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

Structural Calculations

for

CBKD-165 Series

CBKDSAV1518** SERIES

Prepared for:

PROVENT / RRS

3847 Wabash Drive
Mira Loma, CA 91725

Date: September 26, 2023

Project Number: PV2312

HOLD DOWN CLIPS FOR SUNCHOICE UNITS

AV15-18, AD15-18; AH15, AL15, HV13

ProVent P/N	A	Est. Weight	SEISMIC CLIP P/N:	Est. Weight
CBKDSAV151808	8"	195 Lbs.	KDKITSAV1518	20 Lbs.
CBKDSAV151811	11"	225 Lbs.		
CBKDSAV151814	14"	265 Lbs.		
CBKDSAV151818	18"	462 Lbs.		

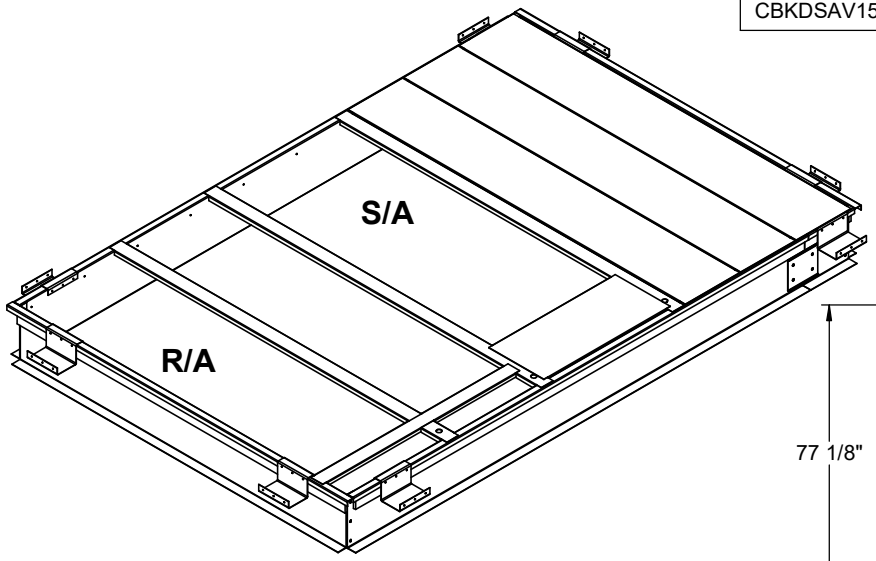
Meets seismic requirements for the following codes:
CBC 2022
IBC 2021

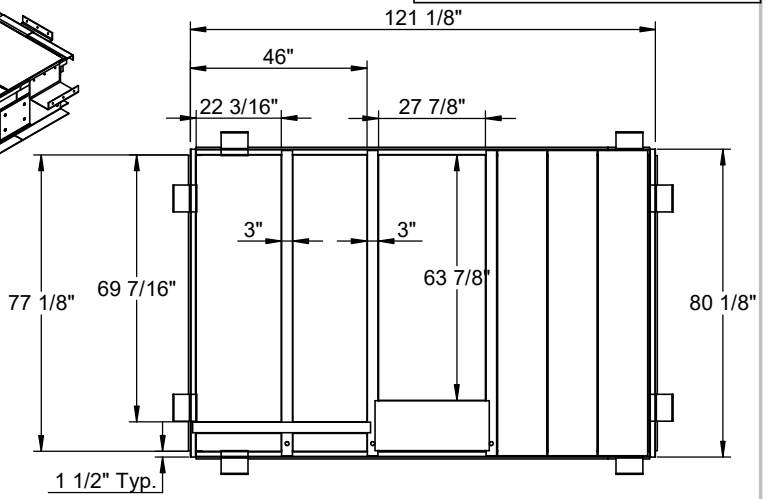
FEATURES

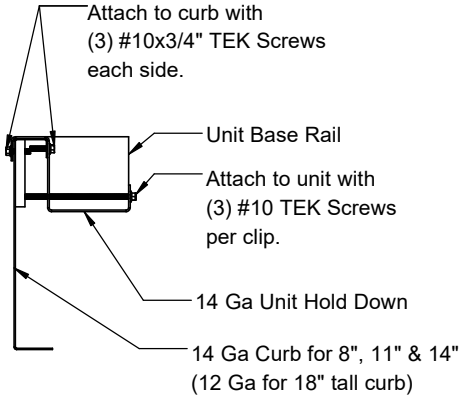
- Roof curb perimeter made of galvanized steel.
- Gasketing package provided.
- Heat treated wood nailer provided.
- Corner flanges are pre-threated for easy bolt on assembly.
- Pitched, adjustable height, welded, different height, isolation and calculated curbs are available.

NOTES

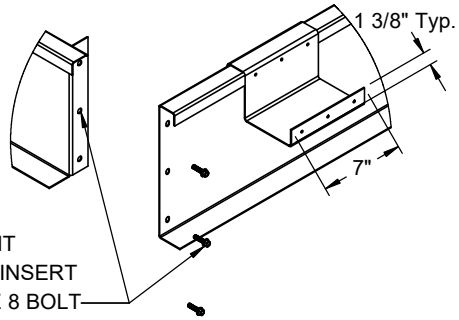
Attach ductwork to roof curb.
Flanges of duct rest on top of curb.
Support ductwork below the curb.







HOLD DOWN DETAIL



CORNER & HOLD DOWN DETAIL

ProVent

3847 WABASH DR.
MIRA LOMA, CA 91752

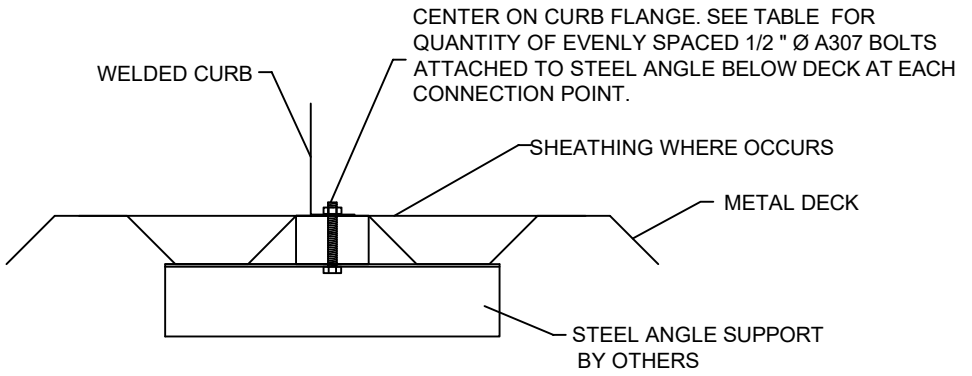
PHONE (951) 685-1101
FAX (619) 872-9799

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

FORM NO:	PART NUMBER:
CBKD-165	CBKD-165

DATE:	REV:	DRAWN BY:
8/25/2023	3	FMM

STEEL ATTACHMENT



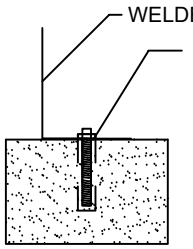
	NO. OF ANCHORAGE BOLTS REQUIRED	
CURB	LONG SIDE	SHORT SIDE
LXS	2 @ 34.5" O.C.	2 @ 19" O.C.
LXL	2 @ 34.5" O.C.	2 @ 29" O.C.
SUN3672	2 @ 60.5" O.C.	2 @ 24.75" O.C.
PRD3715	2 @ 68.88" O.C.	2 @ 39" O.C.
PRS	2 @ 58.88" O.C.	2 @ 28.69" O.C.
PRL	2 @ 72" O.C.	2 @ 41.5" O.C.
SAV1518	3 @ 54.56" O.C	2 @ 68.13" 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

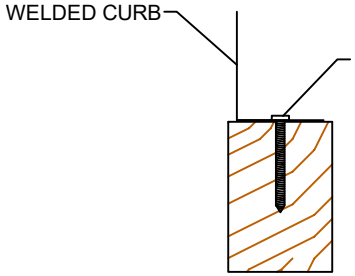
CONCRETE ATTACHMENT



	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



	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.

FOUR INCHES FROM EACH CORNER EVENLY SPACED

ProVent

3847 WABASH DRIVE
MIRA LOMA, CA 91725

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FAX (619) 872-9799

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

FORM NO: CB-60

DATE:	REV:	DRAWN BY:
8/28/2023	10	FMM

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San Diego, CA 92120
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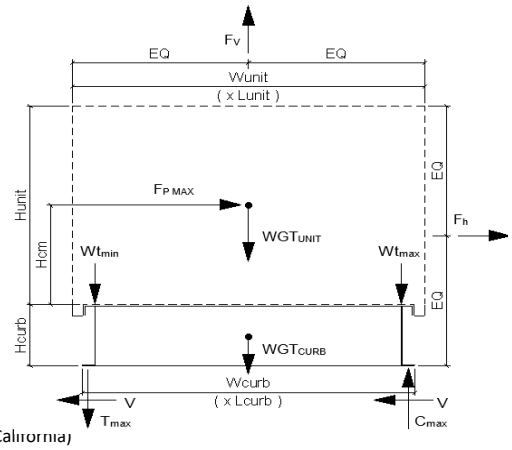
Client:	ProVent PV2312
Description:	CBPKD-165 SAV1518
Unit:	AV 15-18; AD 15-18; AH/AL 15; HV 13

Curb Information

Hcurb =	18	in	(Height of curb)
Lcurb =	121.125	in	(Length of curb)
wcurb =	80.125	in	(Width of curb)
WGTcurb =	545	lbs	(Weight of curb)
# Clips long side =	2		# Clips short side = 2

Unit Information

WGTunit =	2385	lbs	(Oper. Weight of Unit)
Wtmax =	716	lbs	(Maximum corner weight)
Wtmin =	507	lbs	(Minimum corner weight)
Hunit =	49.25	in	(Height of unit above curb)
Hcm =	24.625	in	(Height to center of mass)
Lunit =	129.75	in	(Length of unit)
Wunit =	88.75	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 =	2855	lbs	(0.7*Fpmax) FpmaxASD = 3507 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)
$F_{h\ ASD\ trans}$ =	2246	lbs	= 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.4-2)
$F_{h\ ASD\ long}$ =	1537	lbs	= 0.6*qz*GCr*Wunit*(Hunit+Hcurb)
$F_{vert\ ASD}$ =	2340	lbs	= 0.6*qz*GCr*Lunit*Wunit (Eq. 29.4-3)

Curb Loading

Transverse:

$Compression_{SEISMIC}$ =	2765	lbs	=[FpmaxASD*Hcm+2*(1+0.14S_{DS})*Wtmax*wcurb]/wcurb
$Tension_{SEISMIC}$ =	593	lbs	=[FpmaxASD*Hcm-2*(0.6-0.14S_{DS})*Wtmin*wcurb]/wcurb
$Compression_{WIND}$ =	379	lbs	=[$F_{h\ ASD\ trans}$*Hcm+2*0.6*Wtmax*wcurb-$F_{vert\ ASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ =	1252	lbs	=[$F_{h\ ASD\ trans}$*Hcm-2*0.6*Wtmin*wcurb+$F_{vertASD}$*wcurb/2]/wcurb

---> Negative values indicate opposite load.

Longitudinal:

$Compression_{SEISMIC}$ =	2468	lbs	=[FpmaxASD*Hcm+2*(1+0.14*S_{DS})*Wtmax*Lcurb]/Lcurb
$Tension_{SEISMIC}$ =	296	lbs	=[FpmaxASD*Hcm-2*(0.6-0.14S_{DS})*Wtmin*Lcurb]/Lcurb
$Compression_{WIND}$ =	1	lbs	=[$F_{h\ ASD\ long}$*Hcm+2*0.6*Wtmax*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb
$Tension_{WIND}$ =	874	lbs	=[$F_{h\ ASD\ long}$*Hcm-2*0.6*Wtmin*Lcurb+$F_{vertASD}$*Lcurb/2]/Lcurb

---> Negative values indicate opposite load.

Governing Reactions:

Transverse:	$Comp_{MAX}$ =	2765	lbs	---> Along long edge of curb.
(on long edge)	$Tens_{MAX}$ =	1252	lbs	---> Along long edge of curb.
Longitudinal:	$Comp_{MAX}$ =	2468	lbs	---> Along short edge of curb.
(on short edge)	$Tens_{MAX}$ =	874	lbs	---> Along short edge of curb.

---> Negative values indicate opposite load.

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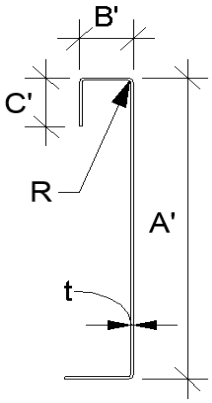
Curb Design

Fy =	50	ksi	Fu =	65	ksi
E =	29500	ksi	t =	0.1017	12 Gauge



Calculate Section Properties of Curb

A'=	18.000	in	a =	17.492 in	= A'-(2r+t)
B'=	1.500	in	a'=	17.898 in	= A'-t
C'=	0.000	in (0 if no lips)	b =	1.246 in	= B'-[r+t/2+α(r+t/2)]
α =	0.000	(0 - no Lip; 1 w/ lip)	b'=	1.449 in	= B'-(t/2+αt/2)
R =	0.1525	(Inside bend radius)	c =	0.000 in	= α[C'-(r+t/2)]
t =	0.1017	in	c'=	0.000 in	= α(C'-t/2)
r'=	0.203	in = R+t/2	u =	0.319 in	= πr/2
x =	0.102	in (Distance between centroid and web centerline)			
Ix =	70.803	in^4	rx =	5.81 in	
Iy =	0.185	in^4	ry =	0.297 in	
A =	2.10	in^2	rmin =	0.297 in	

Axial Compression

Pu =	1.427	k	(Max Axial Comp)	Ωc = 1.80
Pn/Ωc =	6.875	k		
Fe =	6.73	ksi	$\frac{P_n}{\Omega_c}=\frac{F_n A}{\Omega_c}$	$If\ \lambda_c \le 1.5;\ F_n=\left(0.658^{\lambda_c{}^2}\right)F_y$
λc =	2.73			$If\ \lambda_c > 1.5;\ F_n=\frac{0.877}{\lambda_c{}^2}F_y$
Fn =	5.90	ksi		$\lambda_c=\sqrt{\frac{F_y}{F_e}}$ $\quad F_e=\frac{\pi^2 E}{\left(kl/r\right)^2}$
Ly =	77.125	in	Lateral unbraced length	
k_yL_y/r_y =	208		(assume k=0.8)	

Compression Check = O.K.

Check Web Crippling

h =	18	in	-- Check limits:		C = 4.00
t =	0.1017	in	h/t =	176.99 ≤ 260	C_R = 0.14
N =	7.00		N/t =	68.83 ≤ 210	C_N = 0.35
Ω_w =	1.75		N/h =	0.388889 ≤ 2.0	C_h = 0.02
P_n =	4.390	k	R/t =	1.50 ≤ 9.0	
P_n/Ω_w =	2.509	k			
Long side: Pu_{Trans} =	1.383	k	**O.K.**	# clips = 2	
Short side: Pu_{Long} =	1.234	k	**O.K.**	# clips = 2	

(See table C3.4.1-2, fastened to support, one flange, end loading)

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

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 =	4.390	k	Ae =	0.324	in^2
Pn =	14.398	k	Pn/Ω =	8.470	k

Not Req'd

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

Tcrnmax = 877 lbs Max($F_{pmaxASD}$/4 -OR- $Fh_{ASDtrans}$/4 corner connections)

Vcrnmax = 1383 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 = 0.4

# of Bolts required for Shear = 1.1

# of Bolts Used = 3.0

Check Combined Stress in Bolts & Inserts: 0.499 **O.K.**

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

Assume L/t > 25: 25*t = 2.543 in

Lreq'd = 0.655 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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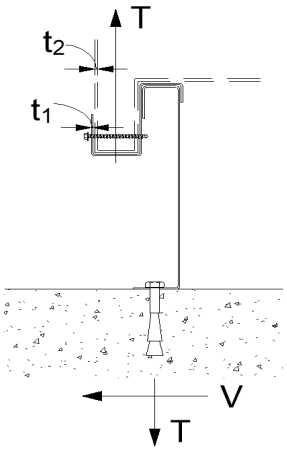
Connection Unit to Curb Clip | #10 SMS screw | Ω = 3.0

t1 = 0.1017 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 = 1.0



For t2/t1 ≤ 1.0:

Shear: $P_{ns} = 4.2F_{u2}\sqrt{t_2^3 d}$ → Pns = 3391 # = 3.86 k

$P_{ns} = 2.7t_1 dF_{u1}$ = 3.39 k

$P_{ns} = 2.7t_2 dF_{u2}$ = 3.39 k

Pns/Ω = 1130 #
Pss/Ω = 540 # <- Controls

For t2/t1 ≥ 2.5:

Pns = 3391 # = 3.39 k

$P_{ns} = 2.7t_1 dF_{u1}$ = 3.39 k

$P_{ns} = 2.7t_2 dF_{u2}$ = 3.39 k

Tension: Pnot = 1.068 k (screw pull-out strength)
Pnov = 3.718 k (screw pull-over strength)
Pts/Ω = 356 # <- Controls
Pts/Ω = 820 # (full tensile screw capacity)

$P_{not} = 0.85t_c dF_{u2})$
$t_c = \min(t_1, t_2)$
$P_{nov} = 1.5t_1 d_w F_{u1}$

	Shear (k)	# clips	V_{clip} (k)	V_{allow}(lb)	# screws	spacing
Long side:	2.855	2	1.43	540 #	3	3.00 in
Short side:	2.855	2	1.43	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 = 0.1017 AISI BSR applies
Fy = 50 ksi | Ω = 2.22 bolt/screw connection
Agv = 0.661 in² | Anv = 0.613 in² | Ant = 0.060 in²
Rn/Ω = 10.697 k

$R_n = 0.6F_y A_{gv} + F_u A_{nt} \leq 0.6F_u A_{nv} + F_u A_{nt}$

BSR O.K. (AISI Sect. E5.3)

Connection of Curb to Supporting Structure

Roof Loading SEISMIC: $(0.6\text{-}0.14S_{DS})D + 0.7E$ WIND: 0.6D + W

Transverse:	$Uplift_{MAX}$ =	1486 lbs		$Shear_{MAX}$ =	1754 lbs
$Compression_{SEISMIC}$ =	3798 lbs	=[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb			
$Tension_{SEISMIC}$ =	1454 lbs	=[FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb			
$Compression_{WIND}$ =	904 lbs	=[$F_{h\ ASD\ trans}$*(Hcm+Hcurb)+0.6*$WGT_{unit+curb}$*wcurb/2-$F_{vert\ ASD}$*wcurb/2]/wcurb			
$Tension_{WIND}$ =	1486 lbs	=[$F_{h\ ASD\ trans}$*(Hcm+Hcurb)-0.6*$WGT_{unit+curb}$*wcurb/2+$F_{vertASD}$*wcurb/2]/wcurb			
Longitudinal:	$Uplift_{MAX}$ =	832 lbs		$Shear_{MAX}$ =	1754 lbs
$Compression_{SEISMIC}$ =	3167 lbs	=[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb			
$Tension_{SEISMIC}$ =	823 lbs	=[FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb			
$Compression_{WIND}$ =	250 lbs	=[$F_{h\ ASD\ long}$*(Hcm+Hcurb)+0.6*$WGT_{unit+curb}$*Lcurb/2-$F_{vert\ ASD}$*Lcurb/2]/Lcurb			
$Tension_{WIND}$ =	832 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)

$Tall_{metal}$ = 997 lbs | $Vall_{metal}$ = 1097 lbs
Transverse: $Tall_{wood}$ = 616 lbs | $Vall_{wood}$ = 672 lbs

# of Screws Req'd for Uplift = 2.41 | COMBINED LOADING: 0.837 O.K.
# of Screws Req'd for Shear = 2.61 | Screw Spacing = 22.6 in o.c.
Total # of screws Required = 6

1/4"ϕ x 3.5" Simpson SDS screws @ 22.6 in o.c. along long side of curb w/ 2.25" threaded embed

Longitudinal:

# of Screws Req'd for Uplift = 1.4 | COMBINED LOADING: 0.990 O.K.
# of Screws Req'd for Shear = 2.6 | Screw Spacing = 24.0 in o.c.
Total # of screws Required = 4

1/4"ϕ x 3.5" Simpson SDS screws @ 24 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**

$Tall_{bolt}$ = 3927 lbs | $Vall_{bolt}$ = 2209 lbs
Transverse: $Tall_{metal}$ = 2086 lbs | $Vall_{metal}$ = 2192 lbs

# of Bolts Req'd for Uplift = 0.71 | COMBINED LOADING: 0.202 O.K.
# of Bolts Req'd for Shear = 0.80 | Bolt Spacing = 54.6 in o.c.
Total # of Bolts Required = 3

1/2" ϕ A307 Bolts to steel angle below deck @ 54.6 in o.c. along long side of curb

Longitudinal:

# of Bolts Req'd for Uplift = 0.40 | COMBINED LOADING: 0.285 O.K.
# of Bolts Req'd for Shear = 0.80 | Req'd Min Spacing = 68.1 in o.c.
Total # of Bolts Required = 2

1/2" ϕ A307 Bolts to steel angle below deck @ 68.1 in o.c. along short side of curb

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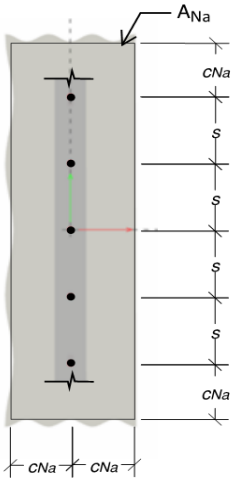
For Concrete anchorage: SEISMIC $(0.6\text{-}0.14S_{DS})D + 0.7\Omega_o E$ Ωo = 2.0

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

$$N_{ag} = \frac{A_{Na}}{A_{Nao}}\varphi_{ec,Na}\varphi_{ed,Na}\varphi_{cp,Na}N_{ba} \quad \text{(ACI318-14, 17.4.5.1b)}$$

$$\varphi_{ec,Na}\varphi_{ed,Na}\varphi_{cp,Na} = 1.0$$

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

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:	$Uplift_{MAX}$ =	3320 lbs	$Shear_{MAX}$ =	3507 lbs

$Compression_{SEISMIC}$ = 5664 lbs =[Ωo*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb

$Tension_{SEISMIC}$ = 3320 lbs =[Ωo*FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb

$Shear_{SEISMIC}$ = 3507 lbs =Ωo*FpmaxASD/2

Min Bolts Req'd Uplift =	2.35	spacing =	54.56	in o.c.	Tapplied =	1106.7	lbs
Min Bolts Req'd Shear =	2.00	spacing =	109.13	in o.c.	Vapplied =	701.4	lbs

Try using	3	bolts
spaced at	54.56	in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \le 1.2$ = 1.18 O.K.

Use 3 - 1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy @ 54.6 in o.c. max. along long side of curb w/ 2.75in embed

Longitudinal:	$Uplift_{MAX}$ =	2057 lbs	$Shear_{MAX}$ =	3507 lbs

$Compression_{SEISMIC}$ = 4401 lbs =[Ωo*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb

$Tension_{SEISMIC}$ = 2057 lbs =[Ωo*FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb

$Shear_{SEISMIC}$ = 3507 lbs =Ωo*FpmaxASD/2

Min Bolts Req'd Uplift =	1.46	spacing =	34.06	in o.c.	Tapplied =	1028.5	lbs
Min Bolts Req'd Shear =	2.00	spacing =	68.13	in o.c.	Vapplied =	701.4	lbs

Try using	2	bolts
spaced at	68.13	in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \le 1.2$ = 1.12 O.K.

Use 2 - 1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy @ 68.1 in o.c. max. along short side of curb w/ 2.75in embed

CURB DESIGN SUMMARY:	CBPKD-165 SAV1518	**Unit:**	AV 15-18; AD 15-18; AH/AL 15; HV 13
CURB RAIL THICKNESS:	0.1017 in 12 Gauge		
UNIT CLIP THICKNESS:	0.1017 in 12 Gauge		
# OF CLIPS (LONG SIDE) -	2 clips with 3 - #10 SMS screws each clip		
WEB STIFFENER:	16Ga x 3/4" x 6" (C-channel) stiffener at each clip		
# OF CLIPS (SHORT SIDE) -	2 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	STEEL	CONCRETE
	1/4"ϕ x 3.5" Simpson SDS screws w/ 2.25" threaded embed	1/2" ϕ A307 Bolts to steel angle below deck	1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy w/ 2.75in embed
LONG DIRECTION	6 @ 22.63 in o.c.	3 @ 54.56 in o.c.	3 @ 54.56 in o.c.
SHORT DIRECTION	4 @ 24.04 in o.c.	2 @ 68.13 in o.c.	2 @ 68.13 in o.c.