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Limited Engineering Calculations for Adjustable Support Bridge Assemblies as manufactured by Advanced Support Products, Inc.

(fig. 1) Pipe Hanger Design Uplift Resistance

**(figs. 2, 3 & 4) Typical Roof Loads Due to Gravity Bearing Stresses
(Minimum, Medium, Maximum Hanger Assemblies)**

(fig. 5) Product Information – Standard Bases

The data utilized for these calculations was obtained from Unistrut for the structural assemblies and from Grinnell for the pipe hangers. The information for the rubber molded bases was obtained from Advanced Support Products, Inc. product data.

The calculations performed are limited and only indicated the static loads that would be exerted on a roof deck by the support assemblies including standard sections of single or multiple lengths of pipe conveying natural gas and water.

The piping and hanger assemblies in this report are considered “dead” loads and should be taken into account during structural design of the roof system. The hanger assembly loads in the attached tables are intended to be used by the structural designer and provide the information required to properly evaluate the complete roof system.

The products and their characteristics were tested by Advanced Support Products, Inc. and represent the basis for our calculations. Roof membrane system analysis as well as long term performance of the products was not part of the calculation process. The following assumptions were taken into account for the calculations:

- Placement of load on pipe supports was assumed to be symmetrical
- Performance of the products at other than static loading was not part of the calculation process.
- Hanger assemblies and piping were assumed to be placed on a horizontal surface and pipe supports are normal to pipe.

Conclusions:

Based on our inspection and analysis of the product design, the load capacity values at each point of support of the pipe hanger assemblies, including the weight of piping are all less than the maximum allowable stresses for typical roof deck insulations types currently in use (5psi maximum). Therefore, the Adjustable Support Bridge Assemblies as manufactured by Advanced Support Products, Inc. meet Factory Mutual Research Corporation’s recommendation that the design uplift resistance for base should not exceed half of the ultimate design uplift resistance of the roof cover system. The uplift resistance therefore, is dependent on the uplift rating of the roof cover system.

(fig. 1) Pipe Hanger Design Uplift Resistance

Advanced Support Products, Inc. Uplift Resistance				
Base Size	FM Wind Uplift Rating			
	60	90	150	180
12" x 12"	30	45	75	90
7.25" x 6"	9.1	13.1	22.7	27.2
7.25" x 9"	13.6	20.4	34.0	65.3
7.25" x 13"	19.6	29.5	49.1	58.9

**(fig. 2) Typical Roof Loads Due to Gravity Bearing Stresses
(Minimum Pipe Hanger Assembly)**

Curb Area	348 sq.in.
Curb Wt.	32.0 lbs.
Frame Wt.	29.0 lbs.
Hanger Wt.	08.0 lbs.
Assembly Wt.	69.0 lbs. 1 pipe
	77.0 lbs. 2 pipes

Pipe Diameter	Quantity	Pipe Contents	Pipe Support Spacing		
			6 feet	8 feet	10 feet
4 inch	1	water	167.0 lbs	199.0 lbs.	229.0 lbs
			0.48 psi	0.57 psi	0.66 psi
	2	water	273.0 lbs	337.0 lbs	397.0 lbs
			0.78 psi	0.97 psi	1.14 psi
6 inch	1	water	259.0 lbs	319.0 lbs	379.0 lbs
			0.74 psi	0.92 psi	1.09 psi
	2	water	457.0 lbs	577.0 lbs	697.0 lbs
			1.31 psi	1.66 psi	2.00 psi

The bearing stresses indicated above reflect utilization of an adjustable support bridge assembly consisting of 2 each Cross Brace Bridges, 2 each Channel Legs and 2 each Adjustable Cross Bars.

**(fig. 3) Typical Roof Loads Due to Gravity Bearing Stresses
(Medium Pipe Hanger Assembly)**

Curb Area	522 sq.in.
Curb Wt.	48.0 lbs.
Frame Wt.	29.0 lbs.
Hanger Wt.	08.0 lbs.
Assembly Wt.	85.0 lbs. 1 pipe
	93.0 lbs. 2 pipes
	101.0 lbs 3 pipes

Pipe Diameter	Quantity	Pipe Contents	Pipe Support Spacing		
			6 feet	8 feet	10 feet
4 inch	1	Gas lbs	150	171	195
		psi	0.29	0.33	0.37
		Water lbs	183	215	245
		psi	0.35	0.41	0.47
	2	Gas lbs	223	265	313
		psi	0.43	0.51	0.60
		Water lbs	289	353	413
		psi	0.55	0.68	0.79
	3	Gas lbs	296	359	431
psi		0.57	0.69	0.83	
Water lbs		395	491	581	
psi		0.76	0.94	1.11	
6 inch	1	Gas lbs	195	235	275
		psi	0.37	0.45	0.53
		Water lbs	275	335	395
		psi	0.53	0.64	0.76
	2	Gas lbs	313	393	473
		psi	0.60	0.75	0.91
		Water lbs	473	593	713
		psi	0.91	1.14	1.37
	3	Gas lbs	431	551	671
		psi	0.83	1.06	1.29
		Water lbs	671	851	1031
		psi	1.29	1.63	1.98

The bearing stresses indicated above reflect utilization of an adjustable support bridge assembly consisting of 2 each Cross Brace Bridges, 2 each Channel Legs and 2 each Adjustable Cross Bars.

**(fig. 4) Typical Roof Loads Due to Gravity Bearing Stresses
(Maximum Pipe Hanger Assembly)**

Curb Area 754 sq.in.
Curb Wt. 80.0 lbs.
Frame Wt. 29.0 lbs.
Hanger Wt. 08.0 lbs.
Assembly Wt. 117.0 lbs. 1 pipe
 125.0 lbs. 2 pipes
 133.0 lbs 3 pipes

Pipe Diameter	Quantity	Pipe Contents	Pipe Support Spacing		
			6 feet	8 feet	10 feet
	1	Gas lbs	182	203	227
		psi	0.29	0.27	0.30
		Water lbs	215	247	277

4inch	2	psi	0.29	0.33	0.37
		Gas lbs	255	297	345
		psi	0.34	0.39	0.46
		Water lbs	321	385	445
	3	psi	0.43	0.51	0.59
		Gas lbs	328	391	463
psi		0.44	0.52	0.61	
Water lbs		427	523	613	
6inch	1	psi	0.57	0.69	0.81
		Gas lbs	195	267	307
		psi	0.37	0.35	0.41
		Water lbs	275	367	427
	2	psi	0.53	0.49	0.57
		Gas lbs	313	425	505
		psi	0.60	0.56	0.91
		Water lbs	473	625	745
	3	psi	0.91	0.83	0.99
		Gas lbs	431	583	703
		psi	0.83	0.77	0.93
		Water lbs	671	883	1063
8inch	1	psi	1.29	1.17	1.41
		Gas lbs	287	347	407
		psi	0.38	0.46	0.54
		Water lbs	417	517	617
	2	psi	0.55	0.69	0.82
		Gas lbs	465	585	705
		psi	0.62	0.78	0.94
		Water lbs	725	925	1125
	3	psi	0.96	1.23	1.49
		Gas lbs	357	437	527
		psi	0.47	0.58	0.70
		Water lbs	567	717	867
10inch	1	psi	0.75	0.95	1.15
		Gas lbs	605	765	945
		psi	0.80	1.01	1.25
	2	Water lbs	1025	1325	1625
		psi	1.36	1.76	2.16
		Gas lbs	417	517	617
12inch	1	psi	0.55	0.69	0.82
		Water lbs	707	907	1107
		psi	0.94	1.20	1.47
		Gas lbs	417	517	617

The bearing stresses indicated above reflect utilization of an adjustable support bridge assembly consisting of 2 each Cross Brace Bridges, 2 each Channel Legs and 2 each Adjustable Cross Bars.

(fig.5) Product Information - Standard Bases (Rubber)

	Minimum Base	Medium Base	Maximum Base
Size (inches)	7.25 x 6	7.25 x 9	7.25 x 13
Weight	4 lbs.	6 lbs.	10 lbs.
Area	43.50 sq.in.	65.25 sq.in.	94.25 sq.in.
Area per Support Bridge			
4 bases	174 sq.in.	261 sq.in.	377 sq.in.
Area per Pipe Section			
8 bases	348 sq.in.	522 sq.in.	754 sq.in.