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

Structural Calculations

for

CBKD-167 Series

CBKDSAV28** 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

AV28, AD28, AE18-23, AW18-23, AH25, AL25, HV25

ProVent P/N	A	Est. Weight	SEISMIC CLIP P/N:	Est. Weight
CBKDSAV2808	8"	240 Lbs.	KDKITSAV28	27 Lbs.
CBKDSAV2811	11"	275 Lbs.		
CBKDSAV2814	14"	311 Lbs.		
CBKDSAV2818	18"	454 Lbs.		

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

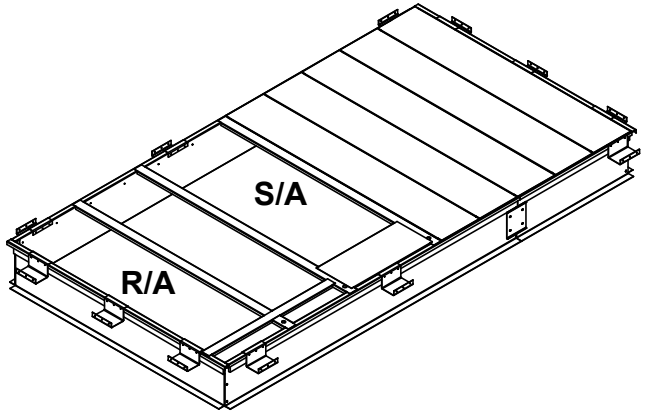
FEATURES

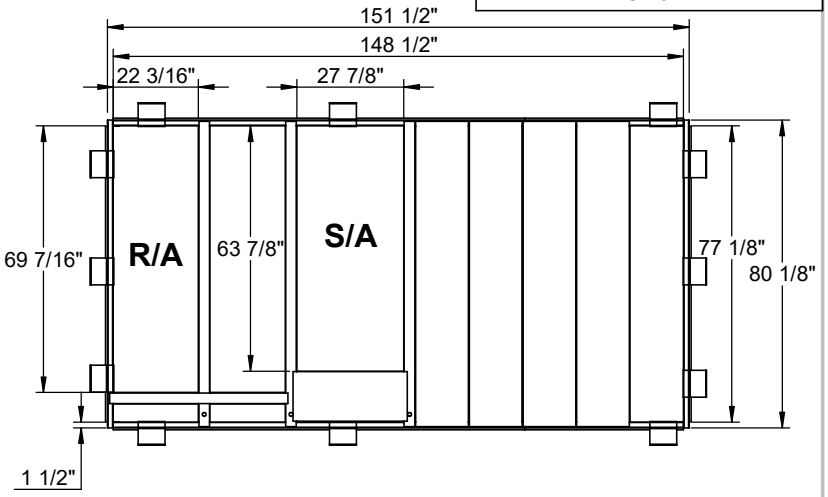
- Roof curb perimeter made of galvanized steel.
- Gasketing package provided.
- Heat treated wood nailer provided.
- Corner flanges are pre-threated for easy bolt on assembly.
- Pitched, adjustable height, welded, different height, isolation and calculated curbs are available.

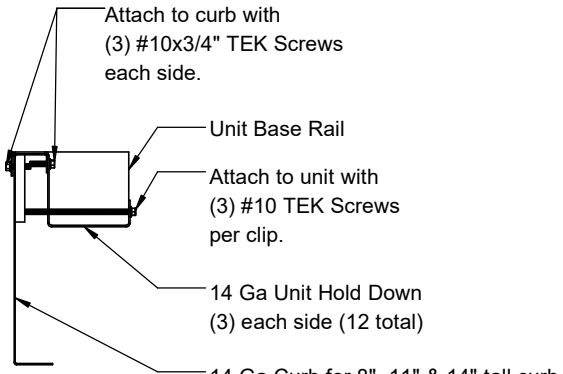
NOTES

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

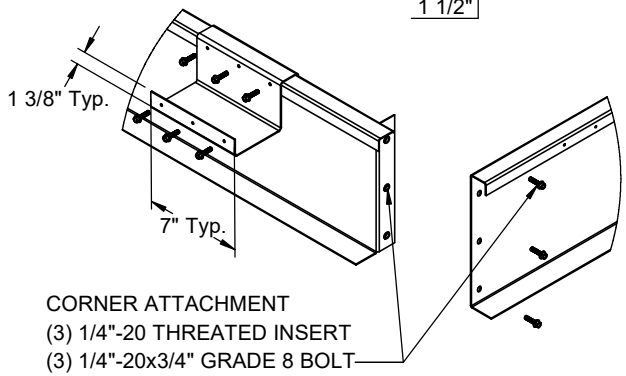
For wood, concrete and steel attachments see Roof Anchorage Detail, Form No. CB-60



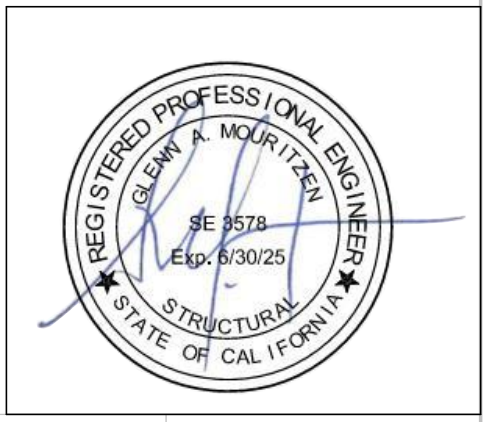




HOLD DOWN DETAIL



CORNER & HOLD DOWN DETAIL

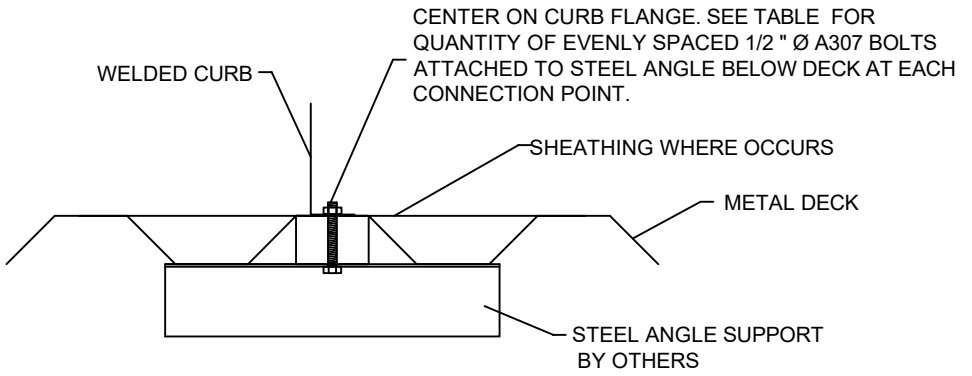


ProVent
3847 WABASH DR.
MIRA LOMA, CA 91752
PHONE (951) 685-1101
FAX (619) 872-9799

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

FORM NO:	PART NUMBER:	
CBKD-167	KDKIT28	
DATE:	REV:	DRAWN BY:
8/25/2023	1	FMM

STEEL ATTACHMENT



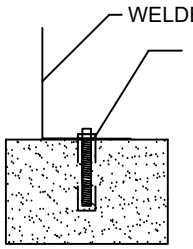
	NO. OF ANCHORAGE BOLTS REQUIRED	
CURB	LONG SIDE	SHORT SIDE
LXS	2 @ 34.5" O.C.	2 @ 19" O.C.
LXL	2 @ 34.5" O.C.	2 @ 29" O.C.
SUN3672	2 @ 60.5" O.C.	2 @ 24.75" O.C.
PRD3715	2 @ 68.88" O.C.	2 @ 39" O.C.
PRS	2 @ 58.88" O.C.	2 @ 28.69" O.C.
PRL	2 @ 72" O.C.	2 @ 41.5" O.C.
SAV1518	3 @ 54.56" O.C	2 @ 68.13"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

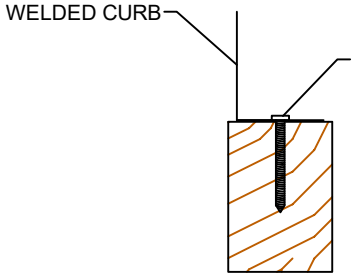
CONCRETE ATTACHMENT



	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

PHONE (951) 685-1101
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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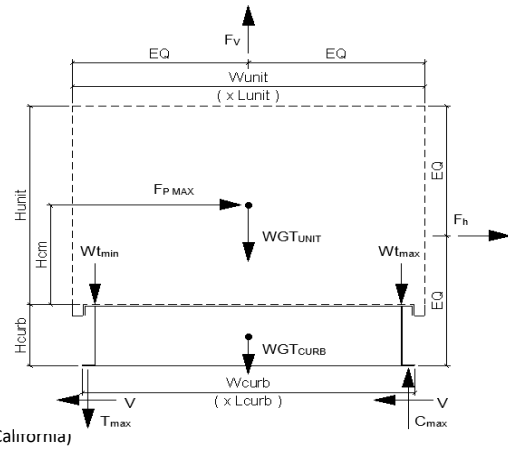
Client:	ProVent PV2312
Description:	CBPKD-167 SAV28
Unit:	AV/AD 28; AE/AW 18-23; AH/AL 25; HV 25

Curb Information

Hcurb =	18	in	(Height of curb)
Lcurb =	151.5	in	(Length of curb)
wcurb =	80.125	in	(Width of curb)
WGTcurb =	585	lbs	(Weight of curb)
# Clips long side =	3		# Clips short side = 3

Unit Information

WGTunit =	3010	lbs	(Oper. Weight of Unit)
Wtmax =	903	lbs	(Maximum corner weight)
Wtmin =	640	lbs	(Minimum corner weight)
Hunit =	57.25	in	(Height of unit above curb)
Hcm =	28.625	in	(Height to center of mass)
Lunit =	160.0625	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 =	3603	lbs	(0.7*Fpmax) FpmaxASD = 4303 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)
$F_{h\ ASD\ trans}$ =	3101	lbs	= 0.6*qz*GCr*Lunit*(Hunit+Hcurb) (Eq. 29.4-2)
$F_{h\ ASD\ long}$ =	1719	lbs	= 0.6*qz*GCr*Wunit*(Hunit+Hcurb)
$F_{vert\ ASD}$ =	2887	lbs	= 0.6*qz*GCr*Lunit*Wunit (Eq. 29.4-3)

Curb Loading

Transverse:

$Compression_{SEISMIC}$ =	3670	lbs	=[FpmaxASD*Hcm+2*(1+0.14S_{DS})*Wtmax*wcurb]/wcurb
$Tension_{SEISMIC}$ =	928	lbs	=[FpmaxASD*Hcm-2*(0.6-0.14S_{DS})*Wtmin*wcurb]/wcurb
$Compression_{WIND}$ =	748	lbs	=[$F_{h\ ASD\ trans}$*Hcm+2*0.6*Wtmax*wcurb-$F_{vert\ ASD}$*wcurb/2]/wcurb
$Tension_{WIND}$ =	1784	lbs	=[$F_{h\ ASD\ trans}$*Hcm-2*0.6*Wtmin*wcurb+$F_{vertASD}$*wcurb/2]/wcurb

---> Negative values indicate opposite load.

Longitudinal:

$Compression_{SEISMIC}$ =	3063	lbs	=[FpmaxASD*Hcm+2*(1+0.14*S_{DS})*Wtmax*Lcurb]/Lcurb
$Tension_{SEISMIC}$ =	322	lbs	=[FpmaxASD*Hcm-2*(0.6-0.14S_{DS})*Wtmin*Lcurb]/Lcurb
$Compression_{WIND}$ =	-35	lbs	=[$F_{h\ ASD\ long}$*Hcm+2*0.6*Wtmax*Lcurb-$F_{vertASD}$*Lcurb/2]/Lcurb
$Tension_{WIND}$ =	1001	lbs	=[$F_{h\ ASD\ long}$*Hcm-2*0.6*Wtmin*Lcurb+$F_{vertASD}$*Lcurb/2]/Lcurb

---> Negative values indicate opposite load.

Governing Reactions:

Transverse:	$Comp_{MAX}$ =	3670	lbs	---> Along long edge of curb.
(on long edge)	$Tens_{MAX}$ =	1784	lbs	---> Along long edge of curb.
Longitudinal:	$Comp_{MAX}$ =	3063	lbs	---> Along short edge of curb.
(on short edge)	$Tens_{MAX}$ =	1001	lbs	---> Along short edge of curb.

---> Negative values indicate opposite load.

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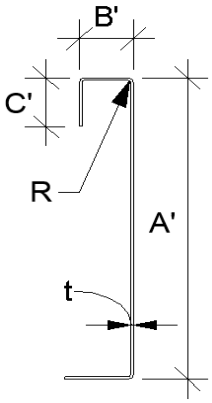
Curb Design

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 =	1.801 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	$\lambda_c=\sqrt{\frac{F_y}{F_e}}$	$F_e=\frac{\pi^2 E}{\left(kl/r\right)^2}$
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	(See table C3.4.1-2, fastened to support, one flange, end loading)
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} =	1.223 k	**O.K.**	# clips = 3		
Short side: Pu_{Long} =	1.021 k	**O.K.**	# clips = 3		

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

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 = 1076 lbs Max($F_{pmaxASD}$/4 -OR- $Fh_{ASDtrans}$/4 corner connections)

Vcrnmax = 1835 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 = 1.5

# of Bolts Used = 3.0

Check Combined Stress in Bolts & Inserts: 0.651 **O.K.**

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

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

Lreq'd = 0.870 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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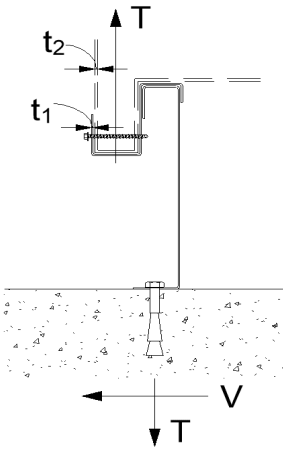
Connection Unit to Curb Clip | #10 SMS screw | Ω = 3.0

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:	3.603	3	1.20	540 #	3	3.00 in
Short side:	3.603	3	1.20	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 in^2 | Anv = 0.613 in^2 | Ant = 0.060 in^2
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:	$Uplift_{MAX}$ =	2169 lbs		$Shear_{MAX}$ =	2152 lbs
$Compression_{SEISMIC}$ =	4875 lbs	=[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb			
$Tension_{SEISMIC}$ =	1999 lbs	=[FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb			
$Compression_{WIND}$ =	1439 lbs	=[$F_{h\ ASD\ trans}$*(Hcm+Hcurb)+0.6*$WGT_{unit+curb}$*wcurb/2-$F_{vert\ ASD}$*wcurb/2]/wcurb			
$Tension_{WIND}$ =	2169 lbs	=[$F_{h\ ASD\ trans}$*(Hcm+Hcurb)-0.6*$WGT_{unit+curb}$*wcurb/2+$F_{vertASD}$*wcurb/2]/wcurb			
Longitudinal:	$Uplift_{MAX}$ =	894 lbs		$Shear_{MAX}$ =	2152 lbs
$Compression_{SEISMIC}$ =	3696 lbs	=[FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb			
$Tension_{SEISMIC}$ =	820 lbs	=[FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb			
$Compression_{WIND}$ =	164 lbs	=[$F_{h\ ASD\ long}$*(Hcm+Hcurb)+0.6*$WGT_{unit+curb}$*Lcurb/2-$F_{vert\ ASD}$*Lcurb/2]/Lcurb			
$Tension_{WIND}$ =	894 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 = 3.52 | COMBINED LOADING: 0.961 O.K.
# of Screws Req'd for Shear = 3.20 | Screw Spacing = 23.9 in o.c.
Total # of screws Required = 7

1/4"ϕ x 3.5" Simpson SDS screws @ 23.9 in o.c. along long side of curb w/ 2.25" threaded embed

Longitudinal:

# of Screws Req'd for Uplift = 1.5 | COMBINED LOADING: 0.931 O.K.
# of Screws Req'd for Shear = 3.2 | Screw Spacing = 18.0 in o.c.
Total # of screws Required = 5

1/4"ϕ x 3.5" Simpson SDS screws @ 18 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 = 1.04 | COMBINED LOADING: 0.326 O.K.
# of Bolts Req'd for Shear = 0.98 | Bolt Spacing = 69.8 in o.c.
Total # of Bolts Required = 3

1/2" ϕ A307 Bolts to steel angle below deck @ 69.8 in o.c. along long side of curb

Longitudinal:

# of Bolts Req'd for Uplift = 0.43 | COMBINED LOADING: 0.382 O.K.
# of Bolts Req'd for Shear = 0.98 | 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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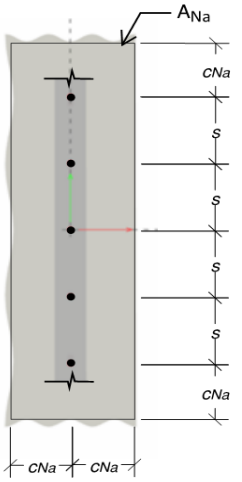
San Diego, CA 92120
(619)727-4800

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	in²		
A_{Nao}=	204.49	in²		
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	in²	N_b = 4246	lbs	$ø_{conc}$ =	0.75
A_{Nco} =	68.0625	in²	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:	$Uplift_{MAX}$ =	4503 lbs	$Shear_{MAX}$ =	4303 lbs

$Compression_{SEISMIC}$ = 7379 lbs =[Ωo*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb

$Tension_{SEISMIC}$ = 4503 lbs =[Ωo*FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*wcurb/2]/wcurb

$Shear_{SEISMIC}$ = 4303 lbs =Ωo*FpmaxASD/2

Min Bolts Req'd Uplift = 3.19 spacing = 46.50 in o.c. Tapplied = 1125.8 lbs

Min Bolts Req'd Shear = 2.40 spacing = 69.75 in o.c. Vapplied = 717.2 lbs

Try using 4 bolts spaced at 46.50 in o.c.

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \le 1.2$ = 1.20 O.K.

Use 4 - 1/2"ϕ HAS rods in Hilti HIT-HY 200 V3 epoxy @ 46.5 in o.c. max. along long side of curb w/ 2.75in embed

Longitudinal:	$Uplift_{MAX}$ =	2144 lbs	$Shear_{MAX}$ =	4303 lbs

$Compression_{SEISMIC}$ = 5020 lbs =[Ωo*FpmaxASD*(Hcm+Hcurb)+(1+0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb

$Tension_{SEISMIC}$ = 2144 lbs =[Ωo*FpmaxASD*(Hcm+Hcurb)-(0.6-0.14S_{DS})*$WGT_{unit+curb}$*Lcurb/2]/Lcurb

$Shear_{SEISMIC}$ = 4303 lbs =Ωo*FpmaxASD/2

Min Bolts Req'd Uplift = 1.52 spacing = 34.06 in o.c. Tapplied = 1072.0 lbs

Min Bolts Req'd Shear = 2.40 spacing = 34.06 in o.c. Vapplied = 717.2 lbs

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

COMBINED LOADING = $\frac{T_{applied}}{T_{allow,ASD}} + \frac{V_{apllied}}{V_{allow,ASD}} \le 1.2$ = 1.16 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-167 SAV28	**Unit:**	AV/AD 28; AE/AW 18-23; AH/AL 25; HV 25
CURB RAIL THICKNESS:	0.1017 in 12 Gauge		
UNIT CLIP THICKNESS:	0.1017 in 12 Gauge		
# OF CLIPS (LONG SIDE) -	3 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) -	3 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	7 @ 23.92 in o.c.	3 @ 69.75 in o.c.	4 @ 46.5 in o.c.
SHORT DIRECTION	5 @ 18.03 in o.c.	2 @ 68.13 in o.c.	2 @ 68.13 in o.c.