

# Bondstrand Series 3300 Fiberglass Pipe

## (General Industrial Service)

### (For sizes 2 through 6 inch, use Series 3000 pipe and fittings products)

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#### Uses and Applications

- Boiler feed water
- Brine and brackish water
- Chemical process piping
- Cooling water
- Demineralized water
- Electroplating
- General service Class 300 piping
- Industrial plant piping
- Municipal waste
- Power plant and steel mill piping
- Sewer lines and sewer force mains
- Source and recycle water
- Sump discharge
- Vent lines
- Water mains
- Water treatment

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#### Performance

Pipe and fittings are rated at 300 psig.

Operating plus surge pressures to 1.25 times rated operating pressure occurring three times or less per 24-hour period.

No thrust blocks are required at rated system pressure for most buried piping configurations and most soil conditions. For above ground use, consult NOV Fiber Glass Systems.

Temperatures to 150°F (66°C) maximum. Sub-zero temperatures will not affect the physical properties.

Full vacuum capability when buried and properly backfilled. For above ground use, refer to collapse pressures listed below under Typical Pipe Performance.

Recommended burial depth: 3 to 25 feet.

Recommended for water, waste water (pH 1 to 8.5), and mild chemicals. Consult Corrosion Guide or Applications Engineering for recommendations for your particular application.

**Individual system components may not have the same ratings as the pipe. Refer to the detailed product information for the specific components to determine the pressure rating for the system as a whole.**

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#### Composition

##### Pipe

Filament-wound fiberglass reinforced epoxy pipe with integral epoxy liner and exterior coating.

Nominal Pipe Size		ASTM Designation	
in	mm	D2310	D2996
8 - 16	200 - 400	RTRP 11FW	RTRP 11FW1-3210

##### Fittings

8 to 16 inch: Filament-wound fiberglass reinforced epoxy elbows

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**Mitered tees, crosses, wyes, and laterals**

**Flanges**

Filament-wound fiberglass flange rings

Filament wound fiberglass stub ends

**Blind flanges**

Compression-molded fiberglass or epoxy-coated cast iron or steel.

**Adhesive**

Two-part epoxy adhesive

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**Joining Systems**

8 to 16 inch

Bell and spigot taper/taper adhesive-bonded joint.

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**Pipe Lengths**

Standard 20 and 39 ft. random lengths.

Other lengths available on request.

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**Fittings**

Elbows:

8 - 16 inch      90°      60°      45°      30°      22½°      11¼°

Tees      Flanges      Blind flanges

Concentric reducers      Reducer bushings      Sleeve couplings

For fittings dimensions, refer to the most recent release of product data sheets.

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### Typical Pipe Dimensions and Weights

Nominal Pipe Size		Outside Diameter		Inside Diameter		Wall Thickness			
						Total		Structural	
in	mm	in	mm	in	mm	in	mm	in	mm
8	200	8.64	219	8.30	211	0.170	4.3	0.140	3.6
10	250	10.85	273	10.42	264	0.215	5.5	0.185	4.7
12	300	12.78	324	12.30	312	0.240	6.1	0.210	5.3
14	350	14.53	367	14.00	356	0.265	6.7	0.235	6.0
16	400	16.65	419	16.03	407	0.310	7.9	0.282	7.2

Nominal Pipe Size		Taper Angle	Taper Length		Pipe Weight	
in	mm		deg	in	mm	lb/ft
8	200	2.00	2.6	66	3.1	4.60
10	250	2.00	3.1	79	4.5	6.70
12	300	2.00	3.6	91	6.1	9.10
14	350	2.00	5.4	137	8.8	13.00
16	400	2.00	6.1	155	11.4	16.90

### Typical Pipe Performance

Nominal Pipe Size		Static Pressure Rating at 150°F		Ultimate Internal Pressure <sup>(1)</sup>		Ultimate Collapse Pressure			
						80°F	27°C	150°F	65.6°C
in	mm	psig	bar	psig	bar	psig	bar	psig	bar
8	200	300	20.7	1,800	124	29	2.0	19	1.3
10	250	300	20.7	1,800	124	33	2.3	22	1.5
12	300	300	20.7	1,800	124	30	2.1	20	1.4
14	350	300	20.7	1,800	124	28	2.0	19	1.3
16	400	300	20.7	1,800	124	33	2.3	21	1.5

<sup>(1)</sup> Quality control minimum, biaxially loaded.

<b>Typical Physical Properties</b>			
Pipe Property	Units	Value	ASTM
Thermal conductivity	Btu-in/(h•ft <sup>2</sup> •°F)	1.7	C177
	W/m•°C	0.25	
Coefficient of thermal expansion (linear) 8 - 16 inch	10 <sup>-6</sup> in/in/°F	12.0	D696 E228
	10 <sup>-6</sup> cm/cm/°C	21.6	
Flow coefficient	Hazen-Williams	150.0	—
Absolute roughness	10 <sup>-6</sup> ft	50.0	—
	10 <sup>-6</sup> m	15.0	
Specific gravity	—	1.81	D792

<b>Typical Mechanical Properties</b>			
Pipe Property <sup>(1)</sup>	Units	Value	ASTM
Tensile strength Longitudinal	10 <sup>3</sup> psi	35	D2105
	MPa	240	
Circumferential	10 <sup>3</sup> psi	70	D1599 <sup>(4)</sup>
	MPa	483	
Tensile modulus Longitudinal	10 <sup>6</sup> psi	2.7	D2105
	GPa	18.5	
Circumferential	10 <sup>6</sup> psi	4.2	—
	GPa	29.0	
Compressive strength Longitudinal	10 <sup>3</sup> psi	35	—
	MPa	240	
Compressive modulus Longitudinal	10 <sup>6</sup> psi	2.7	—
	GPa	18.5	
Long-Term Hydrostatic Design Basis <sup>(3)</sup> Static, Hoop Stress 95% LCL 20-year Life @150°F/65°C	10 <sup>3</sup> psi	18.9	D2992 Procedure B
	MPa	130.3	
Cyclic, Hoop Stress 95% LCL 20-year Life @75°F/24°C	10 <sup>3</sup> psi	6.4	D2992 Procedure A
	MPa	44.1	
Poisson's Ratio <sup>(2)</sup> $\nu_{yx}$ $\nu_{xy}$	—	0.17	—
	—	0.15	

(1) Based on structural wall thickness.

(2) The first subscript denotes the direction of applied stress and the second subscript the measured strain contraction. x denotes longitudinal direction. y denotes circumferential direction.

(3) Test fixtures were free-end type (full end thrust).

Nominal Pipe Size		Change in Length Due to Pressure <sup>(1)</sup>		Stiffness Factor <sup>(2)</sup>	
in	mm	in/100 ft/100 psi	mm/30.5 m/6.9 bar	lb•in <sup>3</sup> /in <sup>2</sup>	N•m
8	200	0.503	6.07	500	56.5
10	250	0.478	6.77	750	84.7
12	300	0.498	6.01	1,250	141.2
14	350	0.507	6.12	1,600	180.8
16	400	0.483	5.84	2,000	226.0

(1) In an unrestrained system due to pressure effects alone.

(2) At 5% deflection.

### Support Spacing

(Values are based on a 1/2 inch (12 mm) deflection at mid span.)

Nominal Pipe Size		Single Span <sup>(1)</sup>						Continuous Span <sup>(2)</sup>					
		Gases		1.00 <sup>(3)</sup>		1.25		Gases		1.00		1.25	
in	mm	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m
8	200	27.8	8.5	16.4	5.0	15.4	4.7	41.6	12.7	24.5	7.5	23.0	7.0
10	250	32.1	9.8	18.6	5.7	17.5	5.3	48.1	14.7	27.8	8.5	26.2	8.0
12	300	34.8	10.6	19.8	6.0	18.7	5.7	52.0	15.8	29.6	9.0	27.9	8.5
14	350	35.9	10.9	21.3	6.5	20.1	6.1	53.7	16.4	31.8	9.7	30.0	9.1
16	400	38.9	11.9	23.0	7.0	21.7	6.6	58.2	17.7	34.4	10.5	32.4	9.9

<sup>(1)</sup> For fluid temperatures above 77°F (25°C) reduce span lengths 0.1-inch/°F (5 mm/°C)

<sup>(2)</sup> Beam fixed at both ends and uniformly distributed loads. Intermediate spans may be calculate by multiplying the single span length by 1.2.

<sup>(3)</sup> Fluid specific gravity.

### Bending Radius

Nominal Pipe Size		Minimum Bending Radius		Maximum Deflection per 39-ft Joint	Minimum Length Required for 10° Change	
in	mm	ft	m	deg	ft	m
8	200	293	89	8	51	16
10	250	364	111	6	63	19
12	300	472	144	5	82	25
14	350	570	174	4	100	30
16	400	626	191	4	109	33

<sup>(1)</sup> At rated pressure. Sharper bends may create excessive stress concentrations. **Do not** bend pipe until adhesive has cured.

# Guide Specification

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This specification covers performance, materials and physical properties requirements for general industrial service piping in 8 through 16 inch nominal pipe sizes at operating temperatures to 150°F.

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## Performance Requirements

Pipe, fittings and other components furnished under this specification shall be rated for service to 300 psig at 150°F. All components shall be rated at or above the design pressure of the system.

When classified in accordance with ASTM standards, the pipe shall meet the following cell limits:

Nominal Pipe Size		ASTM Designation	
in	mm	D2310	D2996
8 - 16	200 - 400	RTRP 11FW	RTRP 11FW1-3210

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## Materials

**Liner**—All filament-wound pipe shall incorporate an integral liner with a nominal thickness of 0.025 ± 0.005. The resin system used in the liner shall be a chemically resistant thermosetting epoxy resin suitable for the intended service.

**Structural wall**—Pipe shall be filament wound using continuous glass fiber reinforcements with a resin-compatible finish and a chemically resistant thermosetting epoxy resin. The glass filaments shall be wound in a dual-angle pattern that takes optimum advantage of the tensile strength of the filaments. The glass fiber content of the reinforced wall shall not be less than 60% by weight. Pigments or dyes may be used in the resin as long as the product remains translucent.

**External surface**—The pipe shall have a typical 0.005-inch thick resin-rich coating with organic fibrous reinforcement. This protection must be provided for both above and below-ground pipe installations. All external surfaces must be resistant to anticipated corrosion imposed by the service and the environment.

**Fittings**—Fittings supplied under this specification shall be filament-wound, compression molded, centrifugally cast, or manufactured from mitered pipe sections. The glass fiber content of the structural portion of compression-molded and filament-wound fittings shall not be less than 55% by weight.

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## Joining Methods

**Adhesive-bonded bell and spigot**—Both tapered bell and tapered spigot shall have matching taper angles and shall be joined by bonding with an epoxy adhesive. The nominal taper angle shall be 2° on 8 through 16 inch nominal pipe sizes. The adhesive shall be a two part epoxy supplied as a kit with all necessary application materials.

**Flanges**—Flanges shall be two-piece van Stone type provided with raised grooves on the sealing surface. Fiberglass-reinforced compression-molded or centrifugally cast stub ends are to be adhesive bonded to the pipe or fitting.

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**Pipe Construction**

**Pipe**—Outside diameter tolerances shall not exceed  $\pm 1.0\%$ . Pipe shall be provided in 40-ft random lengths (34 through 42 ft) unless otherwise specified. Up to 10 percent shorts may be included in any shipment unless otherwise agreed upon in writing between purchaser and manufacturer.

**Wall thickness**—The total wall thickness of pipe furnished to this specification shall not at any point be greater than 120 percent nor less than 87.5 percent of the nominal thickness. Nominal wall thickness shall have dimensions as given in the manufacturer's published literature.

**Fittings and flanges**—Fittings and flanges shall have dimensions as given in the manufacturer's published literature. Flanges shall be drilled to match ANSI B16.5, Class 150 unless specified otherwise in the purchase order.

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**Physical and Mechanical Requirements**

Values for physical and mechanical properties shall be no less than 95% of those shown tabulated above under Typical Physical Properties and Typical Mechanical Properties.

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**Workmanship**

The pipe and fittings shall be free from all defects, including delamination, indentations, pinholes, foreign inclusions, bubbles and resin-starved areas which, due to their nature, degree or extent, detrimentally affect the strength and serviceability of the pipe or fittings. Pigments or dyes may be used in the resin as long as the product is sufficiently translucent to verify the structural integrity of the structural wall. The pipe and fittings shall be as uniform as commercially practicable in color, density and other physical properties.

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**Testing**

**Quality control testing**—Samples of pipe and fittings shall be tested at random based on standard quality control practices to determine conformance of the materials to the following ASTM guidelines for testing fiberglass pipe products: ASTM D1599, D2105, D2925, D2992A or D2992B. Test samples may be hydrostatically tested by the manufacturer to 1.5 times the pressure rating for signs of leakage.

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**Marking**

Each component shall be marked to show the following:

- Manufacturer's name and address
- Nominal pipe size
- Hydrostatic test pressure (if so ordered)
- Date and shift of manufacture (pipe only)

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