Bondstrand™ 2400 Series Product Data

Glassfiber Reinforced Epoxy (GRE) pipe systems for Marine and Offshore services

Uses and Applications

- Ballast water
- Cooling water
- Disposal
- Drains
- Drilling muds
- Fire water
- Fresh water
- Potable water
- Produced water
- Cassions
- Saltwater/seawater
- Sanitary/sewage
- Column piping
- Vent lines

Approvals

ISO/FDIS 14692 is an international standard intended for offshore applications on both fixed and floating topsides facilities. It is used as guidance for the specification, manufacture, testing and installation of GRE (Glassfiber Reinforced Epoxy) piping systems. The United Kingdom Offshore Operators Association (UKOOA) Document Suite, issued in 1994, formed the basis of the ISO 14692 standard.

Bondstrand pipe series that are used in the offshore industry are designed in accordance with the above standards and/or type-approved by major certifying bodies. (*A complete list is available, on request*).

Materials and Characteristics

Filament wound Glassfiber Reinforced epoxy (GRE) pipe with an integral Taper female x shaved spigot adhesive bonded joint or Key-Lock integral female x male mechanical joint.

- Laminate meets requirements of API Specification 15LR and ISO 14692
- Pipe wall design based on hydrostatic design basis (Procedure B) with a 0.5 service factor
- Maximum operating temperature: 93°C (200°F). Temperatures up to 121°C (250°F) are possible. Please consult NOV Fiber Glass Systems
- Pipe sizes: 50 - 1000 mm (2” - 40”)
- Standard pressure rating up to 50 bar (363 psi). Higher pressure ratings are possible. Please consult NOV Fiber Glass Systems
- ASTM D-2310 classification: RTRP-11AW for conductive pipe and RTRP-11FW for non-conductive pipe

Joining Systems

Fittings

Filament wound Glassfiber Reinforced epoxy (GRE) fittings with integral taper female bell ends. A wide range of fittings is available.

Flanges

Filament wound GRE heavy duty and stub end flanges with integral taper female bell end are available. Standard flange drilling pattern per ASME B16.5 and B16.47A, Class 150 are available. Other drilling patterns, such as Class 300, DIN and JIS are available.

For dimensional data and standard configurations for fittings, refer to the respective fitting guides. Optionally, the system can be suppled conductive (Bondstrand 2400C) or with fireproofing (Bondstrand 2400FP).

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Pipe Lengths

From 50 - 150 mm (2”-6”)	9 m random length
From 200 - 1000 mm (8” - 40”)	11.89 m random length

Note: Overall pipe length depends on size, end configuration and production location.

Total Wall Thickness

Pipe Size		Pressure Class (bar)			
in	mm	2410	2416	2420	2425
2	50	2.3	2.3	2.3	2.3
3	80	2.3	2.3	2.3	2.7
4	100	2.3	2.5	2.7	3.3
6	150	2.5	3.4	3.8	4.6
8	200	3.1	4.2	4.8	5.8
10	250	3.5	5.1	5.8	7.2
12	300	3.9	6.0	6.8	8.4
14	350	4.1	6.6	7.4	9.2
16	400	4.5	7.4	8.4	10.5
18	450	4.9	8.1	9.2	11.5
20	500	5.4	8.9	10.1	12.7
24	600	6.3	10.6	12.1	15.1
28	700	7.4	12.6	14.3	17.9
30	750	7.9	13.5	15.3	19.1
32	800	8.4	14.3	16.3	20.4
36	900	9.3	16.1	18.2	22.8
40	1000	10.3	17.8	20.3	24.8

Note: Pipe wall thickness measured according to NOV Fiber Glass Systems' procedure.

Single Span Lengths

Pipe Size		Pressure Class (bar)			
in	mm	2410 m	2416 m	2420 m	2425 m
2	50	2.8	2.8	2.8	2.8
3	80	3.2	3.2	3.2	3.3
4	100	3.4	3.5	3.6	3.8
6	150	3.9	4.3	4.4	4.6
8	200	4.5	4.9	5.0	5.3
10	250	4.7	5.4	5.6	6.9
12	300	4.9	5.9	6.1	6.5
14	350	5.0	6.2	6.4	6.8
16	400	5.2	6.6	6.9	7.2
18	450	5.4	7.0	7.2	7.6
20	500	5.8	7.3	7.6	8.0
24	600	6.2	8.1	8.3	8.8
28	700	6.7	8.8	9.1	9.6
30	750	7.0	9.2	9.4	9.9
32	800	7.2	9.4	9.7	10.3
36	900	7.6	10.0	10.3	10.9
40	1000	8.0	10.6	10.9	11.4

Continuous Span Lengths

Pipe Size		Pressure Class (bar)			
in	mm	2410 m	2416 m	2420 m	2425 m
2	50	4.2	4.2	4.2	4.2
3	80	4.8	4.8	4.8	5.0
4	100	5.1	5.2	5.4	5.7
6	150	5.8	6.4	6.6	6.9
8	200	6.7	7.3	7.5	7.9
10	250	7.3	8.1	8.4	8.9
12	300	7.9	8.9	9.2	9.7
14	350	8.2	9.3	9.6	10.1
16	400	8.7	9.9	10.3	10.8
18	450	9.2	10.4	10.8	11.4
20	500	9.7	11.0	11.3	12.0
24	600	10.6	12.0	12.4	13.1
28	700	11.6	13.2	13.6	14.4
30	750	12.0	13.7	14.1	14.9
32	800	12.4	14.1	14.6	15.4
36	900	13.1	15.0	15.4	16.3
40	1000	13.8	15.8	16.3	17.2

Note: Span lengths are at 21°C (70°F).

Typical Mechanical Properties

Pipe Property	Units	Value 21°C	Value 93°C	Method
Hydrostatic Design Basis	N/mm²	161[1]	121	ASTM D2992, Proc. B (20 years)
Ultimate Hoop Stress at Weeping	N/mm²	280	334	ASTM D1599
Circumferential				
Hoop Tensile Strength	N/mm²	380	-	ASTM D2290
Hoop Tensile Modulus	N/mm²	26700	16300	ASTM D2290
Poisson's Ratio ν_{ha}[2]	-	0.61	0.80	NOV FGS
Longitudinal				
Axial Tensile Strength	N/mm²	80	65	ASTM D2105
Axial Strength Modulus	N/mm²	15500	8550	ASTM D2105
Poisson's Ratio ν_{ah}[3]	-	0.35	0.42	ASTM D2105
Axial Bending Strength	N/mm²	85	-	NOV FGS
Axial Bending Modulus	N/mm²	15500	9900	ASTM D2925
Shear Modulus	N/mm²	12100	11500	NOV FGS

Typical Physical Properties

Pipe Property	Units	Value	Method
Thermal Conductivity Pipe Wall	W/m°C	0.33	NOV FGS
Thermal Expansion @ 21°C	mm/mm°C	18×10^{-6}	ASTM D696
Thermal Expansion @ 93°C	mm/mm°C	24×10^{-6}	ASTM D696
Flow Efficient, Hazen Williams	-	150	-
Absolute Roughness	m	5.3×10^{-6}	-
Density	kg/m³	1800	-
Specific Gravity	-	1.8	ASTM D792
Specific Heat	J/kg°C	910	-
Grounding Resistance @ 500 Volt-Pipe	Ohm/m	$<1 \times 10^{-6}$	ASTM D257
Grounding Resistance @ 500 Volt-Ftg.	Ohm/ea	$<1 \times 10^{-6}$	ASTM D257
Shielding Capability	Volt	100	-

[1] value obtained at 65°C
[2] ν_{ha} = The ratio of axial strain to hoop strain resulting from stress in the hoop direction.
[3] ν_{ah} = The ratio of hoop strain to axial strain resulting from stress in the axial direction.

Specials

Consult the following literature for recommendations about design, installation and use of Bondstrand pipe, fittings and flanges:

Marketing Bulletin Engineering and Design Support Services
Assembly Instructions for Taper/Taper adhesive-bonded joints
Assembly Instructions for Bondstrand Fiberglass Flanges
Bondstrand Corrosion Guide for Fiberglass Pipe and Tubing
Bondstrand Pipe Shaver Overview
Bondstrand Marine Design Manual

Please consult NOV Fiber Glass Systems for the current version of the above literature.

Field testing

Bondstrand™ pipe systems are designed for hydrostatic testing with water at 150% of rated pressure.

Surge pressure

The maximum allowable surge pressure is 150% of the system rated pressure.

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