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

Structural Calculations

for

CBWC-112 Series

CBWCSUN3672** SERIES

Prepared for:

PROVENT / RRS

3847 Wabash Drive
Mira Loma, CA 91725

Date: September 25, 2023

Project Number: PV2312

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

STRUCTURALLY CALCULATED WELDED ROOF CURBS FOR SMALL SUNLINE 3-6 TON UNITS

ZR, XN, XP 036-060
ZE, ZF 036-072

PROVENT P/N	A	EST. WEIGHT
CBWCSUN367208	8"	80 Lbs.
CBWCSUN367211	11"	95 Lbs.
CBWCSUN367214	14"	109 Lbs
CBWCSUN367224	24"	189 Lbs.

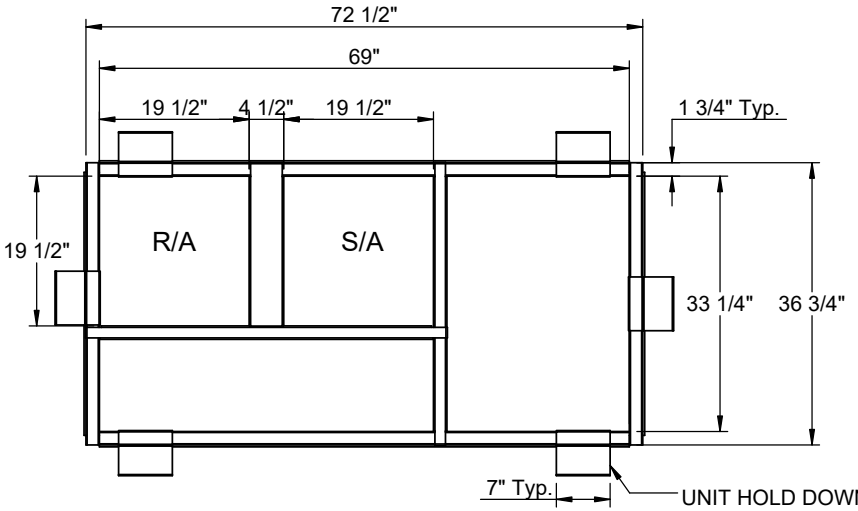
Meets seismic requirements for the following codes:
CBC 2022
IBC 2021

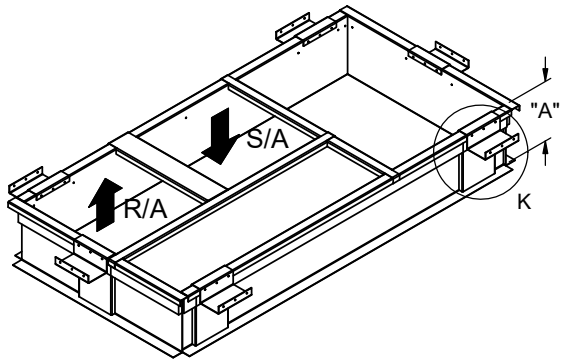
FEATURES

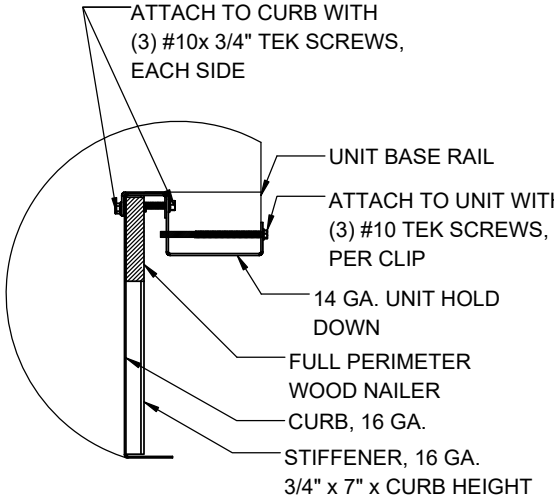
- Roof curb sides and ends are 16 Ga. galvanized steel.
- Gasketing package provided.
- Heat treated wood nailer provided.
- Insulated deck pans provided.
- Pitched curbs and taller curbs are available.

NOTES

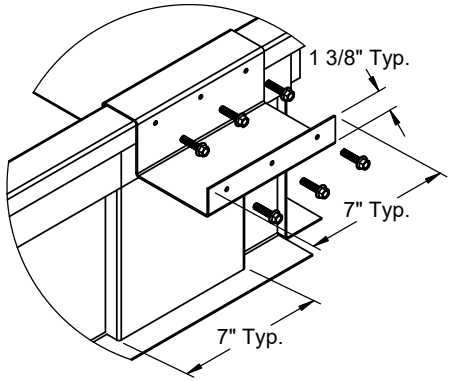
- Attach ductwork to roof curb. Flanges of duct rest on top of curb. Support ductwork below the curb.



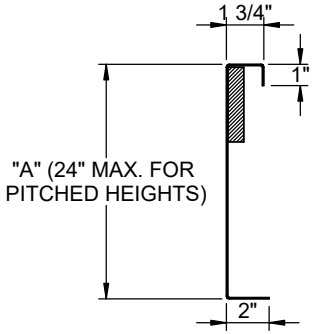




HOLD DOWN DETAIL



DETAIL K



CURB DETAIL

ProVent

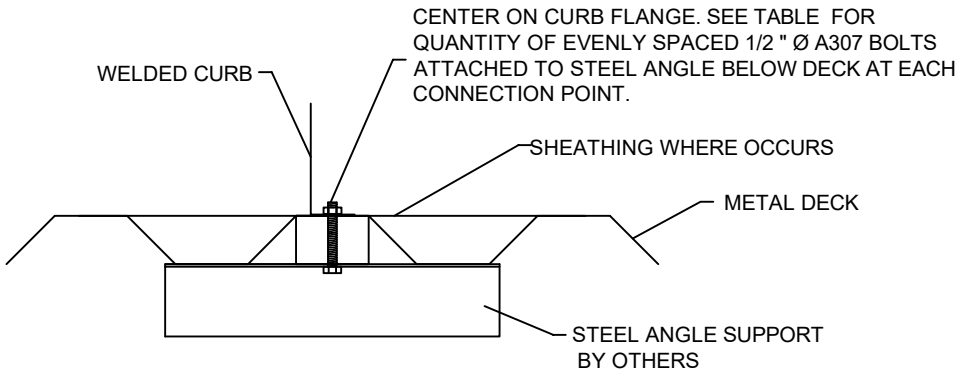
3847 WABASH DR.
MIRA LOMA, CA 91752

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

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

FORM NO:	PART NUMBER:	
CBWC-112	CBWCSUN3672 SERIES	
DATE: 7/27/2023	**REV:** 9	**DRAWN BY:** JG

STEEL ATTACHMENT



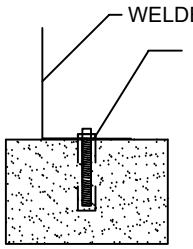
	NO. OF ANCHORAGE BOLTS REQUIRED	
CURB	LONG SIDE	SHORT SIDE
LXS	2 @ 34.5" O.C.	2 @ 19" O.C.
LXL	2 @ 34.5" O.C.	2 @ 29" O.C.
SUN3672	2 @ 60.5" O.C.	2 @ 24.75" O.C.
PRD3715	2 @ 68.88" O.C.	2 @ 39" O.C.
PRS	2 @ 58.88" O.C.	2 @ 28.69" O.C.
PRL	2 @ 72" O.C.	2 @ 41.5" O.C.
SAV1518	3 @ 54.56" O.C	2 @ 68.13"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

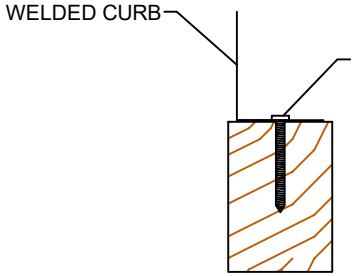
CONCRETE ATTACHMENT



	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: _____
COMPANY: _____
JOB NAME: _____
EQUIPMENT: _____
NOTES: _____

FORM NO: CB-60

DATE:	REV:	DRAWN BY:
8/28/2023	10	FMM

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San Diego, CA 92120
(619)727-4800

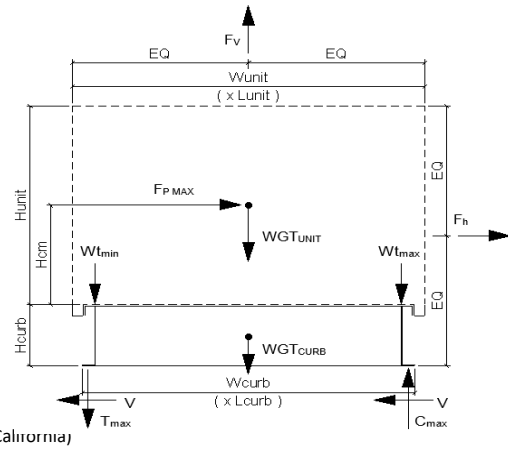
Client:	ProVent PV2312
Description:	CBWC-112 SUN3672
Unit:	ZR, XN, XP 036-060; ZE, ZF 036-072

Curb Information

Hcurb =	24	in	(Height of curb)
Lcurb =	72.5	in	(Length of curb)
wcurb =	36.75	in	(Width of curb)
WGTcurb =	189	lbs	(Weight of curb)
# Clips long side =	2		# Clips short side = 1

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 = 1238 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)
$F_{h\ ASD\ trans}$ =	1199	lbs	= 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.4-2)
$F_{h\ ASD\ long}$ =	654	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
$Compression_{WIND}$ =	461	lbs	=[$F_{h\ ASD\ trans}$*Hcm+2*0.6*Wtmax*wcurb-$F_{vert\ ASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ =	692	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)
$Compression_{WIND}$ =	107	lbs	=[$F_{h\ ASD\ long}$*Hcm+2*0.6*Wtmax*Lcurb-$F_{vertASD}$*Lcurb/2]/(Lcurb-21in)
$Tension_{WIND}$ =	432	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)	$Tens_{MAX}$ =	692	lbs	---> Along long edge of curb.
Longitudinal:	$Comp_{MAX}$ =	1262	lbs	---> Along short edge of curb.
(on short edge)	$Tens_{MAX}$ =	432	lbs	---> Along short edge of curb.

---> Negative values indicate opposite load.

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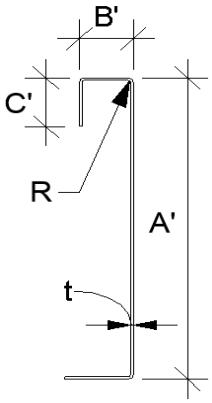
Curb Design

Fy =	50	ksi	Fu =	65	ksi
E =	29500	ksi	t =	0.0566	16 Gauge



Calculate Section Properties of Curb

A'=	24.000	in	a =	23.717	in	= A'-(2r+t)
B'=	1.750	in	a'=	23.943	in	= A'-t
C'=	0.000	in (0 if no lips)	b =	1.609	in	= B'-[r+t/2+α(r+t/2)]
α =	0.000	(0 - no Lip; 1 w/ lip)	b'=	1.722	in	= B'-(t/2+αt/2)
R =	0.0849	(Inside bend radius)	c =	0.000	in	= α[C'-(r+t/2)]
t =	0.0566	in	c'=	0.000	in	= α(C'-t/2)
r'=	0.113	in = R+t/2	u =	0.178	in	= πr/2
x =	0.109	in (Distance between centroid and web centerline)				
Ix =	91.935	in^4	rx =	7.71	in	
Iy =	0.174	in^4	ry =	0.336	in	
A =	1.54	in^2	rmin =	0.336	in	

Axial Compression

Pu =	0.600	k	(Max Axial Comp)
Pn/Ωc =	19.841	k	
Fe =	27.13	ksi	
λc =	1.36		
Fn =	23.12	ksi	
Ly =	44	in	Lateral unbraced length
k_yL_y/r_y =	104		(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 =	24	in	-- Check limits:		
t =	0.0566	in	h/t =	424.03	≤ 260
N =	7.00		N/t =	123.67	≤ 210
Ω_w =	1.75		N/h =	0.291667	≤ 2.0
P_n =	1.366	k	R/t =	1.50	≤ 9.0
P_n/Ω_w =	0.780	k			
Long side: Pu_{Trans} =	0.559	k	**O.K.**	# clips =	2
Short side: Pu_{Long} =	1.262	k	**web stiffener REQ'D**	# clips =	1

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)

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

*****h/t > 260; use web stiffeners**

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 =	1.366	k	Ae =	0.324	in^2
Pn =	12.281	k	Pn/Ω =	7.224	k

O.K.

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

Tcrnmax = 309 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: 0.324 **O.K.**

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

Assume L/t > 25: 25*t = 1.415 in

Lreq'd = 0.537 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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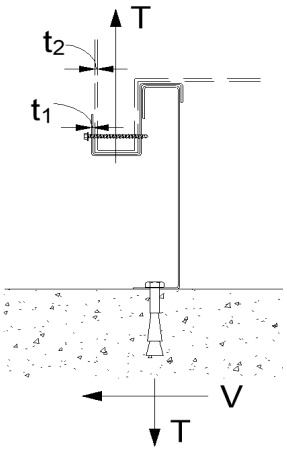
Connection Unit to Curb Clip | #10 SMS screw | Ω = 3.0

t1 = 0.0566 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 = 1.8



For t2/t1 ≤ 1.0: | Pns = 1887 # | For t2/t1 ≥ 2.5: | Pns = 1887 #

Shear: $P_{ns} = 4.2F_{u2}\sqrt{t_2^3 d}$ 3.86 k | $P_{ns} = 2.7t_1 dF_{u1}$ 1.89 k | $P_{ns} = 2.7t_1 dF_{u1}$ 1.89 k
$P_{ns} = 2.7t_2 dF_{u2}$ 3.39 k | $P_{ns} = 2.7t_2 dF_{u2}$ 3.39 k

Pns/Ω = 629 #
Pss/Ω = 540 # <- Controls

Tension: Pnot = 1.068 k (screw pull-out strength) | $P_{not} = 0.85t_c dF_{u2})$
$t_c = \min(t_1, t_2)$
Pnov = 2.069 k (screw pull-over strength) | $P_{nov} = 1.5t_1 d_w F_{u1}$
Pts/Ω = 356 # <- Controls
Pts/Ω = 820 # (full tensile screw capacity)

	Shear (k)	# clips	V_{clip} (k)	V_{allow}(lb)	# screws	spacing
Long side:	1.199	2	0.60	540 #	2	6.00 in
Short side:	1.011	1	1.01	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 = 0.0566 AISI BSR applies
Fy = 50 ksi | Ω = 2.22 bolt/screw connection
Agv = 0.368 in^2 | Anv = 0.352 in^2 | Ant = 0.034 in^2
Rn/Ω = 5.954 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: $Uplift_{MAX}$ = 1380 lbs | $Shear_{MAX}$ = 619 lbs

$Compression_{SEISMIC}$ = 2040 lbs =[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb
$Tension_{SEISMIC}$ = 1213 lbs =[FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb
$Compression_{WIND}$ = 1250 lbs =[$F_{h\ ASD\ trans}$*(Hcm+Hcurb)+0.6*$WGT_{unit+curb}$*wcurb/2-$F_{vert\ ASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ = 1380 lbs =[$F_{h\ ASD\ trans}$*(Hcm+Hcurb)-0.6*$WGT_{unit+curb}$*wcurb/2+$F_{vertASD}$*wcurb/2]/wcurb

Longitudinal: $Uplift_{MAX}$ = 543 lbs | $Shear_{MAX}$ = 619 lbs

$Compression_{SEISMIC}$ = 1370 lbs =[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb
$Tension_{SEISMIC}$ = 543 lbs =[FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb
$Compression_{WIND}$ = 299 lbs =[$F_{h\ ASD\ long}$*(Hcm+Hcurb)+0.6*$WGT_{unit+curb}$*Lcurb/2-$F_{vert\ ASD}$*Lcurb/2]/Lcurb
$Tension_{WIND}$ = 429 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)

$Tall_{metal}$ = 797 lbs | $Vall_{metal}$ = 876 lbs
Transverse: $Tall_{wood}$ = 616 lbs | $Vall_{wood}$ = 400 lbs
# of Screws Req'd for Uplift = 2.24 | COMBINED LOADING: 0.947 O.K.
# of Screws Req'd for Shear = 1.55 | Screw Spacing = 21.5 in o.c.
Total # of screws Required = 4

1/4"ϕ x 3.5" Simpson SDS screws @ 21.5 in o.c. along long side of curb w/ 2.25" threaded embed

Longitudinal:
# of Screws Req'd for Uplift = 0.9 | COMBINED LOADING: 0.810 O.K.
# of Screws Req'd for Shear = 1.5 | Screw Spacing = 14.4 in o.c.
Total # of screws Required = 3

1/4"ϕ x 3.5" Simpson SDS screws @ 14.4 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: $Tall_{metal}$ = 1656 lbs | $Vall_{metal}$ = 1756 lbs
# of Bolts Req'd for Uplift = 0.83 | COMBINED LOADING: 0.288 O.K.
# of Bolts Req'd for Shear = 0.35 | 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 = 0.33 | COMBINED LOADING: 0.104 O.K.
# of Bolts Req'd for Shear = 0.35 | 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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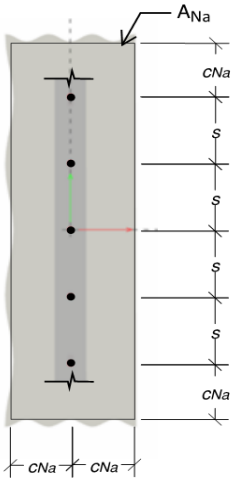
San Diego, CA 92120
(619)727-4800

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:

$Uplift_{MAX}$ =	2570 lbs	$Shear_{MAX}$ =	1238 lbs

$Compression_{SEISMIC}$ =	3397 lbs	=[Ωo*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb
$Tension_{SEISMIC}$ =	2570 lbs	=[Ωo*FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb
$Shear_{SEISMIC}$ =	1238 lbs	=Ωo*FpmaxASD/2

Min Bolts Req'd Uplift =	1.82	spacing =	30.25	in o.c.	Tapplied =	1285.1 lbs
Min Bolts Req'd Shear =	2.00	spacing =	60.50	in o.c.	Vapplied =	309.4 lbs

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

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \le 1.2$ = 1.08 O.K.

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

Longitudinal:

$Uplift_{MAX}$ =	1231 lbs	$Shear_{MAX}$ =	1238 lbs

$Compression_{SEISMIC}$ =	2058 lbs	=[Ωo*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb
$Tension_{SEISMIC}$ =	1231 lbs	=[Ωo*FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb
$Shear_{SEISMIC}$ =	1238 lbs	=Ωo*FpmaxASD/2

Min Bolts Req'd Uplift =	0.87	spacing =	12.38	in o.c.	Tapplied =	615.6 lbs
Min Bolts Req'd Shear =	2.00	spacing =	24.75	in o.c.	Vapplied =	309.4 lbs

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

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \le 1.2$ = 0.61 O.K.

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

CURB DESIGN SUMMARY:	CBWC-112 SUN3672	**Unit:**	ZR, XN, XP 036-060; ZE, ZF 036-072
CURB RAIL THICKNESS:	0.0566 in 16 Gauge		
UNIT CLIP THICKNESS:	0.0566 in 16 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) -	1 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	WOOD	STEEL	CONCRETE
	1/4"ϕ x 3.5" Simpson SDS screws w/ 2.25" threaded embed	1/2" ϕ A307 Bolts to steel angle below deck	1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy w/ 2.75in embed
LONG DIRECTION	4 @ 21.5 in o.c.	2 @ 60.5 in o.c.	2 @ 60.5 in o.c.
SHORT DIRECTION	3 @ 14.38 in o.c.	2 @ 24.75 in o.c.	2 @ 24.75 in o.c.