MOUR GROUP
ENGINEERING + DESIGN

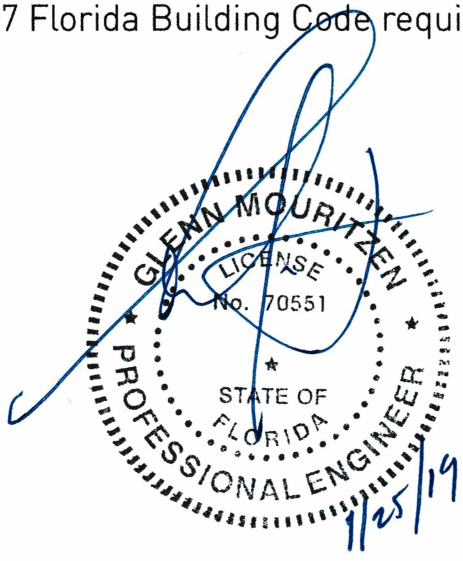
# Wind Calculations

# for

# York CDR Prestige Series (Large Chassis) Rooftop Equipment

Kit #80-265-46**

2017 Florida Building Code requirements

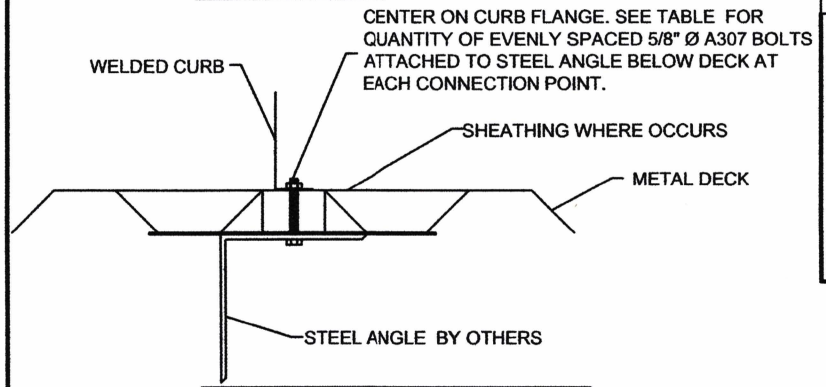



**Prepared for:**

**PROVENT / RRS**
3847 Wabash Drive
Mira Loma, CA 91725

**Date: January 25, 2019**
**Project Number: PV1807**

## STEEL ATTACHMENT



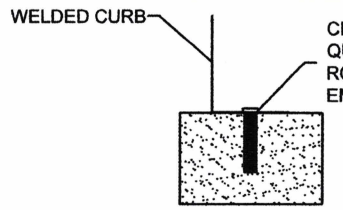

| CURB KIT | NO. OF ANCHORAGE BOLTS REQUIRED LONG SIDE * | SHORT SIDE * | UNIT |
|---|---|---|---|
| 80-265-49 | 2 @ 34.5" o.c. | 2 @ 19" o.c. | LXS |
| 80-265-50 | 2 @ 34.5" o.c. | 2 @ 29" o.c. | LXL |
| 80-265-13 | 2 @ 61" o.c. | 2 @ 25.3" o.c. | SUNLINE 3-6 TON |
| 80-265-45 | 2 @ 58.4" o.c. | 2 @ 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 |

## 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

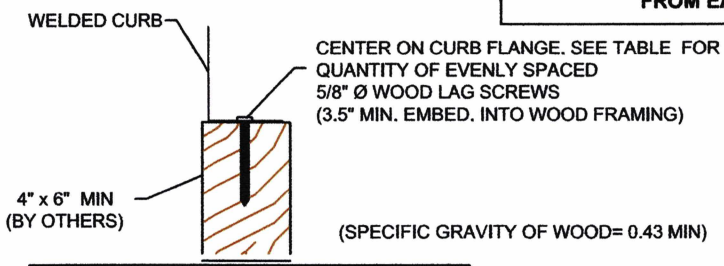



- NORMAL WEIGHT CONC SLAB
- f'c=4000 PSI MIN
- 6" MIN THICK CONC.
- SPECIAL INSPECTION REQUIRED ( ESR-3187)

| CURB KIT | NO. OF ANCHORAGE BOLTS REQUIRED LONG SIDE * | SHORT SIDE ** | UNIT |
|---|---|---|---|
| 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 |

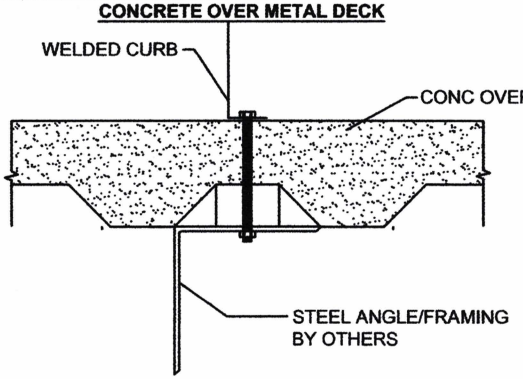
**STEEL AND CONCRETE ANCHORS ARE 6" FROM EACH CORNER EVENLY SPACED**

## WOOD ATTACHMENT




| CURB KIT | NO. OF ANCHORAGE SCREWS REQUIRED LONG SIDE | SHORT SIDE | UNIT |
|---|---|---|---|
| 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. | | |

## CONCRETE OVER METAL DECK




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

GLENN MOURITZEN
LICENSE
No. 70551
STATE OF FLORIDA
PROFESSIONAL ENGINEER
1/25/19


RRS ROOFTOP SYSTEMS

1625 DIPLOMAT DRIVE
CARROLLTON, TX 75006

PHONE (972) 247-7447
FAX (972) 243-0940


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

| FORM NO: | | |
|---|---|---|
| CB-25A | | |
| DATE: | REV: | DRAWN BY: |
| 01/07/19 | 1 | FMM |

**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.)

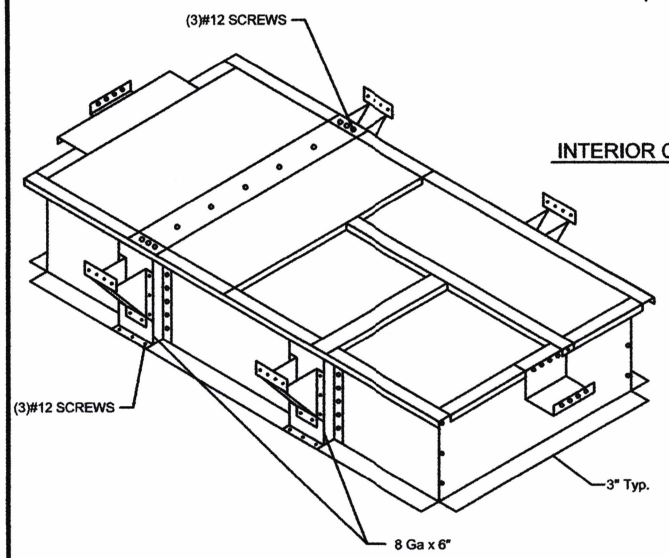
# CALCULATED WIND ROOF CURBS FOR YORK UNITS

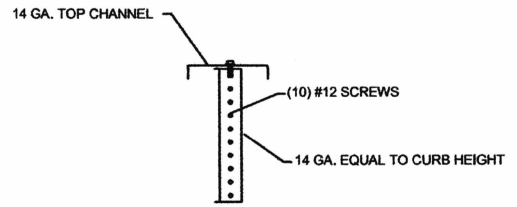
## ZX 08-14, XX 08-12
## ZY 07-12, XY 07-09

| ProVent P/N | A | WEIGHT |
|---|---|---|
| 80-265-4614 | 14" | 136 Lbs |
| 80-265-4618 | 18" | 160 Lbs |

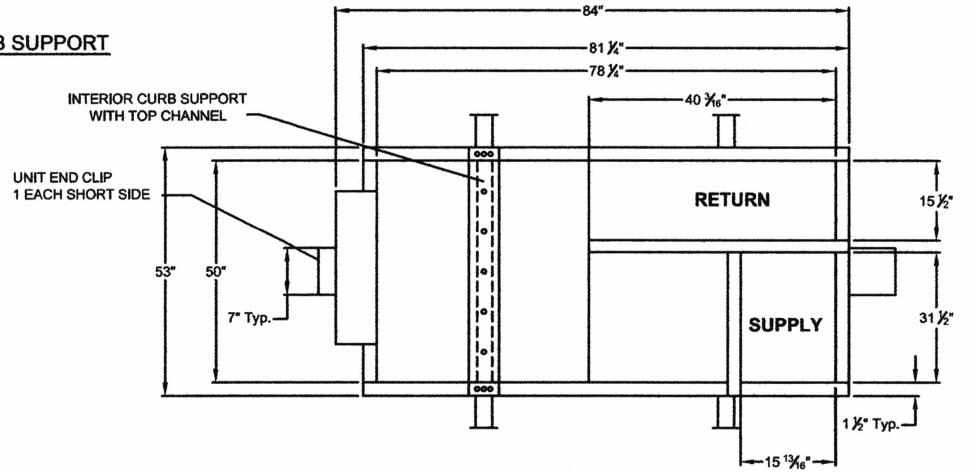
**Meets wind requirements for the following codes:**
FBC 2017
based on ASCE 7-10.

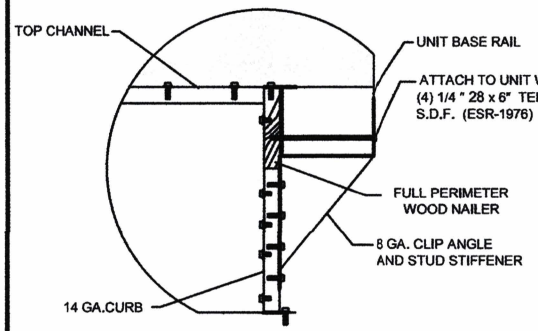
**Wind:**
190 mph exposure D category III or IV building, max BLDG height: 60 ft
Kzt=1.00 max



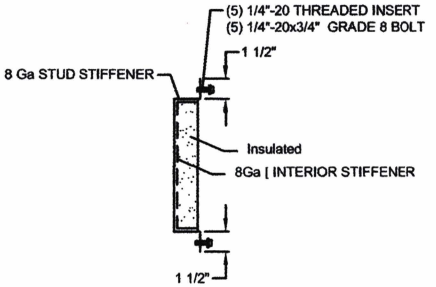




INTERIOR CURB SUPPORT

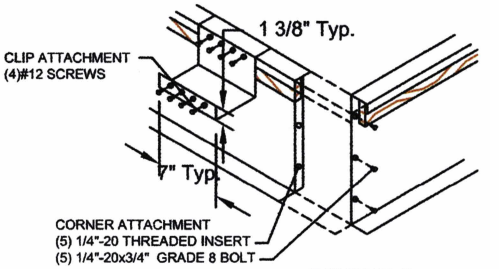


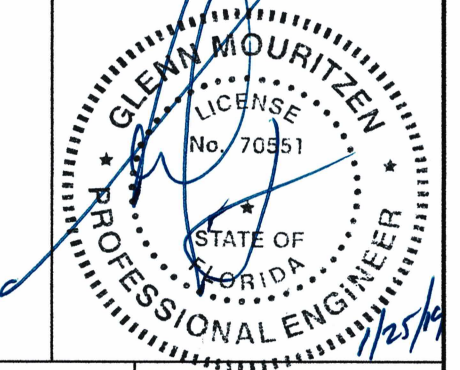

HOLD DOWN DETAIL




STUD STIFFENER




CORNER & END CLIP DETAIL





RRS ROOFTOP SYSTEMS

1625 DIPLOMAT DRIVE
CARROLTON, TX 75006

PHONE (972) 247-7447
FAX (972) 243-0940


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

| FORM NO: | | PART NUMBER: |
|---|---|---|
| CBKD-163A | | 80-265-46 |
| DATE: 01/23/19 | REV: 2 | DRAWN BY: ALL |

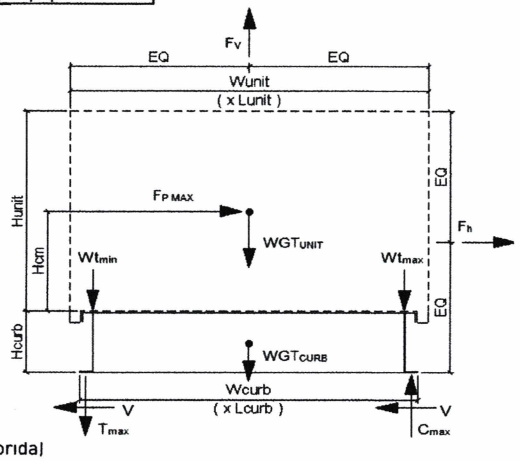
MOUR GROUP
ENGINEERING + DESIGN

6593 Riverdale St.
San Diego, CA 92120
(619)727-4800


Client: ProVent PV1807
Description: 80-265-46**
Unit: York CDR Prestige Series (Large Chassis) Rooftop Equipment

**Curb Information**

| | | | |
|---|---|---|---|
| Hcurb = | 18 | in | (Height of curb) |
| Lcurb = | 84 | in | (Length of curb) |
| wcurb = | 53 | in | (Width of curb) |
| WGTcurb = | 160 | lbs | (Weight of curb) |




**Unit Information**

| | | | |
|---|---|---|---|
| WGTunit = | 1008 | lbs | (Weight of Unit) |
| Wtmax = | 213 | lbs | (Maximum corner weight) |
| Wtmin = | 154 | lbs | (Minimum corner weight) |
| Hunit = | 40.56 | in | (Height of unit above curb) |
| Hcm = | 20.28 | in | (Height to center of mass) |
| Lunit = | 87.1875 | in | (Length of unit) |
| Wunit = | 61.69 | 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 | Wp | (1.6*Sds*Ip)*Wp |
| FpmaxASD = | 423 | lbs | (0.7*Fpmax) |
| | (unit only) | | |

FpmaxASD = 491 lbs (unit and curb)

**Wind Loading - 2017 FBC/2015 IBC**

*** Exposure Category D ***

| | | | |
|---|---|---|---|
| Kz = | 1.31 | | (For 60 ft roof height, Exposure D - Table 29.3-1 ACSE 7-10) |
| Kzt = | 1.0 | | (No topographic effects assumed for rooftop mounted units) |
| 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 | 102.9 | psf | = 0.00256*Kz*Kzt*Kd*$V^2$ (Eq. 29.3-1 ASCE 7-10) |
| $F_{h\ ASD\ trans}$ = | 4159 | lbs | = 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.5-2) |
| $F_{h\ ASD\ long}$ = | 2943 | lbs | = 0.6*qz*GCr*Wunit*(Hunit+Hcurb) |
| $F_{vert\ ASD}$ = | 3459 | lbs | = 0.6*qz*GCr*Lunit*Wunit (Eq. 29.5-3) |

**Curb Loading**

Transverse:

| | | | |
|---|---|---|---|
| $Compression_{SEISMIC}$ = | 603 | lbs | =[FpmaxASD*Hcm+2*(1+0.14$S_{DS}$)*Wtmax*wcurb]/wcurb |
| $Tension_{SEISMIC}$ = | 33 | lbs | = $Comp_{SEISMIC}$-(0.6-0.14$S_{DS}$)*WGTunit |
| $Compression_{WIND}$ = | 118 | lbs | =[$F_{h\ transASD}$*Hcm+2*0.6*Wtmax*wcurb-$F_{vertASD}$*wcurb/2]/wcurb |
| $Tension_{WIND}$ = | 2972 | lbs | = $Comp_{WIND}$+Fvert-0.6*WGTunit |

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

Longitudinal:

| | | | |
|---|---|---|---|
| $Compression_{SEISMIC}$ = | 543 | lbs | =[FpmaxASD*Hcm+2*(1+0.14*$S_{DS}$)*Wtmax*Lcurb]/Lcurb |
| $Tension_{SEISMIC}$ = | -26 | lbs | = $Comp_{SEISMIC}$-(0.6-0.14$S_{DS}$)*WGTunit |
| $Compression_{WIND}$ = | -764 | lbs | =[$F_{h\ transASD}$*Hcm+2*0.6*Wtmax*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb |
| $Tension_{WIND}$ = | 2091 | lbs | = $Comp_{WIND}$+Fvert-0.6*WGTunit |

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

Governing Reactions:

| | | | | |
|---|---|---|---|---|
| Transverse: | $Comp_{MAX}$ = | 603 | lbs | ---> Along long edge of curb. |
| (on long edge) | $Tens_{MAX}$ = | 2972 | lbs | ---> Along long edge of curb. |
| Longitudinal: | $Comp_{MAX}$ = | 543 | lbs | ---> Along short edge of curb. |
| (on short edge) | $Tens_{MAX}$ = | 2091 | lbs | ---> Along short edge of curb. |

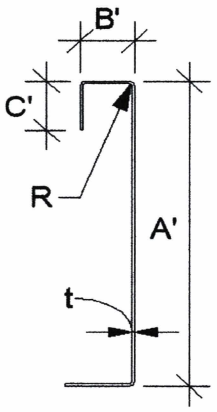
---> Negative values indicate Compression load rather than Tension.

MOUR GROUP
ENGINEERING + DESIGN

6593 Riverdale St.
San Diego, CA 92120
(619)727-4800


## 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 | = πr/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 in$^2$ | | | | |
| rx = | 6.48 in | | | | |
| ry = | 0.984 in | | | | |
| rmin = | 0.984 in | | | | |

## Axial Compression

Pu = 2.080 k  (Max Axial Comp)  Ωc = 1.80
Pn/Ωc = 36.083 k
Fe = 62.46 ksi
λc = 0.89
Fn = 35.76 ksi
Ly = 84 in  Lateral unbraced length
$k_yL_y/r_y$ = 68  (assume k=0.8)

$$\frac{P_n}{\Omega_c} = \frac{F_nA}{\Omega_c} \qquad If\ \lambda_c \le 1.5;\ F_n = \left(0.658^{\lambda_c^2}\right)F_y \qquad If\ \lambda_c > 1.5;\ F_n = \frac{0.877}{\lambda_c^2}F_y$$

$$\lambda_c = \sqrt{\frac{F_y}{F_e}} \qquad F_e = \frac{\pi^2E}{\left(kl/r\right)^2}$$

**Compression Check = O.K.**

## Check Web Crippling

h = 18 in  -- Check limits:  C = 4.00
t = 0.0713 in  h/t = 252.45 ≤ 200  $C_R$ = 0.14
N = 7.00  N/t = 98.18 ≤ 210  $C_N$ = 0.35
$\Omega_w$ = 1.75  N/h = 0.388889 ≤ 2.0  $C_h$ = 0.02
$P_n$ = 2.296 k  R/t = 1.50 ≤ 9.0
$P_n/\Omega_w$ = 1.312 k
Long side: $Pu_{Trans}$ = 0.301 k  O.K.  # clips = 2
Short side: $Pu_{Long}$ = 0.543 k  O.K.  # clips = 1

(See table C3.4.1-2, fastened to support, one flange, end loading)

$$P_n = Ct^2F_y\sin(90)\left(1 - C_R\sqrt{\frac{R}{t}}\right)\left(1 + C_N\sqrt{\frac{N}{t}}\right)\left(1 - C_h\sqrt{\frac{h}{t}}\right)$$

*****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 ≤ 1.28√E/Fys  Ωc = 1.70

w/ts = 118.675
1.28√(E/Fys) = 31.091  --> w/ts over limit  Use C3.7.2

$$P_n = 0.7\left(P_{wc} + A_eF_y\right) \ge P_{wc}$$

Pwc = 2.296 k  Ae = 0.380 in$^2$
Pn = 14.913 k  Pn/Ω = 8.773 k

**Not Req'd**

## Corner Connections

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

Tcrnmax = 1040 lbs  Max($F_{pmaxASD}$/4 -OR- $Fh_{ASDtrans}$/4 corner connections)
Vcrnmax = 1486 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 = 0.4
# of Bolts required for Shear = 1.4  ***If combined fails:
# of Bolts Used = [2.0]  USE --> 3.0

Check Combined Stress in Bolts & Inserts: 0.888 O.K.  StressComb = 0.592 O.K.

## Check 1/8" welded connection

<--- USE WELD  Ω = 2.35

Assume L/t > 25: 25*t = 1.783 in
Lreq'd = 1.005 in

$$P_n/\Omega = \frac{1}{\Omega}0.75tLF_u \ge V_{req} \qquad L_{req'd} = \frac{V_{req}\Omega}{0.75tF_u}$$

MOUR GROUP
ENGINEERING + DESIGN

6593 Riverdale St.
San Diego, CA 92120
(619)727-4800

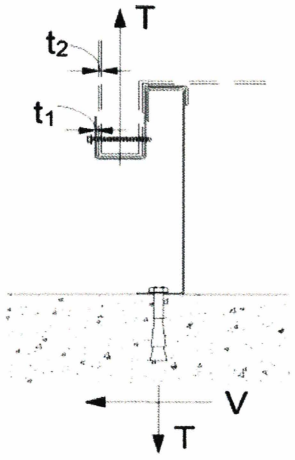

**Connection Unit to Curb Clip** | #12 SMS screw | Ω = 3.0

t1 = 0.0713 in | Fu1 = 65 ksi

t2 = 0.1017 in (unit base rail thickness) | Fu2 = 65 ksi

d = 0.216 in (screw diameter) | dw = 0.375 in (nom. washer diameter)

t2/t1 = 1.4




| | For t2/t1 ≤ 1.0: | | For t2/t1 ≥ 2.5: | |
|---|---|---|---|---|
| ***Shear***: | $P_{ns} = 4.2F_{u2}\sqrt{t_2^3 d}$ | Pns = 2703 # | | Pns = 2703 # |
| | | 4.12 k | | |
| | $P_{ns} = 2.7t_1 dF_{u1}$ | 2.70 k | $P_{ns} = 2.7t_1 dF_{u1}$ | 2.70 k |
| | $P_{ns} = 2.7t_2 dF_{u2}$ | 3.86 k | $P_{ns} = 2.7t_2 dF_{u2}$ | 3.86 k |

Pns/Ω = 901 #

Pss/Ω = 840 # <- Controls

***Tension***: Pnot = 1.214 k (screw pull-out strength) $P_{not} = 0.85t_c dF_{u2}$

$t_c = \min(t_1, t_2)$

Pnov = 2.607 k (screw pull-over strength) $P_{nov} = 1.5t_1 d_w F_{u1}$

Pts/Ω = 405 # <- Controls

Pts/Ω = 845 # (full tensile screw capacity)

| | Shear (k) | # clips | $V_{clip}$ (k) | $V_{allow}$ (lb) | # screws | spacing |
|---|---|---|---|---|---|---|
| Long side: | 4.159 | 2 | 2.08 | 840 # | 3 | 3.00 in |
| Short side: | 2.943 | 1 | 2.94 | 840 # | 4 | 2.00 in |

clip width (in) = 7.00 | clip height = 2.5 in

min spacing = 0.65 in | edge distance = 0.5 in (min. 1.5d)

Check Block shear rupture: O.K. | thinnest part = 0.0713 AISI BSR applies

Fy = 50 ksi | Ω = 2.22 bolt/screw connection

Agv = 0.463 $in^2$ | Anv = 0.410 $in^2$ | Ant = 0.081 $in^2$

Rn/Ω = 8.647 k $R_n = 0.6F_y A_{gv} + F_u A_{nt} \le 0.6F_u A_{nv} + F_u A_{nt}$

**BSR O.K.** (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: | $Uplift_{MAX}$ = 4383 lbs | $Shear_{MAX}$ = 2080 lbs | |
| $Compression_{SEISMIC}$ = | 959 lbs | =[FpmaxASD*(Hcm+Hcurb)+(1+0.14$S_{DS}$)*($WGT_{unit+curb}$/2)*wcurb]/wcurb | |
| $Tension_{SEISMIC}$ = | 299 lbs | =$Comp_{SEISMIC}$-(0.6-0.14$S_{DS}$)*(WGTunit+curb) | |
| $Compression_{WIND}$ = | 1625 lbs | =[$F_{h\ transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*wcurb-$F_{vertASD}$*wcurb/2]/wcurb | |
| $Tension_{WIND}$ = | 4383 lbs | =[$F_{h\ transASD}$*(Hcm+Hcurb)-0.6*($WGT_{unit+curb}$/2)*wcurb+$F_{vertASD}$*wcurb/2]/wcurb | |
| Longitudinal: | $Uplift_{MAX}$ = 2720 lbs | $Shear_{MAX}$ = 1472 lbs | |
| $Compression_{SEISMIC}$ = | 828 lbs | =[FpmaxASD*(Hcm+Hcurb)+(1+0.14$S_{DS}$)*($WGT_{unit+curb}$/2)*Lcurb]/Lcurb | |
| $Tension_{SEISMIC}$ = | 168 lbs | =$Comp_{SEISMIC}$-(0.6-0.14$S_{DS}$)*(WGTunit+curb) | |
| $Compression_{WIND}$ = | -38 lbs | =[$F_{h\ transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb | |
| $Tension_{WIND}$ = | 2720 lbs | =[$F_{h\ transASD}$*(Hcm+Hcurb)-0.6*($WGT_{unit+curb}$/2)*Lcurb+$F_{vertASD}$*Lcurb/2]/Lcurb | |

**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 = | 4.63 | COMBINED LOADING: | 0.949 O.K. |
| # of Screws Req'd for Shear = | 2.03 | Screw Spacing = | 15.2 in o.c. |
| Total # of screws Required = | 6 | | |

Use 5/8" φ wood lag screws @ 15.2 in o.c. along long side of curb

Longitudinal:

| | | | |
|---|---|---|---|
| # of Screws Req'd for Uplift = | 2.9 | COMBINED LOADING: | 0.928 O.K. |
| # of Screws Req'd for Shear = | 1.4 | Screw Spacing = | 15.0 in o.c. |
| Total # of screws Required = | 4 | | |

Use 5/8" φ wood lag screws @ 15 in o.c. along short side of curb

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

| | | | |
|---|---|---|---|
| | $Tall_{bolt}$ = 6903 lbs | $Vall_{bolt}$ = 3682 lbs | |
| Transverse: | 6903 lbs | 3682 lbs | |
| # of Bolts Req'd for Uplift = | 0.64 | COMBINED LOADING: | 0.269 O.K. |
| # of Bolts Req'd for Shear = | 0.56 | Bolt Spacing = | 72.0 in o.c. |
| Total # of Bolts Required = | 2 | | |

Use 5/8" φ A307 Bolts attached to steel angle below deck @ 72 in o.c. along long side of curb

Longitudinal:

| | | | |
|---|---|---|---|
| # of Bolts Req'd for Uplift = | 0.39 | COMBINED LOADING: | 0.135 O.K. |
| # of Bolts Req'd for Shear = | 0.40 | Req'd Min Spacing = | 41.0 in o.c. |
| Total # of Bolts Required = | 2 | | |

Use 5/8" φ A307 Bolts attached to steel angle below deck @ 41 in o.c. along short side of curb

MOUR GROUP
ENGINEERING + DESIGN

6593 Riverdale St.
San Diego, CA 92120
(619)727-4800


**For Concrete anchorage:** SEISMIC (0.6-0.14SDS)D + 0.7$\Omega_o$E ($\Omega_o$ = 2.5)

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

$Tall_{LRFD}$ = 1722 lbs $Vall_{LRFD}$ = 2032 lbs $\propto = (1 + 0.2SDS)D + 2.5E = 1.87$

$Tall_{ASD} = Tall_{LRFD}/\alpha$ = 920.9 lbs $Vall_{ASD} = Vall_{LRFD}/\alpha$ = 1086.6 lbs $(D = 0.465, E = 0.535)$

Transverse: $Uplift_{MAX}$ = 4383 lbs $Shear_{MAX}$ = 2080 lbs

$Compression_{SEISMIC}$ = 1490 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14$S_{DS}$]*($WGT_{unit+curb}$/2)*wcurb]/wcurb

$Tension_{SEISMIC}$ = 830 lbs =$Comp_{SEISMIC}$-(0.6-0.14$S_{DS}$)*(WGTunit+curb)

$Shear_{SEISMIC}$ = 613 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 4.76 spacing = 15.00 in o.c. Tapplied = 730.6 lbs

Min Bolts Req'd Shear = 2.00 spacing = 60 in o.c. Vapplied = 346.6 lbs

Try using 6 bolts spaced at 14.40 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{aplied}}{V_{allow,ASD}} \leq 1.2$ = 1.11

Use 6 - 3/4" φ Hilti Hit-HY 200 adhesive anchors @ 14.4 in o.c. max. along long side of curb w/ 4" embed

Longitudinal: $Uplift_{MAX}$ = 2720 lbs $Shear_{MAX}$ = 2080 lbs

$Compression_{SEISMIC}$ = 1163 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14$S_{DS}$]*($WGT_{unit+curb}$/2)*Lcurb]/Lcurb

$Tension_{SEISMIC}$ = 503 lbs =$Comp_{SEISMIC}$-(0.6-0.14$S_{DS}$)*(WGTunit+curb)

$Shear_{SEISMIC}$ = 613 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 2.95 spacing = 14.5 in o.c. Tapplied = 680.1 lbs

Min Bolts Req'd Shear = 2.00 spacing = 29 in o.c. Vapplied = 519.9 lbs

Try using 4 bolts spaced at 13.67 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{aplied}}{V_{allow,ASD}} \leq 1.2$ = 1.22

Use 4 - 3/4" φ Hilti Hit-HY 200 adhesive anchors @ 13.7 in o.c. max. along short side of curb w/ 4" embed

| CURB DESIGN SUMMARY: | 80-265-46** | | |
|---|---|---|---|
| **CURB RAIL THICKNESS:** | 0.0713 in 14 Gauge | | |
| **UNIT CLIP THICKNESS:** | 0.0713 in 14 Gauge | | |
| **# OF CLIPS (LONG SIDE) -** | 2 clips with 3 - #12 SMS screws each clip | | |
| **WEB STIFFENER:** | 16Ga x 3/4" x 7" (C-channel) stiffener at each clip | | |
| **# OF CLIPS (SHORT SIDE) -** | 1 clips with 4 - #12 SMS screws each clip | | |
| **WEB STIFFENER:** | 16Ga x 3/4" x 7" (C-channel) stiffener at each clip | | |
| **CORNER CONNECTION:** | Use 3 - 1/4" φ SAE Grade 8 bolts w/ 1/4-20-UNC Threaded inserts | | |
| **CURB ANCHORAGE** | WOOD<br>5/8" φ lag screw w/ min. 3.5" embed (SGmin=0.43) | STEEL<br>5/8" φ A307 bolts | CONCRETE<br>3/4" φ thrd'd rod in Hilti HIT-HY 200 epoxy, min. 4" embed |
| LONG DIRECTION | 6 @ 15.2 in o.c. | 2 @ 72 in o.c. | 6 @ 14.4 in o.c. |
| SHORT DIRECTION | 4 @ 15 in o.c. | 2 @ 41 in o.c. | 4 @ 13.67 in o.c. |