

Bondstrand™ PSX Fire Resistant Pipe and Fittings

PSX-L3, PSX-L3C, PSX-JF and PSX-JFC Product Data



Applications

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

Materials and Characteristics

Pipe

PSX-L3/ PSX-L3C: Filament-wound fiberglass reinforced polysiloxane-phenolic resin with factory prepared Quick-Lock spigot ends (1" to 4"), tapered ends (6") and plain ends (8" 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.

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).

Joining System

Quick-Lock

Straight/taper (Taper) adhesive bonded joint, with integral pipe stop in bell for sizes 1" to 4".

Taper/Taper

Matching taper adhesive bonded joint for 6" size for 232 psi (16 bar) rating.

Plain End

Plain end adhesive bonded joint for 8" to 16" sizes for 232 psi (16 bar) rating.

Pipe Lengths

1 - 1 ½ inch (25 - 40 mm), 10 feet (3 m)

2 - 6 inch (50 - 150 mm), 20 feet (5.85 m)

8 - 16 inch (200 - 400 mm), 20 feet (5.85 m)

Adhesive

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

View of Joint Illustrations



Quick-Lock



Taper/Taper

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 polysiloxanephenolic (PSXTM) resin is a revolutionary technological breakthrough developed through extensive research and testing by NOV Fiber Glass Systems. 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.

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 liters/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. 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.

Installation

The installation procedures for Bondstrand PSX pipe are identical to those for Quick-Lock or Taper Joint. For complete instructions refer to NOV Fiber Glass Systems installation guide. Quick-Lock adhesive-Bonded Bell and Spigot Joints for Bondstrand Fiberglass Piping Systems, INS2003 and Assembly Instructions for Bondstrand Taper-Taper Adhesive Bonded Joints, INS2402

Nominal Dimensional Data (PSX-L3)

Nominal Pipe Size		ID		Minimal Total Wall Thickness		OD		Shipping Weight	
in	mm	in	mm	in	mm	in	mm	in	mm
1	25	1.1	27.0	0.1	3.2	1.377	35	0.60	0.6
1½	40	1.7	42.0	0.1	3.2	1.967	50	0.60	0.9
2	50	2.1	53.0	0.1	3.4	2.420	62	0.73	1.1
3	80	3.2	82.0	0.1	3.4	3.546	90	1.13	1.7
4	100	4.1	105.0	0.2	4.5	4.554	116	1.87	2.8
6	150	6.3	159.0	0.2	4.5	6.672	170	2.80	4.2
8	200	8.2	209.0	0.2	5.0	8.672	220	4.80	7.2
10	250	10.4	263.0	0.2	5.7	10.833	275.8	7.50	11.2
12	300	12.4	314.0	0.3	6.7	12.912	328.6	10.70	16.1
14	350	13.6	344.0	0.3	7.3	14.152	360.5	12.30	13.5
16	400	15.5	394.0	0.3	8.3	16.172	411.8	16.10	24.1

Nominal Dimensional Data (PSX-JF/PSX-JFC)

Nominal Pipe Size		ID		Minimal Total Wall Thickness		OD		Shipping Weight	
in	mm	in	mm	in	mm	in	mm	in	mm
1	25	1.07	27	0.362	9.2	1.95	48.9	1.33	2.1
1½	40	1.66	42	0.362	9.2	2.55	63.7	2.50	3.7
2	50	2.10	53	0.370	9.4	3.00	75.2	2.60	3.9
3	80	3.22	82	0.370	9.4	4.50	103.8	3.80	5.7
4	100	4.14	105	0.413	10.5	5.80	129.4	4.90	7.4
6	150	6.27	159	0.413	10.5	7.33	183.2	7.90	11.8
8	200	8.23	209	0.433	11.0	9.36	234.0	13.30	18.5
10	250	10.35	263	0.461	11.7	11.58	289.5	16.40	24.1
12	300	12.35	314	0.510	12.7	13.70	343.3	20.30	30.5
14	350	13.56	344	0.524	13.3	15.00	374.2	22.70	34.1
16	400	15.50	394	0.572	14.3	17.00	425.5	28.10	42.1

Maximum Support Spacing⁽¹⁾ (PSX-L3 / PSX-L3C)

Nominal Pipe Size		150°F	66°C	200°F	93°C
in	mm	ft	m	ft	m
1	25	7.5	2.3	7.2	2.2
1½	40	8.5	2.6	8.2	2.5
2	50	9.5	2.9	8.9	2.7
3	80	10.8	3.3	10.2	3.1
4	100	12.1	3.7	11.8	3.6
6	150	13.8	4.2	13.1	4.0
8	200	15.1	4.6	14.4	4.4
10	250	16.7	5.1	16.1	4.9
12	300	18.0	5.5	17.4	5.3
14	350	19.0	5.8	18.0	5.5
16	400	19.7	6.0	19.4	5.9

⁽¹⁾ 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.

Maximum Support Spacing⁽¹⁾ (PSX-JF / PSX-JFC)

Nominal Pipe Size		150°F	66°C	200°F	93°C
in	mm	ft	m	ft	m
1	25	6.6	2.0	6.2	1.9
1½	40	7.9	2.4	7.5	2.3
2	50	8.5	2.6	8.2	2.5
3	80	9.8	3.0	9.5	2.9
4	100	11.5	3.5	11.2	3.4
6	150	13.1	4.0	12.5	3.8
8	200	14.8	4.5	14.1	4.3
10	250	16.1	4.9	15.4	4.7
12	300	17.7	5.4	17.1	5.2
14	350	18.7	5.7	17.7	5.4
16	400	19.7	6.0	19.0	5.8

⁽¹⁾ Recommended maximum support spacing for Bondstrand PSX-JF/ PSX-JFC pipe when carrying liquid with a specific gravity of 1.0.

Typical Mechanical Properties

Pipe Properties	Units	73°F	21°C	200°F	93°C	Method
Short Term Hoop Stress at Weeping	psi/Mpa	23,000	220			ASTM D1599
Circumferential						
Hoop tensile strength	psi/Mpa	21,900	151	19,100	131	ASTM D2290
Hoop tensile modulus	psi/Gpa	3.48 x 10 ⁶	24.0	2.59 x 10 ⁶	17.8	ASTM D2290
Poisson's Ratio*	-	0.54		0.81		NOV FGS
Longitudinal						
Axial tensile strength	psi/Mpa	7,680	53	4,870	33	ASTM D2105
Axial strength modulus	psi/Gpa	1.35 x 10 ⁶	9.3	0.73 x 10 ⁶	5.0	ASTM D2105
Poisson's Ratio**	-	0.35		0.41		ASTM D2105

Typical Physical Properties

Pipe Properties	Value (Btu·in/(hr·ft. 2·°F))	Value (W/m·K)	Method
Thermal Conductivity Pipe Wall	2.3	0.33	NOV FGS
Thermal Expansion, Linear	8.0	18.0	ASTM D696
Flow Coefficient, Hazen-Williams	150		-
Density	0.069	1.93	-
Grounding Resistance @ 1500 volts	1.0 (10 ⁶ ohms)		ASTM D257

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.

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