Centricast™ RB-2530 Product Data

Applications

- Acids
- Caustics
- Salts
- Solvents
- Chemical Process Solutions

Materials and Construction

All pipe is manufactured with glass fabrics and a highly resilient formulation of aromatic amine cured epoxy resin. A 100 mil integral corrosion barrier of pure resin provides excellent corrosion resistance. The pipe's proprietary resin formulation provides the toughness for many corrosive slurries. A 10 mil resin-rich reinforced external corrosion barrier proves excellent corrosion resistance and protection from ultraviolet (UV) radiation. Fiber Glass Systems warrants CENTRICAST RB-2530 pipe and fittings against UV degradation of physical properties and chemical resistance for 15 years.

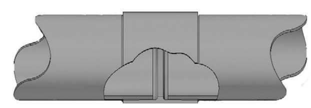
Pipe is available in **1" through 14"** diameters with pressure ratings up to 150 psig, with higher pressure ratings in smaller sizes. **Centricast RB-2530** comes in 20' nominal or exact lengths from 18.0-20.4 feet long.

Fittings

Fittings are manufactured with the same **chemical/temperature** capabilities as the pipe. Depending on the particular part and size, fittings will be compression molded, contact molded, hand fabricated or filament wound.

Joining Systems

Socket Joint
Adhesive bonded straight socket joint with positive stops. This is the standard for Centricast piping systems.



Nominal Dimensional Data

Pipe Size	I.D.		O.D.		Wall Thickness		Reinforcement Thickness		Weight		Capacity	
(In)	(In)	(mm)	(In)	(mm)	(In)	(mm)	(In)	(mm)	(Lbs/Ft)	(kg/m)	(Gal/Ft)	(Ft^3/Ft)
1	0.92	23.2	1.315	33.4	0.20	5.1	0.09	2.3	0.45	0.66	0.03	0.005
1½	1.40	35.6	1.900	48.3	0.25	6.4	0.14	3.6	0.82	1.23	0.08	0.011
2	1.88	47.6	2.375	60.3	0.25	6.4	0.14	3.6	1.06	1.58	0.14	0.019
3	3.00	76.2	3.500	88.9	0.25	6.4	0.14	3.6	1.62	2.42	0.37	0.049
4	3.94	100.1	4.500	114.0	0.28	7.1	0.17	4.3	2.36	3.51	0.63	0.085
6	6.07	154.0	6.625	168.0	0.28	7.1	0.17	4.3	3.55	5.28	1.50	0.201
8	8.03	204.0	8.625	219.0	0.30	7.6	0.19	4.8	4.99	7.43	2.63	0.351
10	10.10	256.0	10.750	273.0	0.33	8.4	0.22	5.6	6.87	10.2	4.15	0.555
12	12.10	307.0	12.750	324.0	0.33	8.4	0.22	5.6	8.19	12.2	5.96	0.797
14	13.30	339.0	14.000	356.0	0.33	8.4	0.22	5.6	9.01	13.4	7.26	0.971

Tolerances or maximum/minimum limits can be obtained from NOV Fiber Glass Systems.

Typical Mechanical Properties

Property		75°F psi	24°C MPa	150°F psi	65°C MPa	200°F psi	93°C MPa
Axial Tensile - ASTM D2105							
Ultimate Stress	2”- 14”	22,000	152	20,320	140	18,885	130
	1”- 1 1/2”	18,000	124	16,982	117	15,830	109
Modulus of Elasticity	2”- 14”	2.5×10^6	17,240	2.43×10^6	16,750	2.25×10^6	15,540
	1”- 1 1/2”	1.30×10^6	8,964	-	-	-	-
Poisson’s Ratio (1) ν_{ah} (ν_{ha})	2”- 14”	0.15 (0.15)					
Axial Compression – ASTM D695							
Ultimate Stress	2”- 14”	35,000	241	30,210	208	23,850	164
	1”- 1 1/2”	19,600	135	16,150	111	12,520	86
Modulus of Elasticity	2”- 14”	2.5×10^6	17,240	2.43×10^6	16,745	2.25×10^6	15,540
	1”- 1 1/2”	1.30×10^6	8,964	1.26×10^6	8,717	1.18×10^6	8,115
Beam Bending – ASTM D2925							
Modulus of Elasticity (Long Term)	2”- 14”	3.7×10^6	25,500	3.5×10^6	24,110	3.27×10^6	22,500
	1”- 1 1/2”	5.6×10^6		5.3×10^6	36,510	4.95×10^6	34,120
Hydrostatic Burst – ASTM D1599							
Ultimate Hoop Tensile Stress	2”- 14”	30,000	207	28,600	197	26,600	183
	1”- 1 1/2”	30,000	207	28,600	197	26,600	183
Hydrostatic Hoop Design Stress ASTM D2992 - Procedure B							
Static 20 Year Life	LTHS	17,490	120.6	11,250	77.6	6,973	48.1
	95% LCL	14,400	99.3	9,449	65.2	6,060	41.8
Static 50 Year Life	LTHS	16,100	111.0	10,040	69.2	5,889	40.6
	95% LCL	12,870	88.7	8,204	56.6	5,008	34.5
Parallel Plate - ASTM D 2412							
Modulus of Elasticity		2.7×10^6	18,620				

(1) ν_{ha} = The ratio of axial strain to hoop strain resulting from stress in the hoop direction.
ν_{ah} = The ratio of hoop strain to axial strain resulting from stress in the axial direction.

Typical Physical Properties

Thermal Expansion Coefficient - ASTM D696	12.0×10^{-6} in/in/°F		21.7×10^{-6} mm/mm/°C
Thermal Conductivity – ASTM C177	0.23 BTU/hr-ft-°F		0.4 W/m-°C
Specific Gravity – ASTM D792		1.47	
Absolute Surface Roughness	0.00021 in		

Testing:

See NOV Fiber Glass Systems’ **Socket Joint Installation Handbook.**

When possible, the piping system should be hydrostatically tested prior to beginning service. Care should be taken when testing to avoid water hammer. **All anchors, guides and supports must be in place prior to testing the line.**

Test pressure should not be more than 1½ times the working pressure of the piping system and never exceed 1½ times the rated operating pressure of the lowest rated component in the system.

Pressure Ratings for Uninsulated Piping Systems[1][2]						
Nominal Pipe Size (In)	Maximum Internal Pressure @ 225°F (psig)			Maximum External Pressure (psig)[6]		
	Socket Fittings[3]	Flanged Fittings[4]	Other Fittings[5]	75°F	150°F	250°F
1	300	300	-	2,125	1,849	1,381
1½	300	300	-	2,065	1,797	1,342
2	300	150	125	1,170	1,014	763
3	275	150	125	335	290	219
4	150	150	100	225	195	147
6	150	150	100	62	54	40
8	150	150	100	45	39	29
10	150	150	75	35	30	23
12	150	150	75	23	20	15
14	125	150	-	16	14	10

ASTM D2997 Designation Codes:	
1"- 1½"	RTRP-21CW-4326
2"- 4"	RTRP-21CW-4456
6"- 8"	RTRP-21CW-4455
10"- 12"	RTRP-21CW-4454
14"	RTRP-21CW-4553

[1]Static pressure ratings, typically created with use of a gear turbine, centrifugal, or multiplex pump having 4 or more pistons or elevation head.

[2]Specially fabricated higher pressure fittings are available on request. Consult the factory for compressible gases. For insulated and/or heat traced piping systems, use 100% of the uninsulated piping recommendations up to 200°F and reduce these ratings 50% for 200°F to 250°F operating temperatures. For uninsulated piping systems, reduce these ratings 30% for 225°F to 250°F operating temperatures. Heat cured adhesive joints are highly recommended for all piping systems carrying fluids at temperatures above 120°F.

[3]Socket elbows, tees, reducers, couplings, flanges and nipples joined with **Weldfast ZC-275** adhesive.

[4]Flanged elbows, tees, reducers, couplings and nipples assembled at factory.

[5]Laterals, crosses, and saddles.

[6]Ratings shown are 50% of ultimate; 14.7 psi external pressure is equal to full vacuum.

Recommended Operating Ratings				
Size (In)	Bending Radius Min. (Ft) Entire Temp. Range	Torque Max. (Ft Lbs) Entire Temp. Range	Parallel Plate Loading ASTM D2412	
			Stiffness Factor (In^3 Lbs/In^2)	Pipe Stiffness (psi)
1	88	41	225	6,700
1½	56	132	760	7,600
2	70	216	760	3,700
3	103	497	760	1,080
4	132	1,000	1,300	870
6	195	2,260	1,300	260
8	253	4,330	1,800	160
10	316	7,820	2,700	125
12	374	11,100	2,700	75
14	411	13,500	2,700	56

Water Hammer:

Care should be taken when designing an FRP piping system to eliminate sudden surges. Soft start pumps and slow actuating valves should be considered.

Support

Proper pipe support spacing depends on the temperature and weight of the fluid in the pipe. The support spacing table is based on unrestrained continuous beam theory using the pipe bending modulus derived from long-term beam bending tests. The maximum spans lengths were developed to ensure a design that limits mid-span deflection to ½ inch and dead weight bending to ⅛ of the ultimate bending stress. Any additional loads on the piping system such as insulation, wind, seismic, etc. requires further consideration. Restrained (anchored) piping systems operating at elevated temperatures may result in guide spacing requirements that are shorter than unrestrained piping systems. In this case, the maximum guide spacing governs the support span requirements for the system. Pipe spans near elbows require special attention. Both supported and unsupported elbows are considered in the following tables and must be followed to properly design the piping system.

There are seven basic rules to follow when designing piping system supports:

1. Do not exceed the recommended support span.
2. Support heavy valves and in-line equipment independently.
3. Protect pipe from external abrasion at supports.
4. Avoid point contact loads.
5. Avoid excessive bending. This applies to handling, transporting, initial layout, and final installed position.
6. Avoid excessive vertical loading to minimize bending stresses on pipe and fittings.
7. Provide adequate axial and lateral restraint to ensure line stability during rapid changes in flow.

Maximum Support Spacing for Uninsulated Pipe, Sg = 1.0

Pipe Size (In.)	Continuous Spans of Pipe (Ft.)		
	75°F	150°F	200°F
1	8.4	8.3	7.9
1½	16.6	16.4	16.1
2	18.3	18.0	17.7
3	20.7	20.4	20.1
4	23.3	22.9	22.3
6	26.0	25.7	25.3
8	28.8	28.4	27.9
10	31.6	31.1	30.6
12	33.1	32.7	32.1
14	34.0	33.6	33.0

Note: Consult factory for insulated pipe support spacing.

Spans are based on ½" (12.7 mm) maximum mid-span deflections. Total system stresses should always be taken into account during design.

Support Spacing vs. Specific Gravity

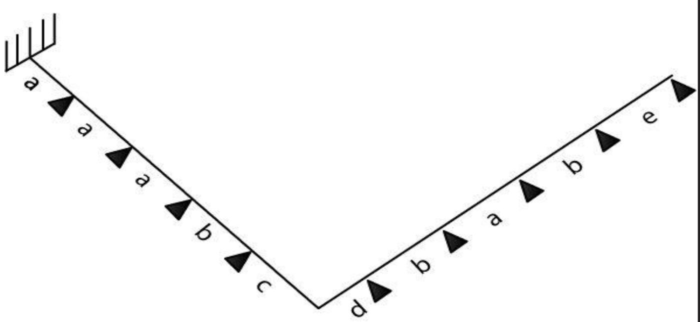
Specific Gravity	3.00	2.00	1.50	1.25	1.00	0.75	Gas/Air
Multiplier	0.76	0.84	0.90	0.95	1.00	1.07	1.40

Example: 6" pipe @ 150°F with 1.5 specific gravity fluid, maximum support spacing = 25.7 x 0.90 = 23.1 ft.

Adjustment Factors for Various Spans With Unsupported Fitting at Change in Direction

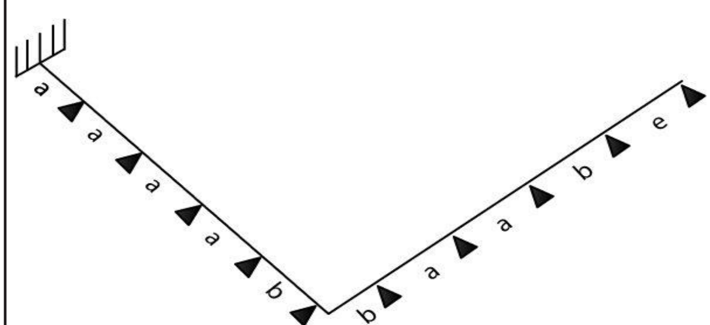
	Span Type	Factor
a	Continuous interior or fixed end spans	1.00
b	Second span from supported end or unsupported fitting	0.80
c+d	Sum of unsupported spans at fitting	≤0.75*
e	Simple supported end span	0.67

*For example: If continuous support is 10 ft., c+d must not exceed 7.5 ft. (c=3 ft. and d=4.5 ft.) would satisfy this condition.



Adjustment Factors for Various Spans With Supported Fitting at Change in Direction

	Span Type	Factor
a	Continuous interior or fixed end spans	1.00
b	Second span from simple supported end or unsupported fitting	0.80
e	Simple supported end span	0.67



Thermal Expansion

The effects of thermal gradients on piping systems may be significant and should be considered in every piping system stress analysis. Pipe line movements due to thermal expansion or contraction may cause high stresses or even buckle a pipe line if improperly restrained. Several piping system designs are used to manage thermal expansion and contraction in above ground piping systems. They are listed below according to economic preference:

1. Use of inherent flexibility in directional changes
2. Restraining axial movements and guiding to prevent buckling
3. Use expansion loops to absorb thermal movements
4. Use mechanical expansion joints to absorb thermal movements

To perform a thermal analysis the following information is required:

1. Isometric layout of piping system
2. Physical and material properties of pipe
3. Design temperatures
4. Installation temperature (final tie in temperature)
5. Terminal equipment load limits
6. Support movements

A comprehensive review of temperature effects on fiberglass pipe may be found in NOV Fiber Glass Systems' **Engineering and Piping Design Guide.**

Change in Temperature °F	Pipe Change in Length (In/100 Ft)
25	0.36
50	0.72
75	1.0
100	1.4
125	1.8

Elbow Strength Allowable Bending Moment - 90° Elbow

Nominal Pipe Size (In)	Allowable Moment (Ft•Lbs)	Nominal Pipe Size (In)	Allowable Moment (Ft•Lbs)
1	100	6	1,650
1½	150	8	2,850
2	225	10	4,500
3	475	12	6,500
4	650	14	10,000

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
ISO 9001:2008
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SUZHOU, CHINA
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