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ENGINEERING + DESIGN

Wind Calculations
for
York Sunline Magna Series Rooftop Equipment
Kit #80-265-18**
2017 Florida Building Code requirements

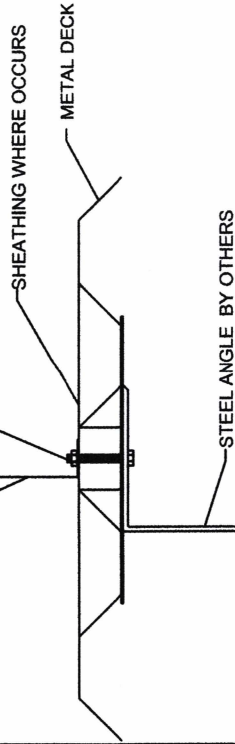


Prepared for:
PROVENT / RRS
3847 Wabash Drive
Mira Loma, CA 91725

Date: January 25, 2019
Project Number: PV1807

STEEL ATTACHMENT

CENTER ON CURB FLANGE. SEE TABLE FOR QUANTITY OF EVENLY SPACED 5/8" Ø A307 BOLTS ATTACHED TO STEEL ANGLE BELOW DECK AT EACH CONNECTION POINT.



CURB KIT	NO. OF ANCHORAGE BOLTS REQUIRED		UNIT
	LONG SIDE *	SHORT SIDE *	
80-265-49	2 @ 34.5" o.c.	2 @ 19" o.c.	LXS
80-265-50	2 @ 34.5" o.c.	2 @ 29" o.c.	LXL
80-265-13	2 @ 61" o.c.	2 @ 25.3" o.c.	SUNLINE 3-6 TON
80-265-45	2 @ 58.4" o.c.	2 @ 28.2" o.c.	PRESTIGE SMALL
80-265-46	2 @ 72" o.c.	2 @ 41" o.c.	PRESTIGE LARGE
80-265-29	3 @ 34.7" o.c.	2 @ 39.5" o.c.	PREDATOR
80-265-19	3 @ 51.6" o.c.	2 @ 72" o.c.	SUNLINE ULTRA
80-265-18	4 @ 38.1" o.c.	3 @ 36" o.c.	SUNLINE MAGNA

WOOD ATTACHMENT

CENTER ON CURB FLANGE. SEE TABLE FOR QUANTITY OF EVENLY SPACED 5/8" Ø WOOD LAG SCREWS (3.5" MIN. EMBED. INTO WOOD FRAMING)



CURB KIT	NO. OF ANCHORAGE SCREWS REQUIRED		UNIT
	LONG SIDE	SHORT SIDE	
80-265-49	5 @ 9.6" o.c.	3 @ 11.5" o.c.	LXS
80-265-50	5 @ 9.6" o.c.	5 @ 8.3" o.c.	LXL
80-265-13	8 @ 9.3" o.c.	4 @ 9.8" o.c.	SUNLINE 3-6 TON
80-265-45	6 @ 12.5" o.c.	3 @ 16.1" o.c.	PRESTIGE SMALL
80-265-46	6 @ 15.2" o.c.	4 @ 15" o.c.	PRESTIGE LARGE
80-265-29	14 @ 5.6" o.c.	7 @ 7.3" o.c.	PREDATOR
80-265-19	15 @ 7.7" o.c.	12 @ 6.9" o.c.	SUNLINE ULTRA
80-265-18	23 @ 5.4" o.c.	14 @ 5.8" o.c.	SUNLINE MAGNA

FOUR INCHES FROM EACH CORNER EVENLY SPACED.

WIND LOAD ROOF ANCHORAGE DETAIL

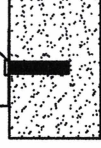
Meets wind requirements for the following codes:
FBC 2017
based on ASCE 7-10.

Wind:

190 mph exposure D category III or IV building, max BLDG height: 60 ft
Kzt=1.00 max

CONCRETE ATTACHMENT

CENTER ON CURB FLANGE. SEE TABLE FOR QUANTITY OF EVENLY SPACED 3/4" Ø THROD ROD IN HILT HIT-HY 200 EPOXY, 4" MIN. EMBED INTO CONCRETE.

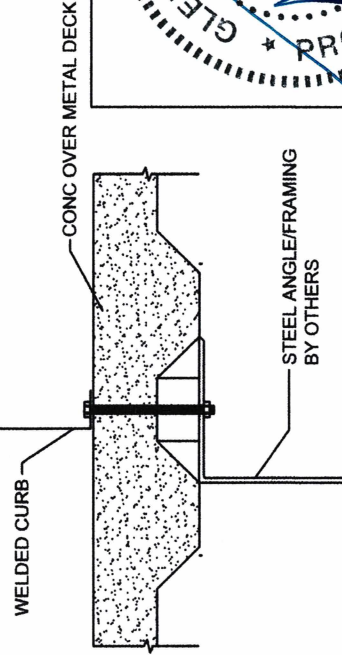


- NORMAL WEIGHT CONC SLAB
- $f_c=4000$ PSI MIN
- 6" MIN THICK CONC.
- SPECIAL INSPECTION REQUIRED (ESR-3187)

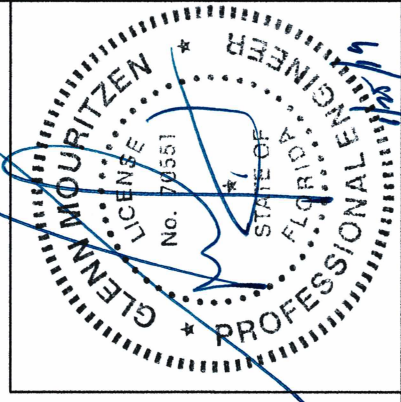
CURB KIT	NO. OF ANCHORAGE BOLTS REQUIRED		UNIT
	LONG SIDE *	SHORT SIDE **	
80-265-49	5 @ 8.6" o.c.	4 @ 6.3" o.c.	LXS
80-265-50	5 @ 8.6" o.c.	5 @ 7.25" o.c.	LXL
80-265-13	9 @ 7.63" o.c.	6 @ 5.1" o.c.	SUNLINE 3-6 TON
80-265-45	6 @ 11.7" o.c.	4 @ 9.4" o.c.	PRESTIGE SMALL
80-265-46	6 @ 14.4" o.c.	5 @ 10.25" o.c.	PRESTIGE LARGE
80-265-29	16 @ 4.63" o.c.	10 @ 4.4" o.c.	PREDATOR
80-265-19	15 @ 7.4" o.c.	12 @ 6.5" o.c.	SUNLINE ULTRA
80-265-18	22 @ 5.4" o.c.	17 @ 4.5" o.c.	SUNLINE MAGNA

STEEL AND CONCRETE ANCHORS ARE 6" FROM EACH CORNER EVENLY SPACED

CONCRETE OVER METAL DECK



NOTE: FOR CONC OVER METAL DECK OVER STEEL FRAMING USE STEEL ATTACHMENT



SUBMITTED TO:
COMPANY:
JOB NAME:
EQUIPMENT:
NOTES:

RRS *ROOFTOP* SYSTEMS

FORM NO:
CB-25A

DATE: 01/07/19
REV: 1
DRAWN BY: FMM

1625 DIPLOMAT DRIVE
CARROLLTON, TX 75006
PHONE (972) 247-7447
FAX (972) 243-0940

For wood, concrete and steel attachments see Roof Anchorage Detail, Form No. CB-25A.

Will conform to wind load code requirements for knock-down or pre-assembled application. (Contact factory for assembled version.)

CALCULATED WIND ROOF CURBS FOR YORK UNITS SERIES 20/ LARGE SUNLINE- LONG RAIL

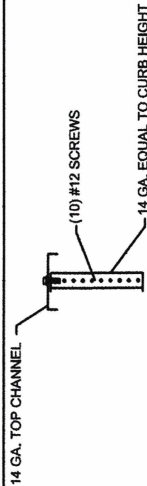
ZJ/ZR 180-300: ZF 210-300: XP 180-240

ProVent P/N	A	WEIGHT
80-265-1814	14"	332 Lbs
80-265-1818	18"	441 Lbs

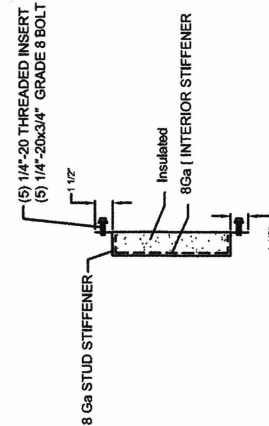
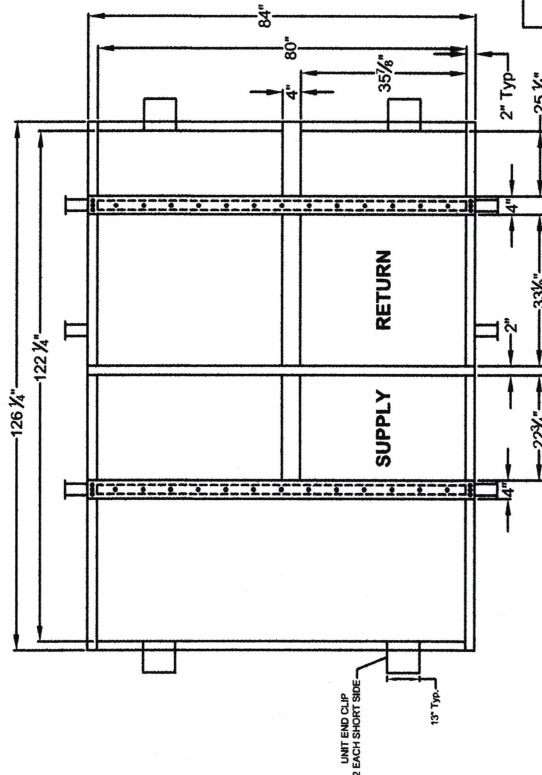
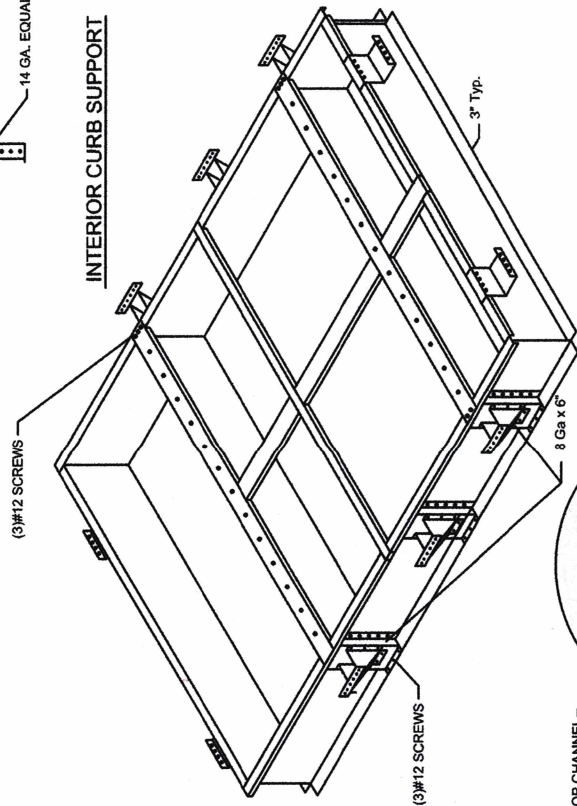
Meets wind requirements for the following codes:
FBC 2017
based on ASCE 7-10.

Wind:

185 mph exposure D category III or IV building, max BLDG height: 60 ft
Kz1=1.66max

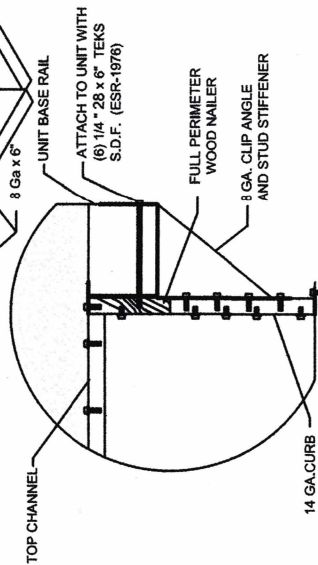


INTERIOR CURB SUPPORT

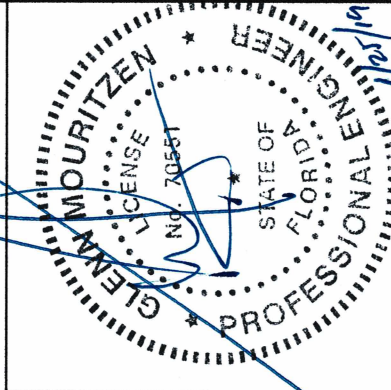
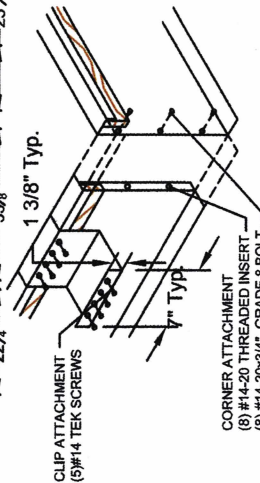


STUD STIFFENER

HOLD DOWN DETAIL



CORNER & END CLIP DETAIL



1625 DIPLOMAT DRIVE
CARROLTON, TX 75006
PHONE (972) 247-7447
FAX (972) 243-0940

SUBMITTED TO:
COMPANY:
JOB NAME:
EQUIPMENT:
NOTES:

FORM NO:
CBKD-91A

PART NUMBER:
80-265-18

DATE:
01/07/19

REV:
-
DRAWN BY:
FMM





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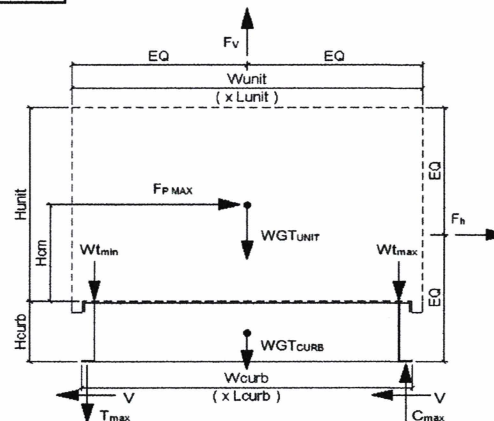
Client: ProVent PV1807
Description: 80-265-18**
Unit: York Sunline Magna Series Rooftop Equipment

Curb Information

Hcurb = 18 in (Height of curb)
Lcurb = 126.25 in (Length of curb)
wcurb = 84 in (Width of curb)
WGTcurb = 441 lbs (Weight of curb)

Unit Information

WGTunit = 2006 lbs (Weight of Unit)
Wtmax = 534 lbs (Maximum corner weight)
Wtmin = 470 lbs (Minimum corner weight)
Hunit = 52.625 in (Height of unit above curb)
Hcm = 26.3125 in (Height to center of mass)
Lunit = 180.59 in (Length of unit)
Wunit = 92 in (Width of unit)



Seismic Loading - 2017 FBC/2015 IBC

Ss = 0.15 (Worst Case for state of Florida)
Fa = 2.5 (Worst case Site class E from Table 11.4-1 ASCE 7-10)
Sms = 0.375 (Fa*Ss)
Sds = 0.250 (2/3*Sms)
Ip = 1.5 (Importance Factor Category III or IV Building)
Fpmax = 0.6000 WGTunit (1.6*Sds*Ip)*WGTunit
FpmaxASD = 843 lbs (0.7*Fpmax)
FpmaxASD = 1028 lbs (unit and curb)
(unit only)

Wind Loading - 2017 FBC/2015 IBC

*** Exposure Category D ***

Kz = 1.31 (For 60 ft roof height, Exposure D - Table 29.3-1 ASCE 7-10)
Kzt = 1.66 (Max. assumed topographic factor)
Kd = 0.85 (Directionality factor Table 26.6-1 ASCE 7-10)
V = 190 (Wind velocity, mph for Occupancy Cat III-IV bldgs Exp. Cat D)
GCr(horiz) = 1.9 (Refer Sect 29.5.1 ASCE 7-10)
GCr(vert) = 1.5 (Refer Sect 29.5.1 ASCE 7-10)
qz = 170.8 psf = 0.00256*Kz*Kzt*Kd*V² (Eq. 29.3-1 ASCE 7-10)
Fh ASD trans = 17248 lbs = 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.5-2)
Fh ASD long = 8787 lbs = 0.6*qz*GCr*Wunit*(Hunit+Hcurb)
Fvert ASD = 17738 lbs = 0.6*qz*GCr*Lunit*Wunit (Eq. 29.5-3)

Curb Loading

Transverse:

Compression_{SEISMIC} = 1369 lbs = [FpmaxASD*Hcm+2*(1+0.14S_{DS})*Wtmax*wcurb]/wcurb
Tension_{SEISMIC} = 236 lbs = Comp_{SEISMIC}-(0.6-0.14S_{DS})*WGTunit
Compression_{WIND} = -2825 lbs = [Fh trans ASD*Hcm+2*0.6*Wtmax*wcurb-Fvert ASD*wcurb/2]/wcurb
Tension_{WIND} = 13709 lbs = Comp_{WIND}+Fvert-0.6*WGTunit

----> Negative values indicate Compression load rather than Tension.

Longitudinal:

Compression_{SEISMIC} = 1281 lbs = [FpmaxASD*Hcm+2*(1+0.14*S_{DS})*Wtmax*Lcurb]/Lcurb
Tension_{SEISMIC} = 148 lbs = Comp_{SEISMIC}-(0.6-0.14S_{DS})*WGTunit
Compression_{WIND} = -6397 lbs = [Fh trans ASD*Hcm+2*0.6*Wtmax*Lcurb-Fvert ASD*Lcurb/2]/Lcurb
Tension_{WIND} = 10138 lbs = Comp_{WIND}+Fvert-0.6*WGTunit

----> Negative values indicate Compression load rather than Tension.

Governing Reactions:

Transverse:	Comp _{MAX} = 1369 lbs	----> Along long edge of curb.
(on long edge)	Tens _{MAX} = 13709 lbs	----> Along long edge of curb.
Longitudinal:	Comp _{MAX} = 1281 lbs	----> Along short edge of curb.
(on short edge)	Tens _{MAX} = 10138 lbs	----> Along short edge of curb.

----> Negative values indicate Compression load rather than Tension.

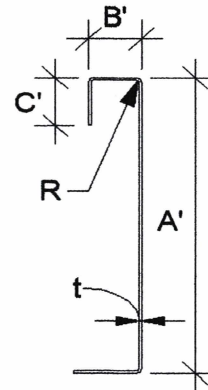


Curb Design

Fy = 50 ksi Fu = 65 ksi t = 0.0713 14 Gauge
E = 29500 ksi

Calculate Section Properties of Curb

A' = 18.000 in a = 17.644 in = A' - (2r + t)
B' = 3.000 in a' = 17.929 in = A' - t
C' = 1.000 in (0 if no lips) b = 2.644 in = B' - [r + t/2 + a(r + t/2)]
a = 1.000 (0 - no Lip; 1 w/ lip) b' = 2.929 in = B' - (t/2 + at/2)
R = 0.1069 (Inside bend radius) c = 0.822 in = a[C' - (r + t/2)]
t = 0.0713 in c' = 0.964 in = a[C' - t/2]
r' = 0.143 in = R + t/2 u = 0.224 in = $\pi r/2$
x = 0.544 in (Distance between centroid and web centerline)
Ix = 76.324 in (Moment of Inertia about X-Axis)
Iy = 1.759 in (Moment of Inertia about Y-Axis)
A = 1.82 in²
rx = 6.48 in
ry = 0.984 in
rmin = 0.984 in



Axial Compression

Pu = 8.624 k (Max Axial Comp) $\Omega_c = 1.80$
Pn/ Ω_c = 36.083 k
Fe = 62.46 ksi
 $\lambda_c = 0.89$ If $\lambda_c \leq 1.5$; $F_n = (0.658^{\lambda_c^2}) F_y$
Fn = 35.76 ksi If $\lambda_c > 1.5$; $F_n = \frac{0.877}{\lambda_c^2} F_y$
Ly = 84 in Lateral unbraced length
 $k_y L_y / r_y = 68$ (assume k=0.8)

Compression Check = O.K.

Check Web Crippling

h = 18 in -- Check limits: C = 4.00
t = 0.0713 in h/t = 252.45 $\leq$ 200 $C_R = 0.14$
N = 7.00 N/t = 98.18 $\leq$ 210 $C_N = 0.35$
 $\Omega_w = 1.75$ N/h = 0.388889 $\leq$ 2.0 $C_h = 0.02$
Pn = 2.296 k R/t = 1.50 $\leq$ 9.0
Pn/ Ω_w = 1.312 k
Long side: Pu_{trans} = 0.456 k O.K. # clips = 3
Short side: Pu_{Long} = 0.640 k O.K. # clips = 2

***h/t > 200; use web stiffeners

Check Web Stiffener

16Ga x 3/4" x 7" (C-channel)
width of stiffener = 7.000 in ts = 0.0566 16 Gauge
web of stiff. w = 6.717 in Rs = 0.0849 in
***Check w/ts $\leq$ 1.28 $\sqrt{E/F_y}$ $\Omega_c = 1.70$
w/ts = 118.675
1.28 $\sqrt{E/F_y}$ = 31.091 --> w/ts over limit Use C3.7.2
Pn = 0.7(P_{wc} + A_eF_y) $\geq$ P_{wc}
Pwc = 2.296 k Ae = 0.380 in²
Pn = 14.913 k Pn/ Ω = 8.773 k
O.K.

Corner Connections

1/4" ϕ SAE Grade 8 bolts w/ 1/4-20-UNC Threaded inserts

Tcrnmax = 4312 lbs Max(F_{pmaxASD}/4 -OR- F_{hASDtrans}/4 corner connections)
Vcrnmax = 6855 lbs (Max Ten/2 corner connections per side)
Bolt: Tall = 2480 lbs Vall = 1096 lbs
Threaded Insert: Tall = 2860 lbs Vall = 1714 lbs

of Bolts required for Tension = 1.7
of Bolts required for Shear = 6.3
of Bolts Used = 7.0

Check Combined Stress in Bolts & Inserts: 1.142 N.G. StressComb = 0.999 O.K.

***If combined fails:
USE --> 8.0

Check 1/8" welded connection

---- USE WELD

$\Omega = 2.35$

Assume L/t > 25: 25*t = 1.783 in $P_n/\Omega = \frac{1}{\Omega} 0.75 t L F_u \geq V_{req}$ $L_{req} d = \frac{V_{req} \Omega}{0.75 t F_u}$
Lreq'd = 4.634 in



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Connection Unit to Curb Clip

#14 SMS screw

$\Omega = 3.0$

$t_1 = 0.0713$ in

$F_{u1} = 65$ ksi

$t_2 = 0.1017$ in (unit base rail thickness)

$F_{u2} = 65$ ksi

$d = 0.242$ in (screw diameter)

$dw = 0.500$ in (nom. washer diameter)

$t_2/t_1 = 1.4$

For $t_2/t_1 \leq 1.0$:

Shear: $P_{ns} = 4.2F_{u2}\sqrt{t_2^3d}$ 3028 # 4.36 k

$P_{ns} = 2.7t_1dF_{u1}$ 3.03 k

$P_{ns} = 2.7t_2dF_{u2}$ 4.32 k

$P_{ns}/\Omega = 1009$ # <- Controls

$P_{ss}/\Omega = 1045$ #

Tension: $P_{not} = 1.360$ k (screw pull-out strength)

For $t_2/t_1 \geq 2.5$:

$P_{ns} = 2.7t_1dF_{u1}$ 3028 # 3.03 k

$P_{ns} = 2.7t_2dF_{u2}$ 4.32 k

$P_{not} = 0.85t_c d F_{u2}$

$t_c = \min(t_1, t_2)$

$P_{nov} = 1.5t_1 d_w F_{u1}$

$P_{ts}/\Omega = 453$ # <- Controls

$P_{ts}/\Omega = 1220$ #

(full tensile screw capacity)

	Shear (k)	# clips	V_{clip} (k)	V_{allow} (lb)	# screws	spacing
Long side:	17.248	3	5.75	1009 #	6	1.20 in
Short side:	8.787	2	4.39	1009 #	5	1.50 in

clip width (in) = 7.00

min spacing = 0.73 in

clip height = 2.5 in

edge distance = 0.5 in (min. 1.5d)

thinnest part = 0.0713 AISI BSR applies

$\Omega = 2.22$ bolt/screw connection

$A_{nv} = 0.369$ in²

$A_{nt} = 0.080$ in²

Check Block shear rupture: O.K.

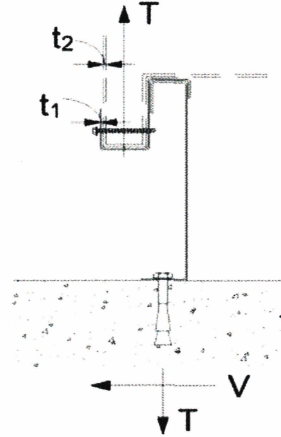
$F_y = 50$ ksi

$A_{gv} = 0.463$ in²

$R_n/\Omega = 8.620$ k

BSR O.K.

$R_n = 0.6F_y A_{gv} + F_u A_{nt} \leq 0.6F_u A_{nv} + F_u A_{nt}$
(AISI Sect. E5.3)



Connection of Curb to Supporting Structure

Roof Loading SEISMIC: (0.6-0.14SDS)D + 0.7E

WIND: 0.6D + W

Transverse: Uplift_{MAX} = 17234 lbs Shear_{MAX} = 8624 lbs

Compression_{SEISMIC} = 1808 lbs = $[F_{pmaxASD}*(H_{cm}+H_{curb})+(1+0.14S_{DS})*(WGT_{unit+curb}/2)*w_{curb}]/w_{curb}$

Tension_{SEISMIC} = 426 lbs = $Comp_{SEISMIC}-(0.6-0.14S_{DS})*(WGT_{unit+curb})$

Compression_{WIND} = 964 lbs = $[F_{htransASD}*(H_{cm}+H_{curb})+0.6*(WGT_{unit+curb}/2)*w_{curb}-F_{vertASD}*w_{curb}/2]/w_{curb}$

Tension_{WIND} = 17234 lbs = $[F_{htransASD}*(H_{cm}+H_{curb})-0.6*(WGT_{unit+curb}/2)*w_{curb}+F_{vertASD}*w_{curb}/2]/w_{curb}$

Longitudinal: Uplift_{MAX} = 11219 lbs Shear_{MAX} = 4393 lbs

Compression_{SEISMIC} = 1627 lbs = $[F_{pmaxASD}*(H_{cm}+H_{curb})+(1+0.14S_{DS})*(WGT_{unit+curb}/2)*L_{curb}]/L_{curb}$

Tension_{SEISMIC} = 244 lbs = $Comp_{SEISMIC}-(0.6-0.14S_{DS})*(WGT_{unit+curb})$

Compression_{WIND} = -5051 lbs = $[F_{htransASD}*(H_{cm}+H_{curb})+0.6*(WGT_{unit+curb}/2)*L_{curb}-F_{vertASD}*L_{curb}/2]/L_{curb}$

Tension_{WIND} = 11219 lbs = $[F_{htransASD}*(H_{cm}+H_{curb})-0.6*(WGT_{unit+curb}/2)*L_{curb}+F_{vertASD}*L_{curb}/2]/L_{curb}$

Wood Attachment: Use 5/8" ϕ wood lag screws

w/ 3.5" Min. Embed

Tall_{metal} = 946.67 lbs

Vall_{metal} = 1043.33 lbs

Transverse: Tall_{wood} = 1195.95 lbs

Vall_{wood} = 1024 lbs

of Screws Req'd for Uplift = 18.20

COMBINED LOADING: 0.993 O.K.

of Screws Req'd for Shear = 8.42

Screw Spacing = 5.4 in o.c.

Total # of screws Required = 23

Use 5/8" ϕ wood lag screws @ 5.4 in o.c. along long side of curb w/ 3.5" Min. Embed

Longitudinal:

of Screws Req'd for Uplift = 11.9

COMBINED LOADING: 0.977 O.K.

of Screws Req'd for Shear = 4.3

Screw Spacing = 5.8 in o.c.

Total # of screws Required = 14

Use 5/8" ϕ wood lag screws @ 5.8 in o.c. along short side of curb w/ 3.5" Min. Embed

Steel Deck Attachment: Use 5/8" ϕ A307 Bolts attached to steel angle below deck

Tall_{bolt} = 6903 lbs

Vall_{bolt} = 3682 lbs

Transverse: Tall_{bolt} = 6903 lbs

Vall_{bolt} = 3682 lbs

of Bolts Req'd for Uplift = 2.50

COMBINED LOADING: 0.866 O.K.

of Bolts Req'd for Shear = 2.34

Bolt Spacing = 38.1 in o.c.

Total # of Bolts Required = 4

Use 5/8" ϕ A307 Bolts attached to steel angle below deck @ 38.1 in o.c. along long side of curb

Longitudinal:

of Bolts Req'd for Uplift = 1.63

COMBINED LOADING: 0.575 O.K.

of Bolts Req'd for Shear = 1.19

Req'd Min Spacing = 36.0 in o.c.

Total # of Bolts Required = 3

Use 5/8" ϕ A307 Bolts attached to steel angle below deck @ 36 in o.c. along short side of curb



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For Concrete anchorage: SEISMIC $(0.6-0.14S_{DS})D + 0.7\Omega_o E$ ($\Omega_o = 2.5$)

Concrete Attachment: 3/4" ϕ Hilti Hit-HY 200 adhesive anchors w/ 4" embed

$$T_{all,LRFD} = 1722 \text{ lbs} \quad V_{all,LRFD} = 2032 \text{ lbs} \quad \alpha = (1 + 0.2SDS)D + 2.5E = 1.87$$

$$T_{all,ASD} = T_{all,LRFD}/\alpha = 920.9 \text{ lbs} \quad V_{all,ASD} = V_{all,LRFD}/\alpha = 1086.6 \text{ lbs} \quad (D = 0.465, E = 0.535)$$

$$\text{Transverse: } Uplift_{MAX} = 17234 \text{ lbs} \quad Shear_{MAX} = 8624 \text{ lbs}$$

$$\text{Compression}_{SEISMIC} = 2622 \text{ lbs} = [2.5 * F_{pmaxASD} * (H_{cm} + H_{curb}) + (1 + 0.14S_{DS}) * (WGT_{unit+curb}/2) * w_{curb}] / w_{curb}$$

$$\text{Tension}_{SEISMIC} = 1239 \text{ lbs} = \text{Comp}_{SEISMIC} - (0.6 - 0.14S_{DS}) * (WGT_{unit+curb})$$

$$\text{Shear}_{SEISMIC} = 1285 \text{ lbs} = 2.5 * F_{pmaxASD} / 2$$

$$\text{Min Bolts Req'd Uplift} = 18.71 \text{ spacing} = 5.68 \text{ in o.c.} \quad T_{applied} = 783.4 \text{ lbs}$$

$$\text{Min Bolts Req'd Shear} = 7.94 \text{ spacing} = 14.60714 \text{ in o.c.} \quad V_{applied} = 392.0 \text{ lbs}$$

$$\text{Try using } 22 \text{ bolts spaced at } 5.44 \text{ in o.c.} \quad \text{COMBINED LOADING} = \frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{applied}}{V_{allow,ASD}} \leq 1.2 = 1.21$$

Use 22 - 3/4" ϕ Hilti Hit-HY 200 adhesive anchors @ 5.4 in o.c. max. along long side of curb w/ 4" embed

$$\text{Longitudinal: } Uplift_{MAX} = 11219 \text{ lbs} \quad Shear_{MAX} = 8624 \text{ lbs}$$

$$\text{Compression}_{SEISMIC} = 2168 \text{ lbs} = [2.5 * F_{pmaxASD} * (H_{cm} + H_{curb}) + (1 + 0.14S_{DS}) * (WGT_{unit+curb}/2) * L_{curb}] / L_{curb}$$

$$\text{Tension}_{SEISMIC} = 786 \text{ lbs} = \text{Comp}_{SEISMIC} - (0.6 - 0.14S_{DS}) * (WGT_{unit+curb})$$

$$\text{Shear}_{SEISMIC} = 1285 \text{ lbs} = 2.5 * F_{pmaxASD} / 2$$

$$\text{Min Bolts Req'd Uplift} = 12.18 \text{ spacing} = 5 \text{ in o.c.} \quad T_{applied} = 659.9 \text{ lbs}$$

$$\text{Min Bolts Req'd Shear} = 7.94 \text{ spacing} = 8.571429 \text{ in o.c.} \quad V_{applied} = 507.3 \text{ lbs}$$

$$\text{Try using } 17 \text{ bolts spaced at } 4.50 \text{ in o.c.} \quad \text{COMBINED LOADING} = \frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{applied}}{V_{allow,ASD}} \leq 1.2 = 1.18$$

Use 17 - 3/4" ϕ Hilti Hit-HY 200 adhesive anchors @ 4.5 in o.c. max. along short side of curb w/ 4" embed

CURB DESIGN SUMMARY: 80-265-18**			
CURB RAIL THICKNESS: 0.0713 in 14 Gauge			
UNIT CLIP THICKNESS: 0.0713 in 14 Gauge			
# OF CLIPS (LONG SIDE) - 3 clips with 6 - #14 SMS screws each clip			
WEB STIFFENER: 16Ga x 3/4" x 7" (C-channel) stiffener at each clip			
# OF CLIPS (SHORT SIDE) - 2 clips with 5 - #14 SMS screws each clip			
WEB STIFFENER: 16Ga x 3/4" x 7" (C-channel) stiffener at each clip			
CORNER CONNECTION: Use 8 - 1/4" ϕ SAE Grade 8 bolts w/ 1/4-20-UNC Threaded inserts			
CURB ANCHORAGE	WOOD	STEEL	CONCRETE
	5/8" ϕ lag screw w/ min. 3.5" embed (SGmin=0.43)	5/8" ϕ A307 bolts	3/4" ϕ thrd'd rod in Hilti HIT-HY 200 epoxy, min. 4" embed
LONG DIRECTION	23 @ 5.38 in o.c.	4 @ 38.08 in o.c.	22 @ 5.44 in o.c.
SHORT DIRECTION	14 @ 5.85 in o.c.	3 @ 36 in o.c.	17 @ 4.5 in o.c.