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

Structural Calculations
for
CBWC-118 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

P***A ALL MODELS

ProVent P/N	A	WEIGHT
CBWCLXS08	8"	64 Lbs
CBWCLXS11	11"	75 Lbs
CBWCLXS14	14"	87 Lbs
CBWCLXS24	24"	161 Lbs

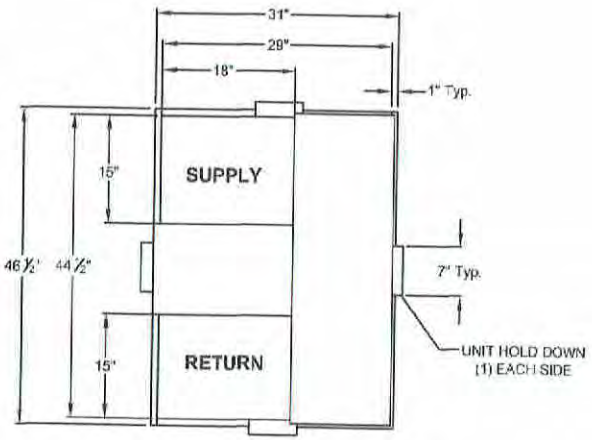
Meets seismic requirements for the following codes:
CBC 2016
IBC 2015

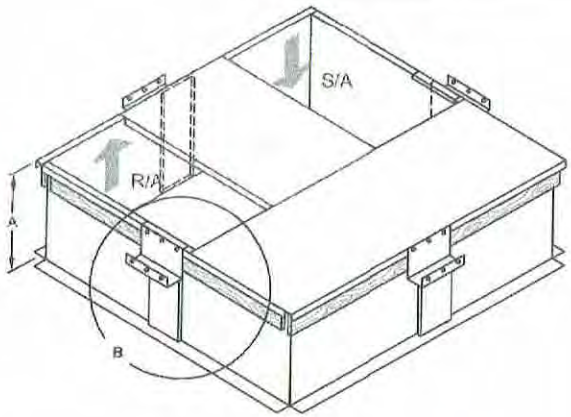
FEATURES

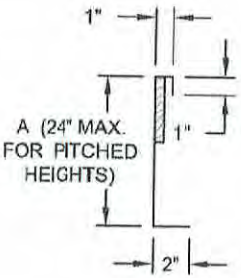
- Roof curb sides and ends are 16 ga. galvanized steel.
- Gasketing package provided.
- Heat treated wood nailer provided.
- Insulated deck pans provided.
- Pitched curbs and taller curbs are available.

NOTES

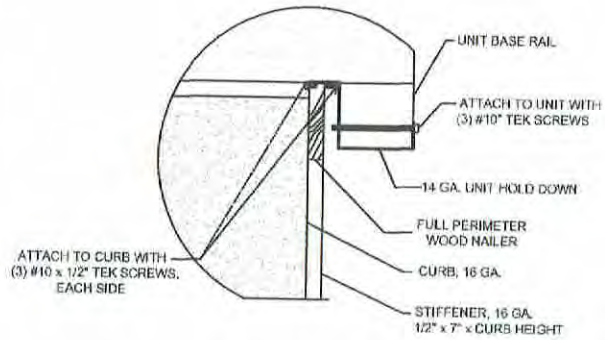
- Attach ductwork to roof curb. Flanges of duct rest on top of curb. Support ductwork below the curb.
- Thru the curbs utilities are available. Contact your York distributor or Provent directly.



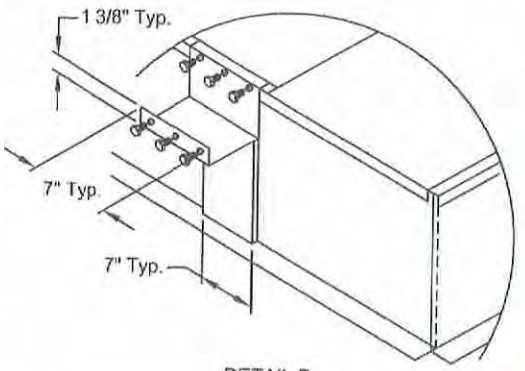




CURB DETAIL



HOLD DOWN DETAIL



DETAIL B

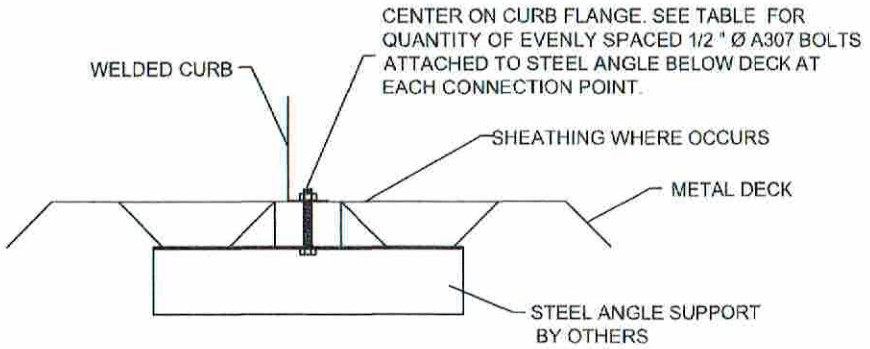
REGISTERED PROFESSIONAL ENGINEER
GLENN A. MOURITZEN
NO. 3578
EXP. 06/30/2021
STRUCTURAL
STATE OF CALIFORNIA
7/29/19

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-118		CBWCLXS SERIES
DATE: 07/31/18	REV: 5	DRAWN BY: ALL

STEEL ATTACHMENT



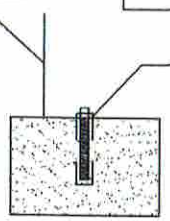
CURB	NO. OF ANCHORAGE BOLTS REQUIRED	
	LONG SIDE	SHORT SIDE
LXS	2 @ 34.5" O.C	XX @ 2 @ 19" O.C
LXL	2 @ 34.5" O.C.XX	2 @ 29" O.C
SUN3672	2 @ 60" O.C	2 @ 24.25" O.C
PRD3715	2 @ 68.38" O.C	2 @ 38.5" O.C
PRS	2 @ 58.38" O.C	2 @ 28.19" O.C.
PRL	2 @ 72" O.C	2 @ 41" O.C
SLU180	2 @ 102.25" O.C.	2 @ 71" O.C.
SLM1830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

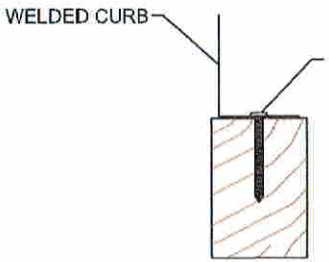
CONCRETE ATTACHMENT



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.

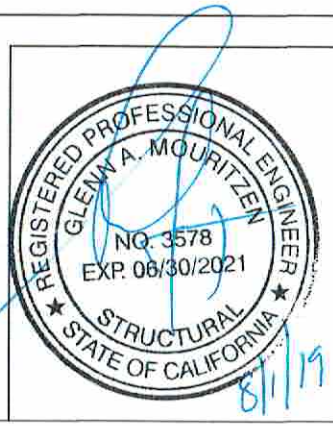
* SIX INCHES FROM EACH CORNER EVENLY SPACED.
** CENTERED.

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

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Page ___ of ___

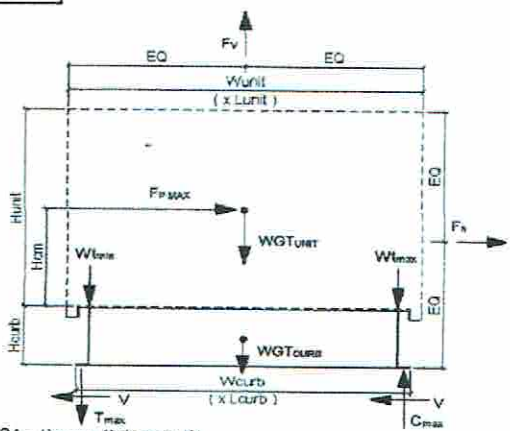
Client: ProVent PV1806
Description: CBWC-118 [CBWCLXS**]
Unit: ALL YORK P***A MODELS

Curb Information

Hcurb =	24	in	(Height of curb)
Lcurb =	46.5	in	(Length of curb)
wcurb =	31	in	(Width of curb)
WGTcurb =	161	lbs	(Weight of curb)
# Clips long side =	1	# Clips short side =	1

Unit Information

WGTunit =	367	lbs	(Weight of Unit)
Wtmax =	120	lbs	(Maximum corner weight)
Wtmin =	71	lbs	(Minimum corner weight)
Hunit =	49	in	(Height of unit above curb)
Hcm =	24.5	in	(Height to center of mass)
Lunit =	51.25	in	(Length of unit)
Wunit =	35.75	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	WGTunit	(1.6*Sds*Ip)*WGTunit
FpmaxASD =	976	lbs (unit only)	(0.7*Fpmax) FpmaxASD = 1404 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)
$F_{h\,ASD\,trans}$ =	963	lbs	= 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.5-2)
$F_{h\,ASD\,long}$ =	672	lbs	= 0.6*qz*GCr*Wunit*(Hunit+Hcurb)
$F_{vert\,ASD}$ =	372	lbs	= 0.6*qz*GCr*Lunit*Wunit (Eq. 29.5-3)

Curb Loading

Transverse:

$Compression_{SEISMIC}$ =	1075	lbs	$=[FpmaxASD*Hcm+2*(1+0.14S_{DS})*Wtmax*wcurb]/wcurb$
$Tension_{SEISMIC}$ =	953	lbs	$= Comp_{SEISMIC}-(0.6-0.14S_{DS})*WGTunit$
$Compression_{WIND}$ =	719	lbs	$=[F_{h\,transASD}*Hcm+2*0.6*Wtmax*wcurb-F_{vertASD}*wcurb/2]/wcurb$
$Tension_{WIND}$ =	871	lbs	$= Comp_{WIND}+Fvert-0.6*WGTunit$

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

Longitudinal:

$Compression_{SEISMIC}$ =	818	lbs	$=[FpmaxASD*Hcm+2*(1+0.14*S_{DS})*Wtmax*Lcurb]/Lcurb$
$Tension_{SEISMIC}$ =	696	lbs	$= Comp_{SEISMIC}-(0.6-0.14S_{DS})*WGTunit$
$Compression_{WIND}$ =	312	lbs	$=[F_{h\,transASD}*Hcm+2*0.6*Wtmax*Lcurb-F_{vertASD}*Lcurb/2]/Lcurb$
$Tension_{WIND}$ =	464	lbs	$= Comp_{WIND}+Fvert-0.6*WGTunit$

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

Governing Reactions:

Transverse: (on long edge)	$Comp_{MAX}$ =	1075	lbs	---> Along long edge of curb.
	$Tens_{MAX}$ =	953	lbs	---> Along long edge of curb.
Longitudinal: (on short edge)	$Comp_{MAX}$ =	818	lbs	---> Along short edge of curb.
	$Tens_{MAX}$ =	696	lbs	---> Along short edge of curb.

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

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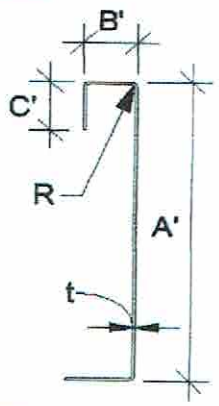
Curb Design

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' =	[3.000] in	a' =	23.943 in	= A'-t
C' =	[1.000] in (0 if no lips)	b =	2.717 in	= B'-[r+t/2+a(r+t/2)]
a =	[1.000] (0 - no Lip; 1 w/ lip)	b' =	2.943 in	= B'-(t/2+at/2)
R =	0.0849 (Inside bend radius)	c =	0.859 in	= a[C'-(r+t/2)]
t =	0.0566 in	c' =	0.972 in	= a(C'-t/2)
r' =	0.113 in = R+t/2	u =	0.178 in	= πr/2

x = 0.446 in (Distance between centroid and web centerline)
Ix = 125.486 in (Moment of Inertia about X-Axis)
Iy = 1.511 in (Moment of Inertia about Y-Axis)
A = 1.79 in²
rx = 8.38 in
ry = 0.919 in
rmin = 0.919 in

Axial Compression

Pu = 0.488 k (Max Axial Comp) Ωc = 1.80
Pn/Ωc = 33.817 k
Fe = 54.49 ksi
λc = 0.96
Fn = 34.06 ksi
Ly = 84 in Lateral unbraced length
k_yL_y/r_y = 73 (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 C = 4.00
N = 7.00 N/t = 123.67 ≤ 210 C_R = 0.14
Ω_w = 1.75 N/h = 0.291667 ≤ 2.0 C_N = 0.35
P_n = 1.366 k R/t = 1.50 ≤ 9.0 C_h = 0.02
P_n/Ω_w = 0.780 k

(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} = 1.075 k **web stiffener REQ'D** # clips = 1
Short side: Pu_{Long} = 0.818 k **web stiffener REQ'D** # clips = 1

***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

$$P_n = 0.7\left(P_{wc} + A_cF_y\right) \ge P_{wc}$$

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 = 244 lbs Max($F_{pmaxASD}$/4 -OR- $Fh_{ASDtrans}$/4 corner connections)
Vcrnmax = 476 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 = 0.1
# of Bolts required for Shear = 0.4 ***If combined fails:
# of Bolts Used = [1.0] USE --> 2.0
Check Combined Stress in Bolts & Inserts: 0.533 O.K. StressComb = 0.267 **O.K.**

Check 1/8" welded connection

<--- USE WELD Ω = 2.35
Assume L/t > 25: 25*t = 1.415 in
Lreq'd = 0.406 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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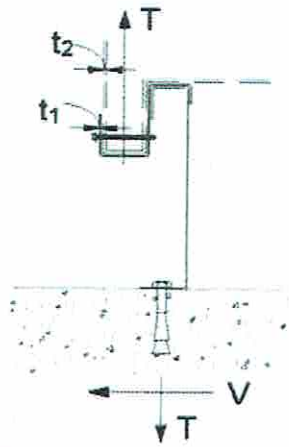
Connection Unit to Curb Clip | #10 SMS screw | Ω = 3.0

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: | For t2/t1 ≥ 2.5:

Shear: $P_{ns} = 4.2F_{u2}\sqrt{t_2^3 d}$ Pns = 1887 # (3.86 k) | Pns = 1887 # (1.89 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: $P_{not} = 0.85t_c dF_{u2}$; $t_c = \min(t_1, t_2)$; $P_{nov} = 1.5t_1 d_w F_{u1}$
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)

	Shear (k)	# clips	V_{clip} (k)	V_{allow} (lb)	# screws	spacing
Long side:	0.976	1	0.98	540 #	2	6.00 in
Short side:	0.976	1	0.98	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 in² | Anv = 0.352 in² | Ant = 0.034 in²
Rn/Ω = 5.954 k | $R_n = 0.6F_y A_{gv} + F_u A_{nt} \le 0.6F_u A_{nv} + F_u A_{nt}$ (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: | $Uplift_{MAX}$ = 2355 lbs | $Shear_{MAX}$ = 702 lbs

$Compression_{SEISMIC}$ = 2532 lbs = [FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*wcurb]/wcurb
$Tension_{SEISMIC}$ = 2355 lbs = $Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)
$Compression_{WIND}$ = 1479 lbs = [$F_{h\,transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*wcurb-$F_{vertASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ = 1535 lbs = [$F_{h\,transASD}$*(Hcm+Hcurb)-0.6*($WGT_{unit+curb}$/2)*wcurb+$F_{vertASD}$*wcurb/2]/wcurb

Longitudinal: | $Uplift_{MAX}$ = 1623 lbs | $Shear_{MAX}$ = 702 lbs

$Compression_{SEISMIC}$ = 1799 lbs = [FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*Lcurb]/Lcurb
$Tension_{SEISMIC}$ = 1623 lbs = $Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)
$Compression_{WIND}$ = 673 lbs = [$F_{h\,transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb
$Tension_{WIND}$ = 729 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 = 2.49 | COMBINED LOADING: 0.379 O.K.
# of Screws Req'd for Shear = 0.69 | Screw Spacing = 6.4 in o.c.
Total # of screws Required = 7

Use 5/8" ϕ wood lag screws @ 6.4 in o.c. along long side of curb w/ 3.5" Min. Embed

Longitudinal:
# of Screws Req'd for Uplift = 1.7 | COMBINED LOADING: 0.511 O.K.
# of Screws Req'd for Shear = 0.7 | Screw Spacing = 7.7 in o.c.
Total # of screws Required = 4

Use 5/8" ϕ wood lag screws @ 7.7 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**

Transverse: | $Tall_{bolt}$ = 6903 lbs | $Vall_{bolt}$ = 3682 lbs
6903 lbs | 3682 lbs
# of Bolts Req'd for Uplift = 0.34 | COMBINED LOADING: 0.072 O.K.
# of Bolts Req'd for Shear = 0.19 | Bolt Spacing = 34.5 in o.c.
Total # of Bolts Required = 2

Use 5/8" ϕ A307 Bolts attached to steel angle below deck @ 34.5 in o.c. along long side of curb

Longitudinal:
# of Bolts Req'd for Uplift = 0.24 | COMBINED LOADING: 0.048 O.K.
# of Bolts Req'd for Shear = 0.19 | Req'd Min Spacing = 19.0 in o.c.
Total # of Bolts Required = 2

Use 5/8" ϕ A307 Bolts attached to steel angle below deck @ 19 in o.c. along short side of curb

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For Concrete anchorage: SEISMIC (0.6-0.14SDS)D + 0.7Ω_oE (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 $\alpha = (1 + 0.2SDS)D + 2.5E = 1.87$

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

Transverse: $Uplift_{MAX}$ = 5651 lbs $Shear_{MAX}$ = 1756 lbs

$Compression_{SEISMIC}$ = 5828 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*(WGT$_{unit+curb}$/2)*wcurb]/wcurb

$Tension_{SEISMIC}$ = 5651 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)

$Shear_{SEISMIC}$ = 1756 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 6.14 spacing = 3.75 in o.c. Tapplied = 565.1 lbs

Min Bolts Req'd Shear = 2.00 spacing = 22.5 in o.c. Vapplied = 175.6 lbs

Try using 10 bolts spaced at 3.83 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{applied}}{V_{allow,ASD}} \leq 1.2$ = 0.78

Use 10 - 3/4" φ Hilti Hit-HY 200 adhesive anchors @ 3.8 in o.c. max. along long side of curb w/ 4" embed

Longitudinal: $Uplift_{MAX}$ = 3820 lbs $Shear_{MAX}$ = 1756 lbs

$Compression_{SEISMIC}$ = 3996 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*(WGT$_{unit+curb}$/2)*Lcurb]/Lcurb

$Tension_{SEISMIC}$ = 3820 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)

$Shear_{SEISMIC}$ = 1756 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 4.15 spacing = 1.75 in o.c. Tapplied = 424.5 lbs

Min Bolts Req'd Shear = 2.00 spacing = 7 in o.c. Vapplied = 195.1 lbs

Try using 9 bolts spaced at 2.38 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{applied}}{V_{allow,ASD}} \leq 1.2$ = 0.64

Use 9 - 3/4" φ Hilti Hit-HY 200 adhesive anchors @ 2.4 in o.c. max. along short side of curb w/ 4" embed

CURB DESIGN SUMMARY: CBWC-118

CURB RAIL THICKNESS: 0.0566 in 16 Gauge

UNIT CLIP THICKNESS: 0.0566 in 16 Gauge

 # OF CLIPS (LONG SIDE) - 1 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) - 1 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
	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	7 @ 6.42 in o.c.	2 @ 34.5 in o.c.	10 @ 3.83 in o.c.
SHORT DIRECTION	4 @ 7.67 in o.c.	2 @ 19 in o.c.	9 @ 2.38 in o.c.