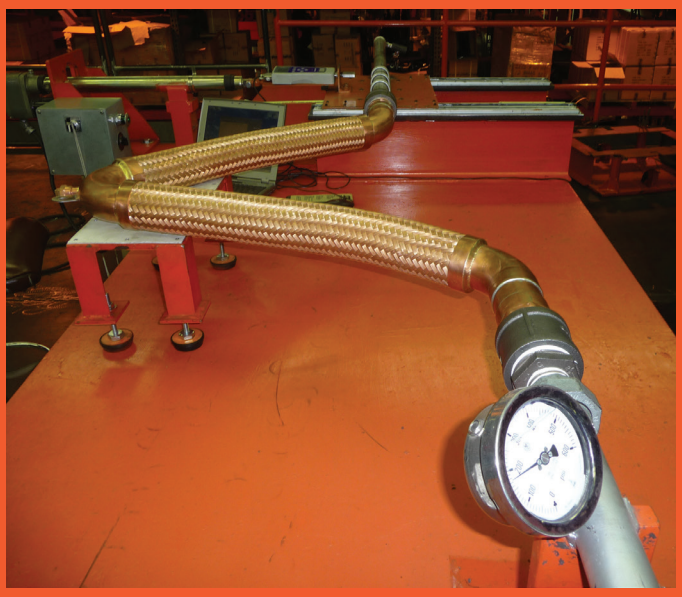
MASON-MERCER

TEST DATA STAINLESS STEEL & BRONZE VEES



We are pleased to provide you with this essential test data on the stiffness of Vees in all directions.

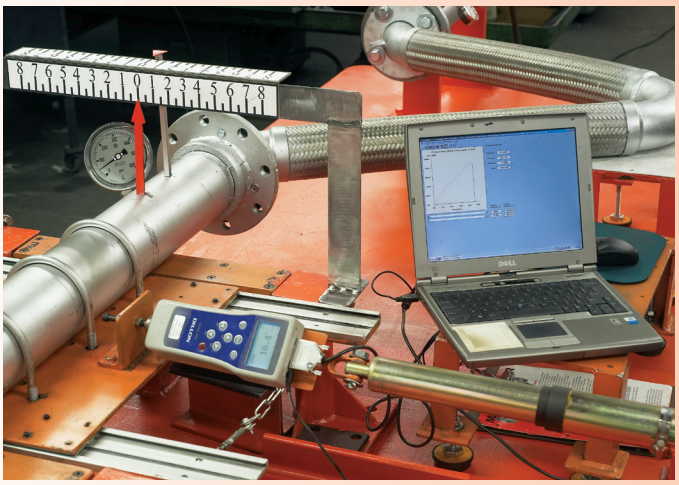
Theory and design have their place, but testing tells the true story and should be the basis of application whenever possible.

Our Bulletin BH-29 did the job for straight hoses and proved the inadequacy of short lengths.

Vees are much more complex. They move in all modes and it takes different forces to move them In and Out, Up and Down or Transverse. We built our own test equipment to cover this broad range of sizes from 1/2" through 12" with proper force and movement calibration. These test reports supplement Product Bulletin VH-30.

Bulletin VT-32-2

Typical curves for a 6" Flanged VFL are published on pages 4 and 5 to show how the test values were plotted. Tables are much easier to work with, so all data is tabular after that. Small values are rounded up to the nearest whole number and in larger sizes to the nearest 5 or 10. In and Out movements are published as the higher of the two values on pages 6 through 8.



Seismic movements are limited to 4" in all modes because the motion may be violent. Since simple expansion and contraction is always slow motion and intermittent, 6" allowable movements will not cause problems. Expansion movement should always be in and out rather than transverse, or up and down.

We are reassured by the curves showing no particular increase in spring rate as you travel from 4" to 6". If the hoses started to bend rather than flex, there would be distinct changes in the shapes of the curves.

The advantage of using Vees to handle expansion and contraction is the thrust is taken by the braid, as in straight hoses. The displacement forces are minuscule compared to the pressure thrust from a straight bellows as it is only what is needed to bend the legs. Anchorage comparisons are published in each table as a percentage of what it would take to hold a bellows. The bellows spring rate multiplied by the movement are added to the pressure thrust to determine the total anchorage requirement.

This major reduction in anchorage requirements makes it possible to provide anchors in lightweight structures and eliminate or reduce the cost of supplementary steel.

Older seismic requirements were primarily designed to make certain equipment stayed in place. The newer codes require that in addition to staying in place, equipment must remain operable after the quake.

Teflon Bellows Failure

Too often the failure is the equipment water nozzles break off or if cast iron, the machine shatters when pipes are solid. Where space allows, a Vee connection is so soft that this kind of failure can be put behind us.

Lack of Flex Connector Caused Cast Iron Failure

Solid pipe loops may be compared to the Vees flexible legs. Anchorage requirements are very low too, but the lengths of the legs seldom fit within structures, so they are used outdoors most of the time.

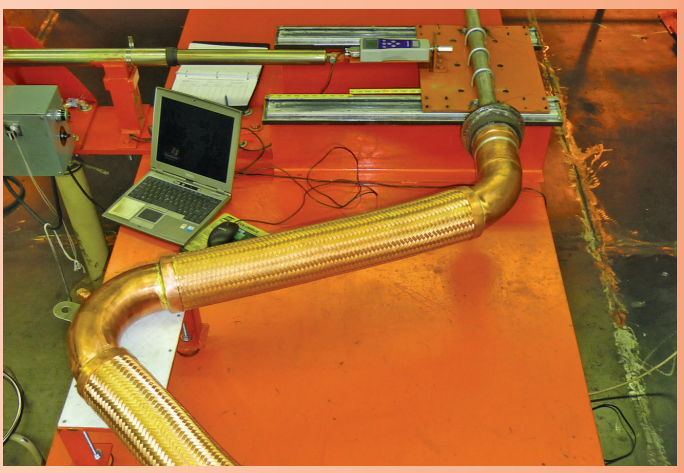
Our test data at different pressures is very close to what the forces are. Since anchors are designed with their own safety factor, these numbers provide what the designer needs. In most cases, the pipe attached to a Vee is self guided, but guides are always appropriate. Anchors must be provided at both ends of the expanding or contracting pipe runs.

Seismic applications are a different matter and guides must be used near the Vees to force the Vees into motion at seismic boundaries.

We certainly hope you find this information useful. It is unprofessional to ask you to specify or use a product without providing detailed information.

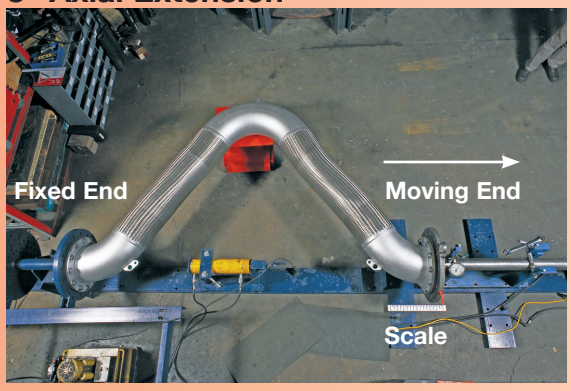
MASON INDUSTRIES, INC.

Norman J. Mason, P.E.
President

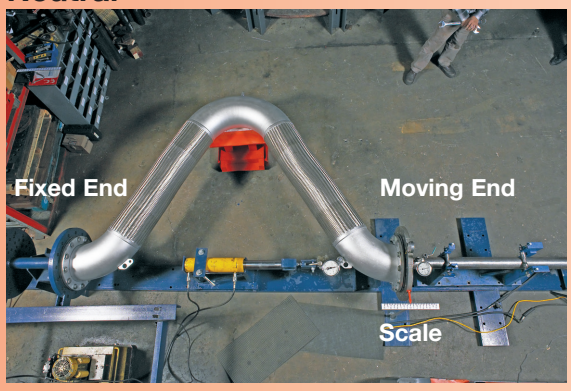


12” VFL MOVEMENTS TESTS

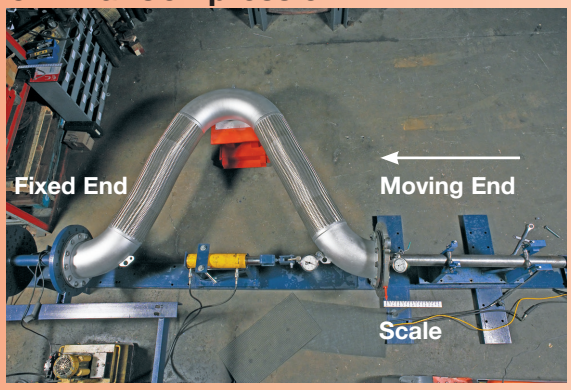
8” Axial Extension



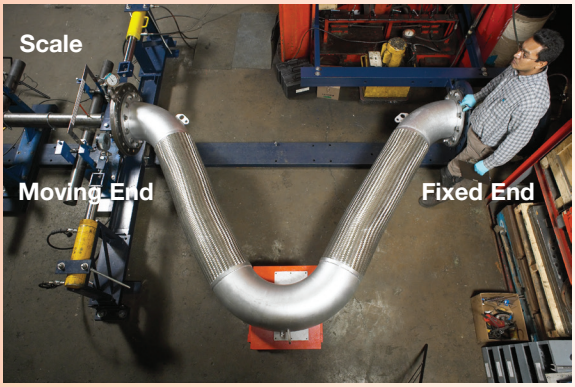
Neutral



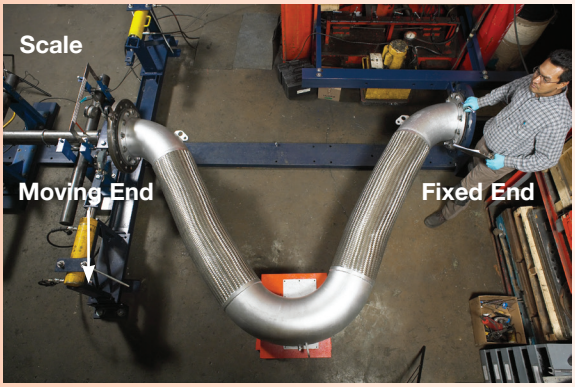
8” Axial Compression



Neutral with Hose Flat



8” Down with Hose Flat

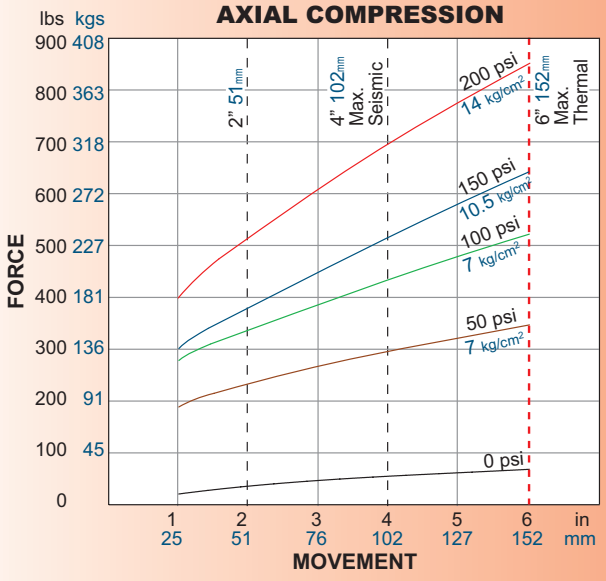


In Line

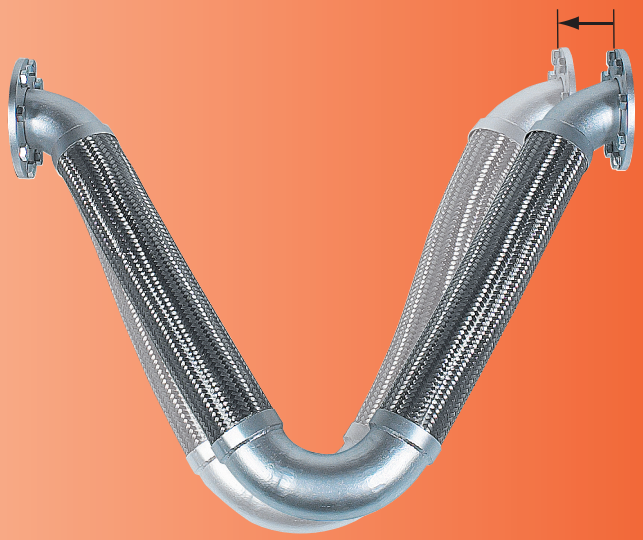
8” Transverse

VFL 6” TEST CURVES

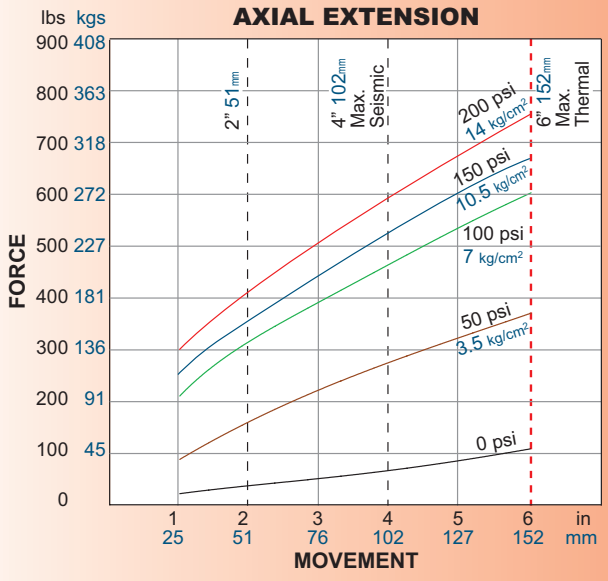
AXIAL COMPRESSION



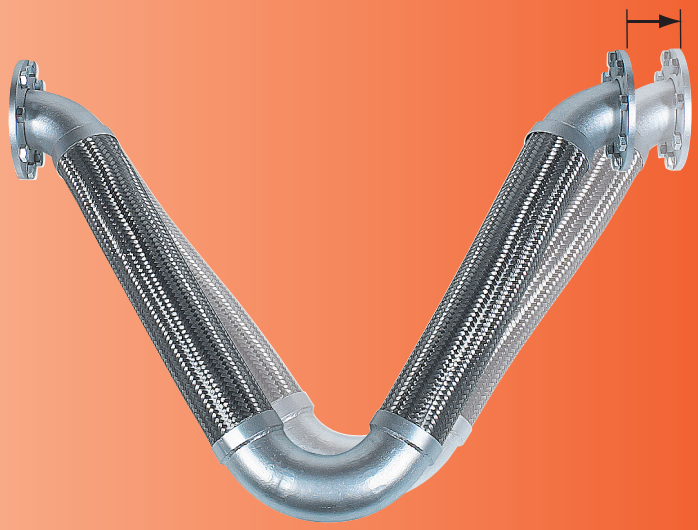
6” Compression



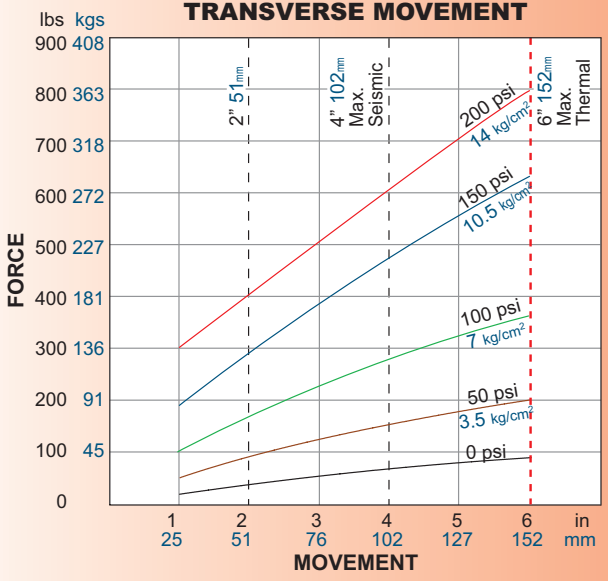
AXIAL EXTENSION



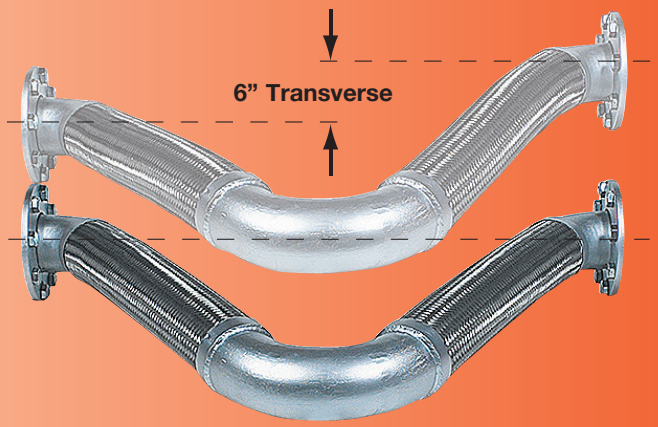
6” Extension

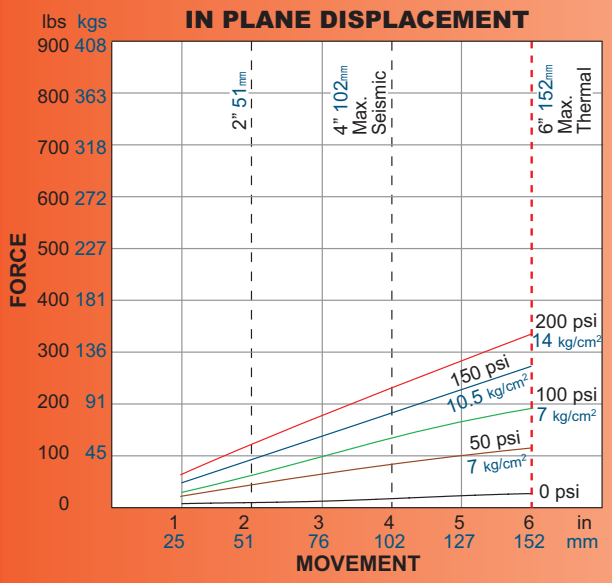


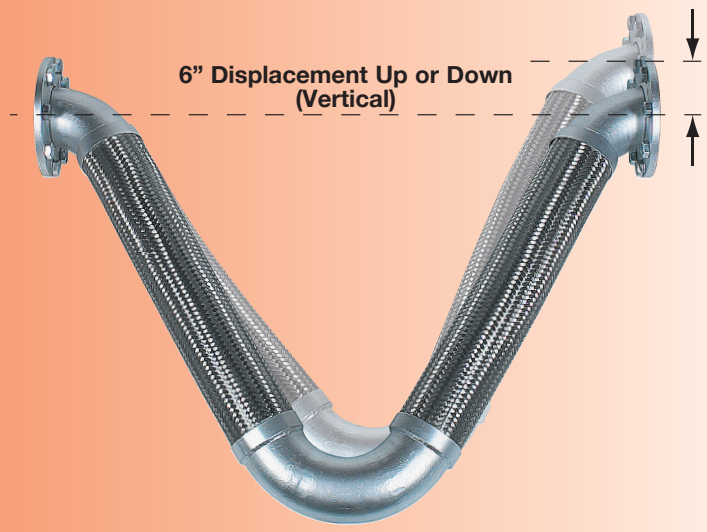
TRANSVERSE MOVEMENT



6” Transverse







Size 6" FORCE - MOVEMENT TABLE*

MAXIMUM 4" SEISMIC MOVEMENT
Force Required to Move 6" Standard Vee

Type & Size	Pressure (psi)	(kg/cm²)	2" 50mm Movement (lbs)						4" 100mm Max Seismic Movement (lbs)					
			Axial		Vertical		Trans-Verse		Axial		Vertical		Trans-Verse	
	0	0	40	18	5	2	40	18	50	23	20	9	70	32
6" 150mm	50	3.5	230	104	40	18	90	41	300	136	80	36	160	73
VFL	100	7.0	340	154	60	27	150	68	430	195	130	59	270	123
VGN	150	10.5	400	181	80	36	250	113	520	236	190	86	480	218
	200	14.0	510	231	120	54	400	181	700	317	220	99	620	281

*While all Vees were tested to 8" movement in all planes, data is only reported to 6" recommended maximum movement.

THERMAL MOVEMENT
Force Required to Move Vee Hose

6" 150mm Max Movement (lbs) (kg)	
Axial Only	
80	36
350	159
520	236
660	299
850	386

VEE SPECIFICATION:

Piping and equipment connections shall be protected against seismic damage by the insertion of braided flexible hose Vee assemblies rated for ±4" (100mm) seismic motion in all planes. Should the application include ±6" (150mm) thermal movement or thermal movement alone, install the Vee so the thermal movement is axial.

All submittals shall include a recognized test report, covering the full range of the specified movements at the operating pressures. Forces required to move the Vees shall not exceed the values below. Vees shall have a minimum burst pressure of four times their rated pressure. Vees in steel lines shall have stainless hose and braid with threaded ends, weld ends or floating flanges. In stainless lines, all fittings in contact with the media must be stainless as well. Copper lines, bronze hose and braid with copper or bronze fittings. Guiding and anchoring shall be as designed by the manufacturer, stamped by a PE and included with the submittals. Submittals shall include Movement-Force Test Reports. 60 Degree Vees, ADA Resilient Anchors and ASG Sliding Guides, all as manufactured by Mason Industries, Inc.

AXIAL FORCE OF DISPLACEMENT for 6" MOVEMENT **Lbs / 2.2 = Kilograms**

Pressure (psi)	FORCE (lbs) FOR STAINLESS VEE SIZES														FORCE (lbs) FOR COPPER VEE SIZES								
	1/2"	3/4"	1"	11/4"	11/2"	2"	21/2"	3"	4"	5"	6"	8"	10"	12"	1/2"	3/4"	1"	11/4"	11/2"	2"	21/2"	3"	4"
50	4	4	5	8	9	22	60	75	90	230	350	1200	1900	1900	4	6	7	13	13	25	80	90	140
100	5	4	6	12	13	28	90	120	140	240	520	1650	2700	2800	5	7	8	18	24	40	120	150	230
150	5	5	7	17	18	38	125	160	200	370	660	2200	3300	3400	5	8	9	20	25	45	150	200	300
170	5	5	7	18	19	40	130	170	215	380	680	2350	3700	3750	5	8	10	24	31	60	160	215	320
175	5	6	8	19	19	41	135	175	225	385	690	2400	–	–	5	9	12	25	38	63	170	230	350
180	5	6	8	20	20	42	140	180	235	390	720	2500	–	–	–	–	–	–	–	–	–	–	–
200	5	6	9	21	22	44	160	200	290	400	850	–	–	–	–	–	–	–	–	–	–	–	–
230	5	7	10	23	24	50	180	230	290	–	–	–	–	–	–	–	–	–	–	–	–	–	–
250	5	7	10	26	27	54	190	280	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Note: Forces for lesser movements are proportionately lower, e.g., 3" movement is 1/2 of 6" movement force.

Test Data VMN Stainless Vee with Steel Pipe Nipples

MAXIMUM 4" SEISMIC MOVEMENT
Force Required to Move Standard Vee

Type & Size	Pressure (psi)	(kg/cm²)	2" 50mm Movement (lbs)	(kg)					4" 100mm Max Seismic Movement (lbs)	(kg)				
			Axial		Vertical		Trans-Verse		Axial		Vertical		Trans-Verse	
	0	0	2	0.9	1	0.5	1	0.5	3	1.4	1	0.5	2	0.9
	50	3.5	2	0.9	1	0.5	1	0.5	3	1.4	2	0.9	2	0.9
1/2" 15mm	100	7.0	3	1.4	2	0.9	2	0.9	4	1.8	2	0.9	2	0.9
VMN	150	10.5	3	1.4	2	0.9	2	0.9	4	1.8	2	0.9	3	1.4
	200	14.0	3	1.4	2	0.9	2	0.9	4	1.8	3	1.4	3	1.4
	250	17.6	3	1.4	2	0.9	2	0.9	4	1.8	3	1.4	3	1.4
	0	0	1	0.5	1	0.5	1	0.5	2	0.9	1	0.5	1	0.5
	50	3.5	2	0.9	1	0.5	1	0.5	3	1.4	2	0.9	1	0.5
3/4" 20mm	100	7.0	2	0.9	1	0.5	2	0.9	3	1.4	2	0.9	2	0.9
VMN	150	10.5	3	1.4	2	0.9	2	0.9	4	1.8	3	1.4	2	0.9
	200	14.0	4	1.8	3	1.4	2	0.9	5	2.3	3	1.4	3	1.4
	250	17.6	5	2.3	3	1.4	3	1.4	6	2.7	4	1.8	3	1.4
	0	0	1	0.5	1	0.5	1	0.5	2	0.9	2	0.9	2	0.9
	50	3.5	2	0.9	3	1.4	2	0.9	3	1.4	3	1.4	2	0.9
1" 25mm	100	7.0	2	0.9	3	1.4	2	0.9	4	1.8	4	1.8	3	1.4
VMN	150	10.5	3	1.4	4	1.8	3	1.4	5	2.3	5	2.3	4	1.8
	200	14.0	3	1.4	5	2.3	4	1.8	6	2.7	6	2.7	5	2.3
	250	117.6	5	2.3	6	2.7	4	1.8	7	3.2	7	3.2	6	2.7
	0	0	3	1.4	2	0.9	3	1.4	3	1.4	2	0.9	3	1.4
	50	3.5	4	1.8	3	1.4	4	1.8	6	2.7	4	1.8	4	1.8
11/4" 30mm	100	7.0	5	2.3	4	1.8	5	2.3	7	3.2	5	2.3	6	2.7
VMN	150	10.5	7	3.2	5	2.3	7	3.2	9	4.0	6	2.7	9	4.0
	200	14.0	9	4.0	7	3.2	8	3.6	11	5.0	8	3.6	11	5.0
	250	17.6	10	4.5	8	3.6	10	4.5	13	5.9	10	4.5	13	5.9
	0	0	3	1.4	2	0.9	2	0.9	3	1.4	3	1.4	3	1.4
	50	3.5	5	2.3	3	1.4	5	2.3	5	2.3	5	2.3	6	2.7
11/2" 40mm	100	7.0	7	3.2	4	1.8	8	3.6	8	3.6	6	2.7	10	4.5
VMN	150	10.5	10	4.5	7	3.2	11	5.0	12	5.4	9	4.0	15	6.8
	200	14.0	13	5.9	9	4.0	14	6.4	16	7.3	13	5.9	20	9.1
	250	17.6	15	6.8	13	5.9	18	8.2	18	8.2	16	7.3	25	11.3

THERMAL MOVEMENT† Force Required to Move Vee Hose or Stainless Steel Bellows Expansion Joint

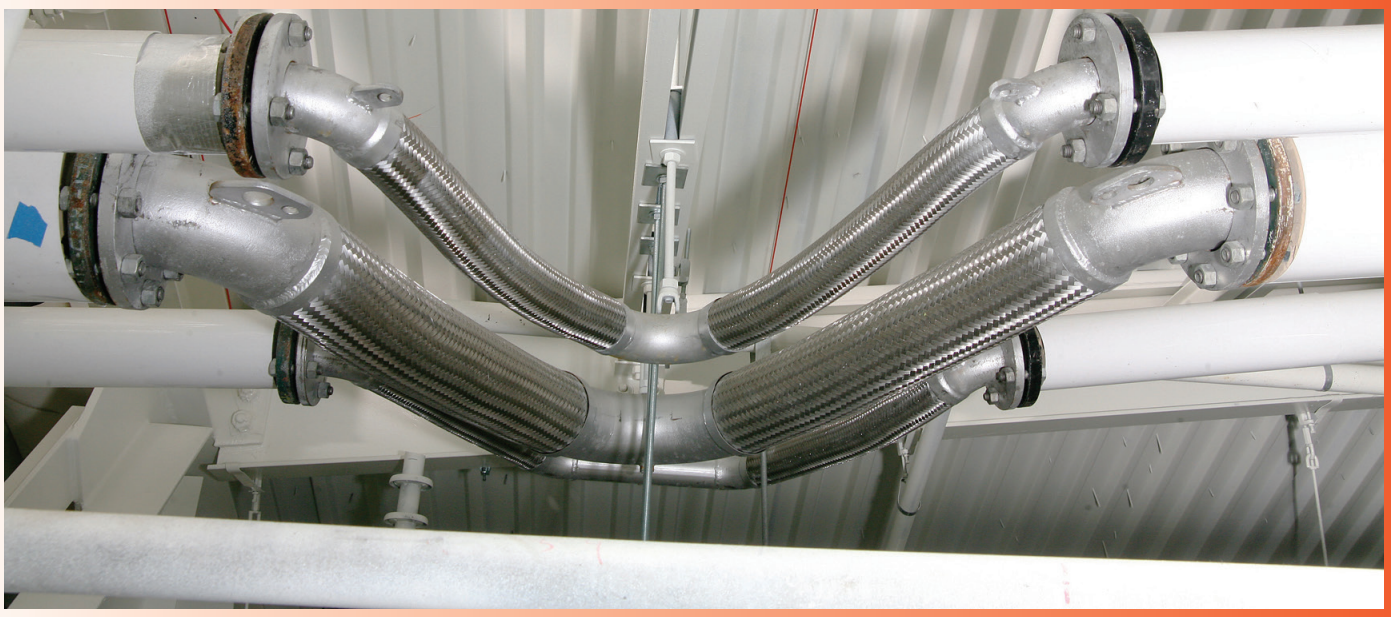
Force on Anchor* if Vees are Used Rather than Bellows

6" 150mm Max Movement (lbs) (kg)				Percentage of Bellows Force if Using Vees*
Vee Axial		Bellows Axial		
4	1.8	—	—	—
4	1.8	—	—	—
5	2.3	—	—	—
5	2.3	—	—	—
5	2.3	—	—	—
5	2.3	—	—	—
3	1.4	180	82	1.7%
4	1.8	270	122	1.5
4	1.8	270	122	1.5
5	2.3	445	202	1.1
6	2.7	530	240	1.1
7	3.2	—	—	—
4	1.8	270	122	1.5
5	2.3	445	202	1.1
6	2.7	530	240	1.1
7	3.2	565	256	1.2
9	4.0	690	313	1.3
10	4.5	—	—	—
4	1.8	270	122	
8	3.6	410	186	2.0
12	5.4	610	277	2.0
17	7.7	810	367	2.1
21	9.5	1010	458	2.1
26	11.8	—	—	—
5	2.3	230	100	1.1
9	4.0	275	125	1.3
13	5.9	770	349	1.7
18	8.2	1045	474	1.7
22	10.0	1320	599	1.7
27	12.2	—	—	—

†In these small diameters, movements up to 2" are sometimes accommodated by housed expansion joints known as Expansion Compensators, our model "EC". They could be made to handle 2" - 6" movements by adding bellows in series. Reference is to indicate order of magnitude, not exact numbers.

*i.e. $\frac{\text{Vee Force}}{\text{Bellows Force}} \times 100 = \%$

Size 3/4" 100psi: $\frac{4}{270} \times 100 = 1.5\%$



HORIZONTAL VFL INSTALLATION

MAXIMUM 4" SEISMIC MOVEMENT
Force Required to Move Standard Vee

THERMAL MOVEMENT
Force Required to Move Vee Hose or Stainless Steel Bellows Expansion Joint

Force on Anchor* if Vees are Used Rather than Bellows

Type & Size	Pressure (psi)	(kg/cm²)	2" 50mm Movement (lbs)	(kg)					4" 100mm Max Seismic Movement (lbs)	(kg)					6" 150mm Max Movement (lbs)	(kg)			Percentage of Bellows Force if Using Vees*
			Axial		Vertical		Trans-Verse		Axial		Vertical		Trans-Verse		Vee Axial		Bellows Axial		
	0	0	6	2.7	5	2.3	5	2.3	9	4.0	3	1.4	5	2.3	12	5	500	227	2.4%
2" 50mm	50	3.5	15	6.8	5	2.3	11	5.0	17	7.7	7	3.2	13	5.9	22	10	1055	479	2.1
VFL	100	7.0	20	9.1	10	4.5	17	7.7	24	10.9	11	5.0	22	10.0	28	13	1610	730	1.7
VMN	150	10.5	26	11.8	15	6.8	22	10.0	32	14.5	17	7.7	31	14.0	38	17	2170	984	1.8
VGN	200	14.0	33	15.0	18	8.2	28	12.7	37	16.8	20	9.1	38	17.2	44	20	2720	1234	1.6
	250	17.6	38	17.2	20	9.1	30	13.6	46	20.9	24	10.9	45	20.4	54	25	3270	1483	1.7
	0	0	12	5.4	5	2.3	5	2.3	13	5.9	10	4.5	10	4.5	25	11	710	322	3.5
21/2" 65mm	50	3.5	35	15.9	20	9.1	20	9.1	40	18.1	25	11.3	35	15.9	60	27	1310	594	4.6
VFL	100	7.0	60	27.2	35	15.9	35	15.9	79	35.8	50	22.7	55	24.9	90	41	1900	862	4.7
VMN	150	10.5	75	34.0	45	20.4	40	18.1	105	47.6	65	29.5	75	34.0	125	57	2490	1266	5.0
VGN	200	14.0	90	40.8	50	22.7	50	22.7	130	59.0	75	34.0	90	40.8	160	73	3110	1411	5.1
	250	17.6	115	52.2	60	27.2	65	29.5	165	74.8	85	38.6	115	52.2	190	86	5040	2286	3.8
	0	0	10	4.5	5	2.3	5	2.3	15	6.8	12	5.4	15	6.8	25	11	720	327	3.5
3" 80mm	50	3.5	40	18.1	20	9.1	30	13.6	45	20.4	30	13.6	40	18.1	75	34	1590	721	4.7
VFL	100	7.0	70	31.8	30	13.6	50	22.7	85	38.6	60	27.2	75	34.0	120	54	2460	1116	4.9
VMN	150	10.5	90	40.8	40	18.1	70	31.8	120	54.4	70	31.8	115	52.2	160	73	3320	1506	4.8
VGN	200	14.0	110	49.9	50	22.7	80	36.3	150	68.0	80	36.3	135	61.2	200	91	4190	1901	4.8
	250	17.6	130	59.0	60	27.2	90	40.8	190	86.2	95	43.0	160	72.6	280	127	5020	2277	5.6
	0	0	10	4.5	5	2.3	25	11.3	20	9.1	15	6.8	25	11.3	35	16	800	363	4.4
4" 100mm	50	3.5	45	20.4	20	9.1	60	27.2	70	31.8	35	15.9	80	36.3	90	41	2430	1102	3.7
VFL	100	7.0	35	15.9	40	18.1	80	36.3	105	47.6	70	31.8	120	54.4	140	64	3970	1801	3.5
VMN	150	10.5	100	45.4	55	24.9	85	38.6	150	68.0	80	36.3	150	68.0	200	91	5500	2495	3.6
VGN	200	14.0	135	61.2	65	29.5	100	45.4	195	86.2	95	43.0	120	54.4	290	132	7040	3193	4.1
	230	16.2	165	74.8	70	31.8	110	49.9	260	117.9	105	47.6	180	81.6	290	132	7850	3561	3.7
	0	0	25	11.3	20	9.1	40	18.1	40	18.1	40	18.1	60	27.2	65	30	1200	544	5.4
5" 125mm	50	3.5	125	56.7	60	27.2	65	29.5	110	49.9	110	49.9	120	54.4	230	104	3310	1501	6.9
VFL	100	7.0	200	90.7	70	31.8	80	36.3	140	63.5	140	63.5	150	68.0	240	109	5420	2460	4.4
VGN	150	10.5	260	117.9	80	36.3	90	40.8	155	70.3	155	70.3	160	72.6	370	168	6540	2967	5.7
	200	14.0	275	124.7	90	40.8	100	45.3	170	77.1	170	77.1	170	77.1	400	181	9650	4377	4.1
	0	0	40	18.1	5	2.3	40	18.1	50	22.7	20	9.1	70	31.8	80	36	1500	680	5.3
6" 150mm	50	3.5	230	104.3	40	18.1	90	40.8	300	136.1	80	36.3	160	72.6	350	159	4300	1950	8.1
VFL	100	7.0	340	154.2	60	27.2	150	68.0	430	195.0	130	59.0	270	122.5	520	236	7100	3221	7.3
VGN	150	10.5	400	181.4	80	36.3	250	113.4	520	235.9	190	86.2	480	217.7	660	299	9900	4491	6.7
	200	14.0	510	231.3	120	54.4	400	181.4	700	317.5	220	99.8	620	281.2	850	386	12700	5761	6.7
	0	0	125	56.7	50	22.7	100	45.3	200	90.7	100	45.3	120	54.4	350	159	1800	5352	19.4
8" 200mm	50	3.5	700	317.5	250	113.4	200	90.7	900	408.2	250	113.4	350	158.8	1200	544	6020	2731	19.9
VFL	100	7.0	900	408.2	270	122.5	260	117.9	1300	589.7	300	136.0	550	249.5	1650	748	10250	4649	16.1
VGN	150	10.5	1100	499.0	280	127.0	350	158.8	1700	771.1	700	317.5	700	317.5	2200	998	14470	6564	15.2
	180	12.7	1200	544.3	500	226.8	400	181.4	1900	861.8	850	385.6	850	385.6	2500	1134	17200	7802	14.5
	0	0	250	113.4	125	56.7	100	45.3	400	181.4	150	68.0	200	90.7	500	227	2400	1089	20.8
10" 250mm	50	3.5	1000	453.6	350	158.8	350	158.8	1500	680.4	400	181.4	700	317.5	1900	862	9200	4173	20.7
VFL	100	7.0	1250	567.0	625	283.5	500	226.8	2200	997.9	750	340.2	1000	453.6	2700	1225	15350	6963	17.6
VGN	150	10.5	1400	635.0	900	408.2	550	249.5	2500	1134.0	1000	453.6	1200	544.3	3300	1497	22000	9979	15.0
	170	12.0	1500	680.4	1050	476.3	700	317.5	2750	1247.4	1200	544.3	1300	589.7	3700	1678	24700	11204	15.0
	0	0	300	136.0	160	72.6	100	45.3	500	226.8	180	81.6	200	90.7	600	272	3530	1601	17.0
12" 300mm	50	3.5	1000	453.6	300	136.0	500	226.8	1500	680.4	400	181.4	1000	453.6	1900	862	12420	5634	15.3
VFL	100	7.0	1100	499.0	600	272.2	600	272.2	2250	1020.6	700	317.5	1200	544.3	2800	1270	21330	9675	13.1
VGN	150	10.5	1200	544.3	800	362.9	700	317.5	2300	1043.3	1000	453.6	1300	589.7	3400	1542	30200	13699	11.3
	170	12.0	1300	589.7	1000	453.6	800	362.9	2500	1134.0	1200	544.3	1400	635.0	3750	1701	33730	15300	11.1

*i.e. $\frac{\text{Vee Force}}{\text{Bellows Force}} \times 100 = \%$ Size 4" 100psi: $\frac{140}{3970} \times 100 = 3.5\%$

Test Data VCPSB Bronze Braided Vee with Copper Sweat Ends

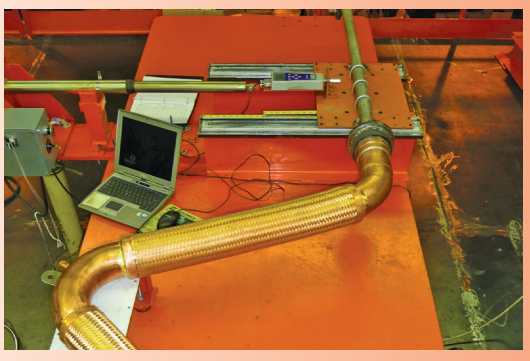
SEISMIC TRAVEL
Force Required to Move Standard Length VCPSB

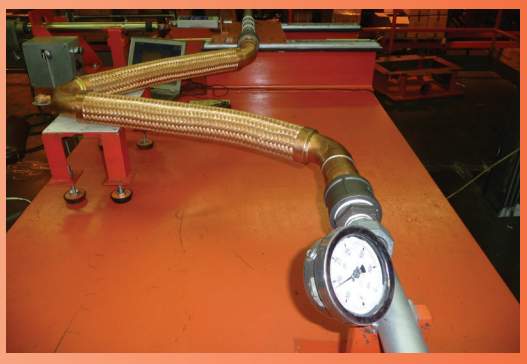
Type & Size	Pressure (psi)	(kg/cm²)	2" 50mm Movement (lbs) (kg) Axial		Vertical		Trans-Verse		4" 100mm Max Seismic Movement (lbs) (kg) Axial		Vertical		Trans-Verse	
	0	0	1	0.5	1	0.5	1	0.5	2	0.9	1	0.5	2	0.9
1/2" 15mm	50	3.5	1	0.5	1	0.5	2	0.9	3	1.4	1	0.5	3	1.4
VCPSB	100	7.0	2	0.9	1	0.5	2	0.9	3	1.4	1	0.5	3	1.4
	175	12.3	2	0.9	1	0.5	2	0.9	3	1.4	2	0.9	4	1.8
	0	0	2	0.9	1	0.5	2	0.9	3	1.4	3	1.4	4	1.8
3/4" 20mm	50	3.5	2	0.9	2	0.9	2	0.9	4	1.8	4	1.8	4	1.8
VCPSB	100	7.0	2	0.9	2	0.9	4	1.8	5	2.3	5	2.3	6	2.7
	175	12.3	3	1.4	2	0.9	5	2.3	6	2.7	7	3.2	8	3.6
	0	0	2	0.9	3	1.4	3	1.4	3	1.4	4	1.8	5	2.3
1" 25mm	50	3.5	2	0.9	3	1.4	3	1.4	3	1.4	5	2.3	7	3.2
VCPSB	100	7.0	2	0.9	4	1.8	4	1.8	4	1.8	7	3.2	8	3.6
	175	12.3	3	1.4	6	2.7	5	2.3	7	3.2	8	3.6	10	4.5
	0	0	2	0.9	3	1.4	4	1.8	5	2.3	5	2.3	8	3.6
11/4" 30m	50	3.5	3	1.4	5	2.3	6	2.7	8	3.6	8	3.6	12	5.4
VCPSB	100	7.0	5	2.3	8	3.6	10	4.5	10	4.5	12	5.4	15	6.8
	175	12.3	10	4.5	13	5.9	13	5.9	17	7.7	18	8.2	23	10.4
	0	0	3	1.4	3	1.4	5	2.3	4	1.8	5	2.3	8	3.6
11/2" 40mm	50	3.5	5	2.3	10	4.5	14	6.4	9	4.0	13	5.9	19	8.6
VCPSB	100	7.0	12	5.4	16	7.3	25	11.3	18	8.2	20	9.1	33	15.0
	175	12.3	20	9.1	25	11.3	37	16.8	28	12.7	33	15.0	52	23.6
	0	0	4	1.8	5	2.3	5	2.3	6	2.7	5	2.3	5	2.3
2" 50mm	50	3.5	15	6.8	18	8.2	16	7.3	18	8.2	16	7.3	23	10.4
VCPSB	100	7.0	23	10.4	30	13.6	23	10.4	30	13.6	25	11.3	40	18.1
	175	12.3	40	18.1	50	22.7	40	18.1	48	21.8	40	18.1	60	27.2
	0	0	10	4.5	10	4.5	10	4.5	25	11.3	20	9.1	20	9.1
21/2" 65mm	50	3.5	10	4.5	30	13.6	40	18.1	30	13.6	55	24.9	55	24.9
VCPSB	100	7.0	75	34.0	50	22.7	65	29.5	70	31.8	75	34.0	80	36.3
	175	12.3	85	38.6	65	29.5	100	45.4	125	56.7	110	49.9	140	63.5
	0	0	20	9.1	15	6.8	20	9.1	25	11.3	25	11.3	25	11.3
3" 80mm	50	3.5	50	22.7	40	18.1	60	27.2	75	34.0	70	31.8	80	36.3
VCPSB	100	7.0	80	36.3	70	31.8	80	36.3	110	49.9	100	45.4	135	61.2
	175	12.3	120	54.4	90	40.8	140	63.5	170	77.1	130	59.0	220	99.8
	0	0	20	9.1	20	9.1	20	9.1	30	13.6	30	13.6	30	13.6
4" 100mm	50	3.5	90	40.8	50	22.7	110	49.9	120	54.4	70	31.8	150	68.0
VCPSB	100	7.0	140	63.5	80	36.3	170	77.1	180	81.6	120	54.4	240	108.9
	175	12.3	210	95.3	130	59.0	210	95.3	280	127.0	180	81.6	320	145.0

THERMAL TRAVEL
Force Required to Move VCPSB Hose

6" 150mm Max Movement (lbs) (kg) Vee Axial	
4	1.8
4	1.8
4	1.8
5	2.3
5	2.3
6	2.7
7	3.2
9	4.0
6	2.7
7	3.2
8	3.6
12	5.4
10	4.5
13	5.9
18	8.2
25	11.3
6	2.7
13	5.9
24	10.9
38	17.2
9	4.0
25	11.3
40	18.1
63	28.6
25	11.3
80	36.3
120	54.4
170	77.1
30	13.6
90	40.8
150	68.0
230	104.3
40	18.1
140	63.5
230	104.3
350	158.8

Bellows Data - Not Available





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