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

Structural Calculations
for
CBWC-300 Series

CBWCPRS** 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 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 DIRECT FIT (SUN CORE) SMALL CABINET UNITS

ZX04-07; XXA7, ZXA7
ZY, ZQ, XY, XQ, ZL04-06

PROVENT P/N	A	EST. WEIGHT
CBWCPRS08	8"	128 Lbs.
CBWCPRS11	11"	139 Lbs.
CBWCPRS14	14"	150 Lbs
CBWCPRS24	24"	189 Lbs.

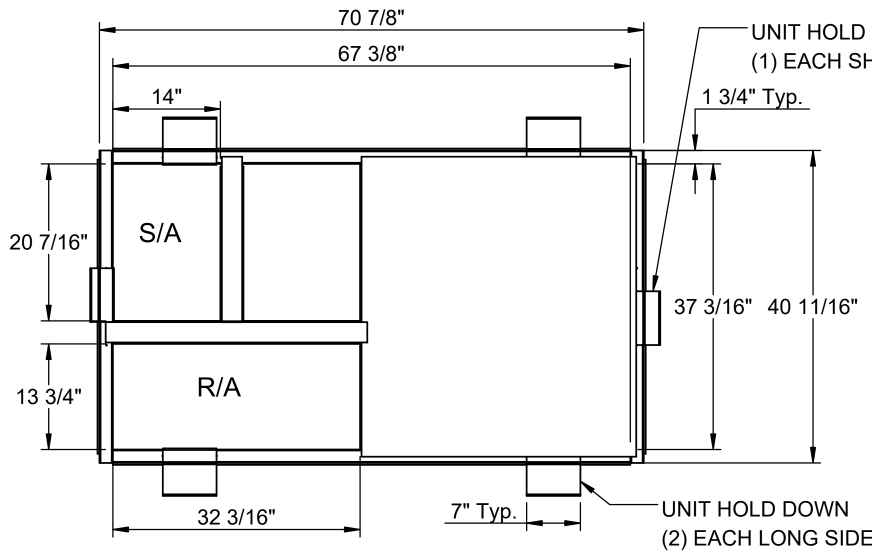
Meets seismic requirements for the following codes:
CBC 2022
IBC 2021

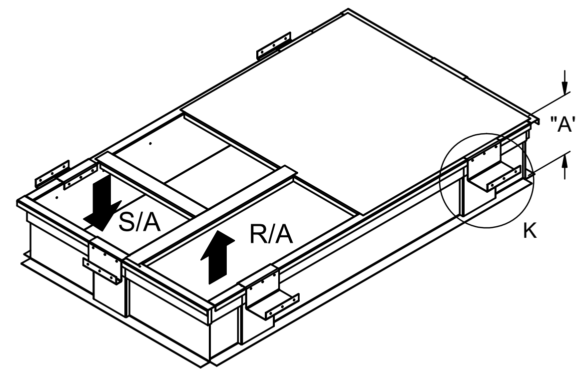
FEATURES

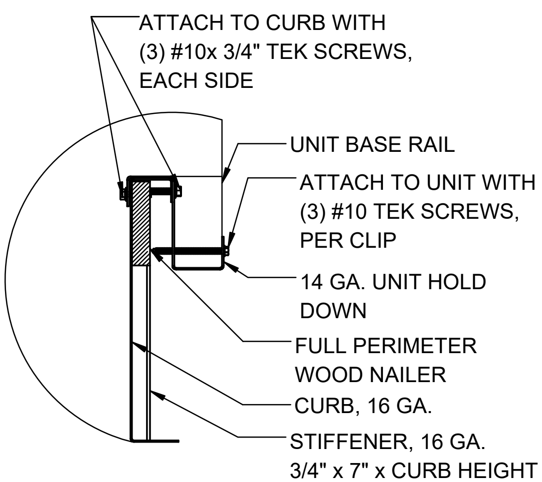
- Roof curb sides and ends are 16 Ga. galvanized steel.
- Gasketing package provided.
- Heat treated wood nailer provided.
- Insulated deck pans provided.
- Pitched curbs and taller curbs are available.

NOTES

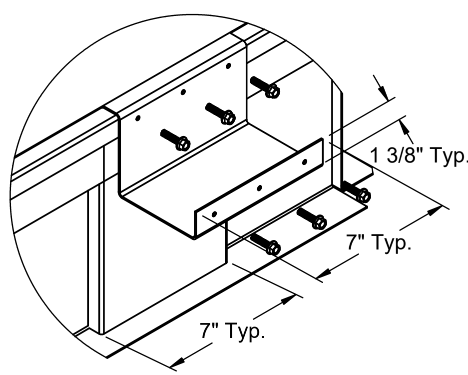
- Attach ductwork to roof curb. Flanges of duct rest on top of curb. Support ductwork below the curb.



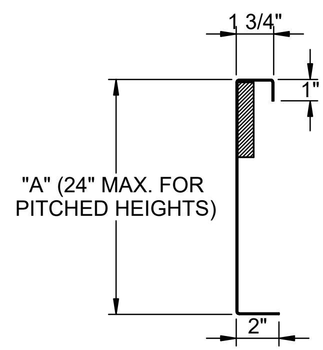




HOLD DOWN DETAIL



DETAIL K



CURB DETAIL

ProVent

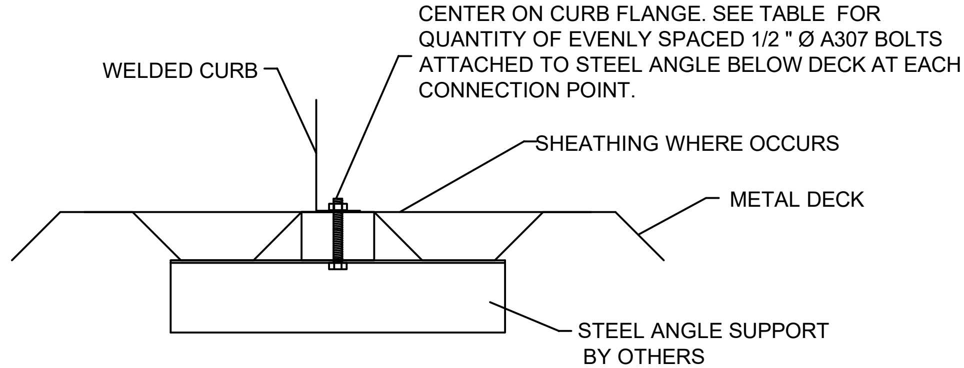
3847 WABASH DR.
MIRA LOMA, CA 91752

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

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

FORM NO:	PART NUMBER:	
CBWC-300	CBWCPRS SERIES	
DATE:	**REV:**	**DRAWN BY:**
7/27/2023	10	JG

STEEL ATTACHMENT



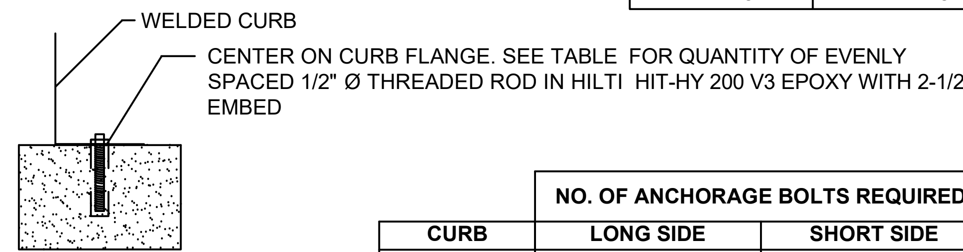
	NO. OF ANCHORAGE BOLTS REQUIRED	
CURB	**LONG SIDE**	**SHORT SIDE**
LXS	2 @ 34.5" O.C.	2 @ 19" O.C.
LXL	2 @ 34.5" O.C.	2 @ 29" O.C.
SUN3672	2 @ 60.5" O.C.	2 @ 24.75" O.C.
PRD3715	2 @ 68.88" O.C.	2 @ 39" O.C.
PRS	2 @ 58.88" O.C.	2 @ 28.69" O.C.
PRL	2 @ 72" O.C.	2 @ 41.5" O.C.
SAV1518	3 @ 54.56" O.C	2 @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

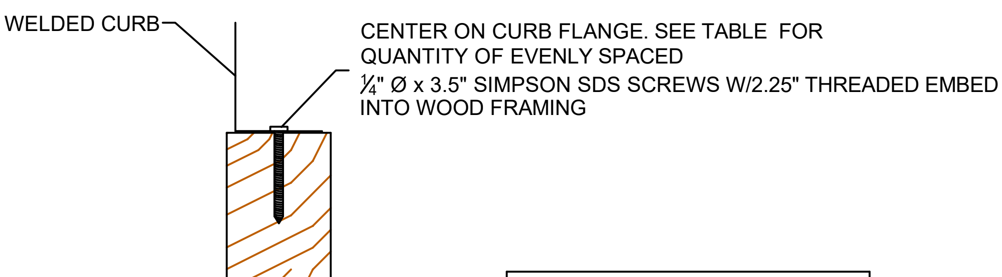
CONCRETE ATTACHMENT



	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



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.

ProVent
3847 WABASH DRIVE
MIRA LOMA, CA 91725
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SUBMITTED TO: ____________
COMPANY: ____________
JOB NAME: ____________
EQUIPMENT: ____________
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FORM NO:		
CB-60		
DATE:	**REV:**	**DRAWN BY:**
8/28/2023	10	FMM

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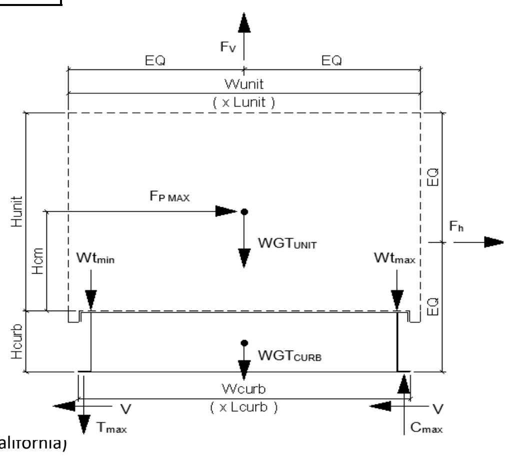
San Diego, CA 92120
(619)727-4800

Client:	ProVent PV2312
Description:	CBWC-300 PRS
Unit:	ZX 04-07; XX/ZX A7; ZY, ZQ, XY, XQ, ZL 04-06



Curb Information

Hcurb =	24	in	(Height of curb)
Lcurb =	70.875	in	(Length of curb)
wcurb =	40.69	in	(Width of curb)
WGTcurb =	189	lbs	(Weight of curb)
# Clips long side =	2		# Clips short side = 1

Unit Information

WGTunit =	916	lbs	(Oper. Weight of Unit)
Wtmax =	243	lbs	(Maximum corner weight)
Wtmin =	202	lbs	(Minimum corner weight)
Hunit =	40.56	in	(Height of unit above curb)
Hcm =	20.28	in	(Height to center of mass)
Lunit =	74.05	in	(Length of unit)
Wunit =	48.88	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 =	1096	lbs	(0.7*Fpmax) FpmaxASD = 1323 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)
$F_{h\ ASD\ trans}$ =	1231	lbs	= 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.4-2)
$F_{h\ ASD\ long}$ =	812	lbs	= 0.6*qz*GCr*Wunit*(Hunit+Hcurb)
$F_{vert\ ASD}$ =	736	lbs	= 0.6*qz*GCr*Lunit*Wunit (Eq. 29.4-3)

Curb Loading

Transverse:

$Compression_{SEISMIC}$ =	1187	lbs	=[FpmaxASD*Hcm+2*(1+0.14S_{DS})*Wtmax*wcurb]/wcurb
$Tension_{SEISMIC}$ =	433	lbs	=[FpmaxASD*Hcm-2*(0.6-0.14S_{DS})*Wtmin*wcurb]/wcurb
$Compression_{WIND}$ =	537	lbs	=[$F_{h\ ASD\ trans}$*Hcm+2*0.6*Wtmax*wcurb-$F_{vert\ ASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ =	739	lbs	=[$F_{h\ ASD\ trans}$*Hcm-2*0.6*Wtmin*wcurb+$F_{vertASD}$*wcurb/2]/wcurb

---> Negative values indicate opposite load.

Longitudinal:

$Compression_{SEISMIC}$ =	954	lbs	=[FpmaxASD*Hcm+2*(1+0.14*S_{DS})*Wtmax*Lcurb]/Lcurb
$Tension_{SEISMIC}$ =	201	lbs	=[FpmaxASD*Hcm-2*(0.6-0.14S_{DS})*Wtmin*Lcurb]/Lcurb
$Compression_{WIND}$ =	156	lbs	=[$F_{h\ ASD\ long}$*Hcm+2*0.6*Wtmax*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb
$Tension_{WIND}$ =	358	lbs	=[$F_{h\ ASD\ long}$*Hcm-2*0.6*Wtmin*Lcurb+$F_{vertASD}$*Lcurb/2]/Lcurb

---> Negative values indicate opposite load.

Governing Reactions:

Transverse:	$Comp_{MAX}$ =	1187	lbs	---> Along long edge of curb.
(on long edge)	$Tens_{MAX}$ =	739	lbs	---> Along long edge of curb.
Longitudinal:	$Comp_{MAX}$ =	954	lbs	---> Along short edge of curb.
(on short edge)	$Tens_{MAX}$ =	358	lbs	---> Along short edge of curb.

---> Negative values indicate opposite load.

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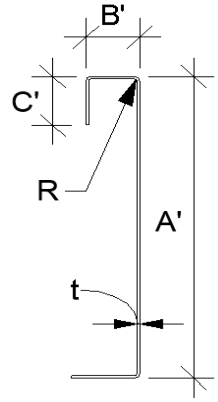

Curb Design

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 =	0.615 k	(Max Axial Comp)
Pn/Ωc =	24.417 k	
Fe =	37.12 ksi	
λc =	1.16	
Fn =	28.45 ksi	
Ly =	37 in	Lateral unbraced length
k_yL_y/r_y =	89	(assume k=0.8)

Ωc = 1.80

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

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

Compression Check = O.K.

Check Web Crippling

h =	24 in	-- Check limits:		C = 4.00
t =	0.0566 in	h/t =	424.03 ≤ 260	C_R = 0.14
N =	7.00	N/t =	123.67 ≤ 210	C_N = 0.35
Ω_w =	1.75	N/h =	0.291667 ≤ 2.0	C_h = 0.02
P_n =	1.366 k	R/t =	1.50 ≤ 9.0	
P_n/Ω_w =	0.780 k			
Long side: Pu_{Trans} =	0.593 k	**O.K.**	# clips = 2	
Short side: Pu_{Long} =	0.954 k	**web stiffener REQ'D**	# clips = 1	

(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 s** *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 =	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 =	331 lbs	Max($F_{pmaxASD}$/4 -OR- $Fh_{ASDtrans}$/4 corner connections)
Vcrnmax =	593 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 =	3.0
Check Combined Stress in Bolts & Inserts:	0.208 **O.K.**

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

Assume L/t > 25: 25*t =	1.415 in
Lreq'd =	0.505 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

t2 = 0.1017 in (unit base rail thickness)

d = 0.190 in (screw diameter)

Fu1 = 65 ksi

Fu2 = 65 ksi

dw = 0.375 in (nom. washer diameter)

t2/t1 = 1.8

For t2/t1 ≤ 1.0:

Shear: $P_{ns} = 4.2F_{u2}\sqrt{t_2^3 d}$ — Pns = 1887 # — 3.86 k

$P_{ns} = 2.7t_1dF_{u1}$ — 1.89 k

$P_{ns} = 2.7t_2dF_{u2}$ — 3.39 k

For t2/t1 ≥ 2.5:

Pns = 1887 #

$P_{ns} = 2.7t_1dF_{u1}$ — 1.89 k

$P_{ns} = 2.7t_2dF_{u2}$ — 3.39 k

Pns/Ω = 629 #

Pss/Ω = 540 # <- Controls

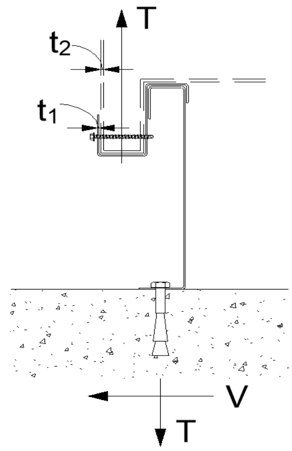
Tension: Pnot = 1.068 k (screw pull-out strength)

Pnov = 2.069 k (screw pull-over strength)

Pts/Ω = 356 # <- Controls

Pts/Ω = 820 # (full tensile screw capacity)

$$P_{not} = 0.85t_cdF_{u2})$$
$$t_c = \min(t_1, t_2)$$
$$P_{nov} = 1.5t_1d_wF_{u1}$$



	Shear (k)	# clips	V_{clip} (k)	V_{allow}(lb)	# screws	spacing
Long side:	1.231	2	0.62	540 #	2	6.00 in
Short side:	1.096	1	1.10	540 #	3	3.00 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 = 0.341 in^2 — Ant = 0.034 in^2

Rn/Ω = 5.954 k — $R_n = 0.6F_yA_{gv} + F_uA_{nt} \leq 0.6F_uA_{nv} + F_uA_{nt}$

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:	$Uplift_{MAX}$ = 1376 lbs		$Shear_{MAX}$ = 661 lbs
$Compression_{SEISMIC}$ =	2168 lbs	=[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb	
$Tension_{SEISMIC}$ =	1284 lbs	=[FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb	
$Compression_{WIND}$ =	1303 lbs	=[$F_{h\ ASD\ trans}$*(Hcm+Hcurb)+0.6*$WGT_{unit+curb}$*wcurb/2-$F_{vert\ ASD}$*wcurb/2]/wcurb	
$Tension_{WIND}$ =	1376 lbs	=[$F_{h\ ASD\ trans}$*(Hcm+Hcurb)-0.6*$WGT_{unit+curb}$*wcurb/2+$F_{vertASD}$*wcurb/2]/wcurb	
Longitudinal:	$Uplift_{MAX}$ = 671 lbs		$Shear_{MAX}$ = 661 lbs
$Compression_{SEISMIC}$ =	1555 lbs	=[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb	
$Tension_{SEISMIC}$ =	671 lbs	=[FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb	
$Compression_{WIND}$ =	471 lbs	=[$F_{h\ ASD\ long}$*(Hcm+Hcurb)+0.6*$WGT_{unit+curb}$*Lcurb/2-$F_{vert\ ASD}$*Lcurb/2]/Lcurb	
$Tension_{WIND}$ =	544 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:

$T_{all\,metal}$ = 797 lbs — $V_{all\,metal}$ = 876 lbs

$T_{all\,wood}$ = 616 lbs — $V_{all\,wood}$ = 400 lbs

# of Screws Req'd for Uplift = 2.23 — COMBINED LOADING: 0.972 O.K.

# of Screws Req'd for Shear = 1.65 — Screw Spacing = 21.0 in o.c.

Total # of screws Required = 4

1/4"ϕ x 3.5" Simpson SDS screws @ 21 in o.c. along long side of curb w/ 2.25" threaded embed

Longitudinal:

# of Screws Req'd for Uplift = 1.1 — COMBINED LOADING: 0.914 O.K.

# of Screws Req'd for Shear = 1.7 — Screw Spacing = 16.3 in o.c.

Total # of screws Required = 3

1/4"ϕ x 3.5" Simpson SDS screws @ 16.3 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:

$T_{all\,bolt}$ = 3927 lbs — $V_{all\,bolt}$ = 2209 lbs

$T_{all\,metal}$ = 1656 lbs — $V_{all\,metal}$ = 1756 lbs

# of Bolts Req'd for Uplift = 0.83 — COMBINED LOADING: 0.293 O.K.

# of Bolts Req'd for Shear = 0.38 — Bolt Spacing = 58.9 in o.c.

Total # of Bolts Required = 2

1/2" ϕ A307 Bolts to steel angle below deck @ 58.9 in o.c. along long side of curb

Longitudinal:

# of Bolts Req'd for Uplift = 0.41 — COMBINED LOADING: 0.132 O.K.

# of Bolts Req'd for Shear = 0.38 — Req'd Min Spacing = 28.7 in o.c.

Total # of Bolts Required = 2

1/2" ϕ A307 Bolts to steel angle below deck @ 28.7 in o.c. along short side of curb

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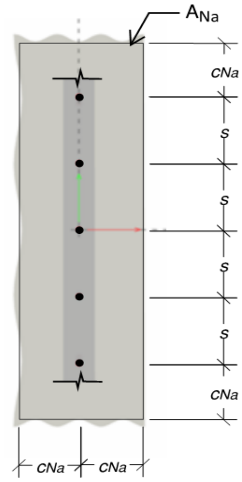
For Concrete anchorage: SEISMIC $(0.6\text{-}0.14S_{DS})D + 0.7\Omega_o E$ Ωo = 2.0

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

$$N_{ag} = \frac{A_{Na}}{A_{Nao}}\varphi_{ec,Na}\varphi_{ed,Na}\varphi_{cp,Na}N_{ba}$$ (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) $\lambda_a = 1.0$

$øN_{ag}$ = 4820 lbs (group) CONTROLS λ_a =1.0 for normal weight conc; 0.6 for light

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:__ $Uplift_{MAX}$ = 2724 lbs $Shear_{MAX}$ = 1323 lbs

$Compression_{SEISMIC}$ =	3608 lbs	$=[\Omega o*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*WGT_{unit+curb}*wcurb/2]/wcurb$
$Tension_{SEISMIC}$ =	2724 lbs	$=[\Omega o*FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*WGT_{unit+curb}*wcurb/2]/wcurb$
$Shear_{SEISMIC}$ =	1323 lbs	=Ωo*FpmaxASD/2

Min Bolts Req'd Uplift = 1.93 spacing = 29.44 in o.c. Tapplied = 1361.8 lbs

Min Bolts Req'd Shear = 2.00 spacing = 58.88 in o.c. Vapplied = 330.7 lbs

Try using 2 bolts spaced at 58.88 in o.c. COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \leq 1.2$ = 1.15 O.K.

__Use 2 - 1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy @ 58.9 in o.c. max. along long side of curb w/ 2.75in embed__

__Longitudinal:__ $Uplift_{MAX}$ = 1498 lbs $Shear_{MAX}$ = 1323 lbs

$Compression_{SEISMIC}$ =	2382 lbs	$=[\Omega o*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*WGT_{unit+curb}*Lcurb/2]/Lcurb$
$Tension_{SEISMIC}$ =	1498 lbs	$=[\Omega o*FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*WGT_{unit+curb}*Lcurb/2]/Lcurb$
$Shear_{SEISMIC}$ =	1323 lbs	=Ωo*FpmaxASD/2

Min Bolts Req'd Uplift = 1.06 spacing = 14.35 in o.c. Tapplied = 748.8 lbs

Min Bolts Req'd Shear = 2.00 spacing = 28.69 in o.c. Vapplied = 330.7 lbs

Try using 2 bolts spaced at 28.69 in o.c. COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \leq 1.2$ = 0.71 O.K.

__Use 2 - 1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy @ 28.7 in o.c. max. along short side of curb w/ 2.75in embed__

__CURB DESIGN SUMMARY:__	CBWC-300 PRS	**Unit:**	ZX 04-07; XX/ZX A7; ZY, ZQ, XY, XQ, ZL 04-06
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 3 - #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__	4 @ 20.96 in o.c.	2 @ 58.88 in o.c.	2 @ 58.88 in o.c.
__SHORT DIRECTION__	3 @ 16.35 in o.c.	2 @ 28.69 in o.c.	2 @ 28.69 in o.c.