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

Structural Calculations

for

CBKD-80 Series

CBKDPRD3715** SERIES

Prepared for:

PROVENT / RRS

3847 Wabash Drive
Mira Loma, CA 91725

Date: September 26, 2023

Project Number: PV2312

For wood,concrete, and steel attachments, see Roof Anchorage Detail, Form no. CB-60.

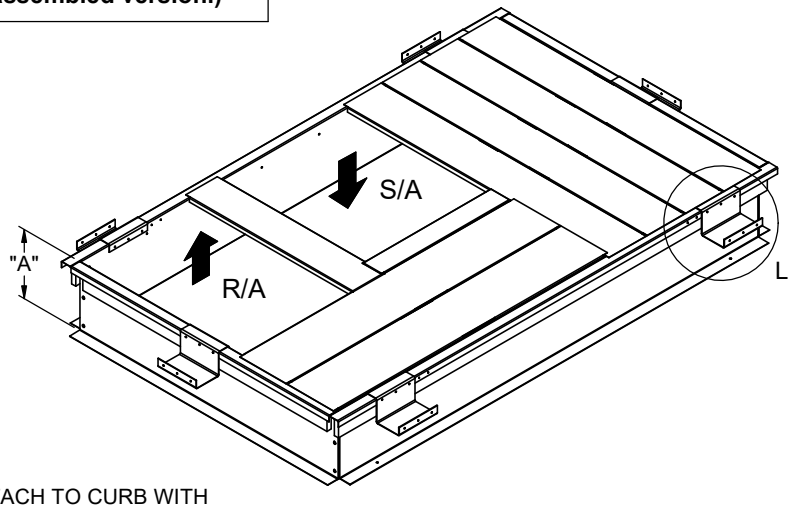
Will conform to seismic code requirements for knock-down or pre-assembled application. (Contact facory for assembled version.)

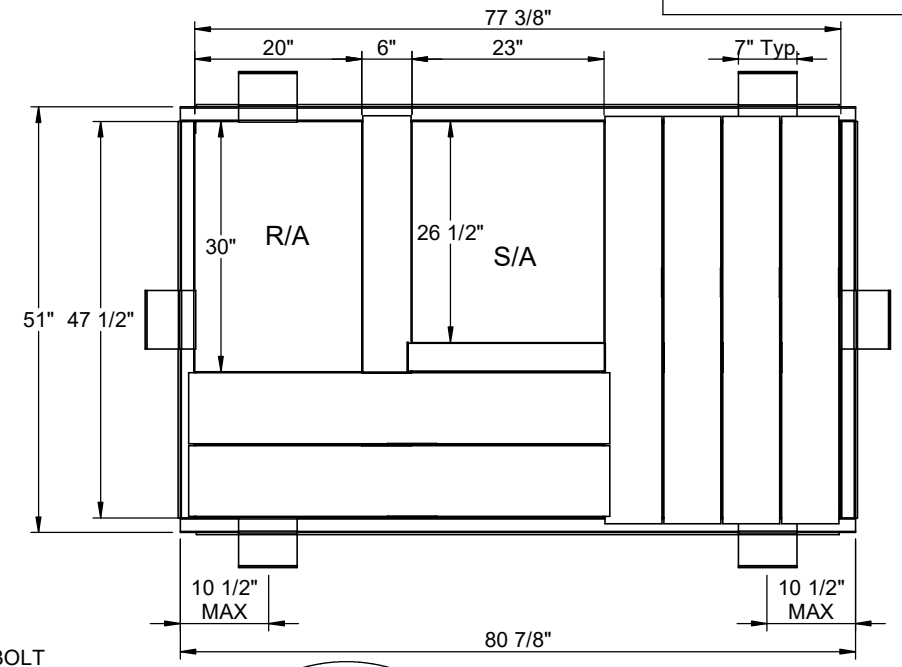
STRUCTURALLY CALCULATED HOLD DOWN CLIPS FOR KNOCK-DOWN ROOF CURBS FOR PREDATOR (SUN PRO) UNITS

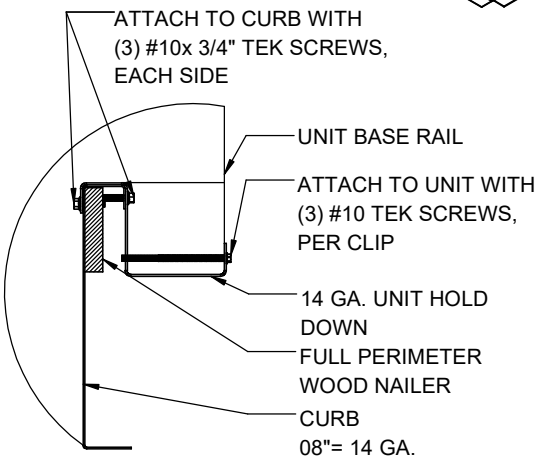
ZT, ZH, ZJ, ZR 037-150
ZF, XP, ZB 078-150

PROVENT P/N	A	EST. WEIGHT	SEISMIC KIT P/N	WEIGHT
CBKDPRD371508	8"	115 Lbs.	KDKITPRD3715	23 Lbs.
CBKDPRD371511	11"	129 Lbs.		
CBKDPRD371514	14"	144 Lbs		

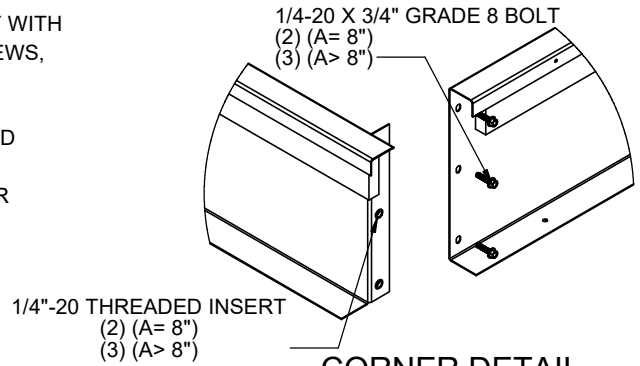
Meets seismic requirements for the following codes:
CBC 2022
IBC 2021



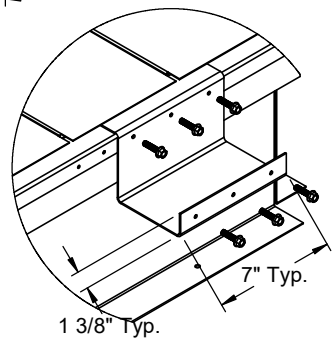




HOLD DOWN DETAIL



CORNER DETAIL



DETAIL L

ProVent

3847 WABASH DR.
MIRA LOMA, CA 91752

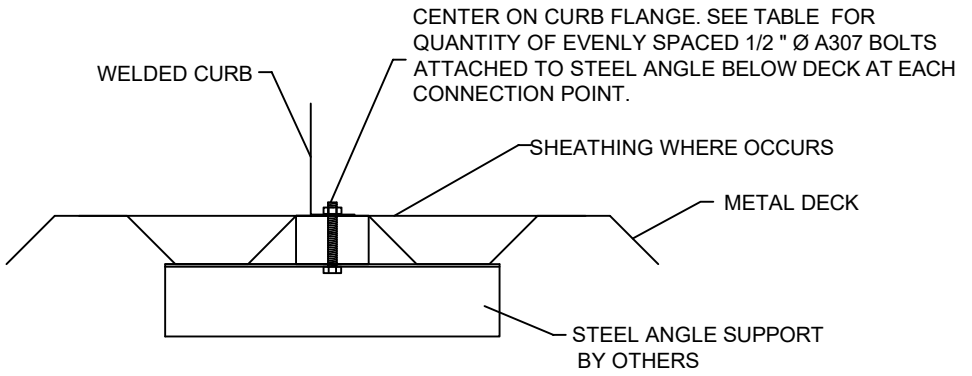
PHONE (951) 685-1101
FAX (619) 872-9799

SUBMITED TO:
COMPANY:
JOB NAME:
EQUIPMENT:
NOTES:

FORM NO:	PART NUMBER:
CBKD-80	KDKITPRD3715 SERIES

DATE:	REV:	DRAWN BY:
8/25/2023	7	FMM

STEEL ATTACHMENT



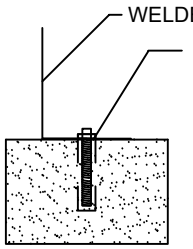
	NO. OF ANCHORAGE BOLTS REQUIRED	
CURB	LONG SIDE	SHORT SIDE
LXS	2 @ 34.5" O.C.	2 @ 19" O.C.
LXL	2 @ 34.5" O.C.	2 @ 29" O.C.
SUN3672	2 @ 60.5" O.C.	2 @ 24.75" O.C.
PRD3715	2 @ 68.88" O.C.	2 @ 39" O.C.
PRS	2 @ 58.88" O.C.	2 @ 28.69" O.C.
PRL	2 @ 72" O.C.	2 @ 41.5" O.C.
SAV1518	3 @ 54.56" O.C	2 @ 68.13" O.C.
SAV2025	3 @ 61.56" O.C	2 @ 68.13" O.C.
SAV28	3 @ 69.75" O.C	2 @ 68.13" O.C.

ASSUMES:
CONC SLAB
f'c= 4000PSI MINIMUM
4" MIN THICKNESS
NORMAL WEIGHT CONCRETE
MIN. 7-1/4" EDGE DISTANCE

Meets seismic requirements for the following codes:
CBC 2022
IBC 2021

ROOF ANCHORAGE DETAIL	
CBKD Series	CBWC Series
LXS	LXS
LXL	LXL
SUN3672	SUN3672
PRD3715	PRD3715
PRS	PRS
PRL	PRL
SAV1518	SAV1518
SAV2025	SAV2025
SAV28	SAV28

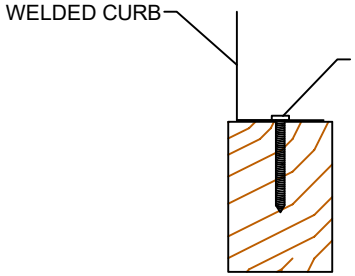
CONCRETE ATTACHMENT



	NO. OF ANCHORAGE BOLTS REQUIRED	
CURB	LONG SIDE	SHORT SIDE
LXS	2 @ 34.5" O.C.	2 @ 19.0" O.C.
LXL	2 @ 34.5" O.C.	2 @ 29" O.C.
SUN3672	2 @ 60.5" O.C.	2 @ 24.75" O.C.
PRD3715	4 @ 22.96" O.C.	2 @ 39" O.C.
PRS	2 @ 58.88" O.C.	2 @ 28.69" O.C.
PRL	3 @ 36" O.C.	2 @ 41.5" O.C.
SAV1518	4 @ 36.38" O.C.	2 @ 68.13" O.C.
SAV2025	4 @ 41.04" O.C.	3 @ 34.06" O.C.
SAV28	5 @ 34.88" O.C.	3 @ 34.06" O.C.

*** SIX INCHES FROM EACH CORNER EVENLY SPACED.**
**** CENTERED.**

WOOD ATTACHMENT



	NO. OF ANCHORAGE SCREWS REQUIRED	
CURB	LONG SIDE	SHORT SIDE
LXS	4 @ 12.83" O.C.	3 @ 11.5" O.C.
LXL	4 @ 12.83" O.C.	3 @ 16.5" O.C.
SUN3672	4 @ 21.5" O.C.	3 @ 14.38" O.C.
PRD3715	7 @ 12.15" O.C.	5 @ 10.75" O.C.
PRS	4 @ 20.96" O.C.	3 @ 16.35" O.C.
PRL	6 @ 15.2" O.C.	4 @ 15.17" O.C.
SAV1518	6 @ 22.63" O.C.	5 @ 18.03" O.C.
SAV2025	7 @ 21.19" O.C.	5 @ 18.03" O.C.
SAV28	8 @ 20.5" O.C.	5 @ 18.03" O.C.

FOUR INCHES FROM EACH CORNER EVENLY SPACED

ProVent

3847 WABASH DRIVE
MIRA LOMA, CA 91725

PHONE (951) 685-1101
FAX (619) 872-9799

SUBMITTED TO: _____
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8/28/2023	10	FMM

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San Diego, CA 92120
(619)727-4800

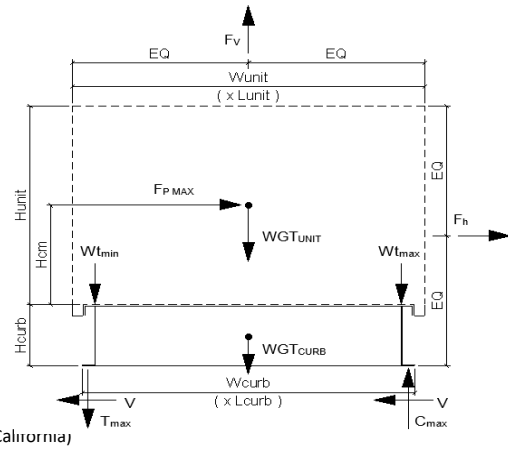
Client:	ProVent PV2312
Description:	CBPKD-80 PRD3715
Unit:	ZT, ZH, ZR, ZJ 037-150; ZF, XP, ZB 078-150

Curb Information

Hcurb =	14	in	(Height of curb)
Lcurb =	80.875	in	(Length of curb)
wcurb =	51	in	(Width of curb)
WGTcurb =	159	lbs	(Weight of curb)
# Clips long side =	2		# Clips short side = 1

Unit Information

WGTunit =	1736	lbs	(Oper. Weight of Unit)
Wtmax =	521	lbs	(Maximum corner weight)
Wtmin =	369	lbs	(Minimum corner weight)
Hunit =	50.75	in	(Height of unit above curb)
Hcm =	25.375	in	(Height to center of mass)
Lunit =	89	in	(Length of unit)
Wunit =	59	in	(Width of unit)



Seismic Loading - 2021 IBC/2022 CBC

Ss =	2.85		(Worst case for majority of California)
Fa =	1.20		(Default Site Class D - Table 11.4-1 ASCE 7-16)
Ip =	1.50		(Importance Factor Category III Building)
Sms =	3.420		(Fa*Ss)
Sds =	2.280		(2/3*Sms) ap = 2.5
Fpmax =	1.710	Wp	(0.4*ap*Sds*Ip)*Wp*3/Rp <=1.6*Sds*Ip*Wp Rp = 6
FpmaxASD =	2078	lbs	(0.7*Fpmax) FpmaxASD = 2268 lbs
	(unit only)		(unit and curb)

Wind Loading - 2021 IBC/2022 CBC

Kz =	1.13		(For 60 ft roof height, Exposure C - Table 26.10-1 ACSE 7-16)
Kzt =	1.0		(No topographic effects assumed for rooftop mounted units)
Kd =	0.85		(Directionality factor Table 26.6-1 ASCE 7-16)
V =	115		(Wind velocity, mph for Occupancy Cat III-IV bldgs Exp. Cat C, Fig 25.5-1D, 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	32.5	psf	$= 0.00256*Kz*Kzt*Kd*V^2$ (Eq. 26.10-1 ASCE 7-16)
$F_{h\ ASD\ trans}$ =	1484	lbs	= 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.4-2)
$F_{h\ ASD\ long}$ =	983	lbs	= 0.6*qz*GCr*Wunit*(Hunit+Hcurb)
$F_{vert\ ASD}$ =	1067	lbs	= 0.6*qz*GCr*Lunit*Wunit (Eq. 29.4-3)

Curb Loading

Transverse:

$Compression_{SEISMIC}$ =	2408	lbs	$=[FpmaxASD*Hcm+2*(1+0.14S_{DS})*Wtmax*wcurb]/wcurb$
$Tension_{SEISMIC}$ =	827	lbs	$=[FpmaxASD*Hcm-2*(0.6-0.14S_{DS})*Wtmin*wcurb]/wcurb$
$Compression_{WIND}$ =	829	lbs	$=[F_{h\ ASD\ trans}*Hcm+2*0.6*Wtmax*wcurb-F_{vert\ ASD}*wcurb/2]/wcurb$
$Tension_{WIND}$ =	829	lbs	$=[F_{h\ ASD\ trans}*Hcm-2*0.6*Wtmin*wcurb+F_{vertASD}*wcurb/2]/wcurb$

---> Negative values indicate opposite load.

Longitudinal:

$Compression_{SEISMIC}$ =	2737	lbs	$=[FpmaxASD*Hcm+2*(1+0.14*S_{DS})*Wtmax*Lcurb]/(Lcurb-2*10.5in)$
$Tension_{SEISMIC}$ =	601	lbs	$=[FpmaxASD*Hcm-2*(0.6-0.14S_{DS})*Wtmin*Lcurb]/(Lcurb-21in)$
$Compression_{WIND}$ =	540	lbs	$=[F_{h\ ASD\ long}*Hcm+2*0.6*Wtmax*Lcurb-F_{vertASD}*Lcurb/2]/(Lcurb-21in)$
$Tension_{WIND}$ =	540	lbs	$=[F_{h\ ASD\ long}*Hcm-2*0.6*Wtmin*Lcurb+F_{vertASD}*Lcurb/2]/(Lcurb-21in)$

---> Negative values indicate opposite load.

Governing Reactions:

Transverse:	$Comp_{MAX}$ =	2408	lbs	---> Along long edge of curb.
(on long edge)	$Tens_{MAX}$ =	829	lbs	---> Along long edge of curb.
Longitudinal:	$Comp_{MAX}$ =	2737	lbs	---> Along short edge of curb.
(on short edge)	$Tens_{MAX}$ =	601	lbs	---> Along short edge of curb.

---> Negative values indicate opposite load.

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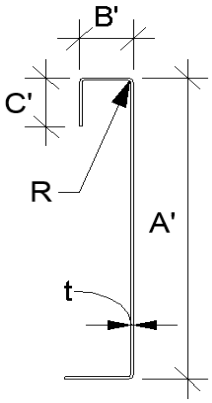
Curb Design

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



Calculate Section Properties of Curb

A'=	14.000	in	a =	13.644	in = A'-(2r+t)
B'=	1.750	in	a'=	13.929	in = A'-t
C'=	0.000	in (0 if no lips)	b =	1.572	in = B'-[r+t/2+α(r+t/2)]
α =	0.000	(0 - no Lip; 1 w/ lip)	b'=	1.714	in = B'-(t/2+αt/2)
R =	0.1069	(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 =	0.171	in (Distance between centroid and web centerline)			
Ix =	27.499	in^4	rx =	4.73	in
Iy =	0.204	in^4	ry =	0.407	in
A =	1.23	in^2	rmin =	0.407	in

Axial Compression

Pu =	1.039	k	(Max Axial Comp)
Pn/Ωc =	18.250	k	
Fe =	33.42	ksi	
λc =	1.22		
Fn =	26.73	ksi	
Ly =	48	in	Lateral unbraced length
k_yL_y/r_y =	93		(assume k=0.8)

Ωc = 1.80

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

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

Compression Check = O.K.

Check Web Crippling

h =	14	in	-- Check limits:		
t =	0.0713	in	h/t =	196.35 ≤ 260	
N =	7.00		N/t =	98.18 ≤ 210	
Ω_w =	1.75		N/h =	0.5 ≤ 2.0	
P_n =	2.422	k	R/t =	1.50 ≤ 9.0	
P_n/Ω_w =	1.384	k			
Long side: Pu_{Trans} =	1.204	k	**O.K.**	# clips = 2	
Short side: Pu_{Long} =	1.368	k	**O.K.**	# clips = 2	

C = 4.00
C_R = 0.14
C_N = 0.35
C_h = 0.02

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

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

*assumes partial load goes to clips on adjacent side.

Check Web Stiffener 16Ga x 3/4" x 6" (C-channel)

width of stiffener =	6.000	in	ts =	0.0566	16 Gauge
web of stiff. w =	5.717	in	Rs =	0.0849	in
***Check w/ts ≤ 1.28√E/Fys			Ωc =	1.70	
w/ts =	101.007				
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 =	2.422	k	Ae =	0.324	in^2
Pn =	13.021	k	Pn/Ω =	7.659	k

Not Req'd

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

Tcrnmax =	567	lbs	Max($F_{pmaxASD}$/4 -OR- $Fh_{ASDtrans}$/4 corner connections)			
Vcrnmax =	1368	lbs	Max(Tens/2 -OR- Comp/2 corner connections per side)			
Bolt:	Tall =	2480	lbs	Vall =	1208	lbs
Threaded Insert:	Tall =	2860	lbs	Vall =	1536	lbs

# of Bolts required for Tension = 0.2
# of Bolts required for Shear = 1.1
# of Bolts Used = 3.0
Check Combined Stress in Bolts & Inserts: 0.454 **O.K.**

Check 1/8" welded connection <--- USE WELD Ω = 2.35

Assume L/t > 25: 25*t =	1.783	in
Lreq'd =	0.925	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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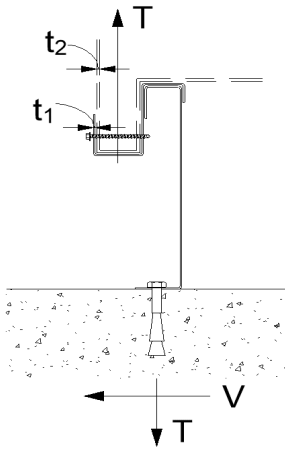
Connection Unit to Curb Clip | #10 SMS screw | Ω = 3.0

t1 = 0.0713 in | Fu1 = 65 ksi
t2 = 0.1017 in (unit base rail thickness) | Fu2 = 65 ksi
d = 0.190 in (screw diameter) | dw = 0.375 in (nom. washer diameter)
t2/t1 = 1.4



For t2/t1 ≤ 1.0:

Shear: $P_{ns} = 4.2F_{u2}\sqrt{t_2^3 d}$ Pns = 2377 # = 3.86 k

$P_{ns} = 2.7t_1 dF_{u1}$ = 2.38 k

$P_{ns} = 2.7t_2 dF_{u2}$ = 3.39 k

Pns/Ω = 792 #
Pss/Ω = 540 # <- Controls

For t2/t1 ≥ 2.5:

Pns = 2377 # = 2.38 k

$P_{ns} = 2.7t_1 dF_{u1}$ = 2.38 k

$P_{ns} = 2.7t_2 dF_{u2}$ = 3.39 k

Tension: Pnot = 1.068 k (screw pull-out strength)
Pnov = 2.607 k (screw pull-over strength)
Pts/Ω = 356 # <- Controls
Pts/Ω = 820 # (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:	2.078	2	1.04	540 #	2	6.00 in
Short side:	2.078	2	1.04	540 #	2	6.00 in

clip width (in) = 7.00 | clip height = 1.4 in
min spacing = 0.57 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 in² | Anv = 0.443 in² | Ant = 0.042 in²
Rn/Ω = 7.500 k

$R_n = 0.6F_y A_{gv} + F_u A_{nt} \leq 0.6F_u A_{nv} + F_u A_{nt}$

BSR O.K. (AISI Sect. E5.3)

Connection of Curb to Supporting Structure

Roof Loading SEISMIC: $(0.6\text{-}0.14S_{DS})D + 0.7E$ WIND: 0.6D + W

Transverse: $Uplift_{MAX}$ = 1485 lbs | $Shear_{MAX}$ = 1134 lbs

$Compression_{SEISMIC}$ = 3001 lbs =[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb
$Tension_{SEISMIC}$ = 1485 lbs =[FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb
$Compression_{WIND}$ = 1180 lbs =[$F_{h\ ASD\ trans}$*(Hcm+Hcurb)+0.6*$WGT_{unit+curb}$*wcurb/2-$F_{vert\ ASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ = 1111 lbs =[$F_{h\ ASD\ trans}$*(Hcm+Hcurb)-0.6*$WGT_{unit+curb}$*wcurb/2+$F_{vertASD}$*wcurb/2]/wcurb

Longitudinal: $Uplift_{MAX}$ = 838 lbs | $Shear_{MAX}$ = 1134 lbs

$Compression_{SEISMIC}$ = 2354 lbs =[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb
$Tension_{SEISMIC}$ = 838 lbs =[FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb
$Compression_{WIND}$ = 514 lbs =[$F_{h\ ASD\ long}$*(Hcm+Hcurb)+0.6*$WGT_{unit+curb}$*Lcurb/2-$F_{vert\ ASD}$*Lcurb/2]/Lcurb
$Tension_{WIND}$ = 444 lbs =[$F_{h\ ASD\ long}$*(Hcm+Hcurb)-0.6*$WGT_{unit+curb}$*Lcurb/2+$F_{vertASD}$*Lcurb/2]/Lcurb

Wood Attachment: **1/4"ϕ x 3.5" Simpson SDS screws w/ 2.25" threaded emb** (SGmin = 0.43)

Transverse: $Tall_{metal}$ = 997 lbs | $Vall_{metal}$ = 1097 lbs
$Tall_{wood}$ = 616 lbs | $Vall_{wood}$ = 672 lbs
# of Screws Req'd for Uplift = 2.41 | COMBINED LOADING: 0.820 O.K.
# of Screws Req'd for Shear = 1.69 | Screw Spacing = 18.2 in o.c.
Total # of screws Required = 5

1/4"ϕ x 3.5" Simpson SDS screws @ 18.2 in o.c. along long side of curb w/ 2.25" threaded embed

Longitudinal:
# of Screws Req'd for Uplift = 1.4 | COMBINED LOADING: 0.762 O.K.
# of Screws Req'd for Shear = 1.7 | Screw Spacing = 14.3 in o.c.
Total # of screws Required = 4

1/4"ϕ x 3.5" Simpson SDS screws @ 14.3 in o.c. along short side of curb w/ 2.25" threaded embed

Steel Deck Attachment: **1/2" ϕ A307 Bolts to steel angle below deck**

Transverse: $Tall_{bolt}$ = 3927 lbs | $Vall_{bolt}$ = 2209 lbs
$Tall_{metal}$ = 2086 lbs | $Vall_{metal}$ = 2192 lbs
# of Bolts Req'd for Uplift = 0.71 | COMBINED LOADING: 0.284 O.K.
# of Bolts Req'd for Shear = 0.52 | Bolt Spacing = 68.9 in o.c.
Total # of Bolts Required = 2

1/2" ϕ A307 Bolts to steel angle below deck @ 68.9 in o.c. along long side of curb

Longitudinal:
# of Bolts Req'd for Uplift = 0.40 | COMBINED LOADING: 0.174 O.K.
# of Bolts Req'd for Shear = 0.52 | Req'd Min Spacing = 39.0 in o.c.
Total # of Bolts Required = 2

1/2" ϕ A307 Bolts to steel angle below deck @ 39 in o.c. along short side of curb

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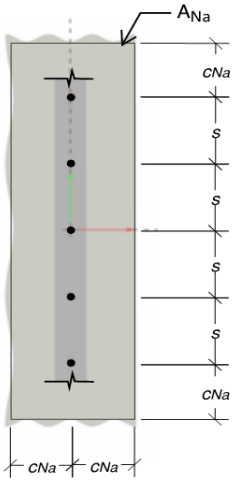
San Diego, CA 92120
(619)727-4800

For Concrete anchorage: SEISMIC $(0.6\text{-}0.14S_{DS})D + 0.7\Omega_o E$ Ωo = 2.0

Concrete Attachment: 1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy w/ 2.75in embed

Epoxy: Hilti HIT-HY 200 V3 (ICC ESR 4868)



f'c =	3000	psi		
h =	4	in (concrete thickness, t_min = h_ef + 2do)	O.K.	
h_ef =	2.75	in (effective embedment)		
da =	0.5	in (anchor diameter)	do = 0.625	in (hole diameter)
n =	2	(number of dummy anchors to check capacity with spacing effect)		
s =	16.9	in (initial spacing estimate)		
τk,cr / uncr =	1135	2220 psi (from ESR 4868, Table 14, Temp range B)		
τk,cr / uncr =	1156	2261 psi	If $f'_c > 2500$,	$multiply\ by\ (f'_c/2500)^{0.1}$
c_Na=	7.15	in (min. edge distance for full capacity);	$c_{Na} = 10d_a\sqrt{\frac{\tau_{uncr}}{1100}}$	

Tension:

Bond strength

$$N_{ag} = \frac{A_{Na}}{A_{Nao}}\varphi_{ec,Na}\varphi_{ed,Na}\varphi_{cp,Na}N_{ba} \quad \text{(ACI318-14, 17.4.5.1b)}$$

$$\varphi_{ec,Na}\varphi_{ed,Na}\varphi_{cp,Na} = 1.0$$

***Bond strength will govern over concrete breakout

A_{Na}=	408.98	in^2		
A_{Nao}=	204.49	in^2		
N_{ba} =	4943	lbs	$N_{ba} = \lambda_a\tau_{cr}\pi d_a h_{ef}\alpha_{n,seismic}$	$\alpha_{n,seismic} = 0.99$
N_{ag} =	9886	lbs (group)		λ_a =1.0
øN_{ag} =	4820	lbs (group)	CONTROLS	λ_a =1.0 for normal weight conc; 0.6 for lightv

Breakout strength

$$N_{cbg} = \frac{A_{Nc}}{A_{Nco}}\varphi_{ec,N}\varphi_{ed,N}\varphi_{cp,N}N_b \qquad N_b = \lambda_a k_c\sqrt{f'_c}h_{ef}^{1.5}$$

A_{Nc} =	207.4875	in^2	N_b = 4246	lbs	$ø_{conc}$ =	0.75
A_{Nco} =	68.0625	in^2	kc = 17		$ø_{bond}$ =	0.65
N_{cbg} =	12945	lbs (group)			$ø_{seis}$ =	0.75
øN_{cbg} =	7281	lbs (group)			$ø_{steel}$ =	0.65

Shear:

Steel strength	Vsa,eq =	4940	(from ESR4868, Table 11)		$\alpha_{v,seismic}$ =	0.6
	øVsa,eq =	1927				
	$Tall_{LRFD}$ =	2410	lbs (anchor)	$Vall_{LRFD}$ = 3067	lbs	$\propto = (1 + 0.2SDS)D + 2.5E$
	$Tall_{ASD} = Tall_{LRFD}/\alpha$ =	1411	lbs	$Vall_{ASD} = Vall_{LRFD}/\alpha$ = 1796	lbs	D =0.758 E =0.242 $\propto$ =1.709

Transverse:

$Uplift_{MAX}$ =	3236	lbs	$Shear_{MAX}$ =	2268 lbs

$Compression_{SEISMIC}$ =	4752	lbs	=[Ωo*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb
$Tension_{SEISMIC}$ =	3236	lbs	=[Ωo*FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb
$Shear_{SEISMIC}$ =	2268	lbs	=Ωo*FpmaxASD/2

Min Bolts Req'd Uplift =	2.29	spacing =	34.44	in o.c.	Tapplied =	1078.8	lbs
Min Bolts Req'd Shear =	2.00	spacing =	68.88	in o.c.	Vapplied =	453.7	lbs

Try using	3	bolts
spaced at	34.44	in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \le 1.2$ = 1.02 O.K.

Use 3 - 1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy @ 34.4 in o.c. max. along long side of curb w/ 2.75in embed

Longitudinal:

$Uplift_{MAX}$ =	1943	lbs	$Shear_{MAX}$ =	2268 lbs

$Compression_{SEISMIC}$ =	3459	lbs	=[Ωo*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb
$Tension_{SEISMIC}$ =	1943	lbs	=[Ωo*FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb
$Shear_{SEISMIC}$ =	2268	lbs	=Ωo*FpmaxASD/2

Min Bolts Req'd Uplift =	1.38	spacing =	19.50	in o.c.	Tapplied =	971.3	lbs
Min Bolts Req'd Shear =	2.00	spacing =	39.00	in o.c.	Vapplied =	453.7	lbs

Try using	2	bolts
spaced at	39.00	in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \le 1.2$ = 0.94 O.K.

Use 2 - 1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy @ 39 in o.c. max. along short side of curb w/ 2.75in embed

CURB DESIGN SUMMARY:	CBPKD-80	PRD3715	**Unit:** ZT, ZH, ZR, ZJ 037-150; ZF, XP, ZB 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 - #10 SMS screws each clip		
WEB STIFFENER:	16Ga x 3/4" x 6" (C-channel) stiffener at each clip		
# OF CLIPS (SHORT SIDE) -	2 clips with 2 - #10 SMS screws each clip		
WEB STIFFENER:	16Ga x 3/4" x 6" (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 1/4"ϕ x 3.5" Simpson SDS screws w/ 2.25" threaded embed	STEEL 1/2" ϕ A307 Bolts to steel angle below deck	CONCRETE 1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy w/ 2.75in embed
LONG DIRECTION	5 @ 18.22 in o.c.	2 @ 68.88 in o.c.	3 @ 34.44 in o.c.
SHORT DIRECTION	4 @ 14.33 in o.c.	2 @ 39 in o.c.	2 @ 39 in o.c.