



Bonstrand PSX.L3, PSX.L3C, PSX.JF and PSX.JFC Polysiloxane-phenolic Fire-resistant Fiberglass Pipe and Fittings

For offshore platforms, marine
and onshore service

Description

Bondstrand PSX•JF and PSX•L3 fiberglass reinforced polysiloxane-phenolic piping systems (non-conductive and conductive version) may be used for offshore platforms and onshore services where fire-resistant piping with low smoke emissions and low toxicity are required. Bondstrand PSX•JF and PSX•L3 products are designed for use in dry and wet deluge systems where low weight, corrosion resistance and fire-resistance are desired. The polysiloxane-phenolic (PSX™) resin is a revolutionary technological breakthrough developed through extensive research and testing by Ameron. The product is designed to withstand hydrocarbon fire including jet fire at over 300KW/m² heat flux from 0.3 kg/sec., high velocity impinging propane flame. Low smoke and toxicity emission, and low flame spread make it suitable for use in enclosed space and critical service areas.

Uses and applications

- Offshore fire water lines
- Onshore fire water lines
- Piping in offshore living quarters
- Refinery and petrochemical general applications
- Offshore general services

Approvals

PSX•L3 and PSX•JF have Type Approval from ABS (Certificate No.98-HS24317-X for Steel Vessel Rules (1997)) Section 4/6.14, MODU Rules (1997) Section 4/2.17, IMO Resolution A.753 (18)- Level 3 Fire Endurance Test.

PSX•L3 and PSX•L3C (conductive) have U.S. Coast Guard Type Approval per IMO Resolution A.753 (18) and PFM 1-98 (Certificates 164.141/5/0 and 164.141/6/0, respectively.)

Performance

PSX•JF pipe has proved capable of maintaining rated service pressure with no leak after exposure to impinging jet fire for a period of 5 minutes with the pipe empty, followed by injection of water at 150 psi (10 bar) and a flow rate of less than 73 litres/minute for an additional 15 minutes. After the heat was removed, the piping was pressurized for an additional 60 minutes at 150 psi (10 bar), then 60 minutes at 225 psi (15 bar), followed by 5 minutes at 350 psi (24 bar). No passive fire protection is needed on the joints.

PSX•L3 pipe is capable of maintaining rated service pressure after 30 minutes stagnant wet exposure to 1100°C fire and 113.5 kW/m² heat flux. PSX•L3 pipe and fittings meet IMO Level 3 fire test requirements even with the smallest diameter (1") pipe and Quick-Lock® joint with no passive fire protection needed on the joint.

Pipe and fittings are designed to operate at up to 16 bar system pressure.

Testing and standards

Bondstrand products are manufactured to meet the highest standard of quality in accordance with ISO 9001. The products are designed to meet ANSI and ASTM standards. Bondstrand PSX•L3/C and PSX•JF/C piping meet all applicable requirements of ASTM F1173 for fiberglass-reinforced resin pipe and fittings.

Testing for IMO Level 3 fire endurance has been performed by independent laboratories and witnessed by third parties. Det Norske Veritas has certified that PSX•L3 pipe systems meet the requirements for IMO Level 3. The United States Coast Guard has accepted PSX•L3 products for applications requiring IMO Level 3 performance in 8-inch and smaller diameters.

PSX•JF products have been tested by SINTEF Energy for performance in jet fire conditions in accordance with UKOOA guidelines. The PSX•JF system meets the requirements for fire endurance in a hydrocarbon jet fire, certified by SINTEF.

Characteristics

Pipe

PSX•L3/ PSX•L3C : Filament-wound fiberglass reinforced polysiloxane-phenolic resin with factory prepared Quick-Lock spigot ends (1" to 4") and Tapered ends (6" to 16").

PSX•JF/ PSX•JFC : Bondstrand PSX•L3/ PSX•L3C pipe with layers of thermoplastic tape and filament-wound polysiloxane-phenolic resin to form an integral fire protection jacket.

Fittings – Filament-wound fiberglass-reinforced polysiloxane-phenolic resin with integral Quick-Lock bell ends (1" to 4") and taper bell ends (6" to 16").

Flanges – Filament-wound fiberglass-reinforced polysiloxane-phenolic resin Quick-Lock (Taper) bell and flanged ends drilled to ANSI Class 150. Flanges conforming to other standards such as ANSI Class 300, JIS, DIN or ISO are available upon request.

Joining systems – Quick-Lock straight/taper (Taper) adhesive bonded joint, with integral pipe stop in bell for sizes 1" to 4". Matching taper adhesive bonded joint for 6-through 16-inch sizes for 232 psi (16 bar) rating.

Adhesive – Bondstrand PSX•34 epoxy siloxane adhesive for bonding PSX•L3/ PSX•JF joints. For more information, consult product data sheet FP698. It is available in 3oz and 6oz single kits. PSX•60 shall be used for PSX•L3C/ PSX•JFC joints.

Pipe lengths – Pipe is manufactured and shipped in the following standard lengths.

Nominal Pipe Size		
(in)	(mm)	(m)
1" - 1½"	25 – 40	3.0
2" - 6"	50 – 150	5.85
8" – 16"	200 – 400	5.85

Installation

The installation procedures for Bondstrand PSX pipe are identical to those for Series 2000M. For complete instructions refer to Ameron installation guide. Quick-Lock adhesive-Bonded Bell and Spigot Joints for Bondstrand Fiberglass Piping Systems, FP170 and Assembly Instructions for Bondstrand Taper-Taper Adhesive Bonded Joints, FP564A.

Typical Physical Properties

Pipe Property	Unit	Value	Test Method
Thermal conductivity	Btu•in./(hr. •ft. ² •°F)	2.3	Ameron
Pipe Wall	W/m ² •K	0.33	
Thermal Expansion, Linear	10 ⁻⁶ in./in. •°F	8.0	ASTM D696
	10 ⁻⁶ mm/mm •°C	18.0	
Flow Coefficient	Hazel-Williams	150	
Density	lb./in. ³	.069	
	g/cm ³	1.93	
Grounding resistance @ 1500 volts	10 ⁶ ohms	1.0 ¹	

Typical Mechanical Properties

Pipe Property	Unit	73°F/21°C	200°F/93°C	Test Method
Bi-axial				
Short term hoop tensile strength at weeping	psi Mpa	32,000 220		ASTM D1599
Circumferential				
Tensile strength	psi Mpa	21,900 151	19,100 131	ASTM D1599
Tensile Modulus	psi Gpa	3.48 x 10 ⁶ 24.0	2.59 x 10 ⁶ 17.8	Ameron
Poisson's ratio *		0.54	0.81	
Longitudinal				
Tensile strength	psi Mpa	7,680 53	4,870 33	ASTM D2105
Tensile Modulus	psi Gpa	1.35 x 10 ⁶ 9.3	0.73 x 10 ⁶ 5.0	ASTM D2105
Poisson's ratio **		.39	.44	

Note: Physical and Mechanical Properties shown above are for Bondstrand PSX•L3/ PSX•L3C. Since PSX•L3/ PSX•L3C forms the core of PSX.JF/ PSX•JFC pipe, these properties will apply to both systems.

* Circumferential change due to longitudinal applied stress.

** Longitudinal change due to circumferential applied stress.

Support Spacing for Bondstrand PSX·L3/ PSX·L3C

Recommended maximum support spacing for Bondstrand PSX•L3/ PSX•L3C pipe when carrying liquid with a specific gravity of 1.0 at various operating temperatures.

Nominal Pipe Size		150°F	66°C	200°F	93°C
in	mm	ft	m	ft	m
1	25	9.7	3.0	8.2	2.5
1½	40	10.9	3.3	9.2	2.8
2	50	11.8	3.6	10.0	3.1
3	80	13.5	4.1	11.4	3.5
4	100	15.3	4.7	13.0	4.0
6	150	17.2	5.1	14.6	4.2
8	200	19.8	6.0	16.8	5.1
10	250	22.1	6.7	18.7	5.7
12	300	24.1	7.3	20.4	6.2
14	350	25.0	7.6	21.2	6.5
16	400	26.7	8.1	22.6	6.9

Support Spacing for Bondstrand PSX·JF/ PSX·JFC

Recommended maximum support spacing for Bondstrand PSX•JF/ PSX•JFC pipe when carrying liquid with a specific gravity of 1.0

Nominal Pipe Size		150°F	66°C	200°F	93°C
in	mm	ft	m	ft	m
1	25	10.7	3.3	9.0	2.8
1½	40	11.7	3.8	9.9	3.0
2	50	13.0	4.0	11.0	3.4
3	80	14.9	4.5	12.6	3.8
4	100	16.7	5.1	14.2	4.3
6	150	18.9	5.7	16.0	4.9
8	200	21.2	6.5	17.9	5.5
10	250	23.5	7.2	19.9	6.1
12	300	25.5	7.8	21.6	6.6
14	350	26.3	8.0	22.3	6.8
16	400	28.0	8.5	23.7	7.2

Allowable Bending Radius for Bondstrand PSX•L3/ PSX•L3C at Rated Pressure

Nominal Pipe Size		Minimum Bending Radius		Maximum Deflection For 100 ft. length		Turning Angle
in	mm	ft.	m	ft.	m	deg.
1	25	58	17.7	28.7	8.7	119
1½	40	83	25.1	16.9	5.1	75
2	50	101	30.7	13.3	4.0	59
3	80	148	45.0	8.7	2.7	40
4	100	190	57.8	6.7	2.0	31
6	150	278	84.8	4.5	1.4	21
8	200	366	111.5	3.4	1.0	16
10	250	460	140.1	2.7	0.8	12
12	300	548	167.0	2.3	0.7	10
14	350	590	179.7	2.1	0.6	10
16	400	674	205.4	1.9	0.6	9

Note: Do not bend end pipe until adhesive has cured

Typical dimensions and weights for Bondstrand PSX•L3

Nominal Pipe Size		Pipe Inside Diameter		Min Total Wall Thickness		Pipe O.D.		Shipping Weight (approx)	
(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(lb/ft)	(kg/m)
1	25	1.07	27	.126	3.2	1.377	35	0.9	1.3
1½	40	1.66	42	.126	3.2	1.967	50	1.6	2.4
2	50	2.10	53	.134	3.4	2.420	62	1.7	2.5
3	80	3.22	82	.134	3.4	3.546	90	2.6	3.8
4	100	4.14	105	.177	4.5	4.554	116	3.6	5.3
6	150	6.27	159	.177	4.5	6.672	170	5.7	8.4
8	200	8.23	209	.197	5.0	8.672	220	7.8	11.6
10	250	10.35	263	.213	5.4	10.833	275	10.3	15.3
12	300	12.35	314	.252	6.4	12.912	328	12.9	19.1
14	350	13.56	344	.268	6.8	14.152	360	14.4	21.4
16	400	15.50	394	.307	7.8	16.172	411	18.1	26.9

Note: Pipe OD is for reference only and for use on support clamp design

Typical dimensions and weights for Bondstrand PSX•L3 Jacketed pipe

Nominal Pipe Size		Pipe Inside Diameter		Min Total Wall Thickness		Pipe O.D.		Shipping Weight (approx)	
(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(lb/ft)	(kg/m)
1	25	1.07	27	.220	5.6	1.566	40	0.9	1.3
1½	40	1.66	42	.220	5.6	2.156	55	1.6	2.4
2	50	2.10	53	.228	5.8	2.609	66	1.7	2.5
3	80	3.22	82	.228	5.8	3.735	95	2.6	3.8
4	100	4.14	105	.272	6.9	4.743	121	3.6	5.3
6	150	6.27	159	.272	6.9	6.861	174	5.7	8.4
8	200	8.23	209	.291	7.4	8.861	225	7.8	11.6
10	250	10.35	263	.307	7.8	11.022	280	10.3	15.3
12	300	12.35	314	.346	8.8	13.101	333	12.9	19.1
14	350	13.56	344	.362	9.2	14.341	364	14.4	21.4
16	400	15.50	394	.402	10.2	16.361	416	18.1	26.9

* Min. Total Wall includes 2.4mm thick jacket.

Note: Pipe OD is for reference only and for use on support clamp design.

Typical dimensions and weights for Bondstrand PSX•JF/ PSX• JFC pipe

Nominal Pipe Size		Pipe Inside Diameter		Min Total Wall Thickness		Pipe O.D.		Shipping Weight (approx)	
(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(lb/ft)	(kg/m)
1	25	1.07	27	.362	9.2	1.849	47	1.3	2.0
1½	40	1.66	42	.362	9.2	2.440	62	2.4	3.6
2	50	2.10	53	.370	9.4	2.893	74	2.5	3.8
3	80	3.22	82	.370	9.4	4.019	102	3.7	5.5
4	100	4.14	105	.413	10.5	5.026	128	4.9	7.3
6	150	6.27	159	.413	10.5	7.144	182	7.8	11.5
8	200	8.23	209	.433	11.0	9.144	232	11.1	16.5
10	250	10.35	263	.449	11.4	11.306	287	13.8	20.5
12	300	12.35	314	.488	12.4	13.385	340	17.0	25.4
14	350	13.56	344	.504	12.8	14.625	372	18.9	28.1
16	400	15.50	394	.543	13.8	16.644	423	23.2	34.5

* Min. total wall includes 6.0 mm thick jacket.

Note: Pipe OD is for reference only and for use on support clamp design

Technical support

Consult Ameron for further recommendations concerning the shoreside or offshore use of Bondstrand piping systems.

Important notice

This literature and the information and recommendations it contains are based on data reasonably believed to be reliable. However, such factors as variations in environment, application or installation, changes in operating procedures, or extrapolation of data may cause different results. Ameron makes no representation or warranty, expressed or implied, including warranties of merchantability or fitness for purpose, as to the accuracy, adequacy or completeness of the recommendations or information contained herein. Ameron assumes no liability whatsoever in connection with this literature or the information or recommendations it contains. Product specifications are subject to change.



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