**SECTION 3.5**

**FIBERGLASS WASTEWATER PIPE**

**PART 1: GENERAL**

* 1. **Scope of Work**

This specification designates the requirements for Fiberglass (Glass-Fiber­ Reinforced Thermosetting-Resin) Sewer Pipe (RTRP). Centrifugally Cast or Filament Wound manufacturing process is acceptable.

**PART 2: QUALITY ASSURANCE**

 All Pipes, joints, and fittings supplied under this specification to, as a minimum, conform to the requirements of ASTM D-3262 or ASTM D-3754.

**2.1 Reference Standards**

This specification references American Society for Testing and Materials (ASTM) standard specifications, which are made a part hereof by such reference and shall be the latest edition and revision thereof.

ASTM D-3681 Test Method for Chemical Resistance of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe in a Deflected Condition.

ASTM D-3262 Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

ASTM D-3754 Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe.

ASTM D-4161 Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.

ASTM F-477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

ASTM D-2412 Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

**2.2 Submittals**

* Contractor shall submit load and pipe calculations confirming selected pipe behavior. Load calculations shall include jacking load resistance, buckling resistance, pipe deflection, pipe wall strain cracking and wall crushing load. All design calculations shall be sealed by a Registered Professional Engineer of the State of Texas.
* Product data submittals to include the following as a minimum:
* Details of the proposed pipe.
* Details of proposed manholes.
* Properties, strengths, etc. of the pipe.
* Joint detail drawing, including maximum interior joint gap opening, in the deflected position and in the straight alignment.
* Instructions on storage, handling, transportation, and pipe installation.
* Standard catalog sheets.
* Gasket type and composition showing ability to withstand the chemicals and conditions within sanitary sewers.
* Pipe laying schedule.
* Connections to all proposed structures including water stop.
* Special fittings.
* Methods of maintaining grade and position during installation and grouting.
* Methods of testing pipe deflection after installation.
* Methods for achieving designed buoyancy resistance, assuming empty pipe.

**PART 3: PRODUCTS**

**3.1 Materials**

* + 1. Resin Systems

The manufacturer to use only approved quality polyester resin systems for which he can provide a proven history of performance in this particular application. The historical data to have been acquired from a composite material of similar construction and composition as the proposed product.

* + 1. Glass Reinforcements

The reinforcing glass fibers used to manufacture the components to be of highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins.

* + 1. Fillers

Sand may be used. Sand shall be minimum 98% silica with a maximum moisture content of 0.2%.

* + 1. Additives

Resin additives, such as pigments, dyes, and other coloring agents, if used, to be in no way detrimental to the performance of the product nor are they to impair visual inspection of the finished product.

3.1.5 Rubber Gaskets

The gasket shall meet the requirements of ASTM F-477 and the chemical composition of the Gasket shall be compatible with the environment found in sanitary sewers.

**3.2 Design**

* All RTRP or RPMP sewer pipe shall be in accordance with ASTM D-3262 or ASTM D-3754. The stiffness is to be measured in accordance with ASTM D-2412 and in no case shall the stiffness be less than SN46.
* The design calculations shall be based on the following loading conditions:

|  |  |
| --- | --- |
| Soil Density | 132 lb./ft3 (min.) |
| Live Loading | Negligible |
| Max. Depth of Soil Cover Above Pipe Crown | See Profile |
| Max. Hydrostatic Head Above Pipe Crown | 25 feet |
| Min. Internal Pressure | 18 psi |
| Max. Modulus of Soil Reaction (E') for Initial Pipe Deflection | 750 |
| Surge Pressure | 0 psi |

**PART 4: EXECUTION**

**4.1 Manufacture and Construction**

4.1.1 Pipes

The pipes to be furnished in the diameters specified and within the tolerances specified herein. They must be manufactured by the centrifugal casting or filament wound process to result in a dense, nonporous, corrosion-resistant, consistent composite structure to meet the operating conditions. Stiffening ribs or rings are not to be used.

4.1.2 Joints

 Unless otherwise specified, the pipe to be field connected with fiberglass sleeve couplings that utilize elastomeric sealing rings as the sole means to maintain joint water tightness. The joints must meet the performance requirements of ASTM D-4161. The joint sleeves on jacking pipe shall have a maximum outside diameter no greater than the outside diameter of the pipe.

4.1.3 Fittings

 Flanges, elbows, reducers, tees, wyes and other fittings, when installed, to be capable of withstanding all operating conditions. They may be contact molded or manufactured from mitered sections of pipe joined by glass fiber reinforced overlays.

4.1.4 Jacking Load

 The contractor must control the jacking loads within the safe limits of the pipe as recommended by the pipe manufacturer.

**4.2 Dimensions**

4.2.1 Wall Thickness

 The average wall thickness of the pipe shall not be less than the nominal wall thickness published in the manufacturer's literature and the minimum wall thickness at any point shall not be less than 87.5% of the nominal wall thickness when measured in accordance to test method of stiffness of ASTM D-3262 or ASTM D-3754.

4.2.2 End Squareness

All pipe ends to be square to the pipe axis. (±¼” or ±0.5% of the nominal diameter of the pipe, whichever is greater)

4.2.3 Tolerance of Fittings

The tolerance of the angle of an elbow and the angle between the main and leg of a wye or tee to be ±2 degrees. The tolerance on the laying length of a fitting to be ±2 inches.

**4.3 Deflection**

A pipe submittal will be required from the manufacturer indicating the inside diameter of the pipe to be installed and the manufacturing tolerances. Maximum allowable deflection is 3% (30 days after installation) and 5% long term deflection; allowable deflection will include manufacturing tolerances and will not be in addition to. If the pipe is over deflected in an "other than open cut" section, either before or after grouting, it shall be removed and new pipe will be installed, or a quality, structurally sound repair agreed upon by the owner will be made.

* 1. **Testing**
* The physical properties and characteristics of the pipes used in the project to have been determined by prototype testing of the manufactured product. These tests need not be conducted specifically for this project if prior tests on similar product of the same stiffness class and diameter have been previously completed. The Contractor is to obtain copies of all test results which must be retained and are to be made available to the Engineer.
* Joints - Coupling joints to be qualified per the tests of Section 7 of ASTM D-4161.
* Installed Pipe - Joints are to be individually tested in accordance with section 507 of the NCTCOG Public Works Construction Standards and the City of Dallas Addendum thereto. Total seepage in infiltration of ground water for both the pipe and the joint shall be zero (0).
* Rejected pipe must be identified by the manufacturer in a manner that will insure it will not be used on this project. The owner must agree to the method of identification of rejected pipe.

**4.5 Marking**

Each pipe shall be clearly marked on the exterior surface of the pipe barrel with the nominal diameter, pipe stiffness, date of manufacture, the name or trademark of the manufacturer and the manufacturer's Quality Assurance stamp of approval in accordance with ASTM standards. Marking shall be indented on the pipe sections or painted thereon with waterproof paint.

**PART 5: METHOD FOR MEASUREMNT AND PAYMENT**

Method of Measurement and Payment for the work included in this section will be in accordance with the payment schedule in the Bid Proposal.

**\*\*END OF SECTION\*\***