

## GREEN THREAD® 250 Piping System

### GENERAL SPECIFICATIONS

#### **SECTION 1 – Scope**

This section covers the use of fiberglass reinforced plastics (FRP) pipe for critical services up to 230°F (110°C) and 250 psig (18 bar) steady pressure. This piping system shall be furnished and installed complete with all the fittings, joining materials, supports, specials and other necessary appurtenances.

#### **SECTION 2 – General Conditions**

**2.01 Coordination.** Materials furnished and work performed under this section shall be coordinated with related work and equipment specified under other sections, i.e. Valves, Supports and Equipment.

**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 tested using the following standards, and shall carry U.S. Coast Guard and ABS Type-Approval Certificates for the proposed services :

##### *Standard Specifications*

- ASTM D2996 - Standard Specification for Filament-Wound “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe
- ASTM D4024 - Standard Specification for Reinforced Thermosetting Resin (RTR) Flanges
- IMO A.753(18) - Guidelines for the Application of Plastic Pipes on Ships Standard Test Methods
- ASTM D2992 - Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings
- 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

ASTM F1173 - Standard Specification for Thermosetting Resin Fiberglass Pipe Systems to be used for Marine Applications

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

**2.04 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.

**2.05 Acceptable Manufacturers.** Fiber Glass Systems or approved equal.

#### **SECTION 3 – Materials and Construction**

**3.01 1”-24” (25mm-600mm) 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 54¾° winding angle under controlled tension. Pipe shall be heat cured and the cure shall be confirmed by determining the glass transition temperature.

All pipe shall be supplied with square-cut ends for use with mechanical couplings or with positive-stop socket joint fittings in the 1”-12” (25mm-300mm) sizes or matching tapered fittings in 14”-24” (350mm-600mm) sizes.

All pipe shall be supplied with a nominal 0.020” (0.5 mm) thick reinforced liner, made of the same resin system as the pipe. Minimum reinforced wall thickness of pipe shall be greater than 0.140” (3mm).

The pipe shall have a minimum continuous steady pressure rating of 250 psig (18 bar) at 200°F (93°C) in accordance with ASTM D2992 Procedure B.

Where required by code or specified on drawings, pipe shall be electrically conductive. Conductivity to be enabled by incorporation of conductive filaments (typically carbon or graphite) in the pipe wall, at predetermined intervals, and shall have a nominal 0.020” (0.5 mm) thick conductive liner reinforced with conductive veil, to prevent the accumulation of potentially incendive static charge buildup.

*Suggested specification for*  
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**3.02 Flanges and Fittings.** All fittings shall be manufactured using the same type materials as the pipe, and shall be manufactured by filament winding methods.

Fittings shall be adhesive bonded or flanged.

Flanges shall have ANSI B16.5 Class 150 bolt hole patterns, unless otherwise specified.

All fittings shall be made electrically conductive by the incorporation of conductive filaments (woven, non-woven or continuous) in the liner and /or wall of the fittings and flanges.

**3.03 Gaskets.** Gaskets shall be 1/8" (3 mm) 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.

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

**3.05 Bolts, Nuts, and Washers.** ASTM A307, Grade B, hex head bolts shall be supplied. Washers shall be supplied on all nuts and bolts.

**3.06 Acceptable Products.** GREEN THREAD 250 as manufactured by Fiber Glass Systems or approved equal.

**3.07 ASTM D-2996 Cell Classification.** Pipe shall conform to the following Cell Classifications.

1"	RTRP-11FW1-3111
1 1/2"	RTRP-11FW1-3111
2"	RTRP-11FW1-3112
3"	RTRP-11FW1-3112
4"	RTRP-11FW1-3112
6"	RTRP-11FW1-3113
8"	RTRP-11FW1-3116
10"	RTRP-11FW1-3116
12"	RTRP-11FW1-3116
14"	RTRP-11FW1-3116
16"	RTRP-11FW1-3116
18"	RTRP-11FW1-3116
20"	RTRP-11FW1-3116
24"	RTRP-11FW1-3116

**SECTION 4 –Fire Resistance**

**4.01 Fire Endurance.** Piping systems shall be designed to meet the following fire endurance requirements with no passive fire protection:

- 1) IMO A.753(18), Appendix 2, "Test Method for Fire Endurance Testing of Water Filled Plastic Piping," Level 3
- 2) ASTM F 1173, Section A5 "Wet Condition Classification of Water-Filled Plastic Pipe"

**SECTION 5 – Installation and Testing**

**5.01 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 training by the contractor's employees. Each bonder shall fabricate one pipe-to-pipe and one pipe-to-fitting joint which shall pass the minimum pressure test for the application without leaking. Training and certification shall be conducted in accordance with ANSI B31.3.

*This suggested specification is being provided only as a general reference for specifying FGS piping products. It is not intended to be all-inclusive or to address all of the specific applications or requirements for your particular project.*



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