AMERON
INTERNATIONAL
FIBERGLASS - COMPOSITE PIPE GROUP

Bondstrand® Guide Specification

Bondstrand 4000 Pipe & Fittings

Fiberglass reinforced thermosetting epoxy resin pipe for plant piping in general service

Scope

This specification defines the reinforced thermosetting resin (RTR) piping system to be used in those sections of Plant Piping–General Services calling for fiberglass piping systems.

References, Quality Assurance

References are made to other standards and tests which are a part of this section as modified. Where conflict exists between the requirements of this specification and listed references, the specification shall prevail.

Physical and Mechanical Properties

Pipe Property	Units	70°F 21°C		200°F 93°C		ASTM Method
Nominal Pipe Size		1", 1½" 8"-16"	2"-6"	1", 1½" 8"-16"	2"-6"	
Circumferential						
Tensile stress at weeping	10^3 psi MPa	18.50 128.00	32.00 220.00	- -	- -	D1599
Tensile modulus	10^6 psi GPa	3.65 25.20	4.20 29.00	3.20 22.10	3.70 25.50	
Poisson's ratio		0.56	0.26	0.68	0.32	D2105
Longitudinal Tensile strength	10^3 psi MPa	8.50 58.60	16.00 110.00	6.90 47.60	13.00 90.00	D2105
Tensile modulus	10^6 psi GPa	1.60 11.10	3.00 20.70	1.24 8.60	2.40 16.50	D2105
Poisson's ratio		0.37	0.16	0.41	0.20	D2105
Beam apparent Elastic modulus	10^6 psi GPa	1.70 11.70	2.40 16.60	1.08 6.90	1.77 12.20	D2925
Hydrostatic design basis (cyclic)	10^3 psi MPa	6.00 41.40	16.00[1] 110.00	- -	- -	D2992
Thermal conductivity Pipe wall	Btu•in/(hr•ft^2•°F) W/m•°C	1.70 0.25	1.70 0.25	- -	- -	C177
Thermal expansion Linear	10^{-6} in/in/°F 10^{-6} mm/mm°C	8.50 15.30	10.00 18.00	- -	- -	D696
Flow coefficient	Hazen-Williams	150.00	150.00	-	-	
Absolute roughness	10^{-6} ft 10^{-6} m	17.40 5.30	17.40 5.30	-	-	
Specific gravity	-	1.80	1.80	-	-	D792
Density	lb/in^3	0.07	0.07	-	-	

1) Static

Performance Requirements

Pipe shall be manufactured according to ASTM D2996 Specification for RTRP. When classified under ASTM D2310, the pipe shall meet Type I, Grade I and Class F (RTRP 11FE) cell limits in 2" through 16" nominal pipe sizes.

The piping system must meet USFDA requirements for food processing piping under Federal Regulations 21CFR 175.105 and 21CFR 177.242 when bonded with RP6B adhesive.

ISO-9001

DNV
CERTIFICATED FIRM

Materials

Pipe Construction

Filament-wound fiberglass reinforced epoxy resin pipe shall be Bondstrand® 4000 as manufactured by Ameron International Fiberglass Pipe Group, or approved equal. The integral reinforced corrosion barrier shall have a nominal 50 mil thickness and be constructed with the same epoxy resin as the pipe structural wall. Non-reinforced liners, or corrosion barriers, shall not be allowed due to potential for fracturing during lower temperatures, transportation and installation.

Structural wall

The pipe shall have the following nominal wall thickness:

Pipe Diameter (inches)	Nom. Wall Thickness inches	mm
2	.123	3.1
3	.126	3.2
4	.151	3.8
6	.181	4.6
8	.226	5.7
10	.226	5.7
12	.226	5.7
14	.250	6.4
16	.269	6.8

Pipe end preparation options

The piping manufacturer will provide 20' or 40' RL joints if the contractor requests them in sizes 2" through 6" to reduce field labor time in those sections of the system where longer lengths may be employed. Additionally, the pipe manufacturer will provide pipe joints with the spigot ends already prepared for adhesive application to reduce field labor time on all pipe sizes (2" – 16").

Pressure rating

Aromatic amine cured epoxy resin piping shall be rated for a minimum of 150 psi at 200°F in sizes through 16".

Fittings

It is important to maintain compatibility of fittings, piping and adhesives to ensure that the system performs as specified. Pipe, fittings and adhesive shall be supplied by the same manufacturer.

Filament-wound fittings

Fittings in 1" through 16" sizes shall be filament-wound with a reinforced resin-rich liner of equal or greater thickness than the pipe liner and shall be manufactured with the same resin type as the pipe.

Compression-molded fittings

Compression molded fittings in sizes 2" through 6" may be used in some services, contact manufacturer. Where fast closure of valves may produce surges (water hammer), filament-wound fittings will be used. Contact molded, spray up or hand lay-up fittings shall not be allowed.

Testing

Inspection and testing

Inspection and testing of the piping will be performed in accordance with the requirements of ANSI B31.1. Hydrostatic testing of all installed piping shall be performed with water at 1½ times the design pressure of the lowest rated piping system component.

Test and repair procedures

The RTRP manufacturer will provide test and repair procedures in the event field repairs are required.

Installation

Installation procedures and techniques as well as system design criteria including burial, anchoring, guiding and supporting shall be in accordance with manufacturer's recommendations.

Piping system installers and fitters will be trained by a direct factory employee of the piping system manufacturer and certified by the trainer prior to system assembly in the field.

Important Notice

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