MOUR GROUP
ENGINEERING + DESIGN

6593 Riverdale St.
San Diego, CA 92120

619-727-4800

# Structural Calculations

# for

# CBKD Series Roof Curbs

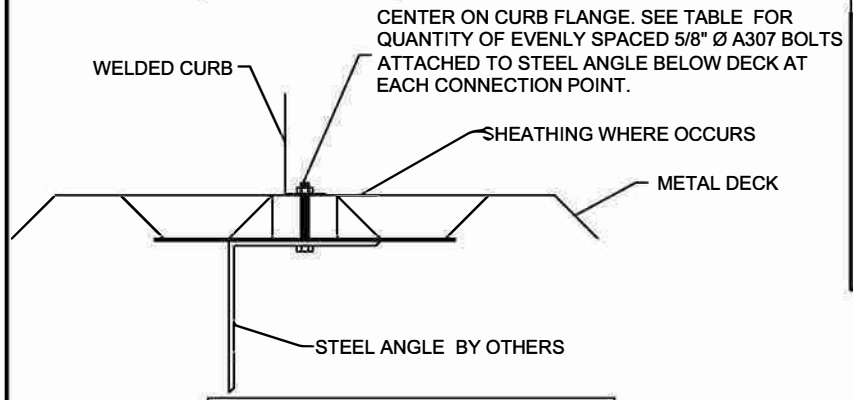
CBKD-160A (80-265-49)
2020 Florida Building Code requirements


**Prepared for:**

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

**Date: May 19, 2021**
**Project Number: PV2101**

## STEEL ATTACHMENT



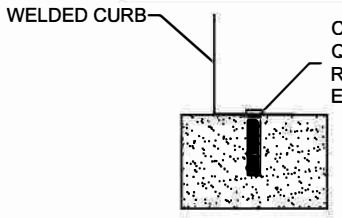

| | NO. OF ANCHORAGE BOLTS REQUIRED | | |
|---|---|---|---|
| CURB KIT | LONG SIDE * | SHORT SIDE * | UNIT |
| 80-265-49 | 2 @ 34.5" o.c. | 2 @ 19" o.c. | LXS |
| 80-265-50 | 2 @ 34.5" o.c. | 2 @ 29" o.c. | LXL |
| 80-265-13 | 2 @ 61" o.c. | 2 @ 25.25" o.c. | SUNLINE 3-6 TON |
| 80-265-45 | 2 @ 58.38" o.c. | 2 @ 28.19" o.c. | PRESTIGE SMALL |
| 80-265-46 | 2 @ 72" o.c. | 2 @ 41" o.c. | PRESTIGE LARGE |
| 80-265-29 | 3 @ 34.69" o.c. | 2 @ 39.5" o.c. | PREDATOR |
| 80-265-19 | 3 @ 51.63" o.c. | 2 @ 72" o.c. | SUNLINE ULTRA |
| 80-265-18 | 3 @ 57.13" o.c. | 2 @ 72" o.c. | SUNLINE MAGNA |

## WIND LOAD ROOF ANCHORAGE DETAIL

**Meets wind requirements for the following codes:**
FBC 2020
based on ASCE 7-16.

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

## CONCRETE ATTACHMENT

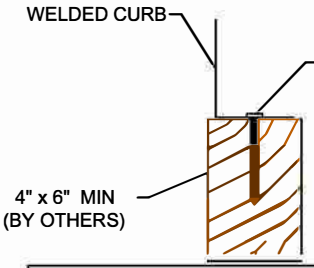



- NORMAL WEIGHT CONC SLAB
- f'c=4000 PSI MIN
- 6" MIN THICK CONC.
- SPECIAL INSPECTION REQUIRED ( ESR-3187)

| | NO. OF ANCHORAGE BOLTS REQUIRED | | |
|---|---|---|---|
| CURB KIT | LONG SIDE * | SHORT SIDE ** | UNIT |
| 80-265-49 | 5 @ 8.63" o.c. | 3 @ 9.5" o.c. | LXS |
| 80-265-50 | 5 @ 8.63" o.c. | 4 @ 9.67" o.c. | LXL |
| 80-265-13 | 5 @ 15.25" o.c. | 3 @ 12.63" o.c. | SUNLINE 3-6 TON |
| 80-265-45 | 5 @ 14.59" o.c. | 3 @ 14.09" o.c. | PRESTIGE SMALL |
| 80-265-46 | 5 @ 18" o.c. | 4 @ 13.67" o.c. | PRESTIGE LARGE |
| 80-265-29 | 9 @ 8.67" o.c. | 5 @ 9.88" o.c. | PREDATOR |
| 80-265-19 | 8 @ 14.75" o.c. | 6 @ 14.4" o.c. | SUNLINE ULTRA |
| 80-265-18 | 12 @ 10.39" o.c. | 8 @ 10.29" o.c. | SUNLINE MAGNA |

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

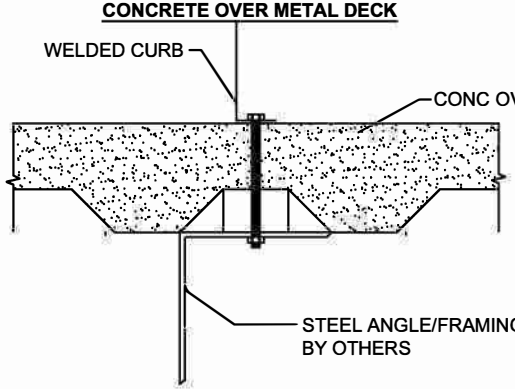
## WOOD ATTACHMENT



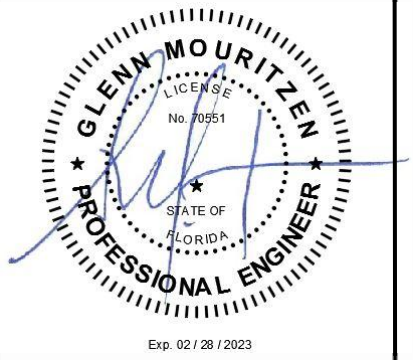

(SPECIFIC GRAVITY OF WOOD= 0.43 MIN)

| | NO. OF ANCHORAGE SCREWS REQUIRED | | |
|---|---|---|---|
| CURB KIT | LONG SIDE | SHORT SIDE | UNIT |
| 80-265-49 | 6 @ 7.7" o.c. | 3 @ 11.5" o.c. | LXS |
| 80-265-50 | 5 @ 9.63" o.c. | 5 @ 8.25" o.c. | LXL |
| 80-265-13 | 6 @ 13" o.c. | 3 @ 14.63" o.c. | SUNLINE 3-6 TON |
| 80-265-45 | 6 @ 12.48" o.c. | 3 @ 16.09" o.c. | PRESTIGE SMALL |
| 80-265-46 | 6 @ 15.2" o.c. | 4 @ 15" o.c. | PRESTIGE LARGE |
| 80-265-29 | 10 @ 8.15" o.c. | 6 @ 8.7" o.c. | PREDATOR |
| 80-265-19 | 8 @ 15.32" o.c. | 6 @ 15.2" o.c. | SUNLINE ULTRA |
| 80-265-18 | 14 @ 9.1" o.c. | 8 @ 10.86" 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




Exp. 02 / 28 / 2023


**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: | | |
|---|---|---|
| CB-25A | | |
| DATE: | REV: | DRAWN BY: |
| 3/29/2021 | 2 | ALL |

**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.)

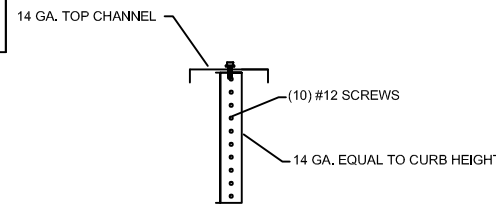
# CALCULATED WIND ROOF CURBS FOR YORK UNITS

## P***A ALL MODELS

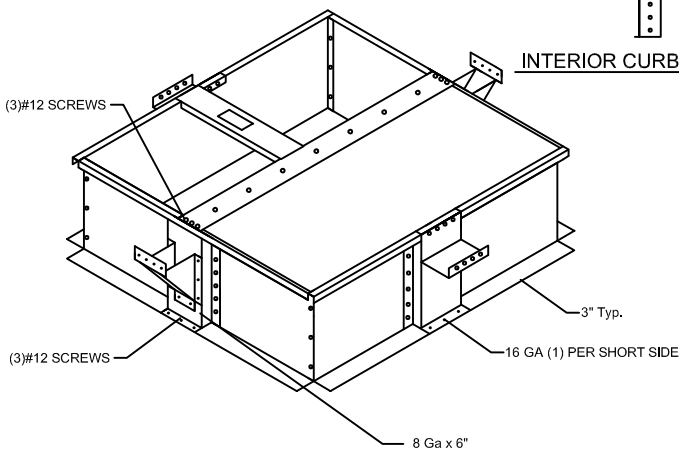
| ProVent P/N | A | WEIGHT |
|---|---|---|
| 80-265-4914 | 14" | 129 Lbs |
| 80-265-4918 | 18" | 153 Lbs |

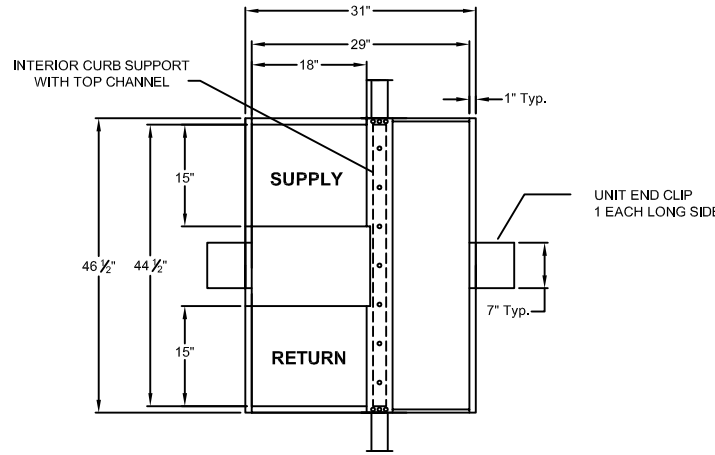
**Meets wind requirements for the following codes:**
FBC 2020
based on ASCE 7-16.

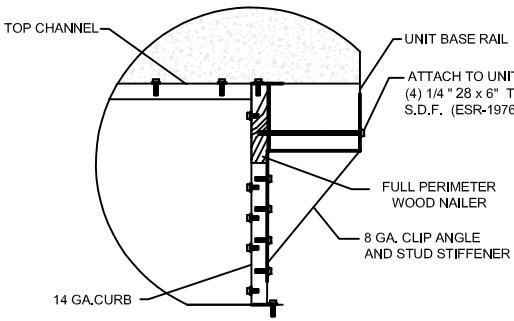
**Wind:**
190 mph exposure D category III or IV building, max BLDG height: 60 ft
Kzt=1.00 max



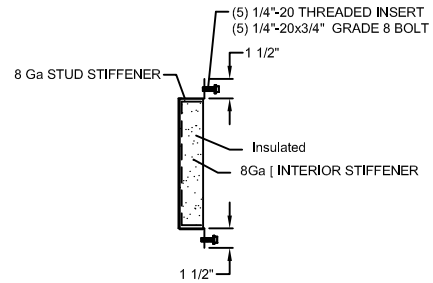

INTERIOR CURB SUPPORT



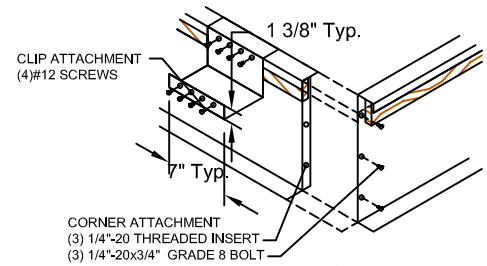



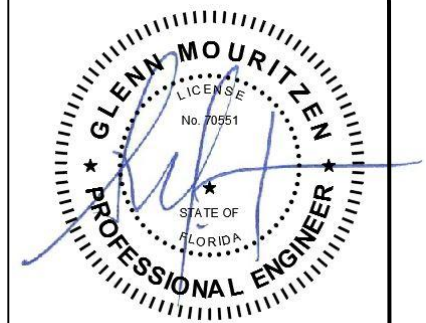

HOLD DOWN DETAIL




STUD STIFFENER




CORNER & END CLIP DETAIL

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**CARROLTON, TX 75006**

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


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

| FORM NO: | | PART NUMBER: |
|---|---|---|
| CBKD-160A | | 80-265-49 |
| **DATE:** | **REV:** | **DRAWN BY:** |
| 3/29/2021 | 2 | ALL |

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| | | | |
|---|---|---|---|
| Client: | ProVent | PV2101 | Previous: PV1807 |
| Description: | CBKD-160 | 80-265-49** | |
| Unit: | P***A ALL MODELS | | |

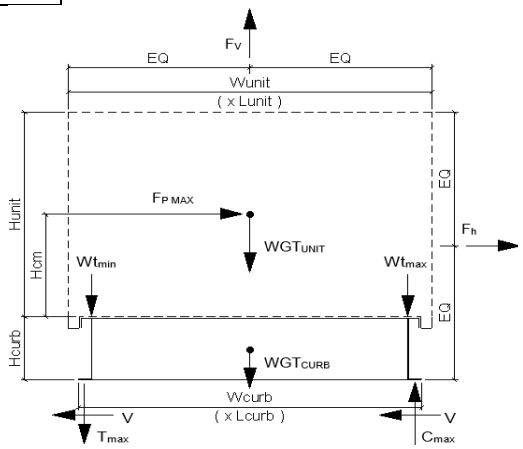
**Curb Information**

| | | | |
|---|---|---|---|
| Hcurb = | 18 | in | (Height of curb) |
| Lcurb = | 46.5 | in | (Length of curb) |
| wcurb = | 31 | in | (Width of curb) |
| WGTcurb = | 153 | lbs | (Weight of curb) |

# Clips long side = 1 # Clips short side = 1

**Unit Information**

| | | | |
|---|---|---|---|
| WGTunit = | 367 | lbs | (Weight of Unit) |
| Wtmax = | 120 | lbs | (Maximum corner weight) |
| Wtmin = | 71 | lbs | (Minimum corner weight) |
| Hunit = | 49 | in | (Height of unit above curb) |
| Hcm = | 24.5 | in | (Height to center of mass) |
| Lunit = | 51.25 | in | (Length of unit) |
| Wunit = | 35.75 | in | (Width of unit) |




**Seismic Loading - 2020 FBC/2018 IBC**

| | | | |
|---|---|---|---|
| Ss = | 0.15 | | (Worst Case for state of Florida) |
| Fa = | 2.4 | | (Worst case Site class E from Table 11.4-1 ASCE 7-16) |
| Sms = | 0.360 | | (Fa*Ss) |
| Sds = | 0.240 | | (2/3*Sms) |
| Ip = | 1.5 | | (Importance Factor Category III or IV Building) |
| Fpmax = | 0.576 | WGTunit | (1.6*Sds*Ip)*WGTunit (Eq 13.3-2 ASCE 7-16) |
| FpmaxASD = | 148 | lbs | (0.7*Fpmax) FpmaxASD = 210 lbs |
| | (unit only) | | (unit and curb) |

**Wind Loading - 2020 FBC/2018 IBC** *** Exposure Category D ***

| | | | |
|---|---|---|---|
| Kz = | 1.31 | | (For 60 ft roof height, Exposure D - Table 26.10-1 ACSE 7-16) |
| Kzt = | 1.00 | | (Max. assumed topographic factor) |
| Kd = | 0.85 | | (Directionality factor Table 26.6-1 ASCE 7-16) |
| Ke = | 1.00 | | (Ground Elevation Factor Table 26.9-1 ASCE 7-16) |
| V = | 190 | | (Wind velocity, mph for Occupancy Cat III-IV bldgs Exp. Cat C, Fig 26.5-1D - ASCE7-16) |
| $GCr_{(horiz)}$ = | 1.9 | | (Refer Sect 29.4.1 ASCE 7-16) |
| $GCr_{(vert)}$ = | 1.5 | | (Refer Sect 29.4.1 ASCE 7-16) |
| qz | 102.9 | psf | $= 0.00256*Kz*Kzt*Kd*Ke*V^2$ (Eq. 26.10-1 ASCE 7-10) |
| $F_{h\ ASD\ trans}$ = | 2797 | lbs | = 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.4-2) |
| $F_{h\ ASD\ long}$ = | 1951 | lbs | = 0.6*qz*GCr*Wunit*(Hunit+Hcurb) |
| $F_{vert\ ASD}$ = | 1178 | lbs | = 0.6*qz*GCr*Lunit*Wunit (Eq. 29.4-3) |

**Curb Loading**

Transverse:

| | | | |
|---|---|---|---|
| $Compression_{SEISMIC}$ = | 365 | lbs | $=[FpmaxASD*Hcm+2*(1+0.14S_{DS})*Wtmax*wcurb]/wcurb$ |
| $Tension_{SEISMIC}$ = | 157 | lbs | $= Comp_{SEISMIC}-(0.6-0.14S_{DS})*WGTunit$ |
| $Compression_{WIND}$ = | 1766 | lbs | $=[F_{h\ transASD}*Hcm+2*0.6*Wtmax*wcurb-F_{vertASD}*wcurb/2]/wcurb$ |
| $Tension_{WIND}$ = | 2724 | lbs | $= Comp_{WIND}+Fvert-0.6*WGTunit$ |

---> Negative values indicate opposite load.

Longitudinal:

| | | | |
|---|---|---|---|
| $Compression_{SEISMIC}$ = | 326 | lbs | $=[FpmaxASD*Hcm+2*(1+0.14*S_{DS})*Wtmax*Lcurb]/Lcurb$ |
| $Tension_{SEISMIC}$ = | 118 | lbs | $= Comp_{SEISMIC}-(0.6-0.14S_{DS})*WGTunit$ |
| $Compression_{WIND}$ = | 583 | lbs | $=[F_{h\ transASD}*Hcm+2*0.6*Wtmax*Lcurb-F_{vertASD}*Lcurb/2]/Lcurb$ |
| $Tension_{WIND}$ = | 1541 | lbs | $= Comp_{WIND}+Fvert-0.6*WGTunit$ |

---> Negative values indicate opposite load.

Governing Reactions:

| | | | | |
|---|---|---|---|---|
| Transverse: | $Comp_{MAX}$ = | 1766 | lbs | ---> Along long edge of curb. |
| (on long edge) | $Tens_{MAX}$ = | 2724 | lbs | ---> Along long edge of curb. |
| Longitudinal: | $Comp_{MAX}$ = | 583 | lbs | ---> Along short edge of curb. |
| (on short edge) | $Tens_{MAX}$ = | 1541 | lbs | ---> Along short edge of curb. |

---> Negative values indicate opposite load.

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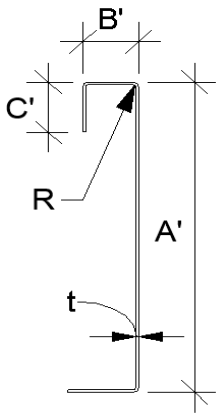
## Curb Design

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'= | [1.000] in | | a'= | 17.929 in | = A'-t |
| C'= | [0.000] in | (0 if no lips) | b = | 0.822 in | = B'-[r+t/2+α(r+t/2)] |
| α = | [0.000] | (0 - no Lip; 1 w/ lip) | b'= | 0.964 in | = B'-(t/2+αt/2) |
| R = | 0.1069 in | (Inside bend radius) | c = | 0.000 in | = α[C'-(r+t/2)] |
| t = | 0.0713 in | | c'= | 0.000 in | = α(C'-t/2) |
| r'= | 0.143 in | = R+t/2 | u = | 0.224 in | = πr/2 |
| x = | 0.047 in | (Distance between centroid and web centerline) | | | |
| Ix = | 44.614 in | (Moment of Inertia about X-Axis) | | | |
| Iy = | 0.039 in | (Moment of Inertia about Y-Axis) | | | |
| A = | 1.41 in$^2$ | | | | |
| rx = | 5.63 in | | | | |
| ry = | 0.168 in | | | | |
| rmin = | 0.168 in | | | | |

## Axial Compression

Pu = 1.399 k (Max Axial Comp)  Ωc = 1.80

Pn/Ωc = 4.049 k

Fe = 5.91 ksi

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

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

λc = 2.91

Fn = 5.18 ksi

Ly = 47 in  Lateral unbraced length

$k_y L_y/r_y$ = 222  (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 ≤ 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

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

$P_n$ = 2.296 k  R/t = 1.50 ≤ 9.0

$P_n/\Omega_w$ = 1.312 k

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

Long side: $Pu_{Trans}$ = 1.766 k  **web stiffener REQ'D**  # clips = 1

Short side: $Pu_{Long}$ = 0.583 k  **O.K.**  # clips = 1

*****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

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

Pwc = 2.296 k  Ae = 0.380 in$^2$

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 = 699 lbs  Max($F_{pmaxASD}$/4 -OR- $Fh_{ASDtrans}$/4 corner connections)

Vcrnmax = 1362 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 = 0.3

# of Bolts required for Shear = 1.2  ***If combined fails:

# of Bolts Used = [2.0]  USE --> 3.0

Check Combined Stress in Bolts & Inserts: 0.762 O.K.  StressComb = 0.508 **O.K.**

## Check 1/8" welded connection

<--- USE WELD  Ω = 2.35

Assume L/t > 25: 25*t = 1.783 in

Lreq'd = 0.921 in

$$P_n/\Omega = \frac{1}{\Omega} 0.75 t L F_u \ge V_{req} \qquad L_{req'd} = \frac{V_{req}\Omega}{0.75 t F_u}$$

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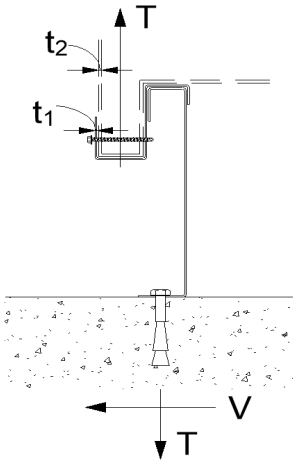
**Connection Unit to Curb Clip** | #12 SMS screw | Ω = 3.0

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: | Pns = 2703 #

***Shear***: $P_{ns} = 4.2F_{u2}\sqrt{t_2^3 d}$ = 4.12 k

$P_{ns} = 2.7t_1 dF_{u1}$ = 2.70 k

$P_{ns} = 2.7t_2 dF_{u2}$ = 3.86 k

Pns/Ω = 901 #

Pss/Ω = 840 # <- Controls

For t2/t1 ≥ 2.5: | Pns = 2703 #

$P_{ns} = 2.7t_1 dF_{u1}$ = 2.70 k

$P_{ns} = 2.7t_2 dF_{u2}$ = 3.86 k

***Tension***: Pnot = 1.214 k (screw pull-out strength)

Pnov = 2.607 k (screw pull-over strength)

$P_{not} = 0.85t_c dF_{u2})$

$t_c = \min(t_1, t_2)$

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

Pts/Ω = 405 # <- Controls

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

| | Shear (k) | # clips | $V_{clip}$ (k) | $V_{allow}$(lb) | # screws | spacing |
|---|---|---|---|---|---|---|
| Long side: | 0.976 | 1 | 0.98 | 840 # | 2 | 6.00 in |
| Short side: | 1.399 | 1 | 1.40 | 840 # | 2 | 6.00 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 = 0.440 $in^2$ | 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: | $Uplift_{MAX}$ = 4268 lbs | $Shear_{MAX}$ = 1399 lbs

$Compression_{SEISMIC}$ = 556 lbs =[FpmaxASD*(Hcm+Hcurb)+(1+0.14$S_{DS}$)*($WGT_{unit+curb}$/2)*wcurb]/wcurb

$Tension_{SEISMIC}$ = 262 lbs =$Comp_{SEISMIC}$-(0.6-0.14$S_{DS}$)*(WGTunit+curb)

$Compression_{WIND}$ = 3402 lbs =[$F_{h\ transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*wcurb-$F_{vertASD}$*wcurb/2]/wcurb

$Tension_{WIND}$ = 4268 lbs =[$F_{h\ transASD}$*(Hcm+Hcurb)-0.6*($WGT_{unit+curb}$/2)*wcurb+$F_{vertASD}$*wcurb/2]/wcurb

Longitudinal: | $Uplift_{MAX}$ = 2217 lbs | $Shear_{MAX}$ = 976 lbs

$Compression_{SEISMIC}$ = 460 lbs =[FpmaxASD*(Hcm+Hcurb)+(1+0.14$S_{DS}$)*($WGT_{unit+curb}$/2)*Lcurb]/Lcurb

$Tension_{SEISMIC}$ = 166 lbs =$Comp_{SEISMIC}$-(0.6-0.14$S_{DS}$)*(WGTunit+curb)

$Compression_{WIND}$ = 1350 lbs =[$F_{h\ transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb

$Tension_{WIND}$ = 2217 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 = 4.51 | COMBINED LOADING: 0.903 O.K.

# of Screws Req'd for Shear = 1.37 | Screw Spacing = 7.7 in o.c.

Total # of screws Required = 6

Use 5/8" φ wood lag screws @ 7.7 in o.c. along long side of curb

Longitudinal:

# of Screws Req'd for Uplift = 2.3 | COMBINED LOADING: 0.886 O.K.

# of Screws Req'd for Shear = 1.0 | Screw Spacing = 11.5 in o.c.

Total # of screws Required = 3

Use 5/8" φ wood lag screws @ 11.5 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 = 0.62 | COMBINED LOADING: 0.204 O.K.

# of Bolts Req'd for Shear = 0.38 | Bolt Spacing = 34.5 in o.c.

Total # of Bolts Required = 2

Use 5/8" φ A307 Bolts attached to steel angle below deck @ 34.5 in o.c. along long side of curb

Longitudinal:

# of Bolts Req'd for Uplift = 0.32 | COMBINED LOADING: 0.082 O.K.

# of Bolts Req'd for Shear = 0.27 | Req'd Min Spacing = 19.0 in o.c.

Total # of Bolts Required = 2

Use 5/8" φ A307 Bolts attached to steel angle below deck @ 19 in o.c. along short side of curb

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**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: $Uplift_{MAX}$ = 4268 lbs $Shear_{MAX}$ = 1399 lbs

$Compression_{SEISMIC}$ = 987 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14$S_{DS}$)*($WGT_{unit+curb}$/2)*wcurb]/wcurb

$Tension_{SEISMIC}$ = 693 lbs =$Comp_{SEISMIC}$-(0.6-0.14$S_{DS}$)*(WGTunit+curb)

$Shear_{SEISMIC}$ = 262 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 4.64 spacing = 5.63 in o.c. Tapplied = 853.7 lbs

Min Bolts Req'd Shear = 2.00 spacing = 22.5 in o.c. Vapplied = 174.8 lbs

Try using 5 bolts
spaced at 8.63 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \leq 1.2$ = 1.09

Use 5 - 3/4" ϕ Hilti Hit-HY 200 adhesive anchors @ 8.6 in o.c. max. along long side of curb w/ 4" embed

Longitudinal: $Uplift_{MAX}$ = 2217 lbs $Shear_{MAX}$ = 1399 lbs

$Compression_{SEISMIC}$ = 748 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14$S_{DS}$)*($WGT_{unit+curb}$/2)*Lcurb]/Lcurb

$Tension_{SEISMIC}$ = 453 lbs =$Comp_{SEISMIC}$-(0.6-0.14$S_{DS}$)*(WGTunit+curb)

$Shear_{SEISMIC}$ = 262 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 2.41 spacing = 3.5 in o.c. Tapplied = 738.9 lbs

Min Bolts Req'd Shear = 2.00 spacing = 7 in o.c. Vapplied = 174.8 lbs

Try using 3 bolts
spaced at 9.50 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \leq 1.2$ = 0.96

Use 3 - 3/4" ϕ Hilti Hit-HY 200 adhesive anchors @ 9.5 in o.c. max. along short side of curb w/ 4" embed

| CURB DESIGN SUMMARY: | CBKD-160 80-265-49** | | Unit: P***A ALL MODELS |
|---|---|---|---|
| CURB RAIL THICKNESS: | 0.0713 in 14 Gauge | | |
| UNIT CLIP THICKNESS: | 0.0713 in 14 Gauge | | |
| # OF CLIPS (LONG SIDE) - | 1 clips with 2 - #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 2 - #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 | STEEL | CONCRETE |
| | 5/8" ϕ lag screw w/ min. 3.5" embed (SGmin=0.43) | 5/8" ϕ A307 bolts to steel angle below | 3/4" ϕ thrd'd rod in Hilti HIT-HY 200 epoxy, min. 4" embed |
| LONG DIRECTION | 6 @ 7.7 in o.c. | 2 @ 34.5 in o.c. | 5 @ 8.63 in o.c. |
| SHORT DIRECTION | 3 @ 11.5 in o.c. | 2 @ 19 in o.c. | 3 @ 9.5 in o.c. |