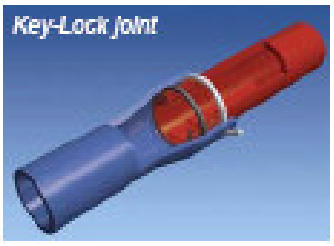
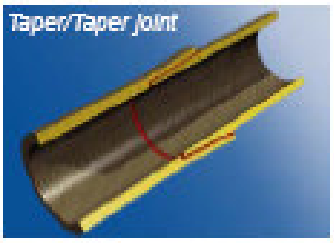
HB Composites





Series 2400 Fiberglass Pipe and Fittings

using Key-Lock® mechanical joint or Taper/ Taper adhesive joint

Uses and applications

- Saltwater and seawater lines
- Brackish water lines
- Fire protection systems
- Potable water lines
- Waste water and sewage systems
- Drainage systems
- Oil field reinjection systems
- Crude oil transmission lines
- Temporary pipelines
- Electrical conduit
- General industrial service for mildly corrosive liquids

Performance

Laminate meets requirements of API Specification 15LR.
Pipe wall design using a 124 N/mm_2 hydrostatic design basis (Procedure B.) with a 0.5 service factor. Liner thickness: 0.5 mm.
Maximum operating temperature: 121°C (250 °F).
ASTM D-2310 Classification: RTRP-11FW (or RTRP-11 FE as applicable).
This system is designed to provide minimal 4:1 safety factor in accordance with ASTM D-1599.

Description

Pipe

Filament-wound fiberglass reinforced epoxy pipe with Key-Lock, male and female or Double O-Ring male and female mechanical joint or Taper/ Taper male and female adhesive joint.

Fittings

Standard filament-wound couplings, 45° and 90° Elbows, Tees and Reducing Tees, Concentric Reducers, Flanges* and Nipples. Special fittings are available on request.

* Flanges are available with the following drillings : ANSI B16.5 Class 150 and 300, DIN, ISO & JIS. Other drilling patterns are available on request.

For dimensional data and standard configurations for fittings, please refer to the respective Fitting Guides.

Optional, the system can be supplied conductive - HB Composites 2400C or Fireproofing 2400-FP.

For conductive ASTM D-2310 Classification: RTRP-11AW for pipes or RTRP-11AE as applicable.

Joining systems

Key-Lock, integral filament-wound male and female or Double O-Ring male and female mechanical joint assembled with locking keys. Hydrostatic seal by means of an elastomeric O-ring. Taper/ Taper integral filament-wound male and female adhesive bonded joint.

Pipe sizes

From	50 - 100 mm	(2-4")	: 5.85 or 9 m depends on end configuration.
For	150 mm	(6")	: 5.85, 9 or 11.89 m depends on end configuration.
From	200 - 1000 mm	(8-40")	: 11.89 m random length.

Physical properties

Pipe property	Units	Value	Method
Thermal conductivity	W(m•k)	.33	HB Composites
Thermal expansivity (lineair)	10^{-6} mm/mm/°C	18.0	HB Composites
Flow coefficient	Hazen-Williams	150	—
Absolute roughness	10^{-6} m	5.3	—
Density	g/cm^3	1.8	—
Shielding capability*	volts	100[1]	—
Grounding resistance @1500 volts*	10^6 ohms	1.0[1]	—

* Applicable for conductive

Mechanical properties

Pipe property	Units	21°C	93°C	Method
Bi-axial				
Ultimate hoop stress at weeping	N/mm^2	250	—	ASTM D-1599
Circumferential				
Hoop tensile strength	N/mm^2	220	—	ASTM D-2290
Hoop tensile modulus	N/mm^2	25200	22100	ASTM D-2290
Poisson's ratio axial/ hoop	—	0.65	0.81	HB Composites
Longitudinal				
Axial tensile strength	N/mm^2	80	65	ASTM D-2105
Axial tensile modulus	N/mm^2	12500	9700	ASTM D-2105
Poisson's ratio hoop/ axial	—	0.40	0.44	ASTM D-2105
Axial bending strength	N/mm^2	85	—	HB Composites
Beam				
Apparent elastic modulus	N/mm^2	12500	8000	ASTM D-2925
Hydrostatic Design Basis				
Static	N/mm^2	—	124*	ASTM D-2992 (Proc.B.)
Cyclic	N/mm^2	41.5*	—	ASTM D-2992 (Proc.A.)

* at 65°C

Typical pipe dimensions

Nominal pipe size		Pipe ID	Minimum total wall thickness* (mm)								
(mm)	(in)	(mm)	2410	2412	2414	2416	2420	2425	2432	2440	2450
50	2	53.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.8	3.3
80	3	81.8	2.3	2.3	2.3	2.3	2.3	2.7	3.1	3.9	4.7
100	4	105.2	2.3	2.3	2.3	2.5	2.7	3.3	3.9	4.9	5.9
150	6	159.0	2.5	2.7	3.0	3.4	3.8	4.6	5.6	7.0	8.7
200	8	208.8	3.1	3.2	3.7	4.2	4.8	5.8	7.2	9.1	11.2
250	10	262.9	3.5	3.9	4.5	5.1	5.8	7.2	8.8	11.2	14.0
300	12	313.7	3.9	4.5	5.3	6.0	6.8	8.4	10.4	13.4	16.6
350	14	344.4	4.1	4.8	5.7	6.6	7.4	9.2	11.4	14.6	18.2
400	16	393.7	4.5	5.5	6.4	7.4	8.4	10.5	12.9	15.6	
450	18	433.8	4.9	6.0	7.0	8.1	9.2	11.5	14.2	18.2	
500	20	482.1	5.4	6.6	7.7	8.9	10.1	12.7	15.7	20.1	
600	24	578.6	6.3	7.7	9.3	10.6	12.1	15.1	18.8		
700	28	700.0	7.4	9.1	10.8	12.6	14.3	17.9	22.3		
750	30	750.0	7.9	9.7	11.6	13.5	15.3	19.1	23.9		
800	32	800.0	8.4	10.3	12.3	14.3	16.3	20.4	25.5		
900	36	900.0	9.3	11.5	13.7	16.0	18.2	22.8	28.5		
1000	40	1000.0	10.3	12.8	15.3	17.8	20.3				

* Total wall thickness is including 0.5 mm liner. No liner for conductive pipe

Note: Pipe series designation: First two digits indicate product series. Final two digits indicate inernal pressure class (bar).

External pressure Performance

Nominal pipe size		Ultimate Collapse Pressure* (bar)					
(mm)	(in)	2410	2412	2414	2416	2420	2425*
50	2	26.4	26.4	26.4	26.4	26.4	26.4
80	3	7.3	7.3	7.3	7.3	7.3	13.2
100	4	3.4	3.4	3.4	4.7	6.2	12.8
150	6	1.4	1.8	2.6	4.1	6.1	11.7
200	8	1.3	1.5	2.5	3.8	5.9	11.1
250	10	1.0	1.5	2.4	3.6	5.6	11.3
300	12	0.9	1.4	2.4	3.7	5.5	10.9
350	14	0.8	1.3	2.3	3.8	5.5	11.0
400	16	0.7	1.4	2.3	3.7	5.5	11.2
450	18	0.7	1.4	2.3	3.7	5.5	11.1
500	20	0.7	1.4	2.3	3.6	5.4	11.0
600	24	0.7	1.3	2.4	3.6	5.5	10.9
700	28	0.7	1.3	2.2	3.5	4.9	10.0
750	30	0.7	1.3	2.2	3.5	4.9	9.9
800	32	0.7	1.3	2.2	3.5	4.9	10.0
900	36	0.6	1.2	2.1	3.5	4.9	10.0
1000	40	0.6	1.3	2.2	3.5	4.9	9.9

* Ultimate collapse pressures for higher pressure classes exceed values shown.

Pipe weight

Nominal pipe size		Minimum weight empty pipe kg/m								
(mm)	(in)	2410	2412	2414	2416	2420	2425	2432	2440	2450
50	2	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.84	1.00
80	3	1.02	1.02	1.02	1.02	1.02	1.21	1.41	1.81	2.22
100	4	1.30	1.30	1.30	1.42	1.55	1.93	2.31	2.95	3.61
150	6	2.13	2.32	2.60	2.97	3.35	4.11	5.06	6.42	8.10
200	8	3.52	3.64	4.25	4.86	5.60	6.84	8.60	11.02	13.74
250	10	5.02	5.64	6.56	7.48	8.56	10.75	13.27	17.11	21.67
300	12	6.71	7.80	9.26	10.55	12.03	15.00	18.76	24.49	30.71
350	14	7.75	9.15	10.96	12.78	14.40	18.07	22.6	29.31	
400	16	9.76	12.04	14.11	16.41	18.73	23.63	29.29	35.74	
450	18	11.75	14.51	17.04	19.83	22.64	28.55	35.56	46.11	
500	20	14.43	17.78	20.87	24.26	27.66	35.08	43.74	56.63	
600	24	20.29	24.98	30.37	34.77	39.87	50.15	62.96		
700	28	28.94	35.83	42.75	50.11	56.90	61.98	90.30		
750	30	33.15	40.96	49.25	57.58	65.30	71.93	103.80		
800	32	37.65	46.44	55.74	65.09	74.30	82.25	118.10		
900	36	46.97	58.43	69.94	82.03	93.10	93.75	148.10		
1000	40	57.90	72.37	86.90	101.51	115.90				

Note: Excluding integral joints

Specific tangential initial siffness

Nominal pipe size		Specific Tengential Initial Stiffness (STIS) in N/m2 at 21°C								
(mm)	(in)	2410	2412	2414	2416	2420	2425	2432	2440	2450
50	2	73612	73612	73612	73612	73612	73612	73612	149460	262500
80	3	20961	20961	20961	20961	20961	37727	61392	133456	244609
100	4	9997	9997	9997	13637	18050	36595	64442	135877	244419
150	6	4026	5338	7790	12069	17652	33359	63038	127223	247715
200	8	3907	4369	7222	11085	17253	31856	63111	129998	243258
250	10	3016	4371	7069	10679	16206	32232	60198	125609	244685
300	12	2589	4191	7188	10743	16025	31128	60131	129402	244312
350	14	2325	3938	6911	11070	15912	31411	60634	127764	
400	16	2137	4142	6759	10731	15985	31919	59784	105832	
450	18	2126	4121	6756	10719	15960	31762	60256	126522	
500	20	2139	4097	6691	10547	15629	31574	59965	125215	
600	24	2053	3899	7061	10605	15944	31309	60516		
700	28	1953	3754	6403	10303	15175	29963	57855		
750	30	1959	3737	6514	10387	15218	29962	58164		
800	32	1963	3722	6449	10240	15256	30026	58435		
900	36	1907	3697	6342	10192	15221	29985	58265		
1000	40	1920	3767	6514	10328	15370				

Stiffness factor

Nominal pipe size		Stiffness Factor (SF) per ASTM D-2412 in in•lbs at 21°C								
(mm)	(in)	2410	2412	2414	2416	2420	2425	2432	2440	2450
50	2	108	108	108	108	108	108	108	226	408
80	3	108	108	108	108	108	198	327	730	1377
100	4	108	108	108	149	198	408	730	1583	2926
150	6	149	198	290	453	668	1281	2465	5104	10247
200	8	327	366	609	941	1478	2767	5590	11821	22767
250	10	502	730	1189	1809	2767	5590	10627	22767	45726
300	12	730	1189	2055	3092	4647	9163	18033	39896	77560
350	14	867	1478	2613	4218	6105	12238	24068	52098	
400	16	1189	2323	3817	6105	9163	18585	35435	63987	
450	18	1583	3092	5104	8158	12238	24737	47789	103058	
500	20	2187	4218	6937	11015	16443	33748	65267	139936	
600	24	3626	6937	12665	19148	29009	57839	113898		
700	28	6105	11821	20308	32924	48845	97911	192554		
750	30	7531	14472	25417	40831	60252	119598	238139		
800	32	9163	17492	30536	48843	73309	146468	290405		
900	36	12665	24737	42745	69208	103063	206110	407998		
1000	40	17492	34584	60249	96228	144271				

Pipe stiffness

Nominal **Pipe** pipe size		Stiffness (SF) per ASTM D-2412 in psi at 21°C								
(mm)	(in)	2410	2412	2414	2416	2420	2425	2432	2440	2450
50	2	573.1	573.1	573.1	573.1	573.1	573.1	573.1	1163.6	2043.6
80	3	163.2	163.2	163.2	163.2	163.2	293.7	478.0	1039.0	1904.3
100	4	77.8	77.8	77.8	106.2	140.5	284.9	501.7	1057.8	1902.9
150	6	31.3	41.6	60.6	94.0	137.4	259.7	490.8	990.5	1928.5
200	8	30.4	34.0	56.2	86.3	134.3	248.0	491.3	1012.1	1893.8
250	10	23.5	34.0	55.0	83.1	126.2	250.9	468.7	977.9	1904.9
300	12	20.2	32.6	56.0	83.6	124.8	242.3	468.1	1007.4	1902.0
350	14	18.1	30.7	53.8	86.2	123.9	244.5	472.0	994.7	
400	16	16.6	32.2	52.6	83.5	124.4	248.5	465.4	823.9	
450	18	16.6	32.1	52.6	83.5	124.3	247.3	469.1	985.0	
500	20	16.7	31.9	52.1	82.1	121.7	245.8	466.8	974.8	
600	24	16.0	30.4	55.0	82.6	124.1	243.8	471.1		
700	28	15.2	29.2	49.9	80.2	118.1	233.3	450.5		
750	30	15.2	29.1	50.7	80.9	118.5	231.7	452.9		
800	32	15.3	29.0	50.2	79.7	118.8	233.8	455.0		
900	36	14.8	28.8	49.4	79.3	118.5	233.5	453.7		
1000	40	14.9	29.3	50.7	80.4	119.7				

Span lengths

Nominal pipe size		Parital span recommendations* (in meters) for horizontal support arrangements at 21°C								
(mm)	(in)	2410	2412	2414	2416	2420	2425	2432	2440	2450
50	2	3.42	3.42	3.42	3.42	3.42	3.42	3.42	3.60	3.75
80	3	3.85	3.85	3.85	3.85	3.85	4.02	4.16	4.41	4.60
100	4	4.11	4.11	4.11	4.21	4.30	4.53	4.72	4.99	5.21
150	6	4.69	4.79	4.93	5.10	5.25	5.51	5.78	6.09	6.40
200	8	5.35	5.39	5.60	5.79	5.99	6.28	6.61	6.98	7.32
250	10	5.87	6.04	6.26	6.47	6.68	7.04	7.38	7.81	8.21
300	12	6.32	6.56	6.84	7.06	7.28	7.66	8.06	8.54	8.96
350	14	6.56	6.84	7.14	7.41	7.62	8.03	8.45	8.94	
400	16	6.96	7.33	7.62	7.90	8.15	8.60	9.02	9.42	
450	18	7.30	7.69	7.99	8.29	8.55	9.02	9.47	10.02	
500	20	7.69	8.10	8.42	8.72	8.99	9.50	9.98	10.55	
600	24	8.39	8.83	9.25	9.55	9.86	10.39	10.94		
700	28	9.19	9.68	10.09	10.48	10.70	11.30	11.90		
750	30	9.51	10.01	10.46	10.85	11.10	11.70	12.30		
800	32	9.82	10.33	10.79	11.19	11.50	12.10	12.80		
900	36	10.39	10.95	11.43	11.86	12.20	12.80	13.50		
1000	40	10.95	11.55	12.07	12.52	12.90				

* Note: For continuous span use of above values: plus 20%
For simple span use of above values: minus 20%

1) Span recommendations are based on pipes filled with water with a specific gravity of 1000kg/m_3 and include no provision for weights caused by valves, flanges or other heavy objects.

2) Span recommedations are calculated for a maximum long time deflection of 13 mm to ensure good appearance and adequate drainage.

Bending radius

Nominal pipe size		Minimum allowable bending radius (Rb) in m at 21°C and standard pressure rating								
(mm)	(in)	2410	2412	2414	2416	2420	2425	2432	2440	2450
50	2	10	11	11	12	12	14	17	17	19
80	3	17	18	19	21	24	26	29	29	31
100	4	24	26	28	30	34	35	38	38	41
150	6	42	46	48	48	54	57	61	62	64
200	8	58	66	66	67	74	78	83	82	86
250	10	79	85	86	87	99	100	109	107	109
300	12	101	105	104	106	120	123	131	127	131
350	14	116	119	117	116	134	136	144	141	
400	16	139	136	137	135	154	155	168	180	
450	18	155	151	152	150	171	173	185	180	
500	20	174	170	171	169	194	194	207	202	
600	24	216	212	203	204	233	236	249		
700	28	273	264	259	253	274	275			
750	30	294	285	276	271	293	296			
800	32	315	306	297	291	312	314			
900	36	363	348	339	330	324	352			
1000	40	405	385	374	366	363				

* Note: Do not bend pipe until adhesive has cured. At rated pressure, sharper bends may create excessive stress concentrations.

Field testing

Pipe system is designed for field testing with water at 150% of rated pressure.

Surge pressure

Maximum allowable surge pressure is 150% of rated pressure.

Conversions

1 psi	= 6895 Pa	= 0.07031 kg/cm^2	
1 bar	= 10^5 Pa	= 14.5 psi	= 1.02 kg/cm^2
1 Mpa	= 1 N/mm^2	= 145 psi	= 10.2 kg/cm^2
1 inch	= 25.4 mm		
1 Btu.in/(h•ft^2•°F)	= 0.1442 W/(m•K)		
°C	= 5/9 (°F-32)		

Important Notice

This literature and the information and recommendations it contains are based on data reasonably believed to be reliable. However, such factors as variations in environment, application or installation, changes in operating procedures, or extrapolation of data may cause different results. HB Composites makes no representation or warranty, express or implied,
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