SECTION 1

WATER MAIN CONSTRUCTION

PIPE FOR WATER MAINS

1. SCOPE: This section shall include the furnishing of all types of pipe and other incidentals required for the construction of a complete water system as shown on the drawings and as specified herein.

Unless otherwise noted, the materials listed below are acceptable to the District for use in water distribution systems. Should the Contractor desire to use other materials not listed in these specifications, written permission must be obtained from the District.

All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purposes specified. It shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.

2. SUBMITTALS: The Engineer shall submit to the District three (3) copies of all submittal data for review and/or approval. Submittals shall include at a minimum: (1) the manufacturer's name, (2), type of material, (3), ASTM, ANSI, AWWA or other quality standard and (4) pressure class. If the materials do not meet the quality standards specified, the submittals will be rejected and other materials submitted as specified. The Contractor must obtain approval of all pipe materials prior to commencing construction.

The Contractor shall submit to the District two (2) copies of a certificate of inspection from the pipe manufacturer that the pipe supplied has been inspected at the plant and meets the requirements of these specifications.

3. PIPE DELIVERY, STORAGE AND HANDLING: Units shall be delivered, handled, and maintained in a manner to avoid damage to the pipe. The pipe shall be stored in an open area on high, land not subject to flooding, mud or other means of contamination. During shipment, piping shall be tarped on front of trailer to prevent contamination by diesel fumes from truck. **Piping shipped uncovered will not be accepted.**

4. DUCTILE IRON PIPE: Ductile iron shall conform with ASTM Specification A 536, latest revision, GR. 60-42-10. Ductile iron pipe shall conform with ANSI A 21.51 (AWWA C-151), latest revision, as approved by Sect. Comm. A 21, American National Standards Institute. Pipe dimensions shall conform to Federal Specifications WW-P-41c, Type II, push-on joints; Type III, mechanical joints. Each joint of pipe shall be conspicuously marked on the outside of the barrel to readily identify it from cast iron. Thickness class shall be as required by ANSI A 21.51, latest revision, assuming Type 1 laying conditions. The minimum thickness class for each size pipe shall be as follows: 3" & 4" - Class 51; 6" through 24" - Class 50. (Class 350 may only be used with the approval of the District). The judgement of the class of ductile iron pipe is the determination of the

District's and each judgement will be determined due to the amount of potential water pressure on the ductile iron piping.

A. Joints:

1. Mechanical Joints: ANSI Specification A 21.11 (AWWA C-111), latest revision, for three inch pipe and larger, and CIPRA Specification 3-54 and 4-54 for two inch pipe. Bolted mechanical joints shall be used at canal creek crossings, railroad crossings and where specifically called for on the plans or in the Schedule of Bid Items.

2. Push-on Joints: Single gasket push-on type joints shall conform with ANSI A 21.11 (AWWA C-111), latest revision. Push-on joints may be used where mechanical joints are not specifically called for on the plans or specified above. No solvent weld will be permitted on any size piping.

3. Flanged Joints: Flanged joints shall be constructed of ductile iron pipe conforming to ANSI A 21.6 (AWWA C-106) screwed into flanges drilled and faced per ANSI B 16.1 for both 125 Lb. or 250 Lb. working pressure. The pipe shall extend completely through the screwed-on flange. The flange face shall be flat and perpendicular to the pipe centerline.

B. Pipe Lining: Cement mortar lining shall conform with ANSI A 21.5 (AWWA C-104), latest revision and shall be sealed with a bituminous coating.

C. Exterior Coating: The pipe shall have an outside pipe coating of bituminous material in accordance with the manufacturer' s specifications. The final coat shall be continuous and smooth being neither brittle when subjected to low temperatures nor sticky when exposed to hot sun. The coating shall be strongly adherent to the pipe at all temperatures.

5. THINWALL PVC PIPE: PVC pipe shall be SDR 26 for class 160 or SDR 21 for class 200 as called for on the plans or scheduled in the bid items. The pipe shall be plainly marked with the following information: manufacturer' s name, size, material (PVC) type and grade or compound, NSF Seal, pressure rating and reference to appropriate product standards.

PVC Pipe used for construction shall comply to the following standards:

A.	Standard dimension ratio:	ASTM D-2241
	160 psi pipe	SDR 26
	200 psi pipe	SDR 21
B.	Material:	
	Grade 1 PVC Compound Material	ASTM D-1784

C. Rubber Coupling Rings: ASTM D-1869

D. Burst Pressure Test:

160 psi, SDR-26 minimum quick burst pressure 640 psi

200 psi, SDR-21 minimum quick burst pressure 800 psi

E. Impact Strength: ASTM D-2444

6. THICKWALL PVC PIPE C-900: Thickwall PVC pipe shall conform with AWWA C-900 Pressure Class 150, latest revision for polyvinyl chloride pressure pipe sizes 4 inch through 12 inch. Pipe shall be furnished in ductile iron pipe equivalent outside diameters with rubber-gasketed separate couplings or push-on joints. Pipe and couplings shall not fail when subjected to the following tests; (1) sustained pressure (2) burst pressure (3) flattening and extrusion quality. Tests shall be conducted as outlined in AWWA C-900. Each length of PVC pipe shall pass a hydrostatic integrity test at the factory 4 times the pressure class of the pipe for 5 seconds. The District may request the contractor to install ductile iron piping instead of C-900 or any other PVC piping.

7. HIGH DENSITY POLYETHYLENE PIPE:

A. General: Materials used for the manufacturing of polyethylene pipe and fittings shall be PE 3408 High Density Polyethylene (HDPE) meeting the ASTM D3350 cell classification of 345434C.

High Density Polyethylene Pipe (HDPE) and fittings will be used in accordance with the materials specifications. All additional appurtenances such as tees, gaskets, flange adaptors, etc. will meet the material specifications. The Contractor will supply the pipe and fittings and will include its price in the bid. All pipe installed by guided boring will be joined by an approved butt fusion or electrofusion technique according to the manufacturers specifications.

HDPE pipe shall be produced from resins with a material designation PE3408, and a cell classification PE334434 as specified within ASTM D3350, and dimensions and workmanship as specified by ASTM F714. It will also meet the requirements of AWWA ASTM D3350. Pipe will be legibly marked at intervals of no more than five feet with the manufacturer's name, trademark, pipe size, HDPE cell classification, appropriate legend such as SDR 11, ASTM D3035, AWWA C901 or C906, date of manufacture and point of origin. Pipe not marked as indicated above will be rejected.

The material used in the production of potable water pipe shall be approved by the National Sanitation Foundation (NSF).

B. Pipe Thickness: The material shall have a minimum Hydrostatic Design Basis (HDB) of 1600 psi at 73°F when tested in accordance with PPI TR-3 and shall be listed in the name of the pipe and fitting manufacturer in PPI TR-4.

Polyethylene pipe shall be manufactured in accordance with AWWA C906 for sizes 4" through 54".

Permanent identification of piping service shall be provided by co-extruding longitudinal blue stripes into the pipes outside surface. The striping material shall be the same material as the pipe material except for color.

C. Joints: Butt fusion or Electrofusion welded in accordance with ASTM D3261.

D. Marking: The net weight, pressure class or nominal thickness, sampling period and manufacturer shall be marked on each pipe.

8. PIPE INSTALLATION: Pipe shall be installed in accordance with the manufacture' s recommendations and as specified in Section 6 of these specifications. Disinfection and pressure testing shall meet the requirements in Section 6. Each length of pipe shall pass a hydrostatic integrity test at the factory 4 times the pressure class of the pipe for 5 seconds.

Pipe shall be furnished in 20 ft. laying lengths. Random lengths shall be a minimum of 10 feet long and shall comprise no more than 15 percent of the length of the piping system. Pipe shall be furnished in factory packaged units, with each joint plainly marked with the manufacturer's name, pressure class, size, etc.

9. METHOD OF MEASUREMENT: Pipe shall be measured from the bell or connection at the beginning to the bell or connection at the end, per linear foot, complete in place and accepted, including the furnishing of all labor, tools, materials, and equipment necessary for trenching, laying, jointing, testing, sterilizing, backfilling, connections to existing mains, and all other necessary incidentals.