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

Structural Calculations
for
CBWC-113 Series

Prepared for:

PROVENT / RRS

3847 Wabash Drive
Mira Loma, CA 91725

Date: July 29, 2019

Project Number: PV1806

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

STRUCTURALLY CALCULATED WELDED ROOF CURBS FOR YORK UNITS

ZT, ZR, ZJ, ZH 037-150
ZF, ZH, ZJ, ZR, XP, DH, DM, DF, DR, BP 078-150

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

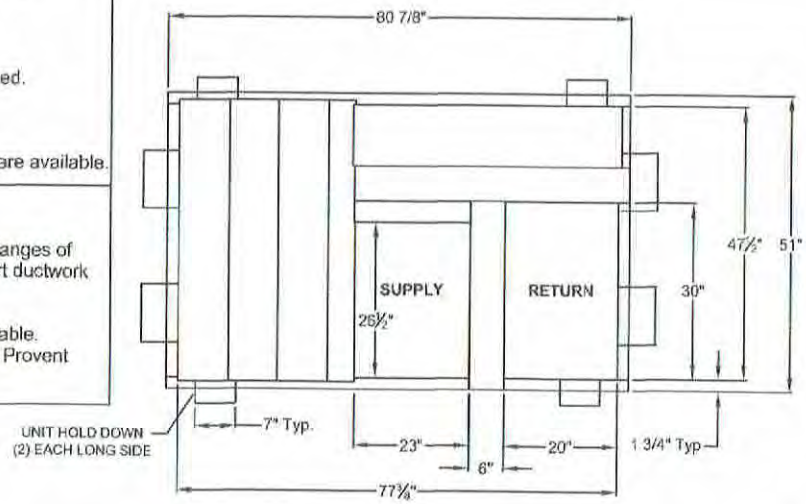
Meets seismic requirements for the following codes:
CBC 2016
IBC 2015

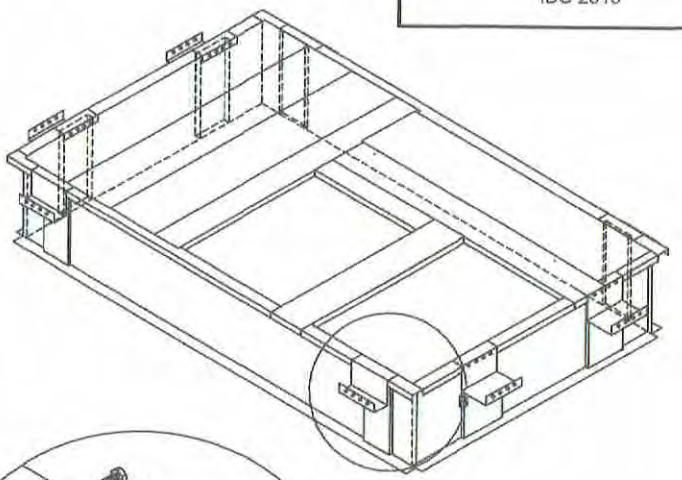
FEATURES

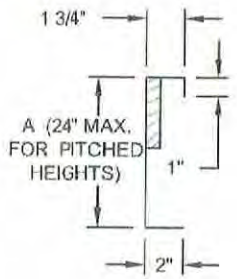
- Roof curb sides and ends are 16 ga. galvanized steel.
- Gasketing package provided.
- Heat treated wood nailer provided.
- Insulated deck pans provided.
- Pitched curbs and taller curbs are available.

NOTES

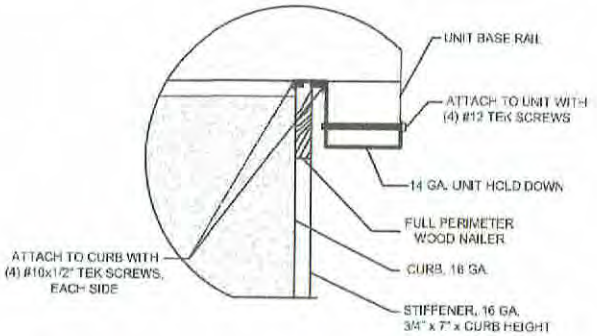
- Attach ductwork to roof curb. Flanges of duct rest on top of curb. Support ductwork below the curb.
- Thru the curbs utilities are available. Contact your York distributor or Provent directly.



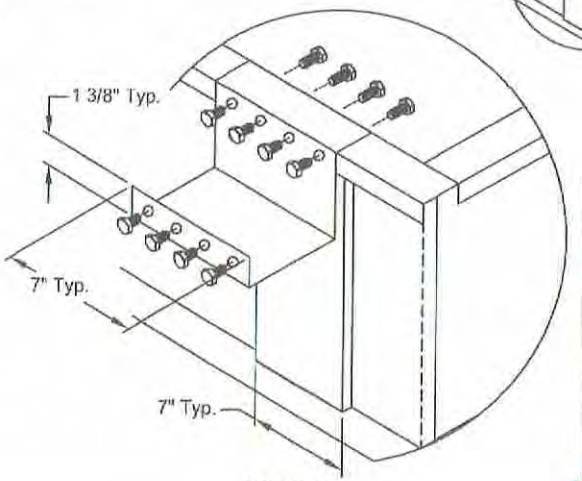




CURB DETAIL



HOLD DOWN DETAIL



DETAIL B

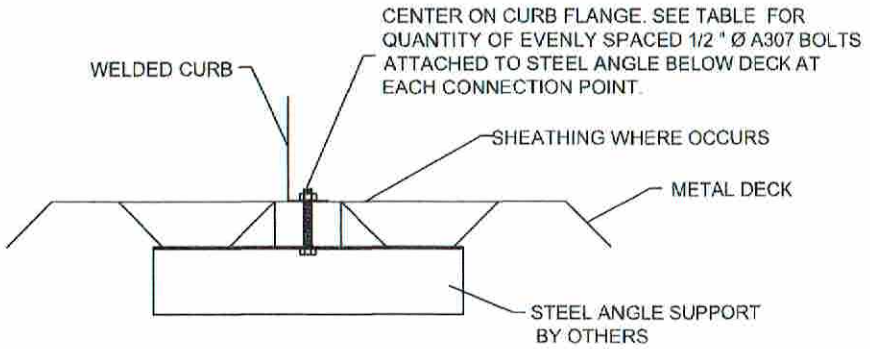
REGISTERED PROFESSIONAL ENGINEER
GLENN A. MOURITZEN
NO. 3578
EXP. 06/30/2021
STRUCTURAL
STATE OF CALIFORNIA
7/29/19

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: 09/27/18	REV: 5	DRAWN BY: ALL

STEEL ATTACHMENT



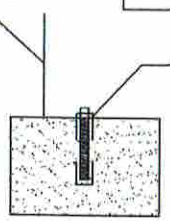
CURB	NO. OF ANCHORAGE BOLTS REQUIRED	
	LONG SIDE	SHORT SIDE
LXS	2 @ 34.5" O.C	XX @ 2 @ 19" O.C
LXL	2 @ 34.5" O.C.XX	2 @ 29" O.C
SUN3672	2 @ 60" O.C	2 @ 24.25" O.C
PRD3715	2 @ 68.38" O.C	2 @ 38.5" O.C
PRS	2 @ 58.38" O.C	2 @ 28.19" O.C.
PRL	2 @ 72" O.C	2 @ 41" O.C
SLU180	2 @ 102.25" O.C.	2 @ 71" O.C.
SLM1830	2 @ 113.25" O.C	2 @ 71" O.C.

Meets seismic requirements for the following codes:
CBC 2016
IBC 2015

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

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

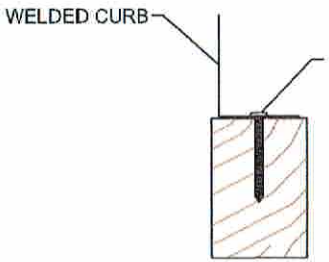
CONCRETE ATTACHMENT



CURB	NO. OF ANCHORAGE BOLTS REQUIRED	
	LONG SIDE	SHORT SIDE
LXS	10 @ 3.73" O.C.	9 @ 2.38" O.C.
LXL	8 @ 4.93" O.C.	7 @ 4.83" O.C.
SUN3672	9 @ 7.5" O.C.	6 @ 4.85" O.C.
PRD3715	17 @ 4.27" O.C.	13 @ 3.21" O.C.
PRS	9 @ 7.3" O.C.	7 @ 4.7" O.C.
PRL	11 @ 7.2" O.C.	9 @ 5.13" O.C.
SLU180	16 @ 6.82" O.C.	13 @ 5.92" O.C.
SLM1830	18 @ 6.66" O.C.	13 @ 5.92" O.C.

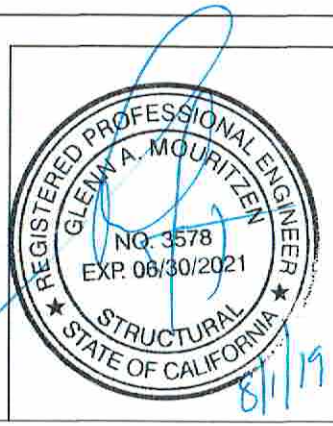
* SIX INCHES FROM EACH CORNER EVENLY SPACED.
** CENTERED.

WOOD ATTACHMENT



CURB	NO. OF ANCHORAGE SCREWS REQUIRED	
	LONG SIDE	SHORT SIDE
LXS	7 @ 6.42" O.C.	4 @ 7.67" O.C.
LXL	7 @ 6.42" O.C.	6 @ 6.6" O.C.
SUN3672	4 @ 21.33" O.C.	3 @ 14.13" O.C.
PRD3715	8 @ 10.34" O.C.	6 @ 8.5" O.C.
PRS	4 @ 20.79" O.C.	3 @ 16.09" O.C.
PRL	4 @ 25.33" O.C.	3 @ 22.5" O.C.
SLU180	7 @ 17.71" O.C.	7 @ 12.5" O.C.
SLM1830	8 @ 16.75" O.C.	6 @ 15" O.C.

FOUR INCHES FROM EACH CORNER EVENLY SPACED



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SUBMITTED TO: _____
COMPANY: _____
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EQUIPMENT: _____
NOTES: _____

FORM NO: CB-60

DATE:	REV:	DRAWN BY:
07/31/18	3	ALL

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Page ___ of ___

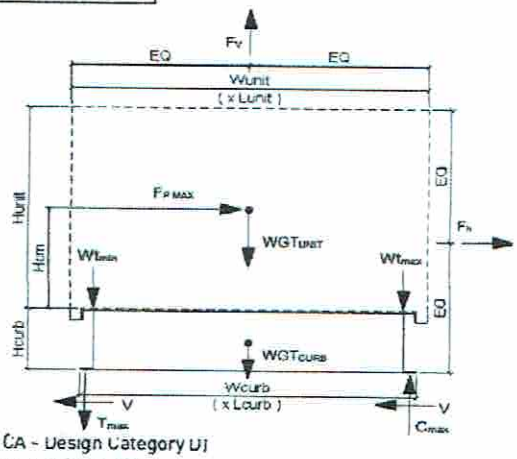
Client: ProVent PV1806
Description: CBWC-113 (CBWCPRD3715**)
Unit: ZT,ZR,ZJ,ZH 037-150; ZF,ZH,ZJ,ZR,XP,DH,DM,DF,DR,BP 078-150

Curb Information

Hcurb =	24	in	(Height of curb)
Lcurb =	80.375	in	(Length of curb)
wcurb =	50.5	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 - 2015 IBC/2016 CBC

Ss =	2.85		(Worst case for majority of CA - Design Category D)
Fa =	1		(Interpolated from Table 11.4-1 ASCE 7-10)
Sms =	2.850		(Fa*Ss)
Sds =	1.900		(2/3*Sms)
Ip =	1.25		(Importance Factor Category III Building)
Fpmax =	3.800	Wp	(1.6*Sds*Ip)*Wp
FpmaxASD =	4522	lbs	(0.7*Fpmax)
	(unit only)		

FpmaxASD = 5075 lbs (unit and curb)

Wind Loading - 2015 IBC/2016 CBC

*** Exposure Category C ***

Kz =	1.13		(For 60 ft roof height, Exposure C - Table 29.3-1 ACSE 7-10)
Kzt =	1.0		(No topographic effects assumed for rooftop mounted units)
Kd =	0.85		(Directionality factor Table 26.6-1 ASCE 7-10)
V =	115		(Max wind velocity, mph for Cat III & IV bldgs Exp. Cat C)
$GCr_{(horiz)}$ =	1.9		(Refer Sect 29.5.1 ASCE 7-10)
$GCr_{(vert)}$ =	1.5		(Refer Sect 29.5.1 ASCE 7-10)
qz	32.5	psf	= 0.00256*Kz*Kzt*Kd*V^2 (Eq. 29.3-1 ASCE 7-10)
$F_{h\ ASD\ trans}$ =	1713	lbs	= 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.5-2)
$F_{h\ ASD\ long}$ =	1135	lbs	= 0.6*qz*GCr*Wunit*(Hunit+Hcurb)
$F_{vert\ ASD}$ =	1067	lbs	= 0.6*qz*GCr*Lunit*Wunit (Eq. 29.5-3)

Curb Loading

Transverse:

$Compression_{SEISMIC}$ =	3105	lbs	=[FpmaxASD*Hcm+2*(1+0.14S_{DS})*Wtmax*wcurb]/wcurb
$Tension_{SEISMIC}$ =	2537	lbs	= $Comp_{SEISMIC}$-(0.6-0.14S_{DS})*WGTunit
$Compression_{WIND}$ =	722	lbs	=[$F_{h\ transASD}$*Hcm+2*0.6*Wtmax*wcurb-$F_{vertASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ =	769	lbs	= $Comp_{WIND}$+Fvert-0.6*WGTunit

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

Longitudinal:

$Compression_{SEISMIC}$ =	2261	lbs	=[FpmaxASD*Hcm+2*(1+0.14*S_{DS})*Wtmax*Lcurb]/Lcurb
$Tension_{SEISMIC}$ =	1693	lbs	= $Comp_{SEISMIC}$-(0.6-0.14S_{DS})*WGTunit
$Compression_{WIND}$ =	220	lbs	=[$F_{h\ transASD}$*Hcm+2*0.6*Wtmax*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb
$Tension_{WIND}$ =	267	lbs	= $Comp_{WIND}$+Fvert-0.6*WGTunit

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

Governing Reactions:

Transverse:	$Comp_{MAX}$ =	3105	lbs	---> Along long edge of curb.
(on long edge)	$Tens_{MAX}$ =	2537	lbs	---> Along long edge of curb.
Longitudinal:	$Comp_{MAX}$ =	2261	lbs	---> Along short edge of curb.
(on short edge)	$Tens_{MAX}$ =	1693	lbs	---> Along short edge of curb.

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

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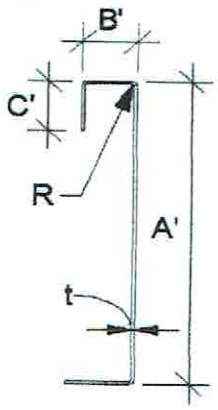
Curb Design

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'=	[2.000] in	a'=	23.943 in	= A'-t
C'=	[0.000] in (0 if no lips)	b =	1.859 in	= B'-[r+t/2+a(r+t/2)]
a =	[0.000] (0 - no Lip; 1 w/ lip)	b'=	1.972 in	= B'-(t/2+at/2)
R =	0.0849 (Inside bend radius)	c =	0.000 in	= a(C'-[r+t/2])
t =	0.0566 in	c'=	0.000 in	= a(C'-t/2)
r'=	0.113 in = R+t/2	u =	0.178 in	= πr/2

x = 0.140 in (Distance between centroid and web centerline)
Ix = 95.991 in (Moment of Inertia about X-Axis)
Iy = 0.258 in (Moment of Inertia about Y-Axis)
A = 1.57 in²
rx = 7.81 in
ry = 0.405 in
rmin = 0.405 in

Axial Compression

Pu = 2.261 k (Max Axial Comp) Ωc = 1.80
Pn/Ωc = 21.697 k
Fe = 29.90 ksi
λc = 1.29
Fn = 24.83 ksi
Ly = 50 in Lateral unbraced length
k_yL_y/r_y = 99 (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:
t = 0.0566 in h/t = 424.03 ≤ 200
N = 7.00 N/t = 123.67 ≤ 210
Ωw = 1.75 N/h = 0.291667 ≤ 2.0
Pn = 1.366 k R/t = 1.50 ≤ 9.0
Pn/Ωw = 0.780 k

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)

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

Long side: Pu_{Trans} = 1.553 k **web stiffener REQ'D** # clips = 2
Short side: Pu_{Long} = 1.130 k **web stiffener REQ'D** # clips = 2

***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 in²
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 = 1131 lbs Max($F_{pmaxASD}$/4 -OR- $Fh_{ASDtrans}$/4 corner connections)
Vcrnmax = 1269 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 = 0.5
# of Bolts required for Shear = 1.2 ***If combined fails:
# of Bolts Used = [2.0] USE --> 3.0

Check Combined Stress in Bolts & Inserts: 0.807 O.K. StressComb = 0.538 **O.K.**

Check 1/8" welded connection

<--- USE WELD Ω = 2.35
Assume L/t > 25: 25*t = 1.415 in
Lreq'd = 1.081 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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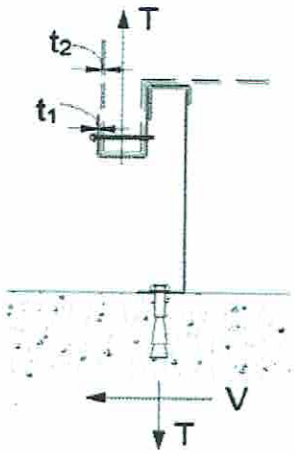
Connection Unit to Curb Clip | #12 SMS screw | Ω = 3.0

t1 = 0.0566 in | Fu1 = 65 ksi
t2 = 0.1017 in (unit base rail thickness) | Fu2 = 65 ksi
d = 0.216 in (screw diameter) | 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 = 2146 #
$P_{ns} = 2.7t_1 dF_{u1}$ 4.12 k
$P_{ns} = 2.7t_1 dF_{u1}$ 2.15 k
$P_{ns} = 2.7t_2 dF_{u2}$ 3.86 k
Pns/Ω = 715 # <- Controls
Pss/Ω = 840 #

For t2/t1 ≥ 2.5:
Pns = 2146 #
$P_{ns} = 2.7t_1 dF_{u1}$ 2.15 k
$P_{ns} = 2.7t_2 dF_{u2}$ 3.86 k

Tension: Pnot = 1.214 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 = 405 # <- Controls
Pts/Ω = 845 # (full tensile screw capacity)

	Shear (k)	# clips	V_{clip} (k)	V_{allow} (lb)	# screws	spacing
Long side:	4.522	2	2.26	715 #	4	2.00 in
Short side:	4.522	2	2.26	715 #	4	2.00 in

clip width (in) = 7.00 | clip height = 1.4 in
min spacing = 0.65 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 in² | Anv = 0.325 in² | Ant = 0.033 in²
Rn/Ω = 5.932 k | $R_n = 0.6F_y A_{gv} + F_u A_{nt} \le 0.6F_u A_{nv} + F_u A_{nt}$ (AISI Sect. E5.3)
BSR O.K.

Connection of Curb to Supporting Structure

Roof Loading SEISMIC: (0.6-0.14SDS)D + 0.7E WIND: 0.6D + W

Transverse: $Uplift_{MAX}$ = 5533 lbs | $Shear_{MAX}$ = 2538 lbs

$Compression_{SEISMIC}$ = 6170 lbs =(FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*wcurb)/wcurb
$Tension_{SEISMIC}$ = 5533 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)
$Compression_{WIND}$ = 1713 lbs =($F_{h\,transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*wcurb-$F_{vertASD}$*wcurb/2)/wcurb
$Tension_{WIND}$ = 1636 lbs =($F_{h\,transASD}$*(Hcm+Hcurb)-0.6*($WGT_{unit+curb}$/2)*wcurb+$F_{vertASD}$*wcurb/2)/wcurb

Longitudinal: $Uplift_{MAX}$ = 3688 lbs | $Shear_{MAX}$ = 2538 lbs

$Compression_{SEISMIC}$ = 4326 lbs =(FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*Lcurb)/Lcurb
$Tension_{SEISMIC}$ = 3688 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)
$Compression_{WIND}$ = 736 lbs =($F_{h\,transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*Lcurb-$F_{vertASD}$*Lcurb/2)/Lcurb
$Tension_{WIND}$ = 659 lbs =($F_{h\,transASD}$*(Hcm+Hcurb)-0.6*($WGT_{unit+curb}$/2)*Lcurb+$F_{vertASD}$*Lcurb/2)/Lcurb

Wood Attachment: **Use 5/8" φ wood lag screws w/ 3.5" Min. Embed**

Transverse: $Tall_{metal}$ = 946.67 lbs | $Vall_{metal}$ = 1043.33 lbs
$Tall_{wood}$ = 1195.95 lbs | $Vall_{wood}$ = 1024 lbs
# of Screws Req'd for Uplift = 5.84 | COMBINED LOADING: 0.888 O.K.
# of Screws Req'd for Shear = 2.48 | Screw Spacing = 10.3 in o.c.
Total # of screws Required = 8
Use 5/8" φ wood lag screws @ 10.3 in o.c. along long side of curb w/ 3.5" Min. Embed

Longitudinal:
# of Screws Req'd for Uplift = 3.9 | COMBINED LOADING: 0.927 O.K.
# of Screws Req'd for Shear = 2.5 | Screw Spacing = 8.5 in o.c.
Total # of screws Required = 6
Use 5/8" φ wood lag screws @ 8.5 in o.c. along short side of curb w/ 3.5" Min. Embed

Steel Deck Attachment: **Use 5/8" φ A307 Bolts attached to steel angle below deck**

$Tall_{bolt}$ = 6903 lbs | $Vall_{bolt}$ = 3682 lbs
Transverse: 6903 lbs | 3682 lbs
# of Bolts Req'd for Uplift = 0.80 | COMBINED LOADING: 0.387 O.K.
# of Bolts Req'd for Shear = 0.69 | Bolt Spacing = 68.4 in o.c.
Total # of Bolts Required = 2
Use 5/8" φ A307 Bolts attached to steel angle below deck @ 68.4 in o.c. along long side of curb

Longitudinal:
# of Bolts Req'd for Uplift = 0.53 | COMBINED LOADING: 0.280 O.K.
# of Bolts Req'd for Shear = 0.69 | Req'd Min Spacing = 38.5 in o.c.
Total # of Bolts Required = 2
Use 5/8" φ A307 Bolts attached to steel angle below deck @ 38.5 in o.c. along short side of curb

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For Concrete anchorage: SEISMIC $(0.6-0.14SDS)D + 0.7\Omega_o E$ $(\Omega_o = 2.5)$

Concrete Attachment: 3/4" φ Hilti Hit-HY 200 adhesive anchors w/ 4" embed

$Tall_{LRFD}$ = 1722 lbs $Vall_{LRFD}$ = 2032 lbs $\alpha = (1 + 0.2SDS)D + 2.5E = 1.87$

$Tall_{ASD} = Tall_{LRFD}/\alpha$ = 920.9 lbs $Vall_{ASD} = Vall_{LRFD}/\alpha$ = 1086.6 lbs $(D = 0.465, E = 0.535)$

Transverse: $Uplift_{MAX}$ = 12976 lbs $Shear_{MAX}$ = 6344 lbs

$Compression_{SEISMIC}$ = 13613 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*(WGT$_{unit+curb}$/2)*wcurb]/wcurb

$Tension_{SEISMIC}$ = 12976 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)

$Shear_{SEISMIC}$ = 6344 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 14.09 spacing = 4.03 in o.c. Tapplied = 763.3 lbs

Min Bolts Req'd Shear = 5.84 spacing = 11.275 in o.c. Vapplied = 373.2 lbs

Try using 17 bolts spaced at 4.27 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{applied}}{V_{allow,ASD}} \leq 1.2$ = 1.17

Use 17 - 3/4" φ Hilti Hit-HY 200 adhesive anchors @ 4.3 in o.c. max. along long side of curb w/ 4" embed

Longitudinal: $Uplift_{MAX}$ = 8365 lbs $Shear_{MAX}$ = 6344 lbs

$Compression_{SEISMIC}$ = 9002 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*(WGT$_{unit+curb}$/2)*Lcurb]/Lcurb

$Tension_{SEISMIC}$ = 8365 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)

$Shear_{SEISMIC}$ = 6344 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 9.08 spacing = 2.944444 in o.c. Tapplied = 643.5 lbs

Min Bolts Req'd Shear = 5.84 spacing = 5.3 in o.c. Vapplied = 488.0 lbs

Try using 13 bolts spaced at 3.21 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{applied}}{V_{allow,ASD}} \leq 1.2$ = 1.15

Use 13 - 3/4" φ Hilti Hit-HY 200 adhesive anchors @ 3.2 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 4 - #12 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 4 - #12 SMS screws each clip

WEB STIFFENER: 16Ga x 3/4" x 7" (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	STEEL	CONCRETE
	5/8" φ lag screw w/ min. 3.5" embed (SGmin=0.43)	5/8" φ A307 bolts	3/4" φ thrd'd rod in Hilti HIT-HY 200 epoxy, min. 4" embed
LONG DIRECTION	8 @ 10.34 in o.c.	2 @ 68.38 in o.c.	17 @ 4.27 in o.c.
SHORT DIRECTION	6 @ 8.5 in o.c.	2 @ 38.5 in o.c.	13 @ 3.21 in o.c.