 738 LF of gravity sewer mains, rehabilitation of approximately 1,647 LF of gravity sewer main and installation of one new sanitary sewer manholes, rehabilitation of 20 existing sanitary sewer manholes and 14 sanitary sewer locking manhole lids.

C. This bid item also includes all personnel, equipment, bypass facilities, supplies and incidentals required to perform the work as specified in the plans.

1.05 BID ITEM # 4 – PINE MOUNTAIN LAKE SEWER COLLECTION SYSTEM IMPROVEMENTS

A. This is a lump sum bid item for the base bid improvements to the Pine Mountain Lake sanitary sewer collection system as shown on the plans.

B. Improvements to the Pine Mountain Lake sanitary sewer collection system including, but not limited to, the replacement of approximately 2,476 LF of gravity sewer mains,

performing spot repairs as shown on the plans and installation of two new sanitary sewer manholes and approximately 75 LF of new sewer main utilizing the bore and jack method.

C. This bid item also includes all personnel, equipment, bypass facilities, supplies and incidentals required to perform the work as specified in the plans.

1.06 BID ALTERNATIVE ITEM # 1 – BIG OAK FLAT SEWER COLLECTION SYSTEM IMPROVEMENTS

A. This is a lump sum bid item for the bid alternative improvements to the Big Oak Flat sanitary sewer collection system as shown on the plans.

B. Improvements to the Big Oak Flat sanitary sewer collection system including, but not limited to, the replacement of approximately 469 LF of gravity sewer mains, rehabilitation of approximately 136 LF of gravity sewer main, performing spot repairs as shown on the plans and installation of one new sanitary sewer manholes, one new flushing branch, two rubber sanitary sewer manhole lid sealing gaskets and bringing two existing sewer manholes to grade.

C. This bid item also includes all personnel, equipment, bypass facilities, supplies and incidentals required to perform the work as specified in the plans.

1.07 BID ALTERNATIVE ITEM # 2 – PINE MOUNTASIN LAKE SEWER COLLECTION SYSTEM IMPROVEMENTS

A. This is a lump sum bid item for the bid alternative improvements to the Pine Mountain Lake sanitary sewer collection system as shown on the plans.

B. Improvements to the Pine Mountain Lake sanitary sewer collection system including, but not limited to, the replacement of approximately 3,798 LF of gravity sewer mains, replacement of approximately 506 LF of sanitary sewer force mains, performing spot repairs as shown on the plans and replacement of 11 existing sanitary sewer manholes.

C. This bid item also includes all personnel, equipment, bypass facilities, supplies and incidentals required to perform the work as specified in the plans.

PART 2 - MATERIAL

A. NOT USED

PART 3 - EXECUTION

A. NOT USED

END OF SECTION

SECTION 013300
SUBMITTALS

PART 1 - GENERAL

1.01 SHOP DRAWINGS

A. Submit shop drawings in accordance with the General Conditions and this Section.

B. The use of contract drawing reproductions for shop drawings is subject to rejection.

C. If the Contractor submits shop drawings of equipment by manufacturers other than those listed in the specifications, provide the following information with the submittal:

1. The name and address of at least three companies or agencies that are currently using the equipment.
2. The name and telephone number of at least one person at each of the above companies or agencies whom the Owner's Representative may contact.
3. A description of the equipment that was installed at the above locations. The description shall be in sufficient detail to allow the Owner's Representative to compare it with the equipment that is proposed to be installed in this project.

D. For materials originating outside of the United States for which tests are required, provide recertification and retesting by an independent domestic testing laboratory.

1.02 SUBMITTAL REQUIREMENTS

A. Make submittals promptly in such sequence as to cause no delay in the work. Schedule submission a minimum of 15 calendar days before reviewed submittals will be needed.

B. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.
2. The project title and number.
3. Contract identification.
4. The names of:
    a. Contractor.
    b. Supplier.
    c. Manufacturer.
5. Identification of the product, with the specification section number.
6. Field dimensions clearly identified as such.
7. Relationship to adjacent or critical features of the work or materials.
8. Identification of deviations from contract documents.
9. Identification of revisions on resubmittals.
10. A 5 inch by 5 inch blank space for Engineer’s stamps.
11. Contractor’s stamp, initialed or signed, shall certify Contractor’s review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal that the product meets the requirements of the work and of the contract documents.

1.03 SUBMITTAL FORMAT

A. Each submittal shall have a transmittal form. Every page in a submittal shall be numbered in sequence. Each copy of a submittal shall be collated and stapled or bound, as appropriate. Copies not collated will be rejected.

B. Where product data from a manufacturer is submitted, clearly mark which model is proposed, with all pertinent data, capacities, dimensions, clearances, diagrams, controls, connections, anchorage, and supports. Present a sufficient level of detail for assessment of compliance with the contract documents.

C. Each submittal shall be assigned a unique number. Submittals shall be numbered sequentially. The submittal numbers shall be clearly noted on the transmittal.

D. Disorganized submittals that do not meet the requirements above will be returned without review.

1.04 RESUBMITTALS

A. Resubmittal of submittals will be reviewed and returned in the same review period as for the original submittal. It is considered reasonable that the Contractor shall make a complete and acceptable submittal by the second submission of a submittal item. The Owner’s Representative reserves the right to withhold monies due to the Contractor to cover additional costs of any review beyond the second submittal.

1.05 CONTRACTOR'S JOBSITE DRAWINGS

A. Provide and maintain on the jobsite one complete set of prints of all drawings which form a part of the contract. Immediately after each portion of the work is installed, indicate all deviations from the original design shown in the drawings either by additional sketches or ink thereon. Upon completion of the job, deliver this record set to the Owner's Representative.

PART 2 - MATERIALS

A. NOT USED

PART 3 - EXECUTION

A. NOT USED

END OF SECTION

SECTION 015100
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 CONSTRUCTION WATER

A. GCSD will supply the Contractor with water for the use in the construction of the improvements. The Contractor shall make their own arrangements, labor, and equipment to collect, load, transport, and apply water as necessary.

B. If the Contractor choses to utilize water from a GCSD fire hydrant, the GCSD will provide the Contractor with a water meter to measure the amount of water utilized.

1.02 ELECTRICAL POWER-CONSTRUCTION PHASE

A. Contractor shall provide portable power for the construction of the proposed improvements where existing GCSD outlets are not available. Provide for the extension of utility lines to the point of usage. The cost of power shall be included in the appropriate bid items to which it is appurtenant and shall include full compensation for furnishing all labor, materials, tools, and equipment required to obtain and distribute power for construction purposes.

1.03 DUST CONTROL

A. Perform dust control operations to prevent construction operations from producing dust in amounts harmful to persons or causing a nuisance to persons living nearby or occupying buildings in the vicinity of the work. Use water or dust preventative to control dust.

1.04 FIRE DANGER

A. Minimize fire danger in the vicinity of and adjacent to the construction site. Provide labor and equipment to protect the surrounding private property from fire damage resulting from construction operations.

1.05 TRAFFIC REGULATION

A. All work being performed on or adjacent to roadways must adhere to:

1. California Department of Transportation (Caltrans) standards, specifications and procedures.
2. The Contractor shall submit, not less than 14 working days prior to start of construction operations, a Traffic Regulation plan, in submittal format and approved by engineer, for all work being done on and/or near local roadways.
3. All work being done to roadways shall follow the dig once policy.

B. Wherever reference is made to the State Specifications and Plans, such reference shall mean the State of California, Business, Transportation, and Housing Agency, Department of Transportation latest edition Standard Specifications and latest edition Standard Plans.

1.06 ACCESS ROADS AND PARKING AREAS

A. Obtain access to project sites through the existing access roads.

B. Provide facilities offsite or on public streets on which parking is permitted by local and state codes and ordinances.

C. Contractor shall not obstruct the flow of traffic during the construction of the proposed improvements.

1.07 EQUIPMENT AND MATERIAL STORAGE

A. Materials and equipment for this project may be stored at the Project Site in designated locations or at the GCSD's District Office.

B. The Contractor shall be directed by the GCSD where to store the equipment and/or materials. All equipment and/or materials stored at the Project Site or the Groveland CSD District Office are being stored at the Contractors risk. The Groveland CSD is not responsible for any damaged, stolen or vandalized equipment and/or materials.

PART 2 - MATERIALS

A. NOT USED

PART 3 - EXECUTION

A. NOT USED

END OF SECTION

SECTION 015526
TRAFFIC REGULATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes procedures for traffic regulation and temporary steel plate bridging during construction in public streets and highways.

1.02 STANDARD SPECIFICATIONS

A. Wherever reference is made to the State Specifications and Plans, such reference shall mean the State of California, Business, Transportation, and Housing Agency, Department of Transportation latest edition Standard Specifications and latest edition Standard Plans.

1.03 SUBMITTALS

A. The Contractor shall submit, not less than 14 working days prior to the start of construction operations, a Traffic Regulation plan, prepared, signed, and approved by the entity with jurisdiction over the specified roadway (i.e. Caltrans, Tuolumne County, Groveland CSD, Pine Mountain Lake, etc.). Preparation of any additional traffic control plans or detail that may be required by the State of California or the County of Tuolumne during the course of the work shall be the Contractor's responsibility. No work shall begin involving or requiring alternate traffic control until a traffic control plan is approved by authorities with jurisdiction over the public roads in which the construction takes.

1.04 GENERAL

A. Provide safe and continuous passage for pedestrian and vehicular traffic at all times.

B. Control traffic at those locations indicated and in conformance with the approved traffic control plans and specifications.

C. Furnish, construct, maintain, and remove detours, road closures, traffic signal equipment, lights, signs, barricades, fences, K-rail, flares, solar-powered flashing arrow signs, miscellaneous traffic devices, flagmen, drainage facilities, paving, and such other items and services as are necessary to adequately safeguard the public from hazard and inconvenience. All such work shall comply with the ordinances, directives, and regulations of authorities with jurisdiction over the public roads in which the construction takes place and over which detoured traffic is routed by the Contractor, mainly the California Department of Transportation and the County of Tuolumne. After devices have been installed, maintain and keep them in good repair and working order until no longer required. Replace such devices that are lost or damaged, to such an extent as to require replacement, regardless of the cause of such loss or damage.

D. Prior to the start of construction operations, notify the police and fire department in whose jurisdiction the project lies, giving the expected starting date, completion date, and the names and telephone numbers of two responsible persons who may be contacted at any hour in the event of a condition requiring immediate emergency service to remove, install, relocate, and maintain warning devices. In the event these persons do not promptly respond or the authority deems it necessary to call out other forces to accomplish emergency service, the Contractor will be held responsible for the cost of such emergency service.

E. Provide a minimum of 48 hours' notice to the California Department of Transportation and the County of Tuolumne for any work which may affect signal loops, equipment, or devices. In the event that any underground utilities, traffic devices, pipes, or conduits are damaged and require emergency repair, all costs incurred in making such repairs, plus 15% for administration costs, shall be paid by the Contractor.

F. Post temporary "No Parking - Tow Away" signs 48 hours prior to work in areas where parking is normally permitted. The Tuolumne County Police Department shall be notified 24 hours prior to the posting of any temporary parking restrictions along the pipeline route.

G. Coordinate the relocation of public bus and school bus routes, bus stops, and trash collection services with the County of Tuolumne and Big Oak Flat-Groveland Unified School District in advance of construction activity.

H. Post the construction information signs at least two weeks prior to construction.

I. Notify each postal address at least two working days prior to restricting parking along the project route via first class United States mail of the nature and duration of the parking restriction.

1.05 TRAFFIC CONTROL DEVICES AND SIGNS

A. Traffic control devices and temporary striping shall conform to the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD) and the California Manual of Uniform Traffic Control Devices (California MUTCD). Construction signs shall conform to the latest edition of the FHA publication “Standard Highway Signs” and the State of California Sign Specification Sheets.

B. The placement of construction signing, striping, barricades, and other traffic control devices used for handling traffic and public convenience shall conform to the California MUTCD and “Work Area Traffic Control Handbook” (WATCH) latest editions. In case of discrepancy, WATCH takes precedence over the MUTCD and California MUTCD. WATCH is published by Building News, Inc.

C. Signs shall be reflectorized when they are used during hours of darkness. Cones and portable delineators used for night lane closures shall have reflective sleeves. Equip barricades used in the diversion of traffic with flashers if in place during hours of darkness.

D. During the duration of a detour, cover existing signs not in accordance with the traffic control plan. Relocate existing signs that are in force to provide visibility from all relocated traffic lanes.

1.06 TEMPORARY STEEL PLATE BRIDGING, WITH A NONSKID SURFACE

A. When backfilling operations of an excavation in the traveled way, whether transverse or longitudinal, cannot be properly completed within a workday, provide steel plate bridging with a nonskid surface and shoring to preserve unobstructed traffic flow. In such cases, the following conditions shall apply:

1. Steel plates used for bridging shall extend a minimum of 12 inches beyond the edges of the trench.
2. Install steel plate bridging to operate with minimum noise.
3. Shore the trench to support the bridging and traffic loads.
4. Use temporary paving with cold asphalt concrete to feather the edges of the plates if plate installation by Method 2 is used.
5. Secure bridging against displacement by using adjustable cleats, shims, or other devices.

B. Install steel plate bridging and shoring using either Method 1 or 2:

1. Method 1 (For Speeds More Than 45 mph): The pavement shall be cold planed to a depth equal to the thickness of the plate and to a width and length equal to the dimensions of the plate.
2. Method 2 (For Speeds 45 mph or Less): Attach approach plate(s) and ending plate (if longitudinal placement) to the roadway by a minimum of two dowels predrilled into the corners of the plate and drilled 2 inches into the pavement. Butt subsequent plates to each other. Compact fine graded asphalt concrete to form ramps, maximum slope 8.5%

with a minimum 12-inch taper to cover all edges of the steel plates. When steel plates are removed, backfill the dowel holes in the pavement with either graded fines of asphalt concrete mix or concrete slurry.

C. Maintain the steel plates, shoring, and asphalt concrete ramps.

D. Unless specified, use of steel plate bridging at any given location shall not exceed four consecutive working days in any given week. Backfilling of excavation shall be covered with a minimum of 3 inches of temporary layer of cold asphalt concrete.

E. The following table shows the required minimal thickness of steel plate bridging required for a given trench width:

Trench Width (feet)	Minimum Plate Thickness (inches)
1	½
1 ½	¾
2	7/8
3	1
4	1 ¼

F. For spans greater than 4 feet, prepare a structural design by a registered civil engineer and submit to the Owner's Representative for review.

G. Design steel plate bridging for HS20-44 truck loading per Caltrans Bridge Design Specifications Manual. Maintain on the steel plate a nonskid surface having a minimum coefficient of friction equivalent to 0.35 as determined by California Test Method No. 342. The Contractor may use standard steel plate with known coefficient of friction equal or exceeding 0.35.

H. Use a “Rough Road” sign (W8-8) with black lettering on an orange background in advanced of steel plate bridging. This is to be used along with any other required construction signing.

1.07 VEHICULAR TRAFFIC CONTROL

A. Complete backfill, compaction, testing, and the first lift of permanent paving to a point not to exceed 1,000 feet behind the working heading. Shoring members, beams, or other obstructions shall not be permitted within a 2-foot clearance between the edge of excavation and the edge of any traffic lane. At construction areas where an open trench exists and/or where traffic detour will be in existence during night hours, replace delineators with barricades or K-rail.

B. Accomplish construction in phases by detouring traffic from its normal patterns. Restore traffic to normal patterns in each phase before proceeding to the next phase.

C. Transition traffic lane transitions from permanent lanes to construction zone patterns in accordance with the requirements for the normal posted speed limit.

D. Unless otherwise shown in the drawings or allowed by the County of Tuolumne, within whose jurisdiction the work is being performed, limit construction activities to 7 a.m. to 5 p.m. Monday through Friday. Return roadways and sidewalks to unrestricted vehicle and pedestrian usage when construction is not underway.

E. During the peak traffic volume hours of the day, from 6:00 a.m. to 8:30 a.m. and 3:30 p.m. to 7:00 p.m. on weekdays only, limit construction activities within the construction zone to those which will not impact the free movement of vehicular traffic in its detoured pattern. Construction equipment or trucks shall not use or travel adjacent to traffic lanes during these

time periods. Truck operations in and out of construction and staging areas shall be controlled by flagmen at all times.

1.08 PEDESTRIAN TRAFFIC CONTROL

A. Maintain and delineate a minimum of one 4-foot-wide pedestrian walkway along each public street at all times during construction. Maintain existing pedestrian accesses at intersections at all times. When existing crosswalks are blocked by construction activity, install signs directing pedestrian traffic to the nearest alternative crosswalk.

B. Erect a fence or provide other means of securement to preclude unauthorized entry to any excavation during all nonworking hours on a 24-hour basis including weekends and holidays. Said fence shall be a minimum of 7 feet high around the entire excavation, consisting of a minimum 9-gauge chain-link type fence fabric and shall be sturdy enough to prohibit toppling by children or adults. There shall be no openings under the wire large enough for any child to crawl through. Lock any gates if no adult is in attendance. Place warning signs spaced on 50-foot centers on the outside of the fence with the statement "DEEP HOLE DANGER."

C. Special Considerations at Schools: The pipeline route passes by schools for children of elementary and high school ages. When construction is within 500 feet of any school crossing, place a guard at each school crossing during normal school hours whose prime responsibility is to provide safe guidance for children and adults past the construction area.

1.09 ACCESS TO ADJACENT PROPERTIES

A. Maintain reasonable access from public streets to adjacent properties at all times during construction. Prior to restricting normal access from public streets to adjacent properties, notify each property owner or responsible person, informing him of the nature of the access restriction, the approximate duration of the restriction, and the best alternate access route for that particular property.

B. Some of the sewer improvements' layout passes shopping centers with driveway access from the street. To minimize access restriction to these driveways, either backfill, compact, and provide temporary pavement or provide steel plates sufficient to support vehicular traffic across the trench in front of these driveways except when actual construction is being performed in the driveway area.

1.10 PERMANENT TRAFFIC CONTROL DEVICES

A. Existing permanent traffic control signs, barricades, and devices shall remain in effective operation unless a substitute operation is arranged for and approved as a portion of vehicular traffic control above. Traffic signal modification and restoration work shall be in accordance with Section 86 of the State Specifications.

B. Maintain daily liaison with the California Department of Transportation and the County of Tuolumne in regards to traffic diversion at signalized intersections.

C. Contact the California Department of Transportation and the County of Tuolumne 48 hours prior to work affecting traffic signal phasing or vehicular detection loops.

D. Provide a certified signal contractor to be responsible for all traffic modifications required to implement the traffic control plans and as directed by the California Department of Transportation and the County of Tuolumne, including installing new traffic signal heads, realigning signal heads, temporary poles and wiring, all other hardware modifications and controller modifications.

E. Completely restore traffic signals affected by the construction of the improvements to its original operation immediately upon completion of the work requiring the signal modification.

F. Traffic Control Detection Loops: Completely replace traffic control detection loops which are cut, removed, or otherwise disturbed for construction of the pipeline to the original position or as directed by the California Department of Transportation and the County of Tuolumne immediately after the specific stage affecting loops is completed. Check new loops for continuity from the traffic signal cabinet to assure splicing and signal operation is correct.

G. Replace traffic signal conduits damaged to the nearest pull box, including new wire, back to the terminal, and/or back to the signal controller to the satisfaction of the owning agency before proceeding to the next construction stage. Splicing is not permitted. Report all such damage immediately to the California Department of Transportation and the County of Tuolumne.

H. Restriping of Streets: Permanent restriping shall be in accordance with the requirements of the agencies having jurisdiction. Place and remove temporary striping required for traffic control during construction by sandblasting. Temporary striping includes any striping required on any pavement replaced prior to the final surface course. Replace any damaged or obliterated raised pavement markers in accordance with the standards of the agency having jurisdiction.

PART 2 - MATERIALS

A. NOT USED

PART 3 - EXECUTION

A. NOT USED

END OF SECTION

SECTION 017410
CLEANING DURING CONSTRUCTION AND FINAL CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes cleaning during construction and final cleaning on completion of the work.

B. At all times maintain areas covered by the contract and adjacent properties and public access roads free from accumulations of waste, debris, and rubbish caused by construction operations.

C. Conduct cleaning and disposal operations to comply with local ordinances and antipollution laws. Do not burn or bury rubbish or waste materials on project site. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains. Do not dispose of wastes into streams or waterways.

D. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

1.02 CLEANING DURING CONSTRUCTION

A. During execution of work, clean site, adjacent properties, and public access roads and dispose of waste materials, debris, and rubbish to assure that buildings, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.

B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

C. Provide containers for collection and disposal of waste materials, debris, and rubbish.

1. Cover or wet excavated material leaving and arriving at the site to prevent blowing dust. Clean the public access roads to the site of any material falling from the haul trucks.

2. Conduct cleaning and disposal operations to comply with local ordinances and antipollution laws. Do not burn or bury waste materials on project site. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains.

1.03 FINAL CLEANING

A. At the completion of work and immediately prior to final inspection, clean the entire project site as follows.

B. Clean, sweep, wash, and polish all work and equipment including finishes.

C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces.

D. Repair, patch, and touch up marred surfaces to match adjacent surfaces.

E. Broom clean paved surfaces; rake clean landscaped areas.

F. Remove from the site temporary structures and materials, equipment, and appurtenances not required as a part of, or appurtenant to, the completed work.

PART 2 - MATERIALS

A. NOT USED

PART 3 - EXECUTION

A. NOT USED

END OF SECTION

SECTION 020120
PROTECTING EXISTING UNDERGROUND UTILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes materials and procedures for protecting existing underground utilities.

PART 2 - MATERIALS

2.01 REPLACEMENT IN KIND

A. Except as indicated below or as specifically authorized by the Owner's Representative, reconstruct utilities with new material of the same size, type, and quality as that removed.

2.02 VITRIFIED CLAY SEWER PIPE AND COUPLINGS

A. For sewer pipe 8 inches and less in diameter, replacement shall consist of plain-end pipe conforming to ASTM C700. Compression couplings shall conform to ASTM C594, band seal couplings or equal. Use at least two lengths of pipe in crossing the trench section.

PART 3 - EXECUTION

3.01 GENERAL

A. Replace in kind street improvements, such as curbs and gutters, barricades, traffic islands, signalization, fences, signs, etc., that are cut, removed, damaged, or otherwise disturbed by the construction.

B. Where utilities are parallel to or cross the construction but do not conflict with the permanent work to be constructed, follow the procedures given below. Notify the utility owner 48 hours in advance of the crossing construction and coordinate the construction schedule with the utility owner's requirements. For utility crossings not shown in the drawings, refer to the General Conditions and the instructions of the Owner's Representative for guidance.

C. Determine the true location and depth of utilities and service connections which may be affected by or affect the work. Determine the type, material, and condition of these utilities. In order to provide sufficient lead time to resolve unforeseen conflicts, order materials and take appropriate measures to ensure that there is no delay in work.

D. If an underground facility is uncovered or revealed at or contiguous to the site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall give written notice to Owner and Engineer. Engineer will promptly review the underground facility and determine the extent to which a change is required to reflect and document the consequences of the existence or location of the underground facility. If Engineer concludes that a change in the Contract Documents is required, a Change Order will be issued. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any underground facility that was not shown or indicated in the Contract Documents.

E. Expose utilities in advance of the pipeline construction.

3.02 PROCEDURES

A. Protect in Place: Protect utilities in place, unless abandoned, and maintain the utility in service, unless otherwise specified in the drawings or in the specifications.

B. Cut and Plug Ends: Cut abandoned utility lines and plug the ends. Plug storm drains and sewers with an 8-inch wall of brick and mortar. Cap waterlines with a cast-iron cap or install a 3-foot-long concrete plug. Dispose of the cut pipe as unsuitable material.

C. Remove and Reconstruct: Where so indicated in the drawings or as required by the Owner's Representative, remove the utility and, after passage, reconstruct it with new materials. Provide temporary service for the disconnected utility.

3.03 COMPACTION

A. Utilities Protected in Place: Backfill and compact under and around the utility so that no voids are left.

B. Utilities Reconstructed: Prior to replacement of the 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 and lay, backfill, and compact.

3.04 THRUST BLOCKS ON WATERLINES

A. The Contractor's attention is called to thrust blocks for pipelines throughout the project whose thrust is in the direction of the new excavation and, therefore, may be affected by the construction. These pipelines are owned and operated by the Owner. Protect thrust blocks in place or shore to resist the thrust by a means approved by the Owner's Representative and reconstruct. If the thrust blocks are exposed or rendered to be ineffective in the opinion of the Owner's Representative, reconstruct them to bear against firm unexcavated or backfill material.

B. Provide firm support by backfilling that portion of the trench for a distance of 2 feet on each side of the thrust block to be reconstructed from the pipe bedding to the pavement subgrade, with either:

1. Sand-cement slurry (94 pounds of cement per cubic yard).

2. The native material compacted to a relative compaction of 95%.

C. Then excavate the backfill material for construction of the thrust block.

D. Test compaction of the backfill material before pouring any concrete thrust block.

END OF SECTION

SECTION 020130
CONNECTIONS TO EXISTING BURIED PIPELINES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes materials and installation of line stopping, by-pass and replacement of existing piping.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with Section 007000 of the General Conditions (Article 6.17).

B. Submit shop drawings in accordance with Tuolumne Utilities District Standard Drawing No. 303.

PART 2 - MATERIALS

2.01 LINE STOPPING FOR EXISTING FORCE MAIN

A. Before beginning line stop installation, the Contractor shall coordinate work with Groveland Community Services District.

B. The outside and inside diameters of the existing pipeline are required prior to ordering the line stopper. Using the manholes and the CCTV videos and reports, determine the outside diameter and inside diameter of the existing main for providing to the line stopping equipment manufacturer.

2.02 BY-PASS FOR EXISTING PIPELINES

A. The by-pass pipe should be flexible enough to adapt to the surface conditions. PVC and polyethylene are recommended for this use.

B. Verify that connections to manholes at both sides of by-pass have been temporary plugged during rehabilitation.

1. Contractor may propose an alternative means of bypass. Alternate means of bypass must be submitted to engineer, in submittal format, at a minimum of 14 days prior to the initiation of work. Engineer approval must be received before alternative means can be implemented.

PART 3 - EXECUTION

3.01 VERIFICATION OF PIPE OUTSIDE DIAMETER PRIOR TO INSTALLATION

A. Excavate the points of connection prior to submittal of shop drawings. Verify outside diameter prior to ordering materials.

3.02 LINE STOPPING PROCEDURE

A. Any damage that occurs due to the Contractor's work to the line stop fitting, accessories, or existing main shall be repaired at Contractor's expense.

B. Dispose of sewage and existing pipe at no additional cost to the Owner. Comply with the County of Tuolumne permit requirements. Any violation of permit requirements shall be the sole responsibility of the Contractor.

C. In order to aid the Contractor in the construction of the replacement pipe or main, the upstream sewage lift stations may be temporarily shut down by coordinating with the Owner.

D. If a longer time than provided by the Owner is needed by the Contractor to complete the connections to the existing pipe, then provide the means for conveying the sewage flow from the upstream lift stations. The means may include bypass force main and/or tanker truck. Coordinate with the Owner.

3.03 BY-PASS PROCEDURE

A. Upstream and downstream connections to manholes should be blocked, either by an inflatable plug or by any other equivalent means.

B. An extra pump shall be always available in the work site, in case of a main pump failure.

C. The by-pass must be fully functional before removing the existing pipe.

END OF SECTION

SECTION 024100
EQUIPMENT, PIPING, AND MATERIALS DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes demolition and removal of existing piping and selected site elements.

B. B. Salvage of existing items to be reused or recycled.

1.02 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.03 PROJECT CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Hazardous Materials: Hazardous materials are not anticipated to be present in construction to be selectively demolished.

C. Storage or sale of removed items or materials on-site is not permitted.

PART 2 - MATERIALS

A. NOT USED

PART 3 - EXECUTION

3.01 GENERAL

A. Prepare remaining surfaces to receive new scheduled and specified materials and finishes or finish to match adjacent surfaces if no additional work is scheduled or indicated.

3.02 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict.

E. Contractor shall confirm whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of measured drawings, and preconstruction photographs or preconstruction video recordings.

3.03 EXISTING PIPING AND ELECTRICAL UTILITIES

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

C. Owner will arrange to shut off indicated services/systems when requested by Contractor.

D. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.04 PLUGGING ABANDONED PIPING

A. Plug buried pipes 6 inches and larger to be abandoned. Plug pipes of all sizes to be abandoned under structures. Plug by placing a 3-foot-long concrete plug in the open ends.

3.05 PREPARATION

A. Site Access and Temporary Controls: Conduct demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

B. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

C. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

D. Protect pipes, walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

3.06 DEMOLITION

A. Existing structures, boxes, pipes, pavements, curbs, and other items are to be removed, altered, salvaged, and disposed of as specified herein. Remove and dispose of all portions of these items that interfere with project construction.

B. Perform the work in a manner that will not damage parts of the structure not intended to be removed or to be salvaged for the Owner. If, in the opinion of the Owner's Representative, the method of demolition used may endanger or damage parts of the structure or affect the satisfactory operation of the facilities, promptly change the method when so notified by the Owner's Representative. No blasting will be permitted.

C. Equipment, material, and piping, except as specified to be salvaged for the Owner, or removed by others, within the limits of the demolition, excavations, and backfills, will become the property of the Contractor and shall be removed from the project site. The salvage value of this equipment, materials, and piping shall be reflected in the contract price of the demolition work.

D. Do not reuse material salvaged from demolition work on this project, except as specifically shown.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them.

B. Do not allow demolished materials to accumulate on-site.

C. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

D. Burning: Do not burn demolished materials.

E. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.08 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 034210
CIRCULAR RUBBER MANHOLE LID SEALING GASKETS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies the furnish, installation and material of construction for circular rubber sanitary sewer manhole lid sealed gaskets.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions.

B. Submit manufacturer's catalog data on rubber sealed sanitary sewer manhole gaskets. Include product dimensions, materials of construction, tensile strength and hardness.

PART 2 - MATERIALS

2.01 RUBBER MANHOLE LID SEALING GASKETS

A. Rubber manhole lid sealing gasket shall be manufactured by Cortex or equal.

B. The manhole lid gaskets furnished under this specification shall be either molded, cut or extruded from a high quality rubber compound such as Nitrile, EPDM, Neoprene or a blend thereof.

1. When extrusion is the method of manufacture for lid gaskets, the material shall be cured in a round forming mold to maintain a flat and circular finished form.
2. Products molded shall have a minimum tensile strength of 1500psi.
3. Products cut from sheet material shall have a minimum tensile strength of 800 psi
4. Products extruded products shall have a minimum tensile strength of 1200 psi

C. All products shall have a hardness (durometer) of 60+5.

D. Manhole lid sealing gasket shall be sized per Tuolumne Utility District Standard Drawing Number 301.

E. Manhole lid sealing gasket shall have a minimum thickness of 3/32inches.

F. Any splice used in fabrication shall have the strength such that it will withstand a 180 degree bend without visible separation.

PART 3 - EXECUTION

3.01 INSTALLATION OF RUBBER MANHOLE LID SEALING GASKET

A. Rubber manhole lid sealing gasket shall be installed per the manufacturer’s recommendation.

B. The lid bearing surface area of both the frame and the lid shall be wire brushed and cleaned of all loose rust, scale or debris.

C. A small bead of butyl rubber caulk, conforming to AASHTO M-198 Type B, shall be applied to the clean and dry bearing surface of the frame prior to the installation of the gasket or on the side of the lid recess is removed.

3.02 RUBBER MANHOLE LID SEALING GASKET SIZING

A. Contractor shall provide the manufacturer with the inside diameter of the manhole frame at the base of the lid recess and the inside diameter of the frame’s clear opening or the width of the lid bearing surface and manhole lid’s thickness.

B. Manhole lid sealing gasket shall be sized per Tuolumne Utility District Standard Drawing Number 301.

END OF SECTION

SECTION 099000
PAINTING AND COATING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes materials and application of painting and coating systems for concrete and masonry surfaces.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions.

B. Submit manufacturer's data sheets for the proposed coating materials.

C. Submit certificate identifying the type and gradation of abrasives used for surface preparation.

D. Submit material safety data sheets for each coating.

PART 2 - MATERIALS

2.01 PAINTING AND COATING SYSTEMS

A. The following index lists the various painting and coating systems by service and generic type:

No.	Title	Generic Coating
Concrete and Masonry Coating Systems		
33.	Submerged Concrete, Raw Water or Raw Sewage	Vinyl ester

B. This system is specified in detail in the following paragraphs. For each coating, the required surface preparation, prime coat, intermediate coat (if required), topcoat, and coating thicknesses are described. Mil thicknesses shown are minimum dry-film thicknesses.

2.02 CONCRETE AND MASONRY COATING SYSTEMS

A. System No. 33--Submerged Concrete, Raw Sewage or Raw Water:

1. Type: Vinyl ester finish coat system, utilizing Dow Derakane 411 or 470 resin, with epoxy or vinyl ester prime coat. Minimum resin content in the finish coat system shall be 29% by weight. The vinyl ester finish coat system shall be formulated with an abrasion-resistant pigment to provide no more than an average 60-mg weight loss when run on a Taber Abraser using a CS-17 wheel, 1,000-gram weight on 1,000 cycles.

2. Service Conditions: Concrete submerged in raw sewage and structures containing moist hydrogen sulfide such as manholes and sewage pumping station wet wells.

3. Surface Preparation: In accordance with Part 3, subsection on "Preparation of Concrete and Masonry Surfaces To Be Coated."

4. Prime Coat:

   a. Apply epoxy or vinyl ester filler and surfacer to fill in depressions. Products: Carboline Plasite 9029 or Tnemec Series 120-5003. Apply Tnemec 120-5002 primer at 10 to 15 mils wet to facilitate application of the 120-5003 surfacer.

   b. Apply prime coat with trowel or squeegee so that exposed aggregate is covered and the surface is level with the surrounding concrete.

5. Finish Coats: Apply three or more coats to a total thickness of 40 mils minimum. Maximum thickness of any single coat shall not exceed 15 mils. Observe manufacturer's

recommended recoating time between coats. Products: Carboline Plasite 4007 or Tnemec 120-5001 Vinester.

PART 3 - EXECUTION

3.01 WEATHER CONDITIONS

A. Do not paint in the rain, wind, snow, mist, and fog.

B. Do not apply paint when the relative humidity is above 85%.

C. Do not apply epoxy, acrylic latex, and polyurethane paints on an exterior or interior surface if air or surface temperature is below 60°F or expected to drop below 60°F in 24 hours.

3.02 SURFACE PREPARATION PROCEDURES

A. Do not abrasive blast or prepare more surface area in one day than can be coated in one day; prepare surfaces and apply coatings the same day. Remove sharp edges, burrs, and weld spatter.

B. Surface preparation shall conform with the SSPC specifications as follows:

Surface Preparation of Concrete	SP-13

C. Brush-off blasting of concrete and masonry surfaces is defined as opening subsurface holes and voids and etching the surface for a coating to bond.

D. Do not apply any part of a coating system before the Owner's Representative has reviewed the surface preparation. If coating has been applied without this review, if directed by the Owner's Representative, remove the applied coating by abrasive blasting and reapply the coat in accordance with this specification.

3.03 ABRASIVE BLAST CLEANING

A. After abrasive blast cleaning and prior to application of coating, dry clean surfaces to be coated by dusting, sweeping, and vacuuming to remove residue from blasting. Apply the specified primer or touch-up coating within the period of an eight-hour working day. Do not apply coating over damp or moist surfaces. Reclean prior to application of primer or touch-up coating any blast cleaned surface not coated within said eight-hour period.

B. Keep the area of the work in a clean condition and do not permit blasting particles to accumulate and constitute a nuisance or hazard.

C. During abrasive blast cleaning, prevent damage to adjacent coatings. Schedule blast cleaning and coating such that dust, dirt, blast particles, old coatings, rust, mill scale, etc., will not damage or fall upon wet or newly coated surfaces.

3.04 PREPARATION OF CONCRETE AND MASONRY SURFACES TO BE COATED

A. Surface preparation of concrete and masonry surfaces shall be in accordance with SSPC SP-13 and the following.

B. Do not apply coating until concrete has cured at least 30 days. Finish concrete surfaces according to manufacturer's and Owner's specifications. Do not use curing compound on surfaces that are to be coated.

C. Concrete and masonry surfaces on which coatings are to be applied shall be of even color, gray or gray-white. The surface shall have no pits, pockets, holes, or sharp changes of surface elevation. Scrubbing with a stiff-bristle fiber brush shall produce no dusting or dislodging of cement or sand. Sprinkling water on the surface shall produce no water beads or standing droplets. Concrete and masonry shall be free of laitance and slick surfaces.

D. Detergent clean the concrete or masonry surface with trisodium phosphate per ASTM D4258. Then sandblast surfaces (brush-off blast). After sandblasting, wash surfaces with water to remove dust and salts, per ASTM D4258 or D4261. The grain of the concrete surface to touch shall not be rougher than that of No. 10 mesh sand.

E. Prior to coating concrete, plaster, and masonry with System No. 33, determine the presence of capillary moisture per ASTM D4263, except as modified below. Tape a 4-foot by 4-foot sheet of polyethylene plastic to the concrete surface to be coated. Allow the plastic sheet to remain in place at least 24 hours. After the specified time has elapsed, remove the plastic sheet and visually examine both the underside of the plastic sheet and the concrete surface beneath it. There shall be no indication of moisture on either surface. If moisture is indicated, allow additional curing time for the concrete and then retest. Provide one test sheet for every 300 square feet of concrete surface to be coated. For walls, provide one test sheet for each 10 feet (or fraction thereof) of vertical rise in all elevations starting within 12 inches of the floor or base slab.

F. Acceptance criteria for concrete surfaces shall be in accordance with SSPC SP-13, Table 1, “Severe Service.”

G. Do not apply coatings to concrete when the concrete is outgassing. Apply coatings only when the concrete surface temperature is stable, not rising.

3.05 PROCEDURES FOR ITEMS HAVING SHOP-APPLIED PRIME COATS

A. After application of primer to surfaces, allow coating to cure for a minimum of two hours before handling to minimize damage.

B. When loading for shipment to the project site, use spacers and other protective devices to separate items to prevent damaging the shop-primed surfaces during transit and unloading. If wood spacers are used, remove wood splinters and particles from the shop-primed surfaces after separation. Use padded chains or ribbon binders to secure the loaded items and minimize damage to the shop-primed surfaces.

C. Cover shop-primed items 100% with protective coverings or tarpaulins to prevent deposition of road salts, fuel residue, and other contaminants in transit.

D. Handle shop-primed items with care during unloading, installation, and erection operations to minimize damage. Do not place or store shop-primed items on the ground or on top of other work unless ground or work is covered with a protective covering or tarpaulin. Place shop-primed items above the ground upon platforms, skids, or other supports.

3.06 PAINTING SYSTEMS

A. All materials of a specified painting system, including primer, intermediate, and finish coats, shall be produced by the same manufacturer. Thinners, cleaners, driers, and other additives shall be as recommended by the paint manufacturer for the particular coating system.

B. Deliver paints to the jobsite in the original, unopened containers.

3.07 PAINT STORAGE AND MIXING

A. Store and mix materials only in areas designated for that purpose by the Owner’s Representative. The area shall be well-ventilated, with precautionary measures taken to prevent fire hazards. Post “No Smoking” signs. Storage and mixing areas shall be clean and free of rags, waste, and scrapings. Tightly close containers after each use. Store paint at an ambient temperature from 50°F to 100°F.

B. Prepare multiple-component coatings using all of the contents of the container for each component as packaged by the paint manufacturer. Do not use partial batches. Do not use multiple-component coatings that have been mixed beyond their pot life. Provide small

quantity kits for touch-up painting and for painting other small areas. Mix only the components specified and furnished by the paint manufacturer. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

3.08 PROCEDURES FOR THE APPLICATION OF COATINGS

A. Follow the recommendations of the coating manufacturer including the selection of spray equipment, brushes, rollers, cleaners, thinners, mixing, drying time, temperature and humidity of application, and safety precautions.

B. Stir, strain, and keep coating materials at a uniform consistency during application. Power mix components. For multiple component materials, premix each component before combining. Apply each coating evenly, free of brush marks, sags, runs, and other evidence of poor workmanship. Use a different shade or tint on succeeding coating applications to indicate coverage where possible. Finished surfaces shall be free from defects or blemishes.

C. Do not use thinners unless recommended by the coating manufacturer. If thinning is allowed, do not exceed the maximum allowable amount of thinner per gallon of coating material. Stir coating materials at all times when adding thinner. Do not flood the coating material surface with thinner prior to mixing. Do not reduce coating materials more than is absolutely necessary to obtain the proper application characteristics and to obtain the specified dry-film thicknesses.

D. Remove dust, blast particles, and other debris from blast cleaned surfaces by dusting, sweeping, and vacuuming. Allow ventilator fans to clean airborne dust to provide good visibility of working area prior to coating applications. Remove dust from coated surfaces by dusting, sweeping, and vacuuming prior to applying succeeding coats.

E. Apply primer immediately after blast cleaning and before any dust, dirt, or any foreign matter has accumulated. Reclean surfaces by blast cleaning that have surface colored or become moist prior to coating application.

F. Before applying subsequent coats, allow the primer and intermediate coats to dry for the minimum curing time recommended by the manufacturer. In no case shall the time between coats exceed the manufacturer's recommendation.

G. Each coat shall cover the surface of the preceding coat completely, and there shall be a visually perceptible difference in applied shade or tint of colors.

H. Applied coating systems shall be cured at 75°F or higher for 48 hours. If temperature is lower than 75°F, curing time shall be in accordance with printed recommendations of the manufacturer, unless otherwise allowed by the Owner's Representative.

3.09 SURFACES NOT TO BE COATED

A. Do not paint the following surfaces unless otherwise noted in the drawings or in other specification sections. Protect during the painting of adjacent areas:

1. Concrete walkways.
2. Mortar-coated pipe and fittings.
3. Buried pipe, unless specifically required in the piping specifications.

3.10 PROTECTION OF SURFACES NOT TO BE PAINTED

A. Remove, mask, or otherwise protect pipes, hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting

process. Mask openings in motors to prevent paint and other materials from entering the motors.

3.11 SURFACES TO BE COATED

A. Coat surfaces with the specific coating systems as described below:

1. Coat concrete surfaces where shown in the drawings. Apply System No. 33 on submerged concrete surfaces unless otherwise shown in the drawings.

3.12 DRY-FILM THICKNESS TESTING

A. Measure coating thickness specified for concrete or masonry surfaces in accordance with ASTM D4138. Test the finish coat of concrete and masonry surfaces in accordance with NACE SP0188-2006 or ASTM D4787. Patch coatings at the points of thickness measurement or holiday detection.

B. Check each coat for the correct dry-film thickness. Do not measure within eight hours after application of the coating.

C. For concrete surfaces, make five separate spot measurements spaced evenly over each 100 square feet of area (or fraction thereof) to be measured. The average of five spot measurements for each such 100 square foot area shall not be less than the specified thickness. No single spot measurement in any 100 square foot area shall be less than 80%, nor more than 120%, of the specified thickness.

D. Perform tests in the presence of the Owner's Representative.

3.13 REPAIR OF IMPROPERLY COATED SURFACES

A. If the item has an improper finish color or insufficient film thickness, clean and topcoat the surface with the specified paint material to obtain the specified color and coverage. Sandblast or power-sand visible areas of chipped, peeled, or abraded paint, feathering the edges. Then prime and finish coat in accordance with the specifications. Work shall be free of runs, bridges, shiners, laps, or other imperfections.

3.14 CLEANING

A. During the progress of the work, remove discarded materials, rubbish, cans, and rags at the end of each day's work.

B. Thoroughly clean brushes and other application equipment at the end of each period of use and when changing to another paint or color.

C. Upon completion of painting work, remove masking tape, tarps, and other protective materials, using care not to damage finished surfaces.

END OF SECTION

SECTION 311100
CLEARING, STRIPPING, AND GRUBBING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes the work included in clearing, stripping, grubbing, and preparing the project site for construction operations.

1.02 CLEARING

A. Remove and dispose of trees, snags, stumps, shrubs, brush, limbs, sticks, branches, and other vegetative growth. Remove rocks, tiles, and lumps of concrete. Remove all evidence of their presence from the surface. Remove and dispose of trash piles and rubbish. Protect structures and piping above and below ground, trees, shrubs, and vegetative growth and fencing which are not designated for removal.

1.03 STRIPPING

A. Remove and dispose of organic sod, topsoil to a depth of 2” to 4”, grass and grass roots, and other objectionable material remaining after clearing from the areas designated to be stripped or until all organics in excess of 3 percent by volume are removed.

1.04 GRUBBING

A. After clearing and stripping, remove and dispose of wood or root matter, including stumps, logs, trunks, roots, or root systems greater than 1 inch in diameter or thickness to a depth of 12 inches below the ground surface after stripping.

PART 2 - MATERIALS

2.01 TREES AND SHRUBBERY

A. Existing trees, shrubbery, and other vegetative material may not be shown in the drawings. Inspect the site as to the nature, location, size, and extent of vegetative material to be removed or preserved, as specified herein.

2.02 PRESERVATION OF TREES, SHRUBS, AND OTHER PLANT MATERIAL

A. Save and protect plant materials (trees, shrubbery, and plants) beyond the limits of clearing and grubbing from damage resulting from the work. No filling, excavating, trenching, or stockpiling of materials will be permitted within the drip line of these plant materials. The drip line is defined as a circle drawn by extending a line vertically to the ground from the outermost branches of a plant or group of plants. To prevent soil compaction within the drip line area, no equipment will be permitted within this area.

B. Cut and remove tree branches where necessary for construction. Remove branches other than those required for a balanced appearance of any tree. Treat cuts with a tree sealant.

PART 3 - EXECUTION

3.01 CLEARING, STRIPPING, AND GRUBBING AREAS AND LIMITS

A. Clear, strip, and grub excavation and embankment areas associated with replacement or spot repair of sanitary sewer pipelines and proposed manholes.

B. Clear and strip stockpile areas.

C. Limits of clearing, stripping, and grubbing:

1. Excavation, Excluding Trenches: 5 feet beyond tops of cut slopes.

2. Trench excavation for piping and electrical conduits: 3 feet from edge of trench.

3.02 DISPOSAL OF CLEARING AND GRUBBING DEBRIS

A. Do not burn combustible materials. Remove cleared and grubbed material from the worksite and dispose.

3.03 DISPOSAL OF STRIPPINGS

A. Remove stripped material and dispose offsite, except topsoil.

END OF SECTION

SECTION 317216
JACKED STEEL CASING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes materials, testing and installation for tunneling by jacked steel casing method.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions.

B. Submit materials list showing material of casing with ASTM reference and grade. Submit manufacturer's certification of compliance with referenced standards, e.g., ASTM A36, A139, and A283 and AWWA C200.

C. Submit manufacturer's certificates of compliance with referenced pipe standards, e.g., ASTM A36, ASTM A139, and ASTM A283. Provide recertification by an independent domestic testing laboratory for materials originating outside of the United States.

D. Submit certificates of welding consumables used for shop and field welding.

E. Submit welding procedure specifications (WPS) and procedure qualification records (PQR) for each welding process and welder qualification records (WQR) for each welder and welding operator. Submit bend and tensile test coupons concurrently with welder qualification and procedure qualification records. Welding procedures shall be required for welds for pipe cylinders, casing joint welds, and grout coupling connections.

F. Submit shop drawings showing the method of preventing pipe flotation and how the concrete backfill will be terminated at the end of the tunnel.

G. Submit diameter, thickness, and class of steel casing.

H. Submit location of approach trench.

I. Submit schedule and method of tunnel construction. Include also approach trench backfill and pipe installation and backfill.

1.03 INSPECTION

A. Perform work in the presence of the Owner’s Representative unless the Owner’s Representative has granted prior approval to perform such work in its absence.

ZSTANDARDS

B. Bore and Jack shall comply with Tuolumne Utility District Standard Drawing No. 103.

PART 2 - MATERIALS

2.01 STEEL CASING

A. Fabrication of casing shall be in accordance with AWWA C200, as modified below. Casing material shall conform to ASTM A283, Grade C; ASTM A139, Grade B; or ASTM A36. Obtain minimum diameter from drawings. Minimum wall thickness shall be 3/8 inches. The Contractor may select a greater thickness and diameter to accommodate the method of work, loadings involved, the site and possible interferences, but at no additional cost to Owner. Provide 2-inch grout connections in the form of threaded couplings welded to the steel shell regularly spaced at 4 feet on centers at the top and bottom of the casing.

B. Join casing sections by butt-welding in the field. Prepare ends of casings for welding by providing 1/4-inch by 45-degree chamfer on outside edges.

2.02 CASING SPACERS

A. Casing spacers shall be bolt-on style with a shell made in two sections of Type 304 stainless steel. Connecting flanges shall be ribbed. The shell shall be lined with a PVC liner 0.090 inch thick with 85-90 durometer. Nuts and bolts shall be 18-8 stainless steel. Construct runners of ultra high molecular weight polymer. Support runners by risers made of Type 304 stainless steel. Weld the supports to the shell, and passivate the welds. Casing spacers shall be Cascade Waterworks Mfg. Co., PSI, APS, or equal.

2.03 CASING SEALS

A. Casing seals shall be 1/8-inch-thick synthetic rubber, designed to fit snugly around pipe and casing. Casing seals shall be one piece with no field seams. Bands and hardware for attachment to pipe and casing outside diameter shall be stainless steel. Products: PSI or equal.

2.04 GROUT

A. Lean grout shall consist of one part portland cement, four parts sand, and sufficient water to produce a workable mixture. Sand for grout to be placed outside the casing shall be of such fineness that 100% will pass a No. 8 sieve and not less than 35% will pass a No. 50 sieve.

PART 3 - EXECUTION

3.01 FABRICATION, ASSEMBLY, AND ERECTION

A. Beveled ends for butt-welding shall conform to ASME B16.25. Remove slag by chipping or grinding. Surfaces shall be clean of paint, oil, rust, scale, slag, and other material detrimental to welding. When welding the reverse side, chip out slag before welding.

B. Fabrication shall comply with ASME B31.3, Chapter V. Welding procedure and performance qualifications shall be in accordance with Section IX, Articles II and III, respectively, of the ASME Boiler and Pressure Vessel Code or AWS D1.1 or AWS B2.1. Prequalified welding procedures may be used.

C. The minimum number of passes for welded joints shall be as follows:

Steel Cylinder Thickness (inch)	Minimum Number of Passes for Welds
Less than 0.1875	1
0.1875 through 0.25	2
Greater than 0.25	3

D. Welds shall be full penetration, except that partial-penetration butt-welds, where used, shall develop the full tensile strength of the mating plates.

E. Use the shielded metal arc welding (SMAW) submerged arc welding (SAW), flux-cored arc welding (FCAW), or gas-metal arc welding (GMAW) process for shop welding. Use the SMAW process for field welding.

F. Welding preparation shall comply with ASME B31.3, paragraph 328.4. Limitations on imperfections in welds shall conform to the requirements in ASME B31.3, Table 341.3.2 and paragraph 341.4 for visual examination.

G. Prepare edges of plate to be butt-welded. Butt-weld all joints.

H. Clean each layer of deposited weld metal prior to depositing the next layer of weld metal, including the final pass, by a power-driven wire brush.

I. Welding electrodes shall comply with AWS A5.1.

3.02 SECTIONAL SHIELD OR JACKING HEAD

A. Fit a sectional shield or steel jacking head to the leading section of the casing to extend around the outer surface of the upper two-thirds of the casing and project at least 18 inches beyond the driving end of the casing but do not protrude more than 1/2 inch outside of the outer casing surface. Anchor the head to prevent wobble or alignment variation during the jacking operation. To avoid causing a collapse of ground outside the casing, carry out excavation entirely within the jacking head and not in advance of the head.

3.03 JACKING PIT

A. Place in the approach trench or jacking pit and firmly bed on the required line and grade guide rails, structural steel, or concrete cradle of sufficient length to provide accurate control of jacking alignment. Provide space to permit the insertion of the lengths of casing to be jacked. Anchor the guide rails and structural steel sections to ensure action of the jacks in line with the axis of the casing. Interpose between the jacks and the end of the casing a bearing block consisting of a timber or structural steel framework constructed to provide uniform end bearing over the perimeter of the casing and distribute the jacking pressure evenly.

B. Jacking pits shall be a minimum of 30 feet from the centerline of the track.

3.04 CONTROL OF ALIGNMENT AND GRADE

A. Control the application of jacking pressure and excavation of material ahead of the casing as it advances to prevent the casing from becoming earthbound or deviating from required line and grade. Do not encroach upon the minimum annular space detailed. Restrict the excavation of material to the least clearance necessary to prevent binding in order to avoid causing a collapse of ground and consequent settlement or possible damage to overlying structures.

3.05 EXTERIOR GROUTING

A. Immediately after completion of the jacking or boring operation, inject lean grout through the grout connections in such a manner as to completely fill all voids outside the casing pipe resulting from the jacking or boring operation. Control grout pressure to avoid deformation of the casing, avoid damaging or plugging of adjacent subdrains, and avoid movement of the surrounding ground. After completion of grouting, close the grout connections with malleable iron or cast-iron threaded plugs.

3.06 CLOSING THE JACKING PIT

A. Seal the end of the casing with casing seals. After jacking equipment and muck from the tunnel have been removed from the approach trench or jacking pit, prepare the bottom of the jacking pit as a pipe foundation. Remove loose and disturbed material below pipe grade to undisturbed earth and recompact the material in accordance with Tuolumne Utilities District Std Dwg No. 102.

3.07 ALIGNMENT

A. The variation in the field position of the casing from the line and grade as indicated in the drawings shall be limited to 1 inch in lateral alignment and 1/4 inch in vertical grade providing

that, in the case of gravity flow pipes, the final grade of the flow line shall be in the indicated direction.

END OF SECTION

SECTION 330140
CURED-IN-PLACE SEWER PIPE LINING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes materials, testing and installation into existing sewers of cured-in-place sewer pipe lining (CIPP) lining conforming to ASTM F1216.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions.

B. Submit plans showing points of insertion and methodologies.

C. Submit certificates of compliance with design and test reports performed by a third party in accordance with applicable ASTM and specified test methods.

D. Submit design calculations for hydraulic capacity.

E. Submit certifications of the materials including the cell classification, grades, type of resins, glass fibers, and other materials used in the manufacture of the liner pipe.

F. Submit a certificate of "Compliance with Specifications" by the manufacturer for materials.

G. Submit liner size, thickness calculations, liner and resin materials, and resin manufacturer's heating requirements. Submit complete calculations including list of parameters, formulas, and other data that are necessary for the design of the liner pipe. Include soil loads, live loads, hydrostatic loads, pipe stiffness (PS), standard dimension ratio (SDR), pipe wall crushing strength, initial and long-term (50 years) values of pipe deflection, pipe bonding strain, hydrostatic collapse resistance, and constrained buckling strength. Submit drawings showing the cross sectional profile of the liner pipe wall.

H. Submit manufacturer's installation instructions including recommendations for transportation, storage, temperature control, handling, inserting, curing, trimming, and finishing. Submit a written description of the resin curing temperatures versus time (step cooking temperatures/hours at initial, intermediate, and final stages) depending upon the sewer size, length, and liner thickness.

I. Submit the selected curing temperature and expected duration of curing time required to ensure proper curing and submit written concurrence from the CIPP liner manufacturer of the curing temperature, temperature monitor procedures, and duration of curing time.

J. Submit a plan detailing source of water to be used, pipeline locations, and discharge location.

K. Submit written descriptions of the methods and equipment for the repair of defects in the CIPP liner observed during the post installation inspection.

L. Submit plans and written descriptions for traffic control, bypass pumping, and pre-insertion cleaning.

M. Submit results of post installation resin and liner sample analyses to confirm installed liner meets the design requirements of these construction documents.

PART 2 - MATERIALS

2.01 CIPP SYSTEM

A. The materials shall be inert to attack by domestic sewage and shall be suitable for use in an underground sewer environment. The installed material shall be light-colored or white to facilitate CCTV inspection.

B. Manufacture the material in such a manner to produce a tight-fitting liner after installation. There shall be no measurable continuous annular space between the outside diameter of the new liner and the existing host pipe.

C. Resin-impregnated tube liner material shall consist of one or more layers of flexible needled felt or an equivalent woven or nonwoven material, capable of carrying resin and withstanding installation pressures and curing temperatures. The material shall be able to stretch to fit irregular pipe sections and negotiate bends. The outside layer of the tube shall be plastic coated with a material compatible with the resin system used.

D. The resin-impregnated flexible felt tube liner shall be cured by circulating heated water to effect the desired cure throughout the length of the tube, extending full length from manhole to manhole(s). The resin shall be cured into a hard impermeable pipe of the minimum specified thickness, providing a structurally sound, uniformly smooth interior and tight-fitting liner within the existing pipe.

2.02 MATERIALS

A. Material shall meet the following requirements:

Design Criteria	Value
Flexural Modulus (minimum) per ASTM D790	300,000 psi
Flexural Strength (ASTM D790 and D2290)	4,500 psi
Long-Term Modulus of Elasticity for CIPP (psi)	50% of Flexural Modulus
Safety Factor	2.0
Tensile Strength (for pressure pipes only) (ASTM D638)	3,000 psi

2.03 DESIGN

A. Design shall be in accordance with most current edition of ASTM F1216, Appendix X1 for "fully deteriorated pipe conditions" both gravity and pressure as applicable.

B. Determine the thickness of the CIPP liner as the minimum thickness required to meet the design structural requirements for both internal and external loadings, excluding any sacrificial membranes or other materials that may be used for protection of the product during installation.

C. Design information is shown in the table below:

Design Criteria	Value
Maximum Wastewater Temperature	80°F
Minimum Wastewater Temperature	40°F
Mean Diameter (inches)	6
Ovality (percent)	2 % minimum
Height of Water Above Top of Pipe (feet)	Variable
Maximum Soil Cover (feet)	Variable
Soil Density (lbs/cu ft)	120
Modulus of Soil Reaction (psi)	1,000
Minimum Liner Tube Thickness (inches)	0.14

D. These criteria yield an in-place wall thickness requirement. Provide allowances for any circumferential stretching, polymerization shrinkage, and resin migration that may occur.

E. It is the Contractor's responsibility to check the sewer size and length prior to manufacturing. Modify the liner thickness and other properties to suit the site conditions.

F. The sewers require lining all flow under gravity conditions.

2.04 LINER TUBE

A. The liner tube shall consist of one or more layers of flexible needled felt or an equivalent nonwoven and/or woven material capable of carrying resin, withstanding installation pressures and curing temperatures, and is compatible with the resin system used. Fabricate the liner tube to a size that, when installed, will fit the internal circumference of the existing sewer without any annular space between liner and walls of the host pipe. Make allowances for circumferential stretching due to insertion of liner and deterioration of existing pipe walls. Fabricate liner felt layers in a manner to maintain uniform thickness.

B. Fabricate the liner from a material which, when cured, will be chemically resistant to withstand internal exposure to sewage gases containing hydrogen sulfide, carbon monoxide, methane, petroleum hydrocarbons, saturation with moisture, and diluted sulfuric acid.

C. Calculate the CIPP wall thickness for each diameter based on a factor of safety of 2:1 using the standard polyester resin. The thickness shall be rounded to the next highest multiple of 1.5 mm after adding an allowance of 5% to the design thickness for resin migration.

D. Design the CIPP per ASTM F1216, Appendix X1, with the following additional requirements:

1. Maximum SDR 35 in accordance with ASTM F1216.

2. External Buckling Design: Where the CIPP is designed as a stand-alone pipe, a fully deteriorated condition, acceptable third-party testing, and verification of design analysis techniques (ASTM F1216, Section X1.2.2) shall be submitted by each manufacturer and/or CIPP product. This testing requirement can be accomplished with soil box testing.

E. Verify the lengths in the field before resin impregnation and installation of the tube. Individual insertion runs may be made over the entire length between manholes.

F. Prior to insertion, provide data on the maximum allowable stresses and elongation of the tube. Mark the exterior of the manufactured tube along its length at regular intervals not to exceed 5 feet. Use these marks as a gauge to measure elongation during insertion. Should the overall elongation of a reach exceed 5%, the liner tube shall be rejected and replaced.

G. Prior to insertion, the liner tube shall be free of visible tears, holes, cuts, foreign materials, dry spots, pinholes, delamination, and other defects. Repair defects that will affect the integrity or strength of the CIPP lining or replace the CIPP liner at no additional cost to the Owner. The method of repair shall maintain the full integrity of the liner.

2.05 RESIN

A. Provide a thermosetting, polyester, vinylester, or epoxy resin, able to cure in the presence or absence of water, and a catalyst system compatible with the unimpregnated liner material that provides the cured physical and chemical resistance strengths specified. The initiation temperature for cure shall be as recommended by the resin manufacturer.

B. Resin shall not be affected by ultraviolet light and shall form no excessive bubbling or wrinkling during lining.

C. The resin system shall meet the requirements of ASTM F1216.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. Exercise care during transportation, handling, storing, and installation of the CIPP lining to ensure that the material is not torn, cut, or otherwise damaged.

B. If any part or parts of the CIPP liner material becomes torn, cut, or otherwise damaged before or during installation, it shall be repaired or replaced before proceeding with further installation and at no additional cost to the Owner.

C. Handle and store the CIPP liner as recommended by the manufacturer to ensure installation in a sound, undamaged condition.

D. Follow the resin manufacturer's requirements for handling and storage of the resin prior to, during, and following impregnation of the tube.

3.02 PREINSTALLATION PROCEDURES

A. Notify the owners and residents of any homes or businesses whose service lateral will be affected by the lining work. Send written notice at least two weeks in advance of construction. In addition, deliver written notification to each such resident or business two to three days in advance of such lining work, further advising of the work. Include in the notifications any restrictions on use of the sewage system facilities. Describe exact days and hours when the sewer system cannot be used.

B. Before installing the liner, clean and inspect the pipeline per ASTM F1216, Section 7. Clear the pipeline of obstructions. Perform inspection by CCTV. Provide a copy of the inspection television tape to the Owner’s Representative. Inspect the existing pipeline to determine the locations of conditions that may prevent proper installation of the tube, such as protruding service taps, collapsed or crushed pipe, and reductions in cross section area of more than 40%. Correct any such deficiencies noted.

C. Before starting the installation, a fully functional by-pass shall be prepared to transport the sewage water from the upstream to the downstream manholes. The by-pass shall consist of portable pumps and a flexible pipe which connects both manholes. Contractor shall maintain the by-pass working uninterruptedly during the CIPP work are in progress.

3.03 INSTALLATION

A. Install the CIPP liner using an inversion process and hydrostatic head per the manufacturer's written recommendation and ASTM F1216.

B. Designate a location and notify the Owner’s Representative where resin impregnation will take place. Use a vacuum impregnation process with a roller system designed to uniformly distribute the resin throughout the tube.

C. During insertion, protect the new liner and the existing pipe and manholes from any damage that might result during the insertion process.

D. Equipment used to supply heat and pressure shall be capable of providing the necessary heat and pressure required for the installation condition.

E. To ensure proper heat distribution of rehabilitation systems using heat exchange methods and to prevent the creation of flat bottoms in the liner profile, isolate the new liner system from inflow, infiltration, or standing water. Accomplish by temporarily stopping inflow and infiltration and removing standing water or by using a reinforced, flexible, preliner to isolate the new liner.

F. After the new liner is completely rounded, cool it to a temperature specified by the manufacturer prior to relieving the internal pressure. In no case shall this temperature be in excess of 100°F.

G. Cut and trim the new liner at each end to conform to the inside manhole wall. If the liner fails to make a tight seal at the manhole wall, apply a sealant to the annular space.

H. Cut and trim the new liner in intermediate manholes, between the insertion and termination manholes, at each inside manhole wall. Seal the liner to the manhole wall with a sealant material.

3.04 RESIN IMPREGNATION

A. The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall. Use a serial vacuum impregnation process (or equal) to provide maximum resin impregnation throughout the tube. Use a roller system to uniformly distribute the resin throughout the tube to ensure uniform wetting of the liner. If the CIPP does not fit tightly against the original pipe at its termination point(s), seal the space between the pipes by filling with a resin mixture compatible with the CIPP.

3.05 CURING IN PLACE

A. After installation of the CIPP liner into the host conduit, perform curing in accordance with the manufacturer's written recommendations. Ensure that the temperature and the period of time that the temperature is to be maintained shall be as determined by the resin/catalyst system employed and as recommended by the manufacturer. The curing of the CIPP liner shall take into account the existing host conduit material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of the soil).

B. Fit the heat source with monitors to accurately gauge the temperature of the incoming and outgoing heat source. Place another such gauge between the CIPP liner and the pipe invert at the removal end to determine the temperature during the curing process. The temperature in the CIPP-lined host conduit during the curing process shall be as recommended by the resin manufacturer. The length of time for allowing the curing process to be completed shall be of the duration recommended by the manufacturer, during which time the Contractor shall maintain the required temperature throughout the CIPP-lined host conduit. Provide temperature strip chart data to the Owner's Representative for review to ensure that curing temperatures for the resin meet the manufacturer's recommendations.

C. If cool-down is to be accomplished by the introduction of cool water into an inversion standpipe to replace the water being drained from a small hole made in the downstream end, cool the hardened pipe to a temperature below 100°F (38°C) before relieving static head in the inversion standpipe. Ensure that, in the release of static head, a vacuum will not be produced that could damage the newly installed CIPP liner.

D. Vent and/or exhaust noxious fumes or odors generated during and remaining after the curing process is completed. This process shall remain in place at all manholes, laterals, etc., until noxious odors have dissipated to an acceptable level in accordance with OSHA requirements for the materials used and there is no more air pollution or potential health hazard left to the general public or the construction workers.

E. Provide piping, pumps, valves, and other equipment to discharge curing water. Contractor shall identify discharge points, ask Owner’s representative for approval and obtain all permits required for the disposal of curing water.

3.06 REINSTATEMENT OF SERVICES

A. Immediately reinstate live services after rehabilitation, testing, and acceptance of sewer lines. Inactive service lines to a vacant lot, vacant building, or to an occupied residence with more than one service line serving the property shall be defined as a “live” service and shall be reinstated. Locate live services prior to rehabilitation activities. Note each service connection by its size, position from a reference manhole, and orientation with respect to the circumference of the pipe. Reconnect from the interior of the sewer line by means of a television camera and a remote controlled cutting device. No excavation will be allowed. Holes cut through the rehabilitation liner shall be neat and smooth and shall match the bottom of the reinstated service line. Reinstate the service opening to a minimum of 95% and a maximum of 100% of the service lateral pipe area. The new edge shall be crack free with no loose or abraded material. The seam between the host pipe and the new liner at the reinstated service shall be free of gaps, voids, or cavities and shall be no more than a hairline crack. Any gaps, voids, or cavities at this joint shall be grouted with a packer and grouting system. Seal gaps between the liner and the service by internal methods prior to the postconstruction televising.

B. Provide a fully operational backup device for reinstating service laterals. If for any reason the remote cutting device fails during the reinstatement of a service lateral, immediately deploy the standby device to complete the reinstatement. The backup device shall be fully functional without requiring removal of parts from the primary device. The backup equipment shall be onsite throughout the reinstatement process.

3.07 FIELD TESTING

A. For each inversion length of CIPP liner, prepare one sample from a section of the cured liner at the termination point in accordance with ASTM F1216. Samples shall be large enough to provide a minimum of three specimens.

B. Test the samples for flexural, tensile, and delamination properties. Flexure properties shall be tested in accordance with ASTM D790 and shall meet the requirements of Table 1 in ASTM F1216. Tensile properties for pressure pipe conditions shall be tested in accordance with ASTM D638 and shall meet the requirements of Table 1 in ASTM F1216. Test for delamination in accordance with ASTM D903 as set forth in Section 8.4 of ASTM F1216.

3.08 INSPECTION

A. Inspection of the finished CIPP liner shall be by CCTV. Television inspection of the liner shall be in accordance with Standard Specifications for Public Works Construction, Section 500-1.1.5. No infiltration of groundwater shall be observed.

B. The finished liner shall be continuous between manholes and shall be free from visual defects such as foreign inclusions, reverse curvatures, flats, dry spots, pinholes, and delamination. Visual inspection shall be accomplished by review of postrehabilitation CCTV. Should defects occur, the entire liner between manholes shall be removed and replaced at no cost to the Owner.

C. In the event the Owner’s Representative, based on review of postinstallation CCTV video, has reasonable cause to suspect that any annular space exists between the liner and the host pipe, excavate and expose the existing sewer and remove the existing host pipe such that confirmation of the suspected annular space can be made. If an annular space equal to or greater than 5% of the pipe diameter is determined to exist, it shall be repaired in a manner approved by the Owner’s Representative at no additional cost to the Owner. If it is determined that no annular space exists, the Contractor shall be reimbursed in accordance with the General Conditions.

D. The maximum allowable size of wrinkle or bulge as shown in the inspection shall not exceed 1/4 inch in the crown or wall of the pipe. No wrinkles will be allowed in the invert of the pipe.

3.09 POSTCONSTRUCTION INSPECTION

A. Perform a postconstruction inspection by CCTV 11 months after completion of the project. Provide a copy of the inspection television tape to the Owner's Representative. Repair or replace any sections of the liner that have wrinkled or bulged. Repair or replace any sections of the liner that show an annular space greater than that specified above. Correct any improperly reinstated service laterals.

END OF SECTION

SECTION 333112
PVC GRAVITY SEWER PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes materials, installation, and testing of PVC gravity sewer pipe conforming to ASTM D3034. Sizes are 4 through 15 inches for ASTM D3034 pipe.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions.

B. Submit reports on testing per ASTM D3034 (pipes 3 inches through 15 inches), ASTM D3212 and ASTM F477.

1.03 MEASUREMENT AND PAYMENT

A. The unit price or lump sum paid for PVC pipe includes full compensation for furnishing the labor, materials, tools, and equipment and doing all work involved to complete the pipeline except:

1. Stabilization of yielding foundation.

2. Concrete construction of special encasement not included in the classes of bedding and manhole bases.

PART 2 - MATERIALS

2.01 PVC MATERIAL

A. Additives and fillers, including stabilizers, antioxidants, lubricants, colorants, etc., shall not exceed 10 parts by weight per 100 of PVC resin in the compound.

2.02 PIPE

A. Pipe 4 through 15 inches shall conform to ASTM D3034, SDR 35.

2.03 JOINTS

A. Provide elastomeric gasket joints of the push-on type, conforming to ASTM D3212.

2.04 GASKETS

A. Gaskets for push-on joints shall conform to ASTM F477.

2.05 FITTINGS

A. Fittings for pipe 4 through 15 inches shall conform to ASTM D3034, SDR 35.

2.06 MANDREL FOR FIELD TESTING OF PIPE DEFLECTION

A. The mandrel shall:

1. Be a rigid, nonadjustable, odd-numbering-leg (nine legs minimum) mandrel having an effective length not less than its nominal diameter.

2. Have a minimum diameter at any point along the full length as follows:

Pipe Material	Nominal Size (inches)	Minimum Mandrel Diameter (inches)
PVC-ASTM D3034 (SDR 35)	6	5.619
	8	7.524
	10	9.405
	12	11.191
	15	13.849

B. Be fabricated of steel; be fitted with pulling rings at each end; be stamped or engraved on some segment other than a runner indicating the pipe material specification, nominal size, and mandrel outside diameter (e.g., PVC, D 3034-8"-7.524"); and be furnished in a carrying case labeled with the same data as stamped or engraved on the mandrel.

C. All costs incurred by the Contractor attributable to mandrel and deflection testing, including any delays, shall be borne by the Contractor at no cost to the Owner.

PART 3 - EXECUTION

3.01 LABORATORY TESTING

A. Conduct tests required in ASTM D3034 or F789, D3212 and F477.

B. The acceptable rates of failure for quality control tests shall be as follows:

1. Outer Diameter: 0%.
2. Minimum Wall Thickness: 0%.
3. Other Dimensions: 0%.
4. Flattening: 0%.
5. Impact: Six of six samples must pass; if one fails, test six more; all six must pass.

3.02 INSTALLING PVC SEWER PIPE

A. Install in accordance with Section 312316, ASTM D2321, and as described below.

B. Pipe shall not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.

C. Minimum bedding thickness shall be 2 inches, or 4 inches in rocky areas, as specified in Tuolumne Utilities District Standard Drawing No. 102.

D. Lay pipe without break, upgrade from structure to structure, with the socket ends of the pipe upgrade.

E. Do not use the pipe as a drain for removing water that has infiltrated into the trench.

F. After joint assembly, bring the bedding material up to pipe spring line. Bedding material shall be as specified in Tuolumne Utilities District STD DWG Nº102. Place the bedding material on each side of the pipe. Tamp the bedding material into final position at pipe spring line and continue to the top of the pipe. Relative compaction shall be in conformance with Tuolumne Utilities District STD DWG Nº102.

G. Then place bedding material to 1 foot above the top of the pipe and compact to the same relative compaction as in the pipe zone per Tuolumne Utilities District STD DWG Nº102. The remainder of the trench backfill shall be native material, installed per Tuolumne Utilities District STD DWG Nº102.

H. Do not use hydro-hammers to compact bedding or backfill.

3.03 INSTALLING LATERALS

A. Each wye branch fitting shall have its barrel diameter equal to the diameter of the sanitary sewer main and the spur (or branch) diameter as indicated in the drawings. Do not place wye branches within 5 feet of any structure.

B. Install wye fittings so that the outlet branch is inclined upward at an angle of 45 degrees. Plug wye branch fittings that are to be left unconnected with a stopper or plug. Join laterals to wye branch fittings at the sanitary sewer main by eighth bends. Eighth bends and quarter bends are a part of lateral sewer line.

C. End of the lateral shall be at least 3 feet below the existing or proposed grade of the ground at existing structure to be served or as called for in the drawings.

D. Where possible, laterals shall run perpendicular to the sewer main at a minimum grade of 1%. Bed laterals the same as the sewer main into which they connect.

E. Plug laterals with stopper in the socket of the last joint. Seal stopper in place so that it will withstand the internal pressure during the test for leakage and so that it may be removed without damage to the socket.

F. Mark the location of each lateral by chiseling a letter "S" 1 1/2 inches high on the top of the curb. If the terminal point of the lateral is more than 8 feet beyond the curb line or curb improvements do not exist, provide and install a 4-inch by 4-inch by 3-foot 0-inch stake extending 2 inches above the ground and placed at the end of the connection.

3.04 INSTALLING PIPE AT MANHOLES AND STRUCTURES

A. Place a 2-foot PVC length of pipe of the same inside diameter as the adjoining pipe at the inlet and outlet to each manhole or structure. Use one of the following methods:

1. Directly cast a manhole coupling into the manhole base. Provide rubber-ring gasket in the coupling.

2. Stretch a rubber-ring gasket around the pipe to serve as a water stop when cast into the structure wall.

B. Do not cast pipe bells into manholes or structures. Cut off the bell so that no recess or offset appears on the exposed face from the inside wall of the pipe to the outside wall of the pipe. The pipe shall have a plain end, flush with the inside wall of the manhole or structure, or as shown in the drawings.

3.05 TESTING FOR DEFECTS OF INSTALLED PIPE

A. Following placement and compaction of backfill and prior to placing permanent pavement, ball and mandrel the pipe to measure for obstructions (excessive deflections, joint offsets, and lateral pipe intrusions).

3.06 FIELD TESTING FOR PIPE DEFLECTION

A. Test installed pipe to ensure that vertical deflections for plastic pipe do not exceed the maximum allowable deflection. Maximum allowable deflections shall be governed by the mandrel requirements stated herein and shall nominally be:

Nominal Pipe Size	Percentage
Up to and including 12 inches	5.0

B. The maximum average inside diameter shall be equal to the average outside diameter per applicable ASTM standard minus two minimum wall thicknesses per applicable ASTM

standards. Manufacturing and other tolerances shall not be considered for determining maximum allowable deflections.

C. Perform deflection tests not sooner than 30 days after completion of placement and compaction of backfill. Clean and inspect the pipe for offsets and obstructions prior to testing.

D. Pull a mandrel through the pipe by hand to verify that maximum allowable deflections have not been exceeded. Prior to use, the mandrel shall be certified by an independent testing laboratory. Use of an uncertified mandrel or a mandrel altered or modified after certification will invalidate test. If the mandrel fails to pass, the pipe will be deemed to be over deflected.

E. Uncover any over deflected pipe and, if not damaged, reinstall. Remove damaged pipe from the site. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any over deflection, shall be uncovered, removed from the site, and replaced with new pipe.

3.07 TESTING FOR ALIGNMENT AND GRADE

A. After the pipe has been installed, tested for leakage, backfilled to existing grade, and manholes raised to grade and resurfaced, "ball" the pipe from manhole to manhole with a sewer scrubbing ball. After balling the pipe, perform the following:

1. Request television inspection by the Owner. If deficiencies are observed, the Owner will make a videotape and defects requiring correction will be noted. Upon completing the corrective work, notify the Owner; the affected portion of the pipeline system will be re-televised. Costs for re-television inspection will be billed to the Contractor.

END OF SECTION

SECTION 400500
GENERAL PIPING REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes the general requirements for selecting piping materials; selecting the associated bolts, nuts, and gaskets for flanges for the various piping services in the project; and miscellaneous piping items.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions.

B. Submit affidavit of compliance with referenced standards (e.g., AWWA, ANSI, ASTM, etc.).

C. Submit certified copies of mill test reports for bolts and nuts, including coatings if specified. Provide recertification by an independent domestic testing laboratory for materials originating outside of the United States.

D. Submit manufacturer's data sheet for gaskets supplied showing dimensions and bolting recommendations.

1.03 DEFINITIONS OF BURIED AND EXPOSED PIPING

A. Buried piping is piping buried in the soil, commencing at the wall or beneath the slab of a structure. Where a coating is specified, provide the coating up to the structure wall. Unless detailed otherwise, coating shall penetrate wall no less than 1 inch. Piping encased in concrete is considered to be buried. Do not coat encased pipe.

B. Exposed piping is piping in any of the following conditions or locations:

1. Above ground.
2. Inside buildings, vaults, or other structures.
3. In underground concrete trenches or galleries.

1.04 PIPING SERVICE

A. Piping service is determined by the fluid conveyed, regardless of the pipe designation.

PART 2 - MATERIALS

2.01 GASKETS FOR FLANGES FOR DUCTILE-IRON PIPING AND FITTINGS IN RAW SEWAGE, SLUDGE, AND SCUM SERVICE (SPECIFICATION SECTION 402040)

A. Gaskets shall be full face, 1/8-inch thick, Buna-N having a hardness of 55 to 65 durometer. Gaskets shall be suitable for a water pressure of 200 psi at a temperature of 250°F. Gaskets shall have “nominal” pipe size inside diameters not the inside diameters per ASME B16.21. Provide Garlock Style 9122 or equal.

2.02 GASKETS FOR FLANGES FOR PVC AND CPVC PIPING

A. Gaskets for flanged joints shall be full faced, 1/8-inch thick, having a hardness of 50 to 70 durometer A. Gasket material shall be EPR.

PART 3 - EXECUTION

3.01 INSTALLING PIPE SPOOLS IN CONCRETE

A. Install pipes in walls and slabs before placing concrete.

3.02 RAISED FACE AND FLAT FACE FLANGES

A. Where a raised face flange connects to a flat-faced flange, remove the raised face of the flange.

3.03 INSTALLING GROOVED-END PIPING

A. Install grooved-end pipe and fittings in accordance with the coupling manufacturer's recommendations and the following.

B. Clean loose scale, rust, oil, grease, and dirt from the pipe or fitting groove before installing coupling. Apply the coupling manufacturer's gasket lubricant to the gasket exterior including lips, pipe ends, and housing interiors.

C. Fasten coupling alternately and evenly until coupling halves are seated. Use torques as recommended by the coupling manufacturer.

END OF SECTION

SECTION 402040
DUCTILE-IRON PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes materials, testing, and installation of ductile-iron pipe and fittings 54 inches and smaller.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions.

B. Provide an affidavit of compliance with standards referenced in this specification, e.g., AWWA C151. Submit copy of report of pressure tests for qualifying the designs of all sizes and types of AWWA C153 fittings that are being used in the project. The pressure test shall demonstrate that the minimum safety factor described in AWWA C153, Section 5.5 is met.

C. Provide the following information:

1. Mortar lining thickness.
2. Wall thickness.
3. Show deflections at push-on and mechanical joints.
4. Submit joint and fitting details and manufacturer’s data sheets.

D. Submit calculations and test data proving that the proposed restrained joint arrangement can transmit the required forces with a minimum safety factor of 1.5.

E. Submit certificate that cement for mortar lining complies with ASTM C150, designating type.

F. Submit drawing or manufacturer's data sheet showing flange facing, including design of facing serrations.

G. Submit weld procedure specification, procedure qualification record, and welder's qualifications prior to any welding to ductile-iron pipe.

1.03 STANDARD

A. Ductile iron pipe shall comply with Tuolumne Utility District Standard Drawing No. 102.

PART 2 - MATERIALS

2.01 PIPE

A. Pipe shall be cast ductile (nodular) iron, conforming to AWWA C151. Provide pipe in nominal 18- or 20-foot laying lengths.

2.02 DESIGN CRITERIA

A. Obtain the following information from the drawings:

1. Elevation of the pipe invert and of the completed ground.
2. Alignment of the pipeline.
3. Field test hydraulic gradient elevation (HGL).
4. Nominal internal diameter, ID.

2.03 PIPE WALL THICKNESS

A. Minimum wall thicknesses for pipe having grooved-end joints shall be as shown in the following table:

Pipe and Fitting Sizes (inches)	Wall Thickness*
16 and smaller	Special Class 53

B. Minimum wall thickness for pipe having push-on or mechanical joints, restrained joints, plain ends, or cast flange ends shall be Special Class 53, unless otherwise shown in the drawings.

C. Minimum wall thickness for pipe having threaded flanges shall be Special Class 53 or Pressure Class 350.

D. Minimum pipe wall thickness required for corporation stops and tapped outlets shall be in accordance with Table A.1 of AWWA C151 for three full threads for design pressures up to 250 psi and four full threads for design pressures over 250 to 350 psi.

2.04 FITTINGS

A. Fittings 48 inches and smaller shall conform to AWWA C110 with a minimum pressure rating of 250 psi. Material shall be ductile iron. Flanges shall be flat faced.

B. Mechanical joint fittings conforming to AWWA C153 may be used in lieu of AWWA C110 fittings.

1. Grooved-end fittings shall conform to AWWA C110 with grooved ends conforming to AWWA C606, radius cut rigid joints. Fitting material shall conform to ASTM A48, Class 30; ASTM A126, Class B; or ASTM A536, Grade 65-42-10. Wall thickness of ductile-iron (ASTM A536) fittings shall conform to AWWA C110 or C153; wall thickness of cast-iron fittings shall conform to AWWA C110. Fittings and couplings shall be furnished by the same manufacturer.

2.05 FLANGES

A. Flanges shall be solid back, Class 125 per AWWA C115. Flanges on pipe shall be either cast or threaded. Material shall be ductile iron.

B. Flanged pipe and fittings shall be shop fabricated, not field fabricated. Threaded flanges shall comply with AWWA C115. Flanges shall be individually fitted and machine tightened in the shop, then machined flat and perpendicular to the pipe barrel. Flanges shall be backfaced parallel to the face of flange. Prior to assembly of the flange onto the pipe, apply a thread compound to the threads to provide a leak-free connection. There shall be zero leakage through the threads at a hydrostatic test pressure of 250 psi without the use of the gasket.

2.06 PIPE LINING--CEMENT MORTAR

A. Line pipe interior and fittings with cement-mortar per AWWA C104. Lining thickness shall be the double thickness listed in AWWA C104, Section 4.7. Cement for lining material shall conform to ASTM C150, Type V.

B. Maintain a moist environment inside the lined pipe and fittings by sealing the ends with polyethylene sheet.

C. Loose areas of cement-mortar lining are not acceptable. Remove and reconstruct lining in areas where quality is defective, such as sand pockets, voids over sanded areas, blisters, drummy areas, cracked areas, and thin spots. Longitudinal cracks in excess of 1/32 inch in width or where crack extends to metal shall be repaired with epoxy. Repair all cracks larger than 1/16 inch with epoxy.

2.07 GROOVED-END COUPLINGS

A. Grooved-end pipe couplings shall be ductile iron, ASTM A536 (Grade 65-45-12). Gaskets shall be Buna-N and shall conform to ASTM D2000.

B. Bolts in exposed service shall conform to ASTM A193, Grade B8, Class 2. Bolts in buried or submerged service shall be ASTM A193, Grade B8, Class 2.

C. Couplings for pipe 24 inches and smaller shall conform to AWWA C606 for flexible radius ductile-iron pipe, except where rigid radius couplings are required to connect to fittings. Couplings for pipe sizes 30 and 36 inches shall be in accordance with the coupling manufacturer's published literature for tolerances and dimensions for flexible and rigid radius cut joints. Couplings shall be Victaulic Style 31, Gustin-Bacon No. 500, or equal.

D. Grooved-end transition couplings for connecting ductile-iron pipe 12 inches and smaller to steel pipe shall be Victaulic Style 307 or equal.

2.08 GASKETS FOR FLANGES

A. See Section 400500.

2.09 GASKETS FOR MECHANICAL, PUSH-ON, AND RESTRAINED JOINTS

A. Synthetic rubber in accordance with AWWA C111.

2.10 BOLTS AND NUTS FOR FLANGES

A. See Section 400500.

2.11 JOINTS

A. Joints in buried piping shall be of the push-on or mechanical-joint type per AWWA C111 except where flanged joints are required to connect to valves, meters, and other equipment.

PART 3 - EXECUTION

3.01 DELIVERY, UNLOADING, AND TEMPORARY STORAGE OF PIPE AT SITE

A. Limit onsite pipe storage to a maximum of one week.

B. Use unloading and installation procedures that avoid cracking of the lining. If necessary, use plastic sheet bulkheads to close pipe ends and keep cement-mortar lining moist.

C. Deliver the pipe alongside the pipelaying access road over which the pipe trailer-tractors can travel under their own power. Place the pipe in the order in which it is to be installed and secure it from rolling.

D. Do not move pipe by inserting any devices or pieces of equipment into the pipe barrel. Field repair linings damaged by unloading or installation procedures.

3.02 SANITATION OF PIPE INTERIOR

A. During laying operations, do not place tools, clothing, or other materials in the pipe.

B. When pipelaying is not in progress, close the ends of the installed pipe by a child- and vermin-proof plug.

3.03 INSTALLING FLANGED PIPE AND FITTINGS

A. Install in accordance with Section 400500. Cut the bore of the gaskets such that the gaskets do not protrude into the pipe when the flange bolts are tightened.

3.04 INSTALLING GROOVED-END PIPE AND FITTINGS

A. See Section 400500.

3.05 INSTALLING BURIED PIPING

A. Install in accordance with AWWA C600, Section 312316, and as follows.

B. When installing piping in trenches, do not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.

C. Provide thrust blocks at fittings if necessary.

3.06 JOINT DEFLECTIONS FOR BURIED PIPE

A. Do not exceed the following deflection angles for unrestrained buried pipe joints:

Pipe Size (inches)	Maximum Deflection (degrees)	
	Push-On Joint	Mechanical Joint
4	4	6 1/2
6	4	5 1/2
8	4	4

B. Small angular changes (less than 7 degrees) in horizontal alignment defined in the drawings by a point of inflection (PI) with no accompanying curve data shall be approximated as a curve by deflecting by equal amounts equal length pipe segments to create a curve equally distributed on both sides of the given PI. Accomplish a larger (greater than or equal to 7 degrees) change in horizontal alignment where a curve is not called for in the drawings through the use of an elbow placed at the station of the PI shown in the drawings. Provide thrust restraint as required in the drawings.

C. Small angular changes (less than 5 degrees) in vertical alignment may be accomplished by the use of pulled joints. For larger vertical deflections, place an elbow at the station and elevation of the vertical PI shown in the drawings. Provide thrust restraint as required.

D. Assemble joints in accordance with AWWA C600 and the manufacturer's recommendations.

3.07 CLEANING PIPE

A. After interior joints have been pointed and mortar has hardened, sweep pipe clean of all dirt and debris. If hardened mud exists in the pipe, remove with the use of pressurized water hoses.

3.08 BURIED WARNING AND IDENTIFICATION TAPE

A. Provide detectable warning tape. Warning and identification shall read “CAUTION BURIED SEWER FORCE MAIN PIPING BELOW” or similar wording.

END OF SECTION