Silver Streak® Product Data

Applications

- Flue Gas Desulfurization
- Limestone Slurry
- Ammonium Sulfate
- Gypsum Slurry

Materials and Construction

All pipe manufactured by filament winding process using amine-cured epoxy thermosetting resin to impregnate strands of continuous glass filaments with a resin-rich corrosion barrier. Manufactured with a proprietary blend of abrasion-resistant additives, **Silver Streak** piping is offered with a standard 80 mil nominal liner.

Pipe is available in **2" through 24"** diameters with pressure ratings up to 225 psig static at a maximum operating temperature of 225°F and is ideal for yard piping. **Silver Streak LD** pipe, available in **30" through 54"** diameters, is ideal for recirculating piping and operates at temperatures up to 200°F and pressures up to 150 psig.

The entire 80 mil nominal liner contains 80% resin/abrasion-resistant additives and 20% reinforcement. The pipe is rated for full vacuum service at 175°F and comes spigot x spigot in **2" through 12"** sizes and spigot x spigot or bell x spigot in **14" through 24"** sizes.

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

Bell & Spigot
Matched-taper joint secured with epoxy adhesive. Self-locking feature resists movement, facilitating joining runs of pipe without awaiting adhesive cure.

Nominal Dimensional Data (Liner Thickness = 0.080"/1.8 mm)

Pipe Size (In)	I.D.		O.D.		Wall Thickness		Weight		Capacity	
	(In)	(mm)	(In)	(mm)	(In)	(mm)	(Lbs/Ft)	(kg/m)	(Gal/Ft)	(Ft³/Ft)
2	2.00	51	2.40	61	0.200	5.1	1.1	1.6	0.16	0.022
3	3.28	83	3.65	93	0.186	4.7	1.6	2.4	0.44	0.059
4	4.28	109	4.66	118	0.190	4.8	2.1	3.1	0.75	0.100
6	6.35	161	6.75	171	0.197	5.0	3.1	4.6	1.65	0.220
8	8.36	212	8.83	224	0.233	5.9	5.0	7.4	2.85	0.381
10	10.36	263	10.87	276	0.251	6.4	6.6	9.8	4.38	0.585
12	12.29	312	12.81	325	0.260	6.6	8.1	12.1	6.16	0.824
14	14.04	357	14.71	374	0.338	8.6	12.3	18.3	8.04	1.075
16	16.04	407	16.68	424	0.320	8.1	13.2	19.6	10.5	1.403
18	17.83	453	18.50	470	0.336	8.5	15.5	23.1	12.97	1.734
20	19.83	504	20.56	522	0.364	9.2	18.7	27.8	16.04	2.145
24	23.83	605	24.66	626	0.414	10.5	25.7	38.3	23.17	3.097

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

Properties of Pipe Sections Based on Minimum Reinforced Wall

Size (In)	Reinforcement End Area (In^2)	Reinforcement Moment of Inertia (In^4)	Reinforcement Section Modulus (In^3)	Nominal Wall End Area (In^2)
2	0.74	0.48	0.40	1.38
3	1.03	1.61	0.88	2.03
4	1.37	3.52	1.51	2.67
6	2.13	11.6	3.45	4.05
8	3.64	34.1	7.72	6.29
10	5.02	71.4	13.1	8.37
12	6.24	124	19.3	10.3
14	10.2	266	36.2	15.3
16	10.8	364	43.7	16.4
18	12.8	531	57.5	19.2
20	15.8	808	78.6	23.0
24	22.3	1,641	133	31.5

Average Physical Properties

Property		75°F psi	24°C MPa	225°F psi	107°C MPa
Axial Tensile - ASTM D2105					
Ultimate Stress		10,550	72.7	7,160	49.4
Modulus of Elasticity		1.75×10^6	12,093	1.03×10^6	7,102
Poisson's Ratio $V_{a/h}$ ($V_{h/a}$)		0.35 (0.56)			
Axial Compression - ASTM D694					
Ultimate Stress		33,300	229.6	17,800	122.7
Modulus of Elasticity		1.26×10^6	8,687	0.54×10^6	3,723
Beam Bending - ASTM D2925					
Ultimate Stress		23,000	158.6	16,000	110.3
Modulus of Elasticity (Long Term)		2.18×10^6	15,030	1.10×10^6	7,653
Hydrostatic Burst - ASTM D1599					
Ultimate Hoop Tensile Stress		46,300	319	49,500	341.3
Ring Tensile - ASTM D2990		27,280	188	-	-
Minimum Hoop Tensile Stress					
Hydrostatic Design - ASTM D2992,					
Procedure B - Hoop Tensile Stress	(LTHS)	27,715	191	16,945*	116.8*
*20 Year Static Life at 200°F/93.3°C	(LCL)	22,400	154	14,654*	101.0*

Thermal Expansion Coefficient - ASTM D696	1.26×10^{-5} in/in/°F	1.58×10^{-5} mm/mm/°C
Thermal Conductivity	0.23 BTU/hr-ft-°F	0.4 W/m-°C
Specific Gravity - ASTM D792	1.8	
Absolute Surface Roughness	0.00021 Inch	0.0053 mm
Manning Roughness Coefficient, n	0.009	

Testing:

Hydrostatic testing should be performed to evaluate the structural integrity of a new piping system installation. Test pressures of 1.5 times the design pressure but not exceeding 1.5 times the static pressure rating of the lowest rated fiberglass component in the piping system is recommended. The hydrotest pressure should be repeated up to ten times to provide a high degree of confidence in the piping system. The final pressurization should be allowed to stabilize for 15-30 minutes, then, inspected for leaks. Do not attempt to repair leaks while system is pressurized. The hydro test should be repeated after any re-work is performed.

When hydro testing open vents to prevent entrapment of air in the lines as the system is slowly filled with water. Then close the vents and slowly pressurize to the test pressure. Upon completion of hydro test, relieve the pressure on the system slowly, open vents and any drains to allow for complete drainage of the system.

Piping systems with design temperatures above 150°F should be tested at 1.5 times the static pressure rating of the lowest rated fiberglass component in the system.

Recommended Operating Ratings

Size (In)	Axial Tensile Loads Max. (Lbs) Temperature 75°F	225°F	Axial Compressive Loads Max. (Lbs)(1) Temperature 75°F	225°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)
2	1,900	1,300	6,600	3,000	75	130	n/a	n/a	n/a
3	2,700	1,800	8,500	4,000	110	280	n/a	n/a	n/a
4	3,600	2,400	11,000	6,000	140	480	n/a	n/a	n/a
6	5,600	3,800	17,000	9,000	210	1,100	n/a	n/a	n/a
8	9,500	6,500	30,000	16,000	270	2,480	n/a	n/a	n/a
10	13,000	8,900	41,000	22,000	340	4,200	n/a	n/a	n/a
12	16,000	11,000	51,000	27,000	400	6,200	n/a	n/a	n/a
14	26,000	18,000	85,000	45,000	460	11,000	n/a	n/a	n/a
16	28,000	19,000	90,000	48,000	520	14,000	n/a	n/a	n/a
18	33,000	22,000	100,000	56,000	580	18,000	n/a	n/a	n/a
20	41,000	28,000	130,000	70,000	640	25,000	n/a	n/a	n/a
24	58,000	39,000	180,000	99,000	770	42,000	n/a	n/a	n/a

(1)Compressive loads are for short columns only.

Pressure Ratings

Size (In)	Maximum Internal Static Pressure (psig) 225°F	Maximum External Static Pressure (psig) 175°F
2-24	225	Full Vacuum

ASTM D2996 Designation Codes:

2"-24"	RTRP-11FY1-3110

Pipe Lengths Available

Size (In)	Random Length (Ft)
2-6	20
8-24	40

Water Hammer:

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

Supports

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 1/2 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	225°F
2	14.7	13.7	12.4
3	16.5	15.4	13.9
4	17.9	16.7	15.1
6	20.2	18.9	17.1
8	23.2	21.6	19.6
10	25.2	23.5	21.3
12	26.7	24.9	22.5
14	30.0	28.0	25.4
16	30.6	28.6	25.9
18	32.0	29.8	27.0
20	33.7	31.4	28.4
24	36.7	34.3	31.0

[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

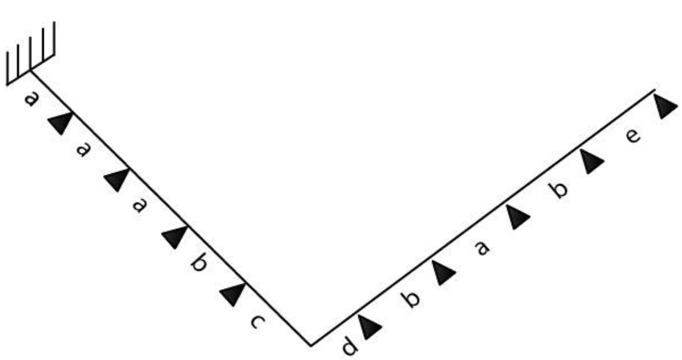
Specific Gravity	2.00	1.50	1.25	1.00	0.75
Multiplier	0.87	0.92	0.96	1.00	1.05

Example: 6" pipe @ 150°F with 1.5 specific gravity fluid, maximum support spacing = 18.9 x 0.92 = 17.4 ft.

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

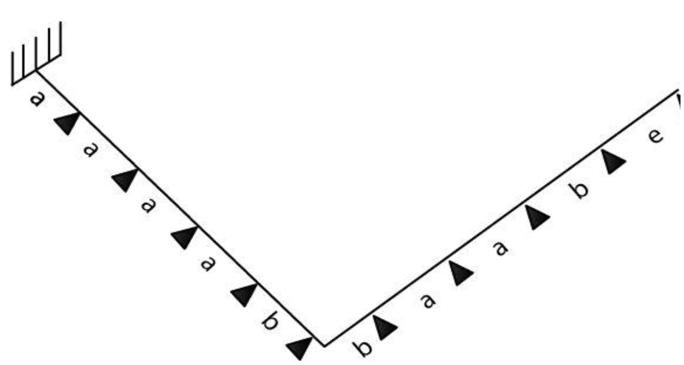
	Span Type	Factor
a	Continuous interior or fixed end spans	1.00
b	Second span from supported end or unsupported fitting	0.80
c+d	Sum of unsupported spans at fitting	≤0.75*
e	Simple supported end span	0.67

*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 flexibility 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. Using directional changes inherent flexibility
2. Restrain pipe axially and guide supports to control deflections and 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. An isometric layout of piping system
2. Physical geometry and material properties of pipe
3. Design temperatures
4. Installation temperature (Final tie in temperature)
5. Terminal equipment load limits
6. Support movements

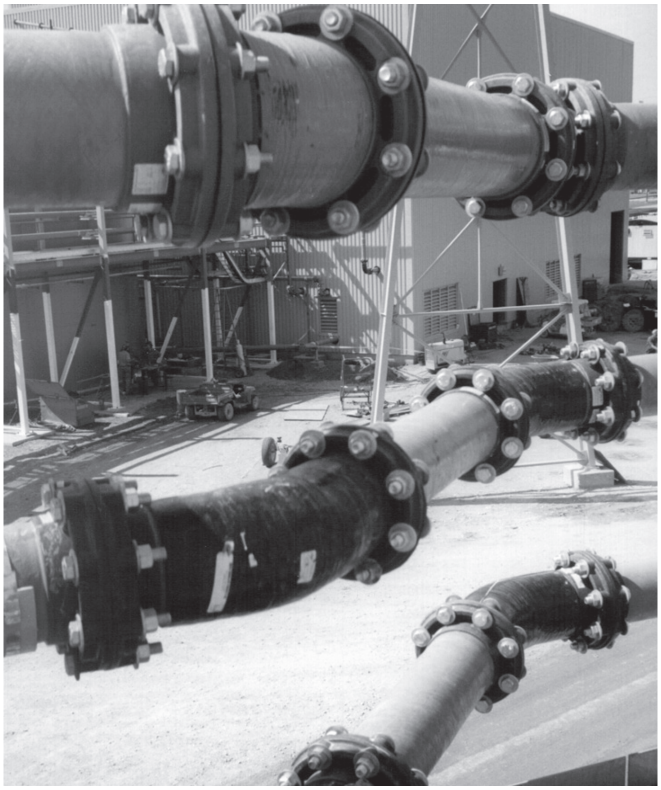
A comprehensive review of temperature effects on fiberglass pipe may be found in NOV Fiber Glass Systems' **"Engineering and Piping Design Guide", Manual No. E5000, Section 3.**

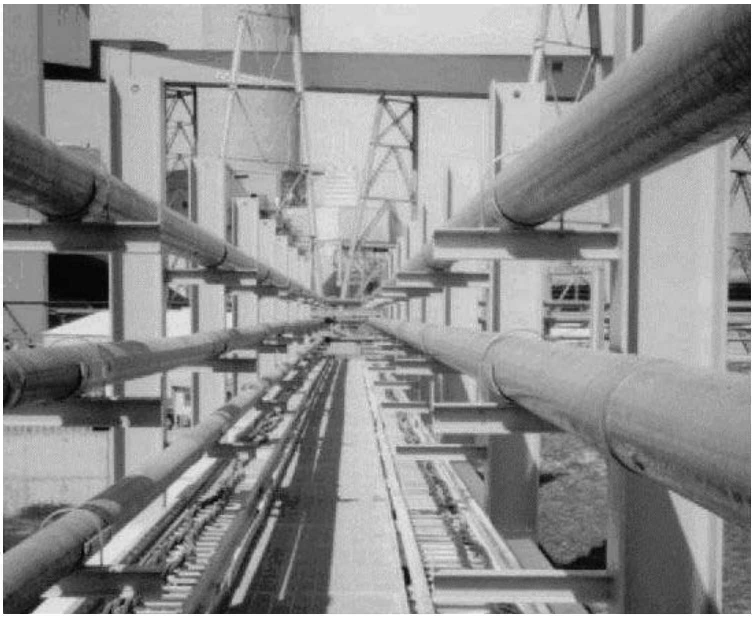
Change in Temperature °F	Pipe Change in Length (In/100 Ft)
25	0.38
50	0.76
75	1.13
100	1.51

Restrained Thermal End Loads and Guide Spacing

Size (In)	Operating Temperature °F (Based on installation temperature of 75°F)							
	125°F		150°F		175°F		200°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)
2	11.1	481	9.2	637	8.1	736	7.4	778
3	17.4	661	14.4	875	12.7	1,011	11.5	1,069
4	22.4	877	18.5	1,161	16.2	1,342	14.8	1,419
6	32.7	1,366	27.0	1,809	23.7	2,090	21.6	2,211
8	42.7	2,339	35.3	3,095	31.0	3,577	28.2	3,783
10	52.7	3,225	43.5	4,269	38.2	4,933	34.8	5,218
12	62.2	4,009	51.4	5,307	45.1	6,132	41.1	6,486
14	71.2	6,573	58.8	8,700	51.7	10,054	47.1	10,364
16	81.0	6,959	66.9	9,210	58.8	10,643	53.5	11,257
18	90.0	8,225	74.3	10,886	65.3	12,579	59.5	13,305
20	99.8	10,153	82.5	13,437	72.4	15,528	66.0	16,424
24	119.8	14,329	98.9	18,966	86.9	21,916	79.1	23,180

Note: If guide spacing exceeds support span length, then guide at each support.





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Fax:: 1 (210) 434-7543

2700 West 65th Street
Little Rock, Arkansas 72209 USA
Phone: 1 (501) 568-4010
Fax: 1 (501) 568-4465

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