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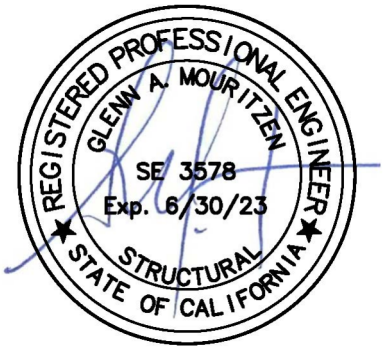
6593 Riverdale St.
San Diego, CA 92120
619-727-4800

Structural Calculations

for

CBWC-300 Series

CBWCPRS



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 Nos. CB-60.

STRUCTURALLY CALCULATED WELDED ROOF CURBS FOR YORK UNITS

ZX 04-07, XX A7,
ZXA7, ZY, ZQ, XY, XQ, ZL 04-06

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

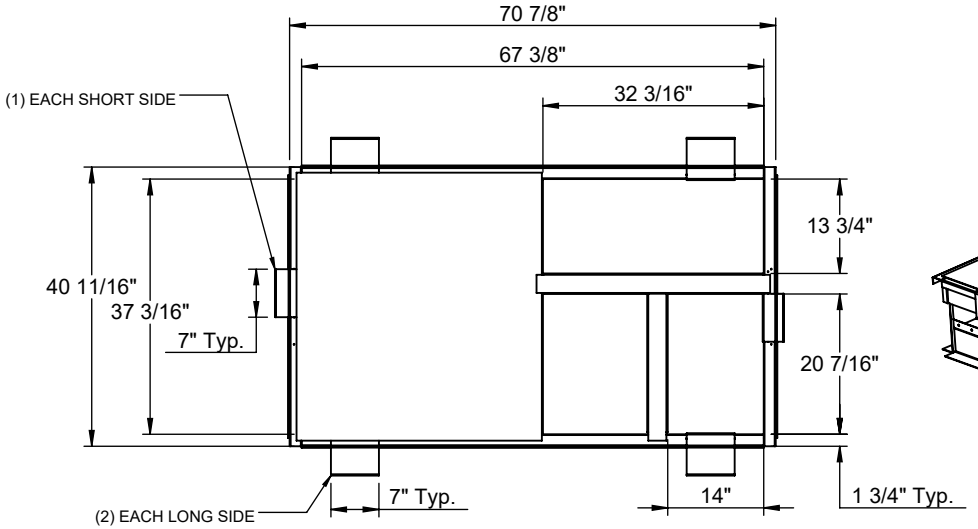
Meets seismic requirements for the following codes:
CBC 2019
IBC 2018

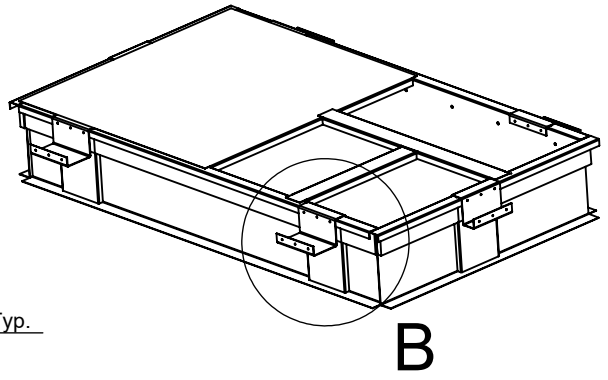
FEATURES

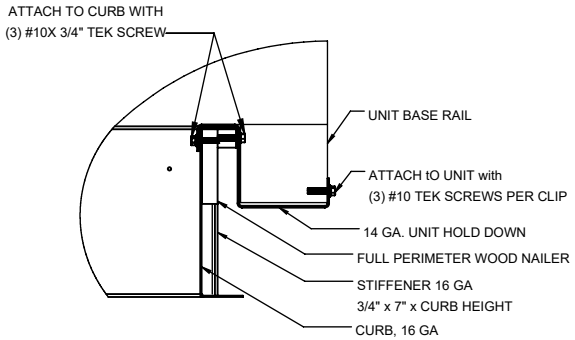
- Roof curb sides and ends are 16 Ga. galvanized steel.
- Gasketing package provided.
- Heat treated wood nailer provided.
- Pitched curbs and taller curbs are available.

Notes

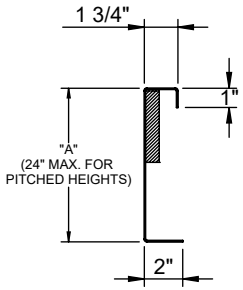
Attached ductwork to roof curb. Flanges of duct rest on top of curb. Support ductwork below the curb.



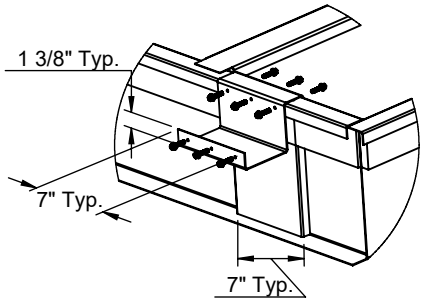




HOLD DOWN DETAIL



CURB DETAIL



DETAIL B

ProVent

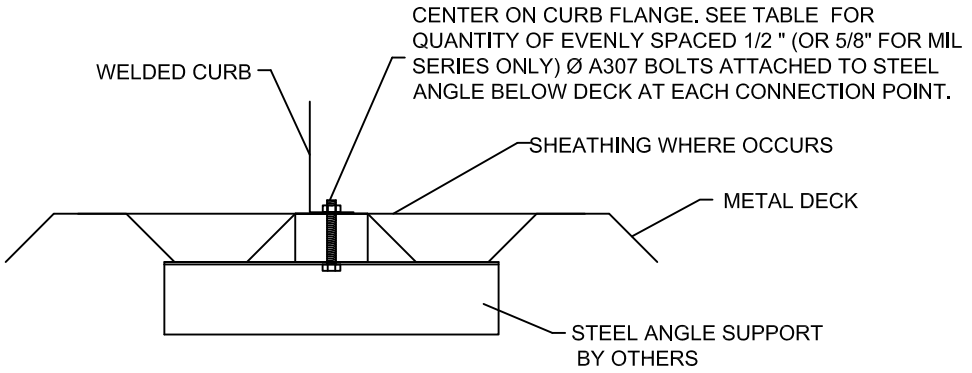
3847 WABASH DRIVE
MIRA LOMA, CA 91725

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:
10/7/2021	9	ALL

STEEL ATTACHMENT



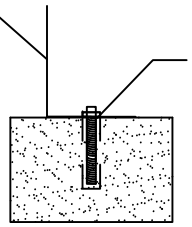
	NO. OF ANCHORAGE BOLTS REQUIRED	
CURB	LONG SIDE	SHORT SIDE
LXS	2 @ 34.5" O.C.	2 @ 19" O.C.
LXL	2 @ 34.5" O.C.	2 @ 29" O.C.
SUN3672	2 @ 60.5" O.C.	2 @ 39" O.C.
PRD3715	2 @ 68.88" O.C.	2 @ 39" O.C.
PRS	2 @ 58.88" O.C.	2 @ 28.69" O.C.
PRL	2 @ 72" O.C.	2 @ 41.5" O.C.
SLU180	3 @ 51.38" O.C.	2 @ 71.5" O.C.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

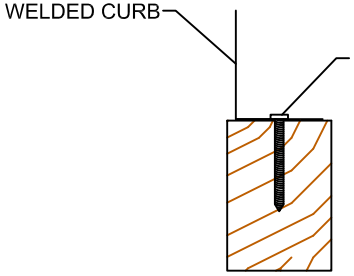
CONCRETE ATTACHMENT



	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.

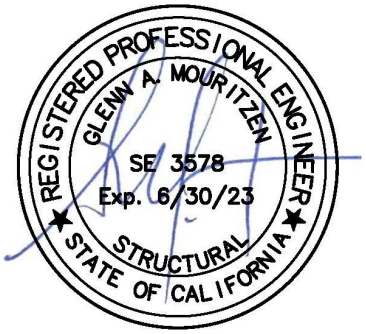
*** SIX INCHES FROM EACH CORNER EVENLY SPACED.**
**** CENTERED.**

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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FORM NO: CB-60

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

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

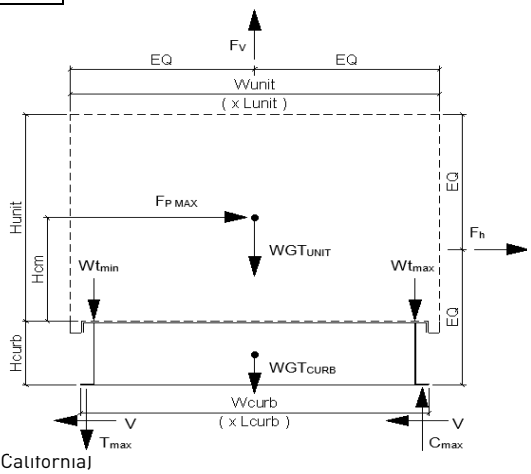
Client:	ProVent PV2101 Previous: PV1806
Description:	CBWC-300 CBWCPRS
Unit:	ZX 04-07; XX A7; ZX A7; ZY, ZQ, XY, XQ, ZL 04-06

Curb Information

Hcurb =	24	in	(Height of curb)
Lcurb =	70.875	in	(Length of curb)
wcurb =	40.6875	in	(Width of curb)
WGTcurb =	186	lbs	(Weight of curb)
# Clips long side =	2		# Clips short side = 1

Unit Information

WGTunit =	711	lbs	(Weight of Unit)
Wtmax =	181	lbs	(Maximum corner weight)
Wtmin =	142	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 - 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 =	851	lbs	(0.7*Fpmax) FpmaxASD = 1074 lbs
	(unit only)		(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)
$F_{h\ ASD\ trans}$ =	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:

$Compression_{SEISMIC}$ =	902	lbs	$=[FpmaxASD*Hcm+2*(1+0.14S_{DS})*Wtmax*wcurb]/wcurb$
$Tension_{SEISMIC}$ =	702	lbs	$= Comp_{SEISMIC}-(0.6-0.14S_{DS})*WGTunit$
$Compression_{WIND}$ =	463	lbs	$=[F_{h\ transASD}*Hcm+2*0.6*Wtmax*wcurb-F_{vertASD}*wcurb/2]/wcurb$
$Tension_{WIND}$ =	772	lbs	$= Comp_{WIND}+Fvert-0.6*WGTunit$

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

Longitudinal:

$Compression_{SEISMIC}$ =	721	lbs	$=[FpmaxASD*Hcm+2*(1+0.14*S_{DS}]*Wtmax*Lcurb]/Lcurb$
$Tension_{SEISMIC}$ =	521	lbs	$= Comp_{SEISMIC}-(0.6-0.14S_{DS})*WGTunit$
$Compression_{WIND}$ =	82	lbs	$=[F_{h\ transASD}*Hcm+2*0.6*Wtmax*Lcurb-F_{vertASD}*Lcurb/2]/Lcurb$
$Tension_{WIND}$ =	391	lbs	$= Comp_{WIND}+Fvert-0.6*WGTunit$

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

Governing Reactions:

Transverse:	$Comp_{MAX}$ =	902	lbs	---> Along long edge of curb.
(on long edge)	$Tens_{MAX}$ =	772	lbs	---> Along long edge of curb.
Longitudinal:	$Comp_{MAX}$ =	721	lbs	---> Along short edge of curb.
(on short edge)	$Tens_{MAX}$ =	521	lbs	---> Along short edge of curb.

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

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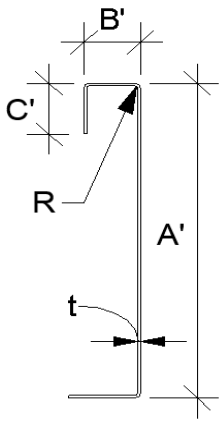
Curb Design

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 in	(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 = 0.615 k (Max Axial Comp) Ωc = 1.80
Pn/Ωc = 7.886 k
Fe = 10.48 ksi
λc = 2.18
Fn = 9.19 ksi
Ly = 70 in Lateral unbraced length
k_yL_y/r_y = 167 (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} = 0.451 k **O.K.** # clips = 2
Short side: Pu_{Long} = 0.721 k **O.K.** # 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 > 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 = 308 lbs Max($F_{pmaxASD}$/4 -OR- $Fh_{ASDtrans}$/4 corner connections)
Vcrnmax = 386 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: 0.476 O.K. StressComb = 0.238 **O.K.**

Check 1/8" welded connection

<--- USE WELD Ω = 2.35
Assume L/t > 25: 25*t = 1.415 in
Lreq'd = 0.329 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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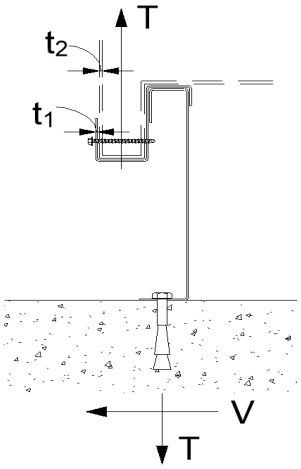
Connection Unit to Curb Clip | #10 SMS screw | Ω = 3.0

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
$P_{ns} = 2.7t_1 dF_{u1}$ = 1.89 k | $P_{ns} = 2.7t_2 dF_{u2}$ = 3.39 k | $P_{ns} = 2.7t_2 dF_{u2}$ = 3.39 k
$P_{ns} = 2.7t_2 dF_{u2}$ = 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:	1.231	2	0.62	540 #	2	6.00 in
Short side:	0.851	1	0.85	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: $Uplift_{MAX}$ = 1508 lbs | $Shear_{MAX}$ = 615 lbs

$Compression_{SEISMIC}$ = 1760 lbs =[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*wcurb]/wcurb
$Tension_{SEISMIC}$ = 1508 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)
$Compression_{WIND}$ = 1241 lbs =[$F_{h\ transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*wcurb-$F_{vertASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ = 1438 lbs =[$F_{h\ transASD}$*(Hcm+Hcurb)-0.6*($WGT_{unit+curb}$/2)*wcurb+$F_{vertASD}$*wcurb/2]/wcurb

Longitudinal: $Uplift_{MAX}$ = 1011 lbs | $Shear_{MAX}$ = 537 lbs

$Compression_{SEISMIC}$ = 1262 lbs =[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*Lcurb]/Lcurb
$Tension_{SEISMIC}$ = 1011 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)
$Compression_{WIND}$ = 409 lbs =[$F_{h\ transASD}$*(Hcm+Hcurb)+0.6*($WGT_{unit+curb}$/2)*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb
$Tension_{WIND}$ = 606 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 emb** (SGmin = 0.43)

$Tall_{metal}$ = 997 lbs | $Vall_{metal}$ = 1097 lbs
Transverse: $Tall_{wood}$ = 616 lbs | $Vall_{wood}$ = 400 lbs

# of Screws Req'd for Uplift = 2.45 | COMBINED LOADING: 0.645 O.K.
# of Screws Req'd for Shear = 1.54 | 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

Longitudinal:
# of Screws Req'd for Uplift = 1.6 | COMBINED LOADING: 0.627 O.K.
# of Screws Req'd for Shear = 1.3 | 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

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 = 0.91 | COMBINED LOADING: 0.101 O.K.
# of Bolts Req'd for Shear = 0.35 | 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 = 0.61 | COMBINED LOADING: 0.182 O.K.
# of Bolts Req'd for Shear = 0.31 | 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 (0.6-0.14SDS)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 $\propto = (1 + 0.2SDS)D + 2.5E$ =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: $Uplift_{MAX}$ = 3261 lbs $Shear_{MAX}$ = 1342 lbs

$Compression_{SEISMIC}$ = 3513 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*wcurb]/wcurb

$Tension_{SEISMIC}$ = 3261 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)

$Shear_{SEISMIC}$ = 1342 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 3.54 spacing = 15.63 in o.c. Tapplied = 652.2 lbs

Min Bolts Req'd Shear = 2.00 spacing = 46.875 in o.c. Vapplied = 268.4 lbs

Try using 5 bolts
spaced at 14.72 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \leq 1.2$ = 0.96

Use 5 - 3/4" φ Hilti Hit-HY 200 adhesive anchors @ 14.7 in o.c. max. along long side of curb w/ 4" embed

Longitudinal: $Uplift_{MAX}$ = 2017 lbs $Shear_{MAX}$ = 1342 lbs

$Compression_{SEISMIC}$ = 2269 lbs =[2.5*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*($WGT_{unit+curb}$/2)*Lcurb]/Lcurb

$Tension_{SEISMIC}$ = 2017 lbs =$Comp_{SEISMIC}$-(0.6-0.14S_{DS})*(WGTunit+curb)

$Shear_{SEISMIC}$ = 1342 lbs =2.5*FpmaxASD/2

Min Bolts Req'd Uplift = 2.19 spacing = 8.34375 in o.c. Tapplied = 504.2 lbs

Min Bolts Req'd Shear = 2.00 spacing = 16.6875 in o.c. Vapplied = 335.5 lbs

Try using 4 bolts
spaced at 9.56 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \leq 1.2$ = 0.86

Use 4 - 3/4" φ Hilti Hit-HY 200 adhesive anchors @ 9.6 in o.c. max. along short side of curb w/ 4" embed

CURB DESIGN SUMMARY: CBWC-300

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) - 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 1/4" φ Simpson SDS screw w/ 2.25" threaded embed (SGmin=0.43)	STEEL 1/2" φ A307 bolts	CONCRETE 3/4" φ thrd'd rod in Hilti HIT-HY 200 epoxy, min. 4" embed
LONG DIRECTION	4 @ 20.96 in o.c.	2 @ 58.88 in o.c.	5 @ 14.72 in o.c.
SHORT DIRECTION	3 @ 16.34 in o.c.	2 @ 28.69 in o.c.	4 @ 9.56 in o.c.