MOUR GROUP
ENGINEERING + DESIGN

6593 Riverdale St.
San Diego, CA 92120

619-727-4800

Structural Calculations

for

CBKD Series Roof Curbs

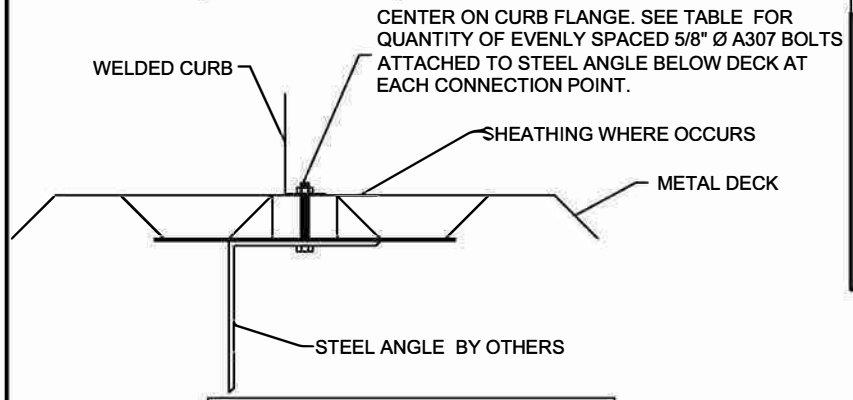
CBKD-95A (80-265-29)
2020 Florida Building Code requirements

Prepared for:

PROVENT
3847 Wabash Drive
Mira Loma, CA 91725

Date: May 19, 2021
Project Number: PV2101

STEEL ATTACHMENT



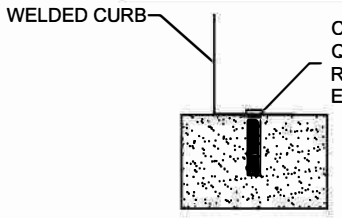
	NO. OF ANCHORAGE BOLTS REQUIRED		
CURB KIT	LONG SIDE *	SHORT SIDE *	UNIT
80-265-49	2 @ 34.5" o.c.	2 @ 19" o.c.	LXS
80-265-50	2 @ 34.5" o.c.	2 @ 29" o.c.	LXL
80-265-13	2 @ 61" o.c.	2 @ 25.25" o.c.	SUNLINE 3-6 TON
80-265-45	2 @ 58.38" o.c.	2 @ 28.19" o.c.	PRESTIGE SMALL
80-265-46	2 @ 72" o.c.	2 @ 41" o.c.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

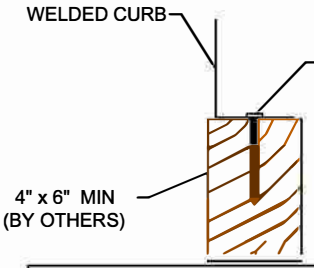


- NORMAL WEIGHT CONC SLAB
- f'c=4000 PSI MIN
- 6" MIN THICK CONC.
- SPECIAL INSPECTION REQUIRED (ESR-3187)

	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

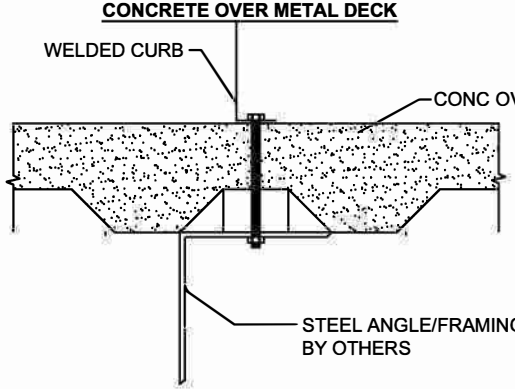
WOOD ATTACHMENT



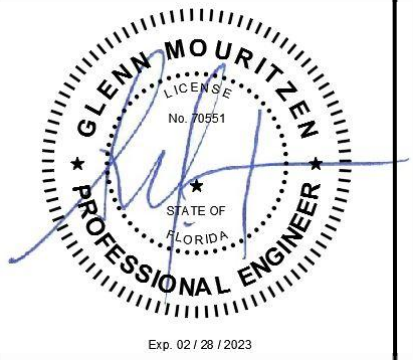
(SPECIFIC GRAVITY OF WOOD= 0.43 MIN)

	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.)

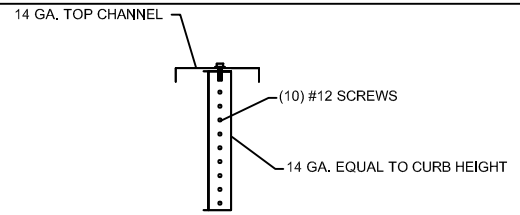
CALCULATED WIND ROOF CURBS FOR YORK UNITS

ZT, ZH, ZJ, ZR 037-150
ZF, XP, ZB 078-150

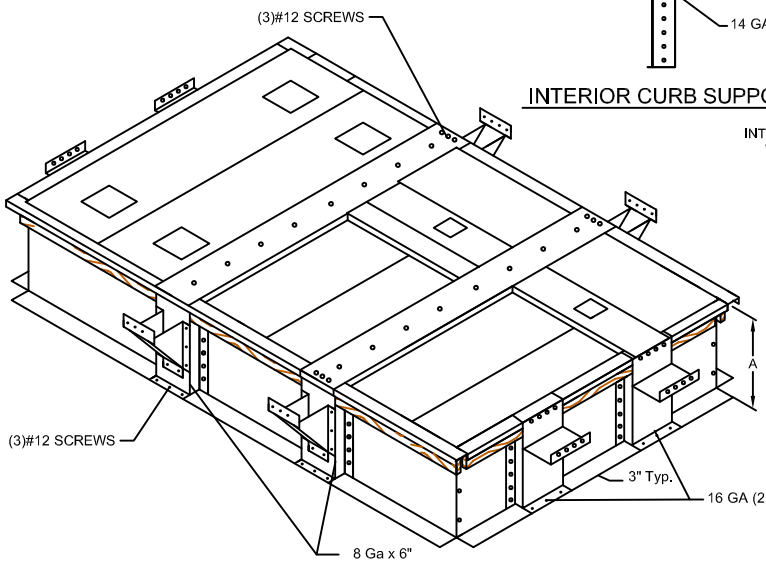
ProVent P/N	A	WEIGHT
80-265-2914	14"	270 Lbs
80-265-2918	18"	350 Lbs

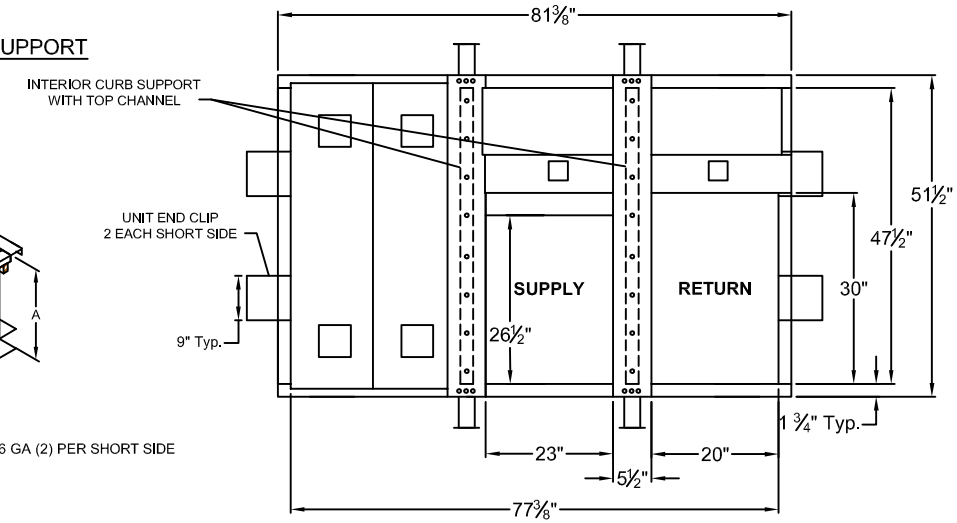
Meets wind requirements for the following codes:
FBC 2020
based on ASCE 7-16.

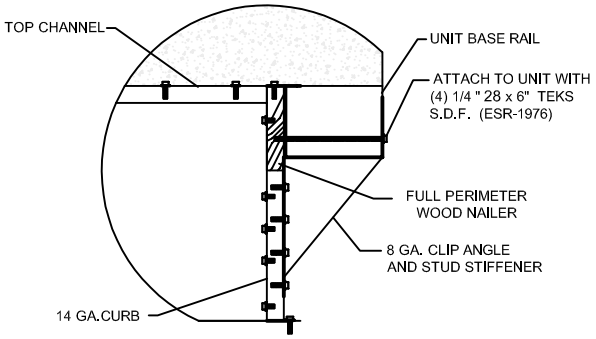
Wind:
190 mph exposure D category III or IV building, max BLDG height: 60 ft
Kzt=1.00 max



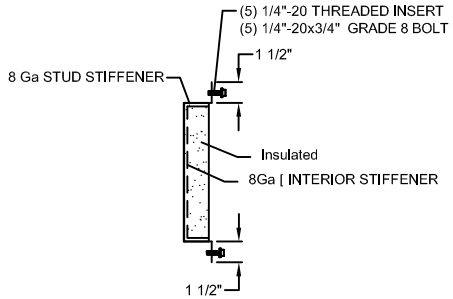
INTERIOR CURB SUPPORT



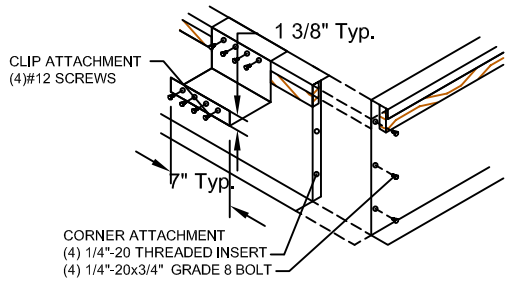




HOLD DOWN DETAIL



STUD STIFFENER



CORNER & END CLIP DETAIL

GLENN MOURITZEN
LICENSE No. 70551
STATE OF FLORIDA
PROFESSIONAL ENGINEER
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:		PART NUMBER:
CBKD-95A		80-265-29
DATE:	REV:	DRAWN BY:
3/29/2021	2	ALL

MOUR GROUP
ENGINEERING + DESIGN

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

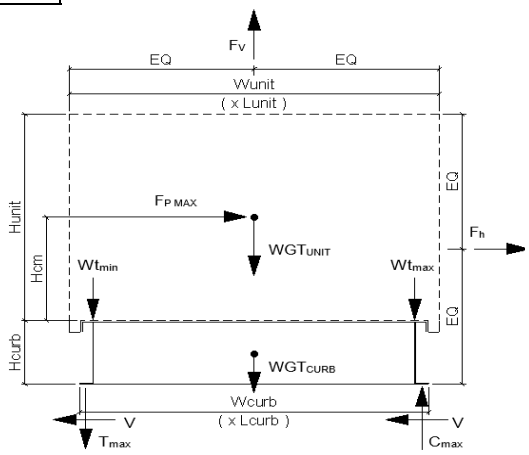
Client:	ProVent PV2101	Previous: PV1807	
Description:	CBKD-95	80-265-29**	
Unit:	ZT,ZH,ZJ,ZR 037-061; ZF,ZH,ZJ,ZR,XP 078-150		

Curb Information

Hcurb =	18	in	(Height of curb)
Lcurb =	81.375	in	(Length of curb)
wcurb =	51.5	in	(Width of curb)
WGTcurb =	350	lbs	(Weight of curb)
# Clips long side =	2	# Clips short side =	2

Unit Information

WGTunit =	1253	lbs	(Weight of Unit)
Wtmax =	381	lbs	(Maximum corner weight)
Wtmin =	251	lbs	(Minimum corner weight)
Hunit =	50.75	in	(Height of unit above curb)
Hcm =	25.375	in	(Height to center of mass)
Lunit =	119.5	in	(Length of unit)
Wunit =	59	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 =	505	lbs	(0.7*Fpmax) FpmaxASD = 646 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)
$F_{h\ ASD\ trans}$ =	6693	lbs	= 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.4-2)
$F_{h\ ASD\ long}$ =	3304	lbs	= 0.6*qz*GCr*Wunit*(Hunit+Hcurb)
$F_{vert\ ASD}$ =	4535	lbs	= 0.6*qz*GCr*Lunit*Wunit (Eq. 29.4-3)

Curb Loading

Transverse:

$Compression_{SEISMIC}$ =	1037	lbs	=[FpmaxASD*Hcm+2*(1+0.14S_{DS})*Wtmax*wcurb]/wcurb
$Tension_{SEISMIC}$ =	327	lbs	= $Comp_{SEISMIC}$-(0.6-0.14S_{DS})*WGTunit
$Compression_{WIND}$ =	1488	lbs	=[$F_{h\ transASD}$*Hcm+2*0.6*Wtmax*wcurb-$F_{vertASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ =	5270	lbs	= $Comp_{WIND}$+Fvert-0.6*WGTunit

---> Negative values indicate opposite load.

Longitudinal:

$Compression_{SEISMIC}$ =	945	lbs	=[FpmaxASD*Hcm+2*(1+0.14*S_{DS})*Wtmax*Lcurb]/Lcurb
$Tension_{SEISMIC}$ =	235	lbs	= $Comp_{SEISMIC}$-(0.6-0.14S_{DS})*WGTunit
$Compression_{WIND}$ =	-780	lbs	=[$F_{h\ transASD}$*Hcm+2*0.6*Wtmax*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb
$Tension_{WIND}$ =	3003	lbs	= $Comp_{WIND}$+Fvert-0.6*WGTunit

---> Negative values indicate opposite load.

Governing Reactions:

Transverse:	$Comp_{MAX}$ =	1488	lbs	---> Along long edge of curb.
(on long edge)	$Tens_{MAX}$ =	5270	lbs	---> Along long edge of curb.
Longitudinal:	$Comp_{MAX}$ =	945	lbs	---> Along short edge of curb.
(on short edge)	$Tens_{MAX}$ =	3003	lbs	---> Along short edge of curb.

---> Negative values indicate opposite load.

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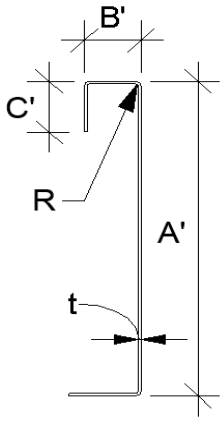
Curb Design

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'=	[1.813] in		a'=	17.929 in	= A'-t
C'=	[0.000] in	(0 if no lips)	b =	1.634 in	= B'-[r+t/2+α(r+t/2)]
α =	[0.000]	(0 - no Lip; 1 w/ lip)	b'=	1.777 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 =	0.148 in	(Distance between centroid and web centerline)			
Ix =	53.924 in	(Moment of Inertia about X-Axis)			
Iy =	0.233 in	(Moment of Inertia about Y-Axis)			
A =	1.52 in^2				
rx =	5.95 in				
ry =	0.391 in				
rmin =	0.391 in				

Axial Compression

Pu = 3.346 k (Max Axial Comp) Ωc = 1.80
Pn/Ωc = 19.078 k
Fe = 26.28 ksi
λc = 1.38
Fn = 22.55 ksi
Ly = 52 in Lateral unbraced length
k_yL_y/r_y = 105 (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
Ω_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/Ω_w = 1.312 k
Long side: Pu_{Trans} = 0.744 k O.K. # clips = 2
Short side: Pu_{Long} = 0.473 k O.K. # clips = 2

(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

O.K.

Corner Connections

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

Tcrnmax = 1673 lbs Max($F_{pmaxASD}$/4 -OR- $Fh_{ASDtrans}$/4 corner connections)
Vcrnmax = 2635 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 = 0.7
# of Bolts required for Shear = 2.4 ***If combined fails:
# of Bolts Used = [3.0] USE --> 4.0

Check Combined Stress in Bolts & Inserts: 1.026 N.G. StressComb = 0.770 O.K.

Check 1/8" welded connection

<--- USE WELD Ω = 2.35
Assume L/t > 25: 25*t = 1.783 in
Lreq'd = 1.782 in

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

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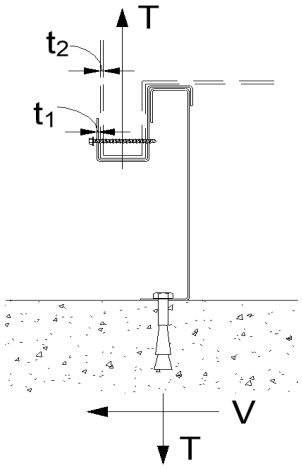
Connection Unit to Curb Clip #14 SMS screw Ω = 3.0

t1 = 0.0713 in Fu1 = 65 ksi

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

d = 0.242 in (screw diameter) dw = 0.500 in (nom. washer diameter)

t2/t1 = 1.4



For t2/t1 ≤ 1.0: Pns = 3028 #

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

$P_{ns} = 2.7t_1 dF_{u1}$ 3.03 k

$P_{ns} = 2.7t_2 dF_{u2}$ 4.32 k

Pns/Ω = 1009 # <- Controls

Pss/Ω = 1045 #

For t2/t1 ≥ 2.5: Pns = 3028 #

$P_{ns} = 2.7t_1 dF_{u1}$ 3.03 k

$P_{ns} = 2.7t_2 dF_{u2}$ 4.32 k

Tension: Pnot = 1.360 k (screw pull-out strength)

Pnov = 3.476 k (screw pull-over strength)

Pts/Ω = 453 # <- Controls

Pts/Ω = 1220 # (full tensile screw capacity)

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

$t_c = \min(t_1, t_2)$

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

	Shear (k)	# clips	V_{clip} (k)	V_{allow}(lb)	# screws	spacing
Long side:	1.652	2	0.83	1009 #	2	6.00 in
Short side:	3.346	2	1.67	1009 #	2	6.00 in

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

min spacing = 0.73 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 = 0.438 in^2 Ant = 0.080 in^2

Rn/Ω = 8.620 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: $Uplift_{MAX}$ = 7423 lbs $Shear_{MAX}$ = 3346 lbs

$Compression_{SEISMIC}$ = 1373 lbs =[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*wcurb]/wcurb

$Tension_{SEISMIC}$ = 465 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)

$Compression_{WIND}$ = 3851 lbs =[$F_{h\ transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*wcurb-$F_{vertASD}$*wcurb/2]/wcurb

$Tension_{WIND}$ = 7423 lbs =[$F_{h\ transASD}$*(Hcm+Hcurb)-0.6*($WGT_{unit+curb}$/2)*wcurb+$F_{vertASD}$*wcurb/2]/wcurb

Longitudinal: $Uplift_{MAX}$ = 3548 lbs $Shear_{MAX}$ = 1652 lbs

$Compression_{SEISMIC}$ = 1173 lbs =[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*Lcurb]/Lcurb

$Tension_{SEISMIC}$ = 265 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)

$Compression_{WIND}$ = -25 lbs =[$F_{h\ transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb

$Tension_{WIND}$ = 3548 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 = 7.84 COMBINED LOADING: 0.988 O.K.

# of Screws Req'd for Shear = 3.27 Screw Spacing = 8.2 in o.c.

Total # of screws Required = 10

Use 5/8" φ wood lag screws @ 8.2 in o.c. along long side of curb w/ 3.5" Min. Embed

Longitudinal:

# of Screws Req'd for Uplift = 3.7 COMBINED LOADING: 0.725 O.K.

# of Screws Req'd for Shear = 1.6 Screw Spacing = 8.7 in o.c.

Total # of screws Required = 6

Use 5/8" φ wood lag screws @ 8.7 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: 6903 lbs 3682 lbs

# of Bolts Req'd for Uplift = 1.08 COMBINED LOADING: 0.318 O.K.

# of Bolts Req'd for Shear = 0.91 Bolt Spacing = 34.7 in o.c.

Total # of Bolts Required = 3

Use 5/8" φ A307 Bolts attached to steel angle below deck @ 34.7 in o.c. along long side of curb

Longitudinal:

# of Bolts Req'd for Uplift = 0.51 COMBINED LOADING: 0.187 O.K.

# of Bolts Req'd for Shear = 0.45 Req'd Min Spacing = 39.5 in o.c.

Total # of Bolts Required = 2

Use 5/8" φ A307 Bolts attached to steel angle below deck @ 39.5 in o.c. along short side of curb

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For Concrete anchorage: SEISMIC (0.6-0.14SDS)D + 0.7Ω_oE (Ω_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: $Uplift_{MAX}$ = 7423 lbs $Shear_{MAX}$ = 3346 lbs

$Compression_{SEISMIC}$ = 2189 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*wcurb]/wcurb

$Tension_{SEISMIC}$ = 1281 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)

$Shear_{SEISMIC}$ = 808 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 8.06 spacing = 7.17 in o.c. Tapplied = 824.8 lbs

Min Bolts Req'd Shear = 3.08 spacing = 19.125 in o.c. Vapplied = 239.0 lbs

Try using 9 bolts
spaced at 8.67 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \leq 1.2$ = 1.12

Use 9 - 3/4" ϕ Hilti Hit-HY 200 adhesive anchors @ 8.7 in o.c. max. along long side of curb w/ 4" embed

Longitudinal: $Uplift_{MAX}$ = 3548 lbs $Shear_{MAX}$ = 3346 lbs

$Compression_{SEISMIC}$ = 1690 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*Lcurb]/Lcurb

$Tension_{SEISMIC}$ = 782 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)

$Shear_{SEISMIC}$ = 808 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 3.85 spacing = 9.166667 in o.c. Tapplied = 709.6 lbs

Min Bolts Req'd Shear = 3.08 spacing = 9.166667 in o.c. Vapplied = 239.0 lbs

Try using 5 bolts
spaced at 9.88 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \leq 1.2$ = 0.99

Use 5 - 3/4" ϕ Hilti Hit-HY 200 adhesive anchors @ 9.9 in o.c. max. along short side of curb w/ 4" embed

CURB DESIGN SUMMARY:	CBKD-95	80-265-29**	Unit:	ZT,ZH,ZJ,ZR 037-061; ZF,ZH,ZJ,ZR,XP 078-150
CURB RAIL THICKNESS:	0.0713 in	14 Gauge		
UNIT CLIP THICKNESS:	0.0713 in	14 Gauge		
# OF CLIPS (LONG SIDE) -	2 clips with 2 - #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 2 - #14 SMS screws each clip			
WEB STIFFENER:	16Ga x 3/4" x 7" (C-channel) stiffener at each clip			
CORNER CONNECTION:	Use 4 - 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	10 @ 8.15 in o.c.	3 @ 34.69 in o.c.	9 @ 8.67 in o.c.
SHORT DIRECTION	6 @ 8.7 in o.c.	2 @ 39.5 in o.c.	5 @ 9.88 in o.c.