

Moreno Engineering, Inc.

**Engineering Calculations for Pipe Support Systems
as manufactured by Advanced Support Products, Inc.
Utilizing 17" Circular Base
August 12, 2003**

- (fig. 1) Pipe Support Design Uplift Resistance
(figs. 2, 3 & 4) Typical Roof Loads Due to Gravity Bearing Stresses
(Minimum, Medium, Maximum Hanger Assemblies)
(fig. 5) Product Information – 17" Circular Bases**

After carefully reviewing the above mentioned products, we have concluded that the products as stipulated in this report meet or exceed the roof type pipe supports for similar applications.

The data utilized for these calculations was obtained from Uni-strut for the structural assemblies and from Grinnell for the pipe hangers. The information for the 17" circular injected molding plastic base was obtained from Advanced Support Products, Inc. product data.

The calculations performed are limited and only indicate 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 or water.

The piping and hanger assemblies mentioned herein are considered "dead" loads and should be taken into account during the 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 as noted herein 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 placed on a horizontal surface and pipe supports are normal to piping.

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 insulation types currently in use (5 psi maximum). Therefore, the Pipe Support Systems utilizing 17" circular bases as manufactured by Advanced Support Products, Inc. meet Factory Mutual Research Corporation's recommendation stipulating that the design uplift resistance for an adhered base should not exceed half of the ultimate design uplift resistance of the roof cover system. The uplift resistance of any roof system is therefore dependent on the uplift rating of the roof cover system.

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(fig. 1) Pipe Support Design Uplift Resistance

Advanced Support Products 17" CIRCULAR BASE UPLIFT RESISTANCE					
BASE SIZE (INCHES)	BASE AREA (SQ.IN.)	FM WIND UPLIFT RATING (PSF) **			
		60	90	150	180
12 x 12 (ref.)	144	30	45	75	90
17" diameter	227	47	71	118	142
** FACTORY MUTUAL RATINGS (LBS PER SQ. FT.)					

(fig. 2) Typical Roof Loads Due to Gravity Bearing Stresses
(Minimum Pipe Hanger Assemblies)
(4 Base system)

17" CIR. BASE AREA	908 sq.in.	
17" CIR. BASE WT	20.0 lbs	
FRAME WT.	29.0 lbs	
HANGER WT.	8.0 lbs	
ASSEMBLY WT.	57.0 lbs	1 pipe
	86.0 lbs	2 pipe

Pipe Dia.	Qty.	Pipe Contents	Pipe Support Spacing		
			6 Feet	8 Feet	10 Feet
4 inch	1	water	155.0 lbs 0.17 psi	187.0 lbs 0.21 psi	217.0 lbs 0.24 psi
	2	water	282.0 lbs 0.31 psi	346.0 lbs 0.38 psi	406.0 lbs 0.45 psi
6 inch	1	water	247.0 lbs 0.27 psi	307.0 lbs 0.34 psi	367.0 lbs 0.40 psi
	2	water	466.0 lbs 0.51 psi	586.0 lbs 0.65 psi	706.0 lbs 0.78 psi

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

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**(fig. 3) Typical Roof Loads Due to Gravity Bearing Stresses
(Medium Pipe Hanger Assemblies)
(4 Base System)**

17" CIR. BASE AREA	908 sq.in.	
17" CIR. BASE WT	20.0 lbs	
FRAME WT.	29.0 lbs	
HANGER WT.	8.0 lbs	
ASSEMBLY WT.	57.0 lbs	1 pipe
	86.0 lbs	2 pipe
	112.0 lbs	3 pipe

Pipe Dia.	Qty.	Pipe Contents	Pipe Support Spacing			
			6 Feet	8 Feet	10 Feet	
4 inch	1	gas	122 lbs	143 lbs	167 lbs	
			0.13 psi	0.16 psi	0.18 psi	
		water	155 lbs	187 lbs	217 lbs	
			0.17 psi	0.21 psi	0.24 psi	
		2	gas	216 lbs	258 lbs	306 lbs
				0.24 psi	0.28 psi	0.34 psi
	water		282 lbs	346 lbs	406 lbs	
		0.31 psi	0.38 psi	0.45 psi		
	3	gas	307 lbs	370 lbs	442 lbs	
			0.34 psi	0.41 psi	0.49 psi	
		water	406 lbs	502 lbs	592 lbs	
			0.45 psi	0.55 psi	0.65 psi	
6 inch	1	gas	167 lbs	207 lbs	247 lbs	
			0.18 psi	0.23 psi	0.27 psi	
		water	247 lbs	307 lbs	367 lbs	
			0.27 psi	0.34 psi	0.40 psi	
		2	gas	306 lbs	386 lbs	466 lbs
				0.34 psi	0.43 psi	0.51 psi
	water		466 lbs	586 lbs	706 lbs	
		0.51 psi	0.65 psi	0.78 psi		
	3	gas	442 lbs	562 lbs	682 lbs	
			0.49 psi	0.62 psi	0.75 psi	
		water	682 lbs	862 lbs	1042 lbs	
			0.75 psi	0.95 psi	1.15 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

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

17" CIR. BASE AREA	908 sq.in.	
17" CIR. BASE WT	20.0 lbs	
FRAME WT. **	29.0 lbs	
HANGER WT.	8.0 lbs	
ASSEMBLY WT.	57.0 lbs	1 pipe
	86.0 lbs	2 pipe
	112.0 lbs	3 pipe

Pipe Dia.	Qty.	Pipe Contents	Pipe Support Spacing			
			6 Feet	8 Feet	10 Feet	
4 inch	1	gas	122 lbs	143 lbs	167 lbs	
			0.13 psi	0.16 psi	0.18 psi	
		water	155 lbs	187 lbs	217 lbs	
			0.17 psi	0.21 psi	0.24 psi	
		2	gas	216 lbs	258 lbs	306 lbs
				0.24 psi	0.28 psi	0.34 psi
	water		282 lbs	346 lbs	406 lbs	
		0.31 psi	0.38 psi	0.45 psi		
	3	gas	307 lbs	370 lbs	442 lbs	
			0.34 psi	0.41 psi	0.49 psi	
		water	406 lbs	502 lbs	592 lbs	
	0.45 psi		0.55 psi	0.65 psi		
6 inch	1	gas	167 lbs	207 lbs	247 lbs	
			0.18 psi	0.23 psi	0.27 psi	
		water	247 lbs	307 lbs	367 lbs	
			0.27 psi	0.34 psi	0.40 psi	
		2	gas	306 lbs	386 lbs	466 lbs
				0.34 psi	0.43 psi	0.51 psi
	water		466 lbs	586 lbs	706 lbs	
		0.51 psi	0.65 psi	0.78 psi		
	3	gas	442 lbs	562 lbs	682 lbs	
			0.49 psi	0.62 psi	0.75 psi	
		water	682 lbs	862 lbs	1042 lbs	
	0.75 psi		0.95 psi	1.15 psi		
8 inch	1	gas	227 lbs	287 lbs	347 lbs	
			0.25 psi	0.32 psi	0.38 psi	
		water	357 lbs	457 lbs	557 lbs	
			0.39 psi	0.50 psi	0.61 psi	
		2	gas	426 lbs	546 lbs	666 lbs
				0.47 psi	0.60 psi	0.73 psi
	water		686 lbs	886 lbs	1086 lbs	
		0.76 psi	0.98 psi	1.20 psi		
	1	gas	297 lbs	377 lbs	467 lbs	
			0.33 psi	0.42 psi	0.51 psi	

1521Green Oak Place, Ste 190

Kingwood, Texas 77339

(281) 359-0133

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10 inch	2	water	507 lbs	657 lbs	807 lbs
			0.56 psi	0.72 psi	0.89 psi
		gas	566 lbs	726 lbs	906 lbs
			0.62 psi	0.80 psi	1.00 psi
12 inch	1	water	986 lbs	1286 lbs	1586 lbs
			1.09 psi	1.42 psi	1.75 psi
		gas	357 lbs	457 lbs	557 lbs
			0.39 psi	0.50 psi	0.61 psi
water	647 lbs	847 lbs	1047 lbs		
	0.71 psi	0.93 psi	1.15 psi		

The bearing stresses indicated above reflect utilization of an adjustable support bridge consisting Of 2 each Cross Brace Bridges, 2 each channel legs and 2 each Adjustable Cross Bars

(fig. 5) Product Information – 17” Circular Bases

STANDARD BASE	SIZE (INCHES)	WEIGHT (LBS)	AREA (SQ.IN.)
	17" Diameter	7 lbs	227
BASE AREA PER SUPPORT ASSEMBLY MODEL SS1000 PIPE SECTION			
(1 BASE)		7 lbs	227
BASE AREA PER ADJUSTABLE SUPPORT BRIDGE MODEL SS4000 PIPE SECTION			
(4 BASES)		28 lbs	908
BASE AREA PER ADJUSTABLE SUPPORT BRIDGE MODEL SS6000 PIPE SECTION			
(6 BASES)		42 lbs	1362
BASE AREA PER ADJUSTABLE SUPPORT BRIDGE MODEL SS8000 PIPE SECTION			
(8 BASES)		56 lbs	1816