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Sky Lift Hardware
Base Plate and Anchor Alternates

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Sky Lift Hardware Base Plate and Anchor Alternates

Sky Lift Hardware may be used in patio cover applications with column heights of 24", 30" or 36" where the governing loads are axial (dead) load combined with lateral wind, seismic, or other loads. Sky Lift Hardware may also be used in Shade Sail applications with column heights of 12", 14", 16" or 18" where the governing loads are transverse (perpendicular to the building wall) lateral loads. This evaluation considers alternates for the Base Plate and Anchors to simplify and standardize the designs. Base Plates will be considered in both 3.5" and 5.5" standard widths, to match either 4-inch or 6-inch wall top plates.

For Shade Sail applications, loads are governed by anchors, so consider alternates for patio cover applications first, and then determine capacities for Shade Sail applications.

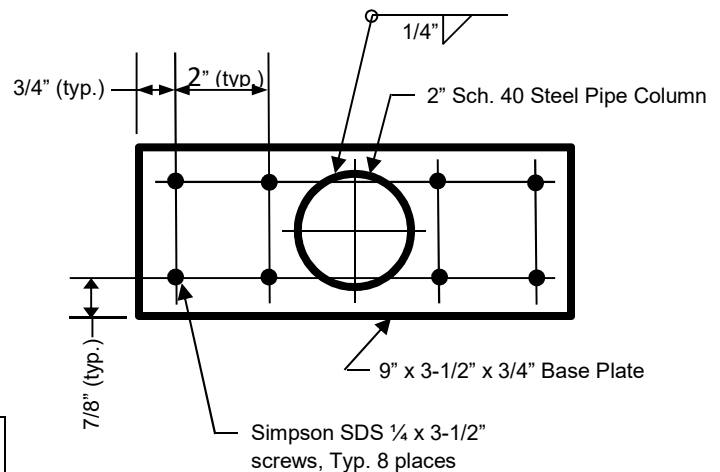
In patio cover applications, 2" Sch. 40 steel pipe Sky Lift Hardware has the following load capacities (see "Sky Lift Hardware, Evaluation for Lateral Loads", dated July 12, 2012), governed by column axial loads combined with column bending:

Sky Lift Hardware Load Capacity^{(1), (2)}

Column Height	24"	30"	36"
Load Capacity	3,822 lbs.	3,190 lbs.	2,737 lbs.

- (1) Stated loads capacities are vertical dead loads. The Sky Lift Hardware design includes up to 15% of vertical load as lateral load (in line with bearing wall), and up to 5% of vertical load as transverse load (perpendicular to bearing wall).
- (2) Higher levels of lateral and transverse load capacities require additional engineering.

The current Base Plate and Anchor design is shown below:



Consider first a 5-1/2" wide Base Plate similar to the current design, but with lateral gussets (equivalent to the "stiff" Base Plate assumed for maximum column loading). The Base Plate thickness will be governed by bending based on maximum anchor loads.

$$S = M / Z = 1.875 \times 2 \times T / Z, \text{ where}$$

S = Base Plate bending stress = 30,900 psi maximum

Z = section modulus = $b \times t^2 / 6 \text{ in}^3$

T = maximum anchor tension = 580 lbs.

b = Base Plate width = 4" (equivalent)

t = Base Plate thickness

$$t_{\min} = ((3.75 \times 580) \times 6 / 4 \times 30900)^{1/2} = 0.325"$$

Use 3/8" plate with 1/4" gussets.

For 3.5" wide Base Plate,

$$T_{\min} = ((1.75 \times 580) \times 6 / 4 \times 30900)^{1/2} = 0.222''$$

Use 3/8" plate for consistency.

Now consider these Base Plates and anchors for Shade Sail applications, where the Load Capacity will be governed by anchor pull-out from lateral (transverse) loads. Consider the 5.5 in. wide Base Plate to be "flexible", and the 3.5 in. wide Base Plate to be "stiff".

For the 5.5 in. wide (flexible) Base Plate,

$$T_{\max} = 580 = P \times L / 4 \times 3.75$$

$$P_{\max} = (580 \times 3.75 \times 4) / L, \text{ where}$$

P_{\max} = max. lateral (transverse) load, lbs.

L = column height, in.

For 12 in. column, $P_{\max} = 725$ lbs.

For 14 in. column, $P_{\max} = 621$ lbs.

For 16 in. column, $P_{\max} = 543$ lbs.

For 18 in. column, $P_{\max} = 483$ lbs.

For the 3.5 in. wide (stiff) Base Plate,

$$P_{\max} = 4 \times ((580 \times 2.625) + (580 \times 0.875^2 / 2.625)) / L$$

For 12 in. column, $P_{\max} = 563$ lbs.

For 14 in. column, $P_{\max} = 483$ lbs.

For 16 in. column, $P_{\max} = 423$ lbs.

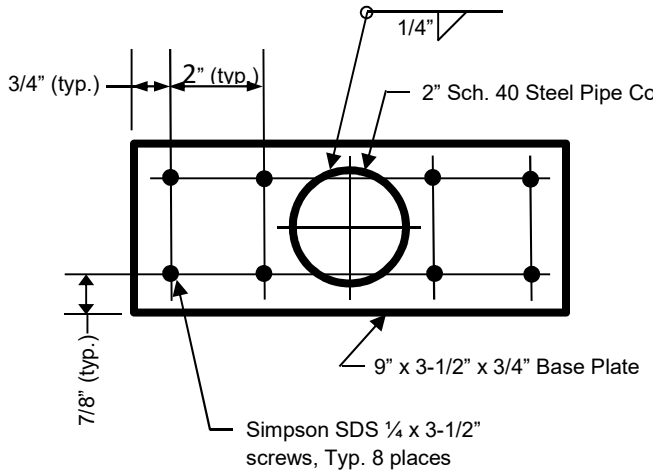
For 18 in. column, $P_{\max} = 375$ lbs.

Shade Sail load capacities and equivalent shade sail areas are as follows:

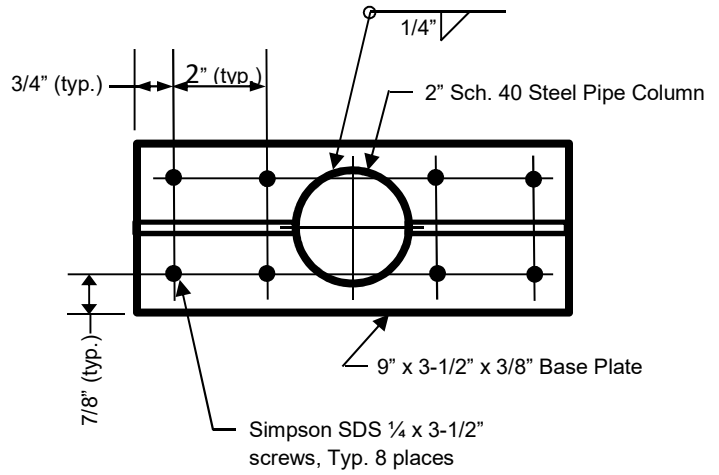
Column Height		5.5" wide Base Plate	3.5" wide Base Plate
12 in.	Load	725 lbs.	563 lbs.
	Sail Area	48.0 sq. ft.	37.5 sq. ft.
14 in.	Load	621 lbs.	483 lbs.
	Sail Area	41.4 sq. ft.	32.2 sq. ft.
16 in.	Load	543 lbs.	423 lbs.
	Sail Area	45.2 sq. ft.	28.2 sq. ft.
18 in.	Load	483 lbs.	375 lbs.
	Sail Area	32.2 sq. ft.	25.0 sq. ft.

Base Plate alternates are shown on page 4.

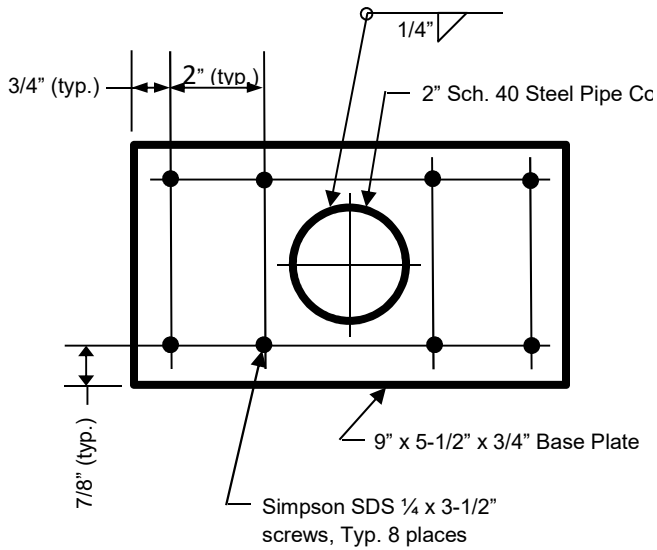
3.5" wide Base Plate, without gussets:



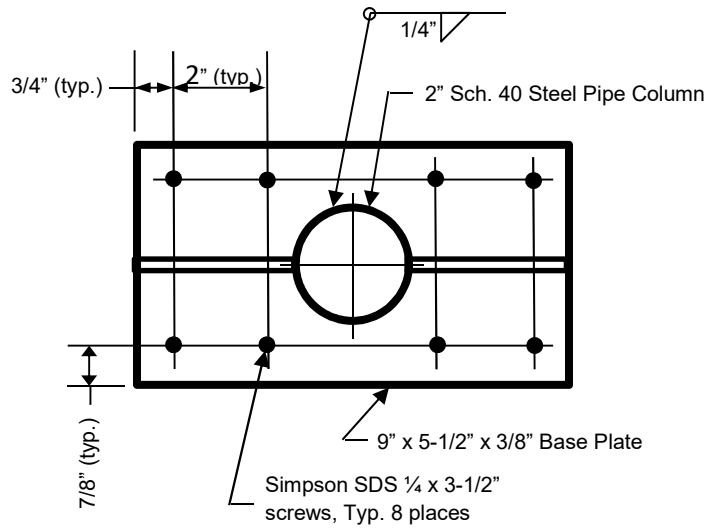
3.5" wide Base Plate, with gussets:



5.5" wide Base Plate, without gussets:



5.5" wide Base Plate, with gussets:



Typical gussets:

