

SECTION 02010

SEWER FORCE MAIN / RECLAIMED WATER MAIN SPECIFICATIONS

For

The Town of Lake Placid

1.00 Polyvinylchloride Pipe

- 1.01 Polyvinylchloride Pipe: AWWA C900; Pressure Class 100, DR 25, for operating pressure less than 50 PSI; Class 150, DR 18, for operating pressure greater than 50 PSI. Force Main / Reclaimed Water Main under paved areas shall be AWWA C900, DR 14, Pressure Class 200. For pipe less than 4 inches in diameter, use ASTM D2241, SDR 21, Pressure Class 200; for pressure less than 50 PSI, use ASTM 1785 Schedule 80. The color code for each pipe shall be green for force main and shall be purple/lavender for reclaimed water main and meet the Utility Location and Coordination Council, "Uniform Color Code."
- 1.02 All polyvinylchloride (PVC) pipe shall be laid with metal locator tape buried one foot above and parallel to the pipe centerline. The locator tape shall be at least 2 inches wide with aluminum backing and shall be lettered, "SEWAGE FORCE MAIN" or "RECLAIMED WATER MAIN" in large letters.

And

All polyvinylchloride (PVC) pipe shall be laid with a 12 gauge solid copper locating wire with PVC coating buried on top of the pipe. Wire and installation shall meet National Electrical Code Federal Specification J-C-308.

- 1.03 All fittings on PVC pipe shall be Mega-Lug type or approved alternate.

2.00 High Density Polyethylene Pipe (HDPE)

- 2.01 Polyethylene Piping Material The pipe 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. The pipe will be the color green or purple/lavender and shall meet the Utility Location and Coordination Council, "Uniform Color Code," for sewer and drain lines and reclaimed water lines, per APWA/ULCC Standards Committee.
- 2.02 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.

2.03 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.

2.04 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.

2.05 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.

2.06 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 Ratio (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 13.5 - 130 psi DR 21 - 80 psi

DR 9 - 200 psi DR 15.5 - 110 psi DR 26 - 65 psi

DR 11 - 160 psi DR 17 - 100 psi DR 32.5 - 50 psi

2.07 The pipe and fittings shall have product traceability. The manufacturer shall include a printline 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. The printline shall be black on the green pipe.

2.08 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, and wyes shall be manufactured by mitered fabrication. For force mains /reclaimed water mains or pressure rated fittings, all fittings shall be de-rated according to the manufacturer's written specifications, and clearly labeled on the fitting as such. For gravity or sanitary sewer, either direct bury or insertion lining fittings will be fully pressure rated. All fittings will have a quality control label as approved by the manufacturer.

2.09 Heat fusion joining systems: Pipe and fittings shall be thermal butt fusion, saddle fusion, or socket fusion according to manufacturer recommended procedures.

2.10 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.

2.11 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.

2.12 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.

2.13 Mechanical couplings shall be installed in accordance with the mechanical coupling manufacturer's recommended procedures.

2.14 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 size pipe on this project for five years or longer.

3.00 Ductile Iron Pipe

Ductile iron pipe shall meet the requirements of ANSI Specification A21.51, AWWA C151. Pipe wall thickness shall conform to a minimum of class 50 with 350 psi working pressure. Exterior of pipe shall have bituminous coating. Interior of pipe shall be poly-lined in accordance with manufacturer's specifications and be resistant to the corrosive elements normally found in municipal waste water. The color code for each pipe shall be green for force main and shall be purple/lavender for reclaimed water main and meet the Utility Location and Coordination Council, "Uniform Color Code."

4.00 Air Release Valve Unit:

As shown on the plans.

5.00 Tests, Inspection, and Repairs:

5.01 All materials shall be tested in accordance with the applicable Federal, ASTM, or AWWA Specification and the basis for rejection shall be as specified therein. Certified copies of the tests shall be submitted with each shipment of material.

5.02 All materials will be subject to inspection and approved by the Project Engineer after delivery and no broken, cracked, misshapen, imperfectly coated, or otherwise damaged or unsatisfactory material shall be used.

5.03 All material found during the progress of the work to have cracks, flaws, or other defects shall be rejected and promptly removed from the site.

5.04 If damage occurs to any pipe, fittings, valves, hydrants, or water main accessories in handling, the damage shall be immediately brought to the Project Engineer's attention. The Project Engineer shall prescribe corrective repairs, or rejection of the damaged items.

6.00 Construction:

6.01 Excavating the trench:

A) As a general rule, do not open the trench to far ahead of the pipe laying so as to: avoid possibly flooding the trench, reduce or eliminate pumping or sheeting, reduce caving caused by ground water, reduce potential workmen and traffic hazards.

B) The trench width at the ground surface may vary with and depend upon the depth, type of soils and position of surface structures. The minimum clear width of the trench in the pipe zone should be one foot greater than the outside diameter of the pipe. The maximum clear width of the trench at the top of the pipe should not exceed a width equal to the pipe diameter plus two feet. If the above defined trench widths must be exceeded or if the pipe is installed in a compacted embankment, pipe embedment should be compacted to a point of at least 2.5 pipe diameters on both sides of the pipe or to the trench walls, whichever is less.

C) Minimum cover for the top of the pipe is 36 inches below the finished grade.

D) The trench bottom should be smooth and free from large stones, rocks or large dirt clods. Excavation of bells should be provided so that the pipe is uniformly supported along its length. Usually, loose material left by the excavator on the trench bottom will be adequate for bedding the pipe barrel and providing full support. When rock or other non-cushioning material is encountered, excavation shall be extended to 6 inches below the outside bottom of the pipe and a bedding cushion of sand or other selected backfill used as the pipe bed.

6.02 Pipe Laying:

A) Water shall not be allowed in the trenches while the pipes are being laid and/or tested. The Contractor shall not open up more trench than the available pumping facilities are able to dewater to the satisfaction of the Engineer. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working. In no case shall pipelines be used as drains for such water, and the ends of the pipe shall be kept

properly and adequately blocked during construction by the use of approved stoppers and not by improvised equipment. All necessary precautions shall be taken to prevent the entrance of mud, sand, or obstructing matter into the pipelines. If on completion of the work, any such material has entered the pipelines, it must be cleaned as directed by the Engineer so that the entire system will be left clean and unobstructed.

B) Cleanliness: The interior of the pipe shall be thoroughly cleaned of all foreign matter before being gently lowered into the trench and shall be kept clean during the laying operations by means of plugs or other approved methods. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

C) Gradient: Lines shall be laid straight, and depth of cover shall be maintained uniform with respect to finish grade, whether grading is either completed or proposed at time of pipe installation. When a grade of slope is shown on the drawings, batter boards with string line paralleling design grade, or other previously approved means, shall be used by the Contractor to assure conformance to required grade. All pipe shall be laid within a pipe diameter of lines and grades indicated.

D) Pipe Joint Deflection: Whenever it is desirable to deflect pipe, the amount of deflection shall not exceed the following maximum limits: a) for ductile iron pipe, AWWA Standard C900; b) for PVC pipe, no deflection is allowed at the joints, and longitudinal deflection is limited to the maximum shown in AWWA Publication M23. Additionally, joint deflection for ductile iron pipe shall not exceed the maximum allowed by the manufacturer.

E) PVC Pipe Storage: Polyvinylchloride pipe exterior may be damaged by prolonged exposure to direct sunlight and the Contractor shall take necessary precautions during storage and installation to avoid this damage. Pipe shall be stored under cover and sufficient backfill to shield from the sun shall be placed as the pipe is installed.

F) Joint Compounds: No sulphur base joint compound shall be used.

G) Anchors: Concrete thrust blocks shall be placed at all bends, tees, plugs, and other fittings to provide lateral support. Thrust blocks shall conform to the details shown on the illustrative standards. Concrete shall have a compressive strength of 2500 psi after 28 days, and shall have a minimum curing time of 3 days. The poured concrete shall be left exposed for a minimum of 24 hours before backfilling and not more than 48 hours.

H) Joints: The joints of all pipelines shall be made absolutely tight. The particular joint shall be approved by the Project Engineer prior to installation. Where shown on plans or where, in the opinion of the Project Engineer, settlement or vibration is likely to occur; all pipe joints shall be bolted, or retained accordingly.

I) Mechanical Joints: All Mechanical Joints shall be Mega-Lug type, and shall be laid and jointed in full conformance with manufacturer's recommendations.

J) Push-On Joints: Push-on joints shall be made in strict, complete compliance with the manufacturer's recommendations. Lubricant, if required, shall be an inert, nontoxic, water soluble compound incapable of harboring, supporting, or culturing bacterial life. Manufacturer's recommendations shall be submitted to Engineer for review and approval before work is begun.

K) Polyvinylchloride Pipe Joints: The joints of all pipelines shall be made in conformity with the recommendations of the pipe manufacturer. The particular joint used shall be approved by the Engineer prior to installation.

L) Sanitary sewers, force mains and reclaimed water mains shall have a minimum of 10 feet horizontal clearance with parallel potable water lines, and 18 inches vertical clearance when crossing. Concrete encasement shall be constructed in accordance with details shown on the drawings using 2500 psi minimum compressive strength concrete. Encasement shall be constructed where:

- 1) the water line crosses under, or at a depth which provides less than 18 inches clear distance between pipes when crossing over sewer lines; encasement shall extend a minimum of ten feet on each side of the point of crossing; or
- 2) the Engineer shall order the line encased.

The points of beginning and ending of pipe encasement shall be not more than 6 inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation, or the effects of superimposed live loads.

Class I Concrete (minimum compressive strength of 2500 psi) encasement, shall be required for both gravity sewer mains and force mains when the above criteria for separation of water and sewer lines cannot be maintained.

M) Flushing: All sewer mains shall be flushed to remove all sand and other foreign matter. The velocity of the flushing water shall be at least 4 feet per second. Flushing shall be terminated at the direction of the Engineer. The Contractor shall dispose of the flushing water without causing a nuisance or property damage.

N) Hydrostatic Tests:

- 1) All components of the force main distribution system, including fittings, services, connections, and valves shall be hydrostatic tested. No testing shall be done until all concrete thrust blocking is in place and set. If high early strength concrete is used, testing may be conducted 48 hours after the concrete is placed; otherwise, thrust block concrete must cure 5 days before

pressure testing commences. In testing, the part of the system under test shall be filled with potable water and subjected to a sustained pressure of 150 psi. The piping shall be tested in sections, thereby testing each valve for secure closure. While the system is being filled, air shall be carefully and completely exhausted. If permanent air vents are not located at all high points, the Contractor shall install corporation stops or fittings and valves at such points so the air can be expelled as the pipe system is slowly filled with water.

2) Test pressure shall be maintained by pumping for at least one hour and until all sections under test have been checked for evidence of leakage. Rate of loss shall not exceed that specified below, "Allowable Limits For Leakage". Visible leaks shall be corrected regardless of total leakage shown by test.

3) The system as a whole, or any part, shall be tested prior to construction of any subdivision roadway or pavement over the sewer system.

4) The system as a whole, or any part, shall be retested after completion of backfilling when it is believed necessary, as directed by the Project Engineer. The system shall also be retested upon completion of subdivision roadway or other pavement construction that is constructed over the sewer system.

5) All pumps, gauges, and measuring devices shall be furnished, installed, and operated by the Contractor and all such equipment and devices and their installation shall be approved by the Project Engineer. All pressures and leakage testing shall be done in the presence of a representative of the Engineer.

6) Water for testing and flushing shall be potable water provided by the Contractor from a source approved by the Project Engineer.

O) Allowable Limits for Leakage: The hydrostatic pressure tests shall be performed as specified and no installation, or section thereof, will be acceptable until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = \frac{\{N * D * \text{SQRT } P\}}{7400}$$

in which,

L = Allowable leakage, in gallons per hour

N = Approximate number of joints in the section of main being tested

D = Pipe diameter; in inches

P = The average test pressure during the test, in gauge psi

END OF FORCE MAIN / RECLAIMED WATER MAIN SPECIFICATIONS