Red Thread™ HP FM Piping

(Fire Protection Systems - Product Data)

Fiber Glass Systems offers Red Thread HP FM Factory Mutual Approved pipe and fittings for use in underground fire protection systems.

These specially labeled systems are available on request and have the physical and mechanical properties as described in this bulletin. The 4-6 in. pipe is available in 30 foot lengths and the 8-24 in. pipe is available in 40 foot lengths.

Significant features that make Red Thread HP FM Fire Protection piping systems ideal:

- Internal and external corrosion resistance.
- Improved flow characteristics compared to traditional materials.
- Light weight and ease of installation.
- Pressure ratings up to 200 psig and a Mill Test Pressure of 400 psig.

Installation

Red Thread HP FM piping systems should be installed according to instructions in Matched Taper Joint Installation Handbook.

Red Thread HP FM piping for Factory Mutual Approved systems must be joined using PSX 48 adhesive. For installations that are installed in compliance with Factory Mutual procedures, anchoring (thrust blocking) must be in accordance with Factory Mutual installation standards.

Nominal Dimensional Data

Pipe Size		Part Number	Inside Diameter		Outside Diameter		Wall Thickness		Weight		Minimum Bending Radius @ 75°F		Pipe Stiffness @ 5% Deflection	
in.	mm		in.	mm	in.	mm	in.	mm	lbs/ft	kg/m	ft	m	psi	MPa
4	100	011040-073-3	4.36	111	4.55	116	0.095	2.41	1.1	1.64	195	60	87	0.60
6	150	011060-120-3	6.40	163	6.68	170	0.139	3.53	2.4	3.68	287	87	88	0.61
8	200	011080-126-3	8.36	212	8.64	220	0.145	3.68	3.3	4.91	371	113	45	0.31
10	250	011100-156-3	10.36	263	10.71	272	0.179	4.55	5.1	7.59	460	140	44	0.30
12	300	011120-185-3	12.28	312	12.70	323	0.212	5.38	7.2	10.7	545	166	44	0.30
14	350	011140-220-3	14.03	356	14.57	370	0.272	6.91	10.6	15.8	625	191	62	0.43
16	400	011160-250-3	16.03	407	16.65	423	0.311	7.90	13.8	20.5	714	218	62	0.43
18	450	011180-277-3	17.82	453	18.45	469	0.317	8.05	16.4	24.4	792	241	48	0.33
20	500	011200-286-3	19.83	504	20.48	520	0.327	8.31	18.8	28.0	879	268	38	0.26
24	600	011240-334-3	23.83	605	24.59	625	0.382	9.70	26.4	39.3	1055	322	35	0.24

View of Joint Illustrations

T.A.B.

Bell & Spigot

Flanged

Elbows 90°

Available fittings are either molded (Type M) or filament wound (Type FW) as indicated in the tables below. The rated working pressure of all fittings is 200 psig (1.37 MPa).

Pipe Size		Part Numbers	A		X[1]		Type
in.	mm		in.	mm	in.	mm	
4	100	022040-360-3	5.13	130	1.50	38	M
6	150	022060-360-3	12.75	324	2.45	62	FW
8	200	022080-360-3	11.63	295	4.38	111	FW
10	250	022100-360-3	13.06	332	4.13	105	FW
12	300	022120-360-3	13.94	354	4.25	108	FW
14	350	022140-360-3	19.06	484	6.50	165	FW
16	400	022160-360-3	20.25	514	6.75	172	FW
18	450	022180-360-3	21.75	552	8.00	203	FW
20	500	022200-360-3	25.25	641	9.13	232	FW
24	600	022240-360-3	29.00	737	10.00	254	FW

Elbows 45°

Available fittings are either molded (Type M) or filament wound (Type FW) as indicated in the tables below. The rated working pressure of all fittings is 200 psig (1.37 MPa).

Pipe Size		Part Numbers	A		X[1]		Type
in.	mm		in.	mm	in.	mm	
4	100	022040-310-3	3.88	99	1.50	38	M
6	150	022060-310-3	7.50	191	2.45	62	FW
8	200	022080-310-3	8.13	207	4.38	111	FW
10	250	022100-310-3	8.63	219	4.13	105	FW
12	300	022120-310-3	9.50	241	4.25	108	FW
14	350	022140-310-3	12.50	318	6.50	165	FW
16	400	022160-310-3	13.25	337	6.75	172	FW
18	450	022180-310-3	14.75	375	8.00	203	FW
20	500	022200-310-3	17.63	448	9.13	232	FW
24	600	022240-310-3	20.19	513	10.00	254	FW

Sleeve Couplings

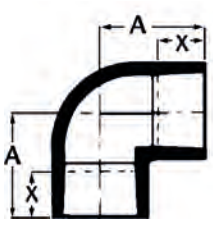
Pipe Size		Part Numbers	A		B		X[1]		Type
in.	mm		in.	mm	in.	mm	in.	mm	
4	100	012040-101-5	7.00	178	4.88	123	1.87	48	FW
6	150	012060-101-3	8.38	213	7.13	181	2.50	64	FW
8	200	012080-101-3	10.0	254	9.00	229	3.19	81	FW
10	250	012100-101-3	10.5	267	11.13	283	3.69	94	FW
12	300	012120-101-3	11.0	279	13.5	343	3.88	99	FW
14	350	012140-101-3	15.0	381	15.5	394	4.33	110	FW
16	400	012160-101-3	17.0	432	17.63	448	4.49	114	FW
18	450	022180-101-3	21.0	533	20.05	509	6.87	174	FW
20	500	022200-101-3	26.0	660	22.10	561	7.81	198	FW
24	600	022240-101-3	29.5	749	26.15	664	8.62	218	FW

Tees

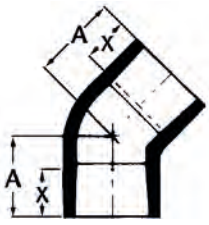
Pipe Size		Part Numbers	A		X[1]		Type
in.	mm		in.	mm	in.	mm	
4	100	022040-410-3	5.13	130	1.50	38	M
6	150	022060-410-3	9.50	241	3.75	95	FW
8	200	022080-410-3	11.63	295	4.38	111	FW
10	250	022100-410-3	13.06	332	4.13	105	FW
12	300	022120-410-3	13.94	354	4.25	108	FW
14	350	022140-410-3	19.06	484	6.5	165	FW
16	400	022160-410-3	20.25	514	6.25	172	FW
18	450	022180-410-3	22.38	568	8.00	203	FW
20	500	022200-410-3	26.25	667	9.13	232	FW
24	600	022240-410-3	28.00	711	10.00	254	FW

[1] X dimension is a nominal make-up dimension for drawing layout work only. Do not use for assembly dimensions.

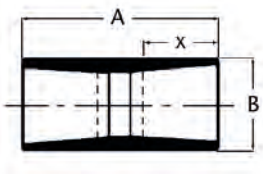
View of Fitting Illustrations



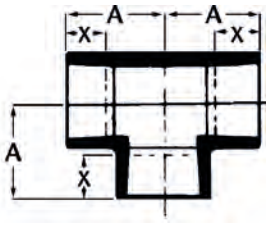
90° Elbow



45° Elbow



Sleeve Coupling



Tee

Concentric Reducers

Pipe Size		Part Numbers	A		X_1 [1]		X_2 [1]		Type
in.	mm		in.	mm	in.	mm	in.	mm	
6 x 4	150 x 100	022060-236-3	9.00	230	2.25	57	1.50	38	M
8 x 4	200 x 100	022080-237-3	18.75	476	4.38	111	2.78	70	FW
8 x 6	200 x 150	022080-235-3	14.75	375	4.38	111	3.75	95	FW
10 x 6	250 x 150	022100-237-3	20.00	508	4.13	105	3.75	95	FW
10 x 8	250 x 200	022100-235-3	16.50	419	4.13	105	4.38	111	FW
12 x 8	300 x 200	022120-237-3	23.06	586	4.25	108	4.38	111	FW
12 x 10	300 x 250	022120-235-3	17.75	451	4.25	108	4.13	105	FW
14 x 10	350 x 250	022140-237-3	28.63	727	6.50	165	4.13	105	FW
14 x 12	350 x 300	022140-235-3	22.75	578	6.50	165	4.25	108	FW
16 x 12	400 x 300	022160-237-3	33.75	857	6.75	172	4.25	108	FW
16 x 14	300 x 350	022160-235-3	28.06	713	6.75	172	6.50	165	FW
18 x 14	450 x 350	022180-237-3	28.88	730	8.00	203	6.50	165	FW
18 x 16	450 x 300	022180-235-3	28.75	654	8.00	203	6.75	172	FW
20 x 16	500 x 300	022200-237-3	31.88	810	9.13	232	6.75	172	FW
20 x 18	500 x 450	022200-235-3	32.00	813	9.13	232	8.00	203	FW
24 x 18	600 x 450	022240-237-3	53.75	1,365	10.00	254	8.00	203	FW
24 x 20	600 x 500	022240-235-3	46.25	1,175	10.00	254	9.13	232	FW

Van Stone Flanges - (ANSI B16.5 Class 150)

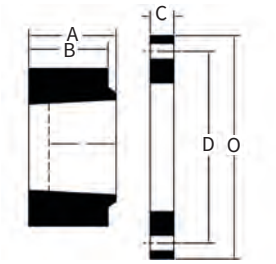
Pipe Size [3]		Part Number	Steel Ring	A		B		C		D		O		X [1]		Hole Size		# of Bolts	Max Bolt Torque		O-Ring Size [2]
in.	mm			in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm		ft•lbs	N•m	
4	100	022040-176-3	022040-179-3	3.74	95	3.50	89	1.00	25	7.50	191	9.00	229	3.30	84	0.75	19	8	100	135	
6	150	022060-176-3	022060-179-3	4.22	107	3.95	100	1.00	25	9.50	241	11.00	279	3.78	96	0.88	22	8	100	135	
8	200	022080-176-3	022080-179-3	5.00	127	4.75	121	1.50	38	11.75	298	13.50	343	4.50	114	0.88	22	8	200	271	
10	250	022100-176-3	022100-179-3	6.25	159	6.00	152	1.88	48	14.25	362	16.00	406	5.75	146	1.00	25	12	200	271	
12	300	022120-176-3	022120-179-3	7.50	191	7.25	184	1.88	48	17.00	432	19.00	483	7.00	178	1.00	25	12	200	271	
14	350	022140-176-3	022140-179-3	7.00	178	6.50	165	1.88	48	18.75	476	20.75	527	6.25	159	1.13	29	12	200	271	
16	400	022160-176-3	022160-179-3	7.87	200	7.38	187	2.25	57	21.25	540	23.25	591	7.12	181	1.13	29	16	200	271	
18	450	022180-176-3	022180-179-3	9.00	229	8.50	216	2.25	57	22.75	578	25.00	635	8.00	203	1.25	32	16	200	271	469
20	500	022200-176-3	022200-179-3	9.88	251	9.38	238	2.25	57	25.00	635	27.50	699	8.88	226	1.25	32	20	200	271	471
24	600	022240-176-3	022240-179-3	11.75	298	11.25	286	2.25	57	29.50	749	32.00	813	10.45	265	1.38	35	20	200	271	475

[1] X dimension is a nominal make-up dimension for drawing layout work only. Do not use for assembly dimensions.

[2] 18- 24 in. (450- 600 mm) use 60- 70 durometer shore A hardness ⅛- ¼ in. gaskets or 18- 24 in. 60- 75 Durometer O-ring optional.

[3] Bonded joint requires field fit. Refer to Matched Joint Installation Handbook for instructions.

View of Fitting Illustrations

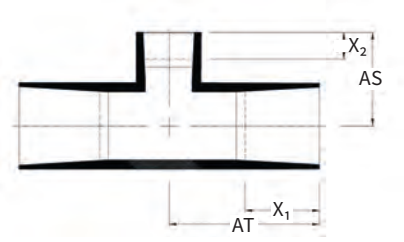


Van Stone Flange

Reducer Tees

Pipe Size		Part Numbers	AT		AS		X_1 [1]		X_2 [1]	
in.	mm		in.	mm	in.	mm	in.	mm	in.	mm
8 x 6	200 x 150	022080-460-3	11.63	295	10.25	260	4.38	111	2.45	62
10 x 6	250 x 150	022100-460-3	13.06	332	11.75	298	4.13	105	2.45	62
10 x 8	250 x 200	022100-480-3	13.06	332	13.63	346	4.13	105	4.38	143
12 x 6	300 x 150	022120-460-3	13.94	354	13.25	337	4.25	108	2.45	62
12 x 8	300 x 200	022120-480-3	13.94	354	15.13	384	4.25	108	4.38	143
12 x 10	300 x 250	022120-490-3	13.94	354	15.06	382	4.25	108	4.13	105
14 x 6	350 x 150	022140-460-3	19.06	484	13.75	349	6.50	265	2.45	62
14 x 8	350 x 200	022140-480-3	19.06	484	15.63	397	6.50	265	4.38	111
14 x 10	350 x 250	022140-490-3	19.06	484	15.50	394	6.50	265	4.13	105
14 x 12	350 x 300	022140-492-3	19.06	484	15.94	405	6.50	265	4.25	108
16 x 6	400 x 150	022160-460-3	20.25	514	14.75	375	6.75	172	2.45	62
16 x 8	400 x 200	022160-480-3	20.25	514	16.63	422	6.75	172	4.38	111
16 x 10	400 x 250	022160-490-3	20.25	514	16.56	421	6.75	172	4.13	105
16 x 12	400 x 300	022160-492-3	20.25	514	16.94	430	6.75	172	4.25	108
16 x 14	400 x 350	022160-494-3	20.25	514	19.50	495	6.75	172	6.50	165
18 x 6	450 x 150	022180-460-3	22.38	568	17.80	452	8.00	203	2.45	62
18 x 8	450 x 200	022180-480-3	22.38	568	19.67	500	8.00	203	4.38	111
18 x 10	450 x 250	022180-490-3	22.38	568	19.62	499	8.00	203	4.13	105
18 x 12	450 x 300	022180-492-3	22.38	568	19.98	507	8.00	203	4.25	108
18 x 14	450 x 350	022180-494-3	22.38	568	20.52	521	8.00	203	6.50	165
18 x 16	450 x 400	022180-496-3	22.38	568	21.00	533	8.00	203	6.75	172
20 x 6	500 x 150	022200-460-3	26.25	667	19.80	503	9.13	232	2.45	62
20 x 8	500 x 200	022200-480-3	26.25	667	21.17	538	9.13	232	4.38	111
20 x 10	500 x 250	022200-490-3	26.25	667	21.13	537	9.13	232	4.13	105
20 x 12	500 x 300	022200-492-3	26.25	667	21.48	556	9.13	232	4.25	108
20 x 14	500 x 350	022200-494-3	26.25	667	22.00	560	9.13	232	6.50	165
20 x 16	500 x 400	022200-496-3	26.25	667	22.52	572	9.13	232	6.75	172
20 x 18	500 x 450	022200-498-3	26.25	667	22.77	578	9.13	232	8.00	203

View of Fitting Illustrations



Reducing Tee

Reducer Tees

Pipe Size		Part Numbers	AT		AS		X_1 [1]		X_2 [1]	
in.	mm		in.	mm	in.	mm	in.	mm	in.	mm
24 x 6	600 x 150	022240-460-3	28.00	711	22.30	566	10.00	254	2.45	62
24 x 8	600 x 200	022240-480-3	28.00	711	23.67	601	10.00	254	4.38	111
24 x 10	600 x 250	022240-490-3	28.00	711	23.63	600	10.00	254	4.13	105
24 x 12	600 x 300	022240-492-3	28.00	711	23.98	609	10.00	254	4.25	108
24 x 14	600 x 350	022240-494-3	28.00	711	24.52	623	10.00	254	6.50	165
24 x 16	600 x 400	022240-496-3	28.00	711	25.00	635	10.00	254	6.75	172
24 x 18	600 x 450	022240-498-3	28.00	711	25.27	642	10.00	254	8.00	203
24 x 20	600 x 500	022240-499-3	28.00	711	27.77	705	10.00	254	9.13	232

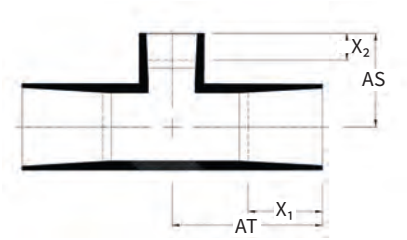
All Reducing Tees are filament wound.

[1] X dimension is a nominal make-up dimension for drawing layout work only. Do not use for assembly dimensions.

Maintenance Coupling

Pipe Size		Part Numbers	Coupling Length	
in.	mm		in.	mm
4	100	44RT0801	4.00	101.6
6	150	66RT0801	4.88	124.0
8	200	88RT0801	7.00	177.8
10	250	AART0801	8.50	215.9
12	300	BBRT0801	10.00	254.0

View of Fitting Illustrations



Reducing Tee

Typical Mechanical Properties

Pipe Property	70°F	21°C	150°F	65°C	200°C	93°C	Method
	psi	MPa	psi	MPa	psi	MPa	
Hydrostatic Design Basis							
(LTHS)	23,400[1]	161[1]	23,400	161	17,500	121	ASTM D2992
(LCL)	20,900[1]	144[1]	20,900	144	15,800	109	Proc. B (20 yrs)
Ultimate Hoop Stress at Weeping	36,000	248	45,000	313	48,400	334	ASTM D1599
Circumferential							
Hoop Tensile Modulus	3.84×10^6	26,500	2.86×10^6	19,700	2.25×10^6	15,500	NOV FGS
Poisson's Ratio ν_{ha}	0.61		0.73		0.8		NOV FGS
Longtitudinal							
Axial Tensile Strength	11,600	80	10,100	70	9,200	63.4	ASTM D2105
Axial Modulus	2.24×10^6	15,000	1.53×10^6	11,200	1.24×10^6	8,550	ASTM D2105
Poisson's Ratio ν_{ah}	0.35		0.39		0.42		ASTM D2105
Axial Bending Strength	23,000	85	-	-	-	-	NOV FGS
Axial Bending Modulus LTHS - 95% LCL	2.25×10^6	15,000	1.75×10^6	12,100	1.43×10^6	9,900	ASTM D2925
Shear Modulus	1.76×10^6	12,100	1.65×10^6	11,400	1.58×10^6	10,900	NOV FGS

Typical Physical Properties

Pipe Property	Value	Value	Method
Thermal Conductivity Pipe wall	0.19 BTU/hr•ft•°F	0.33 W/m°C	NOV FGS
Thermal Expansion	12.0×10^{-6} in/in/°F	21.6×10^{-6} mm/mm/°C	ASTM D696
Flow Coefficient, Hazen Williams	150		-
Absolute Roughness	1.7×10^{6} ft	5.3×10^{6} m	-
Density	121 lbs/ft^3	1940 kg/m^3	ASTM D792

[1] Value obtained at 150° F

[2] The differential pressure between internal and external pressure which causes collapse.

[3] A 0.67 design factor is recommended for short duration vacuum service. A full vacuum is equal to 14.7 psig (0.101 MPa) differential pressure at sea level.

[4] A 0.33 design factor is recommended for sustained (long-term) differential collapse pressure design and operation.

Ultimate Collapse Pressure

Size		Collapse Pressure[2,3,4]			
		psig		MPa	
In.	mm	75°F	200°F	24°C	93°C
2	50	177	133	1.22	0.92
3	80	171	129	1.18	0.89
4	100	69	51	0.48	0.35
6	150	69	51	0.48	0.35
8	200	29	20	0.20	0.14
10	250	27	20	0.19	0.13
12	300	27	20	0.19	0.14
14	350	45	33	0.31	0.23
16	400	45	33	0.31	0.23
18	450	31	23	0.22	0.16
20	550	23	16	0.16	0.11
24	600	20	14	0.14	0.10

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FM APPROVED

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