



CAPITAL RUBBER

METAL HOSE SOLUTIONS

Phone: 630-595-6644 • Fax: 630-595-1411 • www.capitalrubber.com



***KEEPING YOUR
BUSINESS FLOWING***



PENFLEX



Metal Hose Solutions

EXPERIENCE THAT GIVES YOU THE EDGE

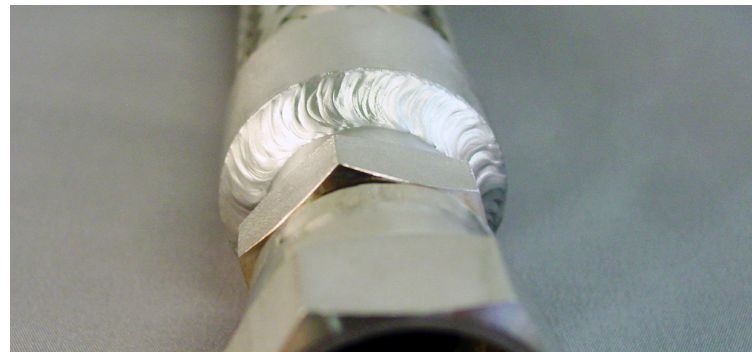
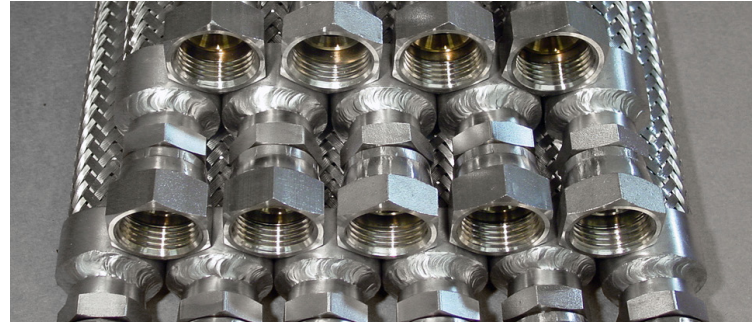
Capital Rubber has been in the business of helping our customers solve their metal hose requirements since 1975. We are the leader in critical hose and fitting products to keep your business flowing. We are committed to working with our customers to fabricate the right product for their applications, producing products that meet their quality expectations and servicing them throughout the process.

QUALITY, SERVICE AND FLEXIBILITY ARE #1

Capital Rubber's flexibility enables us to facilitate the change required to do business in this new marketplace. We are a service-oriented fabricator focused on quality assemblies for all our customer's hose assembly and component needs. This has been and always will be our focus and commitment to our customers. We pride ourselves in the ability to create and adjust new and innovative programs for our customers, helping them succeed while others fail! When we, as a company, reflect back on the strengths that brought this corporation to where it is today, we ask ourselves one important question: Why have we been able to satisfy our customers?

DEDICATED AND HARD WORKING EMPLOYEES!

Capital Rubber employees are talented, hard working people. Capital Rubber provides them with access to resources and opportunities. Managers, who are accountable for creating high involvement, a continuous improvement environment, and take active roles in the development and recognition of these employees, serve as their mentors and coaches.



Our Mission is Simple: To be a leader in the hose and fittings industry.

We will achieve this by providing quality products, exceptional service and a dedicated team serving you, our valued customer. We pledge to continue to take on the challenges of preserving this philosophy, by being a unique and creative company, dedicated to quality, service and the betterment of our customers!



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Fitting Options & Accessories



Male Pipe Nipple

Alloys: 304 and 316 Stainless Steel,
Carbon Steel

Sizes: 1/8" thru 8"

Schedules: 40 and 80



Male Pipe Hex

Alloys: 304 and 316 Stainless Steel,
Carbon Steel, Brass

Sizes: 1/4" thru 4"



Female Pipe Union

Alloys: 304 and 316 Stainless Steel,
Carbon Steel, Malleable Iron, Brass

Sizes: 1/4" thru 4"

Class: 125#, 150#, 300#



Female Pipe Coupling

Alloys: 304 and 316 Stainless Steel,
Carbon Steel

Sizes: 1/4" thru 4"

Class: 150#, 300#



Female Pipe Hex Coupling

Alloys: 316 Stainless Steel, Carbon Steel

Sizes: 1/4" thru 2"



Female Pipe Swivel

Alloys: 316 Stainless Steel, Carbon Steel

Sizes: 1/4" thru 2"



Fixed Flange

Alloys: 304 and 316 Stainless Steel,
Carbon Steel

Sizes: 1/2" thru 12"

Class: 150# thru 1500#

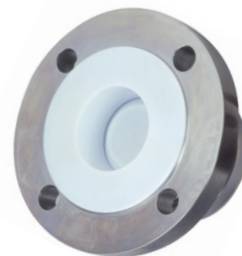


Floating Flange

Alloys: 304 and 316 Stainless Steel,
Carbon Steel

Sizes: 1/2" thru 12"

Class: 150# thru 1500#



Teflon Lined Metal Hose

Alloys: 304 and 316 Stainless Steel

Sizes: 1" thru 6"

Fitting Options & Accessories



TTMA (Tank Truck) Flange

Alloys: 304 and 316 Stainless Steel,
Carbon Steel, Aluminum
Sizes: 3" and 4"



Sanitary Tri-Clamp

Alloys: 304 and 316 Stainless Steel
Sizes: 1" thru 3"



SAE Flange

Alloys: 316 Stainless Steel and Carbon Steel
Sizes: 1/2" thru 5"
Class: Code 61 and Code 62



37 Degree JIC Swivel

Alloys: 304 and 316 Stainless Steel,
Carbon Steel
Sizes: 1/4" thru 3"



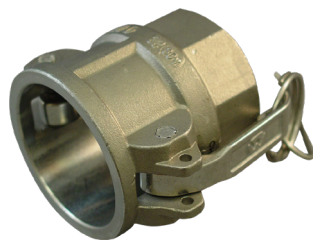
37 Degree Male JIC

Alloys: 304 and 316 Stainless Steel,
Carbon Steel
Sizes: 1/4" thru 3"



Female O-ring Face Seal

Alloys: 316 Stainless Steel, Carbon Steel
Sizes: 1/4" thru 2"



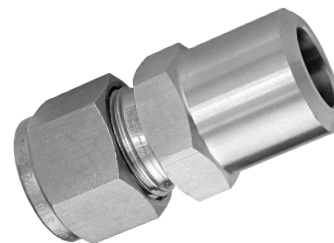
Cam & Grove Female

Alloys: 304 and 316 Stainless Steel,
Carbon Steel, Brass, Aluminum
Sizes: 1/2" thru 12"



Cam & Grove Male

Alloys: 304 and 316 Stainless Steel,
Carbon Steel, Brass, Aluminum
Sizes: 1/2" thru 12"



Compression Fitting

Alloys: 316 Stainless Steel, Alloy 400,
Alloy C-276, Brass, Carbon Steel
Sizes: 1/8" thru 2"
Style: Single and Double Ferrule

Fitting Options & Accessories



Tube/Pipe Ends

Alloys: 304 and 316 Stainless Steel,
Carbon Steel

Sizes: 1/8" thru 12"

Wall Thickness: Multiple



Groove End

Alloys: 304 and 316 Stainless Steel,
Carbon Steel

Sizes: 1" thru 8"

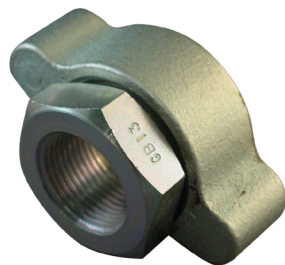
Schedules: 40 and 80



Copper Sweat Ends

Alloys: Copper

Sizes: 1/2" thru 3"



Ground Joint

Alloys: Malleable Iron

Sizes: 1/2" thru 4"



Reducers

Alloys: 304 and 316 Stainless Steel, Carbon Steel

Sizes: 1/8" thru 12"

Schedules: 10 thru 80

Shapes: Concentric & Eccentric



Elbows

Alloys: 304 and 316 Stainless Steel, Carbon Steel

Sizes: 1/8" thru 12"

Schedules: 10 thru 80

Shapes: 45 and 90 Degree



Fire Sleeve

Excellent way to protect handler from burns, withstands repeated exposure to molten steel, aluminum and glass, also provides effective insulation to prevent heat loss.



Armor Guard

Fantastic way to prolong the life of hose lines that are exposed to rugged operating conditions. It will distribute bending radii to avoid kinking and protect hose from abrasion and deep cuts.

***Any custom
hose end
that can be
welded to
Stainless Steel.***

Pressure Chart

Quick Find Pressure Chart

Maximum Working Pressure @70°F(PSIG)^a

Series	P3 Annular Stainless	P4 Annular Stainless	700 Annular Stainless		800 Annular Stainless		900 Annular Stainless		740 Annular Monel		794 Annular Bronze		
Braid Layers	1	1	2	1	2	1	2	1	2	1	2	1	2
1/4"	2,360	2,500	4,000	2,116	3,125	2,562	4,099	2,754	4,131	1,722	2,755	1,035	1,656
5/16"	1,647	2,200	3,520	----	----	----	----	----	----	----	----	----	----
3/8"	1,639	1,530	2,448	1,501	2,401	1,501	2,401	1,921	3,073	----	----	685	1,096
1/2"	1,225	1,200	1,920	1,075	1,720	2,194	3,510	2,194	3,510	741	1,186	706	1,130
5/8"	1,200	----	----	----	----	----	----	----	----	----	----	----	----
3/4"	1,034	850	1,360	792	1,267	1,311	2,098	1,994	3,192	629	1,006	577	923
1"	796	590	944	571	914	1,069	1,710	1,599	2,558	517	827	470	752
1-1/4"	600	540	864	531	850	1,110	1,776	1,317	2,107	----	----	361	577
1-1/2"	557	475	760	472	755	868	1,388	1,062	1,698	343	549	329	526
2"	570	530	848	516	826	810	1,296	842	1,346	376	602	317	507
2-1/2"	----	410	656	387	619	578	925	----	----	----	----	272	435
3"	----	335	536	316	506	540	864	----	----	211	338	201	322
4"	----	240	384	232	371	333	533	----	----	----	----	142	227
5"	----	----	----	191	306	----	----	----	----	----	----	----	----
6"	----	----	----	165	264	266	425	----	----	----	----	----	----
8"	----	----	----	234	374	----	----	----	----	----	----	----	----
10"	----	----	----	230	367	----	----	----	----	----	----	----	----
12"	----	----	----	161	257	----	----	----	----	----	----	----	----
14"	----	----	----	119	190	----	----	----	----	----	----	----	----

- a. Pressures listed have been reduced to account for welding as the method of attachment. Other methods such as brazing, neck-down designs or crimping will result in different pressures. Contact the factory for details.
See page 18 for temperature adjustment factors.

IMPORTANT NOTICE

All Penflex information and data is published to assist plant engineers and owners in designing flexible metal hose assemblies. We cannot anticipate all the factors and parameters of every application. All information provided is intended to address basic, minimum concepts.

Engineers should not rely solely on the information listed or referenced here, this information should be used in conjunction with all applicable federal, state, and local laws, building codes, other industry guidelines and sound engineering practice.

All the information on this page and the following pages is provided by Penflex.

Series 700

Series 700 Stainless Steel and Compressed Hose

Construction: Annular / Standard Pitch – [Open Pitch & Compressed Pitch hose available upon request, consult factory](#)

Material: 1/4"-12" Hose: 321 and 316L Stainless Steel

14" Hose: 304 Stainless Steel

1/4"-6" Braid: 304L and 316L Stainless Steel

8"-14" Braid: 304 Stainless Steel

Characteristics: Medium Weight / Medium Flexibility

Available in Inconel 600/625, Monel 400, Hastelloy C276, and Bronze

Nom. I.D. (IN.)	Part Number	Braid Layers	Nom. O.D. (IN.)	Maximum Pressure @70°F(PSIG) ^a			Centerline Bend Radius(IN.)		Weight per Foot (LB.)	Carton Qty. ^b (FT.)	Reel Qty. ^b (FT.)
				Working	Test	Nominal Burst	Dynamic	Static			
1/4"	7xx-004 ^c	0	.48	180	270	----	5.00	1.00	.09	100	500
	7xx-1SB-004	1	.57	2,116	3,844	8,464			.17		
	7xx-2SB-004	2	.64	3,125	4,687	12,500			.26		
3/8"	7xx-006 ^c	0	.63	100	150	----	5.50	1.25	.13	100	500
	7xx-1SB-006	1	.70	1,501	2,251	6,004			.25		
	7xx-2SB-006	2	.81	2,401	3,602	9,604			.36		
1/2"	7xx-008 ^c	0	.82	80	120	----	6.00	1.50	.23	100	500
	7xx-1SB-008	1	.89	1,075	1,613	4,301			.34		
	7xx-2SB-008	2	.96	1,720	2,580	6,880			.46		
3/4"	7xx-012 ^c	0	1.21	70	105	----	8.00	2.25	.39	100	500
	7xx-1SB-012	1	1.28	792	1,188	3,168			.59		
	7xx-2SB-012	2	1.35	1,267	1,901	5,069			.79		
1"	7xx-016 ^c	0	1.51	40	60	----	9.00	2.75	.53	100	450
	7xx-1SB-016	1	1.58	571	857	2,285			.75		
	7xx-2SB-016	2	1.65	914	1,370	3,654			.98		
1-1/4"	7xx-020 ^c	0	1.85	25	38	----	10.50	3.50	.76	50	400
	7xx-1SB-020	1	1.93	531	797	2,125			1.07		
	7xx-2SB-020	2	2.02	850	1,274	3,398			1.37		
1-1/2"	7xx-024 ^c	0	2.19	20	30	----	12.00	4.00	.84	50	350
	7xx-1SB-024	1	2.28	472	708	1,887			1.23		
	7xx-2SB-024	2	2.37	755	1,133	3,021			1.63		
2"	7xx-032 ^c	0	2.60	15	23	----	15.00	5.00	.90	50	250
	7xx-1SB-032	1	2.72	516	774	2,064			1.52		
	7xx-2SB-032	2	2.84	826	1,239	3,302			2.14		
2-1/2"	7xx-040 ^c	0	3.23	12	18	----	20.00	8.00	1.16	25	na
	7xx-1SB-040	1	3.33	387	581	1,548			1.86		
	7xx-2SB-040	2	3.43	619	929	2,477			2.56		
3"	7xx-048 ^c	0	3.78	10	15	----	22.00	9.00	1.21	25	na
	7xx-1SB-048	1	3.88	316	474	1,264			2.00		
	7xx-2SB-048	2	3.98	506	758	2,022			2.80		
3-1/2"	7xx-056 ^c	0	4.32	9	14	----	24.00	10.00	1.62	25	na
	7xx-1SB-056	1	4.45	297	445	1,188			2.61		
	7xx-2SB-056	2	4.58	475	712	1,900			3.60		
4"	7xx-064 ^c	0	4.85	8	12	----	27.00	13.00	1.69	25	na
	7xx-1SB-064	1	4.98	232	348	927			2.68		
	7xx-2SB-064	2	5.10	371	557	1,485			3.68		
5"	7xx-080 ^c	0	5.90	6	9	----	31.00	18.00	2.50	25	na
	7xx-1SB-080	1	6.03	191	286	764			3.75		
	7xx-2SB-080	2	6.15	306	458	1,222			5.00		
6"	7xx-096 ^c	0	6.87	5	8	----	36.00	19.00	3.47	25	na
	7xx-1SB-096	1	7.10	165	247	660			4.75		
	7xx-2SB-096	2	7.33	264	396	1,056			6.04		
8"	7xx-128 ^c	0	9.09	6	9	----	40.00	20.00	5.56	10-12/25	na
	7xx-1SB-128	1	9.19	234	350	934			9.44		
	7xx-2SB-128	2	9.28	374	561	1,495			13.36		
10"	7xx-160 ^c	0	11.18	5	8	----	50.00	25.00	6.80	10-12/25	na
	7xx-1SB-160	1	11.32	230	344	918			12.90		
	7xx-2SB-160	2	11.45	367	551	1,469			19.00		
12"	7xx-192 ^c	0	13.23	3	5	----	60.00	30.00	9.02	10-12/25	na
	7xx-1SB-192	1	13.37	161	241	643			14.83		
	7xx-2SB-192	2	13.50	257	386	1,029			20.64		
14"	7xx-224 ^c	0	14.70	3	5	----	70.00	35.00	14.10	10.5	na
	7xx-1SB-224	1	14.84	119	178	476			21.70		
	7xx-2SB-224	2	14.98	190	285	760			29.30		

a. Pressures listed have been reduced to account for welding as the method of attachment.
Other methods such as brazing, neck-down designs or crimping will result in different pressures.
Contact the factory for details.

b. Actual length may vary \pm 20%.

c. For xx specify 21 for 321 stainless steel or 16 for 316L stainless steel.



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Series 800

Series 800 Stainless Steel Hose

Construction: Annular / Close Pitch

Material: Hose: 316L & 321 Stainless Steel

Braid: 304L Stainless Steel — SHB

Characteristics: Heavy Weight / Medium Flexibility

Nom. I.D. (IN.)	Part Number	Braid Layers	Nom. O.D. (IN.)	Maximum Pressure @70°F(PSIG) ^a			Centerline Bend Radius (IN.)		Weight per Foot (LB.)	Carton Qty ^b . (FT.)	Reel Qty ^b (FT.)
				Working	Test	Nominal Burst	Dynamic	Static			
1/4"	8xx-004 ^c	0	.50	180	270	----			.09		
	8xx-1SHB-004	1	.57	2,562	3,844	10,250	5.00	1.00	.17	100	500
	8xx-2SHB-004	2	.64	4,099	6,150	16,400			.26		
3/8"	8xx-006 ^c	0	.67	100	150	----			.13		
	8xx-1SHB-006	1	.74	1,501	2,251	6,004	5.50	1.25	.25	100	500
	8xx-2SHB-006	2	.81	2,401	3,602	9,604			.36		
1/2"	8xx-008 ^c	0	.82	80	120	----			.39		
	8xx-1SHB-008	1	.92	2,194	3,291	8,777	8.00	1.50	.63	100	500
	8xx-2SHB-008	2	1.02	3,510	5,265	14,040			.87		
3/4"	8xx-012 ^c	0	1.21	70	105	----			.48		
	8xx-1SHB-012	1	1.31	1,311	1,967	5,244	8.00	2.00	.79	100	500
	8xx-2SHB-012	2	1.41	2,098	3,147	8,392			1.10		
1"	8xx-016 ^c	0	1.50	40	60	----			.79		
	8xx-1SHB-016	1	1.60	1,069	1,604	4,276	9.00	3.00	1.20	100	450
	8xx-2SHB-016	2	1.70	1,710	2,566	6,840			1.61		
1-1/4"	8xx-020 ^c	0	1.85	33	50	----			1.02		
	8xx-1SHB-020	1	1.97	1,110	1,666	4,443	10.00	3.25	1.66	40-45	400
	8xx-2SHB-020	2	2.10	1,776	2,665	7,040			2.30		
1-1/2"	8xx-024 ^c	0	2.17	20	30	----			1.36		
	8xx-1SHB-024	1	2.30	868	1,302	3,472	10.00	3.25	2.11	40-45	350
	8xx-2SHB-024	2	2.43	1,388	2,082	5,552			2.86		
2"	8xx-032 ^c	0	2.51	15	23	----			1.60		
	8xx-1SHB-032	1	2.64	810	1,215	3,240	11.50	5.38	2.56	40-45	250
	8xx-2SHB-032	2	2.76	1,296	1,944	5,184			3.52		
2-1/2"	8xx-040 ^c	0	3.23	10	15	----			2.00		
	8xx-1SHB-040	1	3.36	578	867	2,312	24.00	7.00	3.12	25	na
	8xx-2SHB-040	2	3.49	925	1,387	3,700			3.30		
3"	8xx-048 ^c	0	3.78	10	15	----			2.97		
	8xx-1SHB-048	1	3.91	540	810	2,160	28.00	7.50	4.42	25	na
	8xx-2SHB-048	2	4.03	864	1,295	3,456			5.87		
4"	8xx-064 ^c	0	4.81	8	12	----			3.10		
	8xx-1SHB-064	1	4.93	333	500	1,332	40.00	20.00	4.55	25	na
	8xx-2SHB-064	2	5.05	533	800	2,132			6.00		
6"	8xx-096 ^c	0	6.87	5	8	----			3.85		
	8xx-1SHB-096	1	7.10	266	398	1,062	48.00	24.00	6.45	25	na
	8xx-2SHB-096	2	7.33	425	638	1,700			9.05		

a. Pressures listed have been reduced to account for welding as the method of attachment. Other methods such as brazing, neck-down designs or crimping will result in different pressures. Contact the factory for details.

b. Actual length may vary \pm 20%.

c. For xx specify 21 for 321 stainless steel or 16 for 316L stainless steel.



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Series 900

Series 900 Stainless Steel Hose

Construction: Annular / Close Pitch

Material: Hose: 316L Stainless Steel

Braid: 304L Stainless Steel — HTSB, see below

Characteristics: Heavy Weight / Medium Flexibility

Nom. I.D. (IN.)	Part Number	Braid Layers	Nom. O.D. (IN.)	Maximum Pressure @70°F(PSIG) ^a			Centerline Bend Radius (IN.)		Weight per Foot (LB.)	Carton Qty. (FT.)
				Working	Test	Nominal Burst	Dynamic	Static		
1/4"	916-004	0	.50	180	270	----	12.00	6.00	.20	cut to length
	916-1HTSB-004	1	.58	2,754	4,131	11,017			.28	
	916-2HTSB-004	2	.64	4,406	6,609	17,627			.36	
3/8"	916-006	0	.67	100	150	----	12.00	6.00	.31	cut to length
	916-1HTSB-006	1	.75	1,921	2,881	7,682			.43	
	916-2HTSB-006	2	.83	3,073	4,610	12,291			.55	
1/2"	916-008	0	.82	80	120	----	14.00	7.00	.40	cut to length
	916-1HTSB-008	1	.92	2,194	3,291	8,777			.58	
	916-2HTSB-008	2	1.02	3,510	5,265	14,040			.76	
3/4"	916-012	0	1.22	70	105	----	15.00	7.50	.65	cut to length
	916-1HTSB-012	1	1.34	1,994	2,991	7,980			.92	
	916-2HTSB-012	2	1.46	3,192	4,788	12,769			1.19	
1"	916-016	0	1.52	40	60	----	16.00	8.00	1.02	cut to length
	916-1HTSB-016	1	1.65	1,599	2,398	6,397			1.48	
	916-2HTSB-016	2	1.77	2,558	3,830	10,234			1.94	
1-1/4"	916-020	0	1.85	25	38	----	18.00	9.00	1.56	cut to length
	916-1HTSB-020	1	1.97	1,317	1,975	5,270			2.02	
	916-2HTSB-020	2	2.09	2,107	3,161	8,431			2.48	
1-1/2"	916-024	0	2.19	20	30	----	19.00	9.50	2.01	cut to length
	916-1HTSB-024	1	2.31	1,062	1,592	4,247			2.65	
	916-2HTSB-024	2	2.43	1,698	2,547	6,795			3.30	
2"	916-032	0	2.51	15	23	----	24.00	12.00	2.43	cut to length
	916-1HTSB-032	1	2.64	842	1,262	3,368			3.17	
	916-2HTSB-032	2	2.77	1,346	2,019	5,388			3.91	

- a. Pressures listed have been reduced to account for welding as the method of attachment. Other methods such as brazing, neck-down designs or crimping will result in different pressures. Contact the factory for details.

Series P3

Series P3 Stainless Steel Hose

Construction: Annular / Standard Pitch/ Close Pitch

Material: Hose: 304, 321 and 316L Stainless Steel

Braid: 304L and 316L Stainless Steel

Characteristics: Light Weight /High Flexibility

Nom. I.D. (in.)	Part Number	Braid Layers	Nom. O.D. (IN.)	Maximum Pressure @70°F(PSIG)			Bend Radius (IN.)		Weight per Foot (LB.)	Reel Qty. ^b (FT.)
				Work	Test	Burst	Dynamic	Static		
1/4"	30xx-004	0	0.38	72	108	----	3.15	1.10	0.05	500
	P3-H30xx-B30xx-004	1	0.43	2,360	3,540	9,440			0.10	
5/16"	30xx-005	0	0.48	72	108	----	4.85	1.23	0.05	500
	P3-H30xx-B30xx-005	1	0.53	1,647	2,470	6,588			0.12	
3/8"	30xx-006	0	0.56	72	108	----	5.08	1.52	0.07	500
	P3-H30xx-B30xx-006	1	0.62	1,639	2,458	6,556			0.16	
1/2"	30xx-008	0	0.66	72	108	----	5.47	1.75	0.08	500
	P3-H30xx-B30xx-008	1	0.72	1,225	1,837	4,900			0.18	
5/8"	30xx-010	0	0.85	71	107	----	6.28	2.21	0.12	500
	P3-H30xx-B30xx-010	1	0.92	1,200	1,800	4,800			0.27	
3/4"	30xx-012	0	1.05	43	65	----	6.58	2.65	0.19	500
	P3-H30xx-B30xx-012	1	1.12	1,034	1,551	4,136			0.39	
1"	30xx-016	0	1.27	43	65	----	7.50	3.33	0.24	450
	P3-H30xx-B30xx-016	1	1.34	796	1,194	3,184			0.48	
1-1/4"	30xx-020	0	1.62	43	65	----	10.20	4.10	0.33	450
	P3-H30xx-B30xx-020	1	1.69	600	900	2,400			0.66	
1-1/2"	30xx-024	0	1.95	28	42	----	11.75	5.08	0.51	350
	P3-H30xx-B30xx-024	1	2.03	557	835	2,228			0.91	
2"	30xx-032	0	2.38	28	42	----	12.55	6.27	0.64	225
	P3-H30xx-B30xx-032	1	2.48	570	855	2,280			1.27	

- a. Pressures listed have been reduced to account for welding as the method of attachment. Other methods such as brazing, neck-down designs or crimping will result in different pressures. Contact the factory for details.
- b. Actual length may vary \pm 20%.

Series P4

Series P4 Stainless Steel Hose

Construction: Annular/Standard Pitch

Material: Hose: 321 and 316L Stainless Steel

Braid: 304L and 316L Stainless Steel

Characteristics: Medium Weight /Medium Flexibility

Nom. Size (in.)	Part number	Braids	Nom. OD (in.)	Braid Construction	Max. Pressure @70°F (PSIG)		Braid Coverage (%)	Bend Radius (in.)		Wt/ Ft (lb.)	Reel Qty (ft)
					WORK	BURST		Dyn.	Static		
1/4"	40xx-004	0	0.40	24 x 5 x .014	200	~~~~	98%	5.00	1.00	0.08	500
	P4-H40xx-B40xx-004	1	0.48		2,500	10,000				0.17	
	P4-H40xx-2B40xx-004	2	0.56		4,000	16,000				0.26	
5/16"	40xx-005	0	0.48	24 x 6 x .014	180	~~~~	98%	5.00	1.00	0.09	500
	P4-H40xx-B40xx-005	1	0.57		2,200	8,800				0.19	
	P4-H40xx-2B40xx-005	2	0.64		3,520	14,080				0.29	
3/8"	40xx-006	0	0.63	24 x 8 x .014	100	~~~~	98%	5.50	1.25	0.13	500
	P4-H40xx-B40xx-006	1	0.70		1,530	6,120				0.27	
	P4-H40xx-2B40xx-006	2	0.81		2,448	9,792				0.41	
1/2"	40xx-008	0	0.82	24 x 9 x .014	80	~~~~	94%	6.00	1.50	0.23	500
	P4-H40xx-B40xx-008	1	0.89		1,200	4,800				0.39	
	P4-H40xx-2B40xx-008	2	0.96		1,920	7,680				0.55	
3/4"	40xx-012	0	1.21	36 x 9 x .014	70	~~~~	95%	8.00	2.25	0.39	500
	P4-H40xx-B40xx-012	1	1.28		850	3,400				0.62	
	P4-H40xx-2B40xx-012	2	1.35		1,360	5,440				0.85	
1"	40xx-016	0	1.51	36 x 10 x .014	40	~~~~	92%	9.00	2.75	0.53	450
	P4-H40xx-B40xx-016	1	1.58		590	2,360				0.79	
	P4-H40xx-2B40xx-016	2	1.65		944	3,776				1.05	
1-1/4"	40xx-020	0	1.85	48 x 8 x .016	25	~~~~	92%	10.50	3.50	0.76	400
	P4-H40xx-B40xx-020	1	1.93		540	2,160				1.12	
	P4-H40xx-2B40xx-020	2	2.02		864	3,456				1.48	
1-1/2"	40xx-024	0	2.19	48 x 10 x .016	20	~~~~	93%	12.00	4.00	0.84	350
	P4-H40xx-B40xx-024	1	2.28		475	1,900				1.29	
	P4-H40xx-2B40xx-024	2	2.37		760	3,040				1.74	
2"	40xx-032	0	2.60	48 x 10 x .020	15	~~~~	95%	15.00	5.00	.90	250
	P4-H40xx-B40xx-032	1	2.72		530	2,120				1.61	
	P4-H40xx-2B40xx-032	2	2.84		848	3,392				2.33	
2-1/2"	40xx-040	0	3.23	72 x 8 x .020	12	~~~~	94%	20.00	8.00	1.16	250
	P4-H40xx-B40xx-040	1	3.33		410	1,640				1.86	
	P4-H40xx-2B40xx-040	2	3.43		656	2,624				2.56	
3"	40xx-048	0	3.78	72 x 9 x .020	10	~~~~	93%	22.00	9.00	1.21	200
	P4-H40xx-B40xx-048	1	3.88		335	1,340				2.00	
	P4-H40xx-2B40xx-048	2	3.98		536	2,145				2.80	
4"	40xx-064	0	4.85	72 x 11 x .020	8	~~~~	91%	27.00	13.00	1.69	150
	P4-H40xx-B40xx-064	1	4.98		240	960				2.68	
	P4-H40xx-2B40xx-064	2	5.08		384	1,536				3.68	

Pressures listed have been reduced to account for welding as the method of attachment. Other methods such as brazing, neck-down designs or crimping will result in different pressures. Contact the factory for details.



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Selection Criteria

The selection of flexible metal hose for a particular application is influenced by six primary considerations:

- Temperature
- Pressure
- Media
- Size
- End Fittings
- Motion

To make the best choice for a specific application, consider all the relevant operating factors against the properties of the various types of flexible metal hoses.

Temperature

The physical properties of any material varies with temperature. Limits for operating temperature are affected by the working pressure, the type of media being conveyed and the nature of the application. By careful selection of material, it is possible to provide flexible metal hose for a wide range of operating temperatures. The choice of hose type, metal alloy, end fitting and method of fitting attachment determines the temperature limit.

Pressure

The nominal pressure ratings of flexible metal hose varies according to type, material and size. Specific pressure ratings for each type of flexible metal hose are found in each section of this catalog. Under actual working conditions, pressure is affected by many other factors such as temperature, pulsating conditions and bending stresses.

Media

The type of media being conveyed is an important consideration in the selection process. Metal hose is subject to corrosion by both the material flowing through it and the outside environment. For almost all applications, a metal hose can be selected that is resistant to the intended media. Since metal hose is a thin-walled product, it will not have the same total life as heavier walled tube or pipe of the same material.

For Corrosion Resistance of Materials to different environment, refer to a chart posted on our web site:

<http://www.penflex.com/tools-corrosion-chart.php>.

Size

The size of flexible metal hose is specified by the nominal diameter. The existing piping will normally dictate the size of the metal hose for a particular application. However, flow rate, velocity and pressure drop considerations may also influence the selection of the hose size.

End Fittings

The use of flexible metal hose is complimented by the extensive range of end fittings that are available. Such end fittings may be male or female pipe threads, unions, flanges, flared tube fittings or other specially designed connectors. End fittings are attached by welding, silver brazing, soldering and occasionally by mechanical means, depending on the type of hose and the alloy. For further detail on the appropriate type of end fitting please consult your fabricating distributor.

Motion

Flexible metal hose is generally used in four types of applications.

- To correct problems of misalignment.
- To provide flexibility in manual handling operations.
- To compensate for regular or constant movement.
- To absorb vibration.

In all types, careful hose selection, design of the assembly and installation are important for optimal service life. The flexibility of a hose is determined by its mechanical design and the inherent flexibility of its material.

Temperature

Temperature Adjustment Factors

In general, the strength and therefore the pressure rating of metal hose decreases as the temperature increases. Thus, as the operating temperature of a metal hose assembly increases, the maximum allowable working pressure of the assembly decreases. The pressure ratings shown in the specifications charts for corrugated and interlocked hose are valid at 70°F. Elevated service temperatures will decrease these pressure ratings by the factors shown in the following chart for the alloy used in the braid wire. What also must be considered is the maximum working temperature of the end fittings, of the hose and their method of attachment.

For example to calculate the maximum working pressure for:

- 3/4" ID, 321 stainless steel corrugated hose
- with single-braided, 304L braid
- at 800°F.

From the corrugated metal hose specification table, the maximum working pressure at 70°F is 792 PSIG. Multiply 792 PSIG by 0.73. The maximum working pressure at 800°F is 578 PSIG.

Temperature Adjustment Factor Based on Braid Alloy

Temperature (°F)	304/304L Stainless Steel	316 L Stainless Steel	321 Stainless Steel	Carbon Steel	Monel	Bronze
70	1.00	1.00	1.00	1.00	1.00	1.00
150	.95	.93	.97	.99	.93	.92
200	.91	.89	.94	.97	.90	.89
250	.88	.86	.92	.96	.87	.86
300	.85	.83	.88	.93	.83	.83
350	.81	.81	.86	.91	.82	.81
400	.78	.78	.83	.87	.79	.78
450	.77	.78	.81	.86	.77	.75
500	.77	.77	.78	.81	.73	----
600	.76	.76	.77	.74	.72	----
700	.74	.76	.76	.66	.71	----
800	.73	.75	.68	.52	.70	----
900	.68	.74	.62	----	----	----
1,000	.60	.73	.60	----	----	----
1,100	.58	.67	.58	----	----	----
1,200	.53	.61	.53	----	----	----
1,300	.44	.55	.46	----	----	----
1,400	.35	.48	.42	----	----	----
1,500	.26	.39	.37	----	----	----

Saturated Steam Pressure To Temperature (PSIG)

Saturated Steam (PSIG)	Temp (°F)	Saturated Steam (PSIG)	Temp (°F)	Saturated Steam (PSIG)	Temp (°F)
0	212	150	366	450	460
10	238	175	377	475	465
20	259	200	388	500	470
30	274	225	397	550	480
40	287	250	406	600	489
50	298	275	414	700	505
60	307	300	422	800	520
75	320	325	429	900	534
80	324	350	436	1000	546
90	331	375	442	1250	574
100	338	400	448	1500	606
125	353	425	454	2500	669

Saturated Steam Pressure To Temperature (Hg)

Saturated Steam Vacuum (in. of Hg)	Temp (°F)
----	0
29.84	20
29.74	32
29.67	40
29.39	60
28.89	80
27.99	100
26.48	120
24.04	140
20.27	160
15.20	180
6.46	200

Pressure Loss and Flow Velocity

Pressure Loss

For the same flow characteristics, the pressure loss is higher in metal hoses than rigid piping, due to the profile of the corrugations. As a rough estimation, expect the pressure loss in corrugated hoses to be 150 percent higher than in new, smooth steel pipes.

Classification of Motion

Random Motion

Such motion is non-predictable and occurs from the manual handling of a hose assembly. Care must be taken to prevent over-bending of the hose and to avoid external abrasion of the wire braid. An armor covering of interlocked hose provides protection against these abuses.

Axial Motion

This type of motion occurs when there is extension or compression of the hose along its longitudinal axis. This class of motion is restricted to unbraided corrugated hose only and is accommodated by traveling loops (see pg. 18) or bellows specifically designed for this purpose.

Angular Motion

This type of motion occurs when one end of a hose assembly is deflected in a simple bend with the ends not remaining parallel.

To find the live hose length:

$$L = \pi R \theta / 180 + 2(s)$$

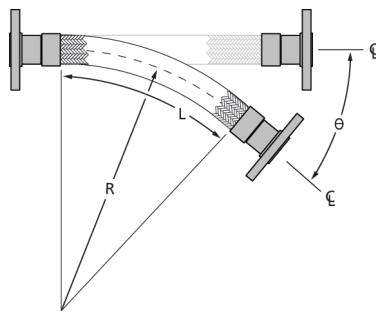
L = Live Hose Length (inches)

$$\pi = 3.1416$$

R = Minimum Centerline Bend Radius — Dynamic (in.)

θ = Angular Deflection (degrees)

S = Outside Diameter of Hose



Offset Motion

Offset motion occurs when one end of the hose assembly is deflected in a plane perpendicular to the longitudinal axis with the ends remaining parallel. This movement can be due to a one-time (static) bend or movement which repeatedly occurs slowly over time (such as thermal expansion).

- The appropriate formula to use to calculate Live Hose Length depends on the condition of the moving end.
- When the offset motion occurs to both sides of the hose centerline, use total travel in the formula; i.e., 2 x "T."
- The offset distance "T" for constant flexing should never exceed 25 percent of the centerline bend radius "R."
- If the difference between "L" and "Lp" is significant, exercise care at installation to avoid stress on hose and braid at the maximum offset distance.

L = Live Hose Length (inches) Lp = Projected Live Hose Length (inches)

R = Minimum Centerline Bend Radius — Dynamic (in.)

T = Offset Motion to One Side of Centerline (inches)

Flow Velocity Consideration

The flow velocity in corrugated metal hose should never exceed 150 ft./sec. for gas or 75 ft./sec. for liquids. When a hose is installed in a bent condition, the flow values should be reduced proportionally to the degree of the bend. Where the flow velocity exceeds these rates, an interlocked metal hose liner or larger hose I.D. is recommended.

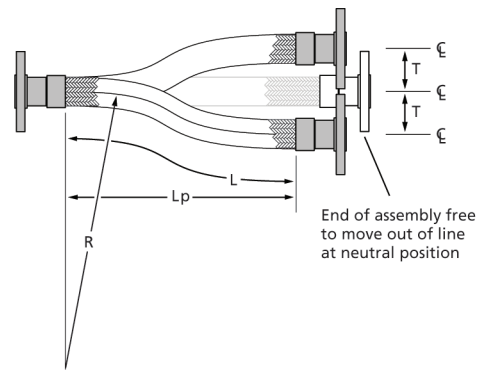
Minimum Bend Radius Occurs at Offset Position

Moving end is free to move "out of line" at neutral position.

To find the live hose length:

$$L = \sqrt{6(RT) + T^2}$$

$$Lp = \sqrt{L^2 - T^2}$$



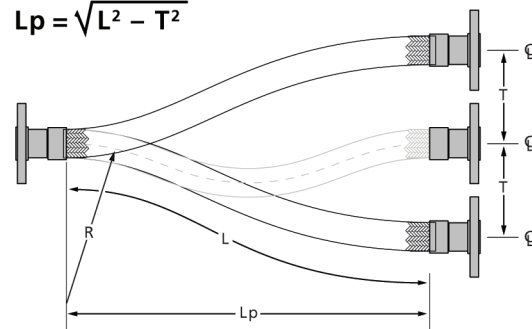
Minimum Bend Radius Occurs at Crowded Position

Moving end of hose is restricted to move only up and down as hose crosses neutral position.

To find the live hose length:

$$L = \sqrt{20(RT)}$$

$$Lp = \sqrt{L^2 - T^2}$$



Classification of Motion

Traveling Loops

In a piping system where axial movement must be accommodated or where the magnitude of the motion is in excess of the limits of an offset movement, the traveling loop configuration offers an ideal solution. In traveling loops, the centerline of a hose assembly is bent in a circular arc. Traveling loops accommodate movement in one of two ways. A constant radius traveling loop accommodates motion by varying the length of the arms of the assembly while the radius remains constant. A variable radius traveling loop accommodates motion by varying the bend radius of the hose assembly. Both types of traveling loops can be installed to absorb either horizontal or vertical movement. The constant radius traveling loop provides for greater movement while the variable radius traveling loop requires less installation space.

Traveling Loops

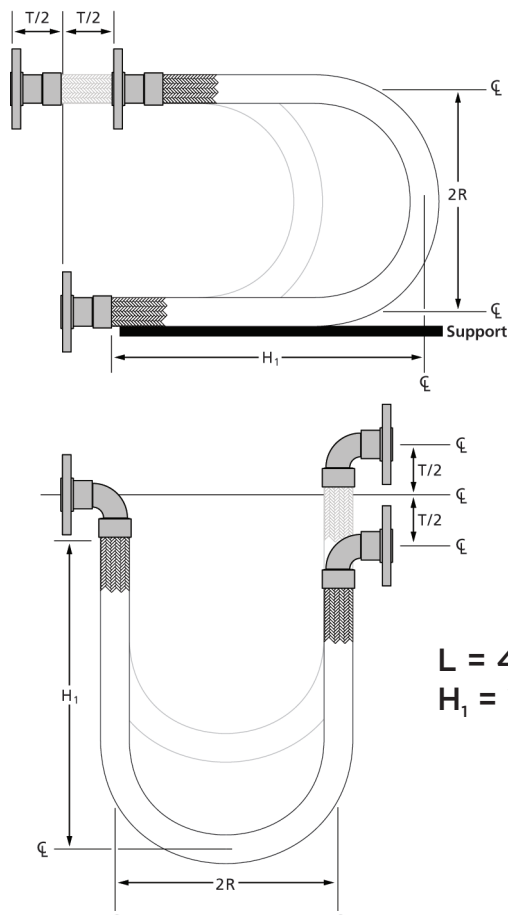
L = Live Hose Length (inches)

R = Minimum Centerline Bend Radius
for Constant Flexing (inches)

T = Total Travel (inches)

H = Hang Length of the Loop (inches)

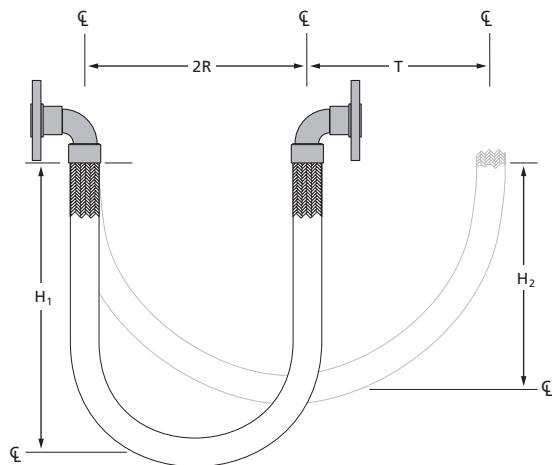
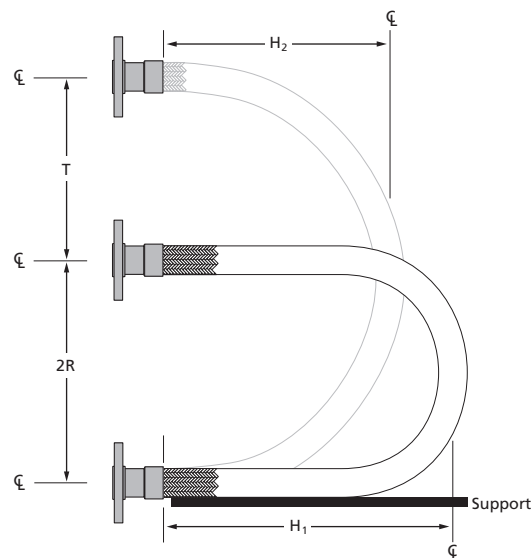
Constant Radius Traveling Loop – Class A



$$L = 4R + T/2$$

$$H_1 = 1.43R + T/2$$

Variable Radius Traveling Loop – Class B



$$L = 4R + 1.57T$$

$$H_1 = 1.43R + 0.79T$$

$$H_2 = 1.43R + 0.5T$$

Assembly Installation

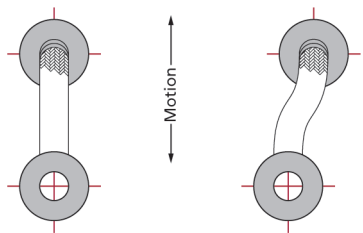
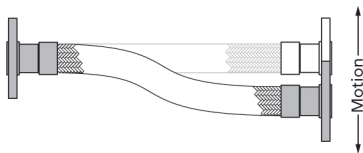
Penflex corrugated hose is engineered to provide maximum service life when properly installed. Improper installation, incorrect flexing or careless handling in an application will reduce the effective service life of the hose and cause premature failure of an assembly. The following installation and handling precautions should be observed to achieve optimum performance from your corrugated hose assemblies.

Avoid torque.

Do not twist the hose assembly during installation when aligning the bolt holes in a flange or in making up pipe threads. The utilization of lap joint flanges or pipe unions will minimize this condition. It is recommended that two wrenches be used in making the union connection; one to prevent the hose from twisting and the other to tighten the coupling.

In plane lateral offset installation

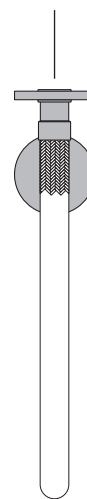
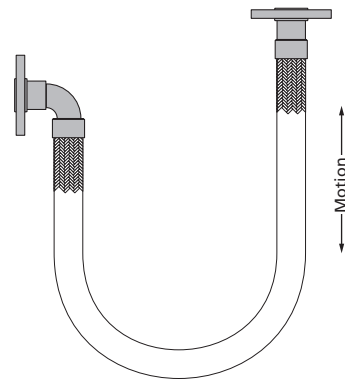
Prevent out-of-plane flexing in an installation. Always install the hose so that the flexing takes place in only one plane. This plane must be the plane in which the bending occurs.



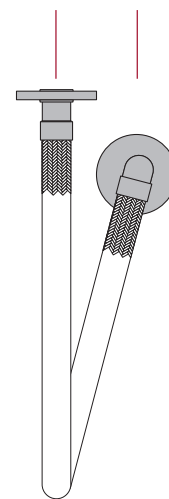
Correct
in plane
flexing

Wrong
out of plane
flexing

In plane traveling loop installation



Correct
in plane
flexing

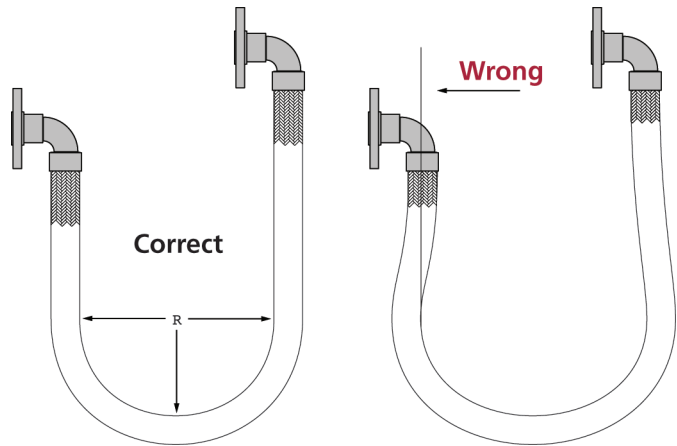


Wrong
out of plane
flexing

Assembly Installation

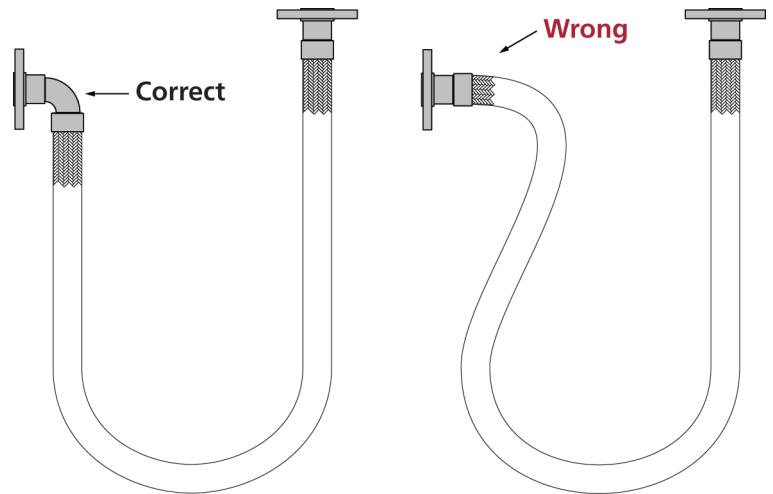
Avoid over bending.

The repetitive bending of a hose to a radius smaller than the radius listed in the specification tables for corrugated hose will result in premature hose failure. Always provide sufficient length to prevent over bending and to eliminate strain on the hose.



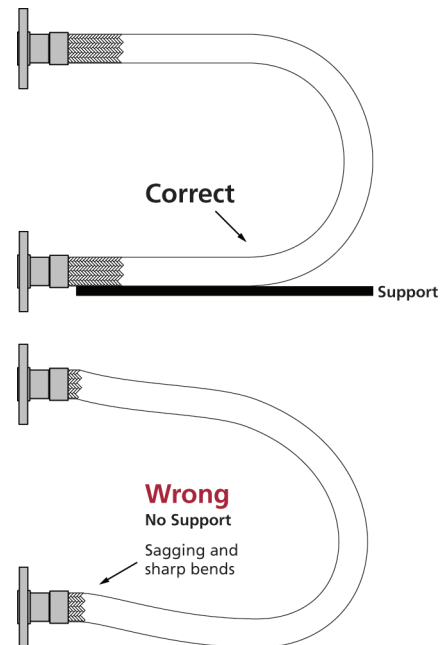
Avoid sharp bends.

Utilize sound geometric configurations that avoid sharp bends, especially near the end fittings of the assembly.



Provide support.

When installing the assembly in a horizontal loop, provide support for the arms to prevent the hose from sagging.

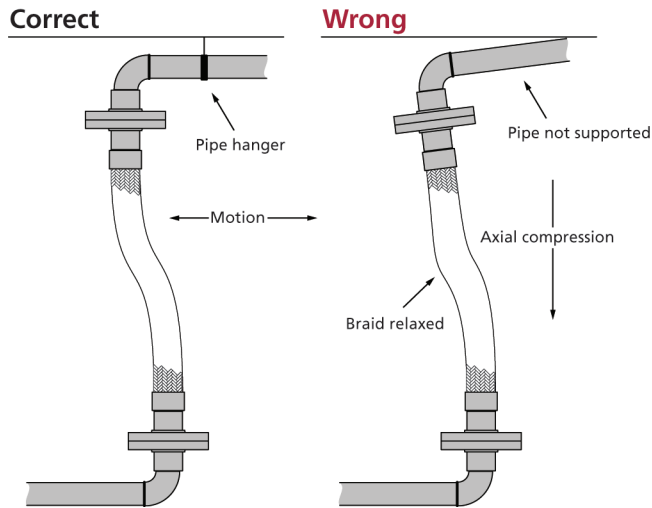


Assembly Installation

Do not extend or compress axially.

A piping system which utilizes metal hose to absorb movement must be properly anchored and/or guided.

Always support the piping to prevent excessive weight from compressing the hose and relaxing the braid tension.



Handle with care.

Avoid careless handling of the hose assembly. Always lift or carry metal hose to prevent abrasion damage particularly to braided corrugated hose. Store metal hose assemblies away from areas where it can be subjected to spillage, corrosive fumes or sprays, weld splatter, etc.

Do...

- follow any printed instructions included with the flexible connector.
- follow industry-recommended practices and use care in handling and installing flexible connector.
- install flexible connectors so that the bend is as close to the center of the connector as possible.
- observe the minimum bend radius as specified by the connector manufacturer.
- trial-fit threaded connections by hand, unmake and then make permanent.
- use a flexible connector of proper length to suit the installation.
- only wrench on the fitting hex flats as provided.
- design the installation to allow for ground movement after installation, such as settling or frost heave.
- install the proper length connector to allow a 2" straight run of hose at each end fitting.
- use pipe wrenches on both mating hexes to avoid twisting the hose.
- keep hose free from all objects and debris.
- handle and store connectors carefully prior to installation.
- check for leaks before covering the installation.
- install in such a manner that the connector can be removed.
- make sure the pressure rating of connector is not exceeded.

Don't...

- apply a wrench to a hose, collar or assembly.
- twist hose assemblies during installation or when aligning the bolt holes in a flange or when making up pipe threads.
- "pre-flex" a flexible connector to limber it up. Over-bending could cause damage and result in leakage.
- over-bend a flexible connector. A 45°–90° bend should be sufficient to install any flexible connector.
- install a flexible connector with the bend next to the end fittings. This could cause damage and result in leakage.
- lay the flexible connector on rocks or objects which could puncture the hose and cause leakage.
- attempt to stretch or compress a flexible connector to fit an installation.
- restrict flexibility by allowing connector to come into contact with other components or equipment during installation.



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We will achieve this by providing quality products, exceptional service
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