ITEM NO. 818

Water Pipe Installation PVC (C-900, and C-909) Pipe
4 inch to 24 inch pipe

818.1 DESCRIPTION: This item shall consist of PVC (C-900 and C-909) for 4 inch to 24 inch pipe installation in accordance with these specifications and as directed by the Engineer.

818.2 REFERENCED STANDARDS: Reference standards cited in this Specification Item No. 818 refer to the current reference standard published at the time of the latest revision.

1. San Antonio Water System (SAWS):
   a. Specifications for Water and Sanitary Sewer Construction
   b. SAWS Materials Specifications
2. City of San Antonio (COSA) Standard Specifications for Construction
3. Texas Commission of Environmental Quality (TCEQ) Chapter 290 Public Water Supply
4. American Society for Testing and Materials International
   a. ASTM D 1248 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.
   b. ASTM D 1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
   c. ASTM D 2122 – Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
   d. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
   e. ASTM 2412 – Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel Plate Loading
   f. ASTM D 2444 - Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight).
   g. ASTM D 3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
   h. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
5. American Water Works Association (AWWA)
   a. AWWA C 900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 4 In through 60 in (100 MM through 1,500 MM).
   b. AWWA C 909 - Standard for Molecularly-Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 Inches through 12 Inches (100mm through 300 mm), for Water Distribution.
   c. AWWA M23 – PVC Pipe – Design and Installation
6. Plastic Pipe Institute

a. PPI TR3 - Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials.

7. Uni-Bell PVC Pipe Association
   a. UNI-B-13 - Recommended Standard Performance Specification for Joint Restraint Devices for Use with Polyvinyl Chloride Pipe.
8. International Organization of Standardization (ISO)
   a. ISO9001

818.3 SUBMITTALS: All submittals shall be in accordance with most recent version of SAWS's General Conditions requirements. Submit the following prior to performing any work.

1. Certifications:
   a. Per General Conditions section 5.12.2 all Contractor submittals for all pipe and other products or materials furnished under this specification shall be marked as reviewed and approved by Contractor for compliance with Contract Documents and the referenced standards.
   b. The Manufacturer shall provide ISO 9001 Certificate by a third party.
   c. Submit written verification that the pipe Manufacturer has been manufacturing pipe per required ASTM with similar design pressure and size as this Project.
   d. Submit written verification from the pipe Manufacturer demonstrating compliance with the production and delivery schedule of the pipe as indicated in the Contractor's schedule.
2. Contractor shall submit Manufacturer's product data, installation recommendations, shop drawings, and certifications.
   a. Submit shop drawings showing design of new pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fittings, flanges, and special details.
   b. Contractor to review and submit PVC pipe manufacturers recommended installation procedures.
   c. Calculations and limits of thrust restraint shall be based on AWWA M23, latest edition.
   d. Submit manufacturer's certifications that PVC pipe and fittings meet requirements of this
   e. Section and AWWA C 900 and AWWA C 909 for pressure pipe applications,
   f. or appropriate ASTM standard specified for gravity sewer pipe.
   g. Submit manufacturer's certification that PVC pressure pipe for water lines and force mains has been hydrostatically tested at factory in accordance with AWWA C 900, AWWA C 909 and this Section.
   h. Submit manufactures allowable deflection
3. Shop Drawings:
   a. Catalog Data Sheets for all materials confirming pipe, fittings, and other materials conform to requirements of this specification.
   b. Pipe Supplier Information.

i. Submit company name, contact name, and contact number.

c. Details of all piping systems components confirming that the pipe and fittings conform to the specified requirements.

d. The Contractor shall submit shop drawings of pipe, fittings, gaskets, hardware, flanges, appurtenances, special details sufficient to demonstrate compliance with these Specifications and applicable pipe installation Specification.

e. Fabrication drawings showing:
   1) Wall thickness.
   2) Pipe length.
   3) Pipe joint

4. Testing Plan: Submit at least prior to start of construction and at minimum, include the following:
   1) Testing dates.
   2) Piping systems and section(s) to be tested.
   3) Method of isolation. Method of isolation to be approved by SAWS Inspector.
   4) Method of conveying water from source to system being tested.
   5) Hydrostatic leak testing.
      i. Submit a hydrostatic leak testing plan which includes equipment (pump, water meter, pressure regulating valve, pressure gauges, etc.), water handling procedures (supply and disposal), sequence and schedule by test section, and pressure test data
      ii. Certifications of Calibration: Approved testing laboratory certificate if pressure gauge for hydrostatic test has been previously used. If pressure gauge is new, no certificate is required.

5. Testing Reports:
   a. Furnish affidavit certified that all pipe meet the provisions of the specification and has been tested and submit reports in accordance with the applicable ASTMs and AWWA Standards. Reports to include the following:
      i. Hydrostatic proof test reports.
      ii. Sustained pressure test reports.
      iii. Burst strength test reports.
      iv. Stress Regression Testing
      v. Additional reports may be requested by SAWS' Inspector

6. Detail drawings indicating type, number, and other pertinent details of the slings and/or other methods proposed for pipe support and handling during manufacturing, transport, and installation. All pipe handling equipment and methods shall be acceptable to Owner.

7. Pipe Manufacturer's Written Quality Assurance/Quality Control Program.

8. Field Service Representative Resume

818.4 MATERIALS: The materials for water main installation shall conform to the specifications contained within the latest revision of SAWS Material Specifications:

1. Material Specification Item No. 113-03: Specifications Ductile-Iron Restrained Joint Fittings for Use on Ductile Iron and Poly-Vinyl Chloride Pipe
2. Material Specification Item No. 95-10, "Pipe Joint Restraint Systems,"
3. Material Specification Item No. 05-12: Specifications for C-900 Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch Through 60-Inch
4. Material Specification Item No. 05-13: Specifications for C909 Oriented Polyvinyl Chloride (PVC) Pressure Pipe, 4-Inch Through 12-Inch
5. Material Specification Item No. 05-31: Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series), ASTM 2241.
6. The pressure rating for pipe materials apply to any work performed in SAWS Pressure Zones. Minimum pressure rating for all pipes shall be 235 psi, or as identified in plans and bid documents.
7. Pipe shall be DR 18 pressure rating 235 psi.
8. PVC water pipe shall be blue in color. **White PVC pipe is not permitted.**
9. Only PVC pipe for 4 inch to 24 inch pipe sizes shall be used.
10. PVC pipe markings shall include:
    a. Manufacturer's name or trademark;
    b. Standard to which it conforms;
    c. Pipe size;
    d. Material designation code;
    e. Pressure rating;
    f. SDR number or schedule number;
    g. Potable water laboratory seal or mark attesting to suitability for potable water;
    h. A certifier's mark may be added; and
    i. Manufactured date (installation shall not exceed one year from this date)

818.5 CONSTRUCTION: PVC (C-900, and C-909) pipe shall be installed as specified within Item No. 812, "Water Main Installation" of these specifications.

1. PVC (C-900,and C-909) mains shall be laid to the depth and grades shown in the contract documents.
2. The pipe shall be laid by inserting the spigot end into the bell flush with the insertion line or as recommended by the manufacturer.
3. **At no time shall the bell end be allowed to go past the "insertion line."**
4. A gap between the end of the spigot, and the adjoining pipe is necessary to allow for expansion and contraction.
5. Deflection of PVC (C-900 and C-909) pipe shall be limited to 1 degree of the manufactures recommended deflection.
    a. Changes in direction of PVC pipe shall only be use of fittings or by deflecting straight pipe sections at joints.
    b. Longitudinal bending of pipe is not allowed

c. Deflection of pipe at fittings is not allowed
d. Deflection of straight pipe sections shall not exceed 1 degree at each joint (even if joint restraint devices are installed), which corresponds to the following in pipe alignment:
    i. Length of pipe, feet offset, inches allowable radius of curvature, feet 204 maximum, feet 1,1146 minimum

6. Joint Restraints:

- A. All mains consisting of PVC (C-900 and C-909) joint restraints as specified in SAWS' Material Specification Item No. 95-10, "Pipe Joint Restraint Systems," shall be installed in accordance with manufacturer's recommendations.
- B. Joint restraints shall be bi-directional and installed to fully restrain the system as shown in Standard Drawing Details DD-839 series, or as indicated in the contract documents.

7. PVC (C-900, and C-909) pipe shall be field cut using a power saw with a steel blade or abrasive disc, depending on the size of pipe.
8. If a bevel is needed after field cutting, it should be in accordance with the latest applicable recommendations of: Uni-Bell or ASTM/AWWA standards. Such work will be subject to approval by the Inspector.
9. Tracer wire shall be utilized for location and taped directly to the pipe.
    a. Tracer wire shall be properly spliced at each end connection and each service connection.
    b. Tracer wire shall be adequately wrapped and protected at each splice location in accordance with manufacturer recommendations.
    c. No bare tracer wire shall be accepted.
    d. Wire shall also come up to the top of valve extensions and fire hydrant stems, as directed by the Inspector.
    e. Tracer wire shall be utilized for location purposes and taped directly to the top of pipe.
    f. Tracer wire shall be of solid core (14 gauge insulated), and shall be taped to the main in minimum of 10 inch increments.
    g. Detection tape shall not be used in lieu of tracer wire.

818.6 MEASUREMENT: PVC pipe will be measured by the linear foot for each size and type as follows:

1. Measurements will be from the center line intersection of runs and branches of tees to the end of the valve of a dead end run.
2. Measurements will also be between the center line intersection of runs and branches of tees.
3. Where the branch is plugged for future connection, the measurement will include the entire laying length of the branch or branches of the fitting.
4. The measurement of each line of pipe of each size will be continuous and shall include the full laying lengths of all fittings and valves installed between the ends of such line except that the laying length of reducers will be divided equally between the connected pipe sizes.
5. Lines leading to a tapping connection with an existing main will be measured to the center of the main tapped.

818.7 PAYMENT: Payment for PVC Pipe w ater main installed will be made at the unit price bid per linear foot of pipe of the various sizes installed by the open cut method.

1. Such payment shall also include tracer wire, detection tape, excavation, selected embedment material, backfill, compaction, compaction testing, polyethylene sleeve, hauling and disposition of surplus excavated material, including all existing pipe, fittings, appurtenances to be abandoned or removed, installation of all-weather surface, and other required testing as per Specification Item No. 804, Excavation Trenching and Backfill.

2. Materials paid on site will be in accordance with Table 1 of Specification Item No. 100 Mobilization.

-End of Specification-