

MASON-MERCER

STAINLESS STEEL or BRONZE BRAIDED HOSE

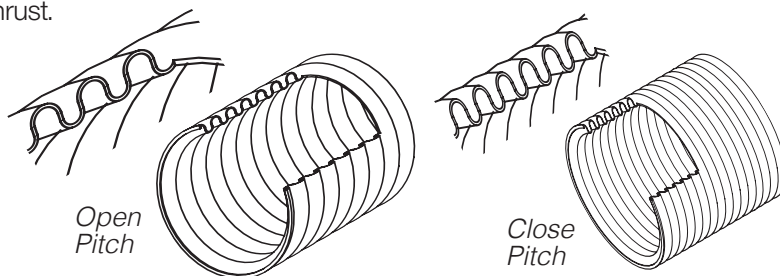


60 years ago (when the writer started), braided stainless steel hose had been in use for quite some time. As I remember, there were only a few major manufacturers, such as Chicago Metal Hose and Anaconda. For the most part, the smaller assemblers did not invest in the expensive equipment that forms straight tubing into the helical and annular forms, and certainly not in the complex braiding equipment. Thus the standards in the industry were maintained by the major firms.

While helical hose (corrugations in a continuous helix) was still popular, the movement toward annular corrugations (each corrugation independent as in expansion joints) was moving along rapidly, because of lower stress and greater movement at a given pitch.

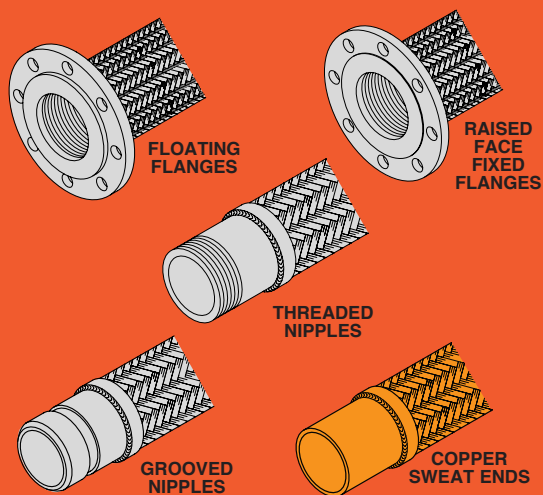
There were two broad descriptions of annular hose, Open and Close pitch, that described the spacing of the corrugations. In general, open pitch was used in low pressure applications where the braid was not required, and the hose might be used to take up some axial expansion as in diesel exhaust.

Close pitched hose was always used for transverse movement and applications where the stainless steel braid was required to control thrust.

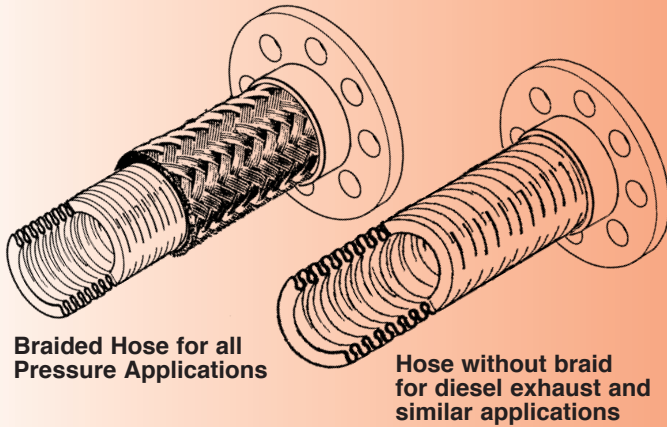


The corrugated hose provides flexibility and prevents leakage, but has virtually no resistance to pressure thrust. In a solid piping system, there is no external thrust, as the pressure on the projected area of the inside of the pipe is equalized by the two ends or bends in the pipe. The force is taken by the pipe wall. Once a flexible hose is inserted, that capability is gone.

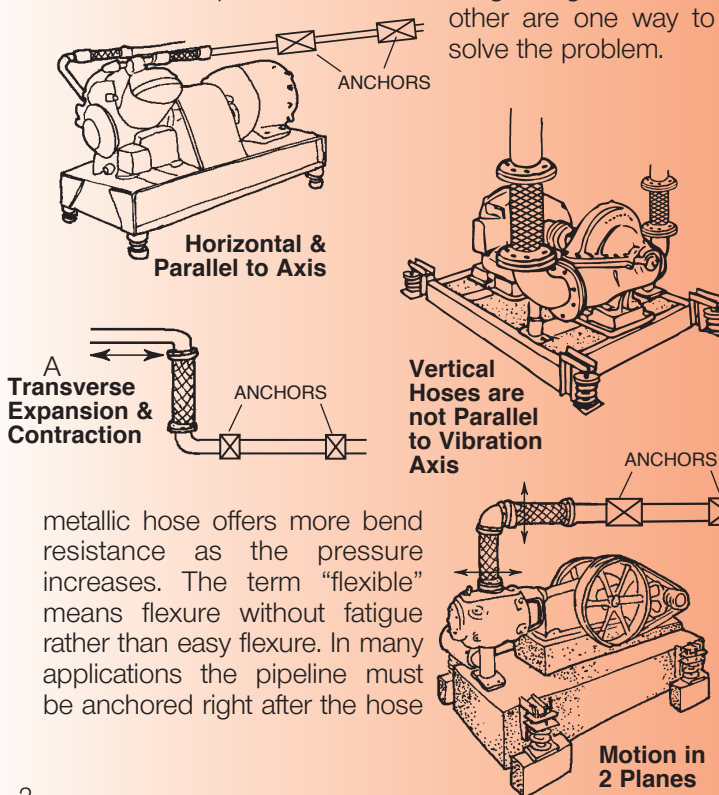
FITTING OPTIONS



When fluid or gas pressure is applied to each corrugation, it tends to open axially, and this adds to the thrust of the pipe area multiplied by the line pressure. As the thrust pulls on the anchored braid ends, the interwoven bias weave applies inward radial pressure to the corrugations as well. Pressure capability is largely a function of the braid. When higher pressures are needed, it is seldom accomplished by thicker tubing as you would lose flexibility. It is most often accommodated by increasing the strength of the braid, using braid with heavier wire or tighter spacing described as Double or Triple Braid or just multiple braid layers. While braid angle is an influence, a quick comparison of braid strength is to multiply the wire area by the total number of wires around the circumference.

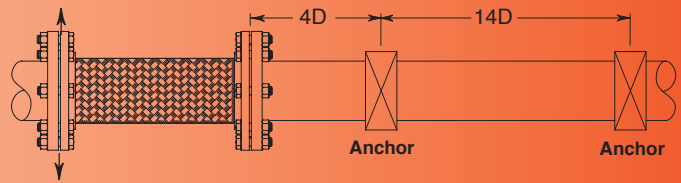


Since the braid is stretched taut by the pressure in the axial direction and kept that way, hoses cannot accept axial motion. All flexibility is at right angles to the axis, so the hose flexes transversely. Most machinery vibrates in a radial direction from the main shaft. Therefore, the hose should be installed parallel to the shaft for best performance, although it seldom is. It must be installed at a 90° angle to the motion in expansion applications. When major motion occurs in two planes, two hoses at right angles to each other are one way to solve the problem.



metallic hose offers more bend resistance as the pressure increases. The term “flexible” means flexure without fatigue rather than easy flexure. In many applications the pipeline must be anchored right after the hose

to force the hose to flex or the hose serves little purpose. For best results, one near the hose and the other some distance away provide a better solution, as pipe may pivot through one anchor. Spacing between anchors is a function of pipe diameter.

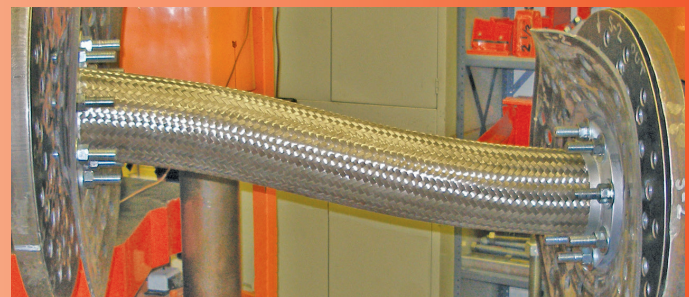


While we have influenced specifications over the years, our volume had always been very low, because we were not competitive. That has changed.

In setting standards for our new product range, we were dismayed to find that the term “Close Pitch” had almost become meaningless. Competitive literature does not include the number of corrugations per foot nor transverse stiffness. We are publishing pitch on all product pages and transverse stiffnesses on pages 5 & 6, so this bulletin begins to provide direction.

Do not be fooled by the salesman who bends a hose like a reed.

When most people visualize a hose flexing, the image is bending in an arc. Unfortunately, this is not true. When flanged hose is displaced, the rigid pipe flanges remain parallel. The hose remains relatively straight at both ends and takes an open “S” shape between the two ends, as shown below. Nippled hoses act the same way.



“S” Shaped Hose

Our hose has a safety factor of 4 times the rated pressure. When comparing allowable operating pressures with other manufacturers, ask for burst pressure. It may be they are working at a lower safety factor. We prefer not to.

All stainless steel hose loses strength at higher temperatures. In the interests of safety and good engineering, use the correction factors to lower ratings when lines are hot.

We arrived at our standards of corrugations per foot by buying samples from approximately six of the well known manufacturers. The variation was more than a factor of two. Our pitch matches the best of the competitors. Some other firms may have a tighter pitch, but our spacing ranks among the “quality suppliers” and makes the hose very flexible.

The question comes up as to why others do not use a tighter pitch. The answer is the fewer the corrugations, the shorter the length of the original tubing to arrive at a finished length, and the faster the forming process. This decreases cost in direct proportion to the shorter length of the original tubing. Flexibility suffers but the product is cheaper.

Our sales representatives already have a full sized photo comparing our braided copper sweat end hoses with a well known competitor's as shown below.

Our 4" live length is 68% longer than their 23/8". We stripped the braid and counted the corrugations. Their product, sold as "close pitched", had 5 active corrugations. We have 22 or 4.4 times as many.

That is why specifications and published information are so important. It is the end user's only protection.

For the past 50 years, we have based our vibration control mountings, hanger and pad recommendations on field experience. Rubber expansion joints have been tested acoustically and constantly improved for reliability. Since proper seismic restraint not only prevents property damage but more importantly saves lives, all of our seismic products are destruction tested for confirmation after design. We would not be living up to our self imposed standards without the same intense engineering attention to Stainless Steel Hose.

Based on visits to jobsites, we knew that very short hose lengths, the typical "plumbers helper", did nothing but possibly reduce misalignment stress. Holding both ends of the hose provided a sense of equal vibration with no reduction from one end to the other. Even double lengths seemed to act about the same way.

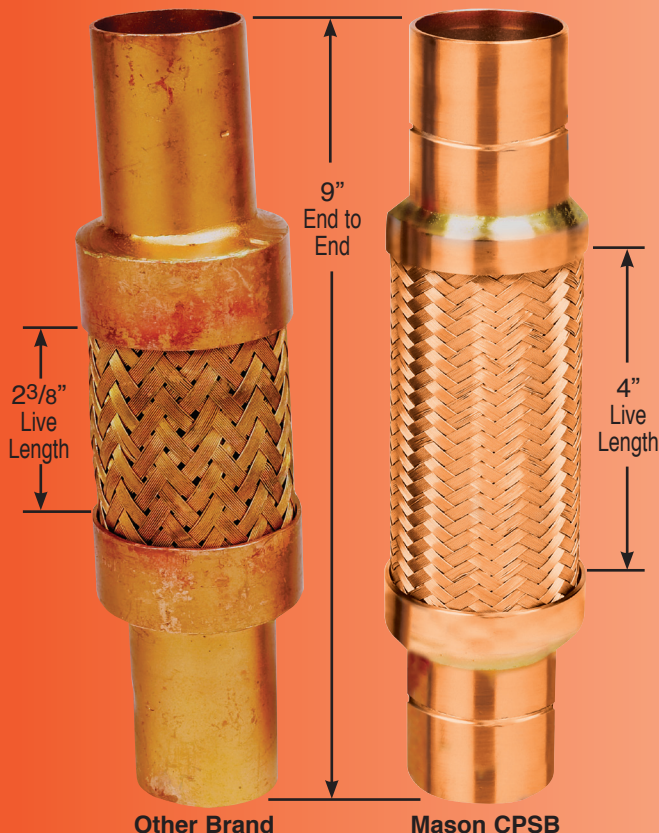
Experience always provides background for the next step. In machinery vibration control a theoretical isolator often failed to perform because the structure was not as stiff as the isolator. We solved the problem by producing isolators with lower stiffness than the structure.

We started this study by calculating transverse schedule 40 pipe stiffness. This is important as the hose faces this resistance.

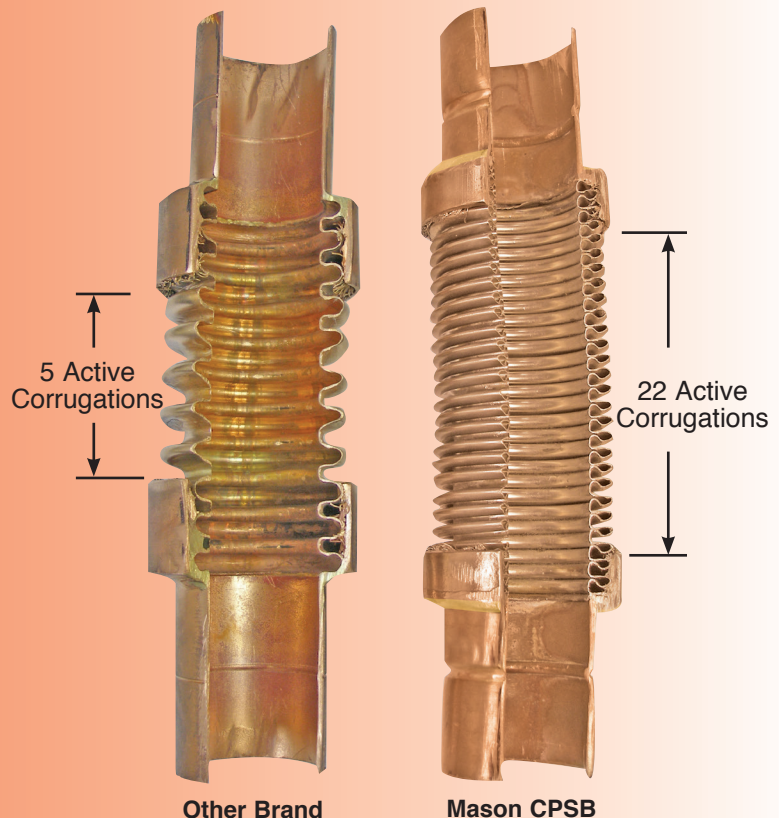
There are many manuals that provide hose designs for misalignment, misalignment and vibration amplitude or straight connectors for vibration only. However, we could find no information on the force required to move a hose transversely—the key factor in selecting a hose to reduce vibration transmission.

Pipeline vibration reduction is based on hose length, pressure and the bending resistance of the steel piping it is attached to. While a vibration amplitude of $\pm 1/8$ " would be unacceptably high, our study is based on that displacement as $\pm 1/8$ " is the industries' "Pump Connector" standard. When comparing the stiffnesses of straight pipe lengths versus flexible hoses, if the flexible hose has a transverse stiffness greater than the pipe it is connected to, there is no reason why it would reduce vibration transmission. There is the influence of the system's inertia based on the mass provided by check and shutoff valves, strainers, etc., as well as the mass of the pipe filled with water directly after the flexible hose, but that is a variable. While it must help, it is an unknown.

11/2" x 9" Copper Fitted Hoses



**11/2" x 9" Cross Section of Copper Fitted Hoses
(Braid Removed to Reveal Active Corrugations)**



TEST DISCUSSION

Our in house capability does not include dynamic measurement. However, the following static data is the first publicized attempt to measure displacement forces as a basis for specifications. Despite recommendations to the contrary, the average pump installation has the hoses installed vertically.

The disturbing force is radial to the pump rotor. Since the hose is vertical, it is most effective when the unbalance is parallel to the floor and least when the force is vertical, as the hose is rigid in that direction. However, when the force is vertical, it is pushing or pulling the riser and in general, the riser and header are stiffer in that direction.

We continue to suggest two hoses at right angles to each other, or when only one hose is used, installed parallel to the axis of the pump, chiller, compressor, etc. While proper suggestions, we recognize piping restrictions often make it impossible.

The test results on pages 5 & 6 are the forces required to displace straight hose lengths 1/8" at three common pressures. These forces are compared to the resistance to 1/8" movement

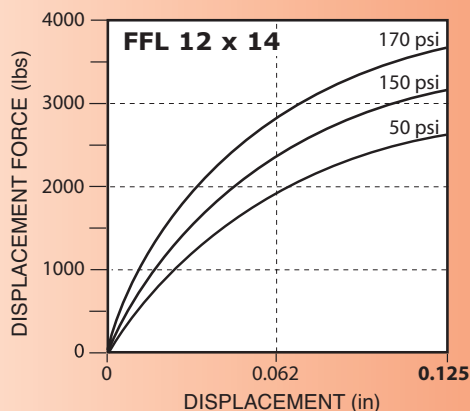
provided by 10', 8' and 6' lengths of schedule 40 Steel Pipe.

We used our computerized Baldwin Universal Tester so we could test two hoses in parallel to prevent machine distortion. Long lengths of pipes were bolted to the flanges at each end and guided through rigid rollers, so the flanges were held parallel as in the field. Water pressure was introduced by a hydraulic pump and measurements taken at 0, 50, 100, 150, 200 and 250psi. All readings were divided by 2 for single hose values. Since our hoses are all very close pitched and flexible, we believe competitive products would prove stiffer.

We tested a few hoses from the same lot and found variations. Therefore, our tabulations are only in the order of magnitude. We anticipated very large forces, but not as large as they turned out to be. Testing rig deflections lowered the 1/8" displacement values. 12" and larger data was not usable. 12", 14" and 16" numbers are extrapolations. We are rebuilding these jigs heavier and will publish corrected test information in the future. Similarly, very small sizes dropped below the testing machine's sensitivity, but they are in the proper direction.

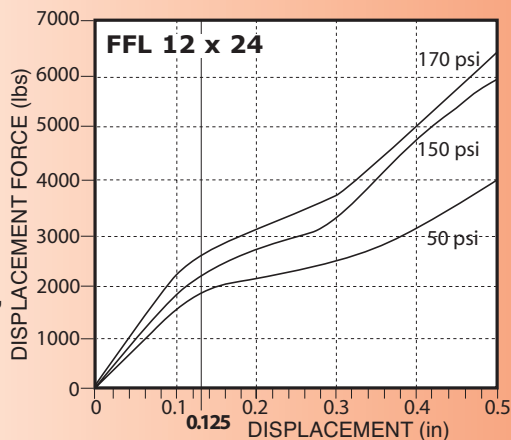
We do not Recommend Industry Pump Connector Length.

Displacement Force is 3690 lbs./0.125" at 170 psi.



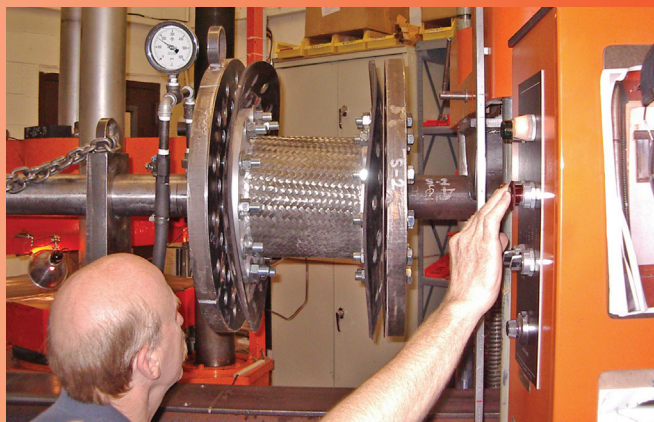
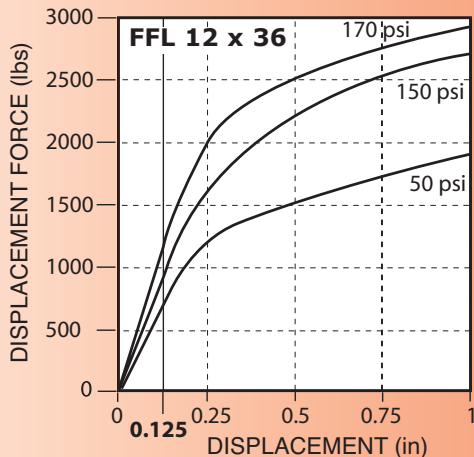
We also do not recommend 12 x 24 length.

It is better than 12 x 14, but Displacement Force is still too high—2650 lbs./0.125" at 170 psi.

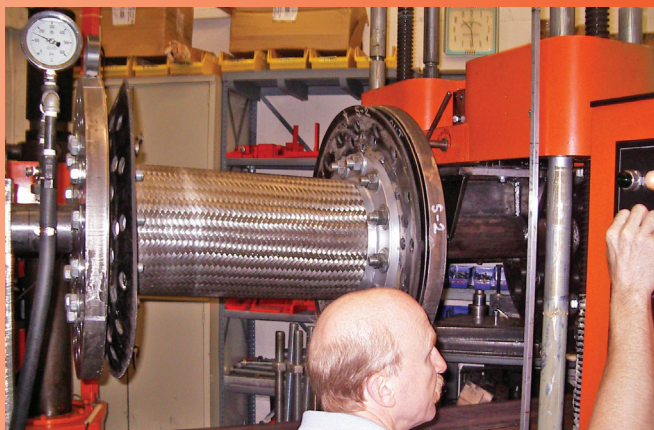


Recommended Length

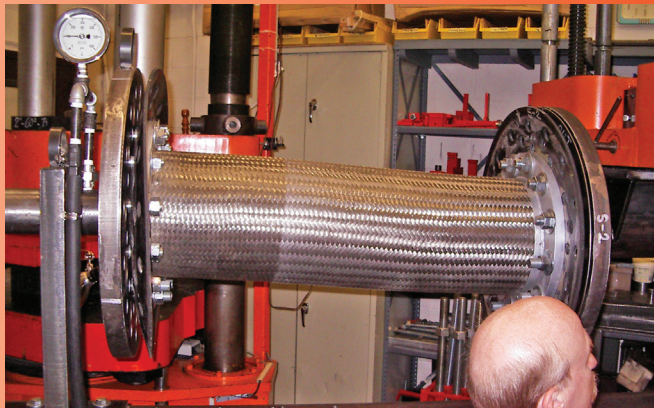
Displacement Force drops to 1150 lbs./0.125" at 170 psi.



Typical Short Industry Pump Connector 12" x 14" at Maximum 0.125" Offset



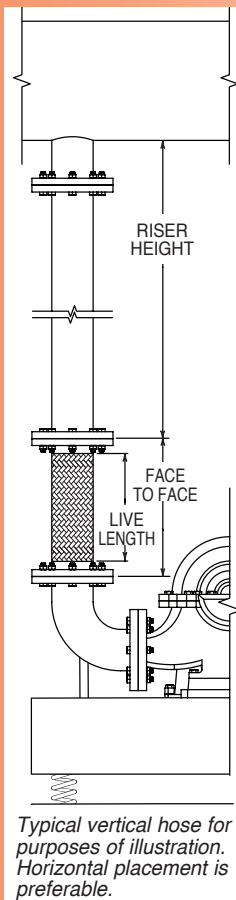
FFL 12 x 24 at 0.5" Offset



FFL 12 x 36 at 1" Offset

In addition to corrugation count and configuration, live length rather than overall length is the stiffness control. All of our tables include this information. We have kept nipples as short as possible to maximize the flexible hose portion, but notice that a 1/2" x 6 1/2" MN has only 2 3/4" of live length, 1 1/4" x 8 1/2" only 3 1/4", 4" x 12" only 5". That is why the forces needed to move these "Pump Connector" lengths are so excessive. The live hose is so short that the connector has difficulty or finds it impossible to assume the shape shown in the bottom photograph on page 4.

The lengths suggested in our specifications are based on experience. The height of equipment rooms controls the length of the risers. The pressure depends on the height of the building. It is hard to visualize 1/2" through 2" threaded hoses that would be connected to pumps or other equipment with long risers that go to the ceiling. They might not be connected to risers at all. Small lines seldom operate at more than 150psi, because they service low buildings. Therefore, we are suggesting overall 24" lengths at 150psi. These selections show the forces needed to flex the hose are all below the stiffness of the pipe. The vibrating energy of small sized equipment is also lower and minimizes risk of serious transmission problems.



The same logic applies to the 2" through 4" sizes if we continue with the assumption that the pressure remains at 150psi. However, at 250psi, the hose stiffness increases dramatically. On virtually all major projects, the specifications allow for threaded nipples only through 2" diameter. So while we provide the force information for 2 1/2", 3" and 4" threaded nipple ends, our recommended lengths are based on flanged hoses in diameters of 2 1/2" and larger.

We have included copper pipe rather than ignoring it. However, copper tubing is both light and soft. Copper flexible hoses are better suited to allowing for thermal movement than reducing vibration.

Moving on to the larger diameter 2 1/2" through 16", we have to assume both higher pressures and longer risers. Typically a 4" pipe 8' long offers 90 lbs resistance to 1/8" movement. A 4" x 24" flanged hose at 150 psi has a resistance of 105 lbs., so it is too stiff. At 36" long, it drops to 50 lbs. and even at 250psi, 80 lbs., and still lower than the pipe stiffness. This sort of comparison is reasonable down through the study. A 36" FF length is about as long as practical because of valve heights and other problems. We are still synthesizing a great deal of information, so establishing one fixed length of 36" for 2 1/2" through 16" diameter appears to be a proper engineering choice at this time rather than an oversimplification.

BALDWIN TESTER REPORT ON FORCE REQUIRED TO DISPLACE 1/2" - 4" NIPPLED HOSES 1/8"

Information provided as a general guide to magnitude

THREADED NIPPLE HOSES (American Units)

| MN Hose Dia. (in) | Length End to End (in) | Live Length (in) | Corru- gations per foot | Force Required for 1/8" displacement (lbs) | | | | | |
|----------------------------|---------------------------------|------------------------|----------------------------------|--|------|------|--|-----|-----|
| | | | | Hoses Water Pressure (psi) | | | Steel Pipe Schedule 40 Riser Length (feet) | | |
| | | | | 50 | 150 | 250 | 6 | 8 | 10 |
| 1/2 | 6 1/2 | 2 3/4 | 92 | 6.0 | 14.0 | 20.0 | | | |
| 1/2 | 12 | 8 1/4 | 92 | 0.8 | 0.8 | 1.0 | 0.5 | 0.2 | 0.1 |
| 1/2 | 18 | 14 1/4 | 92 | 1.0 | 1.0 | 1.0 | lbs | lbs | lbs |
| 1/2 | 24 | 20 1/4 | 92 | *0.3 | 0.4 | 0.5 | | | |
| 3/4 | 7 | 3 1/4 | 80 | 10.0 | 18.0 | 25.0 | | | |
| 3/4 | 12 | 8 1/4 | 80 | 1.5 | 2.5 | 3.8 | 1.1 | 0.5 | 0.2 |
| 3/4 | 18 | 14 1/4 | 80 | 0.4 | 2.0 | 4.0 | lbs | lbs | lbs |
| 3/4 | 24 | 20 1/4 | 80 | * - | 1.0 | 1.5 | | | |
| 1 | 8 | 3 3/4 | 72 | 13.0 | 30.0 | 50.0 | | | |
| 1 | 12 | 7 3/4 | 72 | 2.0 | 4.0 | 12.0 | 2.5 | 1.1 | 0.6 |
| 1 | 18 | 13 3/4 | 72 | 0.5 | 1.5 | 2.5 | lbs | lbs | lbs |
| 1 | 24 | 19 3/4 | 72 | *0.5 | 1.0 | 1.5 | | | |
| 1 1/4 | 8 1/2 | 3 1/4 | 67 | 50 | 110 | 180 | | | |
| 1 1/4 | 12 | 6 3/4 | 67 | 3.5 | 15 | 20 | 6 | 2.4 | 1.2 |
| 1 1/4 | 18 | 12 3/4 | 67 | 1.5 | 4 | 6.5 | lbs | lbs | lbs |
| 1 1/4 | 24 | 18 3/4 | 67 | - | 2.5 | 3.5 | | | |
| 1 1/2 | 9 | 3 3/4 | 63 | 120 | 250 | 310 | | | |
| 1 1/2 | 12 | 6 3/4 | 63 | 20 | 60 | 105 | 9 | 4 | 2 |
| 1 1/2 | 18 | 12 3/4 | 63 | 5 | 15 | 23 | lbs | lbs | lbs |
| 1 1/2 | 24 | 18 3/4 | 63 | 3 | 6 | 8 | | | |
| 2 | 10 1/2 | 4 1/2 | 58 | 180 | 360 | 460 | | | |
| 2 | 12 | 6 | 58 | 120 | 265 | 400 | 20 | 8 | 4 |
| 2 | 18 | 12 | 58 | 20 | 60 | 90 | lbs | lbs | lbs |
| 2 | 24 | 18 | 58 | 6 | 15 | 23 | | | |
| 2 1/2 | 12 | 5 | 48 | 220 | 360 | 475 | | | |
| 2 1/2 | 18 | 11 | 48 | 30 | 80 | 120 | 45 | 20 | 10 |
| 2 1/2 | 24 | 17 | 48 | 10 | 25 | 40 | lbs | lbs | lbs |
| 3 | 12 | 5 | 46 | 350 | 600 | 750 | | | |
| 3 | 18 | 11 | 46 | 100 | 190 | 250 | 90 | 35 | 20 |
| 3 | 24 | 17 | 46 | 35 | 70 | 110 | lbs | lbs | lbs |
| 4 | 12 | 5 | 32 | 500 | 825 | 900 | | | |
| 4 | 18 | 11 | 32 | 150 | 305 | 400 | 210 | 90 | 45 |
| 4 | 24 | 17 | 32 | 110 | 175 | 260 | lbs | lbs | lbs |

*Adjusted for testing sensitivity.

THREADED NIPPLE HOSES (Metric Units)

| MN Hose Dia. (mm) | Length End to End (mm) | Live Length (mm) | Corru- gations per meter | Force Required for 3mm displacement (kg) | | | | | |
|----------------------------|---------------------------------|------------------------|-----------------------------------|--|------|------|---|-----|-----|
| | | | | Hoses Water Pressure (kg/cm ²) | | | Steel Pipe Schedule 40 Riser Length (m) | | |
| | | | | 3.4 | 10.3 | 17.2 | 1.8 | 2.4 | 3 |
| 15 | 165 | 70 | 302 | 2.7 | 6.4 | 9.1 | | | |
| 15 | 305 | 210 | 302 | 0.4 | 0.4 | 0.5 | .23 | .09 | .05 |
| 15 | 457 | 362 | 302 | 0.5 | 0.5 | 0.5 | kg | kg | kg |
| 15 | 610 | 514 | 302 | *0.1 | 0.2 | 0.2 | | | |
| 20 | 178 | 83 | 262 | 4.5 | 8.2 | 11.3 | | | |
| 20 | 305 | 210 | 262 | 0.7 | 1.1 | 1.7 | 0.5 | 0.2 | 0.1 |
| 20 | 457 | 362 | 262 | 0.2 | 0.9 | 1.8 | kg | kg | kg |
| 20 | 610 | 514 | 262 | * - | 0.5 | 0.7 | | | |
| 25 | 203 | 95 | 236 | 5.9 | 13.6 | 22.7 | | | |
| 25 | 305 | 197 | 236 | 0.9 | 1.8 | 5.4 | 1.1 | 0.5 | 0.3 |
| 25 | 457 | 349 | 236 | 0.2 | 0.7 | 1.1 | kg | kg | kg |
| 25 | 610 | 502 | 236 | *0.2 | 0.5 | 0.7 | | | |
| 32 | 216 | 83 | 220 | 23 | 50 | 82 | | | |
| 32 | 305 | 171 | 220 | 2 | 7 | 9 | 2.7 | 1.0 | 0.5 |
| 32 | 457 | 234 | 220 | 1 | 2 | 3 | kg | kg | kg |
| 32 | 610 | 476 | 220 | - | 1 | 2 | | | |
| 40 | 229 | 95 | 207 | 54 | 113 | 141 | | | |
| 40 | 305 | 171 | 207 | 9 | 27 | 48 | 4 | 2 | 0.9 |
| 40 | 457 | 234 | 207 | 2 | 7 | 10 | kg | kg | kg |
| 40 | 610 | 476 | 207 | 1 | 3 | 4 | | | |
| 50 | 267 | 114 | 190 | 82 | 163 | 209 | | | |
| 50 | 305 | 152 | 190 | 54 | 120 | 181 | 9 | 4 | 2 |
| 50 | 457 | 305 | 190 | 9 | 27 | 41 | kg | kg | kg |
| 50 | 610 | 457 | 190 | 3 | 7 | 10 | | | |
| 65 | 305 | 127 | 157 | 100 | 163 | 216 | | | |
| 65 | 457 | 279 | 157 | 14 | 36 | 54 | 20 | 9 | 4 |
| 65 | 610 | 432 | 157 | 5 | 11 | 18 | kg | kg | kg |
| 75 | 305 | 127 | 151 | 159 | 272 | 340 | | | |
| 75 | 457 | 279 | 151 | 45 | 86 | 113 | 40 | 17 | 9 |
| 75 | 610 | 432 | 151 | 16 | 32 | 50 | kg | kg | kg |
| 100 | 305 | 127 | 105 | 227 | 374 | 408 | | | |
| 100 | 457 | 279 | 105 | 68 | 138 | 181 | 96 | 40 | 21 |
| 100 | 610 | 432 | 105 | 50 | 79 | 118 | kg | kg | kg |

BALDWIN TESTER REPORT ON FORCE REQUIRED TO DISPLACE 11/2" - 16" FLANGED HOSES 1/8"

Information provided as a general guide to magnitude

FLANGED END HOSES (American Units)

| FFL Hose Dia. (in) Length Face to Face (in) Live Length (in) Corrugations per foot | | | | Force Required for 1/8" displacement (lbs) | | | | | | |
|---|-----|-------|----|--|------|------|--|----------|----------|--|
| | | | | Hoses Water Pressure (psi) | | | Steel Pipe Schedule 40 Riser Length (feet) | | | |
| | | | | 50 | 150 | 250 | 6 | 8 | 10 | |
| 11/2 | 9 | 67/8 | 63 | 20 | 55 | 85 | 9 lbs | 4 lbs | 2 lbs | |
| 11/2 | 12 | 97/8 | 63 | 8 | 27 | 42 | | | | |
| 11/2 | 18 | 157/8 | 63 | 3 | 10 | 16 | | | | |
| 11/2 | 24 | 217/8 | 63 | 2 | 6 | 6 | | | | |
| 2 | 9 | 61/8 | 58 | 60 | 125 | 185 | 20 lbs | 8 lbs | 4 lbs | |
| 2 | 12 | 91/8 | 58 | 22 | 57 | 95 | | | | |
| 2 | 18 | 151/8 | 58 | 6 | 18 | 29 | | | | |
| 2 | 24 | 211/8 | 58 | 3 | 10 | 15 | | | | |
| 2 1/2 | 9 | 61/8 | 48 | 145 | 275 | 380 | 45 lbs | 20 lbs | 10 lbs | |
| 2 1/2 | 12 | 91/8 | 48 | 45 | 100 | 140 | | | | |
| 2 1/2 | 18 | 151/8 | 48 | 15 | 45 | 75 | | | | |
| 2 1/2 | 24 | 211/8 | 48 | 7 | 25 | 35 | | | | |
| 3 | 9 | 61/8 | 46 | 225 | 475 | 575 | 90 lbs | 35 lbs | 20 lbs | |
| 3 | 12 | 91/8 | 46 | 105 | 245 | 320 | | | | |
| 3 | 18 | 151/8 | 46 | 30 | 105 | 130 | | | | |
| 3 | 24 | 211/8 | 46 | 15 | 55 | 80 | | | | |
| 3 | *36 | 331/8 | 46 | 10 | 35 | 50 | | | | |
| | | | | 50 | 100 | 200 | | | | |
| 4 | 9 | 61/8 | 32 | 490 | 620 | 700 | 210 lbs | 90 lbs | 45 lbs | |
| 4 | 12 | 91/8 | 32 | 220 | 385 | 505 | | | | |
| 4 | 18 | 151/8 | 32 | 65 | 155 | 210 | | | | |
| 4 | 24 | 211/8 | 32 | 40 | 105 | 155 | | | | |
| 4 | 36 | 331/8 | 32 | 20 | 50 | 80 | | | | |
| 5 | 12 | 87/8 | 29 | 440 | 650 | 750 | 440 lbs | 190 lbs | 95 lbs | |
| 5 | 18 | 147/8 | 29 | 190 | 355 | 420 | | | | |
| 5 | 24 | 207/8 | 29 | 85 | 195 | 225 | | | | |
| 5 | 36 | 327/8 | 29 | 65 | 135 | 150 | | | | |
| 6 | 12 | 87/8 | 25 | 675 | 950 | 1050 | 820 lbs | 350 lbs | 180 lbs | |
| 6 | 18 | 147/8 | 25 | 445 | 670 | 750 | | | | |
| 6 | 24 | 207/8 | 25 | 170 | 450 | 505 | | | | |
| 6 | 36 | 327/8 | 25 | 70 | 155 | 180 | | | | |
| | | | | 50 | 150 | 180 | | | | |
| 8 | 12 | 85/8 | 23 | 1200 | 1450 | 1680 | 2110 lbs | 890 lbs | 455 lbs | |
| 8 | 18 | 145/8 | 23 | 710 | 1250 | 1290 | | | | |
| 8 | 24 | 205/8 | 23 | 325 | 750 | 850 | | | | |
| 8 | 36 | 325/8 | 23 | 155 | 400 | 425 | | | | |
| | | | | 50 | 150 | 170 | | | | |
| 10 | 13 | 95/8 | 21 | 1870 | 2200 | 2590 | 4690 lbs | 1980 lbs | 1010 lbs | |
| 10 | 18 | 145/8 | 21 | 1345 | 1580 | 1860 | | | | |
| 10 | 24 | 205/8 | 21 | 900 | 1060 | 1250 | | | | |
| 10 | 36 | 325/8 | 21 | 570 | 680 | 800 | | | | |
| 12 | *14 | 105/8 | 20 | 2670 | 3140 | 3690 | 8130 lbs | 3430 lbs | 1755 lbs | |
| 12 | *24 | 205/8 | 20 | 1920 | 2250 | 2650 | | | | |
| 12 | *36 | 325/8 | 20 | 830 | 980 | 1150 | | | | |
| 14 | *14 | 105/8 | 18 | 3970 | 4675 | 5500 | 10900 lbs | 4600 lbs | 2300 lbs | |
| 14 | *36 | 325/8 | 18 | 2370 | 2780 | 3270 | | | | |
| 16 | *16 | 125/8 | 16 | 5200 | 6120 | 7200 | 16400 lbs | 6900 lbs | 3500 lbs | |
| 16 | *36 | 325/8 | 16 | 2860 | 3370 | 3960 | | | | |

*Not tested. Best estimates.

FLANGED END HOSES (Metric Units)

| FFL Hose Dia. (mm) Length Face to Face (mm) Live Length (mm) Corrugations per meter | | | | Force Required for 3mm displacement (kg) | | | | | | |
|--|------|-----|-----|--|------|------|---|---------|---------|--|
| | | | | Hoses Water Pressure (kg/cm²) | | | Steel Pipe Schedule 40 Riser Length (m) | | | |
| | | | | 3.4 | 10.3 | 17.2 | 1.8 | 2.4 | 3 | |
| 40 | 229 | 175 | 207 | 9 | 25 | 39 | 4 kg | 2 kg | 1 kg | |
| 40 | 305 | 251 | 207 | 4 | 12 | 19 | | | | |
| 40 | 457 | 403 | 207 | 1 | 5 | 7 | | | | |
| 40 | 607 | 556 | 207 | 1 | 2 | 2 | | | | |
| 50 | 229 | 156 | 190 | 27 | 57 | 84 | 9 kg | 4 kg | 2 kg | |
| 50 | 305 | 232 | 190 | 10 | 26 | 43 | | | | |
| 50 | 457 | 384 | 190 | 3 | 8 | 13 | | | | |
| 50 | 610 | 537 | 190 | 1 | 5 | 7 | | | | |
| 65 | 229 | 156 | 157 | 66 | 125 | 173 | 21 kg | 9 kg | 5 kg | |
| 65 | 305 | 232 | 157 | 20 | 45 | 64 | | | | |
| 65 | 457 | 384 | 157 | 7 | 20 | 34 | | | | |
| 65 | 610 | 537 | 157 | 3 | 11 | 16 | | | | |
| 75 | 229 | 156 | 151 | 102 | 215 | 261 | 40 kg | 17 kg | 9 kg | |
| 75 | 305 | 232 | 151 | 48 | 111 | 145 | | | | |
| 75 | 457 | 384 | 151 | 14 | 48 | 59 | | | | |
| 75 | 610 | 537 | 151 | 7 | 25 | 36 | | | | |
| 75 | *914 | 841 | 151 | 5 | 16 | 23 | | | | |
| | | | | 3.4 | 6.9 | 13.8 | | | | |
| 100 | 229 | 156 | 105 | 222 | 281 | 318 | 96 kg | 41 kg | 21 kg | |
| 100 | 305 | 232 | 105 | 100 | 175 | 229 | | | | |
| 100 | 457 | 384 | 105 | 30 | 70 | 96 | | | | |
| 100 | 610 | 537 | 105 | 18 | 48 | 70 | | | | |
| 100 | 914 | 841 | 105 | 9 | 23 | 36 | | | | |
| 125 | 305 | 225 | 95 | 200 | 295 | 340 | 201 kg | 85 kg | 44 kg | |
| 125 | 457 | 378 | 95 | 86 | 161 | 191 | | | | |
| 125 | 610 | 530 | 95 | 39 | 89 | 102 | | | | |
| 125 | 914 | 835 | 95 | 30 | 61 | 68 | | | | |
| 150 | 305 | 225 | 82 | 306 | 431 | 476 | 371 kg | 157 kg | 81 kg | |
| 150 | 457 | 378 | 82 | 202 | 304 | 340 | | | | |
| 150 | 610 | 530 | 82 | 76 | 204 | 229 | | | | |
| 150 | 914 | 835 | 82 | 32 | 70 | 82 | | | | |
| | | | | 3.4 | 10.3 | 12.4 | | | | |
| 200 | 305 | 219 | 75 | 544 | 658 | 760 | 958 kg | 405 kg | 207 kg | |
| 200 | 457 | 371 | 75 | 322 | 567 | 585 | | | | |
| 200 | 610 | 524 | 75 | 147 | 340 | 386 | | | | |
| 200 | 914 | 829 | 75 | 70 | 181 | 193 | | | | |
| | | | | 3.4 | 10.3 | 11.7 | | | | |
| 250 | 330 | 244 | 69 | 848 | 998 | 1175 | 2128 kg | 898 kg | 460 kg | |
| 250 | 457 | 371 | 69 | 610 | 717 | 844 | | | | |
| 250 | 610 | 524 | 69 | 408 | 481 | 567 | | | | |
| 250 | 914 | 829 | 69 | 259 | 308 | 363 | | | | |
| 300 | *256 | 270 | 66 | 1211 | 1424 | 1674 | 3688 kg | 1556 kg | 797 kg | |
| 300 | *610 | 524 | 66 | 871 | 1021 | 1202 | | | | |
| 300 | *914 | 829 | 66 | 376 | 445 | 522 | | | | |
| 350 | *256 | 270 | 59 | 1801 | 2121 | 2495 | 4930 kg | 2080 kg | 1065 kg | |
| 350 | *914 | 829 | 59 | 1075 | 1261 | 1483 | | | | |
| 400 | *406 | 321 | 52 | 2359 | 2776 | 3266 | 7430 kg | 3134 kg | 1605 kg | |
| 400 | *914 | 829 | 52 | 1297 | 1529 | 1796 | | | | |

SPECIFICATION

Flexible stainless steel hoses with a safety factor of 4 shall be manufactured using type 304 stainless steel braided hose with one fixed and one floating raised face carbon steel plate flange. Sizes 2 1/2" (65mm) and smaller may have threaded nipples. Copper sweat ends, 4" (100mm) and smaller, may have SS (gas service) or Bronze (water service) bodies. Grooved ends may be used in sizes 2" (50mm) through 12" (300mm). Welding is not acceptable. Minimum lengths, minimum live lengths and minimum number of convolutions per foot to assure flexibility are as tabulated. Shorter lengths are not acceptable.

Hoses shall be installed on the equipment side of the shut off valves horizontal and parallel to the equipment shafts wherever possible.

Submittals shall include original test data showing force/displacement, fittings, material, live lengths, number of corrugations per foot and safety factor at pressure ratings. Hoses shall be type **BSS** or **CPSB** as manufactured by Mason Industries, Inc.

| Pipe or Tubing Size (in) | FLANGED | | THREADED | | GROOVED | | COPPER SWEAT BRONZE* | | Min. Convo- lutions per (foot) |
|-----------------------------------|-------------------------|------------------------|-----------------------|------------------------|-----------------------|------------------------|-------------------------|------------------------|--|
| | Face to Face (in) | Live Length (in) | End to End (in) | Live Length (in) | End to End (in) | Live Length (in) | End to End (in) | Live Length (in) | |
| 1/2 | — | — | 24 | 193/4 | — | — | 18 | 141/4 | 92 |
| 3/4 | — | — | 24 | 193/4 | — | — | 18 | 133/4 | 80 |
| 1 | — | — | 24 | 193/4 | — | — | 18 | 133/8 | 72 |
| 1 1/4 | — | — | 24 | 183/4 | — | — | 18 | 131/4 | 67 |
| 1 1/2 | 24 | 217/8 | 24 | 183/4 | — | — | 18 | 13 | 63 |
| 2 | 24 | 211/8 | 24 | 18 | 24 | 18 | 18 | 121/2 | 58 |
| 2 1/2 | 24 | 211/8 | 24 | 17 | 24 | 18 | 18 | 103/4 | 48 |
| 3 | 36 | 331/8 | 36 | 29 | 36 | 30 | 18 | 101/2 | 46 |
| 4 | 36 | 331/8 | 36 | 29 | 36 | 28 | 24 | 151/2 | 32 |
| 5 | 36 | 327/8 | — | — | 36 | 28 | — | — | 29 |
| 6 | 36 | 327/8 | — | — | 36 | 28 | — | — | 25 |
| 8 | 36 | 325/8 | — | — | 36 | 28 | — | — | 23 |
| 10 | 36 | 325/8 | — | — | 36 | 26 | — | — | 21 |
| 12 | 36 | 325/8 | — | — | 36 | 26 | — | — | 20 |
| 14 | 36 | 325/8 | — | — | — | — | — | — | 18 |
| 16 | 36 | 325/8 | — | — | — | — | — | — | 16 |

| Pipe or Tubing Size (mm) | FLANGED | | THREADED | | GROOVED | | COPPER SWEAT BRONZE* | | Min. Convolutions per (meter) |
|--------------------------|-------------------|------------------|-----------------|------------------|-----------------|------------------|----------------------|------------------|-------------------------------|
| | Face to Face (mm) | Live Length (mm) | End to End (mm) | Live Length (mm) | End to End (mm) | Live Length (mm) | End to End (mm) | Live Length (mm) | |
| 15 | — | — | 610 | 502 | — | — | 457 | 362 | 302 |
| 20 | — | — | 610 | 502 | — | — | 457 | 349 | 262 |
| 25 | — | — | 610 | 502 | — | — | 457 | 340 | 236 |
| 30 | — | — | 610 | 476 | — | — | 457 | 337 | 220 |
| 40 | 610 | 556 | 610 | 476 | — | — | 457 | 330 | 207 |
| 50 | 610 | 537 | 610 | 457 | 610 | 457 | 457 | 318 | 190 |
| 65 | 610 | 537 | 610 | 432 | 610 | 457 | 457 | 273 | 157 |
| 75 | 914 | 841 | 914 | 737 | 914 | 762 | 457 | 267 | 151 |
| 100 | 914 | 841 | 914 | 737 | 914 | 711 | 457 | 394 | 105 |
| 125 | 914 | 835 | — | — | 914 | 711 | — | — | 95 |
| 150 | 914 | 835 | — | — | 914 | 711 | — | — | 82 |
| 200 | 914 | 829 | — | — | 914 | 711 | — | — | 75 |
| 250 | 914 | 829 | — | — | 914 | 660 | — | — | 69 |
| 300 | 914 | 829 | — | — | 914 | 660 | — | — | 66 |
| 350 | 914 | 829 | — | — | — | — | — | — | 59 |
| 400 | 914 | 829 | — | — | — | — | — | — | 52 |

PRODUCT TABLES

The tables on the following pages cover stock lengths. We describe capability in terms of allowable offset and normal vibration. Normal vibration is the amplitude you would expect at pump, chiller, air compressor connections, etc. These lengths do not describe what is needed for seismic motion on isolated machinery. We would be more than pleased to design to requirements for any special lengths, but the basic rule is the longer the length, the lower the transmitted vibration.

Of all fittings used with stainless steel hoses, the most common are two threaded ends or two flanges. Flexibility depends not on the overall

length, but on the live length of hose between the braid rings. In terms of vibration transmission and allowable movement, flanged connectors of the same length are superior to nipple ends of one kind or another. The nipples are longer than the flanges are thick, and the same braid ring is used in both cases. So for a given length, flanged hose has longer live hose. It is important that you know the live length you are buying, so this information is included in all of our descriptive tables.

All ratings are extremely conservative. We sometimes allow more motion for a given length when we know specifics.

ALSO AVAILABLE

Mason Vee Hoses are also available with CSA approval for natural gas, and UL approval for fire protection and potable water as follows.

CSA Series SPECIAL TESTED, INSPECTED AND TAGGED GAS HOSES



These assemblies have been "CSA" approved for use on gas pipelines. "CSA" is the current certification agency for gas industry products, assuming the authority formerly associated with the American Gas Association (AGA).

Our Certification Report is #230720-1764990. This Certification meets all requirements of ANSI/UL #536- 1997 Standards for Flexible Metal Hose.

- CSAMN**– SS Braided Hose with Carbon Steel Threaded Nipples
- CSAWN**– SS Braided Hose with Carbon Steel Weld Nipples (see p.16)
- CSAFFL**– SS Braided Hose with Carbon Steel Fixed and Floating Flanges

All dimensions are the same as standard products. Rated Pressure @ 70°F (21°C) is 175 psi (12kg/cm²).

MG Series HOSES CLEANED FOR MEDICAL GAS

- CPSB-MG**– Bronze Braided Hose with Copper Female Sweat Ends

NSF Series SPECIAL TESTED, INSPECTED AND TAGGED HOSES for WATER QUALITY ANNEX G of ANSI/NSF-61 and NSF-372



- MNSS-NSF**– SS Braided Hose with Stainless Steel Threaded Nipples
- FFLSS-NSF**– SS Braided Hose with Stainless Steel Fixed and Floating Flanges
- CPSB-NSF**– Bronze Braided Hose with Copper Female Sweat Ends

All dimensions are the same as standard products. Rated Pressure @ 70°F (21°C) is 175 psi (12kg/cm²).

UL Series SPECIAL TESTED, INSPECTED AND TAGGED HOSES for SPRINKLER and FIRE PROTECTION SYSTEMS



FLEXIBLE JOINT FITTINGS
3VX9



- MN-UL**– SS Braided Hose with Carbon Steel Threaded Nipples
- FFL-UL**– SS Braided Hose with Carbon Steel Fixed and Floating Flanges
- GWN-UL**– SS Braided Hose with Carbon Steel Grooved Weld Nipples
- GWNF-UL**– SS Braided Hose with Carbon Steel Grooved Nipple and Fixed Flange
- CPSB-UL**– Bronze Braided Hose with Copper Female Sweat Ends

MN- SS Braided Hose with Carbon Steel Threaded Nipples

Our steam service ratings are very low in the interest of safety although our 70°F 21°C pressure ratings are as high or higher than our competitors. All locations where failure could lead to personal injury or suffocation must be avoided. In dangerous locations we suggest housed expansion joints, solid loops, ball joints, packed devices, etc. rather than thin walled flexible products regardless of manufacturer.

Consult factory with full location description as well as service conditions for higher pressure or temperature applications.

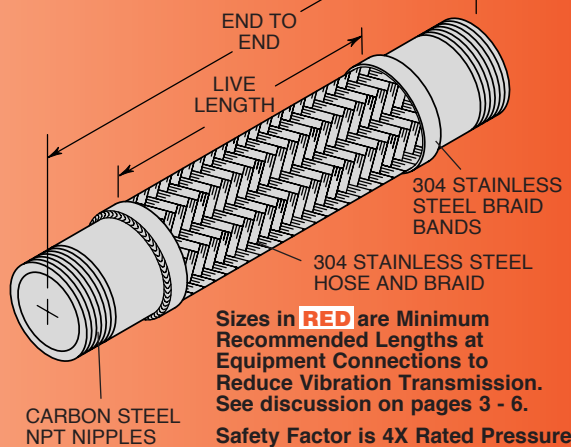
304 SS can be used up to 850°F 454°C in applications such as engine exhaust.

When using MN products in copper or brass water or steam systems, dielectric couplings must be used on each end to prevent leakage from galvanic action.

CARBON STEEL NPT NIPPLES Standard

On Special Orders:

1. Stainless Steel Nipples
2. Other Threads
3. Other Lengths



Sizes in **RED** are Minimum Recommended Lengths at Equipment Connections to Reduce Vibration Transmission. See discussion on pages 3 - 6.

Safety Factor is 4X Rated Pressure. Full Vacuum Rating— 30" 762mm Hg

RATED PRESSURES @ ELEVATED TEMPERATURES (psi) (kg/cm²)

| Hose Size (in) (mm) | 250°F 121°C Factor 0.92 | 350°F 176°C Factor 0.86 | 450°F 232°C Factor 0.81 |
|---------------------|----------------------------|----------------------------|----------------------------|
| 1/2 15 | 1010 69 | 950 59 | 890 61 |
| 3/4 20 | 640 44 | 600 41 | 570 39 |
| 1 25 | 530 36 | 500 34 | 470 32 |
| 1 1/4 32 | 460 32 | 430 30 | 400 28 |
| 1 1/2 40 | 400 28 | 370 26 | 350 24 |
| 2 50 | 330 23 | 310 21 | 290 20 |
| 2 1/2 65 | 270 19 | 250 17 | 235 16 |
| 3 80 | 260 18 | 240 16 | 230 16 |
| 4 100 | 210 15 | 200 14 | 190 12 |

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

| Size (in) (mm) | Max Gauge (psi) (kg/cm ²) | Temp Reference (°F) (°C) |
|----------------|---------------------------------------|--------------------------|
| 1/2 15 | 200 14 | 387 197 |
| 3/4 20 | 200 14 | 387 197 |
| 1 25 | 150 11 | 362 183 |
| 1 1/4 32 | 150 11 | 362 183 |
| 1 1/2 40 | 150 11 | 362 183 |
| 2 50 | 150 11 | 362 183 |
| 2 1/2 65 | 125 9 | 355 179 |
| 3 80 | 125 9 | 355 179 |
| 4 100 | 125 9 | 355 179 |

STOCK SIZES and LENGTHS

MN DIMENSIONS AND PRESSURE RATINGS (American Units)

| Type | Pipe Size & End to End (in) | Live Length (in) | Corrugations per foot | Maximum Lateral Offset (in) | Force Req'd for Max. Offset at 250psi or lower Rated Pressure (lbs) | Rated Pressure @70°F (psi) |
|------|-----------------------------|------------------|-----------------------|-----------------------------|---|----------------------------|
| MN | 1/2 x 6 1/2* | 25/8 | 92 | 1/8 | 20 | 1100 |
| MN | 1/2 x 12 | 8 1/8 | 92 | 1 1/4 | 9 | 1100 |
| MN | 1/2 x 18 | 14 1/8 | 92 | 4 | 7 | 1100 |
| MN | 1/2 x 24 | 20 1/8 | 92 | 7 1/2 | 6 | 1100 |
| MN | 1/2 x 36 | 32 1/8 | 92 | 16 | 0 | 1100 |
| MN | 3/4 x 7* | 31/8 | 80 | 1/8 | 25 | 700 |
| MN | 3/4 x 12 | 8 1/8 | 80 | 1 | 12 | 700 |
| MN | 3/4 x 18 | 14 1/8 | 80 | 2 1/4 | 9 | 700 |
| MN | 3/4 x 24 | 20 1/8 | 80 | 3 1/4 | 8 | 700 |
| MN | 3/4 x 36 | 32 1/8 | 80 | 14 | 0 | 700 |
| MN | 1 x 8* | 35/8 | 72 | 1/8 | 50 | 580 |
| MN | 1 x 12 | 75/8 | 72 | 1 | 25 | 580 |
| MN | 1 x 18 | 135/8 | 72 | 3 | 9 | 580 |
| MN | 1 x 24 | 195/8 | 72 | 6 1/2 | 8 | 580 |
| MN | 1 x 36 | 315/8 | 72 | 11 | 0 | 580 |
| MN | 1 1/4 x 8 1/2* | 35/8 | 67 | 1/8 | 180 | 480 |
| MN | 1 1/4 x 12 | 7 1/8 | 67 | 3/4 | 35 | 480 |
| MN | 1 1/4 x 18 | 13 1/8 | 67 | 2 1/4 | 18 | 480 |
| MN | 1 1/4 x 24 | 19 1/8 | 67 | 5 | 13 | 480 |
| MN | 1 1/4 x 36 | 31 1/8 | 67 | 10 | 0 | 480 |
| MN | 1 1/2 x 9* | 41/8 | 63 | 1/8 | 310 | 450 |
| MN | 1 1/2 x 12 | 7 1/8 | 63 | 5/8 | 170 | 450 |
| MN | 1 1/2 x 18 | 13 1/8 | 63 | 2 | 110 | 450 |
| MN | 1 1/2 x 24 | 19 1/8 | 63 | 4 1/2 | 30 | 450 |
| MN | 1 1/2 x 36 | 31 1/8 | 63 | 9 | 0 | 450 |
| MN | 2 x 10 1/2* | 51/4 | 58 | 1/8 | 460 | 360 |
| MN | 2 x 12 | 63/4 | 58 | 3/8 | 225 | 360 |
| MN | 2 x 18 | 123/4 | 58 | 1 1/2 | 125 | 360 |
| MN | 2 x 24 | 183/4 | 58 | 3 3/4 | 60 | 360 |
| MN | 2 x 36 | 303/4 | 58 | 8 | 0 | 360 |
| MN | 2 1/2 x 12* | 5 | 48 | 1/8 | 475 | 290 |
| MN | 2 1/2 x 18 | 11 | 48 | 1 1/4 | 325 | 290 |
| MN | 2 1/2 x 24 | 17 | 48 | 3 | 160 | 290 |
| MN | 2 1/2 x 36 | 29 | 48 | 7 | 0 | 290 |
| MN | 3 x 12* | 5 | 46 | 1/8 | 750 | 280 |
| MN | 3 x 18 | 11 | 46 | 1 | 600 | 280 |
| MN | 3 x 24 | 17 | 46 | 2 1/2 | 390 | 280 |
| MN | 3 x 36 | 29 | 46 | 6 | 0 | 280 |
| MN | 4 x 12* | 5 | 32 | 1/8 | 900 | 225 |
| MN | 4 x 18 | 11 | 32 | 1/2 | 800 | 225 |
| MN | 4 x 24 | 17 | 32 | 3/4 | 450 | 225 |
| MN | 4 x 36 | 29 | 32 | 5 | 0 | 225 |

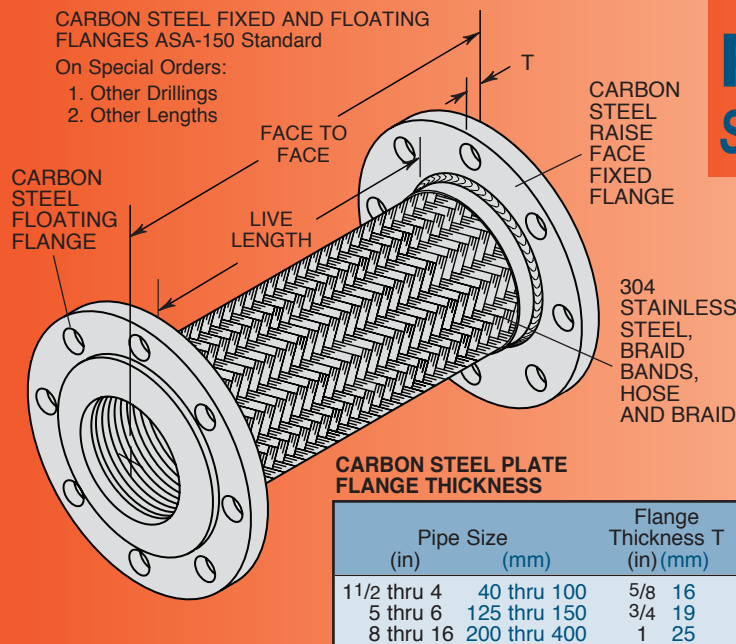
MN DIMENSIONS AND PRESSURE RATINGS (Metric Units)

| Type | Pipe Size & End to End (mm) | Live Length (mm) | Corrugations per meter | Maximum Lateral Offset (mm) | Force Req'd for Max. Offset at 17 kg/cm ² or lower Rated Pressure (kg) | Rated Pressure @21°C (kg/cm ²) |
|------|-----------------------------|------------------|------------------------|-----------------------------|---|--|
| MN | 15 x 165* | 67 | 302 | 3 | 9 | 77 |
| MN | 15 x 305 | 207 | 302 | 32 | 4 | 77 |
| MN | 15 x 457 | 359 | 302 | 102 | 3 | 77 |
| MN | 15 x 610 | 512 | 302 | 191 | 3 | 77 |
| MN | 15 x 914 | 816 | 302 | 406 | 3 | 77 |
| MN | 20 x 178* | 80 | 262 | 3 | 11 | 49 |
| MN | 20 x 305 | 207 | 262 | 29 | 5 | 49 |
| MN | 20 x 457 | 359 | 262 | 89 | 4 | 49 |
| MN | 20 x 610 | 512 | 262 | 178 | 3 | 49 |
| MN | 20 x 914 | 816 | 262 | 356 | 0 | 49 |
| MN | 25 x 203* | 93 | 236 | 3 | 23 | 40 |
| MN | 25 x 305 | 194 | 236 | 25 | 11 | 40 |
| MN | 25 x 457 | 347 | 236 | 76 | 4 | 40 |
| MN | 25 x 610 | 499 | 236 | 165 | 3 | 40 |
| MN | 25 x 914 | 804 | 236 | 279 | 0 | 40 |
| MN | 32 x 216* | 94 | 220 | 3 | 82 | 33 |
| MN | 32 x 305 | 183 | 220 | 19 | 16 | 33 |
| MN | 32 x 457 | 335 | 220 | 57 | 8 | 33 |
| MN | 32 x 610 | 488 | 220 | 127 | 6 | 33 |
| MN | 32 x 914 | 792 | 220 | 254 | 6 | 33 |
| MN | 40 x 229* | 107 | 207 | 3 | 141 | 31 |
| MN | 40 x 305 | 183 | 207 | 16 | 77 | 31 |
| MN | 40 x 457 | 335 | 207 | 51 | 50 | 31 |
| MN | 40 x 610 | 488 | 207 | 214 | 14 | 31 |
| MN | 40 x 914 | 792 | 207 | 229 | 0 | 31 |
| MN | 50 x 267* | 135 | 190 | 3 | 209 | 25 |
| MN | 50 x 305 | 173 | 190 | 10 | 102 | 25 |
| MN | 50 x 457 | 325 | 190 | 38 | 57 | 25 |
| MN | 50 x 610 | 478 | 190 | 95 | 27 | 25 |
| MN | 50 x 914 | 782 | 190 | 203 | 0 | 25 |
| MN | 65 x 305* | 127 | 157 | 3 | 215 | 20 |
| MN | 65 x 457 | 279 | 157 | 32 | 147 | 20 |
| MN | 65 x 610 | 432 | 157 | 76 | 73 | 20 |
| MN | 65 x 914 | 737 | 157 | 178 | 0 | 20 |
| MN | 80 x 305* | 127 | 151 | 3 | 340 | 19 |
| MN | 80 x 457 | 279 | 151 | 25 | 272 | 19 |
| MN | 80 x 610 | 432 | 151 | 65 | 177 | 19 |
| MN | 80 x 914 | 737 | 151 | 152 | 41 | 19 |
| MN | 100 x 305* | 127 | 105 | 3 | 408 | 15 |
| MN | 100 x 457 | 279 | 105 | 19 | 363 | 15 |
| MN | 100 x 610 | 432 | 105 | 44 | 204 | 15 |
| MN | 100 x 914 | 737 | 105 | 127 | 91 | 15 |

End to End Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.

*Industry Pump Connector Lengths are not recommended, but supplied on demand.



FFL-SS Braided Hose with Carbon Steel Fixed & Floating Flanges

FFL Braided Stainless Steel Hose has fixed and floating raised face flanges. Years ago, almost all stainless steel hose was manufactured with a floating flange on one end. It is still important because it makes lining up the holes easier during installation, and eliminates the possibility of twisting the hose, when the holes do not line up. Twisting contributes to early failure.

Raised face flanges seal better. Most competitive plate flanges have flat faces to reduce machining costs, but the raised face is the better product as sealing pressure increases by factors of 2 & 3 because of the reduced gasket area.

All of our stocked flanged hose has one floating flange.

Sizes in **RED** are Minimum Recommended Lengths at Equipment Connections to Reduce Vibration Transmission. See discussion on p.3 - 6.

For RATED PRESSURES @ ELEVATED TEMPERATURES and SATURATED STEAM RECOMMENDED PRESSURE LIMITS, see p.10.

Safety Factor is 4X Rated Pressure. Full Vacuum Rating—30" 762mm Hg

STOCK SIZES and LENGTHS

FFL DIMENSIONS AND PRESSURE RATINGS (American Units)

| Type | Pipe Size & Face to Face (in) | Live Length (in) | Corrugations per foot | Maximum Lateral Offset (in) | Force Req'd for Max. Offset at 250psi or lower Rated Pressure (lbs) | Rated Pressure @70°F (psi) |
|------|-------------------------------|------------------|-----------------------|-----------------------------|---|----------------------------|
| FFL | 1 1/2 X 9* | 63/4 | 63 | 1/8 | 83 | 450 |
| FFL | 1 1/2 X 12 | 93/4 | 63 | 11/4 | 85 | 450 |
| FFL | 1 1/2 X 18 | 153/4 | 63 | 31/2 | 40 | 450 |
| FFL | 1 1/2 X 24 | 213/4 | 63 | 61/2 | 30 | 450 |
| FFL | 2 X 9* | 63/4 | 58 | 1/8 | 185 | 360 |
| FFL | 2 X 12 | 93/4 | 58 | 11/8 | 180 | 360 |
| FFL | 2 X 18 | 153/4 | 58 | 21/2 | 80 | 360 |
| FFL | 2 X 24 | 213/4 | 58 | 5 | 45 | 360 |
| FFL | 2 1/2 X 9* | 6 | 48 | 1/8 | 380 | 290 |
| FFL | 2 1/2 X 12 | 9 | 48 | 1 | 345 | 290 |
| FFL | 2 1/2 X 18 | 15 | 48 | 21/4 | 215 | 290 |
| FFL | 2 1/2 X 24 | 21 | 48 | 43/4 | 110 | 290 |
| FFL | 3 X 9* | 6 | 46 | 1/8 | 575 | 280 |
| FFL | 3 X 12 | 93/4 | 46 | 7/8 | 770 | 280 |
| FFL | 3 X 18 | 153/4 | 46 | 2 | 335 | 280 |
| FFL | 3 X 24 | 213/4 | 46 | 4 | 205 | 280 |
| FFL | 3 X 36 | 333/4 | 46 | 8 | 100 *** | 280 |
| FFL | 4 X 9* | 6 | 32 | 1/8 | 700 | 225 |
| FFL | 4 X 12 | 93/4 | 32 | 3/4 | 1155 | 225 |
| FFL | 4 X 18 | 153/4 | 32 | 11/2 | 525 | 225 |
| FFL | 4 X 24 | 213/4 | 32 | 31/2 | 485 | 225 |
| FFL | 4 X 36 | 333/4 | 32 | 7 | 220 *** | 225 |
| FFL | 5 X 12* | 83/4 | 29 | 1/8 | 750 | 200 |
| FFL | 5 X 18 | 143/4 | 29 | 11/4 | 710 | 200 |
| FFL | 5 X 24 | 203/4 | 29 | 21/4 | 575 | 200 |
| FFL | 5 X 36 | 323/4 | 29 | 51/2 | 430 | 200 |
| FFL | 6 X 12* | 83/4 | 25 | 1/8 | 1050 | 200 |
| FFL | 6 X 18 | 143/4 | 25 | 1 | 2175 | 200 |
| FFL | 6 X 24 | 203/4 | 25 | 2 | 1485 | 200 |
| FFL | 6 X 36 | 323/4 | 25 | 5 | 620 | 200 |
| FFL | 8 X 12* | 81/2 | 23 | 1/8 | 1680 | 200 |
| FFL | 8 X 18 | 141/2 | 23 | 7/8 | 3280 | 200 |
| FFL | 8 X 24 | 201/2 | 23 | 11/2 | 3180 | 200 |
| FFL | 8 X 36 | 321/2 | 23 | 4 | 1405 | 200 |
| FFL | 10 X 13* | 91/2 | 21 | 1/8 | 2590 | 170 |
| FFL | 10 X 18 | 141/2 | 21 | 3/4 | 3750 | 170 |
| FFL | 10 X 24 | 201/2 | 21 | 11/4 | 4020 | 170 |
| FFL | 10 X 36 | 321/2 | 21 | 3 | 2230 | 170 |
| FFL | 12 X 14* | 101/2 | 20 | 1/8 | 3690 | 170 |
| FFL | 12 X 24 | 201/2 | 20 | 1 | 4950 | 170 |
| FFL | 12 X 36 | 321/2 | 20 | 21/2 | 2960 | 170 |
| FFL | 14 X 14* | 101/2 | 18 | 1/8 | 5500 | 170 |
| FFL | 14 X 36 | 321/2 | 18 | 11/4 | 12000 | 170 |
| FFL | 16 X 16* | 121/2 | 16 | 1/8 | 7200 | 170 |
| FFL | 16 X 36 | 321/2 | 16 | 1 | 15000 | 170 |

FFL DIMENSIONS AND PRESSURE RATINGS (Metric Units)

| Type | Pipe Size & Face to Face (mm) | Live Length (mm) | Corrugations per meter | Maximum Lateral Offset (mm) | Force Req'd for Max. Offset at 17kg/cm² or lower Rated Pressure (kg) | Rated Pressure @21°C (kg/cm²) |
|------|-------------------------------|------------------|------------------------|-----------------------------|--|-------------------------------|
| FFL | 40 X 229* | 171 | 207 | 3 | 38 | 31 |
| FFL | 40 X 305 | 248 | 207 | 32 | 39 | 31 |
| FFL | 40 X 457 | 400 | 207 | 89 | 18 | 31 |
| FFL | 40 X 610 | 552 | 207 | 165 | 14 | 31 |
| FFL | 50 X 229* | 171 | 190 | 3 | 84 | 25 |
| FFL | 50 X 305 | 248 | 190 | 29 | 82 | 25 |
| FFL | 50 X 457 | 400 | 190 | 64 | 36 | 25 |
| FFL | 50 X 610 | 552 | 190 | 127 | 20 | 25 |
| FFL | 65 X 229* | 152 | 157 | 3 | 171 | 20 |
| FFL | 65 X 305 | 248 | 157 | 25 | 156 | 20 |
| FFL | 65 X 457 | 400 | 157 | 57 | 98 | 20 |
| FFL | 65 X 610 | 552 | 157 | 121 | 50 | 20 |
| FFL | 80 X 229* | 152 | 151 | 3 | 259 | 19 |
| FFL | 80 X 305 | 248 | 151 | 22 | 349 | 19 |
| FFL | 80 X 457 | 400 | 151 | 51 | 152 | 19 |
| FFL | 80 X 610 | 552 | 151 | 102 | 93 | 19 |
| FFL | 80 X 914 | 857 | 151 | 203 | 45 *** | 19 |
| FFL | 100 X 229* | 152 | 105 | 3 | 319 | 15 |
| FFL | 100 X 305 | 248 | 105 | 19 | 524 | 15 |
| FFL | 100 X 457 | 400 | 105 | 38 | 238 | 15 |
| FFL | 100 X 610 | 552 | 105 | 89 | 220 | 15 |
| FFL | 100 X 914 | 857 | 105 | 178 | 100 *** | 15 |
| FFL | 125 X 305* | 222 | 95 | 3 | 340 | 14 |
| FFL | 125 X 457 | 375 | 95 | 32 | 322 | 14 |
| FFL | 125 X 610 | 527 | 95 | 57 | 261 | 14 |
| FFL | 125 X 914 | 832 | 95 | 140 | 195 | 14 |
| FFL | 150 X 305* | 222 | 82 | 3 | 476 | 14 |
| FFL | 150 X 457 | 375 | 82 | 25 | 987 | 14 |
| FFL | 150 X 610 | 527 | 82 | 51 | 674 | 14 |
| FFL | 150 X 914 | 832 | 82 | 127 | 281 | 14 |
| FFL | 200 X 305* | 216 | 75 | 3 | 762 | 14 |
| FFL | 200 X 457 | 368 | 75 | 22 | 1488 | 14 |
| FFL | 200 X 610 | 521 | 75 | 32 | 1442 | 14 |
| FFL | 200 X 914 | 832 | 75 | 102 | 637 | 14 |
| FFL | 250 X 330* | 241 | 69 | 3 | 1175 | 11 |
| FFL | 250 X 457 | 368 | 69 | 19 | 1701 | 11 |
| FFL | 250 X 610 | 521 | 69 | 32 | 1823 | 11 |
| FFL | 250 X 914 | 826 | 69 | 76 | 1012 | 11 |
| FFL | 300 X 356* | 267 | 66 | 3 | 1674 | 11 |
| FFL | 300 X 610 | 521 | 66 | 25 | 2245 | 11 |
| FFL | 300 X 914 | 826 | 66 | 64 | 1343 | 11 |
| FFL | 350 X 356* | 267 | 59 | 3 | 2495 | 11 |
| FFL | 350 X 914 | 826 | 59 | 32 | 5443 | 11 |
| FFL | 400 X 406* | 318 | 52 | 3 | 3266 | 11 |
| FFL | 400 X 914 | 826 | 52 | 25 | 6804 | 11 |

Face to Face Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.
Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.
Sizes 12" - 16" 300-400mm have double braid. **Estimated.

FFLSS- SS Braided Hose with Stainless Steel Fixed & Floating Flanges

STAINLESS STEEL FIXED AND FLOATING FLANGES ASA-150 Drilling Standard

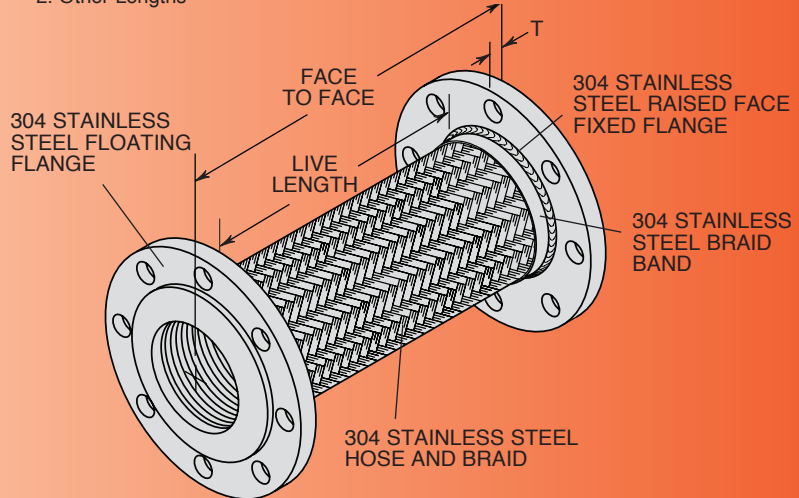
On Special Orders:

1. Other Drillings
2. Other Lengths

STAINLESS STEEL PLATE FLANGE THICKNESS

| Pipe Size (in) | Pipe Size (mm) | Flange Thickness T (in) (mm) |
|----------------|----------------|------------------------------|
| 2 thru 4 | 50 thru 100 | 5/8 16 |
| 5 thru 6 | 125 thru 150 | 3/4 19 |
| 8 thru 12 | 200 thru 300 | 1 25 |

Safety Factor is 4X Rated Pressure.
Full Vacuum Rating— 30" 762mm Hg



STOCK SIZES and LENGTHS

FFLSS DIMENSIONS AND PRESSURE RATINGS (American Units)

| Type | Pipe Size & Face to Face (in) | Live Length (in) | Corrugations per foot | Maximum Lateral Offset (in) | Force Req'd for Max. Offset at 250psi or lower Rated Pressure (lbs) | Rated Pressure @70°F (psi) |
|-------|-------------------------------|------------------|-----------------------|-----------------------------|---|----------------------------|
| FFLSS | 2 X 12 | 93/4 | 58 | 11/8 | 180 | 360 |
| FFLSS | 2 1/2 X 12 | 9 | 48 | 1 | 345 | 290 |
| FFLSS | 3 X 12 | 9 | 46 | 7/8 | 770 | 280 |
| FFLSS | 4 X 12 | 9 | 32 | 3/4 | 1155 | 225 |
| FFLSS | 4 X 18 | 15 | 32 | 11/2 | 525 | 225 |
| FFLSS | 5 X 18 | 143/4 | 29 | 11/8 | 710 | 200 |
| FFLSS | 6 X 18 | 143/4 | 25 | 1 | 2175 | 200 |
| FFLSS | 8 X 24 | 197/8 | 23 | 11/2 | 3180 | 200 |
| FFLSS | 10 X 24 | 197/8 | 21 | 11/4 | 4020 | 170 |
| FFLSS | 12 X 24 | 197/8 | 20 | 1 | 4950 | 170 |

FFLSS DIMENSIONS AND PRESSURE RATINGS (Metric Units)

| Type | Pipe Size & Face to Face (mm) | Live Length (mm) | Corrugations per meter | Maximum Lateral Offset (mm) | Force Req'd for Max. Offset at 17kg/cm² or lower Rated Pressure (kg) | Rated Pressure @21°C (kg/cm²) |
|-------|-------------------------------|------------------|------------------------|-----------------------------|--|-------------------------------|
| FFLSS | 50 X 305 | 248 | 190 | 29 | 82 | 25 |
| FFLSS | 65 X 305 | 229 | 157 | 25 | 156 | 20 |
| FFLSS | 80 X 305 | 229 | 151 | 22 | 349 | 19 |
| FFLSS | 100 X 305 | 229 | 105 | 19 | 524 | 15 |
| FFLSS | 100 X 457 | 381 | 105 | 38 | 238 | 15 |
| FFLSS | 125 X 457 | 375 | 95 | 29 | 322 | 14 |
| FFLSS | 150 X 457 | 375 | 82 | 25 | 987 | 14 |
| FFLSS | 200 X 610 | 521 | 75 | 38 | 1488 | 14 |
| FFLSS | 250 X 610 | 521 | 69 | 32 | 1175 | 11 |
| FFLSS | 300 X 610 | 521 | 66 | 25 | 1674 | 11 |

Face to Face Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.
Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.
Sizes 12" 300mm have double braid.

NOTE: In applications calling for stainless flanges and meeting special overall vibration reduction lengths, order to specified lengths.

Rated Pressure @ Elevated Temperatures for FFL and FFLSS

RATED PRESSURES @ ELEVATED TEMPERATURES (psi) (kg/cm²)

| Hose Size (in) (mm) | 250°F 121°C Factor 0.92 | 350°F 176°C Factor 0.86 | 450°F 232°C Factor 0.81 |
|---------------------|-------------------------|-------------------------|-------------------------|
| 1 1/2 40 | 400 28 | 370 26 | 350 24 |
| 2 50 | 330 23 | 310 21 | 290 20 |
| 2 1/2 65 | 270 19 | 250 17 | 235 16 |
| 3 80 | 260 18 | 240 16 | 230 16 |
| 4 100 | 210 15 | 200 14 | 190 13 |
| 5 125 | 190 13 | 180 12 | 170 11 |
| 6 150 | 190 13 | 180 12 | 170 11 |
| 8 200 | 190 13 | 180 12 | 170 11 |
| 10 250 | 160 11 | 150 10 | 140 9 |
| 12 300 | 160 11 | 150 10 | 140 9 |
| 14 350 | 160 11 | 150 10 | 140 9 |
| 16 400 | 160 11 | 150 10 | 140 9 |

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

| Size (in) (mm) | Max Gauge (psi) (kg/cm²) | Temp Reference (°F) (°C) |
|----------------|--------------------------|--------------------------|
| 1 1/2 40 | 150 11 | 362 183 |
| 2 50 | 150 11 | 362 183 |
| 2 1/2 65 | 125 9 | 355 179 |
| 3 80 | 125 9 | 355 179 |
| 4 100 | 125 9 | 355 179 |
| 5 125 | 100 7 | 337 169 |
| 6 150 | 100 7 | 337 169 |
| 8 200 | 75 5 | 320 160 |
| 10 250 | 60 4 | 307 153 |
| 12 300 | 60 4 | 307 153 |
| 14 350 | 60 4 | 307 153 |
| 16 400 | 60 4 | 307 153 |

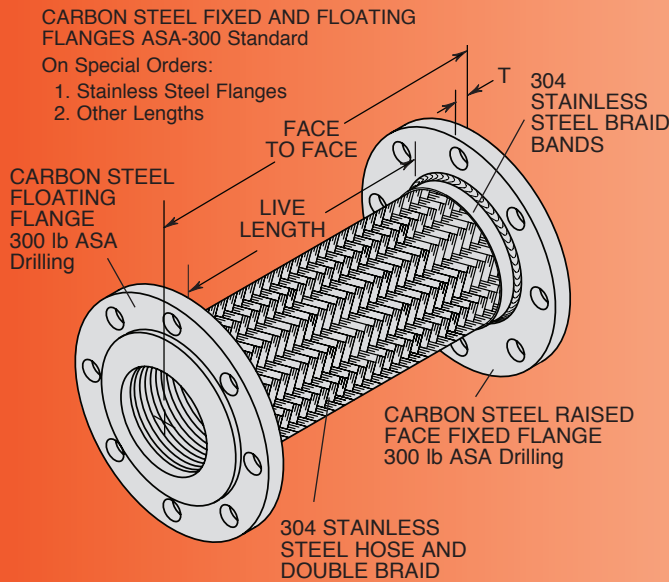
Our steam service ratings are very low in the interest of safety although our 70°F 21°C pressure ratings are as high or higher than our competitors. All locations where failure could lead to personal injury or suffocation must be avoided. In dangerous locations we suggest housed expansion joints, solid loops, ball joints, packed devices, etc. rather than thin walled flexible products regardless of manufacturer.

Consult factory with full location description as well as service conditions for higher pressure or temperature applications.

304 SS can be used up to 850°F 454°C in applications such as engine exhaust with minor pressure.

When using FFL(SS) products in copper or brass water or steam systems, dielectric flanges must be used on each end to prevent leakage from galvanic action.

FFL2B300– SS Double Braided Hose with Carbon Steel 300 ASA Flanges



RATED PRESSURES @ ELEVATED TEMPERATURES (psi)(kg/cm²)

| Hose Size (in) (mm) | 250°F 121°C Factor 0.92 | 350°F 176°C Factor 0.86 | 450°F 232°C Factor 0.81 |
|---------------------|-------------------------|-------------------------|-------------------------|
| 2 50 | 460 31 | 430 29 | 405 28 |
| 2 1/2 65 | 460 31 | 430 29 | 405 28 |
| 3 80 | 345 24 | 323 22 | 304 21 |
| 4 100 | 345 24 | 323 22 | 304 21 |
| 5 125 | 345 24 | 323 22 | 304 21 |
| 6 150 | 345 24 | 323 22 | 304 21 |
| 8 200 | 216 15 | 202 14 | 190 13 |
| 10 250 | 193 13 | 181 12 | 170 11 |
| 12 300 | 156 11 | 146 10 | 138 9 |

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

| Size (in) (mm) | Max Gauge (psi) (kg/cm ²) | Temp Reference (°F) (°C) |
|----------------|---------------------------------------|--------------------------|
| 2 50 | 200 14 | 388 198 |
| 2 1/2 65 | 150 10 | 362 183 |
| 3 80 | 150 10 | 362 183 |
| 4 100 | 150 10 | 362 183 |
| 5 125 | 125 9 | 355 179 |
| 6 150 | 125 9 | 355 179 |
| 8 200 | 90 6 | 330 166 |
| 10 250 | 75 5 | 307 153 |
| 12 300 | 60 4 | 307 153 |

Our steam service ratings are very low in the interest of safety although our 70°F 21°C pressure ratings are as high or higher then our competitors. All locations where failure could lead to personal injury or suffocation must be avoided. In dangerous locations we suggest housed expansion joints, solid loops, ball joints, packed devices, etc. rather than thin walled flexible products regardless of manufacturer.

Consult factory with full location description as well as service conditions for higher pressure or temperature applications.

304 SS can be used up to 850°F 454°C in applications such as engine exhaust with minor pressure.

When using FFL2B300 products in copper or brass water or steam systems, dielectric flanges must be used on each end to prevent leakage from galvanic action.

CARBON STEEL PLATE FLANGE THICKNESS

| Pipe Size (in) (mm) | Flange Thickness T (in) (mm) |
|------------------------|------------------------------|
| 2 thru 4 50 thru 100 | 3/4 19 |
| 5 thru 6 125 thru 150 | 1 25 |
| 8 thru 12 200 thru 300 | 1 1/4 32 |

Face to Face Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.
Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.

STOCK SIZES and LENGTHS

FFL2B300 DIMENSIONS AND PRESSURE RATINGS (American Units)

| Pipe Size & Face to Face (in) | Live Length (in) | Corrugations per foot | Maximum Permanent Lateral Offset(in) | Rated Pressure @70°F (psi) |
|-------------------------------|------------------|-----------------------|--------------------------------------|----------------------------|
| 2 X 12 | 93/8 | 58 | 1 | 500 |
| 2 1/2 X 12 | 87/8 | 48 | 7/8 | 500 |
| 3 X 12 | 87/8 | 46 | 3/4 | 375 |
| 4 X 12 | 87/8 | 32 | 5/8 | 375 |
| 4 X 18 | 147/8 | 32 | 11/4 | 375 |
| 5 X 18 | 141/4 | 29 | 11/8 | 375 |
| 6 X 18 | 141/4 | 25 | 7/8 | 375 |
| 8 X 24 | 191/2 | 23 | 11/4 | 235 |
| 10 X 24 | 191/2 | 21 | 11/8 | 210 |
| 12 X 24 | 191/2 | 20 | 7/8 | 170 |

FFL2B300 DIMENSIONS AND PRESSURE RATINGS (Metric Units)

| Pipe Size & Face to Face (mm) | Live Length (mm) | Corrugations per meter | Maximum Permanent Lateral Offset(mm) | Rated Pressure @21°C (kg/cm ²) |
|-------------------------------|------------------|------------------------|--------------------------------------|--|
| 50 X 305 | 238 | 190 | 25 | 35 |
| 65 X 305 | 225 | 157 | 22 | 35 |
| 80 X 305 | 225 | 151 | 19 | 26 |
| 100 X 305 | 225 | 105 | 16 | 26 |
| 100 X 457 | 378 | 105 | 32 | 26 |
| 125 X 457 | 362 | 95 | 29 | 26 |
| 150 X 457 | 362 | 82 | 22 | 26 |
| 200 X 610 | 495 | 75 | 32 | 16 |
| 250 X 610 | 495 | 69 | 29 | 14 |
| 300 X 610 | 495 | 66 | 22 | 11 |

Safety Factor is 4X Rated Pressure.
Full Vacuum Rating— 30" 762mm Hg

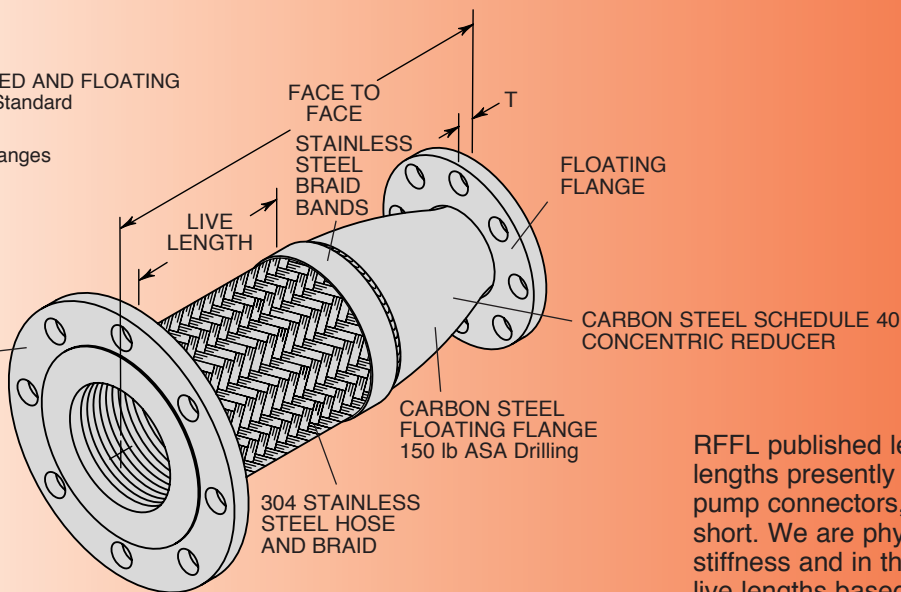
RFFL- SS Reducer with Carbon Steel Fixed & Floating Flanges

CARBON STEEL FIXED AND FLOATING FLANGES ASA-150 Standard

On Special Orders:

1. Stainless Steel Flanges
2. Other Drillings
3. Other Lengths
4. Other Reductions

CARBON STEEL RAISED FACE FIXED FLANGE 150 lb ASA Drilling



RFFL published lengths are based on live lengths presently the industry standard for pump connectors, which we feel are too short. We are physically testing transverse stiffness and in the near future will increase live lengths based on our research.

STOCK SIZES and LENGTHS

RFFL DIMENSIONS AND PRESSURE RATINGS (American Units)

| Type | Pipe Sizes—Large End X Small End (in) | Face to Face (in) | Live Length (in) | Corrugations per foot | Maximum Permanent Lateral Offset (in) | Rated Pressure @70°F (psi) |
|------|---------------------------------------|-------------------|------------------|-----------------------|---------------------------------------|----------------------------|
| RFFL | 2 1/2 X 2 | 14 | 73/4 | 48 | 1/8 | 290 |
| RFFL | 3 X 2 | 14 | 73/4 | 46 | 1/8 | 280 |
| RFFL | 3 X 2 1/2 | 14 | 73/4 | 46 | 1/8 | 280 |
| RFFL | 4 X 2 | 14 | 71/4 | 32 | 1/8 | 225 |
| RFFL | 4 X 2 1/2 | 14 | 71/4 | 32 | 1/8 | 225 |
| RFFL | 4 X 3 | 14 | 71/4 | 32 | 1/8 | 225 |
| RFFL | 5 X 3 | 17 | 91/8 | 29 | 1/8 | 200 |
| RFFL | 5 X 4 | 17 | 91/8 | 29 | 1/8 | 200 |
| RFFL | 6 X 3 | 18 | 95/8 | 25 | 1/8 | 200 |
| RFFL | 6 X 4 | 18 | 95/8 | 25 | 1/8 | 200 |
| RFFL | 6 X 5 | 18 | 95/8 | 25 | 1/8 | 200 |
| RFFL | 8 X 4 | 18 | 87/8 | 23 | 1/8 | 200 |
| RFFL | 8 X 5 | 18 | 87/8 | 23 | 1/8 | 200 |
| RFFL | 8 X 6 | 18 | 87/8 | 23 | 1/8 | 200 |
| RFFL | 10 X 6 | 20 | 97/8 | 21 | 1/8 | 170 |
| RFFL | 10 X 8 | 20 | 97/8 | 21 | 1/8 | 170 |
| RFFL | 12 X 10 | 22 | 107/8 | 20 | 1/8 | 170 |

RFFL DIMENSIONS AND PRESSURE RATINGS (Metric Units)

| Type | Pipe Sizes—Large End X Small End (mm) | Face to Face (mm) | Live Length (mm) | Corrugations per meter | Maximum Permanent Lateral Offset (mm) | Rated Pressure @21°C (kg/cm²) |
|------|---------------------------------------|-------------------|------------------|------------------------|---------------------------------------|-------------------------------|
| RFFL | 65 X 51 | 356 | 197 | 157 | 3 | 20 |
| RFFL | 80 X 51 | 356 | 197 | 151 | 3 | 19 |
| RFFL | 80 X 64 | 356 | 197 | 151 | 3 | 19 |
| RFFL | 100 X 51 | 356 | 184 | 105 | 3 | 15 |
| RFFL | 100 X 64 | 356 | 184 | 105 | 3 | 15 |
| RFFL | 100 X 76 | 356 | 184 | 105 | 3 | 15 |
| RFFL | 125 X 76 | 432 | 232 | 95 | 3 | 14 |
| RFFL | 125 X 102 | 432 | 232 | 95 | 3 | 14 |
| RFFL | 150 X 76 | 475 | 244 | 82 | 3 | 14 |
| RFFL | 150 X 102 | 475 | 244 | 82 | 3 | 14 |
| RFFL | 150 X 127 | 475 | 244 | 82 | 3 | 14 |
| RFFL | 200 X 102 | 475 | 225 | 75 | 3 | 14 |
| RFFL | 200 X 127 | 475 | 225 | 75 | 3 | 14 |
| RFFL | 200 X 152 | 475 | 225 | 75 | 3 | 14 |
| RFFL | 250 X 152 | 508 | 251 | 69 | 3 | 11 |
| RFFL | 250 X 203 | 508 | 251 | 69 | 3 | 11 |
| RFFL | 300 X 254 | 559 | 276 | 69 | 3 | 11 |

Face to Face Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.

Size 12" 300mm has double braid.

Rated Pressure @ Elevated Temperatures RFFL, GWNF and GWN

RATED PRESSURES @ ELEVATED TEMPERATURES (psi) (kg/cm²)

| Hose Size (in) (mm) | 250°F 121°C Factor 0.92 | 350°F 176°C Factor 0.86 | 450°F 232°C Factor 0.81 |
|---------------------|-------------------------|-------------------------|-------------------------|
| 2 50 | 330 23 | 310 21 | 290 20 |
| 2 1/2 65 | 270 19 | 250 17 | 235 16 |
| 3 80 | 260 18 | 240 16 | 230 16 |
| 4 100 | 210 15 | 200 14 | 190 13 |
| 5 125 | 190 13 | 180 12 | 170 11 |
| 6 150 | 190 13 | 180 12 | 170 11 |
| 8 200 | 190 13 | 180 12 | 170 11 |
| 10 250 | 160 11 | 150 10 | 140 9 |
| 12 300 | 160 11 | 150 10 | 140 9 |

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

| Size (in) (mm) | Max Gauge (psi) (kg/cm²) | Temp Reference (°F) (°C) |
|----------------|--------------------------|--------------------------|
| 2 50 | 150 11 | 362 183 |
| 2 1/2 65 | 125 9 | 355 179 |
| 3 80 | 125 9 | 355 179 |
| 4 100 | 125 9 | 355 179 |
| 5 125 | 100 7 | 337 169 |
| 6 150 | 100 7 | 337 169 |
| 8 200 | 75 5 | 320 160 |
| 10 250 | 60 4 | 307 153 |
| 12 300 | 60 4 | 307 153 |

Our steam service ratings are very low in the interest of safety although our 70°F 21°C pressure ratings are as high or higher than our competitors. All locations where failure could lead to personal injury or suffocation must be avoided. In dangerous locations we suggest housed expansion joints, solid loops, ball joints, packed devices, etc. rather than thin walled flexible products regardless of manufacturer.

Consult factory with full location description as well as service conditions for higher pressure or temperature applications.

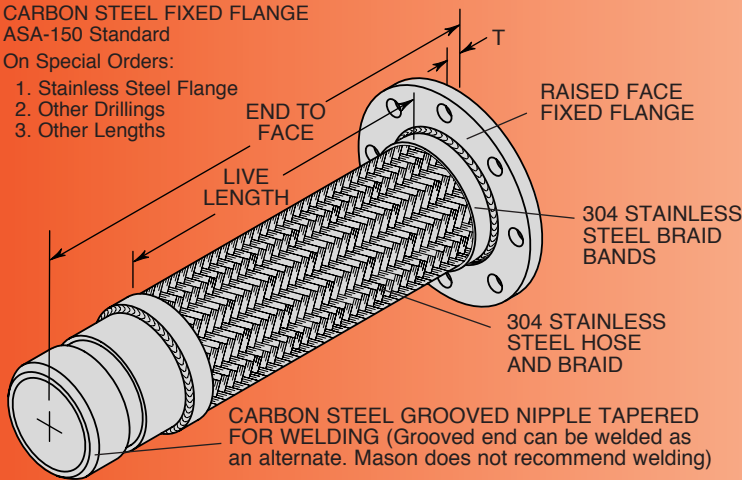
304 SS can be used up to 850°F 454°C in applications such as engine exhaust with minor pressure.

When using RFFL, GWNF or GWN products in copper or brass water or steam systems, dielectric flanges and/or couplings must be used on each end to prevent leakage from galvanic action.

CARBON STEEL FIXED FLANGE ASA-150 Standard

On Special Orders:

1. Stainless Steel Flange
2. Other Drillings
3. Other Lengths



GWNF DIMENSIONS AND PRESSURE RATINGS (American Units)

| Type | Pipe Size & End to Face (in) | Live Length (in) | Corrugations per foot | Maximum Permanent Lateral Offset (in) | Rated Pressure @70°F (psi) |
|------|------------------------------|------------------|-----------------------|---------------------------------------|----------------------------|
| GWNF | 2 x 13 | 91/8 | 58 | 1/4 | 360 |
| GWNF | 2 1/2 x 13 | 83/8 | 48 | 1/4 | 290 |
| GWNF | 3 x 13 | 83/8 | 46 | 1/4 | 280 |
| GWNF | 4 x 16 | 103/8 | 32 | 1/4 | 225 |
| GWNF | 5 x 18 | 121/4 | 29 | 1/4 | 200 |
| GWNF | 6 x 20 | 141/4 | 25 | 1/4 | 200 |
| GWNF | 8 x 22 | 16 | 23 | 1/4 | 200 |
| GWNF | 10 x 25 | 18 | 21 | 1/4 | 170 |
| GWNF | 12 x 27 | 20 | 20 | 1/4 | 170 |

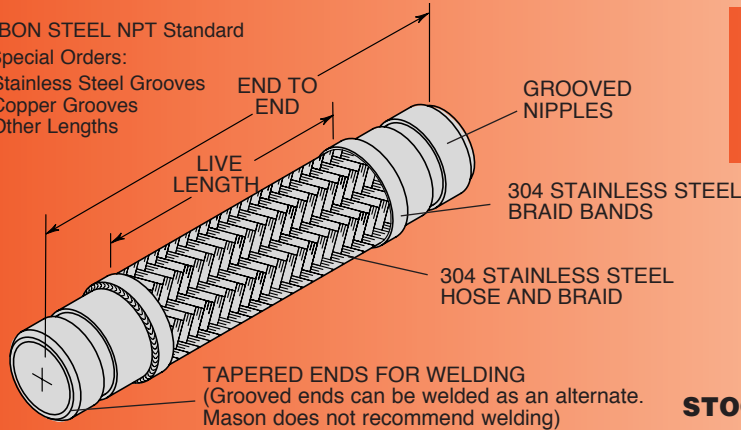
End to Face Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%. Size 12" 300mm has double braid.

CARBON STEEL NPT Standard

On Special Orders:

1. Stainless Steel Grooves
2. Copper Grooves
3. Other Lengths



GWN DIMENSIONS AND PRESSURE RATINGS (American Units)

| Pipe Size & End to End (in) | Live Length (in) | Corrugations per foot | Maximum Permanent Lateral Offset (in) | Rated Pressure @70°F (psi) |
|-----------------------------|------------------|-----------------------|---------------------------------------|----------------------------|
| 2 X 14 | 83/4 | 58 | 1 | 360 |
| 2 X 24 | 183/4 | 58 | 33/4 | 360 |
| 2 X 36 | 303/4 | 58 | 8 | 360 |
| 2 1/2 X 14 | 8 | 48 | 7/8 | 290 |
| 2 1/2 X 24 | 18 | 48 | 3 | 290 |
| 2 1/2 X 36 | 30 | 48 | 7 | 290 |
| 3 X 14 | 8 | 46 | 3/4 | 280 |
| 3 X 36 | 30 | 46 | 6 | 280 |
| 4 X 18 | 10 | 32 | 3/4 | 225 |
| 4 X 36 | 28 | 32 | 5 | 225 |
| 5 X 20 | 12 | 29 | 3/4 | 200 |
| 5 X 36 | 28 | 29 | 4 | 200 |
| 6 X 22 | 14 | 25 | 3/4 | 200 |
| 6 X 36 | 28 | 25 | 31/2 | 200 |
| 8 X 24 | 16 | 23 | 1/4 | 200 |
| 8 X 36 | 28 | 23 | 3 | 200 |
| 10 X 28 | 18 | 21 | 3/4 | 170 |
| 10 X 36 | 26 | 21 | 2 | 170 |
| 12 X 30 | 20 | 20 | 3/4 | 170 |
| 12 X 36 | 26 | 20 | 13/4 | 170 |

End to End Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%. Size 12" 300mm has double braid.

GWNF- SS Braided Hose with Carbon Steel Grooved Weld Nipple and Flange

Safety Factor is 4X Rated Pressure.
Full Vacuum Rating— 30" 762mm Hg

STOCK SIZES and LENGTHS

GWNF DIMENSIONS AND PRESSURE RATINGS (Metric Units)

| Type | Pipe Size & End to Face (mm) | Live Length (mm) | Corrugations per meter | Maximum Permanent Lateral Offset (mm) | Rated Pressure @21°C (kg/cm²) |
|------|------------------------------|------------------|------------------------|---------------------------------------|-------------------------------|
| GWNF | 50 x 330 | 232 | 190 | 6 | 25 |
| GWNF | 65 x 330 | 213 | 157 | 6 | 20 |
| GWNF | 75 x 330 | 213 | 151 | 6 | 19 |
| GWNF | 100 x 406 | 264 | 105 | 6 | 15 |
| GWNF | 125 x 457 | 311 | 95 | 6 | 14 |
| GWNF | 150 x 508 | 362 | 82 | 6 | 14 |
| GWNF | 200 x 559 | 406 | 75 | 6 | 14 |
| GWNF | 250 x 635 | 457 | 69 | 6 | 11 |
| GWNF | 300 x 686 | 508 | 69 | 6 | 11 |

GWN- SS Braided Hose with Carbon Steel Grooved Nipples

Sizes in **RED** are Minimum Recommended Lengths at Equipment Connections to Reduce Vibration Transmission. See discussion on pages 3 - 6.

Safety Factor is 4X Rated Pressure.
Full Vacuum Rating— 30" Hg 762mm

STOCK SIZES and LENGTHS

GWN DIMENSIONS AND PRESSURE RATINGS (Metric Units)

| Pipe Size & End to End (mm) | Live Length (mm) | Corrugations per meter | Maximum Permanent Lateral Offset (mm) | Rated Pressure @21°C (kg/cm²) |
|-----------------------------|------------------|------------------------|---------------------------------------|-------------------------------|
| 50 X 356 | 222 | 190 | 25 | 25 |
| 50 X 610 | 476 | 190 | 95 | 25 |
| 50 X 914 | 781 | 190 | 203 | 25 |
| 65 X 356 | 203 | 157 | 22 | 20 |
| 65 X 610 | 457 | 157 | 76 | 20 |
| 65 X 914 | 762 | 157 | 178 | 20 |
| 80 X 356 | 203 | 151 | 19 | 19 |
| 80 X 900 | 762 | 151 | 152 | 19 |
| 100 X 457 | 254 | 105 | 19 | 15 |
| 100 X 914 | 711 | 105 | 127 | 15 |
| 125 X 508 | 305 | 95 | 19 | 14 |
| 125 X 914 | 711 | 95 | 102 | 14 |
| 150 X 559 | 356 | 82 | 19 | 14 |
| 150 X 914 | 711 | 82 | 89 | 14 |
| 200 X 610 | 406 | 75 | 19 | 14 |
| 200 X 914 | 711 | 75 | 76 | 14 |
| 250 X 711 | 457 | 69 | 19 | 12 |
| 250 X 914 | 660 | 69 | 51 | 12 |
| 300 X 762 | 508 | 66 | 19 | 11 |
| 300 X 914 | 660 | 66 | 44 | 11 |

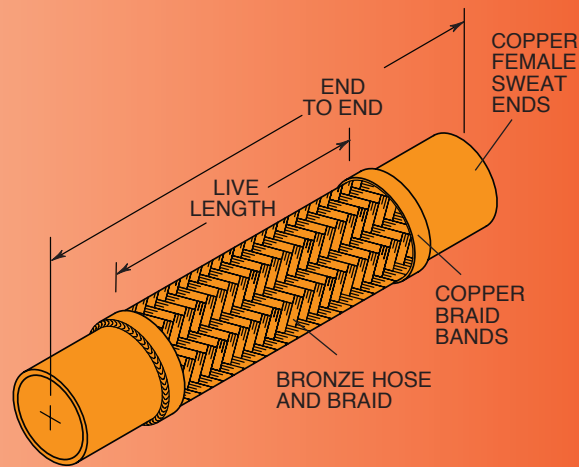
CPSB- Braided Bronze Hose with Copper Sweat Ends

ALL SERVICES EXCEPT REFRIGERANT

Copper Lines have virtually no stiffness or mass. We are recommending our longest standard lengths primarily for offset, not vibration reduction. See spec on page 6.

Consult factory with full location description as well as service conditions for higher pressure or temperature applications.

NOT SUITABLE FOR STEAM.



STOCK SIZES and LENGTHS

CPSB DIMENSIONS AND PRESSURE RATINGS (American Units)

| Type | Tubing Size & End to End (in) | Live Length (in) | Corrugations per foot | Maximum Permanent Lateral Offset (in) | Rated Pressure @ 70°F (psi) |
|-------------|-------------------------------|------------------|-----------------------|---------------------------------------|-----------------------------|
| CPSB | 1/2 X 61/2* | 23/4 | 73 | 1/8 | 500 |
| CPSB | 1/2 X 12 | 81/4 | 73 | 1 | 500 |
| CPSB | 1/2 X 18 | 141/4 | 73 | 3 | 500 |
| CPSB | 1/2 X 24 | 201/4 | 73 | 6 | 500 |
| CPSB | 1/2 X 36 | 321/4 | 73 | 121/2 | 500 |
| CPSB | 3/4 X 7* | 23/4 | 67 | 1/8 | 470 |
| CPSB | 3/4 X 12 | 73/4 | 67 | 3/4 | 470 |
| CPSB | 3/4 X 18 | 133/4 | 67 | 21/2 | 470 |
| CPSB | 3/4 X 24 | 193/4 | 67 | 51/2 | 470 |
| CPSB | 3/4 X 36 | 313/4 | 67 | 11 | 470 |
| CPSB | 1 X 8* | 33/8 | 58 | 1/8 | 450 |
| CPSB | 1 X 12 | 73/8 | 58 | 5/8 | 450 |
| CPSB | 1 X 18 | 133/8 | 58 | 21/4 | 450 |
| CPSB | 1 X 24 | 193/8 | 58 | 5 | 450 |
| CPSB | 1 X 36 | 313/8 | 58 | 81/2 | 450 |
| CPSB | 11/4 X 81/2* | 33/4 | 55 | 1/8 | 400 |
| CPSB | 11/4 X 12 | 71/4 | 55 | 1/2 | 400 |
| CPSB | 11/4 X 18 | 131/4 | 55 | 13/4 | 400 |
| CPSB | 11/4 X 24 | 191/4 | 55 | 4 | 400 |
| CPSB | 11/4 X 36 | 311/4 | 55 | 8 | 400 |
| CPSB | 11/2 X 9* | 4 | 53 | 1/8 | 335 |
| CPSB | 11/2 X 12 | 7 | 53 | 1/2 | 335 |
| CPSB | 11/2 X 18 | 13 | 53 | 11/2 | 335 |
| CPSB | 11/2 X 24 | 19 | 53 | 31/2 | 335 |
| CPSB | 11/2 X 36 | 31 | 53 | 71/2 | 335 |
| CPSB | 2 X 12* | 61/2 | 51 | 1/4 | 235 |
| CPSB | 2 X 18 | 121/2 | 51 | 13/8 | 235 |
| CPSB | 2 X 24 | 181/2 | 51 | 31/4 | 235 |
| CPSB | 2 X 36 | 301/2 | 51 | 7 | 235 |
| CPSB | 21/2 X 12* | 43/4 | 34 | 1/8 | 230 |
| CPSB | 21/2 X 18 | 103/4 | 34 | 7/8 | 230 |
| CPSB | 21/2 X 24 | 163/4 | 34 | 2 | 230 |
| CPSB | 21/2 X 36 | 283/4 | 34 | 41/2 | 230 |
| CPSB | 3 X 12* | 41/2 | 30 | 1/8 | 225 |
| CPSB | 3 X 18 | 101/2 | 30 | 3/4 | 225 |
| CPSB | 3 X 24 | 161/2 | 30 | 11/2 | 225 |
| CPSB | 3 X 36 | 281/2 | 30 | 41/4 | 225 |
| CPSB | 4 X 18* | 91/2 | 28 | 1/2 | 220 |
| CPSB | 4 X 24 | 151/2 | 28 | 11/4 | 220 |
| CPSB | 4 X 36 | 271/2 | 28 | 4 | 220 |

CPSB DIMENSIONS AND PRESSURE RATINGS (Metric Units)

| Type | Tubing Size & End to End (mm) | Live Length (mm) | Corrugations per meter | Maximum Permanent Lateral Offset (mm) | Rated Pressure @ 21°C (kg/cm²) |
|-------------|-------------------------------|------------------|------------------------|---------------------------------------|--------------------------------|
| CPSB | 15 X 165* | 70 | 240 | 3 | 37 |
| CPSB | 15 X 305 | 210 | 240 | 25 | 34 |
| CPSB | 15 X 457 | 362 | 240 | 76 | 34 |
| CPSB | 15 X 610 | 514 | 240 | 152 | 34 |
| CPSB | 15 X 915 | 819 | 240 | 318 | 34 |
| CPSB | 20 X 178* | 70 | 220 | 3 | 32 |
| CPSB | 20 X 305 | 197 | 220 | 19 | 32 |
| CPSB | 20 X 457 | 349 | 220 | 64 | 32 |
| CPSB | 20 X 610 | 502 | 220 | 140 | 32 |
| CPSB | 20 X 915 | 806 | 220 | 279 | 32 |
| CPSB | 25 X 203* | 86 | 190 | 3 | 31 |
| CPSB | 25 X 305 | 187 | 190 | 16 | 31 |
| CPSB | 25 X 457 | 340 | 190 | 57 | 31 |
| CPSB | 25 X 610 | 492 | 190 | 127 | 31 |
| CPSB | 25 X 915 | 797 | 190 | 216 | 31 |
| CPSB | 32 X 216* | 95 | 180 | 3 | 28 |
| CPSB | 32 X 305 | 184 | 180 | 13 | 28 |
| CPSB | 32 X 457 | 337 | 180 | 44 | 28 |
| CPSB | 32 X 610 | 489 | 180 | 102 | 28 |
| CPSB | 32 X 915 | 793 | 180 | 203 | 28 |
| CPSB | 40 X 229* | 102 | 174 | 3 | 23 |
| CPSB | 40 X 305 | 178 | 174 | 13 | 23 |
| CPSB | 40 X 457 | 330 | 174 | 38 | 23 |
| CPSB | 40 X 610 | 483 | 174 | 89 | 23 |
| CPSB | 40 X 915 | 787 | 174 | 191 | 23 |
| CPSB | 50 X 305* | 165 | 167 | 6 | 16 |
| CPSB | 50 X 457 | 318 | 167 | 35 | 16 |
| CPSB | 50 X 610 | 470 | 167 | 83 | 16 |
| CPSB | 50 X 915 | 775 | 167 | 178 | 16 |
| CPSB | 65 X 305* | 121 | 112 | 3 | 16 |
| CPSB | 65 X 457 | 273 | 112 | 22 | 16 |
| CPSB | 65 X 610 | 425 | 112 | 51 | 16 |
| CPSB | 65 X 915 | 730 | 112 | 114 | 16 |
| CPSB | 80 X 305* | 114 | 98 | 3 | 15 |
| CPSB | 80 X 457 | 267 | 98 | 19 | 15 |
| CPSB | 80 X 610 | 419 | 98 | 38 | 15 |
| CPSB | 80 X 915 | 724 | 98 | 108 | 15 |
| CPSB | 100 X 457* | 241 | 92 | 13 | 15 |
| CPSB | 100 X 610 | 394 | 92 | 32 | 15 |
| CPSB | 100 X 915 | 699 | 92 | 102 | 15 |

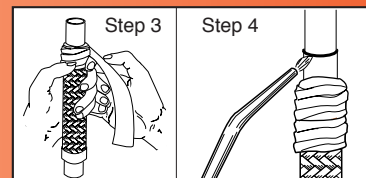
End to End Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.

Female end fits over copper tubing, e.g. 1/2 x 12 (15 x 305mm) fits over 1/2" (15mm) tubing.

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.

INSTALLATION:

1. Thoroughly clean male and female ends using steel wool and steel brushes.
2. Apply flux.
3. Wrap base of copper fitting on connector and 2" (50mm) of the braid with a wet cloth to prevent overheating during soldering.
4. Direct the torch away from the base of the copper fitting and braided section. Avoid contact of the flame with the base of the copper fitting and braid. Heat end of copper fitting for proper flow of silver solder. Silver solder flows at approximately 430°F 221°C.
5. Use caution with brazing rod or other higher temperature techniques. Overheating will cause leaks.
6. Remove wet cloth and remove all soldering flux immediately after installation. Flux chlorides will cause premature failure of joint.

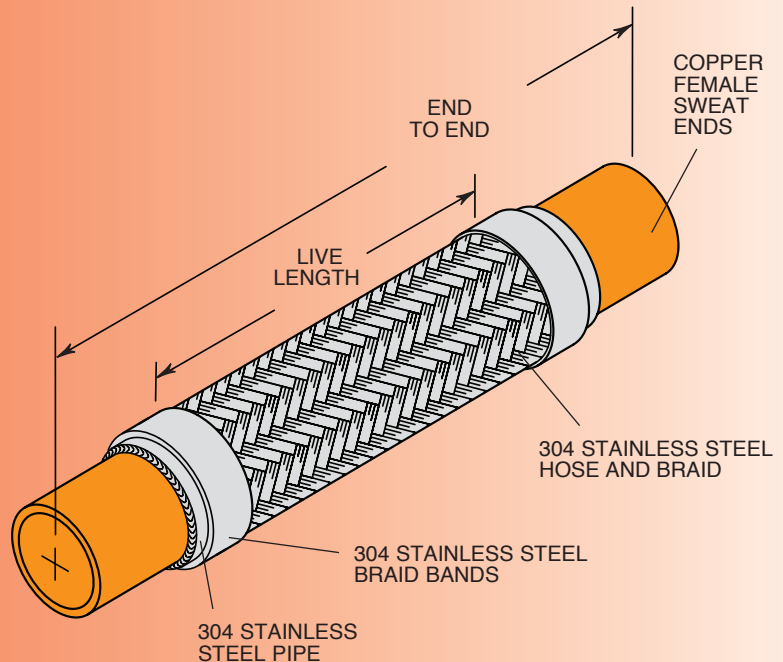


ULCPS- SS Braided Hose with Copper Sweat Ends U. L. Approved for Refrigerant Services

U.L. approved flexible hose are cleaned and bagged for refrigeration service. Do not use for water service.

Safety Factor is 5X Rated Pressure.
Full Vacuum Rating— 30" Hg 762mm

Lengths are industry standard
always ordered for this service.



STOCK SIZES and LENGTHS

ULCPS DIMENSIONS AND PRESSURE RATINGS (American Units)

| Stamped Code | Size & End to End (in) | Fits Over Tubing Size | Tubing OD (in) | Live Length (in) | Maximum Permanent Lateral Offset (in) | Rated Pressure @70°F (psi) |
|--------------|------------------------|-----------------------|----------------|------------------|---------------------------------------|----------------------------|
| NF1 | 1/4 X 8 1/2 | 1/4 | 3/8 | 6 | 1/8 | 650 |
| NF2 | 3/8 X 9 | 3/8 | 1/2 | 6 1/4 | 1/8 | 650 |
| NF3 | 1/2 X 9 3/4 | 1/2 | 5/8 | 6 5/8 | 1/8 | 650 |
| NF4 | 5/8 X 10 1/2 | 5/8 | 3/4 | 6 3/4 | 1/8 | 650 |
| NF5 | 3/4 X 12 | 3/4 | 7/8 | 7 1/2 | 1/8 | 650 |
| NF6 | 1 X 13 | 1 | 1 1/8 | 7 7/8 | 1/8 | 600 |
| NF7 | 1 1/4 X 15 1/2 | 1 1/4 | 1 3/8 | 9 3/4 | 1/8 | 550 |
| NF8 | 1 1/2 X 17 | 1 1/2 | 1 5/8 | 10 1/2 | 1/8 | 510 |
| NF9 | 2 X 20 1/2 | 2 | 2 1/8 | 13 1/4 | 1/8 | 400 |
| NF10 | 2 1/2 X 24 1/4 | 2 1/2 | 2 5/8 | 15 1/2 | 1/8 | 350 |
| NF11 | 3 X 27 | 3 | 3 1/8 | 17 | 1/8 | 320 |
| NF12 | 4 X 33 | 4 | 4 1/8 | 21 | 1/8 | 190 |

ULCPS DIMENSIONS AND PRESSURE RATINGS (Metric Units)

| Stamped Code | Size & End to End (mm) | Fits Over Tubing Size | Tubing OD (mm) | Live Length (mm) | Maximum Permanent Lateral Offset (mm) | Rated Pressure @21°C† (kg/cm²) |
|--------------|------------------------|-----------------------|----------------|------------------|---------------------------------------|--------------------------------|
| NF1 | 6 X 216 | 6 | 10 | 152 | 3 | 45 |
| NF2 | 10 X 229 | 10 | 15 | 159 | 3 | 45 |
| NF3 | 15 X 248 | 15 | 17 | 168 | 3 | 45 |
| NF4 | 17 X 267 | 17 | 19 | 171 | 3 | 45 |
| NF5 | 20 X 305 | 20 | 22 | 191 | 3 | 45 |
| NF6 | 25 X 330 | 25 | 28 | 200 | 3 | 41 |
| NF7 | 32 X 394 | 32 | 35 | 248 | 3 | 38 |
| NF8 | 40 X 432 | 40 | 41 | 267 | 3 | 35 |
| NF9 | 50 X 521 | 50 | 54 | 337 | 3 | 28 |
| NF10 | 65 X 616 | 65 | 68 | 394 | 3 | 24 |
| NF11 | 80 X 686 | 80 | 78 | 432 | 3 | 22 |
| NF12 | 100 X 838 | 100 | 105 | 533 | 3 | 13 |

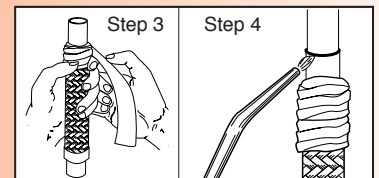
End to End Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 5.

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.

These meet or exceed the higher pressure requirements of R410A, R717 (NH₃) and R744 (CO₂).

INSTALLATION:

1. Thoroughly clean male and female ends.
2. Wrap base of copper fitting on connector and 2" (50mm) of the braid with a wet cloth to prevent overheating during brazing.
3. Direct the torch away from the base of the copper fitting and braided section. Avoid contact of the flame with the base of the copper fitting and braid. Heat end of copper fitting for proper flow of brazing filler material.
4. Use caution with brazing rod or other higher temperature techniques. Overheating will cause leaks.
5. Remove wet cloth.



CSA Series of Braided Hose

Everyone is concerned when installing flexible hose in flammable gas or liquid lines because of the risk of both asphyxiation and fire. Approved by the CSA, the successor to the American Gas Association, and complying with UL 536 provides that assurance. Tests include vibration 300 hours at 15 Hz, 90° bends at rated pressure @ 10 cpm for 20,000 cycles, elongation and tension, 450°F 232°C for 100 hours as well as flame resistance. All of our standard

hoses 1/2" through 4" diameter passed and can be used in straight, looped or Vee configurations. However, in addition to the general UL approval, all specific hoses must be rechecked with an approved thread gauge, if threaded, and retested to 50% above rated pressure using water or rated pressure using air. It must be clearly identified as a Mason product and tagged with maximum pressure rating and minimum bend radius.

CSAWN- SS Braided Hose with Carbon Steel Weld Nipples



These assemblies have been "CSA" approved for use on gas pipelines. "CSA" is the current certification agency for gas industry products, assuming the authority formerly associated with the American Gas Association (AGA).

Our Certification Report is #230720-1764990. This Certification meets all requirements of ANSI/UL #536-1997 Standards for Flexible Metal Hose.

CSAMN and CSAFFL are also available.

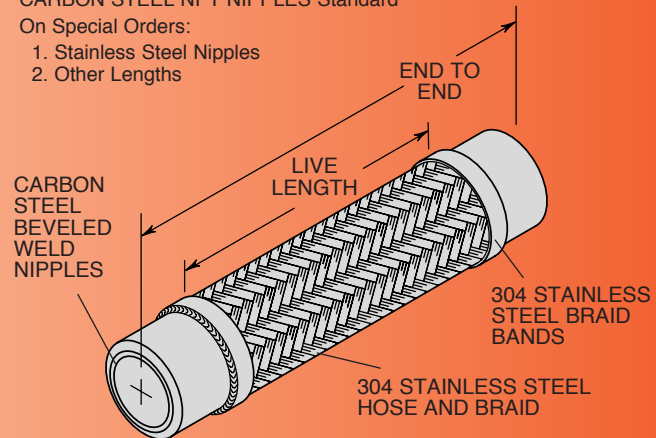
See Standard MN (pg. 8) and FFL (pg. 9) for dimensions.
Rated Pressure @ 70°F (21°C) is 175 psi (12kg/cm²).

Max. Vacuum— 30" 762mm Hg

CARBON STEEL NPT NIPPLES Standard

On Special Orders:

1. Stainless Steel Nipples
2. Other Lengths



STOCK SIZES and LENGTHS

CSAWN DIMENSIONS AND PRESSURE RATINGS (American Units)

| Pipe Size (in) | MN End to End (in) | WN End to End (in) | Live Length (in) | Corrugations per foot | Maximum Permanent Lateral Offset (in) | Rated Pressure @70°F (psi) | Min Burst Pressure (psi) | Safety Factor |
|----------------|--------------------|--------------------|------------------|-----------------------|---------------------------------------|----------------------------|--------------------------|---------------|
| 1/2 | 12 | 11 | 81/4 | 112 | 11/4 | 175 | 4300 | 25 |
| 1/2 | 18 | 17 | 141/4 | 112 | 21/2 | 175 | 4300 | 25 |
| 1/2 | 24 | 23 | 201/4 | 112 | 31/2 | 175 | 4300 | 25 |
| 3/4 | 12 | 10 1/2 | 81/4 | 90 | 1 | 175 | 3168 | 18 |
| 3/4 | 18 | 16 1/2 | 141/4 | 90 | 2 1/4 | 175 | 3168 | 18 |
| 3/4 | 24 | 22 1/2 | 201/4 | 90 | 3 1/4 | 175 | 3168 | 18 |
| 1 | 12 | 10 | 73/4 | 56 | 3/4 | 175 | 3132 | 18 |
| 1 | 18 | 16 | 133/4 | 56 | 2 | 175 | 3132 | 18 |
| 1 | 24 | 22 | 193/4 | 56 | 3 | 175 | 3132 | 18 |
| 1 1/4 | 12 | 10 | 63/4 | 52 | 5/8 | 175 | 2656 | 15 |
| 1 1/4 | 18 | 16 | 123/4 | 52 | 13/4 | 175 | 2656 | 15 |
| 1 1/4 | 24 | 22 | 183/4 | 52 | 23/4 | 175 | 2656 | 15 |
| 1 1/2 | 12 | 10 | 63/4 | 46 | 1/2 | 175 | 2284 | 13 |
| 1 1/2 | 18 | 16 | 123/4 | 46 | 1 1/2 | 175 | 2284 | 13 |
| 1 1/2 | 24 | 22 | 183/4 | 46 | 2 1/2 | 175 | 2284 | 13 |
| 2 | 12 | 10 | 6 | 67 | 1/4 | 175 | 2120 | 12 |
| 2 | 18 | 16 | 12 | 67 | 13/8 | 175 | 2120 | 12 |
| 2 | 24 | 22 | 18 | 67 | 23/8 | 175 | 2120 | 12 |
| 2 1/2 | 18 | 15 1/2 | 11 | 55 | 1 1/4 | 175 | 1724 | 10 |
| 2 1/2 | 24 | 21 1/2 | 17 | 55 | 2 | 175 | 1724 | 10 |
| 3 | 18 | 15 1/2 | 11 | 29 | 1 | 175 | 1564 | 9 |
| 3 | 24 | 21 1/2 | 17 | 29 | 13/4 | 175 | 1564 | 9 |
| 3 | 36 | 33 1/2 | 29 | 29 | 33/4 | 175 | 1564 | 9 |
| 4 | 18 | 15 1/2 | 11 | 28 | 1/2 | 175 | 1160 | 7 |
| 4 | 24 | 21 1/2 | 17 | 28 | 3/4 | 175 | 1160 | 7 |
| 4 | 36 | 33 1/2 | 29 | 28 | 31/4 | 175 | 1160 | 7 |

STOCK SIZES and LENGTHS

CSAWN DIMENSIONS AND PRESSURE RATINGS (Metric Units)

| Pipe Size (mm) | MN End to End (mm) | WN End to End (mm) | Live Length (mm) | Corrugations per meter | Maximum Permanent Lateral Offset (mm) | Rated Pressure @21°C (kg/cm²) | Min Burst Pressure (kg/cm²) | Safety Factor |
|----------------|--------------------|--------------------|------------------|------------------------|---------------------------------------|-------------------------------|-----------------------------|---------------|
| 15 | 305 | 279 | 210 | 367 | 32 | 12 | 302 | 25 |
| 15 | 457 | 432 | 362 | 367 | 63 | 12 | 302 | 25 |
| 15 | 610 | 584 | 514 | 367 | 88 | 12 | 302 | 25 |
| 20 | 305 | 267 | 210 | 295 | 25 | 12 | 222 | 18 |
| 20 | 457 | 419 | 362 | 295 | 57 | 12 | 222 | 18 |
| 20 | 610 | 572 | 514 | 295 | 82 | 12 | 222 | 18 |
| 25 | 305 | 254 | 197 | 184 | 19 | 12 | 220 | 18 |
| 25 | 457 | 406 | 349 | 184 | 50 | 12 | 220 | 18 |
| 25 | 610 | 559 | 502 | 184 | 76 | 12 | 220 | 18 |
| 32 | 305 | 254 | 171 | 171 | 15 | 12 | 186 | 15 |
| 32 | 457 | 406 | 324 | 171 | 43 | 12 | 186 | 15 |
| 32 | 610 | 559 | 610 | 171 | 69 | 12 | 186 | 15 |
| 40 | 305 | 254 | 171 | 151 | 12 | 12 | 160 | 13 |
| 40 | 457 | 406 | 324 | 151 | 38 | 12 | 160 | 13 |
| 40 | 610 | 559 | 610 | 151 | 63 | 12 | 160 | 13 |
| 50 | 305 | 254 | 152 | 220 | 6 | 12 | 149 | 12 |
| 50 | 457 | 406 | 305 | 220 | 34 | 12 | 149 | 12 |
| 50 | 610 | 559 | 457 | 220 | 60 | 12 | 149 | 12 |
| 65 | 457 | 394 | 279 | 180 | 32 | 12 | 121 | 10 |
| 65 | 610 | 546 | 432 | 180 | 50 | 12 | 121 | 10 |
| 80 | 457 | 394 | 279 | 95 | 25 | 12 | 109 | 9 |
| 80 | 610 | 546 | 432 | 95 | 43 | 12 | 109 | 9 |
| 80 | 914 | 851 | 737 | 95 | 95 | 12 | 109 | 9 |
| 100 | 457 | 394 | 279 | 92 | 12 | 12 | 81 | 7 |
| 100 | 610 | 546 | 432 | 92 | 19 | 12 | 81 | 7 |
| 100 | 914 | 851 | 737 | 92 | 82 | 12 | 81 | 7 |

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.

End to End Tolerance: minus 1% plus 3%.



MASON – MERCER

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