

# Series 2000MP Fiberglass Pipe and Fittings

certified to Specification MIL-P-28584B

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## Uses and applications

Chilled water  
Condensate return  
Domestic hot water  
Heating water  
Pumped hot water

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## Listings

MIL-P-28584B for pipe and fittings conveying water at pressures to 125 psig and temperatures to 250°F.

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## Performance

Excellent corrosion resistance over a wide temperature range.  
Weighs 1/6th as much as steel.  
Does not require thrust blocks at ambient temperatures when properly installed.  
Smooth inner liner produces extremely low frictional loss (Hazen-Williams C = 150) for greater discharge and reduced pumping costs.  
Low thermal conductivity (1/100th of steel) minimizes heat losses.

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## Composition

### Pipe

Filament-wound fiberglass reinforced epoxy resin pipe with nominal 0.020-inch (0.5 mm) resin-rich reinforced liner.

Continuous operating temperatures to 250°F (121°C).

### Filament-wound fittings

Furnished with reinforced liner using same materials as pipe.

Tees	45° elbows
90° elbows	Couplings
Flanges	Nipples
Saddles	Tapered body reducers

### Flanged fittings

Flanges match bolt-hole pattern for ANSI B16.5 150 lb flanges, ANSI B16.1 for 125 lb cast iron flanges and ISO Standard 2229.

### Thermosetting adhesives

PSX™•34 two-part epoxy adhesive for field fabrication.

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**Joining systems**

Quick-Lock® straight/taper adhesive-bonded joint featuring integral pipe stop in bell for predictable, precise laying lengths.

Flanges and flanged fittings.

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**Pipe lengths**

2- to 6-inch: 20-ft random lengths.

8- to 10-inch: 20-ft random lengths.

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**Fittings**

Elbows

Tees

Flanges, blind flanges and reducing flanges

Plugs and end-caps

Nipples and couplings

Tapered body reducers

Tapered body reducers, tees and 90° and 45° elbows are available with any combination of Quick-Lock female and filament-wound flange ends.

Laying lengths of filament-wound fittings with Quick-Lock ends match those of ANSI B16.9 steel butt welding fittings. Flanged ends match ANSI B16.1 and B16.5 center-to-face and face-to-face dimensions.

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**Mechanical properties<sup>1</sup>**

Pipe Property <sup>1</sup>	Units	70°F 21°C	150°F 66°C	200°F 93°C	250°F 121°C	Test Method
Circumferential						
Tensile stress at weeping	10 <sup>3</sup> psi MPa	24.0 165	- -	- -	- -	D1599
Tensile modulus	10 <sup>6</sup> psi GPa	3.65 25.2	3.44 23.7	3.20 22.1	2.98 20.5	
Poisson's ratio	-	0.56	0.60	0.70	0.79	Ameron
Longitudinal						
Tensile strength	10 <sup>3</sup> psi MPa	8.50 58.6	7.80 53.8	6.90 47.6	5.80 40.0	D2105
Tensile modulus	10 <sup>6</sup> psi GPa	1.60 11.0	1.35 9.3	1.24 8.5	1.10 7.6	D2105
Poisson's ratio	-	0.37	0.39	0.41	0.43	D2105
Beam apparent						
Elastic modulus	10 <sup>6</sup> psi GPa	1.70 11.7	1.30 9.0	1.00 6.9	- -	D2925
Hydrostatic design						
basis	10 <sup>3</sup> psi MPa	6.0 41.4	-- --	- -		D2992

## Physical properties

Pipe Property	Units	Value	Method
Thermal conductivity Pipe wall	Btu·in/(hr·ft <sup>2</sup> ·°F)	2.3	Ameron
	W/m·K	0.33	
Thermal expansion Linear	10 <sup>-6</sup> in/in/°F	10	Ameron
	10 <sup>-6</sup> mm/mm°C	18	
Flow coefficient	Hazen-Williams	150	–
Absolute roughness	10 <sup>-6</sup> ft	17.4	–
	10 <sup>-6</sup> m	5.3	–
Density	lb/in <sup>3</sup>	1.8	–
	g/cm <sup>3</sup>	0.065	–

## Typical pipe dimensions and weights

Nominal Pipe Size		Pipe ID		Nominal Wall Thickness*		Average** Sectional Area		Pipe Weight	
(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(lb/ft)	(kg/m)
2	50	2.10	53	.157	4.0	1.13	730	0.9	1.5
3	80	3.22	82	.157	4.0	1.70	1100	1.2	1.8
4	100	4.14	105	.203	5.2	2.73	1760	2.0	3.0
6	150	6.26	159	.203	5.2	4.06	2620	3.0	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	4710	5.4	8.1

\* Minimum wall thickness is 87.5% of nominal wall thickness.

\*\*Use these values for calculating longitudinal thrust.

## Typical pipe performance

Nominal Pipe Size		Internal Pressure Rating*		External Pressure Rating*	
(in)	(mm)	(psig)	(MPa)	(psig)	(MPa)
2	50	125	0.86	210	1.45
3	80	125	0.86	135	0.93
4	100	125	0.86	150	1.03
6	150	125	0.86	45	0.31
8	200	125	0.86	30	0.21
10	250	125	0.86	14	0.097

\* At 250°F (121°C) using Bondstrand RP34C adhesive.

\*\*At 70°F. Reduce linearly to 90% at 150°F and 80% at 210°F.

Nominal Pipe Size		Stiffness Factor*		Pipe Stiffness*		Beam Moment of Inertia**	
(in)	(mm)	(lb·in)	(N·m)	(psi)	(MPa)	(in <sup>4</sup> )	(10 <sup>6</sup> mm <sup>4</sup> )
2	50	620	70	2900	20.0	0.59	0.246
3	80	620	70	860	5.93	1.99	0.828
4	100	1360	154	890	6.14	5.50	2.29
6	150	1360	154	270	1.86	18.1	7.53
8	200	1890	214	175	1.17	45.1	18.8
10	250	1890	214	86	0.59	88.6	36.9

\* Per ASTM D2412.

\*\*Use these values to calculate permissible spans.

## Buried installations

### Thrust blocks

Most properly bedded Bondstrand 2000MP installations do not require thrust blocks. Consult Ameron for recommendations for systems operating at elevated temperatures.

### Live loads

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

Nominal Pipe Size		100 psi	Maximum Earth Cover		0.86 MPa
(in)	(mm)	(ft)	0.69 MPa (m)	125 psi (ft)	(m)
2	50	30	9.1	30	9.1
3	80	22	6.7	22	6.7
4	100	24	7.3	23	7.0
6	150	21	6.4	20	6.1
8	200	21	6.4	20	6.1
10	250	22	6.7	19	5.8

\* Based on a 120 lb/ft<sup>3</sup> (1925 kg/m<sup>3</sup>) soil density and 1000 psi (6.9 MPa) modulus of soil reaction.

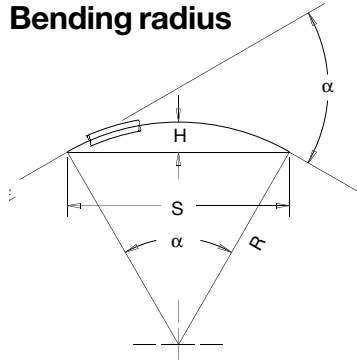
\*\*Internal operating pressure, psi (MPa).

## Support spacing

Recommended maximum support spacing for Bondstrand 2000MP pipe at various operating temperatures. Span recommendations are valid for normal horizontal piping support arrangements, a compromise between continuous spans and simple spans, but include no provision for weights such as fittings, flanges, etc. or thrust from branches, turns, etc. Span recommendations are calculated for a maximum long-term deflection of 1/2 inch to ensure good appearance and adequate drainage. Values are based on 1/2 inch deflection at midspan for fluid specific gravity = 1.0. For continuous spans, increase values by 20%. For end or single spans, decrease values by 20%.

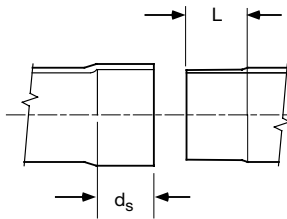
Nominal Pipe Size		Span (feet or meters) Temperature							
(in)	(mm)	100°F	37°C	150°F	66°C	200°F	99°C	250°F	122°C
2	50	13.0	3.9	11.7	3.6	10.4	3.2	9.2	2.8
3	80	14.6	4.5	13.3	4.1	12.0	3.7	10.7	3.3
4	100	16.8	5.1	15.0	4.6	13.2	4.0	11.4	3.5
6	150	18.7	5.7	17.0	5.2	15.2	4.6	13.5	4.1
8	200	21.2	6.5	19.2	5.9	17.2	5.2	15.2	4.6
10	250	22.3	6.8	20.3	6.2	18.4	5.6	16.4	5.0

## Bending radius



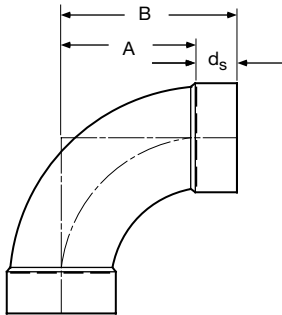
Nominal Pipe Size		Bending Radius, R*		Maximum Allowable Deflection, H, for 100-ft (30 m) Bending Length		Turning Angle, $\alpha$
(in)	(mm)	(ft)	(m)	(ft)	(m)	(deg)
2	50	83	26	14.6	4.5	69
3	80	123	38	10.1	3.1	47
4	100	158	46	7.9	2.4	36
6	150	233	71	5.4	1.6	25
8	200	304	93	4.1	1.3	19
10	250	379	116	3.3	1.0	15

## Quick-Lock bell and spigot dimensions



Quick-Lock Joint Size		Spigot Length L		Bell Depth $d_s$		Spigot Diameter			
(in)	(mm)	(in)	(mm)	(in)	(mm)	Minimum (in)	(mm)	Maximum (in)	(mm)
2	50	2.000	50.8	1.812	46.0	2.330	59.2	2.346	59.6
3	80	2.000	50.8	1.812	46.0	3.450	87.6	3.466	88.0
4	100	2.000	50.8	1.812	46.0	4.430	112.5	4.446	112.9
6	150	2.375	60.3	2.250	57.1	6.544	166.2	6.560	166.6
8	200	2.375	60.3	2.500	63.5	8.544	217.0	8.560	217.4
10	250	2.875	60.3	2.750	69.8	10.680	271.3	10.696	271.7

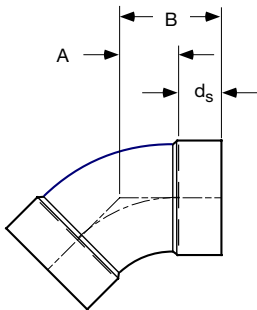
## 90° Elbows



Nominal Pipe Size		Laying Length A		Overall Length B		Approx Weight	
(in)	(mm)	(in)	(mm)	(in)	(mm)	(lb)	(kg)
2	50	3.00	76	4.81	122	1.1	.5
3	80	4.50	114	6.31	160	2.4	1.1
4	100	6.00	152	7.81	198	3.5	1.6
6	150	9.00	229	11.25	286	7.9	3.6
8	200	12.00	305	14.50	368	15	6.8
10	250	15.00	381	17.75	451	25	11.4

See Quick-Lock bell and spigot dimension table on page 5 for bell depth,  $d_s$

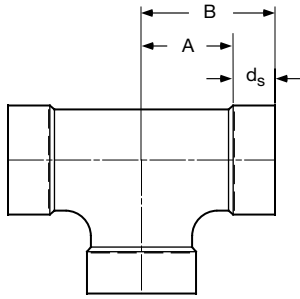
## 45° Elbows



Nominal Pipe Size		Laying Length A		Overall Length B		Approx Weight	
(in)	(mm)	(in)	(mm)	(in)	(mm)	(lb)	(kg)
2	50	1.38	35	3.19	81	0.9	.4
3	80	2.00	51	3.81	97	1.7	.6
4	100	2.50	64	4.31	109	2.5	1.1
6	150	3.75	95	6.00	152	5.2	2.4
8	200	5.00	127	7.50	191	9.3	4.2
10	250	6.25	159	9.00	229	16	7.3

See Quick-Lock bell and spigot dimension table on page 5 for bell depth,  $d_s$

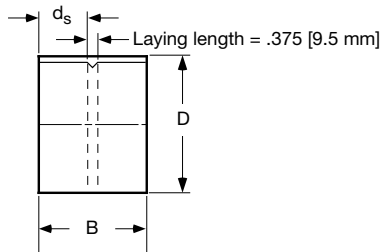
## Tees



Nominal Pipe Size		Laying Length A		Overall Length B		Approx Weight	
(in)	(mm)	(in)	(mm)	(in)	(mm)	(lb)	(kg)
2	50	2.50	64	4.31	109	2.1	1.0
3	80	3.38	86	5.19	132	4.1	1.9
4	100	4.13	105	5.94	151	5.0	2.3
6	150	5.63	143	7.88	200	11	5.0
8	200	7.00	178	9.50	241	18	8.2
10	250	14.50	368	17.25	438	38	17.3

See Quick-Lock bell and spigot dimension table on page 5 for bell depth,  $d_s$

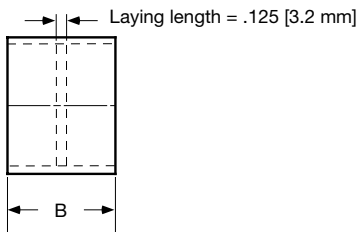
## Couplings



Nominal Pipe Size		Overall Length B		Outside Diameter D		Approx Weight	
(in)	(mm)	(in)	(mm)	(in)	(mm)	(lb)	(kg)
2	50	4.00	102	2.81	71	0.6	.3
3	80	4.00	102	3.94	100	0.9	.4
4	100	4.00	102	5.06	129	1.4	.6
6	150	4.88	124	7.19	183	2.4	1.1
8	200	5.38	137	9.25	235	3.8	1.7
10	250	5.88	149	11.38	289	5.2	2.4

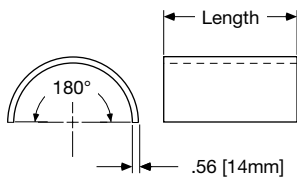
See Quick-Lock bell and spigot dimension table on page 5 for bell depth,  $d_s$

## Nipples and support saddles

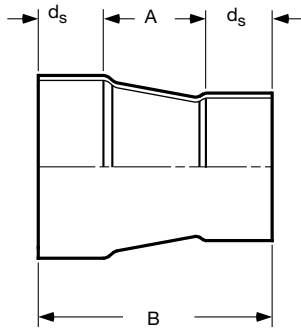


Nominal Pipe Size		Overall Length B		Approx Weight Nipple		Approx Weight Saddle*	
(in)	(mm)	(in)	(mm)	(lb)	(kg)	(lb/in)	(g/mm)
2	50	3.75	95	0.2	.09	0.2	4
3	80	3.75	95	0.3	.14	0.3	5
4	100	3.75	95	0.5	.23	0.4	7
6	150	4.63	118	0.9	.41	0.5	9
8	200	5.13	130	1.4	.64	0.6	11
10	250	5.63	143	1.9	.86	0.8	14

\* Saddles are used to protect pipe at supports and clamps and are available in lengths to 18 inches (500mm).



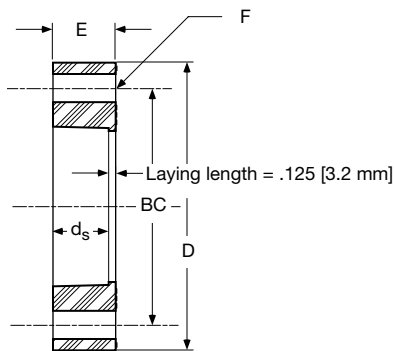
## Reducers



Nominal Pipe Size		Laying Length A		Overall Length B		Approx Weight	
(in)	(mm)	(in)	(mm)	(in)	(mm)	(lb)	(kg)
3 x 2	80 x 50	2.13	54	5.75	146	1.1	.5
4 x 2	100 x 50	3.00	76	6.63	168	2.1	.9
4 x 3	100 x 80	2.88	73	6.50	165	2.2	1.0
6 x 3	150 x 80	3.81	97	7.88	200	3.9	1.8
6 x 4	150 x 100	3.69	95	7.75	197	3.5	1.6
8 x 4	200 x 100	5.44	138	10.19	259	7.1	3.2
8 x 6	200 x 150	3.88	99	8.63	219	6.6	3.0
10 x 6	250 x 150	4.63	118	9.63	245	8.4	3.8
10 x 8	250 x 200	4.12	105	9.37	238	8.0	3.6

See Quick-Lock bell and spigot dimension table on page 5 for bell depth,  $d_s$

## Flanges



Nominal Pipe Size		Bolt Circle BC		Outside Diameter D		Thickness At Face E	
(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)
2	50	4.75	121	6.00	152	2.00	51
3	80	6.00	152	7.50	190	2.00	51
4	100	7.50	190	9.00	229	2.00	51
6	150	9.50	241	11.00	279	2.38	60
8	200	11.75	298	13.50	343	2.63	67
10	250	14.25	362	16.00	406	2.88	73

Nominal Pipe Size		Bolt Count	Hole Size F		Bolt Size		Approx Weight	
(in)	(mm)		(in)	(mm)	(in)	(mm)	(lb)	(kg)
2	50	4	0.75	19.1	0.63	16	3.0	1.4
3	80	4	0.75	19.1	0.63	16	4.1	1.9
4	100	8	0.75	19.1	0.63	16	6.1	2.8
6	150	8	0.88	22.4	0.75	19	9.4	4.3
8	200	8	0.88	22.4	0.75	19	14.9	6.8
10	250	12	1.00	25.4	0.88	22	20.5	9.3

See Quick-Lock bell and spigot dimension table on page 5 for bell depth,  $d_s$

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## Conversions

1 psi = 6895 Pa = 0.07031 kg/cm<sup>2</sup>  
1 bar = 10<sup>5</sup> Pa = 14.5 psi = 1.02 kg/cm<sup>2</sup>  
1 MPa = 10<sup>6</sup> Pa = 145 psi = 10.2 kg/cm<sup>2</sup>  
1 GPa = 10<sup>9</sup> Pa = 145,000 psi = 10,200 kg/cm<sup>2</sup>  
1 in = 25.4 mm  
1 ft = 0.3048 m  
1 lb-in = 0.113 N·m  
1 in<sup>4</sup> = 4.162 x 10<sup>-7</sup>m<sup>4</sup>  
°C = 5/9 (°F - 32)

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## Important Notice

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