

North American 8773 Braided Flexible Connections

Bulletin 8773



8773 Flexible braided hoses for gas, oil, steam, compressed air and oxygen service are ideal for applications requiring a high degree of flexibility with tightness and protection against bursting. They are used in piping systems to neutralize problems caused by vibration, thermal expansion, piping alignment and to accommodate motion.

8773 hoses are selected for use to accommodate angular, axial, offset, radial and random motions. Braided hoses are not to be compressed or stretched, select a hose long enough to allow proper flexing when accommodating axial movements.

They are capable of handling high working pressures. The maximum working pressure is determined by the service temperature. Standard 8773 flexible hoses are for use up to 750 degree F temperature service. 8773-H (High Temp Hoses), are available for use up to 1000 degree F temperature service.

There are various end types available, including nipple, flange, lap joint (floating) flange and welded pipe ends. All combinations of end types and lengths are available to be custom ordered to meet any application.

SPECIFICATIONS

8773 braided flexible connectors are available in ½" through 12" nominal pipe sizes. Standard sizes 2" through 12" can be ordered with flanged ends. Screwed ends can be ordered up to 8".

temperature 8773-H version have 304 stainless steel end connections. 8773-C oxygen service hoses also have 304 stainless steel ends and are factory degreased and cleaned for use with oxygen.

Materials of Construction

Rolled and butt-welded, corrugated 321 stainless steel tubing incased in a 304 Stainless steel braid. The standard 8773 have carbon steel end connections and the high

End Types

Various end types are available. All end types may not be available in all sizes:

Type T

(½", ¾" and 1" sizes only) NPT Male Nipple with Intergral Hex Nut

Type T

(1¼" size and larger) Welded NPT Male Nipple

Type R

(2" size and larger) Raised Face Slip-on Pipe End ANSI Class 150 Drilling

Type A

(2" size and larger) Welded Plate Flange Flat Face ANSI Class 150 Drilling

Type F

(2" size and larger) Lap Joint (floating) with Stub End Flange, ANSI Class 150 Drilling

Type W

Welded Pipe End with 37½" Degree Bevel

Type M

(DIN 50 thru DIN 300) PN 16 Raised Face Metric Flange

TEMPERATURE and PRESSURE RATINGS

- **8773** (Standard), -50° to 750° F
- **8773-H** (High temp), -50° to 1000° F
- **8773-C** (cleaned for oxygen), -50° to 750° F

Common piping practice and industry Piping Standards **must be** observed when selecting a flexible hose assembly. An 8773 hose assembly has a maximum allowable pressure lower than the actual hose rating. Pressure ratings are limited by the various end connection types used. Table 1 lists maximum allowable pressure-temperature ratings for carbon steel and 304 SST ANSI flanges (see table 1). Note that pressure ratings decrease as temperature rises.

The hose pressure-temperature ratings are higher than the 8773 hose assembly maximum usable pressure (see table 2). The hose pressure ratings vary with pipe size and are for the hose maximum working pressure in PSIG at 70F. Contact factory for the availability of hoses with hose ends for higher pressure-temperature ratings. The pressure reducing factor table can be used to determine hose maximum pressure rating at elevated temperatures (see table 3).

Table 1

8773 Maximum usable Pressure-Temperature Rating PSIG.

Temp. °F	Material	
	SST	Steel
-20 to 100	275	285
200	235	260
300	205	230
400	180	200
500	170	170
600	140	140
650	125	125
700	110	110
750	95	95
800	80	-
850	65	-
900	50	-
950	35	-
1000	20	-

Table 2

NPS	Hose Pressure Rating PSIG
½"	1310
¾"	915
1"	645
1¼"	545
1½"	560
2"	450
2½"	570
3"	450
4"	285
6"	240
8"	217
10"	210
12"200	

Table 3

Pressure Reducing Factors for Hose.

Temp. °F	Material	
	SST	Steel
70	1.00	1.00
150	0.97	0.99
200	0.94	0.97
250	0.92	0.96
300	0.88	0.93
350	0.86	0.91
400	0.83	0.87
450	0.81	0.86
500	0.78	0.81
600	0.74	0.74
700	0.70	0.66
800	0.66	0.52
900	0.62	-
1000	0.60	-
1100	0.58	-
1200	0.55	-
1300	0.50	-
1400	0.44	-
1500	0.40	-

PERFORMANCE

See **Table A** for the shortest recommended overall length (OAL) for each size. This is the minimum length required for the listed maximum vibration, maximum static offset, and minimum bend radii when using any combination of end types. Lengths shorter than what are listed in the following table are not recommended.

VELOCITY

8773 braided hose are rated for 150 ft/sec gas (75 ft/sec liquid) maximum. When the hose is installed in a bent condition, these flow values should be reduced by 50% for a 90° bend, 25% for a 45° bend, and so on, proportional

to the angle of bend. In cases where velocity exceeds the above values, hoses with flexible metal liners can be special ordered. The next larger size corrugated hose would be used with the flexible metal liner size equivalent to the mating pipe size.

PRESSURE DROP

Pressure drop through a corrugated metal hose is approximately three times that in comparable size standard steel pipe.

Table A

Braided Hose	Nominal Hose Size	Hose OD (inches)	Weight lb per ft	Minimum Bend Radius Static Bend (inches)	Minimum Bend Radius Intermittent Flexing (inches)	Minimum Recommended OAL (inches) for ½" max. vibration or 1½" static offset	Minimum Recommended OAL (inches) for ¼" max. vibration or ½" static offset
8773-01	½"	.90	.38	1.5	6	9	-
8773-0	¾"	1.27	.67	2.125	8	9	-
8773-1	1"	1.59	.93	2.75	9	10	-
8773-2	1¼"	1.92	1.20	3.25	10.5	12	-
8773-3	1½"	2.27	1.85	3.75	12	12	-
8773-4	2"	2.01	2.44	5.0	15	15	-
8773-5	2½"	3.12	2.19	7.0	14	16	-
8773-6	3"	3.60	2.70	8.25	17	18	-
8773-7	4"	4.84	3.34	11.0	22	21	-
8773-8	6"	7.19	6.20	16.5	33	25	-
8773-9	8"	9.31	12.93	21.5	43	-	25
8773-10	10"	11.44	13.54	27.0	54	-	28
8773-12	12"	13.50	16.94	32.0	64	-	30

SERVICE

8773 Flexible braided hoses can be used with natural gas, oil, steam, compressed air, and other gases or fluids that are compatible with the materials of construction. Hoses ordered for oxygen service are factory degreased and cleaned for oxygen applications.

Special certified hoses can be special ordered for applications that require conformity to ANSI B31 piping codes.

Flanged hoses selected for oxygen service or hoses requiring ANSI B31 conformity must always use end type "R" (fixed raised face flange) end connections.

8773 flexible hoses are applicable for the majority of combustion systems and when installed and used properly can last many years. Life expectancy will vary by application and is dependent upon variables such as

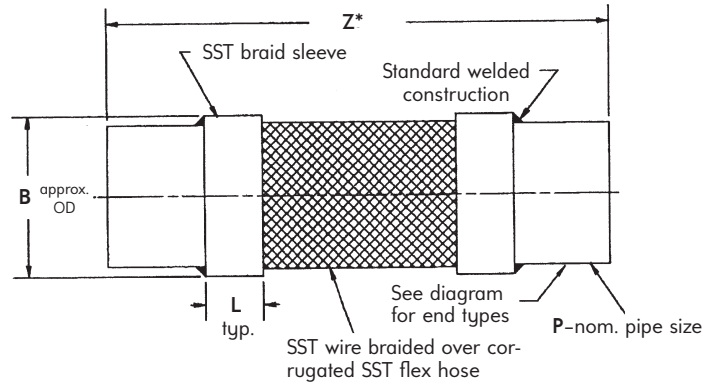
installation technique, temperature, pressure, movement, vibration, cycle count, external damage, fluid type, and the amount of corrosives in the fluid.

The corrosion resistance of the 321 SST material must be considered when exposure to "dirty" gases is possible.

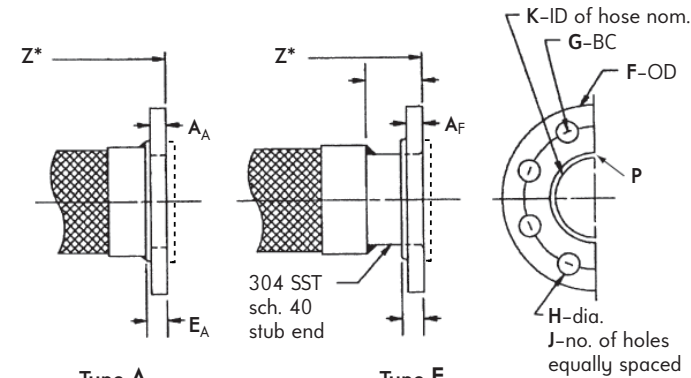
The products of combustion from fluxed aluminum melters contain water vapors, chlorides and fluorides and are known to attack 321 SST flexes when used in such applications

Contact North American for corrosion resistant solutions and availability of alternate materials like Hastelloy C-276 with special Lap Joint 304 stainless steel plate flanges.

DIMENSIONS (inches)



End Types

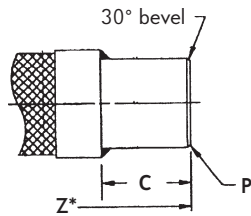


Type A
Fixed Flange Flat Face

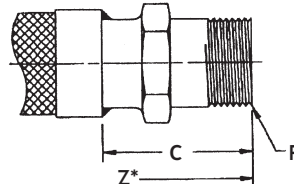
Type F
Lap Joint
(Floating) Flange
(stub end shown dotted)

Type R
Fixed Raised Face
(shown dotted)

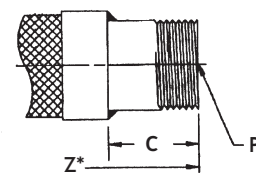
Type M
(not shown)



Type W
Butt-weld end



Type T - Threaded end
with hex on 1/2", 3/4", and 1" sizes only



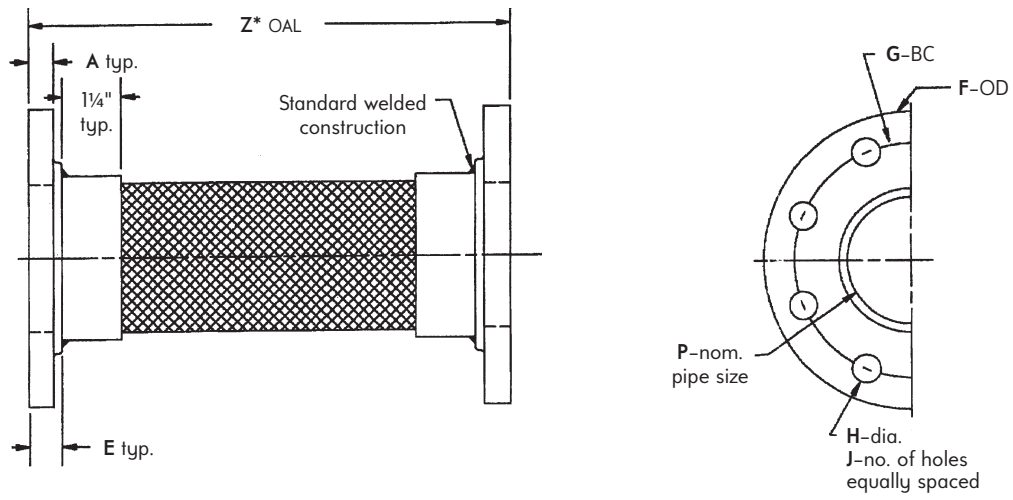
Type T - Threaded end
1/4" and larger

Designation	P	NOMINAL REF.			FLANGED END								
		K	B	L	C	A _A	E _A	A _F	F	G	H	J	
8773-03	1/4	0.21	0.55	3/4	1 1/8	-	-	-	-	-	-	-	-
8773-02	3/8	0.35	0.77	3/4	1 3/16	-	-	-	-	-	-	-	-
8773-01	1/2	0.47	0.94	3/4	1 1/2	3/8	9/16	9/16	3 1/2	2 3/8	5/8	4	-
8773-0	3/4	0.71	1.23	3/4	1 1/2	7/16	9/16	1/2	3 3/8	2 3/4	5/8	4	-
8773-1	1	0.96	1.56	3/4	1 3/4	1/2	5/8	9/16	4 1/4	3 3/8	5/8	4	-
8773-2	1 1/4	1.22	1.91	3/4	2	9/16	3/4	5/8	4 5/8	3 1/2	5/8	4	-
8773-3	1 1/2	1.45	2.21	3/4	2	5/8	13/16	1 1/16	5	3 7/8	5/8	4	-
8773-4	2	1.95	2.89	3/4	2 1/2	1 1/16	1 5/16	3/4	6	4 3/4	3/4	4	-
8773-5	2 1/2	2.44	3.46	1	2 1/4	1 3/16	1 1/16	7/8	7	5 1/2	3/4	4	-
8773-6	3	2.95	4.09	1	2 3/4	7/8	1 1/8	1 5/16	7 1/2	6	3/4	4	-
8773-7	4	3.97	5.35	1	2 3/4	7/8	1 1/4	1 5/16	9	7 1/2	3/4	8	-
8773-8	6	5.82	7.21	1 1/4	3	1 5/16	1 1/2	1	11	9 1/2	7/8	8	-

See next page for 8" to 12" pipe sizes.

Z* = Minimum recommended over all length (OAL) see Table A on page 4.

DIMENSIONS (inches)



Designation	P	A	E	F	G	H	J
8773-9	8	1 1/16	1 1/16	13 1/2	11 3/4	7/8	8
8773-10	10	1 1/8	1 7/8	16	14 1/4	1	12
8773-12	12	1 3/16	2 1/8	19	17	1	12

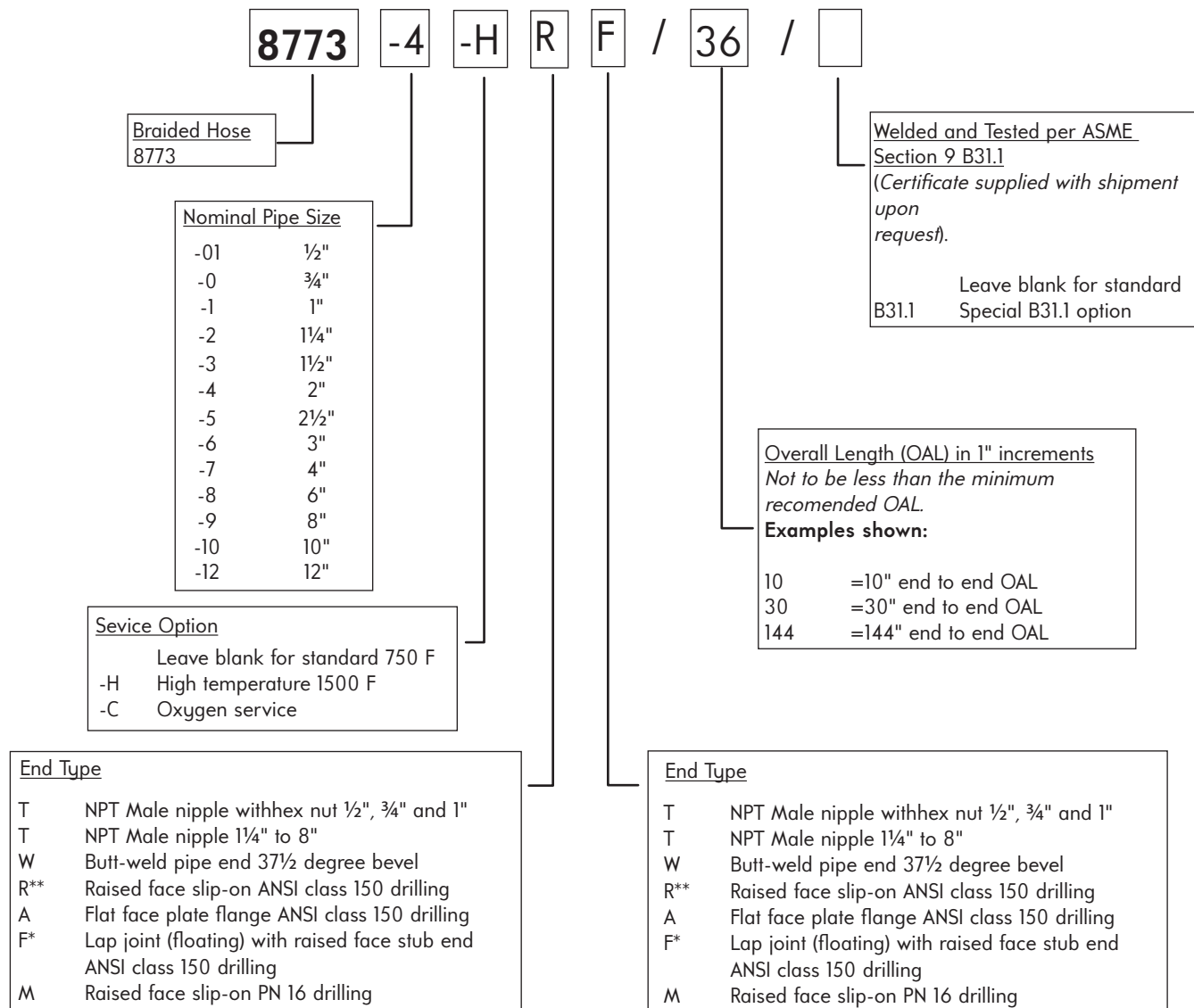
Z* = Over all length (OAL) see **Table A** on page 4.

ORDERING INFORMATION

Specify pipe size, temperature or oxygen service, both end types, and over all length (OAL) when ordering.

Ordering Example:

8773-4-HRF/36 Braided hose, 2" pipe size, high temp - 1200 F service, RF flange one end, lap joint floating flange one end, OAL = 36"



*The type "F" lap joint floating flange allows one flange end to be rotated to simplify installation and easily align bolt holes with a mating flange without imposing torque on the hose.

**When selecting flanged ends for oxygen service or to comply with B31 code conformity applications the raised face flange Type "R" option must be specified.

DIMENSIONS SHOWN ARE SUBJECT TO CHANGE. PLEASE OBTAIN CERTIFIED PRINTS FROM FIVES NORTH AMERICAN COMBUSTION, INC. IF SPACE LIMITATIONS OR OTHER CONSIDERATIONS MAKE EXACT DIMENSION(S) CRITICAL.

WARNING: Situations dangerous to personnel and property may exist with the operation and maintenance of any combustion equipment. The presence of fuels, oxidants, hot and cold combustion products, hot surfaces, electrical power in control and ignition circuits, etc., is inherent with any combustion application. Parts of this product may exceed 160F in operation and present a contact hazard. Fives North American Combustion, Inc. urges compliance with National Safety Standards and Insurance Underwriters' recommendations, and care in operation.

INSTALLATION HINTS

To obtain maximum service life from metal hose, two **IMPORTANT** installation rules must be kept in mind.

1) Do Not Torque

A hose is subject to torque by:

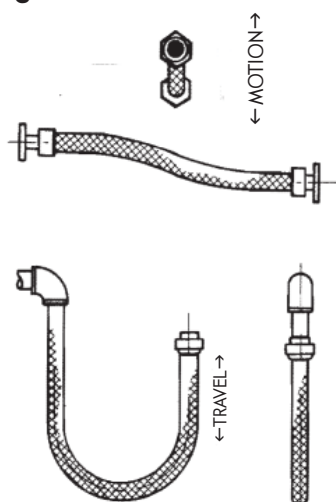
A) Twisting in installation. To minimize possible torque damage to a hose, a union or floating flange should be used at one end of the hose assembly. Where flanges are used, the fixed flange end should be bolted into place before the floating flange end. Where a threaded nipple and a union are used, the nipple end should be threaded into place, and then the union tightened into place using two wrenches.

B) Twisting on flexure. Always install the hose so that flexing takes place in one plane only, and in the plane of bending.

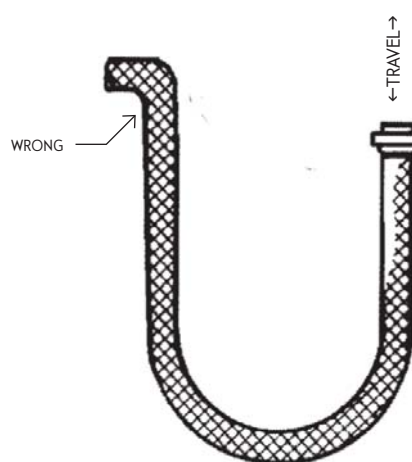
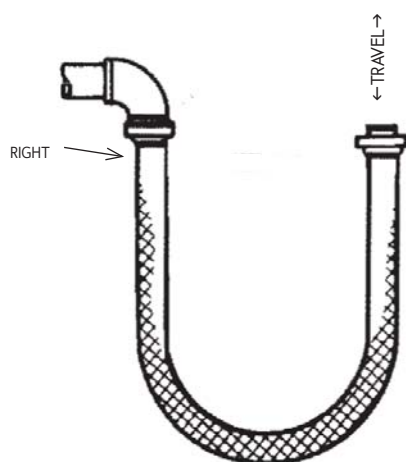
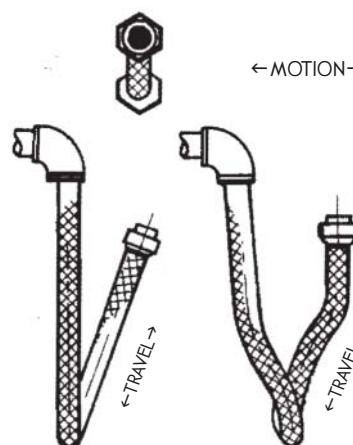
2) Avoid Sharp Bends

There are many ways a hose can be subjected to recurring sharp bends as a result of improper installation. A few examples are illustrated below. The minimum centerline bend radius for intermittent flexing should never be less than the values specified in the Performance Specifications Section.

Right Way



Wrong Way

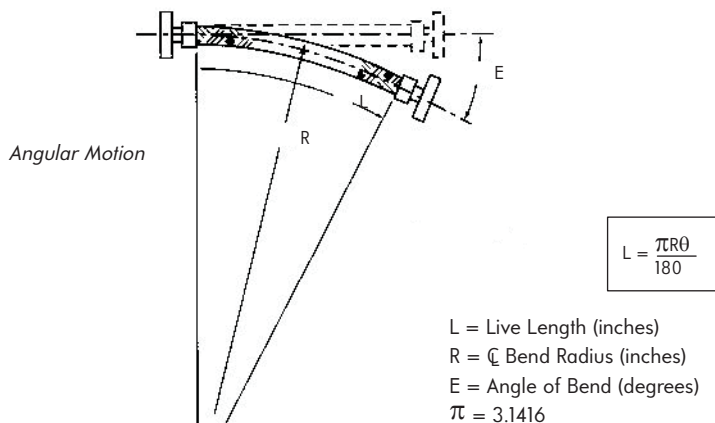


MOTION

Most industrial applications can be reduced to one of five classes of motion: 1) **Angular**; 2) **Axial**; 3) **Offset**; 4) **Radial**; or 5) **Random**.

1. Angular Motion

Motion that occurs when one end of a hose assembly is deflected in a simple bend with the ends not remaining parallel. Angular motion may be incorporated in an installation to accommodate misalignment and vibration only, but must not be used to accommodate expansion that would result in unloading the braid.

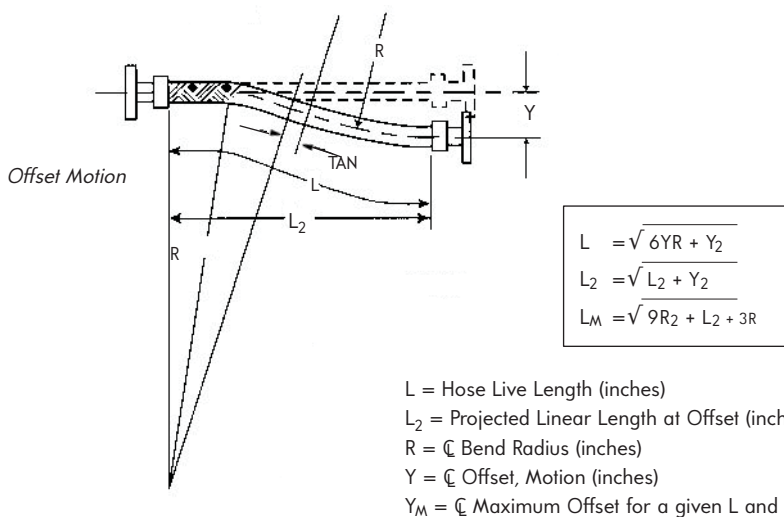


2. Axial Motion

This type of motion occurs when one end of a hose assembly is deflected along its longitudinal axis (compressed or extended). **Axial motion is applicable to annular corrugated, unbraided flexible hose only (See 8782A expansion joints). Neither braided hose nor helical hose like the 8773 (or 8777 flexible nipples) should be used in axial motion applications (compressed or extended).**

3. Offset Motion

Motion that occurs when one end of the hose assembly is deflected in a plane perpendicular to the longitudinal axis with the end remaining parallel. Offset is measured in inches of displacement of the free end center line from the fixed end center line. In offset motion applications, the offset should never be greater than one-fourth (25%) of the minimum center line bend radius.



NOTE: Where offset motion "Y" occurs both sides of C , the hose live length should be based on total travel or 2 times Y.

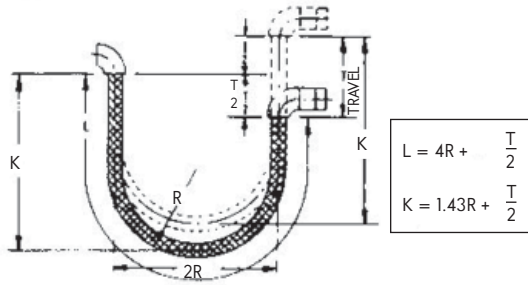
MOTION

4. Radial Motion

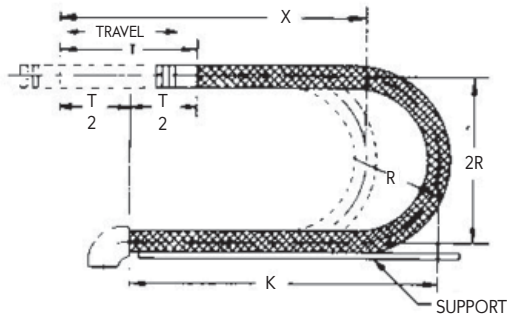
This type of motion occurs when the center line of a hose assembly is bent in a circular arc. In industrial applications, radial motion is most commonly found in traveling loops.

Traveling Loops

For Maximum Vertical Travel



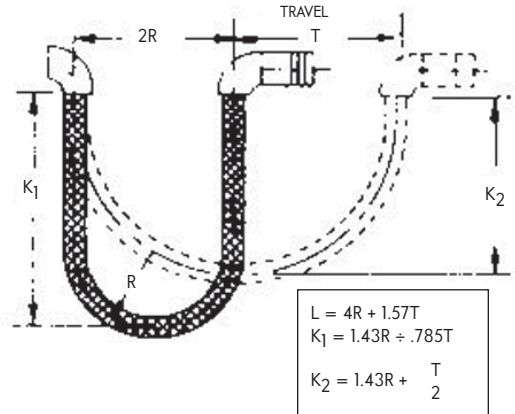
For Maximum Horizontal Travel



- T = Total travel (inches)
- R = \odot bend radius (inches)
- L = Hose live length (inches)
- K = Loop length (inches)

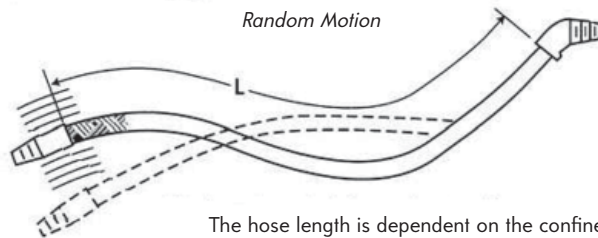
Traveling Loops

For Short Horizontal Travel



5. Random Motion

Non-predictable motion that occurs from manual handling of an assembly. Loading and unloading hose would generally fall into this category. Abusive handling of hose is an important factor to consider in applications involving random motions. The use of an interlocked guard over the corrugated hose is recommended to protect the hose assembly from rough handling and “over-bending” adjacent to the fittings.



The hose length is dependent on the confines of areas and distance to be covered.

DO'S and DON'TS

- **DO protect the braided outer covering from damage.**

DON'T COMPRESS a flexible connector to make it fit! Installing it under compression stresses corrugated element, slackens braid pressure-restrainer, reduces further compressive movement, and generally results in early failure.

DON'T FORCE-ROTATE one end of connector to match bolt holes in mating flange. This sets up residual torque-stress in connector, which causes cracking of corrugations or fitting joint. A flexible connector absorbs vibration, or slow movement perpendicular to its axis. It is NOT capable of withstanding torque.

- **DO consider specifying one end with a Type "F" lap joint floating flange to minimize imposing torque stresses on the hose during installation.**

DON'T STRETCH connector to fit a gap longer than its factory-furnished length. Stretching places excessive residual stresses on braid and fittings. Result? Early rupture.

- **DO be sure to install it at exact normal free length as supplied. If connector is too long, shorten piping.**

DON'T IMPOSE TORQUE on connector when making up fittings and don't use a wrench on the ferrule or on the braid. Where a hex end is provided, use it. If not, use the wrench on the fitting length provided. Always use two wrenches, to keep the hose from being torqued as the joint is made up.

DON'T let welding sparks hit the braid; they may burn some of the braid strands. Protect braid with nonflammable material in front of it when piping must be welded very close nearby.

- **DO use proper tools for installation. Only wrench on the proper fitting area of the assembly.**

DON'T FAIL TO ANCHOR. Anchor piping close to flexible connector, at end opposite source of vibration. Anchor flexible metal hose at the piping end, never at the equipment end. If hose is not securely anchored, it will transmit all vibration to the piping system. Not only that, it will often act like a spring and actually amplify the vibrations. Whenever possible, install flexible connector to vibrating equipment- before valves, pipe line, fittings so that most vibration is absorbed and isolated instead of being transmitted.

- **DO check for leaks and free movement after installation.**

DON'T BEND HOSE sharply near fittings. Fitting end or flange face must always remain perfectly perpendicular to axis of hose. If piping meets at an angle, install hose with a shallow curve along its entire length, leaving small straight section at each end. This kind of installation generally requires a longer hose.

DON'T LET HOSE support any weight except its own. Its light wall was designed to contain internal pressure, but not to carry external loads. Extra weight will stress and stretch it.

- **DO use hangers on all adjacent piping. Install hangers before installing hose, to be certain weight of pipe is on hangers.**

DON'T FORCE HOSE into too much lateral offset. This puts it under great strain. Also, it cannot then handle any movement of any kind. Avoid excessive force.

- **DO check the literature and do not exceed maximum permissible offset.**