

SECTION 33 31 23

SANITARY SEWER FORCE MAINS, VALVES, AND APPURTENANCES

PART 1 GENERAL

1.1 DESCRIPTION

- A. Section Includes Installation of:
 - 1. Pipe and fittings for sewer force mains and interconnections.
 - 2. Valves, air release assemblies, and other force main appurtenances.

- B. Related Requirements:
 - 1. CFPUA Material Specification Manual (MSM).
 - 2. Section 01 50 00 – Bypass Pumping.
 - 3. Section 03 05 00 – Concrete.
 - 4. Section 31 23 34.01 – Excavation, Trenching, Dewatering and Backfilling.
 - 5. Section 33 01 12 – Identification for Utilities Piping
 - 6. Section 33 05 05.31 – Hydrostatic Testing.
 - 7. Section 33 05 09.33 – Thrust Restraint for Utility Piping.
 - 8. Section 33 05 13 – Precast Concrete Manholes and Utility Structures.

1.2 REFERENCE STANDARDS

- A. American Water Works Association:
 - 1. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - 2. AWWA C110 – Ductile-Iron and Gray-Iron Fittings.
 - 3. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 4. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - 5. AWWA C116 – Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray Iron Fittings.
 - 6. AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast.
 - 7. AWWA C153 – Ductile-Iron Compact Fittings.
 - 8. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service.
 - 9. AWWA C512 – Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service.
 - 10. AWWA C517 – Resilient-Seated Cast Iron Eccentric Plug Valves.
 - 11. AWWA C600 – Installation of Ductile Iron Mains and Their Appurtenances.
 - 12. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
 - 13. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. for Water Transmission and Distribution.
 - 14. AWWA C906 – Polyethylene Pressure Pipe and Fittings, 4-In. Through 65-In. for Waterworks.

- B. ASTM International:
 - 1. ASTM D698 – 12e2 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).

2. ASTM D1557 – 12e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
3. ASTM D2241 – Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
4. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Section 01 30 00 – Administrative Requirements
- B. Coordination:
 1. Coordinate Work of this Section with termination of force main connection at Site boundary, connection to CFPWA, and trenching.
 2. The existing system must be kept in operation at all times. Where connections are made to existing mains or other shutdowns are necessary, permission must be obtained and arrangements must be made with the CFPWA Wastewater Collections ORC, Utility Services Division for removing from service those mains that will be affected.
 3. No valves are to be operated unless a CFPWA representative is present. Any valves operated without a CFPWA representative present, or a directive may be subject of penalties in accordance with CFPWA's ordinance.
 4. Notify CFPWA no less than two business days prior to an event requiring a CFPWA representative to be present.
 5. The Contractor shall, at least two business days in advance, notify citizens subject to interruption of service by means of door hangers or any other approved method of the starting time and duration of such interruption.
 6. Bypass pumping and hauling operations may be required to interrupt service. A bypass pumping plan shall be submitted in accordance with Section 01 50 00 – Bypass Pumping. Shutdowns must be held to a minimum in both number and duration.

1.4 SUBMITTALS

- A. Section 01 33 00 – Submittals: Requirements for submittals.
- B. Product Data/Source Quality:
 1. Manufacturer's literature and specifications, as applicable, for products specified in this Section.
 2. Shop test results and inspection data, certified by manufacturer.
- C. Testing Procedures:
 1. Submit proposed testing procedures, methods, apparatus, and sequencing. Obtain ENGINEER and CFPWA approval prior to commencing testing.
- D. Manufacturer Instructions:
 1. Submit manufacturer's instructions for handling, storing, and installing valves and appurtenances. Provide templates and setting drawings for valves and appurtenances that require anchor bolts or similar anchorages.

- E. Manufacturer Certificates:
 - 1. Certificates of compliance with referenced standards, where applicable, including those of AWWA and others required by Engineer.
- F. Field Quality Control Submittals:
 - 1. Results of Contractor furnished laboratory testing and field test results.

1.5 CLOSEOUT SUBMITTALS

- A. 01 70 00 – Execution and Closeout Requirements
- A. Project Record Documents:
 - 1. Maintain accurate and up-to-date record documents showing modifications made in the field, in accordance with approved submittals, and other Contract modifications relative to buried piping Work.
 - 2. Record actual locations of piping mains, valves, hydrants, connections, thrust restraints, elevations, and other utilities found and not indicated on design plans.
- B. Record actual locations of piping mains, valves, hydrants, connections, thrust restraints, elevations, and other utilities found and not indicated on design plans.
- C. Operations and Maintenance Data:
 - 1. Furnish in operations and maintenance manuals complete data for materials in accordance with 01 60 00 - Product Requirements.

1.6 QUALITY ASSURANCE

- A. Qualifications: Company specializing in manufacturing products specified in the CFPWA Materials Specification Manual.
 - 1. Cast manufacturer's name, pressure rating, and year of fabrication into valve body.
- B. Perform Work according to AWWA and PVC Pipe Association standards.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 – Product Requirements.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Storage:
 - 1. Store materials according to manufacturer instructions.
 - 2. Block individual and stockpiled pipe lengths to prevent moving.
 - 3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
 - 4. Store PE and PVC materials out of sunlight.

- D. Protection:
 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 2. Provide additional protection according to manufacturer instructions.

1.8 SITE CONDITIONS

- A. Field Measurements:
 1. Verify field measurements prior to fabrication.
 2. Indicate field measurements on Shop Drawings.

1.9 WARRANTY

- A. Section 01 70 00 – Execution and Closeout Requirements.
- B. Furnish 10-year manufacturer's warranty for valves.

PART 2 PRODUCTS

2.1 CFPUA MATERIALS SPECIFICATION MANUAL

- A. Refer to CFPUA Material Specification Manual (MSM) for the following products:

MSM Section	Material
A	Pipe
B	Fittings and Accessories
C	Joint Restraints
D	Valves and Accessories
F	Service Saddles and Tapping Devices
I	Castings & Aluminum Access Covers
K	Miscellaneous
L	Electrical
M	Coatings and Sealants
N	Concrete

2.2 MATERIALS & ACCESSORIES

- A. Bedding, Cover, and Backfill:
 1. As specified in Section 31 23 34.01 – Excavating, Trenching, Dewatering and Backfilling.
- B. Pipe Location Wire: As specified in Section 33 01 12 – Identification for Utilities Piping.
- C. Thrust Restraints: As specified in Section 33 05 09.33 – Thrust Restraint for Utility Piping.

- D. Vaults and Utility Boxes: As specified in Section 33 05 13 – Precast Concrete Man-holes and Utility Structures.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 – Execution and Closeout Requirements.
- B. Identify project horizontal and vertical control points, establish easement and right-of-way lines, stakeout construction points for work and pipeline alignments, establish limits of disturbance.
- C. Determine exact location and size of water mains, valves, hydrants, and appurtenances from Drawings
- D. Verify location and elevation of existing facilities prior to excavation and installation of proposed interconnecting force mains and valves.

3.2 PREPARATION

- A. Section 01 35 00 – Special Procedures
 - 1. Pre-construction Site Audio/Video Inspections and Photography:
 - 2. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.
- B. Section 01 70 00 – Execution and Closeout Requirements.
- C. All materials, unless otherwise directed, shall be unloaded as nearby as possible to the location of installation by the Contractor. Materials shall be handled with care to avoid damage.
- D. All materials found during the progress of work to have flaws, cracks, or other defects will be rejected by the Engineer regardless of whether or not it has been installed and shall be replaced by and at the expense of the Contractor.
- E. All PVC pressure pipe, upon delivery to the site and until such time as it is placed in the trench, shall be shielded from the weather and direct sunlight to prevent pipe deterioration.
- F. Slings, hooks, or tongs used for lifting shall be padded in such a manner as to prevent damage to exterior surfaces, interior linings, and components. If any part of the coating, lining or components is damaged, the repairs or replacement shall be made by the Contractor at his expense and in a manner satisfactory to the Engineer prior to attempting installation.

- G. Pipe Cutting:
 - 1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
 - 2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
 - 3. Grind edges smooth with beveled end for push-on connections.
- H. Remove scale and dirt on inside and outside before assembly.
- I. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Placement: As specified in Section 31 23 34.01 – Trenching, Excavation, Dewatering and Backfilling.
 - 1. All mains shall be laid and maintained at the required lines and grades with fittings, valves, and appurtenances at the described locations. All pipe shall be laid to the depth as shown on the drawings, or when a depth is not indicated, with a minimum cover of thirty-six (36) inches and a maximum of sixty (60) inches below finished grade. Grade lines shall be set by the Contractor. Realignment must be approved by the Engineer. The Contractor shall have suitable survey equipment on the site at all times.
 - 2. After placement in the trench the spigot end of the pipe shall be centered in the bell and the pipe shall be driven home and then brought to the proper line and grade by tamping approved backfill material under it, except for the bell. Joint deflection shall not exceed manufacturer's limit.
 - 3. The Work shall at all times progress with caution so as to prevent damage to underground obstructions both known and unknown. Should an obstruction not shown on the drawings be encountered, the Engineer shall be immediately notified, and he shall be responsible for alteration to the design should realignment be necessary. Notify the Engineer far enough in advance to allow the realignment to be accomplished by deflection in the pipe joints.
- B. Pipe and Fittings:
 - 1. Handle and assemble pipe according to manufacturer instructions.
 - 2. Install pipe and fittings in strict conformance with AWWA C600 and C605.
 - 3. Install plastic pipe in conformance with ASTM D2774 and recommended practices of the UNI-BELL Plastic Pipe Association.
 - 4. Joint Deflection: Maximum joint deflection shall meet requirements of AWWA C600 or AWWA Manual of Practice M23.
 - 5. Prevent foreign material from entering pipe during placement and Work stoppages using plugs designed for that purpose. If trench contains standing water in joining zone, plug shall remain in place until the trench has been pumped dry before proceeding pipe laying.
 - 6. Allow for expansion and contraction without stressing pipe or joints.
 - 7. Install access fittings to permit work performed under Section 33 05 05.31 – Hydrostatic Testing.
 - a. Blowoffs shall be installed for pipe flushing and pressure testing as follows:
 - 1) Dead ends
 - 2) Valves closed against flushing or pressure testing.

- b. Blowoff should be installed as follows:
 - 1) Opening pointing downward.
 - 2) Minimum 24-inches clearance between opening and ground for proper sampling.
- 8. Cover: Measure depth of cover from final surface grade to top of pipe barrel and record.
- 9. Jointing:
 - a. Fused HDPE
 - 1) HDPE Pipe shall be joined by the butt-fusion process in accordance with pipe manufacturer's directions.
 - 2) Contractor shall provide butt-fusion technicians who are trained and certified by the HDPE pipe manufacturer to complete the project. The date of technician certification shall not exceed 12 months before commencing construction.
 - 3) Butt-fusion means the butt-joining of the pipe by softening the aligned faces of the pipe ends in a suitable apparatus and pressing them together under controlled pressure.
 - 4) The internal and external beads resulting from the butt-fusion process shall be visible and examined for penetration 360 degrees around the pipe diameter.
 - 5) DI/HDPE Mechanical Joint Adaptors shall be ductile iron mechanical joint fittings per CFPUA Material Specification Manual and shall be joined to the HDPE pipe by a heat-fused joint on one end, and connected to a ductile iron pipe valve, or fitting with a mechanical joint on the other end.
 - 6) Solvent epoxy cementing, electro-fusion couplings, and mechanical joining with bolt on wrap around clamps or mechanical joints without an adapter shall not be used for connections.
 - b. Push-On Joints
 - 1) The inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove dirt, grit, oil or excess coatings and other foreign matter. For ductile iron pipe, the gasket shall be flexed inward and inserted in the gasket recess of the bell socket.
 - 2) A thin film of gasket lubricant shall be applied to either the inside surface of the gasket or the spigot ends, care will be taken to avoid contact with the ground.
 - 3) The joint shall be completed by forcing the plain end to the bottom of the socket with a forked tool or jacking device or other approved method. All pipe shall have depth mark prior to insertion. Pipe cut in the field shall be filed to resemble the spigot end of manufactured pipe.
 - 4) When deflection is required, the joint shall be completed prior to setting the deflection. The deflection shall conform to applicable AWWA Standards or manufacturer's recommendation.
 - c. Mechanical Joints
 - 1) The inside of the socket, the outside of the spigot end and the gland shall be thoroughly cleaned and or washed with an approved solution to remove dirt, grit, oil or excess coatings and foreign matter to improve gasket seating.

- 2) The gland shall then be placed on the plain end of the pipe with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end of the pipe.
- 3) The pipe shall be inserted into the socket and the gasket pressed firmly and evenly into the gasket recess. The joint shall be kept straight during the assembly and any deflection required shall be done after the joint has been assembled but prior to tightening the bolts.

C. Valves:

1. Valves shall be set and joined to the pipe and each type of joint as specified for pipe.
2. Cast iron valve boxes shall be firmly supported, maintained centered and plumb over the operating nut of the valve. Outside of paved areas, valve boxes shall be set in a 2' diameter x 6" thick concrete collar. The box cover shall be flush with the surface of the finished pavement. All force main valve box lids shall have the word "SEWER" cast in the lid.
3. All reasonable effort must be made to locate valves/valve boxes, back of curb, in grass areas and at street corners, whenever possible.
4. Valve boxes in areas that will require sod at a later date must be left one to two inches above existing grade (to allow for sod thickness).
5. All valves must be centered over the operating nut/wheel and all valves, after being fully opened, will be backed off one-quarter turn to prevent them from being jammed open. This procedure should take place only after the main has passed pressure testing and has been certified by the Engineer.
6. Should the operating nut be more than three feet below the final grade, an extension shall be supplied and installed by the Contractor. The extension shall bring the nut to within twelve (12) inches of final grade.

D. Insertion Valves or Line Stops on Existing Mains

1. When installing valves in existing mains (cutting-in), the Contractor shall insure that the pipe integrity is maintained and there is no sewage release.
2. A contingency bypass plan must be in place before beginning work.

E. Installation of Tapping Sleeves and Valves

1. Install the tapping sleeve and valve and pressure test prior to making the tap.
2. If leaks are present, the Contractor shall repair them to the satisfaction of the Engineer or Resident Project Representative.
3. Complete the tapping operation and close tapping valve.
4. Tapping valve shall not be opened until new main has been tested and certified for operation.

F. Thrust Restraints: As specified in Section 33 05 09.33 – Thrust Restraint for Utility Piping.

1. New main construction shall be restrained by means of field or factory applied systems as shown on the Engineer drawings.
2. Thrust blocks in new mains are prohibited except when directed by the Engineer.
3. Where a fitting or device is to be inserted into an existing main, thrust blocking shall be installed as directed by the Engineer or CFPUA.

G. Polyethylene (PE) encasement when indicated for ductile iron pipe and fittings:

1. Encase piping in PE as indicated on Drawings to prevent contact with surrounding soil material or insulation from adjacent cathodic protection system.
2. Comply with AWWA C105.
3. Where pipe exits ground, terminate encasement 3 to 6 inches above surface.

H. Pipe Locator Wire: Install per Section 33 01 12 – Identification for Utilities Piping.

I. Pipe Markers: According to CFPUA Details and Material Specification Manual.

3.4 FIELD QUALITY CONTROL

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Section 33 05 05.31 – Hydrostatic Testing.

1. Pressure test piping system according to AWWA C600.

END OF SECTION