

SECTION 331113.23 – PLASTIC PUBLIC WATER UTILITY DISTRIBUTION PIPING

Scope:

This specification covers all aspects of requirements for new water mains, taps, and related accessories including submittals, products, and implementation. All new water infrastructure will be designed to meet required flows of the customer, the fire department responsible for the particular jurisdiction, and the Minimum Standards for Public Water Systems (May 2000 or as amended to date) published by the Drinking Water Permitting and Engineering Program of the Georgia Environmental Protection Division. Design flows for new systems and taps will be determined by evaluating similar types of customers using actual metered data and contacting the appropriate fire department. Where data is not available, the Minimum Standards for Public Water Systems will be used.

The Contractor will install water mains less than 8-inch in size using standard dimension ratio (SDR) 9 high density polyethylene (HDPE) or C900 Polyvinyl Chloride (PVC) pipe for the transmission of potable water as shown on the Drawings and in accordance with these Specifications. HDPE or PVC pipe shall be installed in road right-of-ways or easements obtained by the Owner using trenching or horizontal directional boring 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. Fuses must be submitted electronically. No paper reports will be accepted.
- 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 (test method must have been approved by the pipe manufacturer in writing as part of submittal).

Products:

This section of the specifications covers the requirements for HDPE and PVC pipe for transmission of potable water, fittings, accessories, and service lines. The minimum pipe size allowed is 2-inch for dead ends. The minimum pipe size for all other water mains is 6-inch.

- A. **HDPE Pipe:** Polyethylene pipe shall conform to ANSI/AWWA Standard C 906-90 (or most recent edition) and NSF 61. The pipe shall be PE 3408 with an SDR of 9 as directed by the owner and be rated for a pressure of 200 psi, respectively. The carbon black content shall measure 2% to 3% by weight when tested according to ANSI/ASTM D 1603 or ASTM D 4211. The pipe shall be provided in ductile iron pipe sizes. The pipe shall be produced by Rinker, J-M PE Corporation Pipe, or equal. All polyethylene pipe shall be blue PRISMA coated or shall have co extruded blue striping for identification. 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

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standard straight lengths. No coiled pipe will be accepted for installation on the project. All pipe and fittings must be manufactured in the United States of America.

- (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 shall be able to inspect the pipe at the pipe plant, trench, or 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 project 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 of 200 psi.
 - (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. Polyvinyl Chloride Pipe (PVC):** Polyvinyl chloride pipe shall conform to requirements of AWWA C900 for pipelines 12 inch or less and AWWA C905 for pipelines 14-24 inches in diameter , as amended to date; with a standard dimension ration DR 14 or less as directed by the owner (and approved by the owner's engineer) and be rated for a pressure of 200 psi or less depending on the design of the specific application. All PVC water main piping shall be sized in cast iron equivalent outside diameter for each nominal pipe size unless approved and /or called out differently on the contract drawings. Integral wall-thickened and sleeve-reinforced bell-type pipe ends designed for joint assembly using elastomeric seals shall be measured in accordance to ASTM F 477 and ASTM D 3139 as amended to date. Pipe shall be furnished in standard 20 ft. laying lengths.
- (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

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requirements, independent of laboratory tests. Field repair of any damaged piping shall not be permitted.

- (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 five years. Evidence of completion of projects of similar size and timing for PVC pipe will also be provided upon Owner request. All pipe within any given phase shall be from the same manufacturer and factory.
- (3) **Fittings:** The fittings shall meet all of the requirements of the pipe to which they are to be connected. 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 C900 with a minimum pressure class equal to that of the pipe.
- (4) **Markings:** Pipe and couplings shall bear identification markings in accordance with AWWA C900, as amended to date, that will remain legible during normal handling, storage and installation and which have been applied in a manner that will not reduce the strength of the pipe or coupling or otherwise damage them.
- (5) **Certification:** The manufacturer shall furnish the Owner with certified reports stating that inspection and specified tests have been made and that the results thereof comply with the applicable AWWA and ANSI Specifications.

C. Locating Wire & Detector Tape: The Contractor will supply all locating wire and detector tape. Locating wire shall be 8 gage, coated wire for the HDPE and PVC mainlines and 12 gage, coated wire for the HDPE or PEX service lines. Where pipelines are to be installed using horizontal directional drilling, the Contractor shall supply steel core copper locating wire at no additional cost to the owner. 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: Water Systems, Safety Precaution Blue, and "Caution Water 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 equal to Lineguard Type II Detectable, Allen Systems Detectatape, or equal.

D. Electrofusion Couplings: Electrofusion couplings and saddles will not be used without written approval of Owner.

E. 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.

F. Services: The service lines shall be high density polyethylene (HDPE) tubing material with the standard PE code designation of PE 3408 or Cross-Linked Polyethylene (PEX). HDPE tubing and piping shall SDR 9 as directed by the owner and be rated for a pressure of 200 psi. PEX tubing shall be certified to AWWA C 904 and be rated for a pressure of 200 psi. Service tubing shall comply with all requirements of AWWA C901-02 for Polyethylene Pressure Pipe and Tubing, ½ inch through 2 inch for water services. HDPE and PEX Tubing dimensions shall be compatible with copper tubing outside dimensions. All tubing and pipe shall be smooth on both the interior and exterior surfaces and be free of noticeable imperfections such as cracks, blisters, or kinks in the pipe. The Owner shall be able to inspect the pipe at the pipe plant, trench, or other various storage sites. Based on these observations the Owner will have

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the right to reject any and all piping not conforming to these stated requirements, independent of laboratory tests. Field repair of any damaged tubing or piping shall not be permitted.

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 the manufacturers' 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) Connection to Ductile Iron Pipe or Valves and Fire Hydrants: Connections to ductile iron pipe, valves, and fire hydrants shall be by mechanical joints, flanges or Aquagrip couplings and connectors. 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 Rinker, J-M PE Corporation Pipe, or equal.

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- b. Flange: Flange connections shall be as described above in paragraph 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 of HDPE: 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 the water main.

- (1). Depth of Bedding: Trench shall be undercut to allow for a minimum of six inches (6") of bedding material. After joint assembly, Bedding material shall be placed under and up to the spring line of the pipe for the entire length of pipe and compacted. Compaction to the spring line of the pipe shall be of the same material used in the bedding. Selected backfill shall then be carried to a point twelve inches (12") above the top of pipe, using hand tools for tamping. The remaining backfill shall be as specified in "Selected Backfill" and "General Backfill" paragraphs of these specifications. Pipe shall have at least thirty-six inches (36") of cover before wheel loading and at least forty eight inches (48") of cover before using heavy duty tamping equipment such as a hydrohammer.
- (2). Trench Width: The maximum clear trench width at the top of the pipe shall not exceed a width equal to the nominal pipe diameter plus eighteen inches (18"). If this width is exceeded or the pipe is installed in a compacted embankment, pipe embedment shall be compacted to the trench walls.

H. Backfill and Bedding of PVC: 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

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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 C605-05 Underground Installation of PVC Pressure Pipe and Fittings (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 water main.

- (1). **Depth of Bedding:** Trench shall be undercut to allow for a minimum of six inches (6") of bedding material. After joint assembly, Bedding material shall be placed under and up to the spring line of the pipe for the entire length of pipe and compacted. Compaction to the spring line of the pipe shall be of the same material used in the bedding. Selected backfill shall then be carried to a point twelve inches (12") above the top of pipe, using hand tools for tamping. The remaining backfill shall be as specified in "Selected Backfill" and "General Backfill" paragraphs of these specifications. Pipe shall have at least thirty-six inches (36") of cover before wheel loading and at least forty eight inches (48") of cover before using heavy duty tamping equipment such as a hydrohammer.
- (2). **Trench Width:** The maximum clear trench width at the top of the pipe shall not exceed a width equal to the nominal pipe diameter plus eighteen inches (18"). If this width is exceeded or the pipe is installed in a compacted embankment, pipe embedment shall be compacted to the trench walls.

- I. Cold (Field) Bending of HDPE or PVC:** Contractor shall not bend the pipe to fit a trench more than that allowed by the pipe manufacturer.
- J. 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 and the temperature change.
- K. Installation by Horizontal Boring or Directional Drilling:** This work shall be done in accordance with Section 330523. 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 installed with end seals to protect casing.
- L. 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.
- M. Connecting Service Lines to HDPE Main Lines:** Connection to the main lines shall be made by using self-tapping saddles with integral cutters fused to the main line. Electro-fusion saddles are not allowed without prior approval of Owner. A curb cock shall be installed on the self-tapping saddle with a compression fitting. The meter connection shall be installed with a compression joint (Compression fittings shall have stiffener inserts listed with NSF for potable water service as made by Romac, Philmac or equal inserted in the tubing before making the connection). The joints must withstand 200 psi test pressure. The curb stop and meter fitting shall be Mueller 300 Ball Valve.

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- N. Connecting Services Lines to PVC Main Lines:** Connection to the main lines shall be made by tapping into the main through a tapping saddle and a corporation stop. All tapping saddles must be made of stainless steel and rated for the same pressure as the water main. A corporation stop must be provided in the water main for each new service line. The service lines must be connected in accordance with the manufacturers recommendations using inserts or stiffeners inside the tubing. The joints shall withstand 200 psi test pressure. Bedding of service lines shall be equal to that used for PVC pipe. The meter connection shall be installed with a compression joint (Compression fittings shall have stiffener inserts listed with NSF for potable water service as made by Romac, Philmac or equal inserted in the tubing before making the connection). The curb stop and meter fitting shall be Mueller 300 Ball Valve or approved equal.
- O. Installation of Fire Hydrants:** Fire hydrants, in general, shall be installed and jointed as specified above for pipe and fittings. The installation of hydrants shall include the installation of extension sections, if required, and shall include the installation of crushed stone drain as shown on the Drawing Details and/or as specified herein. Class 1 or 2 soil materials will be installed under all fire hydrants to a depth of at least 6 inches as shown in the plans.
- P. Blocking and Restraining:** Contractor shall fully restrain the pipe through the use of fully restrained joints by means of butt fusion, M-J adapters, flange adapters, or concrete blocking. Thrust blocks are not to be used with HDPE pipe installations.
- Q. 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 new lines in order to remove the HDPE pipe shavings, etc. The successful bidder must propose a method of pigging the lines for approval by the Owner 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.
- R. Testing:** Testing of HDPE 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 the 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. The testing of the PVC pipe will be in accordance with AWWA C900 (as amended) and the manufacturer's recommendations. Contractor will submit a test protocol to the Owner for approval prior to implementing any testing.
- Q. Sterilization of Pipe Lines:** The AWWA Standard for Disinfecting Water Mains ANSI/AWWA C 651-92 (as amended to date) and these Specifications shall be the standard used to disinfect all new water lines and any existing lines contaminated during construction. The Contractor shall furnish all equipment and labor of every nature to disinfect new lines and any line contaminated during construction.
- (1) Clean Lines: Care shall be taken during construction to keep line free from debris, ground water and dirt.
 - (2) Cross Connections: Cross connections shall not be allowed during testing, flushing, chlorinating, or dechlorinating of the new lines.

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- (3) Flushing: All new lines shall be flushed before disinfecting. The recommended velocity by ANSI/AWWA C 651-92 for flushing is 2 ½ feet per second.
- (4) Chlorination: All pipe and appurtenances, both existing and newly constructed which have been exposed to contamination by reason of the construction shall be sterilized after testing and flushing of the line has been completed. The line shall be filled, using the continuous feed method, with fresh water containing 50 parts per million of chlorine and allowed to stand for 24 hours. During the test, chlorine residuals shall be checked every 1,200 feet on new lines and at the end of each new line section.
- (5) Dechlorination: After the new lines have been chlorinated for 24 hours, the chlorinated water shall be flushed from the lines. The discharge of the chlorinated waste shall be chemically treated to remove the residual chlorine. (See appendix of ANSI/AWWA C 651-92 for chemicals and amounts to dissipate the chlorine.) The method for mixing and contact time shall be arranged by the Contractor.
- (6) Connections: After the pipe and appurtenances have been flushed, tested, chlorinated, and have passed the bacteriological test, they may be connected to the existing system.
- (7) Connections Equal to or Less than One Pipe Length (18 feet): The new pipe, fittings, and valves required for the connections shall be spray disinfected or swabbed with a minimum 1% solution of chlorine just prior to being installed, if the length of connection from the new main to the existing main is equal to or less than 18 feet.
- (8) Connections Greater Than One Pipe Length: The pipe required for the connection must be set up above ground, chlorinated and bacteriological samples taken as described above if the length of connection is greater than 18 feet. After the bacteriological tests have proven satisfactory, the new pipe can be used in connecting the new main to the existing system. After the samples have been taken, the ends of the new pipe must be closed with water-tight plugs or caps until the connections are made.

END OF SECTION