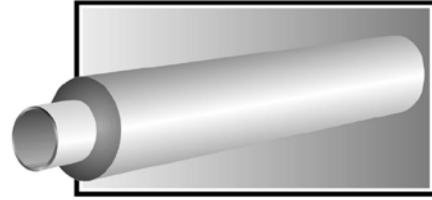


Submittal Data

Fiberglass Bondstrand 2000 Pipe



Uses and Applications

- Chilled Water
- Chilled – Hot Water
- Domestic Hot Water
- Condensate (Hot Water) return
- General service piping
- Jet fuel piping
- Mild chemicals
- Municipal waste
- Potable water
- Power plant, steel mill and industrial plant piping
- Sewer lines and sewer force mains
- Water mains
- Water treatment

Listing

- Mil-P-29206A for jet fuel and petroleum liquids.
- U.S. Federal Regulations 21CFR175.105 and 21CFR177.2280 for conveying foodstuffs when joined with Bondstrand RP6B epoxy adhesive.

Performance

- Pipe designs to 3.1 MPa (450 psi) using an 41.2 MPa (8000 psi) hydrostatic design stress in accordance with ASTM D2992 (B).
- Continuous operating temperatures to 121°C (250°F).
- Excellent corrosion resistance over a wide temperature range. See most recent release of Bondstrand Corrosion Guide (FP132) for specific applications.
- Weighs 1/6th as much as Sch. 40 steel.
- Does not require thrust blocks at ambient temperatures when properly installed in most soils.
- Smooth inner liner (Hazen-Williams C=150) produces extremely low frictional loss for greater discharge and reduced pumping costs.
- Low thermal conductivity (1/100th of steel) minimizes heat losses.

- 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.

Joining Systems

- Quick-Lock[®] straight/taper adhesive-bonded joint. 50-150mm (2-6 in.) pipe outside diameter is within tolerance for reliable bonding without shaving. Integral pipe stop in socket featured for predictable, precise laying lengths.
- Flanges and flanged fittings.

Composition Pipe

- Filament-wound fiberglass reinforced epoxy resin pipe with integral resin rich reinforced liner of 0.5mm (20 mils) nominal thickness.

Filament-wound fittings

- Furnished with 1.3mm (50 mil) reinforced liner using same materials as the pipe.

Tees	Flanges*
90 ^o and 45 ^o elbows	Nipples and couplings
Crosses	Tapered body reducers
45 ^o laterals	Saddles*

*no liner

Molded fittings

- Tees
- 90^o and 45^o elbows
- Reducing flanges
- Plugs and end-caps
- Reducer bushings
- Blind flanges

Flanged fittings

- 2-12 inch long filament-wound flanged fittings match ANSI B16.1 bolt hole pattern and face-to-face dimensions for 150 lb flanges.
- 1-16 inch flanges match ANSI B16.1 and ANSI B16.5 bolt hole pattern for 150 lb flanges.

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- Other flange drilling patterns such as DIN, ISO, JIS, ANSI B16.5 300 lb. etc., available on special request.
- RP6B two-part epoxy adhesive for service in compliance with U.S. Federal Regulations 21CFR175.105 and 21CFR177.2280

Thermosetting adhesives

- PSX™ •34 two-part epoxy adhesive for general industrial service.

Pipe Lengths

Nominal Pipe Size		Random Lengths ¹	
mm	in	m	ft
25-40	1-1/12	3	10
50-150	2-6	6 or 12	20 or 40
200	8	6 or 9	20 or 30
250-400	10-16	6	20

1) Other lengths and exact lengths available on special request.

Typical pipe dimensions and weights

Nominal Pipe Size		Pipe ID		Nominal Wall Thickness ¹		Average Sectional Area ²		Pipe Weight	
in	mm	in	mm	in	mm	in ²	mm ²	lb/ft	kg/m
1	25	1.07	27	.140	3.6	0.50	323	0.4	0.6
1 ½	40	1.67	42	.140	3.6	0.80	516	0.7	1.0
2 ³	50	2.10	53	.123	3.7	.73	730	0.7	1.3
3 ³	80	3.21	82	.126	3.7	1.07	1100	1.1	1.8
4 ³	100	4.14	105	.151	3.8	1.78	1760	1.7	3.0
6 ³	150	6.19	159	.181	4.6	3.22	2620	2.6	4.5
8	200	8.22	209	.226	5.7	5.83	3760	4.3	6.4
10	250	10.35	263	.226	5.7	7.31	4720	5.4	8.0
12	300	12.35	314	.226	5.7	8.69	5610	6.4	9.5
14	350	13.56	344	.250	6.4	10.32	6660	7.4	11.0
16	400	15.50	394	.269	6.8	13.33	8600	9.5	14.1

1) Minimum wall thickness shall not less than 87.5% of nominal wall thickness in accordance with ASTM D2996.

2) Use these values for calculating longitudinal thrust.

3) No-shave pipe.

Typical pipe performance

Nominal Pipe Size		Internal Pressure Rating ¹		Collapse Pressure Rating ²		Designation
in	mm	Psig	MPa	psig	MPa	Per ASTM D2996
1	25	450	3.10	945	6.52	RTRP-11RE-1112
1 ½	40	450	3.10	280	1.93	RTRP-11FE-1114
2 ³	50	450	3.10	260	1.80	11FW-2232
3 ³	80	450	3.10	80	0.55	11FW-2232
4 ³	100	450	3.10	70	0.48	11FW-2232
6 ³	150	375	2.59	50	0.34	11FW-2232
8	200	250	1.72	30	0.21	RTRP-11FE-1114
10	250	200	1.38	14	0.097	RTRP-11FE-1114
12	300	170	1.17	8	0.055	RTRP-11FE-1114
14	350	165	1.14	8	0.055	RTRP-11FE-1115
16	400	165	1.14	8	0.055	RTRP-11FE-1116

1). At 94°C (200°F) using Bondstrand type PSX™ •34 adhesive. For sustained service above 200°F, reduce ratings linearly to 50% from (200°F) to 121°C (250°F)

2). At 21°C (70°F). Reduce linearly to 90% at 66°C (150°F), 80% at 94°C (200°F), and 65% at 110°C (230°F).

3) No-shave pipe.

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.

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Filament-wound fittings

- Fittings in 50-400mm (2-16") 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 50-250mm (2-6") may be used in services at or below 94° C (200°F). 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

Fittings pressure ratings

Nominal Pipe Size		Elbows & Tees				Tapered Body Reducers & Flanges		Blind Flanges & Bushed Saddles	
		Filament-wound		Molded					
<i>in</i>	mm	<i>psig</i>	MPa	<i>psig</i>	MPa	<i>psig</i>	MPa	<i>psig</i>	MPa
1	25	300	2.07	-	-	600	4.14	150	1.03
1 ½	40	300	2.07	-	-	550	3.79	150	1.03
2 ³	50	375	2.59	300	2.07	450	3.10	150	1.03
3 ³	80	325	2.24	225	1.55	350	2.41	150	1.03
4 ³	100	300	2.07	175	1.21	350	2.41	150	1.03
6 ³	150	225	1.55	150	1.03	250	1.72	150	1.03
8	200	225	1.55	-	-	225	1.55	150	1.03
10	250	200	1.38	-	-	175	1.21	150	1.03
12	300	175	1.21	-	-	150	1.03	150	1.03
14	350	150	1.03	-	-	150	1.03	-	-
16	400	150	1.03	-	-	150	1.03	-	-

- Refer to FP282 for fittings dimensions.
- With 316 stainless steel outlet. Other outlet materials available on special order.
- No-shave pipe.

Nominal Pipe Size		Laterals		Crosses		Reducer Bushings	
		<i>psig</i>	MPa	<i>psig</i>	MPa	<i>psig</i>	MPa
<i>in</i>	mm	<i>psig</i>	MPa	<i>psig</i>	MPa	<i>psig</i>	MPa
1	25	-	-	-	-	50	.35
1 ½	40	-	-	-	-	50	.35
2 ²	50	275	1.90	150	1.03	50	.35
3 ²	80	250	1.72	150	1.03	50	.35
4 ²	100	200	1.38	150	1.03	50	.35
6 ²	150	150	1.03	100	0.69	50	.35
8	200	150	1.03	100	0.69	50	.35
10	250	150	1.03	100	0.69	50	.35
12	300	150	1.03	100	0.69	50	.35
14	350	150	1.03	100	0.69	50	.35
16	400	150	1.03	100	0.69	50	.35

- Reducer bushings bonded into flanges will have the same rating as the flange. Otherwise, rated as shown.
- No-shave pipe.

Bending radius

Nominal Pipe Size		Bending Radius ¹ (R)		Maximum Allowable Deflection, H, for 30m (100 ft) Bending Length, S		Turning Angle (α)
				<i>ft</i>	m	
<i>in</i>	mm	<i>ft</i>	m	<i>ft</i>	m	deg
1	25	45.2	13.8	24.9	7.6	127
1 ½	40	66.4	20.2	17.9	5.5	86
2 ²	50	72	22.9	15.9	4.8	76
3 ²	80	100	30.5	12.1	3.7	57
4 ²	100	200	70.0	6.4	2.0	29
6 ²	150	250	76.2	5.0	1.5	23
8	200	304	93	4.1	1.2	19
10	250	379	116	3.3	1.0	15
12	300	450	137	2.8	0.85	13
14	350	494	151	2.5	0.76	12
16	400	564	172	2.2	0.67	10

- Do not bend pipe until adhesive has cured. At rated pressure sharper bends may create excessive stress concentrations.
- No-shave pipe.

Typical Physical Properties

Pipe Property	Units	21°C 70°F		93°C 200°F		ASTM Method
Nominal Pipe Size		1", 1 1/2" 8"-16"	2"-6"	1", 1 1/2" 8"-16"	2"-6"	
Circumferential Tensile stress at weeping	10 ³ psi MPa	24.00 165.00	32.00 22.00	- -	- -	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	0.70	0.32	D2105
Longitudinal Tensile strength	10 ³ psi MPa	8.50 58.60	16.00 110.00	6.9 47.60	13.00 90.00	D2105
Tensile modulus	10 ⁶ psi Gpa	1.60 11.00	3.00 20.70	1.24 8.50	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	1.00 6.90	1.77 12.20	D2925
Hydrostatic design Basis (cyclic)	10 ³ psi MPa	6.00 ¹ 41.40	16.00 ^{1,2} 110.00	- -	- -	D2992

- 1) At 66°C (150°F)
- 2) Static

Nominal Pipe Size		Stiffness Factor ¹		Pipe Stiffness		Beam Moment of Inertia ²	
in	mm	lb•in	N•m	psi	MPa	in ⁴	10 ⁶ mm ⁴
1	25	770	87	26400	182	0.09	0.037
1 1/2	40	1610	182	17200	119	0.36	0.150
2 ³	50	265	30	1350	9.3	0.46	0.191
3 ³	80	285	32	550	3.80	1.57	0.653
4 ³	100	500	56	335	2.30	4.13	1.72
6 ³	150	925	104	200	1.40	16.5	6.87
8	200	1890	214	170	1.17	45.1	18.8
10	250	1890	214	86	0.59	88.6	36.9
12	300	1890	214	51	0.35	149.0	62.0
14	350	2230	252	46	0.32	208.0	86.6
16	400	3250	367	45	0.31	353.0	147.0

- 1) Per ASTM D2412
- 2) Use these values to calculate permissible spans.
- 3) No-shave pipe.

Typical Physical properties

Pipe Property	Units	Value		ASTM Method
Nominal Pipe Size		1", 1 1/2" 8"-16"	2"-6"	
Thermal conductivity Pipe wall	Btu•in/(hr•ft ² •°F) W/m•°C	2.00 0.29	1.70 10.25	C177
Thermal expansion Linear	10 ⁻⁶ in/in/°F 10 ⁻⁶ mm/mm°C	10.00 18.00	8.50 15.30	D696
Flow coefficient	Hazen-Williams	15.00	150.00	-
Absolute roughness	10 ⁻⁶ ft 10 ⁻⁶ m	17.40 5.30	17.40 3.30	-
Specific gravity	-	1.80	1.80	D792
Density	lb/in ³ g/cm ³	0.07 1.80	0.07 1.80	

Buried Installations

Thrust Blocks

- Most installations at ambient temperatures do not require thrust blocks.
- Consult Ameron or Urecon for information regarding blocking of buried pipelines for your specific application.

Live Loads

- Bondstrand 2000 will carry H2O wheel loadings of at least 7250 kg (16,000 lb) per axle when properly bedded in compacted sand in stable soils and provided with at least 1m (3ft) of cover.

Earth Loads on buried pipe

Nominal Pipe size		Maximum Earth Cover ¹					
		100 psi	0.69 MPa	125 psi	0.86 MPa	150 psi	1.03 MPa
<i>in</i>	mm	<i>ft</i>	m	<i>ft</i>	m	<i>ft</i>	m
1	25	30	9	30	9	30	9
1 ½	40	30	9	30	9	30	9
2 ²	50	30	9	30	9	30	9
3 ²	80	30	9	30	9	30	9
4 ²	100	30	9	30	9	30	9
6 ²	150	30	9	24	7	23	7
8	200	23	7	22	6	21	6
10	250	23	7	21	6	19	5
12	300	23	7	21	6	18	5
14	350	23	7	21	6	17	5
16	400	23	7	20	6	16	5

1) Based on a 1925 kg/m³ (120 lb/ft³) soil density 6.9 MPa (1000 psi) modulus of soil reaction.

2) No-shave pipe.

Span Lengths

- Recommended maximum support spacings for Bondstrand Series 2000 pipe at various operating temperatures.
- Values based on 12mm (0.5 in) deflection at midspan for fluid specific gravity = 1.0.

Nominal Pipe Size		Continuous Spans (ft)				Simple Spans (ft)			
<i>in</i>	mm	100 ^o F	150 ^o F	200 ^o F	250 ^o F	100 ^o F	150 ^o F	200 ^o F	250 ^o F
1	25	11.7	11.1	10.3	9.3	7.3	7.4	6.7	6.2
1 ½	40	13.8	13.0	12.1	11.0	9.2	8.7	8.1	7.3
2 ²	50	14.3	13.5	12.6	11.4	9.5	9.0	8.4	7.6
3 ²	80	16.2	15.4	14.3	12.9	10.8	10.2	9.5	8.6
4 ²	100	18.5	17.5	16.3	14.7	12.3	11.7	10.9	9.8
6 ²	150	20.7	19.6	18.2	16.5	13.8	13.1	12.1	11.0
8	200	22.9	21.7	20.2	18.2	15.3	14.5	13.5	12.2
10	250	24.3	23.0	21.4	19.3	16.2	15.3	14.3	12.9
12	300	25.5	24.1	22.4	20.3	17.0	16.1	15.0	13.5
14	350	26.5	25.0	23.3	21.1	17.6	16.7	15.5	14.0
16	400	28.2	26.7	24.9	22.5	18.9	17.8	16.6	15.0

1) Span recommendations include no provision for weights (fittings, valves, flanges, etc.) or thrusts (branches, turns, etc.). Fittings, valves, flanges and other appurtenances must be supported separately.

2) Span recommendations are calculated for a maximum long-term deflection of 12 mm (½ in) to ensure good appearance and adequate drainage.

3) Continuous spans are defined as interior (not end) spans that are uniform in length and free from structural rotation at the supports. Simple spans are supported only at the ends and are hinged or free to rotate at the supports.

4) No-shave pipe.

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.

Testing

Inspection and testing

- Inspection and testing of the piping will be performed in accordance with the requirements of ASMEB31.1 Hydrostatic testing of all installed piping shall be performed with water at 1 ½ 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.

IMPORTANT NOTICE

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