SKYLIGHT STRUCTURAL INFORMATION

In this section we publish simplified engineering span charts and forms for estimating the size of frame members. We also provide basic information about reactions for some skylight shapes. Framework sizes are directly related to governing building codes, specified design loads, deflection criteria, and many other criteria. The more accurately these criteria are identified, the more accurately the sizes may be predicted.

Skylights can be considered to behave in different ways depending on how they are supported. Consider this structural information to be introductory to assist in determining feasibility and general appearance. All aspects of any given project must be evaluated to determine the appropriate skylight framing system.

Aluminum is high strength with low stiffness. The design strength of aluminum alloy 6005-T5 is comparable to A-36 steel. However, the stiffness, or modulus of elasticity of aluminum, is only about one-third that of steel. The design of aluminum in skylights is most often governed by deflection rather than stress.

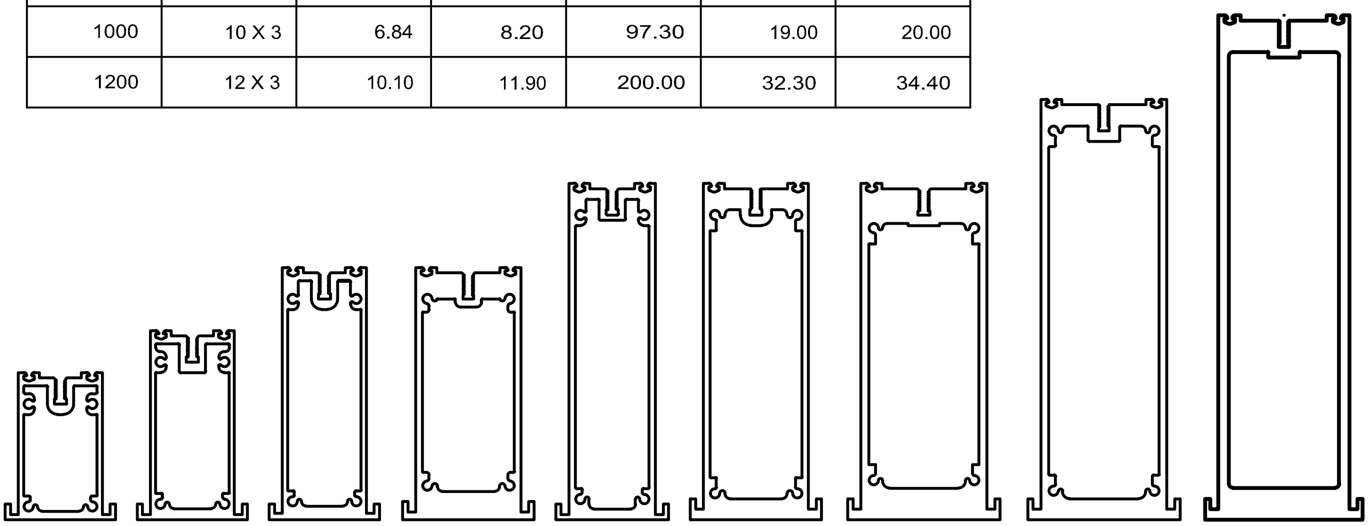
The deflection perpendicular (normal) to the glass plane is a primary concern of skylight engineering. This deflection is specified as a relative limit, for example, span/175 or L/175, and a maximum dimension, for example, 1". This assures proper glass support, effective condensation drainage and minimizes visible distortion. The deflection of the glazed frame in-plane is another concern. In-plane deflection is specified as a maximum ratio of edge clearance and glass bite, and a maximum dimension. The object is to prevent any glass-to-metal contact and to limit the movement of weatherseals and joints. As skylight geometric complexity increases, there are additional considerations for engineering concerns; side sway, story drift, racking, thermal movements, support settlement and stiffness. Some projects involve major expansion and seismic joints. When structures are complex, arched, segmented, cantilevered or multi-spanned, specific structural analysis and computer modeling may be required. Super Sky engineers all skylights with full consideration of all these factors.

There is no substitute for full structural calculations. It is appropriate to give equal consideration to connections within the framework, as well as to the building structure.

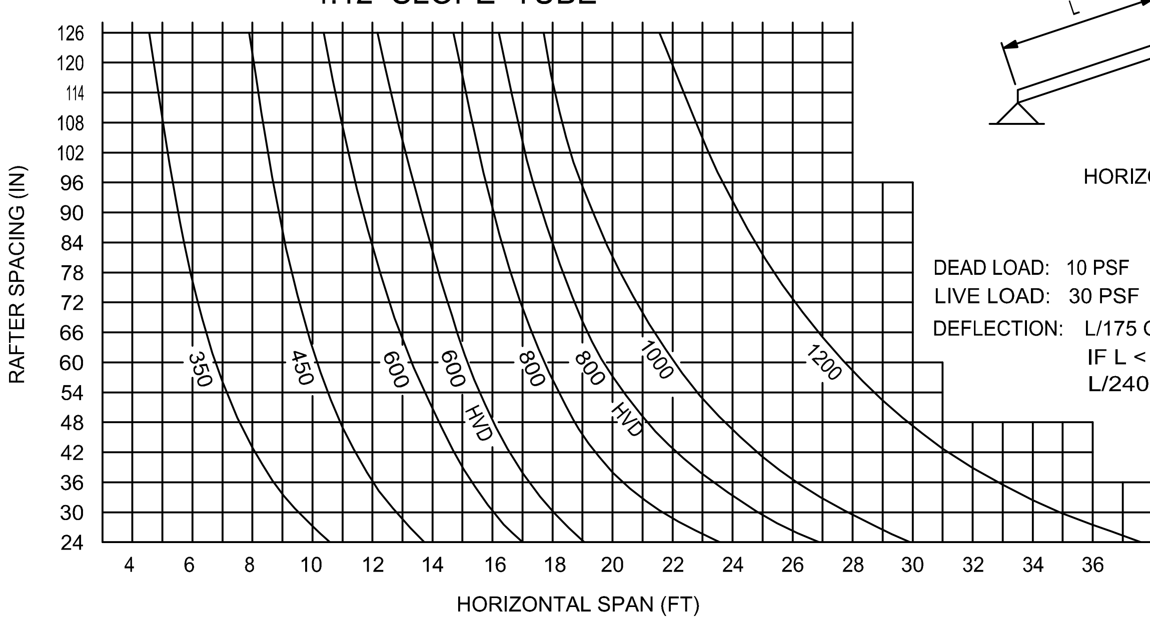
STRUCTURAL ENGINEERING GUIDELINES

TUBULAR SECTION PROPERTIES

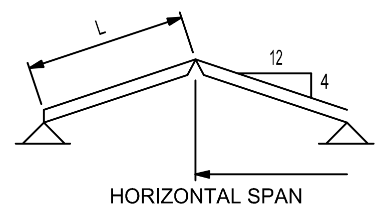
STRUCTURAL SERIES	DEPTH X WIDTH (IN.)	AREA (IN)	WT. PER FOOT (LBS.)	MOMENT OF INERTIA	SECTION MODULUS	
					TOP	BOTTOM
350	3-1/2 X 2	2.12	2.54	3.51	1.91	2.11
450	4-1/2 X 2	2.56	3.07	7.31	3.12	3.39
600	6 X 2	3.19	3.83	16.60	5.44	5.63
600HVD	6 X 2-1/2	5.07	6.08	26.73	8.30	9.61
800	8 X 2-1/2	5.32	6.38	50.15	12.18	12.91
800LT	8 X 2	4.08	4.90	34.62	8.70	8.60
800HVD	8 X 3	7.67	9.20	72.30	17.30	18.90
1000	10 X 3	6.84	8.20	97.30	19.00	20.00
1200	12 X 3	10.10	11.90	200.00	32.30	34.40



4:12 SLOPE TUBE



DEAD LOAD: 10 PSF
LIVE LOAD: 30 PSF
DEFLECTION: L/175 OR 1" MAX.
IF L < 20 FT.
L/240, IF L ≥ 20 FT.



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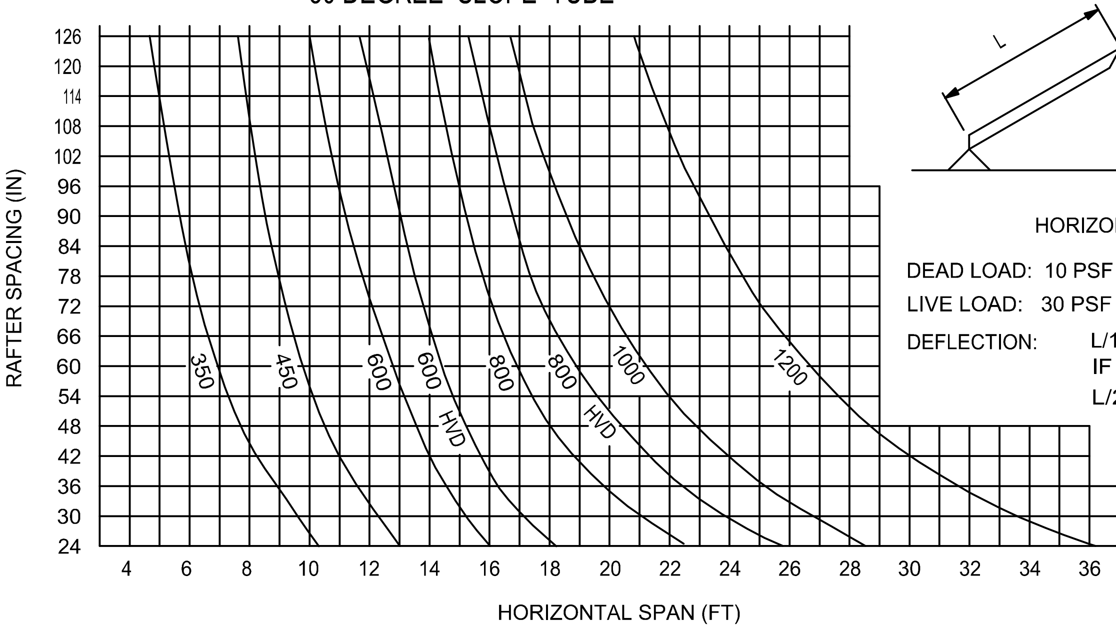
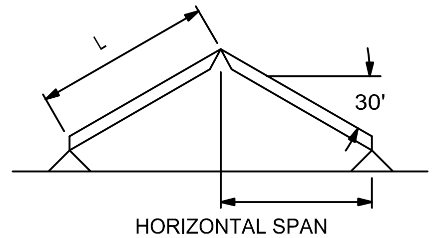
30 DEGREE SLOPE TUBE



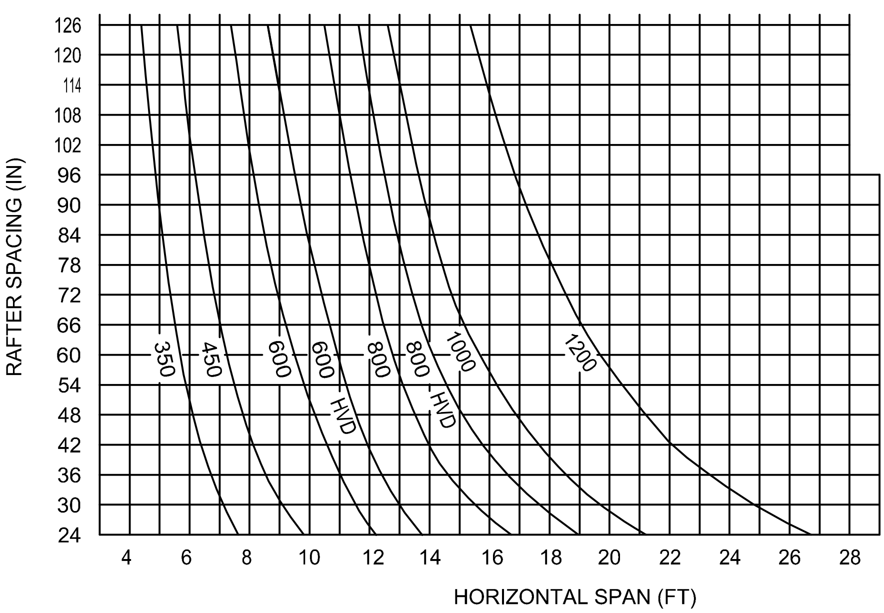


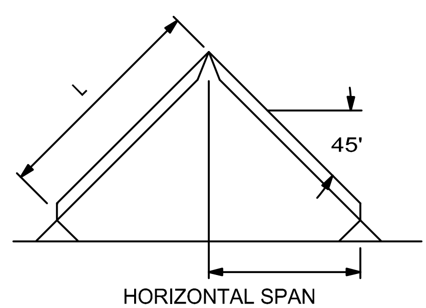
DEAD LOAD: 10 PSF

LIVE LOAD: 30 PSF

DEFLECTION: L/175 OR 1" MAX. IF L < 20 FT.
L/240, IF L ≥ 20 FT.

45 DEGREE SLOPE TUBE





DEAD LOAD: 10 PSF

LIVE LOAD: 30 PSF

WIND LOAD: 20 PSF

DEFLECTION: L/175 OR 1" MAX. IF L < 20 FT.
L/240, IF L ≥ 20 FT.

CAUTION: RAFTER SPACING CANNOT BE MODIFIED FOR DIFFERING LIVE LOADS OR WIND LOADS ON 45' SLOPE. PLEASE CONTACT SUPER SKY PRODUCTS FOR ANY REVISIONS TO THE ABOVE LOAD VALUES.

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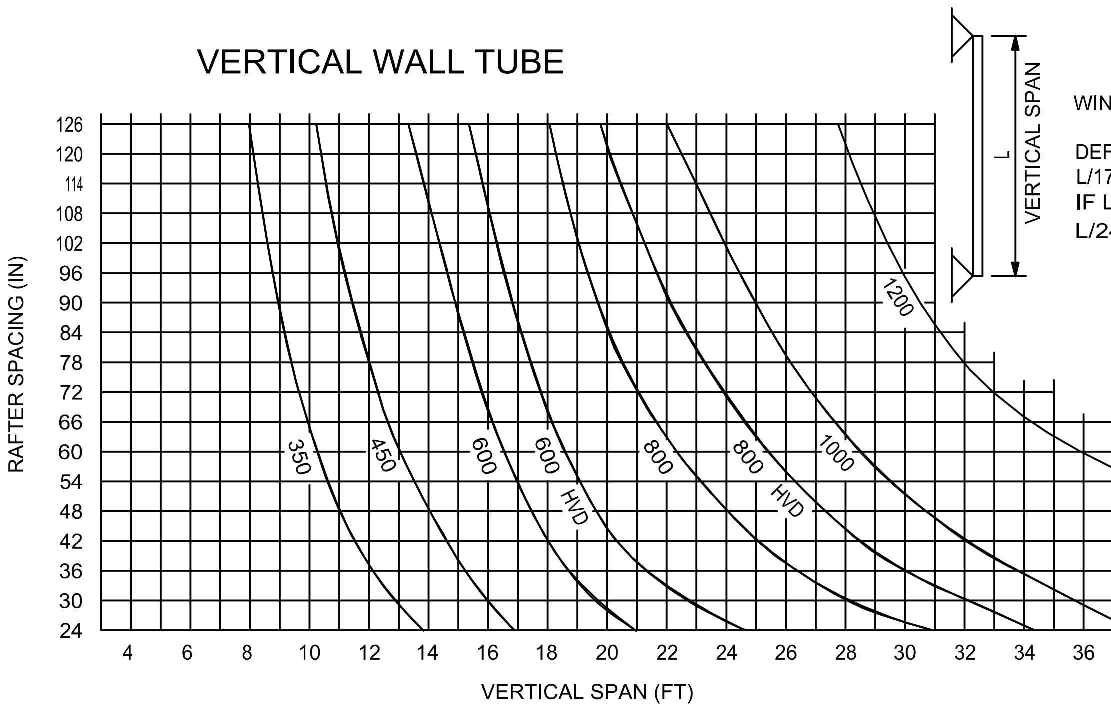
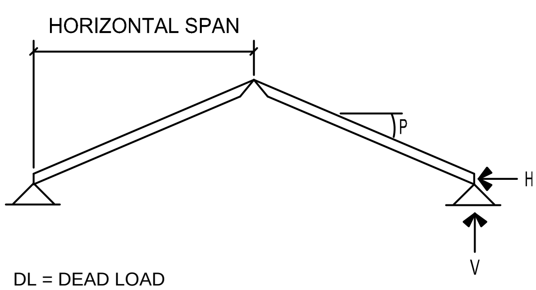
VERTICAL WALL TUBE



WIND LOAD: 20 PSF

DEFLECTION :
L/175 OR 1" MAX,
IF L < 20 FT.
L/240, IF L ≥ 20 FT.

VERTICAL & HORIZONTAL REACTIONS FOR RIDGE SKYLIGHTS



DL = DEAD LOAD
LL = LIVE LOAD
P = SKYLIGHT PITCH
C = 1/COS (P)
W = (C)(DL) + LL
V = W(RAFTER SPACING)(HORIZONTAL SPAN)
C_H= 1/[2TAN (P)]
H = (C)(V)

EXAMPLE:

10'-0" HORIZONTAL SPAN, 30° PITCH,
RAFTERS @ 36" C/C
LL = 40 PSF DL=10 PSF
W = (1.155)(10) + 40 = 52
V = (52)(3'-0")(10'-0") = 1560 LBS.
H = 0.866 (1560) = 1351 LBS.

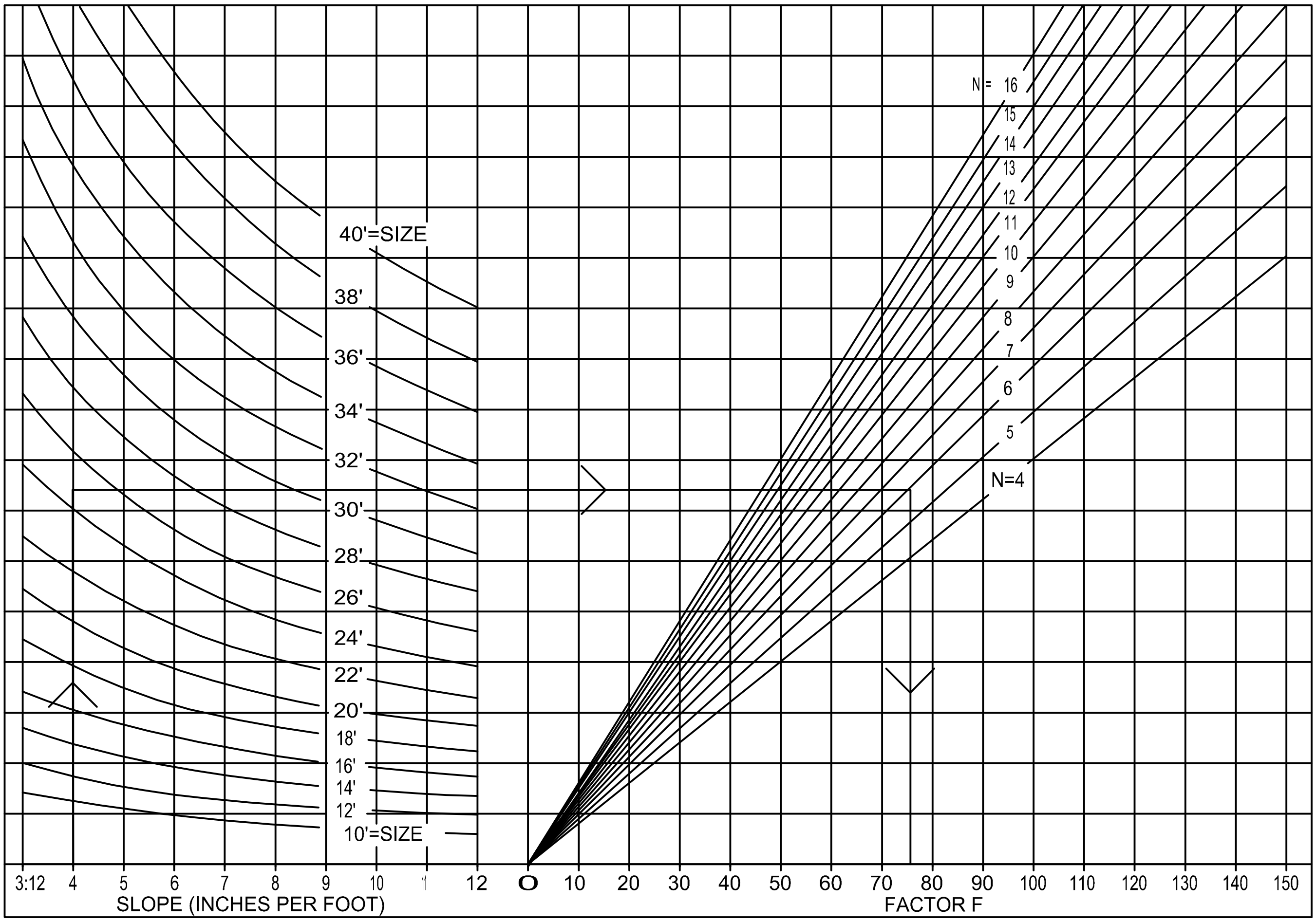
NOTE: IF PITCH IS LESS THAN 4 ON 12
PLEASE CONTACT SUPER SKY PRODUCTS
TO CONFIRM ENGINEERING ASSUMPTIONS.

SLOPE	C	C_H
4 ON 12	1.054	1.5
30°	1.155	0.866
45°	1.414	0.5

SPANNING CHART MODIFIER AND REACTIONS FOR RIDGE SKYLIGHTS

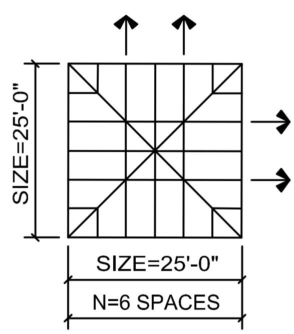
MAXIMUM HORIZONTAL THRUST

FOR PYRAMIDS



EXAMPLE

4:12 SLOPE
SIZE = 25'-0"
N = 6 SPACES
DEAD LOAD = 10 PSF
LIVE LOAD = 30 PSF



PYRAMID DESIGN

THE SIZE OF A PYRAMID'S HIP RAFTER CAN BE MINIMIZED WHEN THE SUPPORTING CURB IS CAPABLE OF RESISTING HORIZONTAL THRUST. A STIFF CURB ALLOWS THE PYRAMID RAFTERS TO SUPPORT AND STABILIZE THE HIP. A FLEXIBLE CURB FORCES THE HIP RAFTER TO ACT AS A SIMPLE BEAM. THE NOMOGRAPH ABOVE PREDICTS THE MAXIMUM HORIZONTAL THRUST WHEN ASSUMING AN INFINITELY RIGID SUPPORTING CURB. THIS ASSUMPTION IS CONSERVATIVE IN ALL CASES.

THRUST (T) = FACTOR F [DEAD LOAD +
(LIVE LOAD X COSINE OF SLOPE)]
T = F [DL + (LL X COS)]
T = 76 [10 PSF + (30 PSF X .9487)]
T = 76 [10 + 28.46]
T = 2923 LBS. (MAXIMUM OUTWARD AT
RAFTERS APPROX.AT THIRD POINTS)

PYRAMID DESIGN & REACTIONS