

**REPLACE IN ITS ENTIRETY WITH  
NEW DOCUMENT**

**DALLAS WATER UTILITIES  
City of Dallas, Texas**



**SPECIAL SPECIFICATIONS FOR CONSTRUCTION OF  
FIVE MILE CREEK WW PIPE REPLACEMENT  
GLENDALE PARK  
FROM E. LEDBETTER DR. TO FRIO DR.  
PID 6358**

**Contract No. 18-285/286E  
Construction Contract No. 21-124**

**April 2021**



**FNI PROJECT NO. DWU18569**

## SECTION 7.1

### CIRCULAR FIBERGLASS WASTEWATER PIPE – DIRECT BURY

#### PART 1: GENERAL

**REPLACE IN ITS ENTIRETY WITH  
NEW DOCUMENT**

##### 1.1 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. Where there is a conflict between the ASTM minimum requirements and the higher performance requirements in this specification, this specification will govern.

##### 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.

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

ASTM D638 Test Method for Tensile Properties of Plastics.

## 2.2 Submittals

- Contractor shall furnish, prior to use of the materials, satisfactory written certification of the manufacturer's compliance with the standards and requirements of this specification.
- Prior to the shipment of fiberglass reinforced pipe for this project submit manufacturer's QA/QC test reports showing the pipe was manufactured and tested in accordance with all standards specified and referenced herein.
- Submit detailed shop drawings and product data for all pipe, fittings, and appurtenances specified in this Section. Product data submittals shall include the following as a minimum: details of the proposed pipe; properties and strengths of the pipe; joint details; instructions on storage, handling, transporting, and installation; standard catalog sheets; and material certifications.
- The Contractor shall submit pipe thickness and stiffness calculations, design data and specification data sheets prepared and stamped by a Registered Professional Engineer of the State of Texas listing all parameters used in the fiberglass reinforced pipe design and thickness calculations based on AWWA M45. Load calculations shall include jacking load resistance, buckling resistance, pipe deflection, pipe wall strain cracking and wall crushing load.
- Submit full ASTM D3681 Corrosion Test report demonstrating the pipes meet the long-term corrosion requirements of these specifications along with the current annual reconfirmation report. Tests shall be based on the product manufactured at the manufacturing facility proposed to produce the pipe for this project. Data from other manufacturing facilities are not acceptable.
- Manufacturer's quality control manager shall have a minimum of 5 years of service in the QC of fiberglass pipe. QC's resume/history to be submitted as proof of minimum experience requirement.
- 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.

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

- 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**

#### **3.1.1 Resin Systems**

The manufacturer to use only approved quality polyester, vinyl ester or epoxy 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.

#### **3.1.2 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.

#### **3.1.3 Silica Sand**

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

#### **3.1.4 Fillers**

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

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

## 3.1.5 Additives

Resin additives, such as curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally effect the performance of the product nor are they to impair visual inspection of the finished product.

## 3.1.6 Elastomeric Gaskets

Gaskets shall be full faced EDPM or Nitrile rubber exceeding ASTM F477 supplied by qualified gasket manufacturers and be suitable for 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./ft <sup>3</sup> (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

Manufacture pipe by the centrifugal casting process are to result in a dense, nonporous, corrosion-resistant, consistent composite structure. Pipes shall be Type 1, Liner 2, and Grade 3. The interior surface of the pipes exposed to sewer flow shall be manufactured using a resin with a 50% elongation-to-break (minimum) when tested in accordance with D638. The resin rich interior surface shall provide superior crack resistance and abrasion resistance. The exterior surface of the pipes shall be comprised of a sand and resin layer to provide UV protection to the exterior.

#### 4.1.2 Joints

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings that utilize full faced EDPM rubber elastomeric sealing gaskets 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 gasket-sealed closure couplings.

## 4.1.3 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.

## 4.2 **Dimensions**

### 4.2.1 Diameter

The actual inside diameter (18" to 126") of the pipes shall be in accordance with approved manufacture's published dimensions.

### 4.2.2 Lengths

Pipe shall be supplied in nominal lengths of 20 feet. Actual laying length shall be nominal +1, -4 inches. Shorter joints may be required for installation in curves or other installation restrictions and shall be approved by the engineer.

### 4.2.13 Wall Thickness

The minimum wall thickness shall be 100% or greater of the stated design thickness. Wall thickness shall be gauged at the thinnest pipe section. Average wall thicknesses will not be acceptable.

### 4.2.4 End Squareness

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

### 4.2.5 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  $\pm 2$  degrees. The tolerance on the laying length of a fitting to be  $\pm 2$  inches.

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

## 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.

## 4.3 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.
- Pipes – Pipes shall be manufactured and tested in accordance with ASTM D3262. Where minimum values differ between ASTM D3262 and the higher values of this specification; this specification will govern.
- Joints - Coupling joints to be qualified per the tests of Section 7 of ASTM D-4161.
- Stiffness – Minimum pipe stiffness when tested in accordance with ASTM D2412 shall normally be 46 psi.
- Strain Corrosion – The extrapolated 50 year strain corrosion value shall not be less than 120% of the minimum value stated in ASTM D3262 section 6 and as tested per ASTM D3681.
- 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

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

accordance with ASTM standards. Marking shall be indented on the pipe sections or painted thereon with waterproof paint.

## 4.6 Installation

- Burial

The bedding and burial of pipe and fittings shall be in accordance with the project plans and specifications and the manufacturer's requirements.

- Pipe Handling

Use textile slings, other suitable materials or a forklift. Use of chains or cables is prohibited.

- Jointing

- Clean ends of pipe and coupling components.
- Apply joint lubricant to pipe ends and elastomeric seals of coupling.
- Use only lubricants approved by the pipe manufacturer.
- Do not exceed forces recommended by the manufacturer for coupling pipe.
- Join pipes in straight alignment then deflect to required angle. Deflection angles exceeding the deflection permitted by the manufacturer is prohibited.

## PART 5: METHOD FOR MEASUREMENT 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\*\***



# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

## SECTION 7.2

### NON-CIRCULAR FIBERGLASS WASTEWATER PIPE

#### PART 1: GENERAL

##### 1.1 Scope of Work

This specification designates the requirements for Fiberglass Reinforced Polymer Mortar Sewer Pipe (FRPM).

#### PART 2: QUALITY ASSURANCE

All Pipes, joints, and fittings supplied under this specification to, as a minimum, conform to the requirements of ISO and ASTM Standards. Where there is a conflict between the ISO or ASTM minimum requirements and the higher performance requirements in this specification, this specification will govern.

##### 2.1 Reference Standards

This specification references standard specifications, which are made a part hereof by such reference and shall be the latest edition and revision thereof.

ISO 16611:2017(E) “Plastics piping systems for drainage and sewerage without pressure - Non-circular pipes and joints made of glass-reinforced thermosetting plastics (GRP/FRP) based on unsaturated polyester resins (UP) - Dimensions, requirements and tests.”

ISO 10952 “Plastics piping systems - Glass-reinforced thermosetting plastics (GRP/FRP) pipes and fittings - Determination of the resistance to chemical attack for the inside of a section in a deflected condition.”

ASTM D-3262 Standard Specifications for Fiber Glass (Glass Fiber Reinforced Thermosetting Resin) Sewer Pipe.

ASTM D-3681 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.

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

## 2.2 Submittals

- Contractor shall furnish, prior to use of the materials, satisfactory written certification of the manufacturer's compliance with the standards and requirements of this specification.
- Prior to the shipment of fiberglass reinforced pipe for this project submit manufacturer's QA/QC test reports showing the pipe was manufactured and tested in accordance with all standards specified and referenced herein.
- Submit detailed shop drawings and product data for all pipe, fittings, and appurtenances specified in this Section. Product data submittals shall include the following as a minimum: details of the proposed pipe; properties and strengths of the pipe; joint details; instructions on storage, handling, transporting, and installation; standard catalog sheets; and material certifications.
- The Contractor shall submit pipe thickness and stiffness calculations, design data and specification data sheets prepared and stamped by a Registered Professional Engineer of the State of Texas listing all parameters used in the fiberglass reinforced pipe design and thickness calculations based on AWWA M45. Load calculations shall include jacking load resistance, buckling resistance, pipe deflection, pipe wall strain cracking and wall crushing load.
- Submit full ASTM D3681 Corrosion Test report demonstrating the pipes meet the long-term corrosion requirements of these specifications along with the current annual reconfirmation report. Tests shall be based on the product manufactured at the manufacturing facility proposed to produce the pipe for this project. Data from other manufacturing facilities are not acceptable.
- Manufacturer's quality control manager shall have a minimum of 5 years of service in the QC of fiberglass pipe. QC's resume/history to be submitted as proof of minimum experience requirement.
- 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.

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

- 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**

#### **3.1.1 Resin Systems**

The manufacturer to use only approved quality polyester, vinyl ester or epoxy 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.

#### **3.1.2 Glass Reinforcements**

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

#### **3.1.3 Silica Sand**

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

#### **3.1.4 Fillers**

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

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

## 3.1.5 Additives

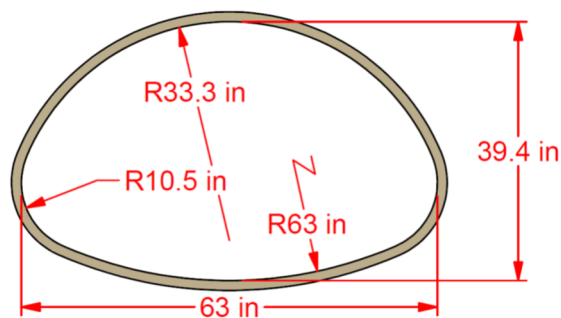
Resin additives, such as curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally effect the performance of the product nor are they to impair visual inspection of the finished product.

## 3.1.6 Elastomeric Gaskets

Gaskets shall be full faced EDPM or Nitrile rubber exceeding ASTM F477 supplied by qualified gasket manufacturers and be suitable for the environment found in sanitary sewers.

## 3.2 **Design**

- Design shall use Finite Element Analysis (FEA) software to confirm minimum thickness is adequate for intended service.
- The manufacturer shall meet the following required shape:



- Design should incorporate a minimum design lift of 50 years and a minimum factor of safety of 2.0.
- The design calculations shall be based on the following loading conditions:

Soil Density	132 lb./ft <sup>3</sup> (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

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

## **PART 4: EXECUTION**

### **4.1 Manufacture and Construction**

#### **4.1.1 Pipes**

The pipe shall be manufactured using a programmed, mandrel process utilizing continuous & chopped glass fiber reinforcements in the circumferential direction or to maintain structural integrity and leak tightness. The pipe shall be manufactured using a programmed, mandrel process utilizing continuous & chopped glass fiber reinforcements in the circumferential direction or to maintain structural integrity and leak tightness. The laminate shall consist of multiple layers of glass matting and resin. Liner should use a thermosetting resin layer with aggregates or fillers with or without reinforcement of glass. The surface exposed to the sewer/chemical environment shall be resin rich and shall limit any exposed fibers. Both internal and external surface shall be free from irregularities which would impair the ability of the component to conform to the requirements of this document. The pipe shall be as uniform as commercially practical in color, ovality, density, and other physical properties. Pipe and fittings shall be manufactured in the United States in compliance with federal mandates.

#### **4.1.2 Joints**

Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings that utilize full faced EDPM rubber elastomeric sealing gaskets as the sole means to maintain joint water tightness. The joints must meet the performance requirements of ISO 16611 & ASTM D4161. Joints at tie-ins, when needed, may utilize gasket-sealed closure couplings.

#### **4.1.3 Fittings**

Flanges, elbows, reducers, tees, wyes, laterals and other fittings shall be capable of withstanding all operating conditions when installed.

### **4.2 Dimensions**

#### **4.2.1 Size**

Contractor shall field verify the size, shape perimeter of the tunnels, shafts, and connections prior to fabrication of the liner. For non-round shapes, the manufacturer is permitted to introduce a slight curvature to the straight sides of the shape(s) shown in the contract drawings when required for manufacturing. For sharp intersections, the manufacturer is permitted to introduce a curvature when required for manufacturing. Pipe circumference shall be one piece. Segmental longitudinal joining systems are not allowed.

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

## 4.2.2 Lengths

Pipe shall be supplied in nominal lengths of 10 ft. When required by radius curves, pit size, sewer irregularities, etc., pipe may be supplied in shorter lengths.

## 4.2.13 Wall Thickness

shall be not less than the wall thickness stated in this document or the stated minimum required by the Finite Element Analysis (FEA) design provided by the pipe manufacturer, whichever is more stringent.

## 4.2.4 End Squareness

Pipe ends shall be square to the pipe axis. All points around each end of liner unit shall fall within ¼-inch.

## 4.2.5 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  $\pm 2$  degrees. The tolerance on the laying length of a fitting to be  $\pm 2$  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.

## 4.3 **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.
- Pipes – Pipes shall be manufactured and tested in accordance with ASTM D3262. Where minimum values differ between ASTM D3262 and the higher values of this specification; this specification will govern.
- Joints - Coupling joints to be qualified per the tests of Section 7 of ASTM D-4161.

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

- Stiffness – Minimum pipe stiffness when tested in accordance with ASTM D2412 shall normally be 46 psi.
- Strain Corrosion – Pipe to have minimum service life of 100 years per strain-corrosion testing.
- 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

Identify each pipe with the name of manufacturer, plant location, code date of manufacturer, nominal size (BN x HN), description “gravity pipe” and ISO 16611.

## 4.6 Installation

- Burial

The bedding and burial of pipe and fittings shall be in accordance with the project plans and specifications and the manufacturer’s requirements.

- Pipe Handling

Use textile slings, other suitable materials or a forklift. Use of chains or cables is prohibited.

- Jointing

- Clean ends of pipe and coupling components.
- Apply joint lubricant to pipe ends and elastomeric seals of coupling.
- Use only lubricants approved by the pipe manufacturer.
- Do not exceed forces recommended by the manufacturer for coupling pipe.
- Join pipes in straight alignment then deflect to required angle. Deflection angles exceeding the deflection permitted by the manufacturer is prohibited.

**PART 5: METHOD FOR MEASUREMENT 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\*\***

**REPLACE IN ITS ENTIRETY WITH  
NEW DOCUMENT**



# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

## SECTION 7.3

### PRECAST REINFORCE POLYMER CONCRETE MANHOLE

#### PART 1: GENERAL

##### 1.1 Scope of Work

This specification designates the requirements acid resistant precast reinforced polymer concrete manhole.

#### PART 2: QUALITY ASSURANCE

##### 2.1 Design Criteria

- Precast reinforced concrete manhole shall conform to:
  - Requirements of ASTM C857 and C858 for underground precast concrete utility structures.
  - AASHTO LRFD HL-93 design live loading applied to manhole cover and transition and base slabs.
  - Dead load of manhole sections fully supported by transition and base slabs.
  - Be designed for the specific site conditions and construction document requirements.
  - Be designed to resist buoyant forces due saturated soil.
  - Wall and slab minimum thicknesses shall be as calculated to resist design forces, but shall not be less than that required for: manufacture and handling; proper embedment of access hatch; proper installation of pipe penetration seal.

##### 2.2 Test Requirements

- For testing of precast (machine-made) manholes, a minimum of four test cylinders for design compressive strength shall be made for each day's production run of each size and class of culvert section. Strength tests for each production run will be based on the average strength of two cylinders which may be tested any time after completion of the specified curing period. When design strength is attained on the initial test, further tests on that run will not be required. Should the initial test fail to meet the design strength, subsequent tests shall be made at 28 days unless additional test cylinders were made during production of that run. Failure

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

to attain design compression strength by the 28-day test will result in rejection of the run represented by the test. Equipment required for testing for precast (machine-made) manholes shall be furnished by the fabricator. Cylinders for compressive strength tests shall be made in accordance with ASTM C31.

## 2.3 Permissible Variations

- Tolerances for precast sections shall conform to ASTM C858.
- Deviations from the above tolerances will be acceptable if the sections can be fitted at the plant or job site and it is determined that an acceptable joint can be made. For this condition an acceptable joint is:
  - When two sections are fitted together on a flat surface, in proper alignment and in the position they will be installed, the longitudinal opening at any point shall not exceed 1 inch. Sections fitted together at the plant and accepted in this manner shall be match-marked for installation.

## 2.4 Inspection

- The quality of materials, the process of manufacture, and the finished manhole shall be subject to inspection and approval by the Owner or an authorized representative at the manufacturing plant. In addition, the manhole shall be subject to further inspection by the Owner at the Project Site prior to and during installation.

## 2.5 Cause for Rejection

- The manhole shall be subject to rejection on account of failure to conform to any of the specification requirements. Individual sections of manhole may be rejected because of the following:
  - Fractures or cracks in the manhole.
  - Defects that indicate imperfect proportioning, mixing and molding.
  - Surface defects indicating honeycombed or open texture.
  - Damaged ends, where such damage would prevent making a structurally sound and water-tight joint.

## 2.6 Submittals

- Contractor shall furnish, prior to use of the materials, satisfactory written certification of the manufacturer's compliance with the standards and requirements of this specification.

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

- Manufacturer's product data sheets and details of following items:
  - Shop drawings of manhole sections, base units and construction details, jointing methods, manhole penetration locations, materials, and dimensions.
  - Summary of criteria used in manhole design including, as minimum, material properties, loadings, load combinations, and dimensions assumed.
  - Manufacturer's certification of compliance with ASTM Standards.
  - Materials to be used for lift hole seals.
  - Mix designs and test results.
  - Thermosetting Resin data sheets and certification.
  - Signed and sealed drawings by a Texas registered Professional Engineer.

## 2.7 Standards

- The applicable provisions of the following standards shall apply as if written here in their entirety:
  - American Society of Testing and Materials (ASTM) Standards:

ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C857	Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
ASTM C858	Standard Specification for Underground Precast Concrete Utility Structures
ASTM D648	Test Method for Deflection Temperature of Plastics Under Flexural Load in Edgewise Position
ASTM D6783	Standard Specification for Polymer Concrete Pipe.
ASTM D2584	Test Method for Ignition Loss of Cured Reinforced Resins.
ASTM C923	Standard Specifications for Resilient Connectors between Concrete Manholes Structures and Pipe.
ASTM C990	Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections using Preformed Flexible Joint Sealants
ASTM C497	Test Methods for Concrete Pipe, Manhole Sections, or Tile
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

- American Association of State Highway and Transportation Officials (AASHTO) Standards:

AASHTO LRFDS-9	LRFD Bridge Design Specifications
AASHTO M198-08	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections using Preformed Flexible Joint Sealants

- State Department of Highways and Public Transportation, Austin, Texas.

## 2.8 Delivery and Storage

- Coordinate delivery with installation where possible to avoid unnecessary handling and equipment movement. When stockpiling is required, storage shall be made as close as possible to the point of installation.
- Store precast sections on level blocking in a manner acceptable to the Engineer. No load shall be placed upon them until design strength is reached and curing completed. Shipment of sections may be made when the design strength and curing requirements have been met.
- Store flexible gasket materials not on the box section, and joint lubricating compounds in a cool dry place. Gaskets and preformed plastic materials for pipe joint construction shall be kept clean, away from oil, grease, excessive heat and out of the direct rays of the sun.

## PART 3: PRODUCTS

### 3.1 Materials

#### 3.1.1 Mixes, Resins, Grouts

Polymer Mixture - the mixture shall consist solely of thermosetting resin sand and aggregate. No cementitious materials shall be allowed as part of the mix design matrix. All sand and aggregate shall be nonreactive in an acid environment.

Thermosetting Resin - The resin shall have a minimum of deflection temperature of 158° F when tested at 264 psi (1.820 mPa) following Test Method D 648. The resin content shall not be less than 7% of the weight of the sample as determined by test method D 2584. Resin selection shall be suitable for applications in the corrosive conditions to which the structures will be exposed.

All materials needed for grouting and patching will be a polyester mortar compound provided by the manufacturer or an approved equal by the manufacture.

Concrete strength shall be 5000 psi minimum.

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

## 3.1.2 Glass Reinforcements

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

## 3.1.3 Acid Resistant Manhole

Materials, manufacture and curing of acid resistant precast reinforced concrete manhole shall conform to ASTM C478. Provide base riser section with integral floors, unless shown otherwise. Manhole shall be a precast concrete structure in accordance with the Drawings and Specifications, and shall be manufactured by Armorock Polymer Concrete, 207 Heritage Ct. Sulfur Springs, TX 75482, or approved equal.

## 3.1.4 Lengths

Use various lengths of manhole sections in combination to provide correct height with the fewest joints.

## 3.1.5 Cold Applied Preformed Gaskets

Cold applied preformed gaskets shall be suitable for sealing joints of tongue and groove concrete box sections. The gasket sealing the joint shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes or obnoxious odors. The gasket joint sealer shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength, and shall be supplied in extruded rope-form of suitable cross-section. The size of the gasket joint sealer shall be in accordance with the manufacturer's recommendations.

Gasket joint sealer shall be protected by a suitable removable two-piece wrapper. The two-piece wrapper shall be so designed that half may be removed longitudinally without disturbing the other half.

The chemical composition of the gasket joint sealing compound shall conform to the requirements of AASHTO M198-08 1, Type B, Flexible Plastic Gasket (Bitumen).

## 3.1.6 Workmanship and Finish

Manhole shall be substantially free from fractures, large or deep cracks and surface roughness. The ends of the manhole shall be normal to the walls and centerline of the

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

manhole within the limits of Permissible Variations specified above. The manhole exterior shall be coated with a bituminous coating for areas to be install below grade.

## 3.1.7 Markings

The following information shall be clearly marked on each section. Markings shall be indented on the manhole or painted thereon with waterproof paint.

- The load rating and ASTM Designation No. of the manhole.
- The date of manufacture.
- The name or trade name of the manufacturer.

## PART 4: EXECUTION

### 4.1 **Installation**

- Burial

The bedding and burial of pipe and fittings shall be in accordance with the project plans and specifications and the manufacturer's requirements.

- Laying

Manhole sections shall be installed such that the bottom section(s) shall be full sections. Partial sections, if necessary, shall be utilized for the top most section only. Manhole cover shall be separate from the manhole walls.

- Jointing

Joints using cold applied preformed plastic gaskets shall be made as follows:

- A suitable primer of the type recommended by the manufacturer of the gasket joint sealer shall be brush- applied to the tongue and groove joint surfaces and the end surfaces and allowed to dry and harden. No primer shall be applied over mud, sand, dirt or sharp cement protrusions. Clean and dry the surface to the primed when primer is applied.
- Before laying the manhole in the trench, attach the plastic gasket sealer around the tapered tongue or tapered groove near the shoulder or hub of each joint. Remove the paper wrapper from one side only of the two-piece wrapper on the gasket and press firmly to the clean, dry manhole joint surface. Do no remove the outside wrapper until immediately before pushing the manhole into its final position.

# REPLACE IN ITS ENTIRETY WITH NEW DOCUMENT

- When the tongue is correctly aligned with the flare of the groove, remove the outside wrapper on the gasket and pull or push home the manhole with sufficient force and power (Back Hoe shovel, chain hoist, ratchet hoist or winch) to cause the evidence of squeeze-out of the gasket material on the side of outside around the complex manhole joint perimeter.
- When the atmospheric temperature is below 60 F, plastic joint seal gaskets shall either be stored in an area warmed to above 70 F, or artificially warmed to this temperature in a manner satisfactory to the Engineer. Apply gaskets to manhole joints immediately prior to placing manhole in trench, followed by connection to previously laid box section.

## **PART 5: METHOD FOR MEASUREMENT 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\*\***