

SECTION 333400 – SANITARY UTILITY SEWERAGE FORCE MAINS

Scope:

The Contractor shall provide all labor, equipment and materials to install force mains using high density polyethylene (HDPE) or ductile iron pipe for the collection of sanitary sewage from lift stations in accordance with these specifications.

Submittals:

- A. The Contractor will submit complete product data from named vendor on all products proposed for use in the project.
- B. Results from recording of each fuse on HDPE pipe will be submitted to the Owner as part of the installation record.
- C. Contractor will submit a proposed method for pigging or cleaning lines for approval by the Owner after installation.
- D. Contractor shall provide proof of qualification for all labor involved in fusing of HDPE pipe. Proof of qualification shall be written confirmation of training by a manufacturer involved in the manufacture of HDPE pipe for more than two years. Only individuals with such qualifications will be allowed to perform fusing operations.
- E. Contractor shall submit proposed pressure testing methodology for review by the Owner prior to initiating any final pressure testing of pipe.

Products:

This section of the specification details the requirements for pressurized sanitary sewer force mains and related accessories. Unless noted otherwise, force mains will be constructed of high density polyethylene pipe (HDPE) meeting the requirements in this section.

- A. **High Density Polyethylene Pipe** : The Contractor shall furnish High Density Polyethylene Pipe and Fittings conforming to ANSI/AWWA Standard C 906-90 and ASTM D3350-02. The pipe shall be PE 3408 with an SDR of 17 or less as directed by the owner and be rated for a pressure of 100 psi or more. The carbon black content shall measure 2% to 3% by weight when tested according to ANSI/ASTM D 1603 or ASTM D4211. The pipe shall be provided in ductile iron pipe sizes. The pipe shall be produced by Rinker, J-M PE Corporation, or equal. Pipe shall be “prisma” coated with a green exterior color or the pipe shall have a green stripe impregnated into the wall of the pipe to make it easily identifiable when excavated. The manufacturer shall have an ISO 9001 listing covering the HDPE manufacturing facility as well as the corporate office. The Owner at no additional cost may require quality audits. All pipe will be provided in standard straight lengths. No coiled pipe will be accepted for installation on the project.
 - (1) **Quality and Inspection:** All pipe shall be smooth on both the interior and exterior surfaces; be free of noticeable imperfections such as cracks, blisters, or kinks in the pipe. The Owner, if Owner so chooses, shall be able to inspect the pipe at the pipe plant, trench, and other various storage sites. Based on these observations the Owner will have the right to reject any and all piping not conforming to these stated requirements, independent of laboratory tests. Field repair of any damaged piping shall not be permitted. The Owner reserves the right to require the removal of fused connections for destructive testing to verify the integrity of fused joints, etc.

- (2) **Experience of Manufacturer:** The pipe manufacturer shall provide evidence, if requested by the Owner, of having provided quality pipe and joints that have shown satisfactory results in service for a period of no less than two years. Evidence of completion of projects of similar size and timing for HDPE pipe will also be provided upon Owner request. All pipe within any given phase shall be from the same manufacturer.
- (3) **Fittings:** The fittings shall meet all of the requirements of the pipe to which they are to be fused. They shall be homogeneous throughout and essentially uniform in color, opacity, density and other properties. Fittings should also be free of such defects as cuts, cracks, or holes. Fabricated fittings will not be allowed where molded or machined fittings are available. All fittings will be manufactured in accordance with AWWA C906 with a minimum pressure class equal to that of the pipe.
- (4) **Markings:** Markings shall be legible during usual handling of the pipe and be applied in a manner that will not damage the pipe. The following markings shall be provided as shown below:
- a. Nominal size and OD base
 - b. Standard material code designation
 - c. Dimension ratio
 - d. Pressure class
 - e. AWWA designation for this standard (AWWA C 906-90)
 - f. Manufacturers production code
 - g. Material test category of pipe
 - h. NSF 61 approved
- B. **Locating Wire & Detector Tape:** The Contractor will supply all locating wire and detector tape. Locating wire shall be 8 gage, coated wire. Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with AWWA color codes with the following legends: Sewer Systems, Safety Precaution Green, "Caution Sewer Line Buried Below". Tape shall be permanently printed with no surface printing allowed. Tape width shall be a minimum of 2-inches when buried less than 10-inches below surface and 3-inches when buried greater than 10-inches. Tape shall be Lineguard Type II Detectable, Allen Systems Detectatape, or equal.
- C. **Electrofusion Couplings:** Electrofusion couplings and saddles will not be used on this Project without written approval of Owner.
- D. **Flange Assemblies:** Flange assemblies shall consist of a metal back-up flange or ring and a polyethylene flange adapter. The back-up flange shall be slipped over the pipe profile flange adapter and then be fused into the plain end pipe.
- E. **Mechanical Joint:** Mechanical joints are to be made with stiffeners which are inserted into the HDPE pipe. Stiffener manufacturer's directions shall be followed when installing stiffeners and mechanical joints. Stiffeners shall be Romac Industries 501-H & RC501-H or equal.
- F. **Restrained Mechanical Joints:** Restrained mechanical joints shall be made using mechanical joint adapters manufactured by Performance Pipe, or equal.
- G. **Vacuum Breaker / Air Relief Valve :** A combination air relief and vacuum breaker valve shall be installed at high points and grade changes within the force main piping as specified on the plans. The valve shall be as manufactured by Cla-Val, Model Number 36WW, or approved equal. The valve shall be mounted in the vertical position on the top of the pipeline

with an isolation valve installed below each valve to allow for maintenance of the valve. The valve shall be installed in a vault or manhole which has adequate drainage and venting.

- H. **Plug Valves:** Plug valves shall be used on sewage, and shall be furnished complete with operators and accessories shown on the Drawings or specified or both. Valves shall be of the eccentric, non-lubricated resilient seat type, designed for sewage at 125 psi working pressure and shall have mechanical joint ends. The valve body shall be semi-steel conforming to ASTM A 126, Class B. Seats shall have a welded-in or cast overlay of not less than 90% pure nickel on all surfaces which will contact the rubber seating area. Upper and lower plug stem bushings shall be of stainless steel and permanently lubricated. Valves shall be manufactured by DeZurik, Clow or equal. Extension stems shall extend from the valves to the connections with the operators. Operators for buried valves shall have extension stems, 2-inch square operating nuts and valve boxes. Extension stems shall be furnished for all buried valves to bring the 2-inch square AWWA operating nut within six inches of the top of the valve box. Operating nuts shall have an arrow cast on the top indicating the direction for opening the valve. Valve boxes shall be two piece, with covers. The bottom part of the valve box may be 6-inch cast iron pipe. The top part shall be of the sliding type sized to fit over the 6-inch pipe and be 36-inches in length. Valve boxes and covers shall be constructed of cast iron. The 6-inch pipe shall extend not less than 18-inches into the sliding top. All valve boxes shall be bushed and furnished with extension stem.
- I. **Manhole Protection:** Manholes where force mains are connected must be protected using a manhole liner equal to Spectrashield Liner Systems.

Implementation:

- A. **Unloading:** Equipment and facilities for unloading, hauling, distributing and storing materials shall be furnished by the Contractor and shall at all times be available for use in unloading materials. Delays in unloading railroad cars, unloading trucks, or hauling from freight terminal that incur demurrage, truck waiting charges or terminal charges shall be at the expense of the Contractor.
- B. **Handling:** Pipe, fittings and other material shall be carefully handled so as to prevent breaking and/or damage. Pipe may be unloaded individually by hand but shall not be unloaded by rolling or dropping off of trucks or cars. Preferred unloading is in units using mechanical equipment, such as forklifts, cherry pickers or front end loaders with forks. If forklift equipment is not available units may be unloaded with use of spreader bar on top and nylon straps looped under the unit.
- C. **Distributing:** Materials shall be distributed and placed so as to least interfere with traffic. No street or roadway may be closed without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for protection of traffic along highways, streets, and roadways upon which material is disturbed. No distributed material shall be placed in drainage ditches.
- D. **Storage:** All pipe, fittings and other materials which cannot be distributed along the route of the work shall be stored for subsequent use when needed. The Contractor shall make his own arrangements for the use of storage areas; except that, with permission, he may make reasonable use of the Owner's storage yards.
- E. **Joining Methods for HDPE Pipe:** The pipe and fittings shall be joined by butt or saddle fusion, mechanical joint adapters, or by flange connections in accordance with manufacturer's recommendations. All joints shall be fused, not including connections to existing utilities, unless otherwise shown on Drawings or requested by the Owner.

- (1). Fusion: The pipe shall be joined by heat fusion of the ends. Prior to fusion the pipe shall be clean and the ends shall be cut square. Fusion system operators shall be trained in the use of the equipment by the pipe supplier or manufacturer of the fusing machine and be experienced in the operation of the equipment. All fuses shall be recorded, the recording of the information must be provided to the Owner, and the recorded information must meet the standard requirements of the pipe manufacturer. All fusions failing to meet these requirements shall be removed and refused.
- (2). Flange: A flange assembly consists of a metal back-up flange or ring and a polyethylene flange adapter. The back-up flange is slipped over the pipe profile and the stub-end, or flange adapter, is then fused into the plain end pipe.
- (3). Payment for HDPE pipe shall be made from the start of the pipeline to the termination point along the top of the pipe.
- (4). Connection to Ductile Iron Pipe or Valves: Connections to ductile iron pipe and valves shall be by mechanical joints or flanges. All connections to ductile iron pipe, valves or fire hydrants must be restrained.
 - a. Restrained Mechanical Joints: Restrained mechanical joints shall be made using mechanical joint adapters and shall incorporate a factory installed stiffener manufactured by Performance Pipe, or equal.
 - b. Flange: Flange connections shall be as described above in E (2).

- F. **Installation of Locating Wire and Detector Tape:** The Contractor shall be required to install locator wire along the entire section of pipeline and along all service connections. The locator wire shall be installed simultaneously with the polyethylene piping. Detector tape shall be installed by the Contractor once backfill has been placed and compacted to at least 12 inches above the top of the pipe and not more than 18 inches above the top of the pipe. Wire shall be properly spliced at each end connection and each service connection. Care should be taken to adequately wrap and protect wire at all splice locations. No bare wire shall be accepted. There will be no additional pay item for this work; it should be included in the Unit Price for installing polyethylene pipelines and services.
- G. **Backfill and Bedding:** Bedding for this material shall be as called for by ASTM D 2774 - 94. The trench width will vary depending on depth and the type of soil present. The bed width should allow for adequate compaction around the pipe. The excavated material, if it is free of rock and well broken up by the digging machine, may provide a suitable bedding material. Maximum particle size of Class I or Class II materials used for bedding, haunching, or initial backfill should be kept to ½" for smaller pipe (<8") and a maximum size of 1" aggregate for pipe diameters greater than 8". The trench bottom should be relatively smooth and free of rock. Objects that may cause point loading on the pipe should be removed and the trench bottom padded using 4-6 inches of tamped bedding. If an unstable soil condition exists, the trench bottom shall be undercut and filled to proper trench depth with a selected material. Contractor will install pipe in accordance with ASTM D 2774 Standard Practice for Underground Installation of Thermoplastic Pipe, AWWA C906-90 (as amended), and the manufacturer's recommendations. Pipe shall not be installed in water or wet mucky soils, on rock or stony soil. When these conditions exist, Contractor shall remove the objectionable material to a depth of 6" below the pipes final grade and install crushed stone or other approved bedding materials. No extra payment will be made for bedding, the cost therefore to be included in the prices bid for sewers.
- H. **Cold (Field) Bending:** Contractor shall not bend the pipe to fit a trench more than that allowed by the pipe manufacturer.

- I. **Installation by Pulling In:** Contractor will submit to Owner maximum proposed pull in length for the pressure class and diameter pipe proposed to be pulled into an open trench. Pull in lengths will not exceed the maximum lengths recommended by the manufacturer for the class and diameter pipe. Final tie-ins should be made one day after pulling in to allow the pipe to recover from the stress of the pulling.
- J. **Installation by Horizontal Boring or Directional Drilling:** This work shall be done in accordance with Section 330523.16. Contractor shall install pipe under creeks and County Roads using horizontal boring or directional drilling when directed by Owner. Casing pipe will be installed for all creek and road crossings. The pipeline shall then be installed directly into the casing without centering spacers. At casing exit or entry points, pipe should be wrapped with an elastomeric sheet material.
- K. **Protection of Pipe Openings:** During installation, the Contractor will ensure that pipe ends that have not been fused will be protected against dirt, debris, animals, and other foreign materials. Plastic caps held in place with duct tape or other methods as approved by the Owner may be used.
- L. **Blocking and Restraining:** Contractor shall fully restrain the pipe through the use of fully restrained joints by means of butt fusion, M-J adapters, or flange adapters. Do not use thrust blocks with HDPE pipe installations.
- M. **Cleaning:** Before acceptance of any line, the line must be clean. If the Contractor fails to close the pipe or debris is found to be in the line, the Contractor shall clean the line by pigging or other suitable means at the Contractor's expense. The Contractor shall be prepared to pig all lines installed within this project in order to remove the HDPE pipe shavings, etc. The successful bidder must propose a method of pigging the lines for approval by Dalton Utilities before proceeding with any pigging operations. This request must be submitted in writing and shall be approved in writing by the Owner prior to line purging.
- N. **Testing:** Testing of HDPE and ductile iron pipe installations will include destructive testing as well as final pressure testing to ensure no leaks are present in the line.
- (1) At the direction of the Owner, Contractor will perform destructive strap testing on selected fuses to determine if the fuses meet with manufacturer's requirements. Pipe used in this testing will not be installed in the Project.
 - (2) The testing of the HDPE pipe will be performed in accordance with AWWA C906-90 (as amended) and the manufacturer's recommendations. Contractor will submit a test protocol to the Owner for approval prior to implementing any testing.

END OF SECTION