

SAN ANTONIO WATER SYSTEM**SAN ANTONIO, TEXAS****SPECIFICATIONS FOR HIGH DENSITY POLYETHYLENE PIPE (HDPE)****OCTOBER 2011****1. SCOPE**

This specification cover item shall consist of pipe installation of gravity sewer mains using HDPE pipes in accordance with these specifications and as directed by the Engineer.

2. GENERAL REQUIREMENTS

- a) High Density Polyethylene Pipe (HDPE) and fittings shall be made of high density extra high molecular weight (EHMW) polyethylene with a standard thermoplastic material designation code of PE3408 and having a cell classification of 345464E per ASTM D3350. The molecular weight category shall be extra high (250,000 to 1,500,000) as per the Gel Permeation Chromatography determination procedure with a typical value of 300,000 to 330,000. The pipe shall be manufactured in accordance with ASTM F714 and/or ASTM D3035.
- b) All HDPE piping must have identifiable green striping (dual) every 120°. The pipe will be color grey and shall meet the Utility Location and Coordination Council, "Uniform Color Code," for sewer lines per APWA/ULCC Standards Committee.
- c) The pipe and fittings shall have product traceability. The manufacturer shall include a print line on the pipe. This shall notate the manufacturer's name, date of manufacture, the lot and supplier of raw material, plant location, and production shift. The ASTM standard shall also appear as ASTM F714 with the material designation as PE3408.
- d) The polyethylene pipe manufacturer shall provide certification that the stress regression testing has been performed on the specific product. The said certification shall include a stress life curve per ASTM D2837. The stress regression testing shall have been performed in accordance with ASTM D2837, and the manufacturer shall provide a product supplying a minimum Hydrostatic Design Basis (HDB) of 1,600 psi as determined by ASTM D2837.

- e) The material shall be listed by the Plastics Pipe Institute (PPI), a division of The Society of the Plastics Industry in PPI TR-4. The pipe material shall have a Hydrostatic Design Basis of 1600 psi at 730F and 800 psi at 1400F. The PPI listing shall be in the name of the pipe manufacturer and testing and validation of samples of the pipe manufacturer's production pipe shall be based upon ASTM D2837 and PPI TR-3.
- f) The manufacturer's certification shall state that the pipe was manufactured from one specific resin in compliance with these specifications. The certificate shall state the specific resin used and its source.
- g) HDPE pipe manufactured from materials meeting the specifications of this section shall have an Environmental Stress Crack Resistance of no failures in 10,000 hrs. (ESCR: FO>10,000) when tested in accordance with ASTM F1248.
- h) Pipe and fittings shall be manufactured from material meeting the requirements of this section. Pipe supplied under this specification shall have a nominal IPS (Iron Pipe Size) outside diameter unless otherwise specified. The Dimension Ration (DR) and pressure rating of the pipe at 73* shall match the following unless noted otherwise on the drawings:

DR 7.3-250 psi	DR 17 – 100 psi
DR 9 – 200 psi	DR 19 – 89 psi
DR 11 – 160 psi	DR 21 – 80 psi
DR 13.5 – 130 psi	DR 26 – 65 psi
DR 15.5 – 110 psi	DR 32.5 – 50 psi

- i) Both pipe and fittings shall carry the same pressure rating. All fittings shall be pressure rated to match the system piping to which they are joined. At the point of fusion, the outside diameter and minimum wall thickness of the fitting shall match the outside diameter and minimum wall thickness specifications of ASTM F714 for the same size pipe. Fittings shall be manufactured by the manufacturer of the pipe. Ells, tees, wyes shall be manufactured by mitered fabrication.
- j) Clamps and Gaskets: Clamps shall be stainless steel, including bolts and lugs as manufactured by JCM Industries Type 108 or equal. Furnish full circle, universal clamp couplings with a minimum 3/16 inch thick neoprene, grid-type gasket. Select clamps to fit outside diameter of pipe. Use minimum clamp length of 30 inches for replacement pipes O.D. of 10.75" (10" nominal) or greater and 18 inches for replacement pipe O.D. less than 10.75".
- k) Terminal sections pipe that are joined within the insertion pit will be connected with a full circle pipe repair clamp. The butt gap between pipe ends will not exceed 1/2 inch.
- l) Force Mains: Where applicable, solid wall pipe for sanitary sewer force mains shall have a minimum working pressure rating of 150 psi, and an inside diameter equal to or greater than the nominal pipe size indicated on the drawings.
- m) For force mains or pressure rated fittings, all fittings shall be de-rated according to the manufacturer's written specifications, and clearly labeled on the fittings as such. For direct bury or insertion lining; fittings will be fully pressure rated. All fittings will have a quality control label as approved by the manufacturer.
- n) High density polyethylene pipe (HDPE) related to pipe bursting or pipe crushing for sanitary sewer or related pipe line habilitation.
- o) Yard Piping: DR 9 only, no more than two splices, and must use long inserts for connections.
- p) Heat fusion joining systems: Pipe and fittings shall be thermal butt fusion, saddle fusion, or socket fusion according to manufacturer recommended procedures.

- q) The butt-fused joint will be true alignment and will have uniform roll back beads resulting from the use of proper temperature and pressure. The joint surfaces will be smooth. The fused joint will be watertight and will have tensile strength equal to that of the pipe. All joints will be subject to acceptance by the Engineers and/or his representative prior to insertion. All defective joints will be cut out and replaced. Any section of the pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than 10% of the wall thickness, will not be used and must be removed from the site. In addition, if in the opinion of the Engineers and/or his representative any section of pipe has other defects, including those hereinafter listed, that may indicate damaged, improperly manufactured, faulty, or substandard pipe, said pipe will be discarded and not used. Defects warranting pipe rejection include the following: concentrated ridges, discoloration, excessive spot roughness, and pitting; insufficient or variable wall thickness; pipe damage from bending, crushing, stretching or other stress; pipe damage that impacts the pipe strength, the intended use, the internal diameter of the pipe, internal roughness characteristics; or any other defect of manufacturing or handling.
- r) The manufacturer shall provide fusion training. The contractor (actual installers) and the onsite joint inspector shall be trained by the manufacturer or manufacturer's authorized representative.
- s) It will not be permitted to join unlike DR's to one another. Transition from unlike SDR's shall be accomplished by mechanical couplings capable of identical pressure ratings or machined polyethylene nipples where a thicker wall polyethylene has been matched to the companion pipe wall.
- t) Mechanical joining systems: Polyethylene pipe and fittings shall be connected by means of a polyethylene flange adapter and backup ring. The polyethylene flange adapter will be of the same specifications as the Light View except will be made from black plate stock. This method is also approved to join to another piping system or valves. Mechanical compression couplings or full circle encasement clamps may be used depending on the test specification.
- u) Mechanical couplings shall be installed in accordance with the mechanical coupling manufacturer's recommended procedures.
- v) Equipment: The fusion equipment and operator shall be required to demonstrate successful field experience. Regarding fusion over 36" capability, the fusion unit shall be field tested for a period of five years and the fusion operator shall have pipe size experience of the same pipe on the project for five years or longer.

