MASON-ADAM

STAINLESS STEEL BRAIDED VEE

LOOPS

A vertical loop has always been a very useful and popular hose configuration and is still used in small diameters. If the radius is generous and considerably larger than the minimum bend radius. (i.e.: Hose forced into an arc less than the minimum bend radius takes a permanent set.) The configuration can move in many interesting ways as sketched.

The degree of motion is dependent on the diameter, length of free hose and the radius. Hoses that are more flexible because of more corrugations per foot, will accept greater displacements for a given configuration.

It is not practical in the larger diameters as the bend radii become large and the configuration takes too much space, because of what is lost to the semicircle at the bottom. Typical bend radii are as follows for intermittent flexing. A fixed bend could be tighter.

Hose Diameter (in)	(mm)	Bend Radius (in)	(mm)	Hose Diameter (in)	(mm)	Bend Radius (in)	(mm)
1/2	15	6 1/2	165	6	150	28	700
3/4	20	8 1/4	206	8	200	34	850
1	25	9 3/4	244	10	250	45	1125
1 1/4	30	11	275	12	300	66	1650
1 1/2	40	12	300	14	350	77	1925
2	50	15	375	16	400	88	2200
2 1/2	65	16	400	18	450	100	2500
3	80	17 1/2	438	20	500	108	2700
4	100	19 3/4	494	24	600	135	3375
5	125	23	575	30	750	165	4125

As a 6" diameter hose would have a 56" diameter semicircle at the bottom, plus the vertical legs, you can see the problem.

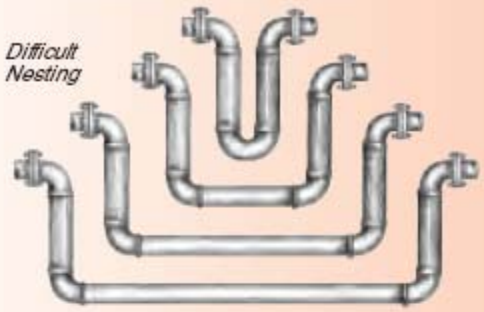
LOOP- UP AND DOWN MOTION

LOOP- IN AND OUT MOTION

PARALLEL LEGS

Since the in and out motion is normally the most important, it became common practice to substitute a 180° elbow at the bottom to eliminate the space and cost of the bottom loop. The legs can move up and down awkwardly, and in a walking motion all determined by the active hose length and flexibility.

Parallel pipe line loops cannot nest in the same plane without changing the 180° return to two 90° with a straight length of pipe between. Rather than working from stock, every nesting location becomes special order.



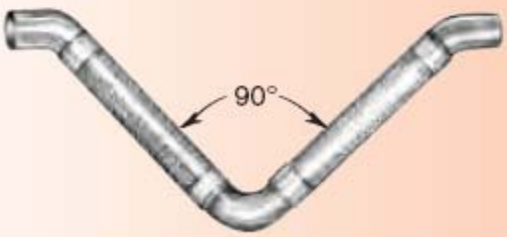
ADDITIONAL HORIZONTAL HOSE

Another market variation is the introduction of a third flexible hose between two 90° elbows in place of the 180° return or the straight pipe. This third element is effective but costly, and does not solve nesting problems either, unless smaller pipes are nested within larger ones or the horizontal flexible hose is lengthened. Once again, special order.

90° VEE

The next approach was the introduction of a 90° Vee. Up and down motion is improved, but opening and closing the Vee suffers.

We liked the general concept primarily because of the nesting, but did not want to suffer so great a loss of motion in compression or extension.

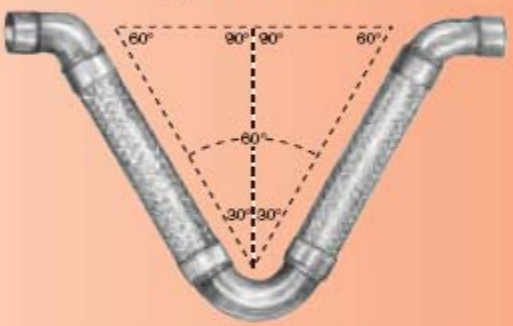


In fairness to others, we should note that all these hose designs can be made to work, if the hoses are made long enough to keep stress within acceptable limits for the stated motions.

MASON'S 60° VEE

Almost anyone with an engineering or mathematical background, and especially those of us who were manual mechanical draftsmen, think of the 30°, 60°, 90° triangle as the cornerstone of countless designs. When you put two of them together, as illustrated, the upside-down apex becomes 60° and this makes for an equilateral triangle. What a great configuration! All engineers with developed instincts know when a design looks right, it is often the solution, even without the mathematics. These simple sketches became the basis of our design.

The elements move more easily both toward and away from each other, up and down, and transversely. All movements are dependent on the length of the legs. They are great for nesting, and the space between the fittings takes less space than the 45° configuration with the same length of free hose.

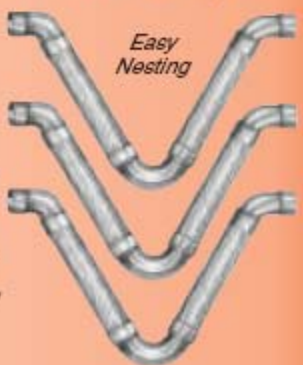


So far our competitors do not do it this way. Perhaps they never thought of it or they related to standard 45°, 90° and 180° fittings only. We studied the advantages and found a way to manufacture 60° and 120° fittings.

It is very difficult to publish all the nesting capabilities, but in one plane, a typical layout could be as shown below.

This illustration is just to suggest the idea and put your imagination to work. Send us your problems and let us work them out with you.

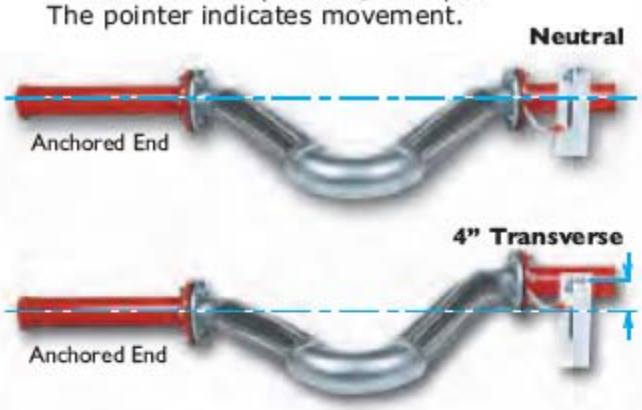
While all our configurations can be nested, it is very difficult for the firms with parallel legs, as mentioned earlier. Customization of parallel leg designs takes time and increases cost. In most cases, our product comes right out of stock, and fits the application.

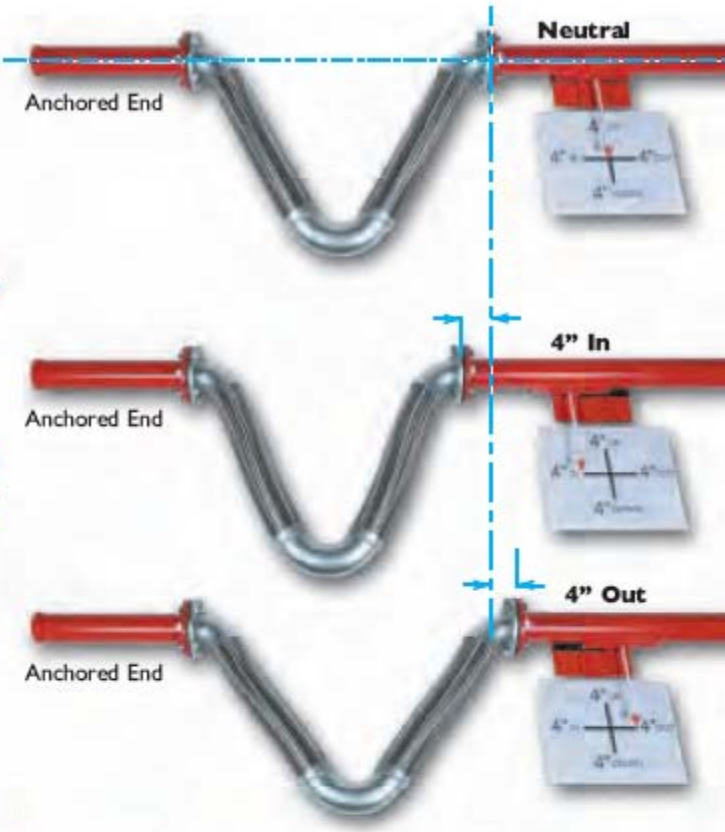


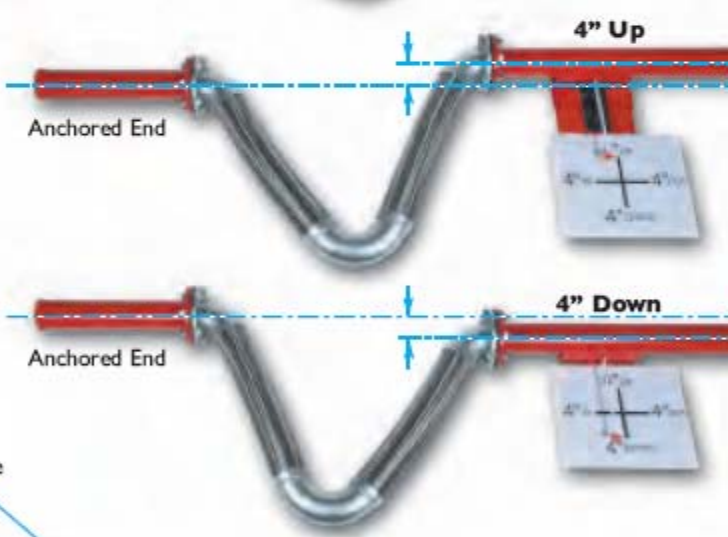
60° VEE MOVEMENTS WHEN INSTALLED VERTICALLY

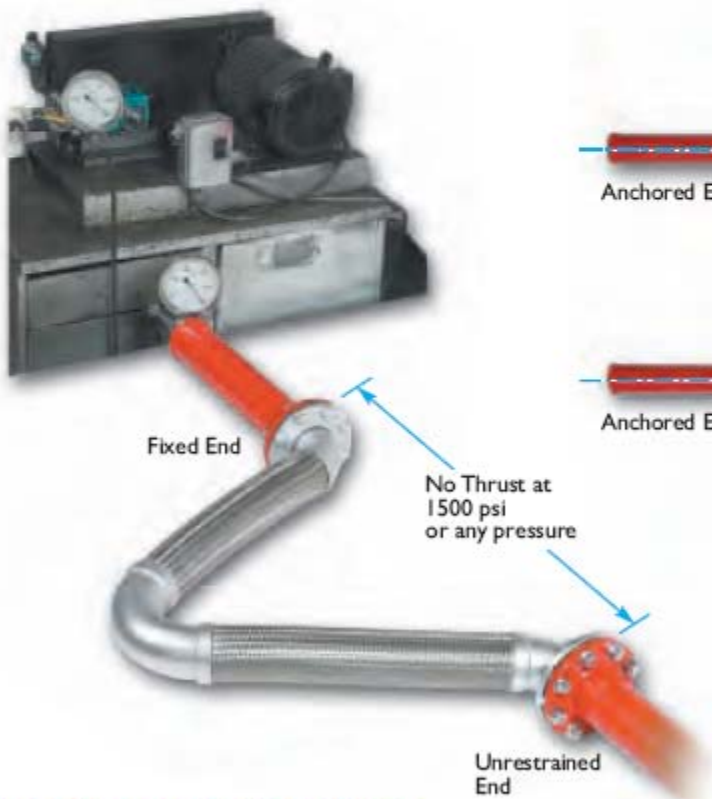
4" Pipe Size

The following photographs show movement in all planes @ 100 psi. The pointer indicates movement.





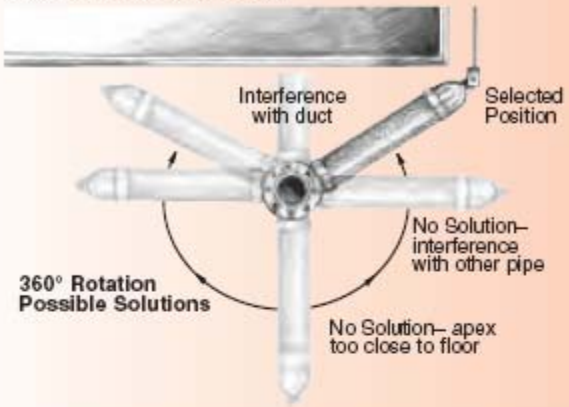




4" DOUBLE BRAIDED VEE PRESSURE TEST

Pressure test discontinued at 1500 psi. No Failure.

Our flanged vees have floating flanges at each end. When space is tight, the design allows for rotation to any angle to avoid obstacles like adjacent piping or ductwork. This is very important, particularly in the larger diameters where the legs become quite long.



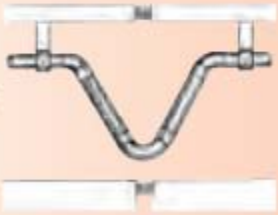
Our standard vee allows for 4" of seismic motion in all directions. The design is very conservative and in expansion locations with no change to the standard product we agree to 6" movements, when the motion is in and out of the Vee.

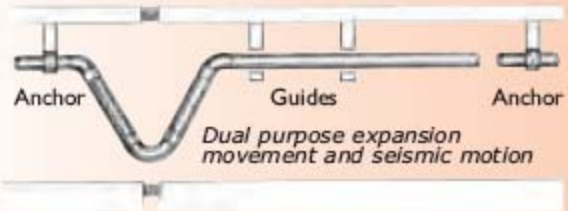
Seismic applications allow for movement of adjacent sections of a structure at building joints or occasionally where piping goes from one building to another. The Vee is anchored close to and on either side of the separation. When it is between adjacent buildings, the location of the anchors depends on the space between the buildings and the rigidity of the pipe. The Vee may be in the space between buildings with a pipe anchor in each building or anchored in one building and guided in the other with an anchor further down.

Sometimes if the Vee is used to allow for expansion and contraction as well, one side is anchored and the other guided, provided there is more than one guide and there is an anchor at the end of the movement run.

Vee between buildings to allow seismic motion only in all planes

Common configuration across building expansion joints for seismic motion only in all planes





Dual purpose expansion movement and seismic motion

Let us help you with these layouts in the design stage, or just specify the Vee's and their function and we will submit layouts, as part of our certifications.

Simple internally pressurized or externally pressurized housed bellows were the only seamless solutions to thermal expansion in straight pipe runs for a very long time. While the force needed to move these configurations is not high, the pressure thrust is approximately equal to the projected area of the expansion joint to the center of the corrugations multiplied by the pressure. If it is a housed expansion joint, the internal area of the external housing is the reference.

A 10" bellows might have a thrust of 13,000 lbs. at 150 psi. The force required to move the joint might be 1,200 lbs. and very low compared to the anchorage requirement. The spring rate is generally of little consequence in steel piping, but establishing two 15,000 lb. anchors might be very difficult.

When a Vee is used to do the same job, there is no thrust. The pressure is taken by the braid and each leg becomes straighter as the braid tightens. The anchorage is minor and just strong enough to take the force to bend the legs.

The following resistances are very approximate. We are running physical tests and will gradually publish test rather than calculated data.

60° Vee Construction **Table 1**

Size in (mm)	Corrugations per foot (meter)	Live Length of Braid & Hose inches (mm)	Approximate Resistance for 4" (100mm) Displacement pounds (kgs)
1/2 15	108 354	14 350	20 9
3/4 20	94 308	15 375	20 9
1 25	84 276	16 400	25 11
1 1/4 30	74 243	17 425	25 11
1 1/2 35	70 230	19 475	40 18
2 50	68 223	20 500	40 18
2 1/2 65	56 290	22 550	50 23
3 75	54 177	24 600	50 23
4 100	32 105	26 650	80 36
5 125	30 98	30 750	80 36
6 150	29 95	33 825	100 45
8 200	26 85	36 900	200 91
10 250	25 82	42 1050	300 136
12 300	24 79	48 1200	400 181

Even adding 50% to these numbers allows for a relatively small anchor.

We do recommend guides as a better way to assure long life. Other companies are less conservative, but guides are not expensive, and the money is well spent.

The pages that follow provide data on all of our stock 60° Vee's.

If you would like to specify them, please use the description on the following page.

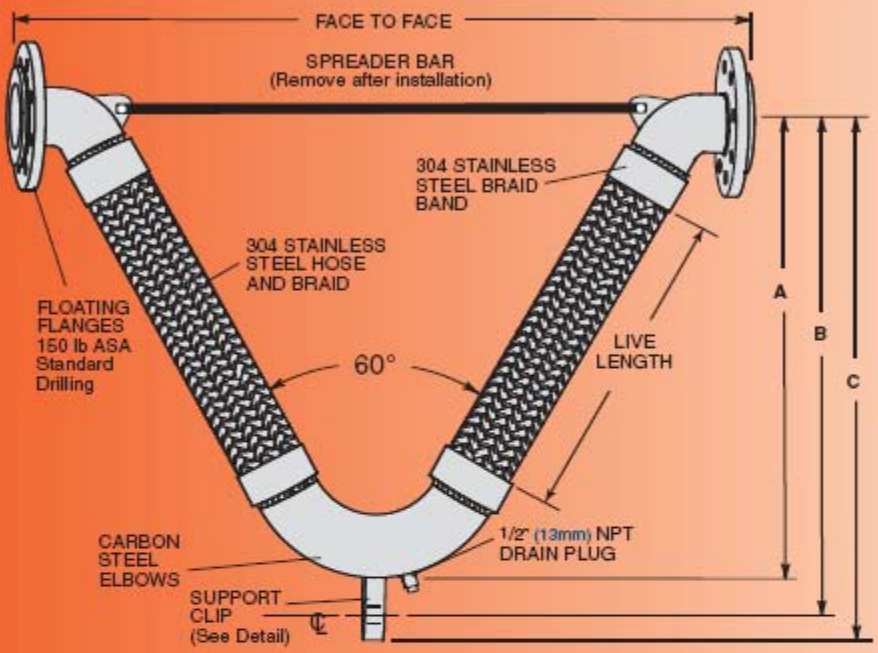
SPECIFICATION:

Expansion and contraction as well as seismic motion shall be absorbed by a 60° Vee flexible hose configuration capable of plus and minus 4" motion in all planes. If 6" inward motion is required in an expansion application only, the Vee shall be extended 2" at the factory by a temporary spreader bar to maintain dimension.

The 304 Stainless Steel Hose and Braid shall have a minimum free length and number of corrugation per foot, as shown in Table 1. Pressure ratings are as published, minimum. All flanged connectors shall have free floating flanges at each end to allow rotation into any position.

The Vee shall not be welded into the piping. Flanges, Threaded or Grooved fittings shall be used in the same sizes as specified throughout the project. Guiding and anchoring shall be installed as is recommended by the manufacturer.

Stainless assemblies shall be the SS 60° Vee, as manufactured by Mason Industries, Inc.



VFL EQUI-V with FLOATING FLANGES

CARBON STEEL PLATE FLANGES

Pipe Size (in)	Pipe Size (mm)	Flange Thickness (in)	Flange Thickness (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

SUPPORT CLIP

Pipe Size (in)	Pipe Size (mm)	SUPPORT CLIP Hole Diameter (in)	SUPPORT CLIP Hole Diameter (mm)	SUPPORT CLIP Thickness (in)	SUPPORT CLIP Thickness (mm)
2	50	1/2	13	1/4	6
2 1/2	63	5/8	16	1/4	6
3	75	5/8	16	1/4	6
4	100	3/4	19	3/8	9
5	125	3/4	19	3/8	9
6	150	7/8	22	3/8	9
8	200	1	25	1/2	13
10	250	1	25	1/2	13
12	300	1 1/8	28	1/2	13

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

Hose Size (in)	Hose Size (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	170 11	160 11	150 10
10	250	160 11	150 10	140 9
12	300	160 11	150 10	140 9

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

Size (in)	Size (mm)	Max Gauge (psi) *(kg/cm²)*	Temp Reference (F)	Temp Reference (°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 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.

VFL DIMENSIONS AND PRESSURE RATINGS (British Units) ±4" ALL DIRECTIONAL SEISMIC MOVEMENT

Type	Pipe Size & Face to Face† (in)	Live Length (in)	Corrugations per foot	A (in)	B (in)	C (in)	Rated Pressure @70°F†† (psi)
VFL	2 X 33	20	68	231/4	241/8	243/4	360
VFL	21/2 X 37	22	56	26	271/8	28	290
VFL	3 X 42	24	54	287/8	30	303/4	280
VFL	4 X 49	26	32	321/2	333/4	347/8	230
VFL	5 X 58	30	30	38	393/4	403/8	200
VFL	6 X 66	33	29	425/8	44	451/4	200
VFL	8 X 80	36	26	491/4	503/4	521/8	180
VFL	10 X 97	42	25	581/2	60	613/8	170
VFL	12 X 112	48	24	673/4	693/8	703/4	170

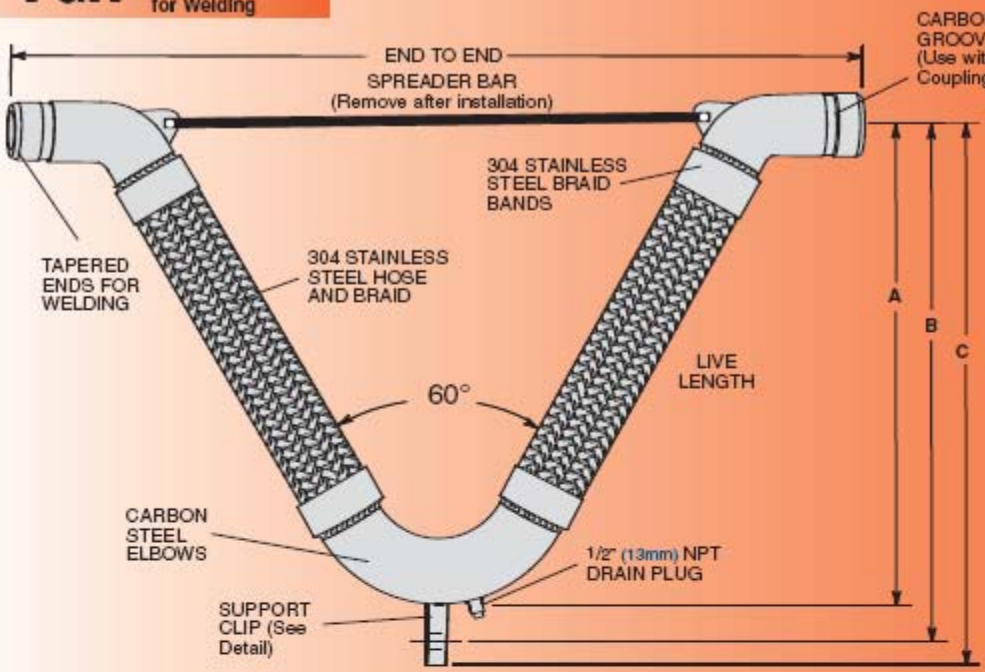
VFL DIMENSIONS AND PRESSURE RATINGS (Metric Units) ±102mm ALL DIRECTIONAL SEISMIC MOVEMENT

Type	Pipe Size & Face to Face† (mm)	Live Length (mm)	Corrugations per meter	A (mm)	B (mm)	C (mm)	Rated Pressure @21°C†† *(kg/cm²)*
VFL	50 X 825	500	233	603	613	629	25
VFL	65 X 925	550	184	660	689	711	20
VFL	80 X 1050	600	177	733	762	781	19
VFL	100 X 1225	650	105	826	857	886	16
VFL	125 X 1450	750	98	965	1010	1026	14
VFL	150 X 1650	825	95	1083	1118	1149	14
VFL	200 X 2000	900	85	1251	1289	1324	12
VFL	250 X 2275	1050	82	1486	1524	1559	12
VFL	300 X 2800	1200	79	1721	1762	1797	12

†Face to Face Tolerances: Sizes 2" - 4"(50 - 100mm), ±1/4"(6mm); Sizes 5" - 8"(125 - 200mm), ±3/8" (9mm); Sizes 10"(250mm) and larger, ±1/2"(13mm). ††Minimum Burst is four times the Rated Pressure. Safety factor of 4.

VGN

EQUI-V with GROOVED NIPPLES Prepared for Welding



GROOVED NIPPLES MAY BE WELDED IN PIPELINES AS AN ALTERNATE. MASON DOES NOT RECOMMEND WELDING.

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
2½	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	170	11	160	11	150	10
10	250	160	11	150	10	140	9
12	300	160	11	150	10	140	9

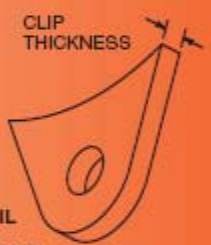
SATURATED STEAM RECOMMENDED PRESSURE LIMITS

Size (in)	(mm)	Max Gauge (psi) *(kg/cm²)*		Temp Reference (F)	(°C)
2	50	150	11	362	183
2½	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 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.



SUPPORT CLIP DETAIL

SUPPORT CLIP

Pipe Size (in)	(mm)	SUPPORT CLIP Hole Diameter (in)	(mm)	Thickness (in)	(mm)
2	50	1/2	13	1/4	6
2½	63	5/8	16	1/4	6
3	75	5/8	16	1/4	6
4	100	3/4	19	3/8	9
5	125	3/4	19	3/8	9
6	150	7/8	22	3/8	9
8	200	1	25	1/2	13
10	250	1	25	1/2	13
12	300	1 1/8	28	1/2	13

VGN DIMENSIONS AND PRESSURE RATINGS (British Units)
±4" ALL DIRECTIONAL SEISMIC MOVEMENT

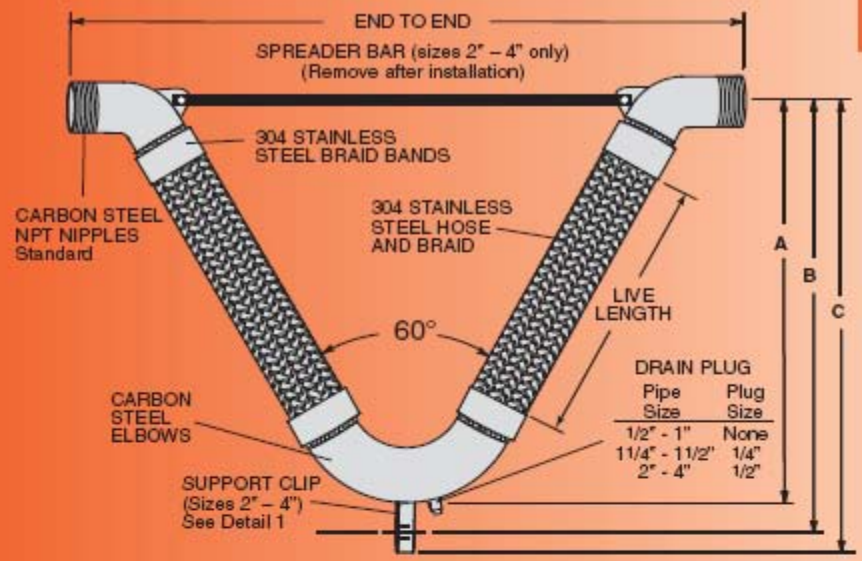
Type	Pipe Size & End to End† (in)	Live Length (in)	Corrugations per foot	A (in)	B (in)	C (in)	Rated Pressure @70°F†† (psi)
VGN	2 X 37	20	68	231/4	241/8	243/4	360
VGN	2½ X 41	22	56	26	271/8	28	290
VGN	3 X 46	24	54	287/8	30	303/4	280
VGN	4 X 55	26	32	321/2	333/4	347/8	230
VGN	5 X 58	30	30	38	393/4	403/8	200
VGN	6 X 72	33	29	425/8	44	451/4	200
VGN	8 X 86	36	26	491/4	503/4	521/8	180
VGN	10 X 105	42	25	581/2	60	613/8	170
VGN	12 X 120	48	24	673/4	693/8	703/4	170

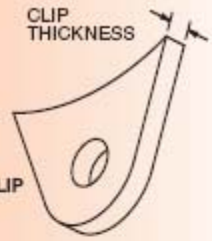
VGN DIMENSIONS AND PRESSURE RATINGS (Metric Units)
±102mm ALL DIRECTIONAL SEISMIC MOVEMENT

Type	Pipe Size & End to End† (mm)	Live Length (mm)	Corrugations per meter	A (mm)	B (mm)	C (mm)	Rated Pressure @21°C†† *(kg/cm²)*
VGN	50 X 925	500	223	603	613	594	25
VGN	65 X 1025	550	184	660	689	700	20
VGN	80 X 1150	600	177	733	762	769	19
VGN	100 X 1375	650	105	826	857	872	16
VGN	125 X 1450	750	98	965	1010	1009	14
VGN	150 X 1800	825	95	1083	1118	1131	14
VGN	200 X 2150	900	85	1251	1289	1303	12
VGN	250 X 2625	1050	82	1486	1524	1543	12
VGN	300 X 3000	1200	79	1721	1762	1769	12

†End to End Tolerances: Sizes 2" - 4"(50 - 100mm), ±1/4"(6mm); Sizes 5" - 8"(125 - 200mm), ±3/8" (9mm); Sizes 10"(250mm) and larger, ±1/2"(13mm). ††Minimum Burst is four times the Rated Pressure. Safety factor of 4.

VMN EQUI-V with MALE NIPPLES

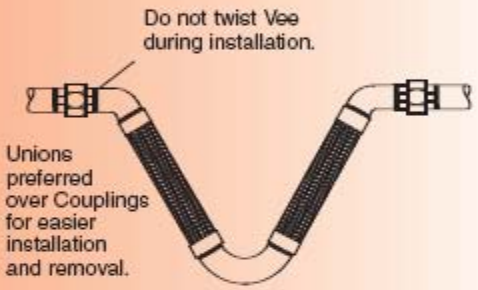




SUPPORT CLIP

Pipe Size (in)	(mm)	SUPPORT CLIP Hole Diameter (in)	(mm)	Thickness (in)	(mm)
2	50	1/2	13	1/4	6
2 1/2	63	5/8	16	1/4	6
3	75	5/8	16	1/4	6
4	100	3/4	19	3/8	9

SUSPENSION BOLT DETAIL 2



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 13

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

Size (in)	(mm)	Max Gauge (psi)	*(kg/cm²)*	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

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VMN DIMENSIONS AND PRESSURE RATINGS (British Units)
±4" ALL DIRECTIONAL SEISMIC MOVEMENT

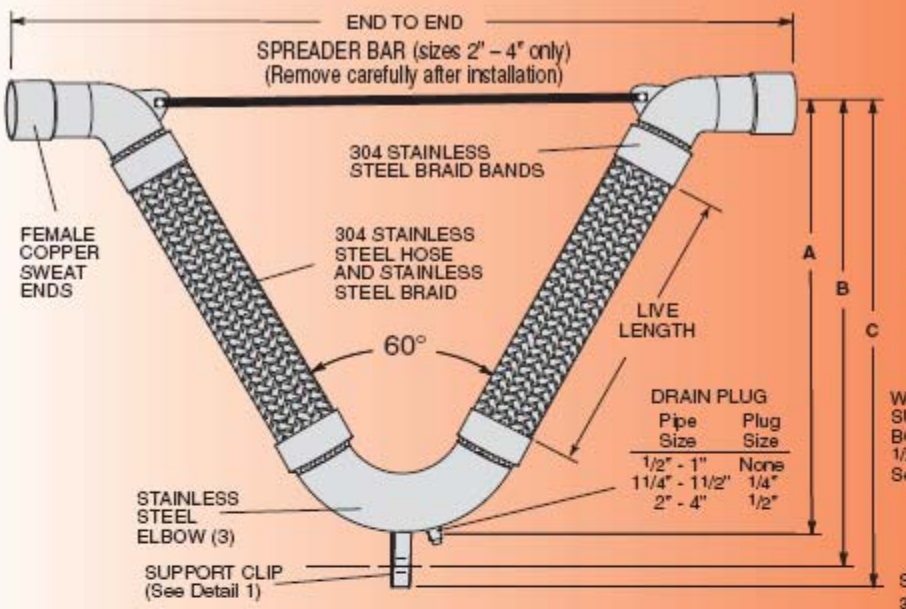
Type	Pipe Size & End to End† (in)	Live Length (in)	Corrugations per foot	A (in)	B (in)	C (in)	D (in)	Rated Pressure @70°F†† (psi)
VMN	1/2 X 23	14	108	151/8	—	—	161/4	1100
VMN	3/4 X 24	15	94	161/8	—	—	171/4	700
VMN	1 X 26	16	84	177/8	—	—	19	580
VMN	1 1/4 X 29	17	74	181/2	—	—	195/8	500
VMN	1 1/2 X 32	19	70	203/4	—	—	217/8	430
VMN	2 X 36	20	68	231/4	241/8	243/4	—	360
VMN	2 1/2 X 41	22	56	26	271/8	28	—	290
VMN	3 X 46	24	54	287/8	30	303/4	—	280
VMN	4 X 55	26	32	321/2	333/4	347/8	—	230

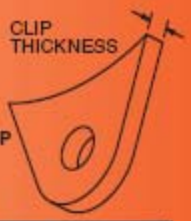
VMN DIMENSIONS AND PRESSURE RATINGS (Metric Units)
±102mm ALL DIRECTIONAL SEISMIC MOVEMENT

Type	Pipe Size & End to End† (mm)	Live Length (mm)	Corrugations per meter	A (mm)	B (mm)	C (mm)	D (mm)	Rated Pressure @21°C†† *(kg/cm²)*
VMN	15 X 575	350	354	378	—	—	407	76
VMN	20 X 600	375	308	403	—	—	432	48
VMN	25 X 650	400	276	447	—	—	476	40
VMN	32 X 725	425	243	463	—	—	492	34
VMN	40 X 800	475	230	519	—	—	548	30
VMN	50 X 900	500	223	581	613	594	—	25
VMN	65 X 1025	550	184	660	689	700	—	20
VMN	80 X 1150	600	177	733	762	769	—	19
VMN	100 X 1375	650	105	826	857	872	—	16

†End to End Tolerances: All Sizes, ±1/4"(6mm) ††Minimum Burst is four times the Rated Pressure. Safety factor of 4.

VCPS EQUI-V with COPPER SWEAT ENDS





SUPPORT CLIP DETAIL 1

SUPPORT CLIP

Pipe Size (in)	(mm)	SUPPORT CLIP Hole Diameter (in)	(mm)	Thickness (in)	(mm)
2	50	1/2	13	1/4	6
2 1/2	63	5/8	16	1/4	6
3	75	5/8	16	1/4	6
4	100	3/4	19	3/8	9

SUSPENSION BOLT DETAIL 2

Sizes 1/2" – 1 1/2"
3/8" (9mm) Dia. x 7/8" (22mm) Long CAP SCREW

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.

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

Hose Size (in)	(mm)	150°F 66°C	300°F 149°C	400°F 204°C
1/2	15	610 42	565 39	360 25
3/4	20	490 34	455 31	290 20
1	25	420 29	385 26	245 17
1 1/4	32	370 26	340 23	215 15
1 1/2	40	345 24	315 22	200 14
2	50	305 21	280 19	180 12
2 1/2	65	285 20	260 18	165 11
3	80	265 18	245 17	155 11
4	100	220 13	205 14	145 10

**ASME B16.22 - 2001 Copper Fittings Control Ratings

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

Size (in)	(mm)	Max Gauge (psi)	(kg/cm²)	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

INSTALLATION INSTRUCTIONS for VCPS

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. Do not use brazing rod or other higher temperature techniques. Overheating will cause leaks.
6. Remove wet rag and remove all soldering flux immediately after installation. Chlorides will cause premature failure of joint.

VCPS DIMENSIONS AND PRESSURE RATINGS (British Units) ±4" ALL DIRECTIONAL SEISMIC MOVEMENT

Type	Tubing* Size & End to End† (in)	Live Length (in)	Corrugations per foot	A (in)	B (in)	C (in)	D (in)	Rated Pressure @70°F†† (psi)
VCPS	1/2 x 20	14	116	1 43/8	—	—	1 55/8	175
VCPS	3/4 x 24	15	92	1 53/4	—	—	1 67/8	175
VCPS	1 x 27	16	58	1 71/8	—	—	1 81/4	175
VCPS	1 1/4 x 29	17	53	1 81/2	—	—	1 95/8	175
VCPS	1 1/2 x 33	19	47	2 03/4	—	—	2 17/8	175
VCPS	2 x 38	20	68	2 25/8	2 31/2	2 41/8	—	175
VCPS	2 1/2 x 42	22	56	2 55/8	2 61/2	2 71/8	—	175
VCPS	3 x 49	24	30	2 83/4	2 97/8	3 03/4	—	175
VCPS	4 x 59	26	29	3 21/2	3 33/4	3 45/8	—	175

VCPS DIMENSIONS AND PRESSURE RATINGS (Metric Units) ±102mm ALL DIRECTIONAL SEISMIC MOVEMENT

Type	Tubing* Size & End to End† (mm)	Live Length (mm)	Corrugations per meter	A (mm)	B (mm)	C (mm)	D (mm)	Rated Pressure @21°C†† (kg/cm²)
VCPS	15 x 500	350	380	365	—	—	397	12
VCPS	20 x 600	375	302	400	—	—	429	12
VCPS	25 x 675	400	190	435	—	—	464	12
VCPS	32 x 725	425	174	463	—	—	492	12
VCPS	40 x 825	475	154	519	—	—	548	12
VCPS	50 x 950	500	223	575	597	613	—	12
VCPS	65 x 1050	550	184	651	673	689	—	12
VCPS	80 x 1225	600	98	730	759	781	—	12
VCPS	100 x 1475	650	95	826	857	879	—	12

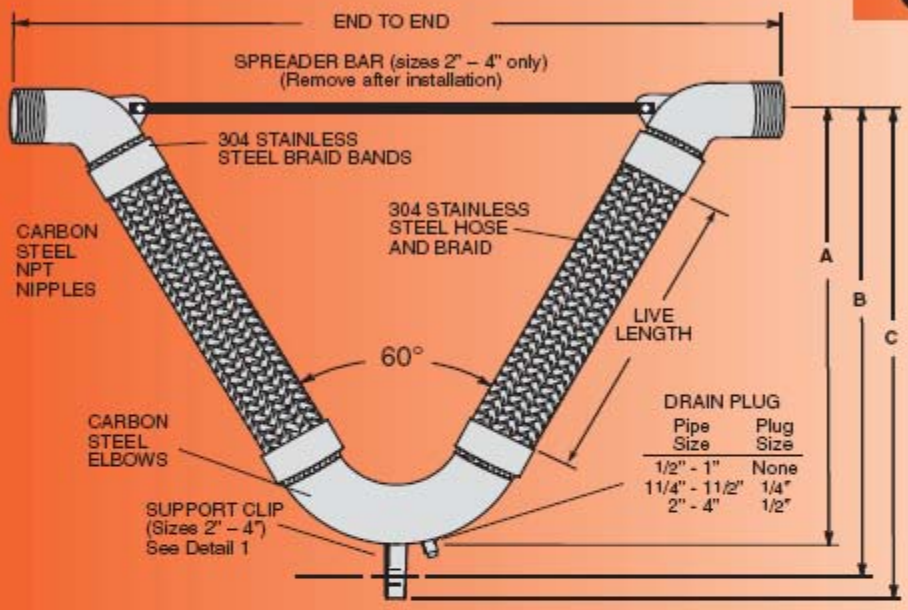
*Female end fits over copper tubing, e.g. 1/2 x 20 1/2 (15 x 513mm) fits over 1/2" (15mm) tubing. †End to End Tolerances: All Sizes, ±1/4"(6mm)

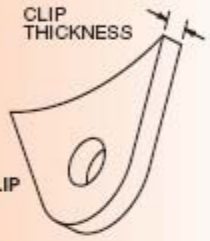
††Minimum Burst is four times the Rated Pressure. Safety factor of 4. Sizes 1/2" (15mm) – 2" (50mm) Copper Fitting Pressure Ratings ASME B16.22 - 2001; Sizes 2 1/2" (65mm) – 4" (100mm) Hose and Braid Controls Rating

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.

CSAVMN EQUI-V HOSE with MALE NIPPLES





SUPPORT CLIP DETAIL 1

SUPPORT CLIP

Pipe Size (in)	Pipe Size (mm)	SUPPORT CLIP Hole Diameter (in)	Hole Diameter (mm)	Thickness (in)	Thickness (mm)
2	50	1/2	13	1/4	6
2 1/2	63	5/8	16	1/4	6
3	75	5/8	16	1/4	6
4	100	3/4	19	3/8	9

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).

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

Sizes 1/2" – 1 1/2"

3/8" (9mm) Diameter x 7/8" (22mm) Long CAP SCREW

SUSPENSION BOLT DETAIL 2

CSAVMN DIMENSIONS AND PRESSURE RATINGS (British Units)
±4" ALL DIRECTIONAL SEISMIC MOVEMENT

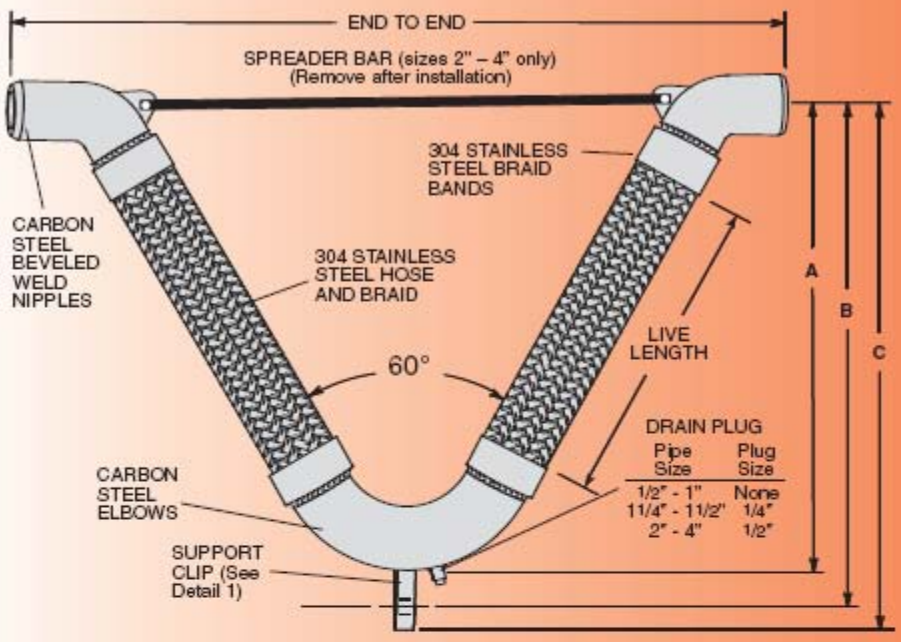
Pipe* Size & End to End† (in)	Live Length (in)	Corrugations per foot	A (in)	B (in)	C (in)	D (in)	Rated Pressure @70°F (psi)	Min Burst Pressure (psi)	Safety Factor
1/2 X 23	14	116	15 1/8	—	—	16 1/4	175	4300	25
3/4 X 24	15	92	16 1/8	—	—	17 1/4	175	3168	18
1 X 26	16	58	17 7/8	—	—	19	175	3132	18
1 1/4 X 29	17	53	18 1/2	—	—	19 5/8	175	2656	15
1 1/2 X 32	19	47	20 3/4	—	—	21 7/8	175	2284	13
2 X 36	20	68	23 1/4	24 1/8	24 3/4	—	175	2120	12
2 1/2 X 41	22	56	26	27 1/8	28	—	175	1724	10
3 X 46	24	30	28 7/8	30	30 3/4	—	175	1564	9
4 X 55	26	29	32 1/2	33 3/4	34 7/8	—	175	1160	7

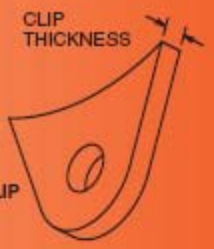
†End to End Tolerances: All Sizes, ±1/4"(6mm)

CSAVMN DIMENSIONS AND PRESSURE RATINGS (Metric Units)
±102mm ALL DIRECTIONAL SEISMIC MOVEMENT

Pipe* Size & End to End† (mm)	Live Length (mm)	Corrugations per meter	A (mm)	B (mm)	C (mm)	D (mm)	Rated Pressure @21°C (kg/cm²)	Min Burst Pressure (kg/cm²)	Safety Factor
15 X 575	350	380	378	—	—	407	12	296	25
20 X 600	375	302	403	—	—	432	12	218	18
25 X 650	400	190	447	—	—	476	12	216	18
32 X 725	425	174	463	—	—	492	12	183	15
40 X 800	475	154	519	—	—	548	12	157	13
50 X 900	500	223	581	613	594	—	12	146	12
65 X 1025	550	184	660	689	700	—	12	119	10
80 X 1150	600	98	733	762	769	—	12	108	9
100 X 1375	650	95	826	857	872	—	12	80	7

CSAVWN EQUI-V HOSE with WELD NIPPLES





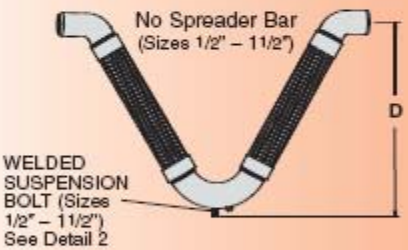
SUPPORT CLIP DETAIL 1

SUPPORT CLIP

Pipe Size (in)	Pipe Size (mm)	SUPPORT CLIP Hole Diameter (in)	Hole Diameter (mm)	Thickness (in)	Thickness (mm)
2	50	1/2	13	1/4	6
21/2	63	5/8	16	1/4	6
3	75	5/8	16	1/4	6
4	100	3/4	19	3/8	9

Sizes 1/2" – 11/2"
3/8" (9mm) Dia. x
7/8" (22mm) Long
CAP SCREW

SUSPENSION BOLT DETAIL 2



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

CSAVWN DIMENSIONS AND PRESSURE RATINGS (British Units)
±4" ALL DIRECTIONAL SEISMIC MOVEMENT

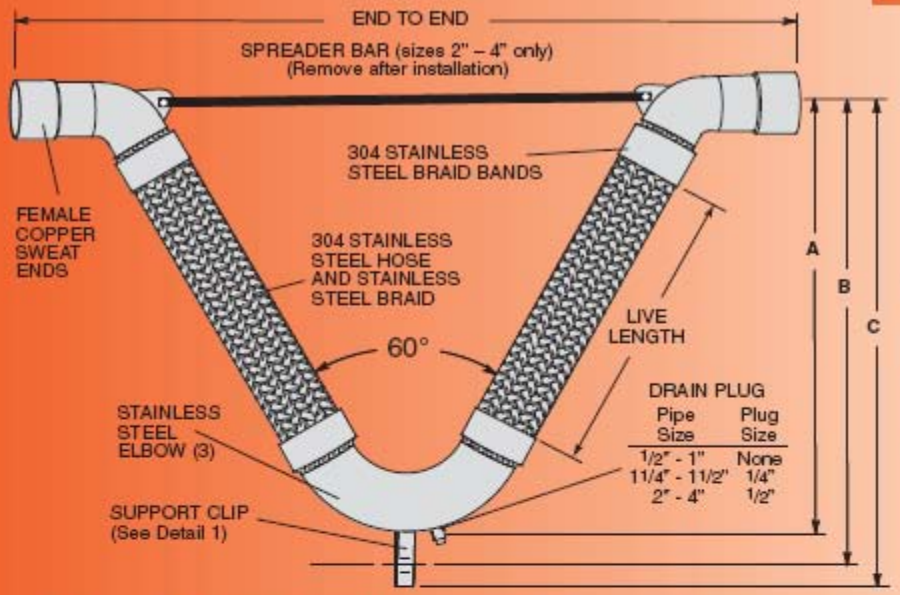
Pipe* Size & End to End† (in)	Live Length (in)	Corrugations per foot	A (in)	B (in)	C (in)	D (in)	Rated Pressure @70°F (psi)	Min Burst Pressure (psi)	Safety Factor
1/2 X 211/2	14	116	151/8	—	—	161/4	175	4300	25
3/4 X 221/2	15	92	161/8	—	—	171/4	175	3168	18
1 X 24	16	58	177/8	—	—	19	175	3132	18
11/4 X 27	17	53	181/2	—	—	195/8	175	2656	15
11/2 X 30	19	47	203/4	—	—	217/8	175	2284	13
2 X 341/2	20	68	231/4	241/8	243/4	—	175	2120	12
21/2 X 38	22	35	26	271/8	28	—	175	1724	10
3 X 43	24	30	287/8	30	303/4	—	175	1564	9
4 X 52	26	29	321/2	333/4	347/8	—	175	1160	7

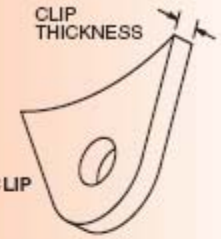
†End to End Tolerances: All Sizes, ±1/4"(6mm)

CSAVWN DIMENSIONS AND PRESSURE RATINGS (Metric Units)
±102mm ALL DIRECTIONAL SEISMIC MOVEMENT

Pipe* Size & End to End† (mm)	Live Length (mm)	Corrugations per meter	A (mm)	B (mm)	C (mm)	D (mm)	Rated Pressure @21°C (kg/cm²)	Min Burst Pressure (kg/cm²)	Safety Factor
15 X 538	350	380	378	—	—	407	12	296	25
20 X 563	375	302	403	—	—	432	12	218	18
25 X 600	400	190	447	—	—	476	12	216	18
32 X 675	425	174	463	—	—	492	12	183	15
40 X 750	475	154	519	—	—	548	12	157	13
50 X 863	500	223	581	613	594	—	12	146	12
65 X 950	550	184	660	689	700	—	12	119	10
80 X 1075	600	98	733	762	769	—	12	108	9
100 X 1300	650	95	826	857	872	—	12	80	7

CSAVCPS EQUI-V HOSE with COPPER SWEAT ENDS





SUPPORT CLIP

Pipe Size (in)	Pipe Size (mm)	SUPPORT CLIP Hole Diameter (in)	Hole Diameter (mm)	Thickness (in)	Thickness (mm)
2	50	1/2	13	1/4	6
21/2	63	5/8	16	1/4	6
3	75	5/8	16	1/4	6
4	100	3/4	19	3/8	9

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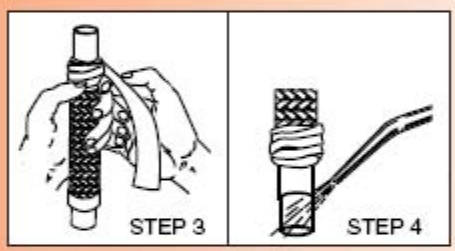
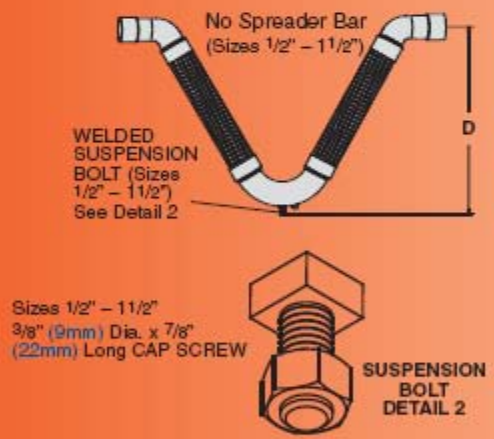




INSTALLATION INSTRUCTIONS for CSAVCPS

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. Do not use brazing rod or other higher temperature techniques. Overheating will cause leaks.
6. Remove wet rag and remove all soldering flux immediately after installation. Chlorides will cause premature failure of joint.

CSAVCPS DIMENSIONS AND PRESSURE RATINGS (British Units)
±4" ALL DIRECTIONAL SEISMIC MOVEMENT

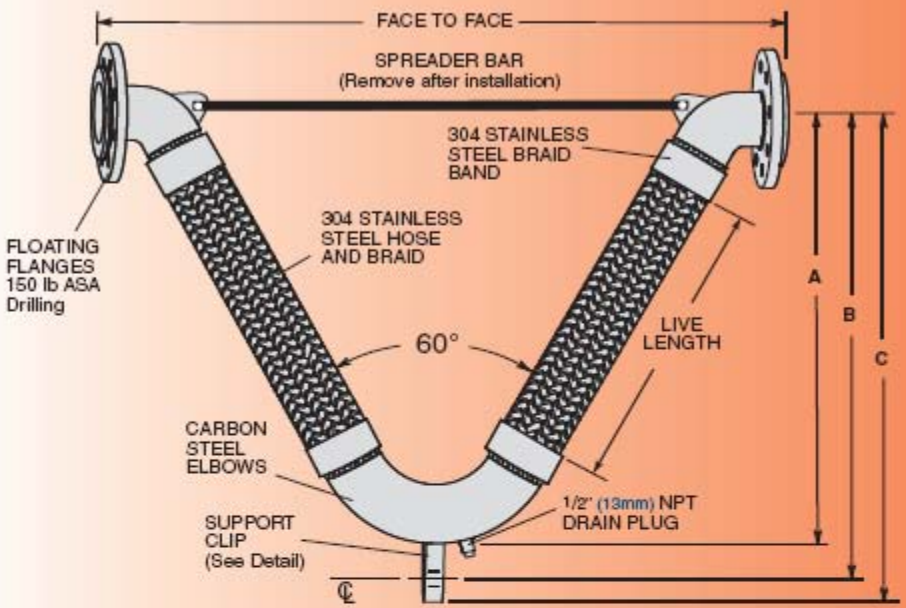
Tubing* Size & End to End† (in)	Live Length (in)	Corrugations per foot	A (in)	B (in)	C (in)	D (in)	Rated Pressure @70°F (psi)	Min Burst Pressure (psi)	Safety Factor
1/2 x 20	14	116	14 3/8	—	—	15 5/8	175	4300	25
3/4 x 24	15	92	15 3/4	—	—	16 7/8	175	3168	18
1 x 27	16	58	17 1/8	—	—	18 1/4	175	3132	18
11/4 x 29	17	53	18 1/2	—	—	19 5/8	175	2656	15
11/2 x 33	19	47	20 3/4	—	—	21 7/8	175	2284	13
2 x 38	20	68	22 5/8	23 1/2	24 1/8	—	175	2120	12
21/2 x 42	22	56	25 5/8	26 1/2	27 1/8	—	175	1724	10
3 x 49	24	30	28 3/4	29 7/8	30 3/4	—	175	1564	9
4 x 59	26	29	32 1/2	33 3/4	34 5/8	—	175	1160	7

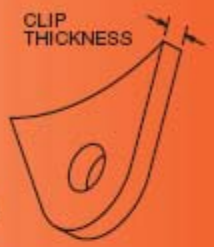
CSAVCPS DIMENSIONS AND PRESSURE RATINGS (Metric Units)
±102mm ALL DIRECTIONAL SEISMIC MOVEMENT

Tubing* Size & End to End† (mm)	Live Length (mm)	Corrugations per meter	A (mm)	B (mm)	C (mm)	D (mm)	Rated Pressure @21°C (kg/cm²)	Min Burst Pressure (kg/cm²)	Safety Factor
15x500	350	380	365	—	—	397	12	296	25
20x600	375	302	400	—	—	429	12	218	18
25x675	400	190	435	—	—	464	12	216	18
32x725	425	174	463	—	—	492	12	183	15
40x825	475	154	519	—	—	548	12	157	13
50x950	500	223	575	597	613	—	12	146	12
65x1050	550	184	651	673	689	—	12	119	10
80x1225	600	98	730	759	781	—	12	108	9
100x1475	650	95	826	857	879	—	12	80	7

*Female end fits over copper tubing, e.g. 1/2 x 20 (15 x 500mm) fits over 1/2" (15mm) tubing.
†End to End Tolerances: All Sizes, ±1/4"(6mm)

CSAVFL EQUI-V HOSE with FLOATING FLANGES





SUPPORT CLIP DETAIL

SUPPORT CLIP

Pipe Size (in)	(mm)	SUPPORT CLIP Hole Diameter (in)	(mm)	Thickness (in)	(mm)
2	50	1/2	13	1/4	6
21/2	63	5/8	16	1/4	6
3	75	5/8	16	1/4	6
4	100	3/4	19	3/8	9

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CARBON STEEL PLATE FLANGES

Pipe Size (in)	(mm)	Flange Thickness (in)	(mm)
2 thru 4	50 thru 100	5/8	16

CSAVFL DIMENSIONS AND PRESSURE RATINGS (British Units)
±4" ALL DIRECTIONAL SEISMIC MOVEMENT

Pipe Size & Face to Face† (in)	Live Length (in)	Corrugations per foot	A (in)	B (in)	C (in)	Rated Pressure @70°F (psi)	Min Burst Pressure (psi)	Safety Factor
2 X 33	20	68	231/4	241/8	243/4	175	2120	12
21/2 X 37	22	56	26	271/8	28	175	1724	10
3 X 42	24	30	287/8	30	303/4	175	1564	9
4 X 49	26	29	321/2	333/4	347/8	175	1160	7

†Face to Face Tolerances: Sizes 2" - 4"(50 - 100mm), ±1/4"(6mm)

CSAVFL DIMENSIONS AND PRESSURE RATINGS (Metric Units)
±102mm ALL DIRECTIONAL SEISMIC MOVEMENT

Pipe Size & Face to Face† (mm)	Live Length (mm)	Corrugations per meter	A (mm)	B (mm)	C (mm)	Rated Pressure @70°F (kg/cm²)	Min Burst Pressure (kg/cm²)	Safety Factor
50 X 825	500	223	603	613	629	12	146	12
65 X 925	550	184	660	689	711	12	119	10
80 X 1050	600	98	733	762	781	12	108	9
100 X 1225	650	95	826	857	886	12	80	7