

SECTION 33 05 31.13 (15068)
PVC C900 SEWER FORCE MAINS

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes materials, installation and testing requirements of the Department for PVC C900 sewer force mains installed in its service area. Size range is 4 through 48 inches.
- B. PVC C900 force mains are acceptable for use in areas with limited heavy vehicle traffic only. Not for use near gas stations or other sites which may have hydrocarbon contamination.
- C. All PVC pipe used shall be of new or recent manufacturer. Pipe with surface discoloration will not be allowed.
- D. Pipe Fittings shall be ductile iron.
- E. Force mains 16 inch or larger shall be fully restrained the entire run of the pipe.
- F. This Section does not purport to cover all material or installation procedures which may be required, whether by the nature of the proposed work, by the Department or by other regulatory agencies.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. The work shall proceed in accordance with the following specifications sections, bound herein:
 - 1. Section 01 33 00 (UC-005) – “Project Approval”
 - 2. Section 01 33 23 (01340) – “Shop Drawings”
 - 3. Section 01 35 13 (01100) – “Special Project Procedures”
 - 4. Section 01 35 26 (01016) – “Safety Requirements and Protection of Property”
 - 5. Section 01 42 16 (01005) – “Defined Terms”
 - 6. Section 01 55 26 (01750) – “Maintenance of Traffic and Use of Public Streets”
 - 7. Section 01 71 23 (01031) – “Grades, Lines and Levels”
 - 8. Section 02 00 00 (01011) – “Site Conditions”
 - 9. Section 31 23 33 (02315) – “Trenching and Backfilling for Piping Systems”
 - 10. Section 33 01 10.54 (02505) (UC-170) – "Cleaning and Testing of Mains"
 - 11. Section 33 14 00 (15060) – “Piping and Fittings”
 - 12. Section 33 31 23 (UC-750) – “Sewer Force Mains”

1.03 QUALITY ASSURANCE

- A. All material and installation shall be in accordance with the Department's Design and Construction Standard Specifications and Details and in shall be in full compliance with all applicable standards listed in Section 01 42 19 (01090) "Reference Standards" and this Section.
- B. No deflection of joints is allowed for PVC pressure mains.
- C. PVC pipe shall not be over-homed. Pipe installed below the water table where the homing mark is not visible shall utilize an over-insertion prevention device; EBAA Iron Mega-Stop Series 500; S&B Technical Product, RIG, Resistance Insertion Grip; or approved equal.
- D. Pipe Embedment Material shall be class 1 backfill material with a maximum rock size of 3/4-inches.

1.04 SUBMITTALS

- A. See Sections 33 31 23 (UC-750) "Sewer Force Mains", 33 14 00 (15060) "Piping and Fittings.", 01 33 23 (01340) "Shop Drawings."
- B. Submit shop drawings in accordance with the Departments specifications or submit the Pre-Approved Product List Manufacturer.
- C. PVC Pipe not on the Pre-Approved Products list shall supply the following:
 - 1. Provide affidavit of compliance with AWWA C900.
 - 2. Submit fully dimensioned cross-section of the bell and barrel of the pipe. Show the bell maximum outside diameter in the pressurized area and its minimum wall thickness at the same location.
 - 3. Submit copies of the following manufacturer-required tests conducted on project pipe:
 - a. Quick-burst strength of pipe and couplings.
 - b. Flattening resistance of pipe.
 - c. Record of additional tests after test sample failure.
 - 4. Submit manufacturer's literature of gray iron and ductile-iron fittings including dimensions, thickness, weight, coating, lining, and a statement of inspection and compliance with the acceptance tests of AWWA C110 or C153. 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 is met.
 - 5. Submit outline drawings and materials description of service connection saddles, corporation stops, and pipe plugs.
 - 6. Submit test results for the restrained joint system to be used certified by an independent test laboratory demonstrating compliance with these

specifications for each size and pressure rating.

7. Submit restrained joint system installation instructions. Include bolt torque limitations and assembly tolerances.

1.05 MANUFACTURER'S SERVICE

- A. Provide pipe manufacturer's services at the jobsite for the following minimum labor days, travel time excluded: One labor-day to instruct the Contractor's personnel in the preparation and execution of rubber-gasket and solvent-welded joints for the sizes of pipes to be installed in the project.

1.06 SAFETY REQUIREMENTS

- A. See Section 01 35 26 (01016) "Safety Requirements and Protection of Property."

1.07 DESIGN REQUIREMENTS

- A. See Section 33 31 23 (UC-750) "Sewer Force Mains." and Section 01 33 00 (UC-005) "Project Approval"

PART 2 PRODUCTS

2.01 GENERAL

- A. See Section 33 14 00 (15060) "Piping and Fittings."

2.02 CASTINGS

- A. Castings shall be in accordance with Section 33 05 81 (05550) "Castings."

2.03 EMBEDMENT MATERIAL

- A. Embedment material, for bedding, haunching and initial backfill, shall conform with the requirements of Section 31 23 33 (02315) "Trenching and Backfilling for Piping Systems."

2.04 PIPE

- A. See Section 33 14 00 (15060) "Piping and Fittings."
- B. Pipe shall conform to AWWA C900, rubber-ring gasket bell end or plain end with elastomeric gasket coupling, cast iron equivalent outside diameter, material cell classification 12454 per ASTM D1784.
 1. Pipe 4-inches through 30 inches DR 18
 2. Pipe 36-inches through 42-inches DR 21
 3. Pipe 48-inches DR 25

2.05 FITTINGS

- A. See Section 33 14 00 (15060) "Piping and Fittings."
- B. Fittings shall be Zinc coated Ductile Iron and shall conform to AWWA C153 or AWWA C110.
- C. Fittings shall be Lined and coated with fusion-bonded epoxy.

2.06 FLANGES

- A. See Section 33 14 00 (15060) "Piping and Fittings."
- B. Flanges on outlets of fittings shall be Class 250 per ASME B16.1.
- C. PVC flanges shall be of the one-piece solid socket design and shall be made of the same material as the pipe. Manufacturer's pressure rating shall be at least 250 psi at a temperature of 73°F. Minimum burst pressure shall be 500 psi. Flanges shall match the dimensions of ASME B16.5, Class 250, steel flanges for outside diameter, bolt circle, and bolt holes. Do not use Van Stone flanges.

2.07 FLANGED COUPLING ADAPTERS

- A. See Section 33 05 98 (15065) "Miscellaneous Materials."

2.08 OUTLETS AND NOZZLES

- A. See Section 33 14 00 (15060) "Piping and Fittings."
- B. All connections to PVC require a saddle.
- C. For outlets larger than 2 inches, use a Ductile Iron tee with a flanged or MJ outlet.

2.09 RESTRAINED JOINTS

- A. See Section 33 14 00 (15060) "Piping and Fittings."
- B. PVC Pipe 16 inch or larger shall be restrained at all joints for the entire run of the pipe.
- C. Provide restrained joints where indicated in the drawings. Restrained joints shall be provided by restraining systems that incorporate a wedge restraint on the restraint ring to provide positive restraint.
- D. Restraint devices for bell-and-spigot joints shall consist of a split restraint ring installed on the spigot, connected to a solid backup ring seated behind the bell.
- E. Restraining Glands shall be EBAA Iron Series 2000 and 1600 or approved equal.
- F. The ASTM A536 ductile iron casting of the restrained gland shall be bonded powder coated. The wedge and wedge assembly shall have a bonded liquid polymer coating

applied for corrosion protection. The gland shall utilize torque limiting twist off wedge actuation screws.

- G. T-bolts, studs, and connecting hardware shall be high-strength, low alloy material in accordance with AWWA C111.
- H. Design restraining devices to have a 2:1 safety factor based on the design strength of the pipe.

2.10 WYE STRAINERS

- A. PVC wye strainers shall be manufactured of the same material as the pipe, with 30-mesh screens and Viton seals. Connecting ends shall be the socket type, solvent welded. Provide one spare screen for each strainer.

2.11 DETECTABLE TAPE/TRACER

- A. Detectable tape/tracer approved for use by the Department are shown on Sheet number 10.2 of the Pre-Approved Product List.

2.12 MISCELLANEOUS MATERIALS

- A. The Contractor shall furnish and install all miscellaneous material and appurtenances required for a complete installation. Section 33 05 98 (15065) "Miscellaneous Materials" specifies material necessary for a complete installation, not specified herein. These materials, including but not limited to the following, shall be installed when required, whether shown on the Plans or not.
 1. Anchor Bolts, Bolts, Nuts and Washers
 2. Blind Flanges
 3. Corporation Stops
 4. Gasket Lubricant
 5. Joint Material for Flanged Pipe, Valves and Fittings
 6. Stainless steel repair clamps, with stainless steel bolts
 7. 90° Street Elbows
 8. Tie-Rods

2.13 SADDLES FOR CONNECTIONS TO SEWER FORCE MAINS

- A. See Section 33 31 23 (UC-750) "Sewer Force Main."

PART 3 EXECUTION

3.01 GENERAL

- A. See Section 33 14 00 (15060) "Piping and Fittings."

3.02 PRODUCT MARKING AND UNDERGROUND LOCATION

- A. Legibly mark pipe at 5-foot intervals and each coupling to identify the nominal diameter, the outside diameter base, that is, cast-iron or steel pipe (IPS), the material code for pipe and couplings, the dimension ratio number, AWWA C900, and the seal of the testing agency that verified the suitability of the material for potable water service (NSF/ANSI 61).
- B. Install 10 gauge tracer wire taped every four feet to the buried PVC pipe, a magnetic detection tape one foot above the buried PVC pipe and 3M compatible magnetic location ball markers two feet below grade every 100 feet or at any vertical and horizontal deflection point. See Pre-Approved product list Sheet 10.2.

3.03 DELIVERY AND TEMPORARY STORAGE OF PIPE

- A. PVC shall be protected from UV degradation caused by extended exposure to direct sun. Pipe with surface discoloration shall not be installed and immediately removed from the project site. Tarps used to protect the pipe from sunlight shall be placed to allow for adequate ventilation to prevent heat build-up.
- B. Ship, store, and place pipe at the installation site, supporting the pipe uniformly. Avoid scratching the pipe surface. Do not stack higher than 4 feet or with weight on bells. Cover to protect from sunlight.
- C. Do not drag PVC pipe over the ground, drop it onto the ground, or drop objects on it.
- D. Store loose pipes on racks with a maximum support spacing of 3 feet. Provide shades for pipe stored outdoors or installed outdoors until the pipe is filled with water. Store fittings indoors in their original cartons.
- E. Store solvent cement indoors or, if outdoors, shade from direct sunlight exposure. Do not use solvent cements that have exceeded the shelf life marked on the storage container.

3.04 HANDLING PIPE

- A. Hoist pipe with mechanical equipment using a cloth belt sling or a continuous fiber rope that avoids scratching the pipe. Do not use a chain. Pipes up to 16 inches in diameter may be lowered by rolling on two ropes controlled by snubbing. Pipes up to 6 inches in diameter may be lifted by hand.

3.05 INSTALLING BURIED PIPING

- A. See Sections 31 23 33 (02315) "Trenching and Backfilling for Piping Systems" and Section 33 14 00 (15060) "Piping and Fittings."
- B. Bedding material and backfill to 1 foot above the pipe for PVC shall be well graded Class 1 backfill with a max rock size of ¾-inch compacted in 6-inch lifts. The minimum trench width shall be the pipe width plus 24-inches (12-inches on each side).

- C. Before installation, check pipe and fittings for cuts, scratches, gouges, buckling, kinking, or splitting on pipe ends. Remove any pipe section containing defects by cutting out the damaged section of pipe.
- D. Do not install PVC pipe when the temperature is below 40°F or above 90°F.
- E. Do not install pipe that is gouged or scratched forming a clear depression.
- F. Pipe shall be installed utilizing an over-insertion prevention device.
- G. Install in accordance with AWWA C605, and as follows.
 1. When installing pipe in trenches, do not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.
 2. Backfill materials in the pipe zone shall be imported sand per Section 31 23 33 (02315) "Trenching and Backfilling of Piping Systems". Do not add successive layers unless the previous layer is compacted to 90% relative compaction per ASTM D1557.
 3. Compact material placed within 12 inches of the outer surface of the pipe by hand tamping only.
 4. Compact trench backfill to the specified relative compaction. Do not float pipe. Do not use high-impact hammer-type equipment except where the pipe manufacturer warrants in writing that such use will not damage the pipe.
 5. Install detector balls 2 feet below grade every 100 feet on straight lines, at any point changing direction, vertical or horizontal; in addition, install 10 gauge tracer wire taped every 4 feet to the buried PVC C900 pipe and a magnetic detection tape 1 foot above the PVC C900 pipe.

3.06 PIPE LAYOUT FOR CURVED ALIGNMENT

- A. Pipe lengths shall not be bent for curved alignment.

3.07 ASSEMBLY OF RUBBER-GASKET PIPE JOINT

- A. See Section 33 14 00 (15060) "Piping and Fittings."
- B. The spigot and bell or bell coupling shall be dirt free and slide together without displacing the rubber ring. Lay the pipe section with the bell coupling facing the direction of laying.
- C. Insert the rubber ring into the groove in the bell in the trench just before joining the pipes. First clean the groove. Observe the correct direction of the shaped ring. Feel that the ring is completely seated.
- D. Lubricate the spigot over the taper and up to the full insertion mark with the lubricant supplied by the pipe manufacturer. If the lubricated pipe end touches dirt, clean the pipe end and reapply lubricant.
- E. Insert the spigot into the bell and force it slowly into position.

- F. Check that the rubber ring has not left the groove during assembly by passing a feeler gauge around the completed joint.

3.08 CLEANING AND TESTING OF SEWER FORCE MAINS

- A. See Section 33 01 10.54 (02505) (UC-170) "Cleaning and Testing of Mains."

END OF SECTION