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ENGINEERING + DESIGN

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

Structural Calculations
for
CBKD-79 Series

CBKDSUN3672** SERIES

REGISTERED PROFESSIONAL ENGINEER
GLENN A. MOURITZEN
SE 3578
Exp. 6/30/25
STRUCTURAL
STATE OF CALIFORNIA

Prepared for:

PROVENT / RRS

3847 Wabash Drive
Mira Loma, CA 91725

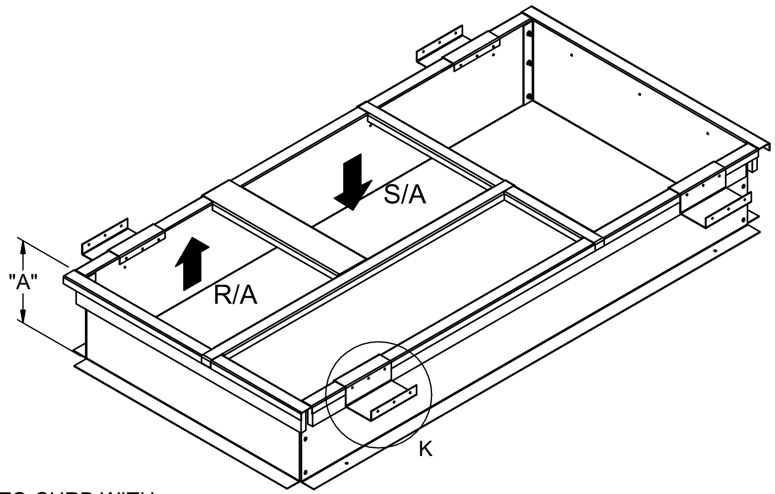
Date: September 26, 2023

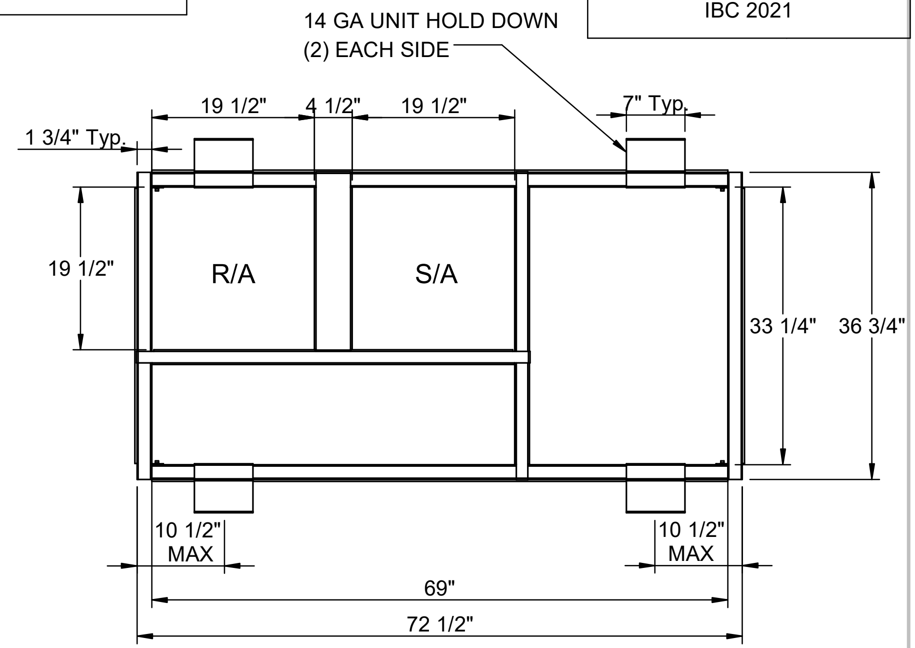
Project Number: PV2312

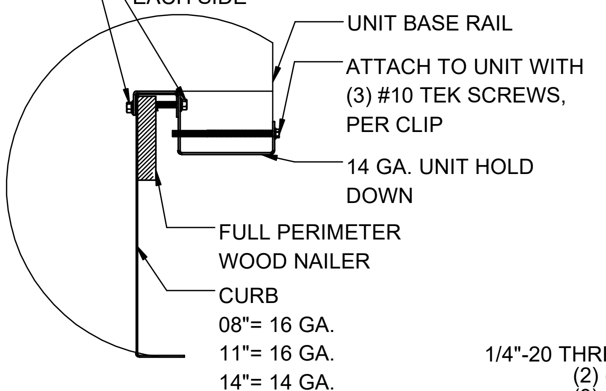
For wood,concrete, and steel attachments, see Roof Anchorage Detail, Form no. CB-60.	**STRUCTURALLY CALCULATED HOLD DOWN CLIPS FOR KNOCK-DOWN ROOF CURBS FOR SMALL SUNLINE 3-6 TON UNITS**
Will conform to seismic code requirements for knock-down or pre-assembled application. (Contact facory for assembled version.)	ZR, XN, XP 036-060 ZE, ZF 036-072

PROVENT P/N	A	EST. WEIGHT	SEISMIC KIT P/N	WEIGHT
CBKDSUN367208	8"	67 Lbs.	KDKITSUN3672	8 Lbs.
CBKDSUN367211	11"	79 Lbs.		
CBKDSUN367214	14"	91 Lbs		

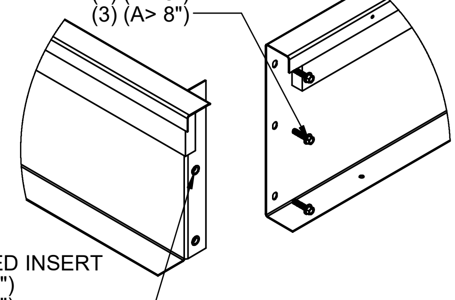
Meets seismic requirements for the following codes:
CBC 2022
IBC 2021



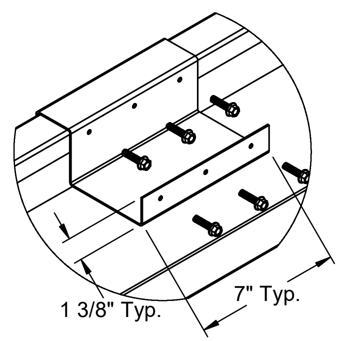




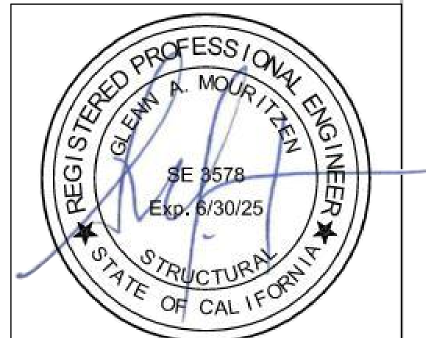
HOLD DOWN DETAIL



CORNER DETAIL



DETAIL K



ProVent

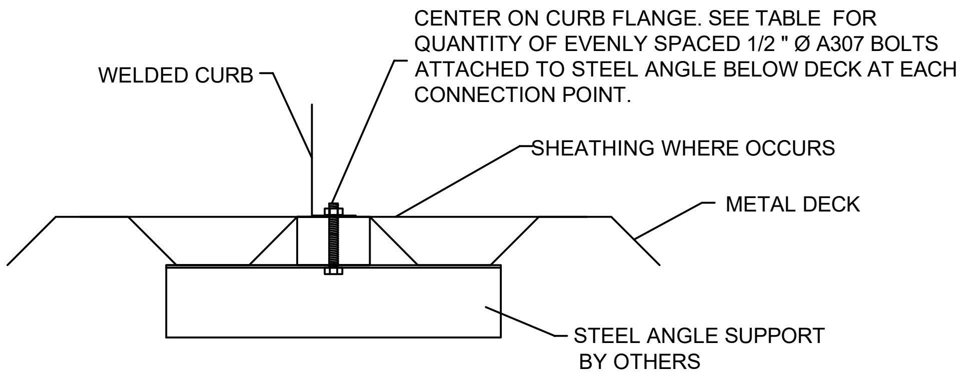
3847 WABASH DR.
MIRA LOMA, CA 91752

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

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

FORM NO:	PART NUMBER:	
CBKD-79	KDKITSUN3672 SERIES	
DATE:	**REV:**	**DRAWN BY:**
8/25/2023	7	FMM

STEEL ATTACHMENT



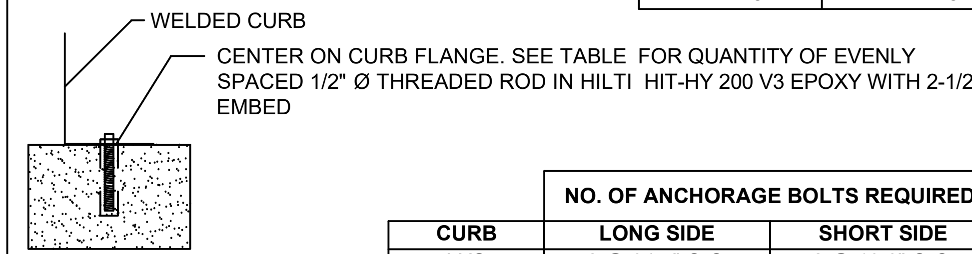
	NO. OF ANCHORAGE BOLTS REQUIRED	
CURB	**LONG SIDE**	**SHORT SIDE**
LXS	2 @ 34.5" O.C.	2 @ 19" O.C.
LXL	2 @ 34.5" O.C.	2 @ 29" O.C.
SUN3672	2 @ 60.5" O.C.	2 @ 24.75" O.C.
PRD3715	2 @ 68.88" O.C.	2 @ 39" O.C.
PRS	2 @ 58.88" O.C.	2 @ 28.69" O.C.
PRL	2 @ 72" O.C.	2 @ 41.5" O.C.
SAV1518	3 @ 54.56" O.C	2 @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

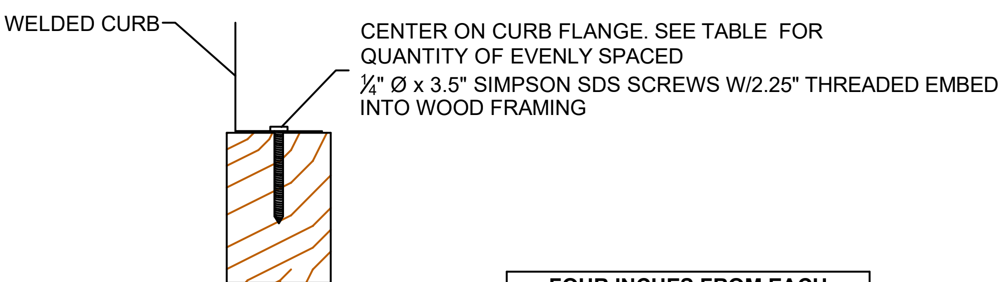
CONCRETE ATTACHMENT



	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



FOUR INCHES FROM EACH CORNER EVENLY SPACED

	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.

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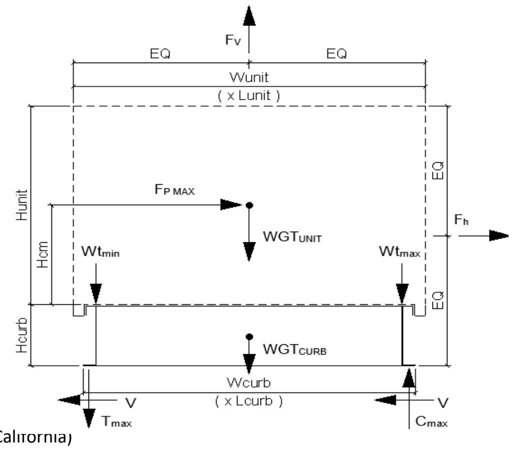
Client:	ProVent PV2312
Description:	CBPKD-79 SUN3672
Unit:	ZR, XN, XP 036-060; ZE, ZF 036-072



Curb Information

Hcurb =	14	in	(Height of curb)
Lcurb =	72.5	in	(Length of curb)
wcurb =	36.75	in	(Width of curb)
WGTcurb =	99	lbs	(Weight of curb)
# Clips long side =	2		# Clips short side = 0

Unit Information

WGTunit =	845	lbs	(Oper. Weight of Unit)
Wtmax =	254	lbs	(Maximum corner weight)
Wtmin =	180	lbs	(Minimum corner weight)
Hunit =	32.625	in	(Height of unit above curb)
Hcm =	16.3125	in	(Height to center of mass)
Lunit =	82.25	in	(Length of unit)
Wunit =	44.875	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 =	1011	lbs	(0.7*Fpmax) FpmaxASD = 1130 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)
$F_{h\ ASD\ trans}$ =	987	lbs	= 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.4-2)
$F_{h\ ASD\ long}$ =	539	lbs	= 0.6*qz*GCr*Wunit*(Hunit+Hcurb)
$F_{vert\ ASD}$ =	750	lbs	= 0.6*qz*GCr*Lunit*Wunit (Eq. 29.4-3)

Curb Loading

Transverse:

$Compression_{SEISMIC}$ =	1118	lbs	=[FpmaxASD*Hcm+2*(1+0.14S_{DS})*Wtmax*wcurb]/wcurb
$Tension_{SEISMIC}$ =	348	lbs	=[FpmaxASD*Hcm-2*(0.6-0.14S_{DS})*Wtmin*wcurb]/wcurb
$Compression_{WIND}$ =	367	lbs	=[$F_{h\ ASD\ trans}$*Hcm+2*0.6*Wtmax*wcurb-$F_{vert\ ASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ =	598	lbs	=[$F_{h\ ASD\ trans}$*Hcm-2*0.6*Wtmin*wcurb+$F_{vertASD}$*wcurb/2]/wcurb

---> Negative values indicate opposite load.

Longitudinal:

$Compression_{SEISMIC}$ =	1262	lbs	=[FpmaxASD*Hcm+2*(1+0.14*S_{DS})*Wtmax*Lcurb]/(Lcurb-2*10.5in)
$Tension_{SEISMIC}$ =	178	lbs	=[FpmaxASD*Hcm-2*(0.6-0.14S_{DS})*Wtmin*Lcurb]/(Lcurb-21in)
$Compression_{WIND}$ =	71	lbs	=[$F_{h\ ASD\ long}$*Hcm+2*0.6*Wtmax*Lcurb-$F_{vertASD}$*Lcurb/2]/(Lcurb-21in)
$Tension_{WIND}$ =	395	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:	$Comp_{MAX}$ =	1118	lbs	---> Along long edge of curb.
(on long edge)	$Tens_{MAX}$ =	598	lbs	---> Along long edge of curb.
Longitudinal:	$Comp_{MAX}$ =	1262	lbs	---> Along short edge of curb.
(on short edge)	$Tens_{MAX}$ =	395	lbs	---> Along short edge of curb.

---> Negative values indicate opposite load.

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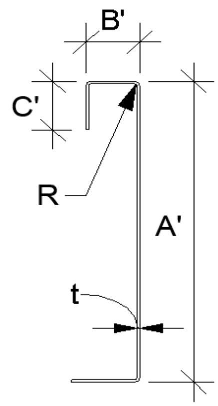
Curb Design

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 =	0.506	k	(Max Axial Comp)
Pn/Ωc =	25.116	k	
Fe =	68.21	ksi	
λc =	0.86		
Fn =	36.79	ksi	
Ly =	33	in	Lateral unbraced length
k_yL_y/r_y =	65		(assume k=0.8)

Ωc = 1.80

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

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

Compression Check = O.K.

Check Web Crippling

h =	14	in	-- Check limits:		C = 4.00	
t =	0.0713	in	h/t =	196.35 ≤ 260	C_R = 0.14	(See table C3.4.1-2, fastened to support, one flange, end loading)
N =	7.00		N/t =	98.18 ≤ 210	C_N = 0.35	
Ω_w =	1.75		N/h =	0.5 ≤ 2.0	C_h = 0.02	
P_n =	2.422	k	R/t =	1.50 ≤ 9.0		
P_n/Ω_w =	1.384	k				
Long side: Pu_{Trans} =	0.559	k	**O.K.**	# clips = 2		
Short side: Pu_{Long} =	0.631	k	**O.K.**	# clips = 2		

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

*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 =	282	lbs	Max($F_{pmaxASD}$/4 -OR- $Fh_{ASDtrans}$/4 corner connections)
Vcrnmax =	631	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 = 0.1

# of Bolts required for Shear = 0.5

# of Bolts Used = 2.0

Check Combined Stress in Bolts & Inserts: 0.318 **O.K.**

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

Assume L/t > 25: 25*t =	1.783	in
Lreq'd =	0.427	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: Pns = 2377 #

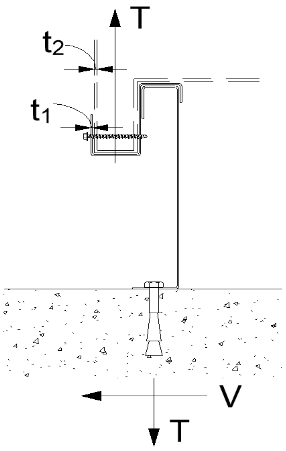
Shear: $P_{ns} = 4.2F_{u2}\sqrt{t_2^3 d}$ 3.86 k
$P_{ns} = 2.7t_1 dF_{u1}$ 2.38 k
$P_{ns} = 2.7t_2 dF_{u2}$ 3.39 k

For t2/t1 ≥ 2.5:
Pns = 2377 #
$P_{ns} = 2.7t_1 dF_{u1}$ 2.38 k
$P_{ns} = 2.7t_2 dF_{u2}$ 3.39 k

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

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:	1.011	2	0.51	540 #	2	6.00 in
Short side:	1.011	2	0.51	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 in^2 | Anv = 0.443 in^2 | Ant = 0.042 in^2
Rn/Ω = 7.500 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: $(0.6\text{-}0.14S_{DS})D + 0.7E$ WIND: 0.6D + W

Transverse: $Uplift_{MAX}$ = 906 lbs | $Shear_{MAX}$ = 565 lbs

$Compression_{SEISMIC}$ = 1555 lbs =[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb
$Tension_{SEISMIC}$ = 799 lbs =[FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb
$Compression_{WIND}$ = 722 lbs =[$F_{h\ ASD\ trans}$*(Hcm+Hcurb)+0.6*$WGT_{unit+curb}$*wcurb/2-$F_{vert\ ASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ = 906 lbs =[$F_{h\ ASD\ trans}$*(Hcm+Hcurb)-0.6*$WGT_{unit+curb}$*wcurb/2+$F_{vertASD}$*wcurb/2]/wcurb

Longitudinal: $Uplift_{MAX}$ = 340 lbs | $Shear_{MAX}$ = 565 lbs

$Compression_{SEISMIC}$ = 1095 lbs =[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb
$Tension_{SEISMIC}$ = 340 lbs =[FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb
$Compression_{WIND}$ = 133 lbs =[$F_{h\ ASD\ long}$*(Hcm+Hcurb)+0.6*$WGT_{unit+curb}$*Lcurb/2-$F_{vert\ ASD}$*Lcurb/2]/Lcurb
$Tension_{WIND}$ = 317 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)

$Tall_{metal}$ = 997 lbs | $Vall_{metal}$ = 1097 lbs
Transverse: $Tall_{wood}$ = 616 lbs | $Vall_{wood}$ = 672 lbs
# of Screws Req'd for Uplift = 1.47 | COMBINED LOADING: 0.771 O.K.
# of Screws Req'd for Shear = 0.84 | Screw Spacing = 32.3 in o.c.
Total # of screws Required = 3

1/4"ϕ x 3.5" Simpson SDS screws @ 32.3 in o.c. along long side of curb w/ 2.25" threaded embed

Longitudinal:

# of Screws Req'd for Uplift = 0.6 | COMBINED LOADING: 0.696 O.K.
# of Screws Req'd for Shear = 0.8 | Screw Spacing = 28.8 in o.c.
Total # of screws Required = 2

1/4"ϕ x 3.5" Simpson SDS screws @ 28.8 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**

$Tall_{bolt}$ = 3927 lbs | $Vall_{bolt}$ = 2209 lbs
Transverse: $Tall_{metal}$ = 2086 lbs | $Vall_{metal}$ = 2192 lbs
# of Bolts Req'd for Uplift = 0.43 | COMBINED LOADING: 0.111 O.K.
# of Bolts Req'd for Shear = 0.26 | Bolt Spacing = 60.5 in o.c.
Total # of Bolts Required = 2

1/2" ϕ A307 Bolts to steel angle below deck @ 60.5 in o.c. along long side of curb

Longitudinal:

# of Bolts Req'd for Uplift = 0.16 | COMBINED LOADING: 0.048 O.K.
# of Bolts Req'd for Shear = 0.26 | Req'd Min Spacing = 24.8 in o.c.
Total # of Bolts Required = 2

1/2" ϕ A307 Bolts to steel angle below deck @ 24.8 in o.c. along short side of curb

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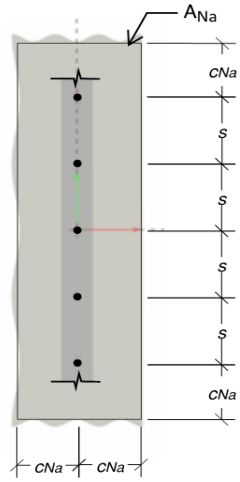
For Concrete anchorage: SEISMIC $(0.6\text{-}0.14S_{DS})D + 0.7\Omega_o E$ $\Omega o =$ 2.0

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);	$c_{Na} = 10 d_a \sqrt{\frac{\tau_{uncr}}{1100}}$

Tension:
Bond strength

***Bond strength will govern over concrete breakout

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

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

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) $\lambda_a = 1.0$

$øN_{ag}$ = 4820 lbs (group) CONTROLS $\lambda_a = 1.0$ 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: Vsa,eq = 4940 (from ESR4868, Table 11) $\alpha_{v,seismic}$ = 0.6

Steel strength 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 $D = 0.758$ $E = 0.242$ $\propto = 1.709$

<u>Transverse:</u> $Uplift_{MAX}$ = 1732 lbs | $Shear_{MAX}$ = 1130 lbs

$Compression_{SEISMIC}$ =	2487 lbs	$=[\Omega o \cdot FpmaxASD \cdot (Hcm+Hcurb)+(1+0.14S_{DS}) \cdot WGT_{unit+curb} \cdot wcurb/2]/wcurb$
$Tension_{SEISMIC}$ =	1732 lbs	$=[\Omega o \cdot FpmaxASD \cdot (Hcm+Hcurb)-(0.6-0.14S_{DS}) \cdot WGT_{unit+curb} \cdot wcurb/2]/wcurb$
$Shear_{SEISMIC}$ =	1130 lbs	$=\Omega o \cdot FpmaxASD/2$

Min Bolts Req'd Uplift =	1.23	spacing = 30.25 in o.c.	Tapplied =	865.8 lbs
Min Bolts Req'd Shear =	2.00	spacing = 60.50 in o.c.	Vapplied =	282.5 lbs

Try using 2 bolts spaced at 60.50 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \leq 1.2$ = 0.77 O.K.

<u>Use 2 - 1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy @ 60.5 in o.c. max. along long side of curb w/ 2.75in embed</u>

<u>Longitudinal:</u> $Uplift_{MAX}$ = 812 lbs | $Shear_{MAX}$ = 1130 lbs

$Compression_{SEISMIC}$ =	1568 lbs	$=[\Omega o \cdot FpmaxASD \cdot (Hcm+Hcurb)+(1+0.14S_{DS}) \cdot WGT_{unit+curb} \cdot Lcurb/2]/Lcurb$
$Tension_{SEISMIC}$ =	812 lbs	$=[\Omega o \cdot FpmaxASD \cdot (Hcm+Hcurb)-(0.6-0.14S_{DS}) \cdot WGT_{unit+curb} \cdot Lcurb/2]/Lcurb$
$Shear_{SEISMIC}$ =	1130 lbs	$=\Omega o \cdot FpmaxASD/2$

Min Bolts Req'd Uplift =	0.58	spacing = 12.38 in o.c.	Tapplied =	406.2 lbs
Min Bolts Req'd Shear =	2.00	spacing = 24.75 in o.c.	Vapplied =	282.5 lbs

Try using 2 bolts spaced at 24.75 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \leq 1.2$ = 0.45 O.K.

<u>Use 2 - 1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy @ 24.8 in o.c. max. along short side of curb w/ 2.75in embed</u>

CURB DESIGN SUMMARY:	CBPKD-79 SUN3672	**Unit:**	ZR, XN, XP 036-060; ZE, ZF 036-072
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 2 - 1/4" ϕ SAE Grade 8 bolts w/ 1/4-20-UNC Threaded inserts		
CURB ANCHORAGE	<u>WOOD</u> 1/4"ϕ x 3.5" Simpson SDS screws w/ 2.25" threaded embed	<u>STEEL</u> 1/2" ϕ A307 Bolts to steel angle below deck	<u>CONCRETE</u> 1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy w/ 2.75in embed
<u>LONG DIRECTION</u>	3 @ 32.25 in o.c.	2 @ 60.5 in o.c.	2 @ 60.5 in o.c.
<u>SHORT DIRECTION</u>	2 @ 28.75 in o.c.	2 @ 24.75 in o.c.	2 @ 24.75 in o.c.