

# GREEN THREAD® Piping System

## GENERAL SPECIFICATIONS

### SECTION 1 – Scope

This section covers the use of fiberglass reinforced plastic (FRP) pipe for dilute acid, caustic, and mild solvent services up to 225°F and 450 psig steady pressure.

The piping system shall be furnished and installed complete with all fittings, joining materials, supports, specials, and other necessary appurtenances.

### SECTION 2 – General Conditions

**2.01 Coordination** - Material furnished and work performed under this section shall be coordinated with related work and equipment specified under other sections.

Valves            Section \_\_\_\_\_  
 Supports        Section \_\_\_\_\_  
 Equipment       Section \_\_\_\_\_

**2.02 Governing Standards** - Except as modified or supplemented herein, all materials and construction methods shall comply with the applicable provisions of the following specifications and be tested using the following standards:

#### Standard Specifications

ASTM D2996	Standard Specification for Filament Wound “Fiberglass” (Glass-Fiber-Reinforced Thermosetting) Resin Pipe
ASTM 4024	Standard Specification for Reinforced Thermosetting Resin (RTR) Flanges
ASTM D5685	Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced-Thermosetting Resin) Pressure Pipe Fittings
ASTM D2925	Beam Deflection of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe Under Bore Flow

#### Standard Test Methods

ASTM D2992	Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe
ASTM D1599	Standard Test method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings
ASTM D2105	Standard Test Method for Longitudinal Tensile Properties of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Tube
ASTM D2412	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

**2.03 Operating Conditions** - In addition to the above listed minimum design requirements, the system shall meet the following minimum operating conditions:

- a. Operating Pressure \_\_\_\_\_
- b. Operating Temperature \_\_\_\_\_
- c. Fluid Conveyed \_\_\_\_\_
- d. Test Pressure \_\_\_\_\_

**2.04 Quality Assurance** - Pipe manufacturer’s quality program shall be in compliance with ISO 9001 and/or API Q1.

**2.05 Delivery, Storage, and Handling** - Pipe and fittings shall be protected from damage due to impact and point loading. Pipe shall be properly supported to avoid damage due to flexural strains. The contractor shall not allow dirt, debris, or other extraneous materials to get into pipe and fittings. All factory machined areas shall be protected from sunlight until installed.

**2.06 Acceptable Manufacturers** - NOV Fiber Glass Systems, 501-568-4010, or approved equal.

### SECTION 3 – Materials and Construction

**3.01 1"-16" Pipe** - The pipe shall be manufactured by the filament winding process using an amine cured epoxy thermosetting resin to impregnate strands of continuous glass filaments, which are wound around a mandrel at a 54<sup>3</sup>/<sub>4</sub>° winding angle under controlled tension. Pipe shall be heat cured and the cure shall be confirmed using a Differential Scanning Calorimeter.

All pipe shall have a resin-rich corrosion barrier reinforced with surfacing veil. The corrosion barrier shall have a minimum resin content of 80%. The minimum acceptable cured thickness of the corrosion barrier shall be as follows:

1" - 1½"	15 mil nominal
2" - 3"	25 mil nominal
4" - 16"	30 mil nominal

Pipe shall be supplied with a matching tapered bell and a matching tapered spigot.

Pipe shall have a minimum continuous steady pressure rating of 225 psig at 225°F in accordance with ASTM D2992 Procedure A.

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**3.02 Flanges and Fittings** - All fittings shall be manufactured using the same type materials as the pipe. Fittings may be manufactured either by compression molding, spray-up/contact molding, or filament winding methods.

Fittings shall be adhesive bonded matched tapered bell and spigot or flanged.

Flanges shall have ANSI B16.5 Class 150 bolt hole patterns.

**3.03 Adhesive** - Adhesive shall be manufacturer's standard for the piping system specified.

**3.04 Gaskets** - Gaskets shall be 1/8" thick, 60-70 durometer full-face type suitable for the service shown on the drawings and as recommended in the manufacturer's standard installation procedures.

**3.05 Bolts, Nuts, and Washers** - ASTM F593, 304 stainless steel hex head bolts shall be supplied. SAE washers shall be supplied on all nuts and bolts.

**3.06 Acceptable Products** - GREEN THREAD as manufactured by NOV Fiber Glass Systems, or approved equal.

## SECTION 4 - Installation and Testing

**4.01 Training and Certification** - All joints installed or constructed in the field shall be assembled by employees of the contractor who have been trained by the pipe manufacturer. The pipe manufacturer or their authorized representative shall train the contractor's employees in the proper joining and assembly procedures required for the project, including hands-on participation by the contractor's employees. Each bondor shall fabricate one pipe-to-pipe and one pipe-to-fitting joint that shall pass the minimum pressure test for the application as stated in section 2.03.d without leaking.

Only bondors who have successfully completed the pressure test shall bond pipe and fittings.

Certification by the manufacturer shall be in compliance with ASME B31.3, Section A328.2 for the type of joint being made.

**4.02 Pipe Installation** - Pipe shall be installed as specified and indicated on the drawings.

The piping system shall be installed in accordance with the manufacturer's current published installation procedures.

**4.03 Testing** - A hydrostatic pressure test shall be conducted on the completed piping system. The piping system shall be subjected to 10 pressurization cycles from 0 psig to 1 1/2 times the design operating pressure as stated in section 2.03.d. After the 10 cycles, the pressure shall be held on the system for a minimum of 1 hour and the line inspected for leaks.

Test pressure shall not exceed 1 1/2 times the maximum rated pressure of the lowest rated element in the system.

Lines that are subjected to severe temperature cycles shall be tested at 1 1/2 times the cyclic pressure rating of the lowest rated component, even if the system shall operate at low pressure.

The system shall be filled with water at the lowest point and air bled off from the highest point. Systems shall be brought up to test pressure slowly to prevent water hammer or over-pressurization.

All pipe joints shall be water tight. All joints that are found to leak by observation or during testing shall be repaired by the contractor and retested.



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