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.

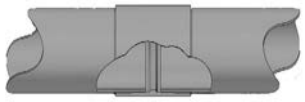
Pipe is available in **1" through 14"** diameters with pressure ratings up to 150 psig, with higher pressure ratings in smaller sizes. **Centricast RB-2530** comes in 20' nominal or exact lengths from 18.0-20.4 feet long.

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.

Properties of Pipe Sections Based on Minimum Reinforced Walls

Size (In)	Reinforcement End Area(In^2)	Reinforcement Moment of Inertia (In^4)	Reinforcement Section Modulus (In^3)	Nominal Wall End Area (In^2)
1	0.35	0.07	0.10	0.70
1½	0.77	0.30	0.32	1.30
2	0.98	0.62	0.52	1.67
3	1.48	2.09	1.19	2.55
4	2.31	5.43	2.41	3.71
6	3.45	18.00	5.42	5.58
8	5.03	44.80	10.40	7.85
10	7.28	101.00	18.80	10.80
12	8.66	170.00	26.70	12.90
14	9.52	226.00	32.30	14.20

Average Physical Properties

Property	75°F/ 24°C 1"		75°F/24°C 1½"-14"		225°F/107°C 1"		225°F/107°C 1½"-14"		250°F/121°C 1"		250°F/121°C 1½"-14"	
	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa
Axial Tensile - ASTM D2105												
Ultimate Stress	18,000	120	22,000	150	15,000	100	18,000	120	14,000	100	17,000	110
Design Stress	4,500	31	5,500	38	3,750	26	4,500	31	3.500	24	4,250	29
Modulus of Elasticity	-	-	2.5×10^6	17,000	-	-	2.1×10^6	14,000	-	-	1.9×10^6	13,000
Poisson's Ratio ν	0.15				0.15				0.15			
Axial Compression - ASTM D695												
Ultimate Stress	19,600	140	35,000	240	10,000	70	19,000	130	7.000	50	13,000	90
Design Stress	4,900	34	8,750	60	2,500	17	4,750	33	1,750	12	3,250	22
Modulus of Elasticity	1.3×10^6	9,000	2.5×10^6	17,000	1.1×10^6	8,000	2.1×10^6	14,000	1.0×0^6	7,000	1.9×10^6	13,000
Beam Bending - ASTM D2925												
Ultimate Stress	28,000	190	42,000	290	23,000	160	35,000	240	21,000	140	32,000	220
Design Stress[1]	3,500	24	5,250	36	2,875	20	4,375	30	2,625	18	4,000	28
Modulus of Elasticity (Long Term)	5.6×10^6	4,000	3.7×10^6	26,000	4.7×10^6	3,200	3.1×10^6	21,000	4.4×10^6	3,000	2.9×10^6	20,000
Hydrostatic Burst - ASTM D1599												
Ultimate Hoop Tensile Stress	30,000	210	30,000	210	25,000	170	25,000	170	23,000	160	23,000	160
Hoop Tensile Modulus of Elasticity	-	-	2.8×10^6	19,000	-	-	2.3×10^6	16,000	-	-	2.2×10^6	15,000
Hydrostatic Design - ASTM D2992, Procedure B-Hoop Tensile Stress Static 50 Year @ 75°F	16,090	110	16,090	110	-	-	-	-	-	-	-	-

[1]Stress and modulus values can be interpolated between temperatures shown.

Thermal Expansion Coefficient - ASTM D696	Non-Insulated Pipe: 11.0×10^{-6} In/In/°F • 19.9×10^{-6} mm/mm/°C Insulated Pipe: 12.0×10^{-6} In/In/°F • 21.7×10^{-6} mm/mm/°C	
Thermal Conductivity	0.07 BTU/hr-ft-°F	0.4 W/m-°C
Specific Gravity - ASTM D792	1.47	
Hazen-Williams Coefficient	150	
Absolute Surface Roughness	0.00021 Inch	0.0053 mm
Manning's Roughness Coefficient, n	0.009	

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 Pressure Fittings[3]	Flanged Pressure Fittings[4]	Other Pressure[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”	RTRP-21CW-4356
1½”-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)	Axial Tensile Loads Max. (Lbs) Temperature 75°F	250°F	Axial Compressive Loads Max. (Lbs)[1] Temperature 75°F	250°F	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)	Hoop Modulus x10^6 (psi)
1	1,560	1,200	1,700	600	50	41	164	4,791	2.7
1½	4,260	3,300	6,770	2,500	56	132	617	6,080	2.7
2	5,410	4,200	8,600	3,200	70	216	617	2,969	2.7
3	8,130	6,300	12,930	4,800	103	497	617	874	2.7
4	12,720	9,800	20,230	7,500	132	1,000	1,105	731	2.7
6	18,960	14,700	30,160	11,200	195	2,260	1,228	245	3.0
8	27,690	21,400	44,060	16,400	253	4,330	1,715	153	3.0
10	40,030	30,900	63,680	23,700	316	7,820	3,106	143	3.5
12	47,630	36,800	75,780	28,100	374	11,100	3,106	85	3.5
14	52,380	40,500	83,340	31,000	411	13,500	3,106	64	3.5

[1]Compressive loads are for short columns only.

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 1/8 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[1]

Pipe Size (In.)	Continuous Spans of Pipe (Ft.)[2]		
	75°F	150°F	250°F
1	8.4	8.3	7.9
1½	16.6	16.4	15.6
2	18.3	18.0	17.2
3	20.7	20.4	19.5
4	23.3	22.9	21.9
6	26.0	25.7	24.5
8	28.8	28.4	27.1
10	31.6	31.1	29.8
12	33.2	32.7	31.2
14	34.1	33.6	32.0

[1]Consult factory for insulated pipe support spacing.
[2]Maximum mid-span deflection ½" with a specific gravity of 1.0.

Support Spacing vs. Specific Gravity

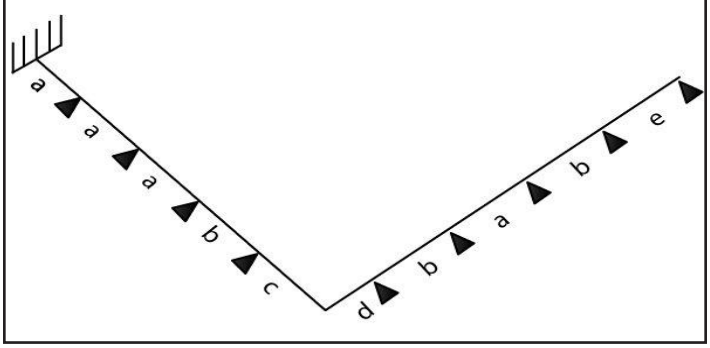
Specific Gravity	3.00	2.00	1.50	1.25	1.00	0.75	Gas/Air
Multiplier	0.76	0.84	0.90	0.95	1.00	1.07	1.40

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

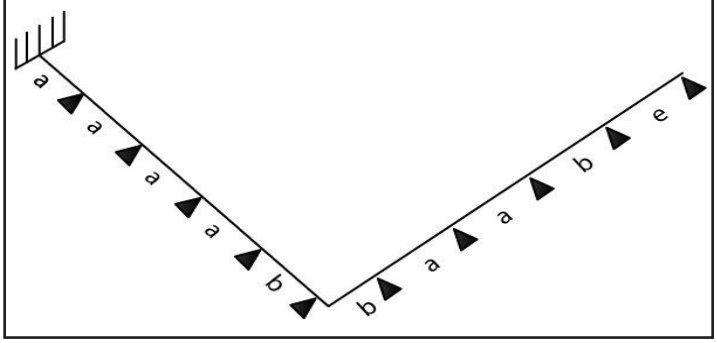
	Span Type	Factor
a	Continuous interior or fixed end spans	1.00
b	Second span from supported end or unsupported fitting	0.80
c+d	Sum of unsupported spans at fitting	≤0.75*
e	Simple supported end span	0.67

*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	0.3
50	0.7
75	1.0
100	1.3
125	1.7
150	2.0
175	2.3
200	2.6

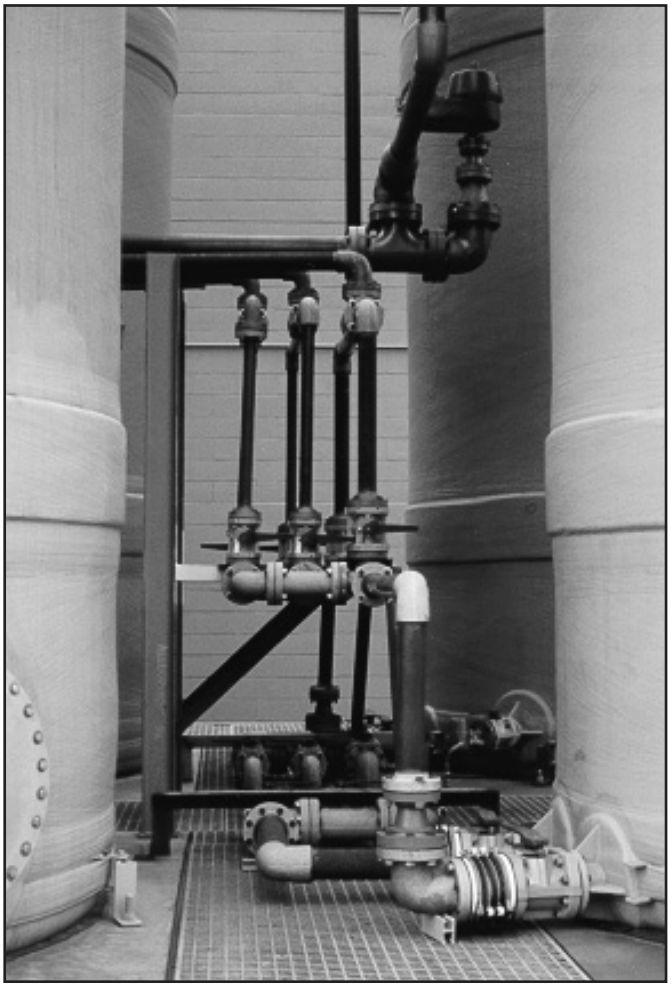
Restrained Thermal End Loads and Guide Spacing

Size (In)	Operating Temperature °F (Based on Installation Temperature of 75°F)									
	100°F		150°F		175°F		200°F		225°F	
	Guide Spacing (Ft)	Thermal End Load (Lbs)	Guide Spacing (Ft)	Thermal End Load (Lbs)	Guide Spacing (Ft)	Thermal End Load (Lbs)	Guide Spacing (Ft)	Thermal End Load (Lbs)	Guide Spacing (Ft)	Thermal End Loads (Lbs)
1	3.9	128	2.3	383	2.0	510	1.8	638	1.6	765
1½	10.4	553	6.0	1,658	5.2	2,210	4.7	2,763	4.3	3,315
2	13.2	700	7.6	2,100	6.6	2,800	5.9	3,500	5.4	4,200
3	19.9	1,053	11.5	3,158	9.9	4,210	8.9	5,263	8.1	6,315
4	25.6	1,648	14.8	4,943	12.8	6,590	11.4	8,238	10.4	9,885
6	38.1	2,458	22.0	7,373	19.1	9,830	17.1	12,288	15.6	14,745
8	49.8	3,588	28.8	10,763	24.9	14,350	22.3	17,938	20.3	21,525
10	62.2	5,185	35.9	15,555	31.1	20,740	27.8	25,925	25.4	31,110
12	74.0	6,170	42.7	18,510	37.0	24,680	33.1	30,850	30.2	37,020
14	81.4	6,785	47.0	20,355	40.7	27,140	36.4	33,925	33.2	40,710

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
LITTLE ROCK, AR
SAND SPRINGS, OK
SUZHOU, CHINA
FIBER GLASS SYSTEMS

CLASSIFIED UL WATER QUALITY

ANSI/NSF 61
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Components 35GH
Water Contact Temp: 23°C

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