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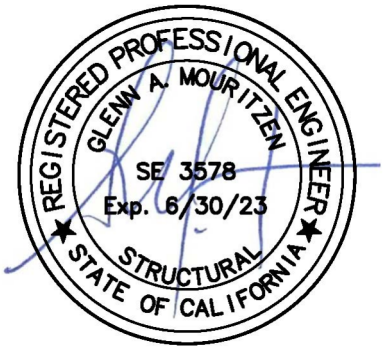
6593 Riverdale St.
San Diego, CA 92120
619-727-4800

Structural Calculations

for

CBWC-113 Series

CBWCPRD3715



Prepared for:

PROVENT / RRS

3847 Wabash Drive
Mira Loma, CA 91725

Date: October 11, 2021

Project Number: PV2101

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

STRUCTURALLY CALCULATED WELDED ROOF CURBS FOR YORK UNITS

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

ProVent P/N	A	WEIGHT
CBWCPRD371508	8"	125 Lbs
CBWCPRD371511	11"	141 Lbs
CBWCPRD371514	14"	157 Lbs
CBWCPRD371524	24"	208 Lbs

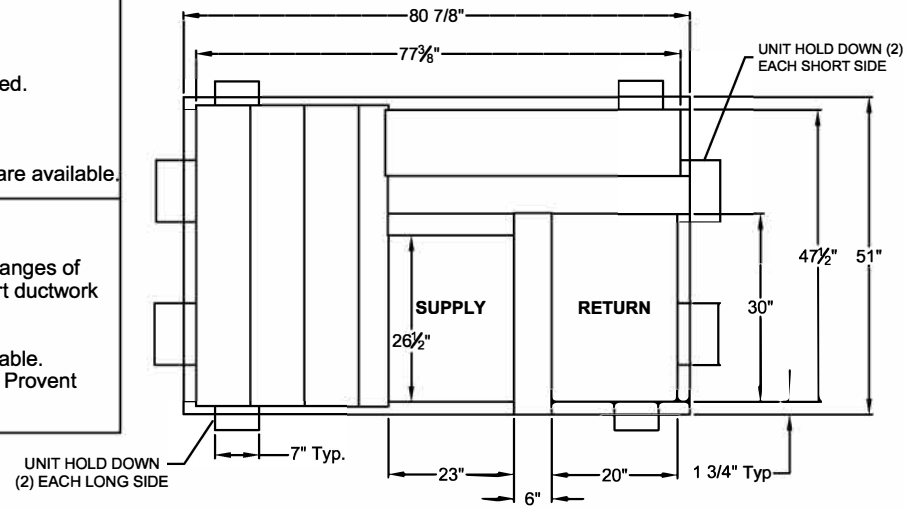
Meets seismic requirements for the following codes:
CBC 2019
IBC 2018

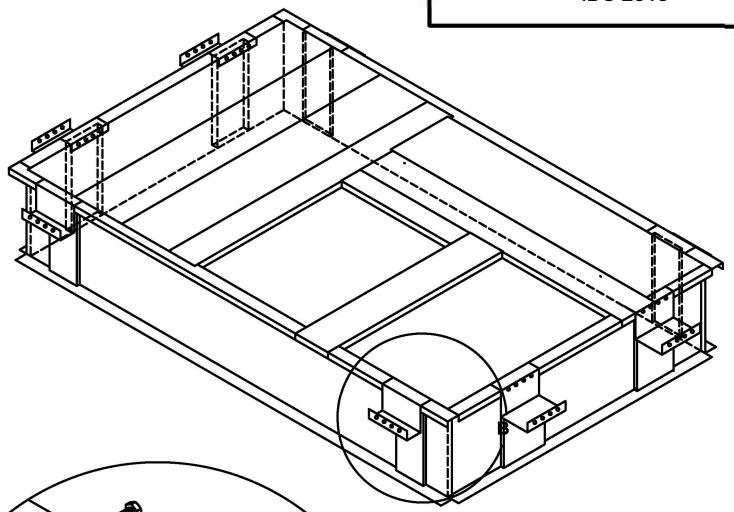
FEATURES

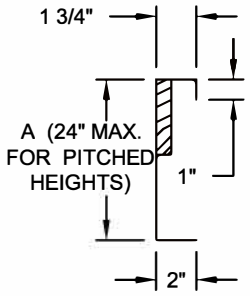
- Roof curb sides and ends are 16 ga. galvanized steel.
- Gasketing package provided.
- Heat treated wood nailer provided.
- Insulated deck pans provided.
- Pitched curbs and taller curbs are available.

NOTES

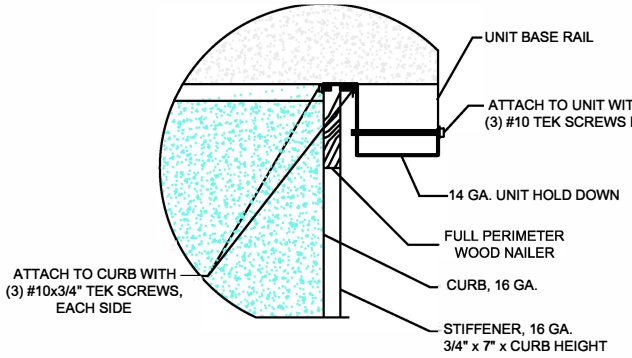
- Attach ductwork to roof curb. Flanges of duct rest on top of curb. Support ductwork below the curb.
- Thru the curbs utilities are available. Contact your York distributor or Provent directly.



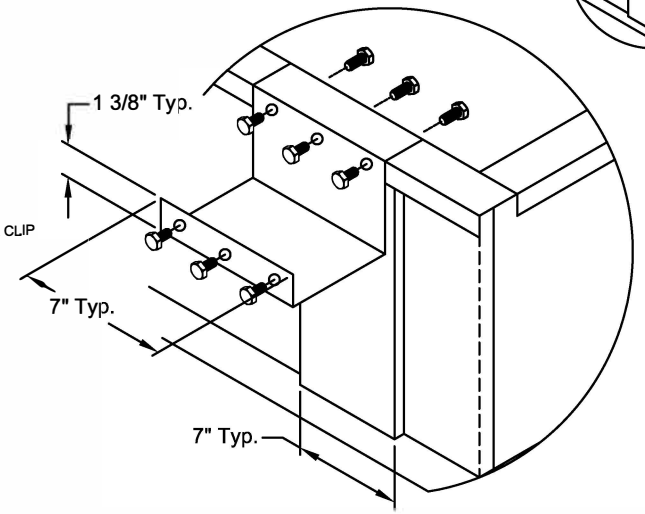




CURB DETAIL



HOLD DOWN DETAIL



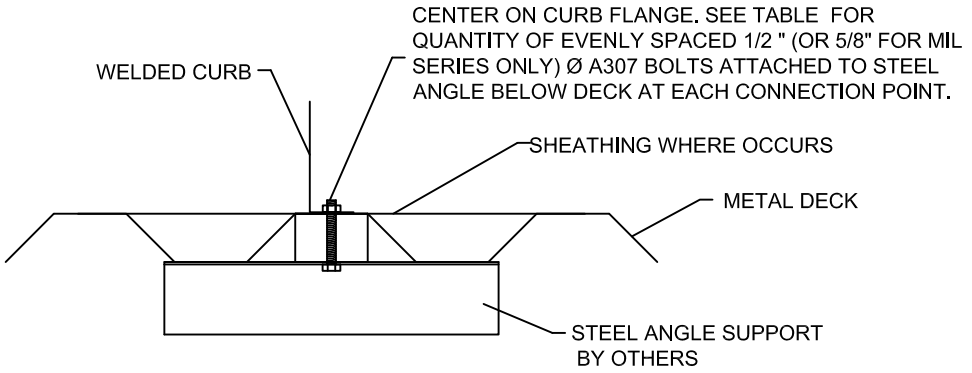
DETAIL B

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:		PART NUMBER:
CBWC-113		CBWCPRD3715 SERIES
DATE: 9/9/2021	REV: 8	DRAWN BY: ALL

STEEL ATTACHMENT



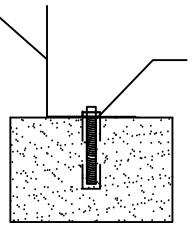
	NO. OF ANCHORAGE BOLTS REQUIRED	
CURB	LONG SIDE	SHORT SIDE
LXS	2 @ 34.5" O.C.	2 @ 19" O.C.
LXL	2 @ 34.5" O.C.	2 @ 29" O.C.
SUN3672	2 @ 60.5" O.C.	2 @ 39" O.C.
PRD3715	2 @ 68.88" O.C.	2 @ 39" O.C.
PRS	2 @ 58.88" O.C.	2 @ 28.69" O.C.
PRL	2 @ 72" O.C.	2 @ 41.5" O.C.
SLU180	3 @ 51.38" O.C.	2 @ 71.5" O.C.
SLM1830	3 @ 56.88" O.C	3 @ 35.75" O.C.

Meets seismic requirements for the following codes:
CBC 2019
IBC 2018

ROOF ANCHORAGE DETAIL	
CBKD Series	CBWC Series
LXS	LXS
LXL	LXL
SUN3672	SUN3672
PRD3715	PRD3715
PRS	PRS
PRL	PRL
SLU180	SLU180
SLM1830	SLM1830

ASSUMES:
CONC SLAB
f'c= 4000PSI MINIMUM
6" MIN THICKNESS
NORMAL WEIGHT CONCRETE
OR SAND LIGHT WEIGHT

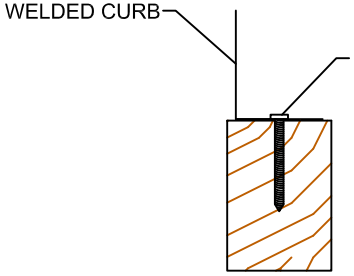
CONCRETE ATTACHMENT



	NO. OF ANCHORAGE BOLTS REQUIRED	
CURB	LONG SIDE	SHORT SIDE
LXS	4 @ 11.5" O.C.	3 @ 9.5" O.C.
LXL	4 @ 11.5" O.C.	3 @ 14.5" O.C.
SUN3672	4 @ 20.17" O.C.	3 @ 12.38" O.C.
PRD3715	9 @ 8.61" O.C.	7 @ 6.5" O.C.
PRS	5 @ 14.72" O.C.	4 @ 9.56" O.C.
PRL	6 @ 14.4" O.C.	5 @ 10.38" O.C.
SLU180	8 @ 14.68" O.C.	7 @ 11.92" O.C.
SLM1830	12 @ 10.34" O.C.	10 @ 7.94" O.C.

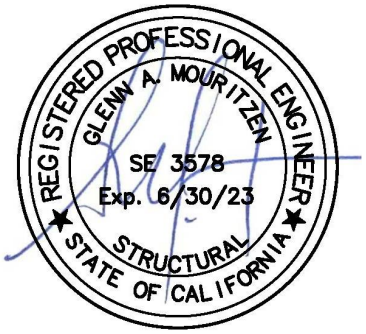
*** SIX INCHES FROM EACH CORNER EVENLY SPACED.**
**** CENTERED.**

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	9 @ 9.11" O.C.	8 @ 6.14" O.C.
PRS	4 @ 20.96" O.C.	3 @ 16.34" O.C.
PRL	5 @ 19" O.C.	4 @ 15.17" O.C.
SLU180	9 @ 13.34" O.C.	7 @ 12.58" O.C.
SLM1830	13 @ 9.81" O.C.	12 @ 6.86" O.C.

FOUR INCHES FROM EACH CORNER EVENLY SPACED



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

FORM NO: CB-60

DATE:	REV:	DRAWN BY:
10/07/2021	7	FMM

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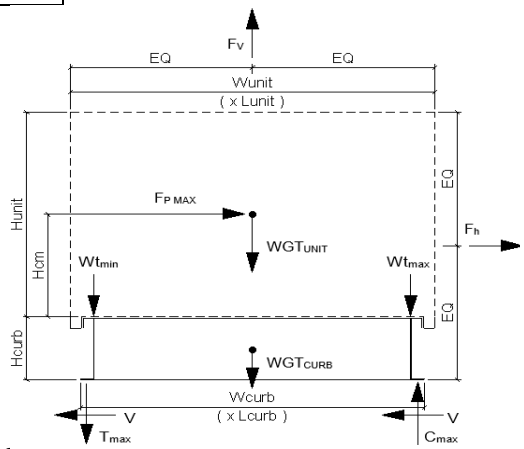
Client:	ProVent PV2101	Previous: PV1806	
Description:	CBWC-113	CBWCPRD3715	
Unit:	ZT, ZH, ZJ, ZR 037-150; ZF, XP, ZB 078-150		

Curb Information

Hcurb =	24	in	(Height of curb)
Lcurb =	80.875	in	(Length of curb)
wcurb =	51	in	(Width of curb)
WGTcurb =	208	lbs	(Weight of curb)
# Clips long side =	2	# Clips short side =	2

Unit Information

WGTunit =	1700	lbs	(Weight of Unit)
Wtmax =	329	lbs	(Maximum corner weight)
Wtmin =	191	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 - 2018 IBC/2019 CBC

Ss =	2.85	(Worst case for majority of California)
Fa =	1.2	Default Site Class D
Sms =	3.420	(Fa*Ss)
Sds =	2.280	(2/3*Sms)
Ip =	1.50	(Importance Factor Category III Building)
Fpmax =	1.710 Wp	(0.4*Sds*Ip)*Wp*3/Rp
FpmaxASD =	2035 lbs (unit only)	(0.7*Fpmax) FpmaxASD = 2284 lbs (unit and curb)

Wind Loading - 2018 IBC/2019 CBC

*** Exposure Category C ***

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	(Max wind velocity, mph for Cat III & IV bldgs Exp. Cat C)
$GCr_{(horiz)}$ =	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)
$F_{h\ ASD\ trans}$ =	1713 lbs	= 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.4-2)
$F_{h\ ASD\ long}$ =	1135 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:

$Compression_{SEISMIC}$ =	1880 lbs	=[FpmaxASD*Hcm+2*(1+0.14S_{DS})*Wtmax*wcurb]/wcurb
$Tension_{SEISMIC}$ =	1403 lbs	= $Comp_{SEISMIC}$-(0.6-0.14S_{DS})*WGTunit
$Compression_{WIND}$ =	713 lbs	=[$F_{h\ transASD}$*Hcm+2*0.6*Wtmax*wcurb-$F_{vertASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ =	761 lbs	= $Comp_{WIND}$+Fvert-0.6*WGTunit

---> Negative values indicate Compression load rather than Tension.

Longitudinal:

$Compression_{SEISMIC}$ =	1506 lbs	=[FpmaxASD*Hcm+2*(1+0.14*S_{DS})*Wtmax*Lcurb]/Lcurb
$Tension_{SEISMIC}$ =	1029 lbs	= $Comp_{SEISMIC}$-(0.6-0.14S_{DS})*WGTunit
$Compression_{WIND}$ =	217 lbs	=[$F_{h\ transASD}$*Hcm+2*0.6*Wtmax*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb
$Tension_{WIND}$ =	265 lbs	= $Comp_{WIND}$+Fvert-0.6*WGTunit

---> Negative values indicate Compression load rather than Tension.

Governing Reactions:

Transverse:	$Comp_{MAX}$ =	1880	lbs	---> Along long edge of curb.
(on long edge)	$Tens_{MAX}$ =	1403	lbs	---> Along long edge of curb.
Longitudinal:	$Comp_{MAX}$ =	1506	lbs	---> Along short edge of curb.
(on short edge)	$Tens_{MAX}$ =	1029	lbs	---> Along short edge of curb.

---> Negative values indicate Compression load rather than Tension.

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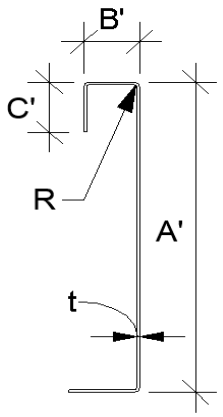
Curb Design

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



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 (Moment of Inertia about X-Axis)
Iy = 0.174 in (Moment of Inertia about Y-Axis)
A = 1.54 in^2
rx = 7.71 in
ry = 0.336 in
rmin = 0.336 in

Axial Compression

Pu = 1.017 k (Max Axial Comp) Ωc = 1.80
Pn/Ωc = 15.456 k
Fe = 20.54 ksi
λc = 1.56
Fn = 18.01 ksi
Ly = 50 in Lateral unbraced length
k_yL_y/r_y = 119 (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 = 24 in -- Check limits: C = 4.00
t = 0.0566 in h/t = 424.03 ≤ 200 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} = 0.940 k **web stiffener REQ'D** # clips = 2
Short side: Pu_{Long} = 0.753 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 = 1.366 k Ae = 0.380 in^2
Pn = 14.262 k Pn/Ω = 8.390 k
O.K.

Corner Connections

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

Tcrnmax = 509 lbs Max($F_{pmaxASD}$/4 -OR- $Fh_{ASDtrans}$/4 corner connections)
Vcrnmax = 702 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 = 0.2
# of Bolts required for Shear = 0.6 ***If combined fails:
# of Bolts Used = [1.0] USE --> 2.0
Check Combined Stress in Bolts & Inserts: 0.845 O.K. StressComb = 0.423 **O.K.**

Check 1/8" welded connection

<--- USE WELD Ω = 2.35
Assume L/t > 25: 25*t = 1.415 in
Lreq'd = 0.598 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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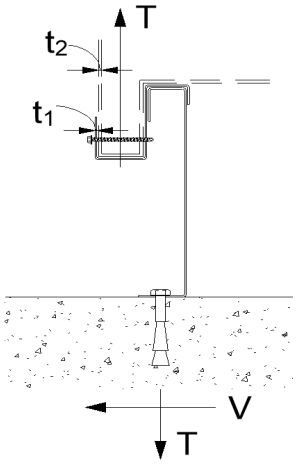
Connection Unit to Curb Clip | #10 SMS screw | Ω = 3.0

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:	2.035	2	1.02	540 #	2	6.00 in
Short side:	2.035	2	1.02	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 $R_n = 0.6F_y A_{gv} + F_u A_{nt} \le 0.6F_u A_{nv} + F_u A_{nt}$

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:	$Uplift_{MAX}$ = 2934 lbs	$Shear_{MAX}$ = 1142 lbs	
$Compression_{SEISMIC}$ =	3470 lbs	=[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*wcurb]/wcurb	
$Tension_{SEISMIC}$ =	2934 lbs	=$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)	
$Compression_{WIND}$ =	1697 lbs	=[$F_{h\ transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*wcurb-$F_{vertASD}$*wcurb/2]/wcurb	
$Tension_{WIND}$ =	1619 lbs	=[$F_{h\ transASD}$*(Hcm+Hcurb)-0.6*($WGT_{unit+curb}$/2)*wcurb+$F_{vertASD}$*wcurb/2]/wcurb	
Longitudinal:	$Uplift_{MAX}$ = 2117 lbs	$Shear_{MAX}$ = 1142 lbs	
$Compression_{SEISMIC}$ =	2653 lbs	=[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*Lcurb]/Lcurb	
$Tension_{SEISMIC}$ =	2117 lbs	=$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)	
$Compression_{WIND}$ =	732 lbs	=[$F_{h\ transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb	
$Tension_{WIND}$ =	654 lbs	=[$F_{h\ transASD}$*(Hcm+Hcurb)-0.6*($WGT_{unit+curb}$/2)*Lcurb+$F_{vertASD}$*Lcurb/2]/Lcurb	

Wood Attachment: **1/4"φ x 3.5" Simpson SDS screws w/ 2.25" threaded embed**

Transverse: $Tall_{metal}$ = 997 lbs | $Vall_{metal}$ = 1097 lbs

$Tall_{wood}$ = 616 lbs | $Vall_{wood}$ = 400 lbs

# of Screws Req'd for Uplift = 4.76 | COMBINED LOADING: 0.846 O.K.

# of Screws Req'd for Shear = 2.85 | Screw Spacing = 9.1 in o.c.

Total # of screws Required = 9

1/4"φ x 3.5" Simpson SDS screws @ 9.1 in o.c. along long side of curb w/ 2.25" threaded embed

Longitudinal:

# of Screws Req'd for Uplift = 3.4 | COMBINED LOADING: 0.786 O.K.

# of Screws Req'd for Shear = 2.9 | Screw Spacing = 6.1 in o.c.

Total # of screws Required = 8

1/4"φ x 3.5" Simpson SDS screws @ 6.1 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

$Tall_{metal}$ = 1656 lbs | $Vall_{metal}$ = 1756 lbs

# of Bolts Req'd for Uplift = 1.77 | COMBINED LOADING: 0.971 O.K.

# of Bolts Req'd for Shear = 0.65 | 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 = 1.28 | COMBINED LOADING: 0.628 O.K.

# of Bolts Req'd for Shear = 0.65 | 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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For Concrete anchorage: SEISMIC (0.6-0.14SDS)D + 0.7Ω_o E (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: $Uplift_{MAX}$ = 6251 lbs $Shear_{MAX}$ = 2855 lbs

$Compression_{SEISMIC}$ = 6786 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*wcurb]/wcurb

$Tension_{SEISMIC}$ = 6251 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)

$Shear_{SEISMIC}$ = 2855 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 6.79 spacing = 9.48 in o.c. Tapplied = 694.5 lbs

Min Bolts Req'd Shear = 2.63 spacing = 28.4375 in o.c. Vapplied = 317.2 lbs

Try using 9 bolts
spaced at 8.61 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \leq 1.2$ = 1.05

Use 9 - 3/4" ϕ Hilti Hit-HY 200 adhesive anchors @ 8.6 in o.c. max. along long side of curb w/ 4" embed

Longitudinal: $Uplift_{MAX}$ = 4209 lbs $Shear_{MAX}$ = 2855 lbs

$Compression_{SEISMIC}$ = 4744 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*Lcurb]/Lcurb

$Tension_{SEISMIC}$ = 4209 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)

$Shear_{SEISMIC}$ = 2855 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 4.57 spacing = 6.75 in o.c. Tapplied = 601.2 lbs

Min Bolts Req'd Shear = 2.63 spacing = 13.5 in o.c. Vapplied = 407.8 lbs

Try using 7 bolts
spaced at 6.50 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \leq 1.2$ = 1.03

Use 7 - 3/4" ϕ Hilti Hit-HY 200 adhesive anchors @ 6.5 in o.c. max. along short side of curb w/ 4" embed

CURB DESIGN SUMMARY: CBWC-113

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 7" (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 7" (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 Simpson SDS screw w/ 2.25" threaded embed (SGmin=0.43)	1/2" ϕ A307 bolts	3/4" ϕ thrd'd rod in Hilti HIT-HY 200 epoxy, min. 4" embed
LONG DIRECTION	9 @ 9.11 in o.c.	2 @ 68.88 in o.c.	9 @ 8.61 in o.c.
SHORT DIRECTION	8 @ 6.14 in o.c.	2 @ 39 in o.c.	7 @ 6.5 in o.c.