

SKYCO SKYLIGHTS – BURGLAR BAR CALCULATIONS

Dear Customer

May 16, 2016

Re: Burglar Bar System Load Capacity

Skyco's current burglar bar design will withstand loads greatly in excess of a 400 lbs load. A load of 400 lbs distributed over only 4 bars (spaced 5.28" apart) as a point load with ends free to rotate which is an extremely conservative analysis would create a deflection less than 0.15 inches. The attached analysis verifies structural performance capability.

Bob Sampson

Engineering & Technical Director

If there are any questions, or if additional assistance is required, please contact Skyco Skylights at: (949) 629-4090, or email Skyco Skylights at: info@skycoskylights.com

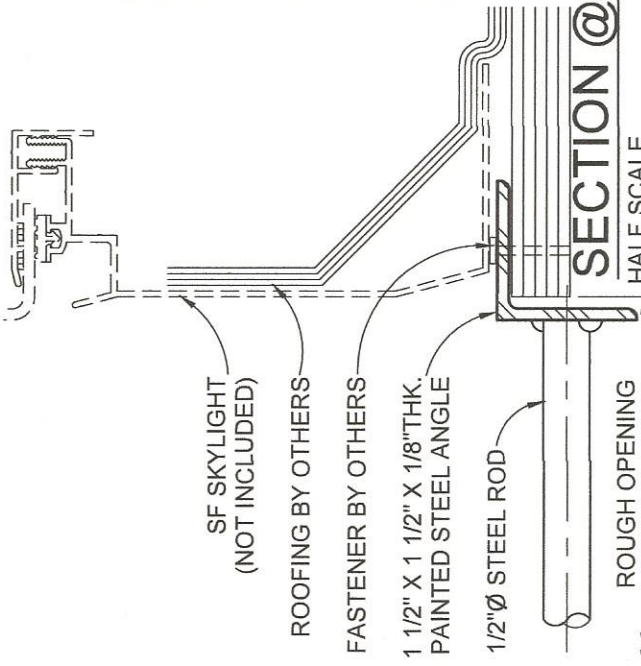
SKYCOO

SKYLIGHTS

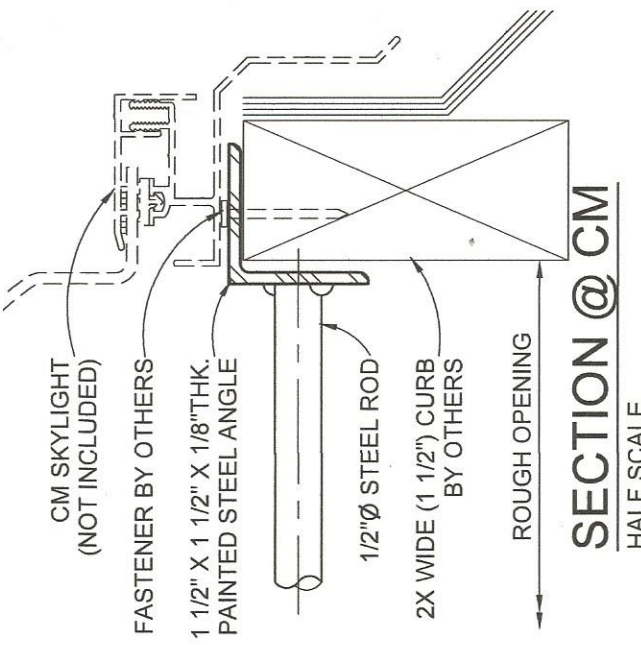
949-629-4090

- FINISH**
- WHITE POWDER COAT
 - OTHER:

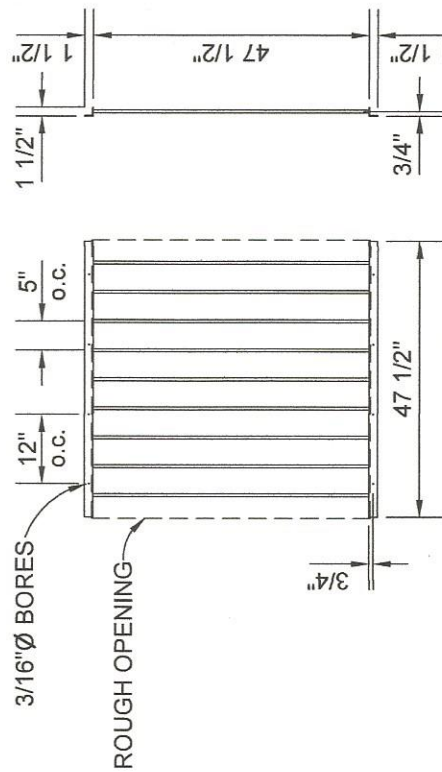
MODEL	ROUGH OPENING	QTY.
4848	SQUARE 48" x 48"	
4896	RECTANGULAR 48" X 96"	



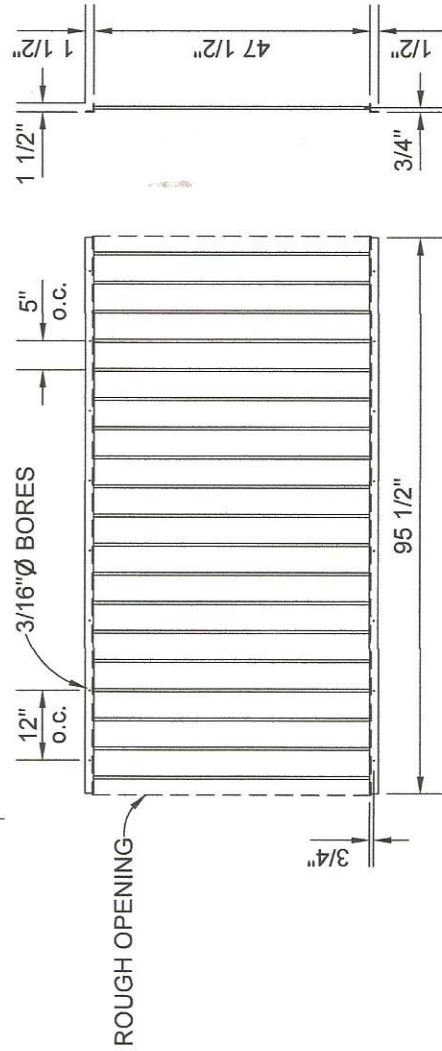
SECTION @ CM
HALF SCALE



SECTION @ SF
HALF SCALE



MODEL: 4848 SB-1
SCALE: 3/8" = 1'-0"



MODEL: 4896 SB-1
SCALE: 3/8" = 1'-0"

STEEL SECURITY BARS

DATE:

APPROVED BY:

PROJECT:		PROJECT ADDRESS:	
CUSTOMER:		CUSTOMER PHONE:	
REV. #	JOB #:	DATE:	DRAWING #:
			SKS-001

CASE 25.

Uniformly distributed load.

$$w := 1.0 \cdot \text{ft} \cdot \left(56.62 \frac{\text{lbf}}{\text{ft}^2} \right)$$

$$w = 4.7 \frac{\text{lbf}}{\text{in}}$$

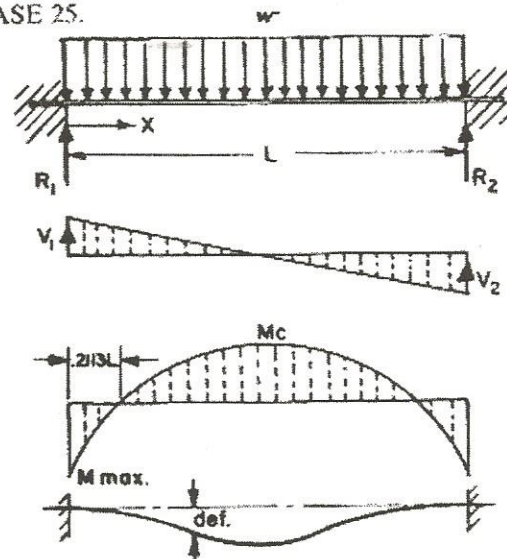
$$L := 3.95 \cdot \text{ft}$$

$$W := w \cdot L \quad W = 224 \text{ lbf}$$

1/2" diameter rod

$$I := 0.00307 \cdot \text{in}^4 \quad S_x := 0.01227 \cdot \text{in}^3$$

$$E := 29 \times 10^6 \cdot \text{psi}$$



$$R_1 := \frac{W}{2}$$

$$R_1 = 112 \text{ lbf}$$

$$R_2 := R_1$$

$$M_{\max} := \frac{-w \cdot L^2}{12}$$

$$M_{\max} = -883 \text{ in} \cdot \text{lbf}$$

Maximum (negative)
bending moment,
at end.

$$\sigma_{\max} := \frac{M_{\max}}{S_x}$$

$$\sigma_{\max} = -71998 \text{ psi}$$

Plastic hinge @ ends

$$M_c := \frac{w \cdot L^2}{24}$$

$$M_c = 442 \text{ in} \cdot \text{lbf}$$

Maximum (positive)
bending moment,
at center.

$$\sigma_c := \frac{M_c}{S_x}$$

$$\sigma_c = 35999 \text{ psi}$$

allow rod to go to yield @ center

Deflection:

$$y_{\text{allowed}} := \frac{L}{68}$$

$$y_{\text{allowed}} = 0.697 \text{ in}$$

$$y_{\max} := \frac{w \cdot L^4}{384 \cdot E \cdot I}$$

$$y_{\max} = 0.697 \text{ in}$$

deflection

$$F_y = 36 \text{ ksi (hot rolled - A36)}$$

$$\text{Total Uniform Load} = 56.62 \text{ #/ft} \cdot (4.0') \cdot 5 \text{ bars} = 1132 \text{ lb.}$$

Alloy Steel
 Aluminum
 Brass
 Bronze
 Copper
 Powdered Metals
 Plastics
 Stainless
 Steel
 Titanium
 Tool Steel



A36 Mild Steel

ASTM A36 steel is the most commonly available of the hot-rolled steels. It is generally available in round rod, square bar, rectangle bar, as well as steel shapes such as I-Beams, H-beams, angles, and channels. The hot roll process means that the surface on this steel will be somewhat rough. Note that its yield strength is also significantly less than 1018 - this means that it will bend much more quickly than will 1018. Finally, machining this material is noticeably more difficult than 1018 steel, but the cost is usually significantly lower.

ASTM A36 Mild (low-carbon) steel		
Minimum Properties	Ultimate Tensile Strength, psi	58,000 - 79,800
	Yield Strength, psi	36,300
	Elongation	20.0%
Chemistry	Iron (Fe)	99%
	Carbon (C)	0.26%
	Manganese (Mn)	0.75%
	Copper (Cu)	0.2%
	Phosphorus (P)	0.04% max
	Sulfur (S)	0.05% max

RESOURCES

Weight Calculator
 Links
 Fraction Equivalents
 Melting Points
 Hardness Table
 Galvanic Info
 Non-US Alloys

MATERIAL SAFETY DATA (MSDS) SHEETS

Aluminum
 Copper
 Nickel
 Stainless
 Steel
 Titanium

ENHANCED SEARCHES

Pipe
 Property
 Specification
 Clearance
 Product

1144 (Stressproof-equivalent) steel

This material is actually pretty cool, at least for steel. It is a higher-strength alloy than 1018 or A36, but in addition has improved ductility as well. The chief feature of 1144 steel, however, is that it has very low distortion or warpage after machining due to a combination of its chemistry, method of manufacture, and heat treatment. Finally, 1144 is relatively easy to machine, with a machinability rating of 83% of AISI 1212 steel.

1144 (Stressproof-equivalent) steel		
Minimum Properties	Ultimate Tensile Strength, psi	115,000
	Yield Strength, psi	100,000
	Elongation	8.0%
	Rockwell Hardness	B95 / C17
Chemistry	Iron (Fe)	97.54 - 98.01%
	Carbon (C)	0.4 - 0.44%
	Manganese (Mn)	1.35 - 1.65%
	Phosphorus (P)	0.04% max
	Sulfur (S)	0.24 - 0.33%

12L14 free machining steel

This alloy has lead added to the mix in order to enhance its machinability. In fact, it is rated with a machinability of 160% of AISI 1212 steel. The addition of lead does, however, reduce the strength of this alloy, although it is generally stronger than 1018.

12L14 free machining steel		
Minimum Properties	Ultimate Tensile Strength, psi	78,300
	Yield Strength, psi	60,200
	Elongation	10.0%
	Rockwell Hardness	B84
Chemistry	Iron (Fe)	97.91 - 98.7%
	Carbon (C)	0.15% max
	Manganese (Mn)	0.85 - 1.15%