Section 02504

FIBERGLASS PIPE

PART 1 G E N E R A L

1.1 SECTION INCLUDES

1. Fiberglass Reinforced Plastic (FRP) pipe and fittings for buried sanitary sewers.

1.2 MEASUREMENT AND PAYMENT

1. Unit Prices.

    1. No separate payment will be made for fiberglass pipe under this Section. Include cost in price in accordance with Section 02531 - Gravity Sanitary Sewers, or Section 02532 - Sanitary Sewer Force Mains.

    2. Refer to Section 01270 - Measurement and Payment for unit price procedures.

2. Stipulated Price (Lump Sum). When Contract is Stipulated Price Contract, payment for work in this section is included in total Stipulated Price.

1.3 REFERENCES

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

2. ASTM D 2992 - Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced-Thermosetting) Resin Pipe and Fittings.

3. ASTM D 3262 - Standard Specification for Reinforced Plastic Mortar Sewer Pipe.

4. ASTM D 3681 - Method for Determining Chemical Resistance of Reinforced Thermosetting Resin Pipe in Deflected Condition.

5. ASTM D 3754 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe.

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

7. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets} Joining Plastic Pipe.

8. AWWA C950 - AWWA Standard for Fiberglass Pressure Pipe.

9. AWWA M45 - Fiberglass Pipe Design.

1.4 SUBMITTALS

1. Conform to requirements of Section 01330 - Submittal Procedures.

2. Submit shop drawings signed and sealed by Professional Engineer registered in State of Texas showing following:

    1. Manufacturer's pipe design calculations.

    2. Details of pictorial nature of critical features and specials indicating alignment and grade, laying dimensions, fabrication, fitting, flange, and special details, with plan view detailing pipe invert elevations, bends, and other critical features. Indicate station numbers for fittings corresponding to Drawings. Do not start production of pipe and fittings prior to review and approval by City Engineer. Provide final approved lay schedule on CD-ROM in Adobe Portable Document Format (*.PDF).

    3. Certification from manufacturer that design was performed for project in accordance with requirements of this section. Certification to be signed and sealed by Professional Engineer registered in State of Texas.

3. Provide test reports upon request, certifying that pipe has been tested in accordance with and exceeds minimum requirements of ASTM D 2412, ASTM D 2992, ASTM D 3262, and ASTM D 3681 as appropriate.

1.5 QUALITY CONTROL

1. Manufacturer to provide permanent quality control department and laboratory facility capable of performing inspections and testing as required by Specifications. Material testing, inspection procedures, and manufacturing process are subject to inspection by City Engineer. Perform manufacturer's tests and inspections required by referenced standards and these Specifications including the following: (Correct nonconforming conditions.)

    1. Provide manufacturer's certificate of conformance to Specifications.

    2. Manufacturer shall make available services of representative, throughout project duration when deemed necessary by City Engineer, to advise aspects of installation including but not limited to handling, storing, cleaning and inspecting, coatings and linings repairs, tapping, and general construction methods affecting pipe.

2. Calibrate within last 12 months for equipment such as scales, measuring devices, and calibration tools used in manufacture of pipe. Each device used in manufacture of pipe is required to have tag recording date of last calibration. Devices are subject to inspection by City Engineer.

PART 2 P R O D U C T S

1.6 MATERIALS

1. Resin Systems: Only use polyester resin systems with proven history of performance in this particular application. Collect historical data from applications of composite material of similar construction and composition as proposed product.

2. Glass Reinforcements: Use reinforcing glass fibers of highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins to manufacture components.

3. Fillers: Silica sand or other suitable materials may be used. Use minimum 98 percent silica with maximum moisture content of 0.2 percent.

4. Additives: Resin additives, such as pigments, dyes, curing agents, thixotropic agents and other coloring agents, when used, shall not be detrimental to performance of product nor impair visual inspection of finished products.

5. Internal Liner Resin: Suitable for service as sewer pipe, and be highly resistant to exposure to sulfuric acid as produced by biological activity from hydrogen sulfide gases and meet or exceed requirements of ASTM D 3681.

6. Rubber Gaskets:

    1. Supply from approved gasket manufacturer in accordance with ASTM F 477, and suitable for service intended. Affix gaskets to pipe by means of suitable adhesive or install in manner so as to prevent gasket from rolling out of pre-cut groove in pipe or sleeve coupling.

    2. Provide following gasket materials for noted contaminants when pipe is to be installed in potentially contaminated area.

Contaminant	**Required Gasket Material**
Petroleum (diesel, gasoline)	Nitrile Rubber(1)
Other Contaminants	As recommended by manufacturer

a. As an alternate, protect gasket from exposure with heat shrink joint sleeves by Aqua-shield[7], or approved equal. For repairs to heat shrink joint sleeves, use Aqua-shield Repair Patch Kit or approved equal.

3. If required gasket material is not available for use, pipe other than fiberglass pipe must be used in potentially contaminated areas unless gaskets) can be protected from exposure by method acceptable to City Engineer.

1.7 MANUFACTURE

1. Pipes:

1. Furnish in diameters specified and within tolerances specified.

2. Do not use stiffening ribs or rings.

3. Manufacture by filament winding or centrifugal casting processes that result in dense, nonporous, corrosion-resistant, consistent composite structure to meet operating conditions as specified herein or as shown on Drawings.

2. Sleeve Couplings: Unless otherwise specified, field connect pipe with fiberglass sleeve couplings that utilize elastomeric sealing gaskets as sole means to maintain joint water tightness. Joints shall meet performance requirements of ASTM D 4161.

3. Sanitary Sewer Application Fittings:

1. Flanges, elbows, reducers, tees, and other fittings capable of withstanding operating conditions when installed. Provide contact molded or manufactured from mitered sections of pipe joined by glass fiber reinforced overlays.

2. Grout Ports: Provide grout ports in wall of pipe when required. Provide plugs of 316 stainless steel or other corrosion-resistant material compatible with pipe and approved by City Engineer. Design and install grout port plugs to meet test pressure of pipe.

3. Manhole Connection: Provide water stop flange (wall pipe) for connection to manhole base of other structure in accordance with Section 02082 - Precast Concrete Manholes.

1.8 DIMENSIONS

1. Diameters:

1. Gravity Sewers: Actual outside diameter in accordance with Table 3 of ASTM D 3262.

2. Force Main Sewers: Actual outside diameter in accordance with AWWA C950.

2. Lengths: Supply at least 90 percent of total footage of each size and class of pipe, excluding special order pipes in nominal lengths of 20 feet. No nominal lengths of less than four (4) feet may be used unless otherwise approved by City Engineer.

3. Wall Thickness: Provide minimum average wall thickness of stated design thickness. Provide minimum single point thickness not be less than 98 percent of stated design thickness for sanitary sewer applications.

4. End Squareness: Provide pipe ends square to pipe axis with maximum tolerance of 1/8 inch.

5. Tolerance of Fittings: Provide tolerance of angle of elbow and angle between main and leg of wye or tee to plus or minus 2 degrees. Provide tolerance on laying length of fitting to plus or minus 2 inches.

1.9 STIFFNESS CLASSES

1. Provide stiffness class of FRP pipe that satisfies design requirements, but not less than 46 psi, when used in direct bury operation; 36 psi when installed within primary tunnel liner.

2. Sanitary Sewer Pipe for Jacking: Govern stiffness class of FRP pipe either by ring deflection or by pipe design providing longitudinal strength required by jacking method and satisfy design requirements. Submit design calculations as required in Paragraph 1.04, Submittals.

    1. Perform pipe stress calculations based on jacking loads to conform to Section 02441 - Microtunneling and Pipe jacked Tunnels.

    2. Provide ring deflection calculations conforming to design requirements of 30 TAC Chapter 317.20 pertaining to flexible pipe used in gravity sewers. Produce pipe deflection calculations that predict deflection will not be less than 5 percent under long term loading conditions (soil prism load) for highest density of soil overburden and surcharge loads. Prepare deflection calculations using long-term (drained) values for soil parameters contained in geotechnical investigation report for Project, or other site-specific data obtained by Engineer.

1.10 TESTING

1. Provide pipes tested in accordance with AWWA C950 and ASTM D 3262 or ASTM D 3754, as applicable.

2. Joints: Provide coupling joints qualified per tests of Section 7 of ASTM D 4161.

3. Stiffness: Provide minimum stiffness as defined above in Section 2.04 A, when tested in accordance with ASTM D 2412.

1.11 INSPECTION AND SHIPPING

1. Permit City Engineer to inspect pipes or witness pipe manufacturing. Inspection shall not relieve manufacturer of responsibilities to provide products that comply with applicable standards and these Specifications. Should City Engineer elect not to inspect manufacturing, testing, or finished pipes, it in no way implies approval of products or tests.

2. Manufacturer's Notification to Customer: Should City Engineer wish to see specific pipes during manufacturing process, manufacturer shall provide City Engineer with minimum of three (3) weeks advance notice of when and where production of those pipes will take place.

3. Repair damage to pipe or protective lining per manufacturer's specifications before final acceptance.

4. Shipping: Where required, provide pipe and fittings with sufficient interior strutting or cross bracing to prevent deflection under their own weight.

PART 3 E X E C U T I O N

1.12 PIPE HANDLING

1. Load, transport, unload, and otherwise handle pipe and fittings to prevent damage of any kind. Handle and transport pipe with equipment designed, constructed and arranged to prevent damage to pipe, lining and coating. Do not permit bare chains, hooks, metal bars, or narrow skids or cradles to come in contact with pipe.

2. Place pipe along project site where storm water or other water will not enter or pass through pipe.

3. Hoist pipe from trench side into trench only by means of sling of canvas, leather, nylon or similar material.

4. Use precautions to prevent injury to pipe.

    1. Package stacked pipe on timbers.

    2. Use nylon straps around pipe for lift when relocating pipe with crane or backhoe.

    3. Do not lift pipe using hooks at each end of pipe.

4. Do not place debris, tools, clothing, or other materials on pipe.

5. Sanitary Sewer Applications: For additional requirements see Section 02531 - Gravity Sanitary Sewers.

1.13 INSTALLATION

1. Install pipe and fittings in accordance with requirements of Section 02531 - Gravity Sanitary Sewers, Section 02532 - Sanitary Sewer Force Mains, Drawings, and manufacturer's recommendations.

2. Pipe Bedding:

    1. Conform to requirements of Section 02317 - Excavation and Backfill for Utilities.

    2. Align pipe at proper grade prior to joint connection and do not shift after jointing operation has been completed.

    3. Take necessary precautions during bedding and backfilling operations to prevent deformation or deflection of cylindrical shape of pipe by more than allowable pipe deflection. Do not move trench support system (trench safety system) once bedding material is compacted.

    4. Excavate outside specified trench section for coupling and bell holes, and for spaces sufficient to permit removal of slings. Provide coupling and bell holes at proper locations for unrestricted access to joint. Form coupling and bell holes large enough to facilitate joint wrapping and to permit visual examination of process. Enlargement of coupling and bell holes as required or directed by City Engineer. Subsequent backfilling thereof will not be considered as authorized additional excavation and backfill. Backfill coupling and bell holes and spaces to satisfaction of City Engineer.

    5. Blocking may be removed 24 hours after placing backfill to top of pavement or natural ground level.

3. Pipe Deflection: Pipe initial vertical cross-section deflection measured after completion of backfilling shall not exceed 3 percent of original pipe diameter.

    1. Deflection may be measured by City Engineer at location along pipe.

    2. If deflection exceeds that specified, do one of the following:

        1. Remove backfill and side support. Reround the pipe and properly replace compacted backfill and side support. Or,

2. Remove entire portion of deflected pipe section and install new pipe as directed by City Engineer at no additional cost to City. Arithmetical averages of deflection are not acceptable.

1.14 JOINTING

1. Clean ends of pipe and coupling components.

2. Check pipe ends and couplings for damage. Correct damage found per pipe manufacturer's recommendation.

3. Coupling grooves must be completely free of dirt.

4. Apply joint lubricant to pipe ends and elastomeric seals of coupling. Use only lubricants approved by pipe manufacturer.

5. Use suitable auxiliary equipment, such as wire rope puller and end protection, to pull joints together.

6. Do not exceed forces recommended by manufacturer for coupling pipe. When excessive force is required, remove coupling, determine source of problem, and correct it.

7. Join pipes in straight alignment and then deflect to required angle. In process of jointing pipe, do not allow maximum deflection gap to be greater than 3/4 inch, or deflection angle to exceed deflection permitted by manufacturer.

8. When joining pipe using mechanical joints, torque bolts to maximum needed for sealing, with maximum torque of 25 ft-lbs, unless otherwise approved by pipe manufacture.

1.15 GROUTING

1. If pressure grouting of pipe is conducted as part of tunnel installation seal grout holes with threaded plug utilizing internal check valve for this purpose.

1.16 REPAIRS

1. A pipe that has damaged sections must be:

    1. Damaged sections of pipe may be cut out and immediately removed from job site. Damaged section must be cut minimum of one (1) foot from either side of damage.

    2. Salvaged sections must be minimum of four (4) feet long.

    3. No field repairs of pipe utilizing resin or similar products may be used unless authorized by City Engineer.

1.17 TESTS

1. Conform to requirements of Section 02533 - Acceptance Testing for Sanitary Sewers.

END OF SECTION