



DENVER

THE MILE HIGH CITY

CITY AND COUNTY OF DENVER
DEPARTMENT OF PUBLIC WORKS | ENGINEERING DIVISION

Storm Drainage and Sanitary Sewer Construction Detail and Technical Specifications

10.4 Centrifugally Cast Fiberglass Reinforced Polymer Mortar Pipe

10.4.1 General

This section covers material requirements, inspection and testing, marking and delivery, installation, and field performance and acceptance tests of Centrifugally Cast Fiberglass Reinforced Polymer Mortar Pipe (CCFRPM), for use in gravity, non-pressure, sanitary sewer installations.

10.4.2 Referenced Standards

This section references American Society for Testing and Materials (ASTM), which are made part hereof by such references, and shall be the latest edition and revision thereof. All material, manufacturing, operations, testing, inspection and production of Centrifugally Cast Fiberglass Reinforced Polymer Mortar Pipe (CCFRPM) shall conform to the following referenced standards:

- ASTM D3262 Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
- ASTM D4161 Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.
- ASTM D2412 Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

10.4.3 Materials

10.4.3.1 Resin Systems

The manufacturer shall use only polyester resin systems with a proven history of performance in this particular application. The historical data shall have been acquired from a composite material of similar construction and composition as the proposed product.

10.4.3.2 Glass Reinforcements

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

10.4.3.3 Silica Sand

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

10.4.3.4 Additives

Resin additives, such as curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally affect the performance of the product.

10.4.3.5 Elastomeric Gaskets

Gaskets shall be supplied by qualified gasket manufacturers and be suitable for the service intended.

10.4.4 Manufacture and Product Construction

10.4.4.1 Pipe

The pipe shall be manufactured using the centrifugal casting process only, so as to result in a dense, non-porous, corrosion-resistant, consistent composite structure. The pipe shall meet the ASTM D3262 standard specification Cell Limit Type 1, Liner 2, and Grade 3. The manufacturer of pipe and fittings must demonstrate a 10 – year history of successful installations in the United States for sanitary sewer service.

10.4.4.2 Joints

Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings that utilize built-in double fin elastomeric sealing gaskets made of EPDM rubber compound as the sole means to maintain joint water tightness. The joints must meet the performance requirements of ASTM D4161. Joints at tie-ins, when needed may utilize fiberglass, gasket-sealed closure couplings.

10.4.4.3 Fittings

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

Properly protected standard ductile iron, fusion-bonded epoxy coated steel and stainless steel fittings may also be used.

10.4.4.4 Outside Diameter

The actual outside diameter (18" to 48") of the pipes shall be in accordance with ASTM D3262. For other diameters, OD's shall be per manufacturer's literature.

10.4.4.5 Pipe Length

Pipe shall be supplied in nominal lengths of 20 feet. Actual laying length shall be nominal +1, -4 inches. At least 90% of the total footage of each size and class of pipe, excluding special order lengths, shall be furnished in nominal length sections.

10.4.4.6 Wall Thickness

The minimum wall thickness shall be the stated design thickness.

10.4.4.7 End Squareness

Pipe ends shall be square to the pipe axis with a maximum tolerance of 1/8".

10.4.4.8 Packaging, Handling, Shipping

The Contractor shall follow the procedures and recommendations for packaging, handling, and shipping, in accordance with the manufacturer's instructions.

10.4.4.9 Testing

1. All pipes shall be manufactured and tested in accordance with ASTM D3262.
2. All joints shall meet the requirements of ASTM D4161.
3. The minimum pipe stiffness when tested in accordance with ASTM D2412 shall be 46 psi.

10.4.5 Inspection of Product During Manufacturing

10.4.5.1 Customer Inspection

The owner or other designated representative shall be entitled to inspect pipes or witness the pipe manufacturing.

10.4.5.2 Manufacturers Notification to Customer

Should the Owner request to see specific pipes during any phase of the manufacturing process, the manufacturer must provide the Owner with at least 48-hours advance notice of when and where the production of those pipes will take place.

10.4.6 Installation

10.4.6.1 Trenching and Excavation

Trenching and excavation shall be performed in accordance with Section 4.0 of these Detail and Technical Specifications.

10.4.6.2 Bedding and Haunching

The bedding shall be Class B as defined in Section 4.0 of these Detail and Technical Specifications. The bedding material shall conform to ASTM C33 or ASTM D448 gradation No. 67 as modified and shall be brought to proper grade and elevation prior to installation of pipe and assembly of joints. Depressions for pipe bell shall be provided. Additional bedding material shall then be placed according to Standard Detail S-301, "Standard Detail for Trenching and Bedding".

10.4.6.3 Pipe Handling

Use textile slings, other suitable materials or a forklift. Use of chains or cables shall not be permitted.

10.4.6.4 Jointing

1. Clean ends of pipe and coupling components.
2. Apply joint lubricant to pipe ends and elastomeric seals of coupling. Use only lubricants approved by the pipe manufacturer.
3. Use suitable equipment and end protection to push or pull the pipes together.
4. Do not exceed forces recommended by the manufacturer for coupling pipe.
5. Join pipes in straight alignment then deflect to required angle. Do not allow the deflection angle to exceed the deflection permitted by the manufacturer.

10.4.7 Field Testing

10.4.7.1 Infiltration/Exfiltration Test

Maximum allowable leakage shall be per local specification requirements.

10.4.7.2 Low Pressure Air Test

Each reach may be tested with air pressure (max 5 psi). The system passes the test if the pressure drop due to leakage through the pipe or pipe joints is less than or equal to the specified amount over the prescribed time period.

10.4.7.3 Individual Joint Testing

For pipes large enough to enter, individual joints may be pressure tested with a portable tester to 5 psi max. with air or water in lieu of line infiltration, exfiltration or air testing.

10.4.7.4 Deflection Testing

A deflection test shall be performed according to section 9.2.5 of these Detail and Technical Specifications. The maximum allowable deflection limits after construction shall be 5%.