For wood, concrete and steel attachments see Roof Anchorage Detail, Form No. CB-26.

Will conform to wind load code requirements for knock-down or pre-assembled application. (Contact factory for assembled version.)

CALCULATED WIND AND SEISMIC ROOF CURBS FOR YORK UNITS

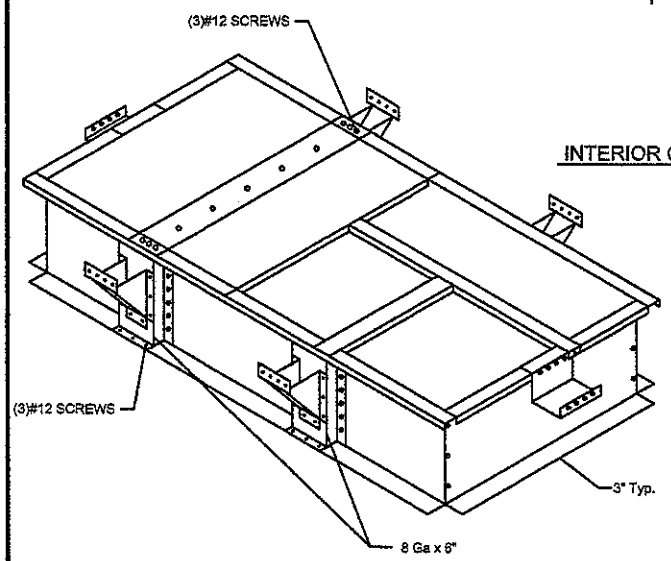
XY, ZX, ZY 04-06; ZX 07

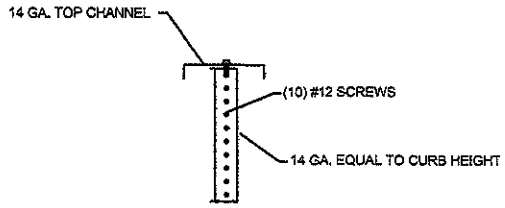
ProVent P/N	A	WEIGHT	CALCULATED KIT P/N	WEIGHT
80-268-4514	14"	84 Lbs	80-266-4514	33 Lbs
80-268-4518	18"	101 Lbs	80-266-4518	40 Lbs

Meets wind, seismic requirements for the following codes:
FBC 2014
based on ASCE 7-10.

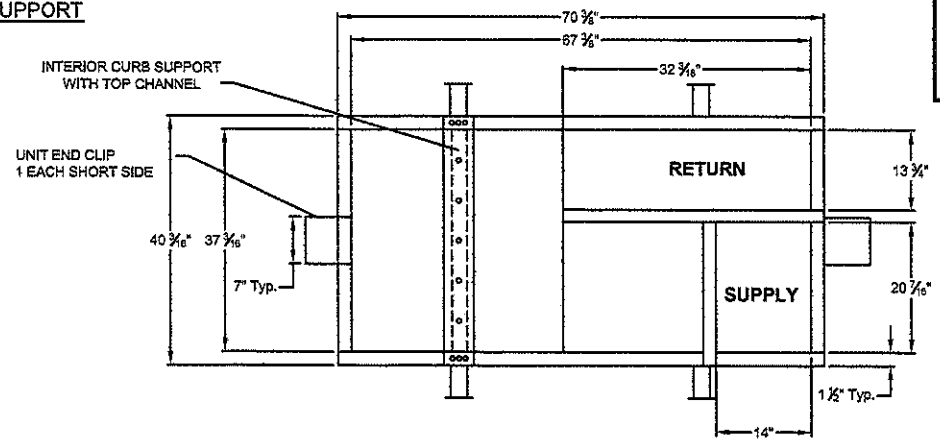
Wind:
190 mph exposure D category III or IV building, max BLDG height: 60 ft
Kzt=1.00 max

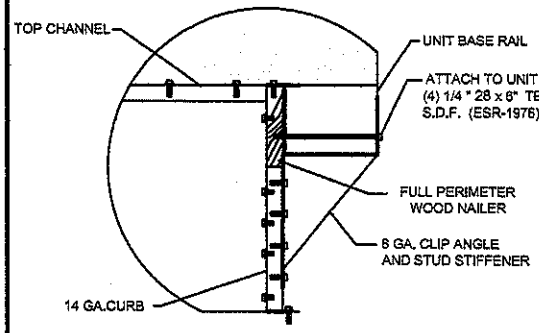
Seismic:
Sds=0.30 max
Sd1=0.187 max
Site Class D
Importance Factor: Ip=1.5



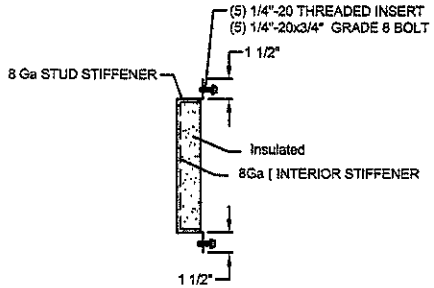


INTERIOR CURB SUPPORT

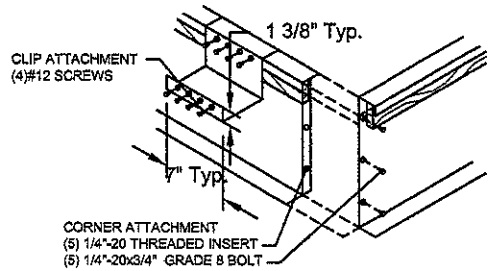




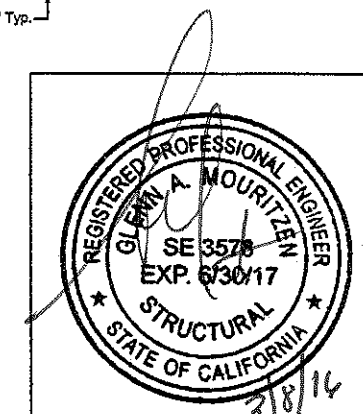
HOLD DOWN DETAIL



STUD STIFFENER



CORNER & END CLIP DETAIL

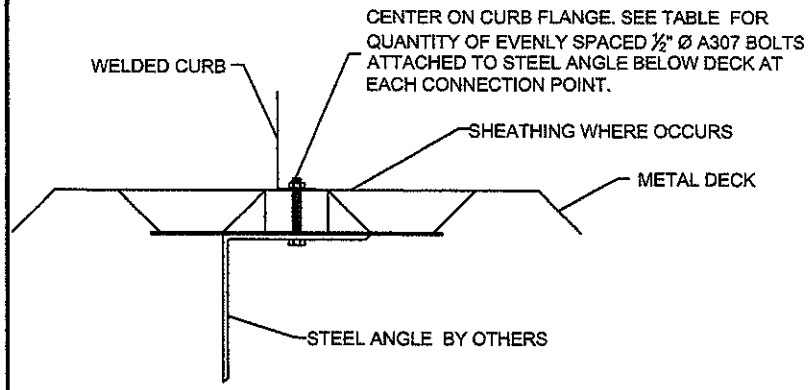


ProVent
3847 WABASH DR.
MIRA LOMA, CA 91725
PHONE (951) 685-1101
FAX (619) 872-9799

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

FORM NO:		PART NUMBER:
CBKD-162		80-268-45
DATE: 03/02/16	REV: 1	DRAWN BY: CNG

STEEL ATTACHMENT



	NO. OF ANCHORAGE BOLTS REQUIRED		
CURB KIT	LONG SIDE *	SHORT SIDE *	UNIT
80-266-49	2	2	LXS
80-266-50	2	2	LXL
80-266-45	2	2	PRESTIGE SMALL
80-266-46	2	2	PRESTIGE LARGE

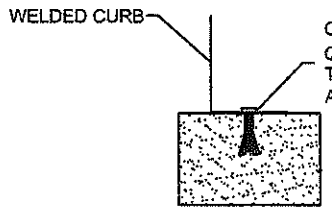
WIND AND SEISMIC LOAD ROOF ANCHORAGE DETAIL

Meets wind, seismic requirements for the following codes:
FBC 2014
based on ASCE 7-10.

Wind:
190 mph exposure D category III or IV building, max BLDG height: 60 ft
Kzt=1.00 max

Seismic:
Sds=0.30 max
Sd1=0.187 max
Site Class D
Importance Factor: Ip=1.5

CONCRETE ATTACHMENT

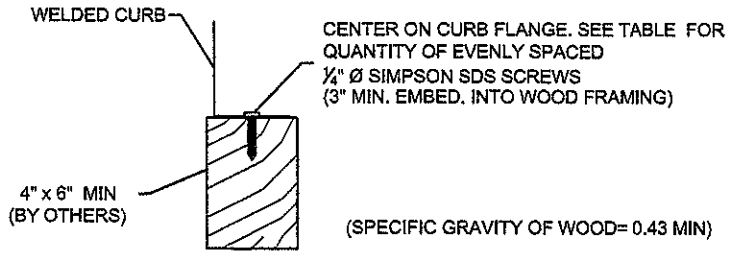


- NORMAL WEIGHT CONC SLAB
- f'c=4000 PSI MIN
- 6" MIN THICK CONC.
- SPECIAL INSPECTION REQUIRED (ESR REPORT 2713)

	NO. OF ANCHORAGE BOLTS REQUIRED		
CURB KIT	LONG SIDE *	SHORT SIDE **	UNIT
80-266-49	4	4	LXS
80-266-50	4	4	LXL
80-266-45	5	4	PRESTIGE SMALL
80-266-46	6	5	PRESTIGE LARGE

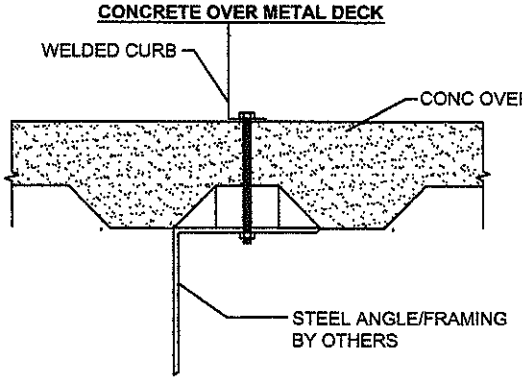
*** THREE INCHES FROM EACH CORNER EVENLY SPACED.**
**** CENTERED ONE FOOT FROM EACH CORNER EVENLY SPACED.**

WOOD ATTACHMENT

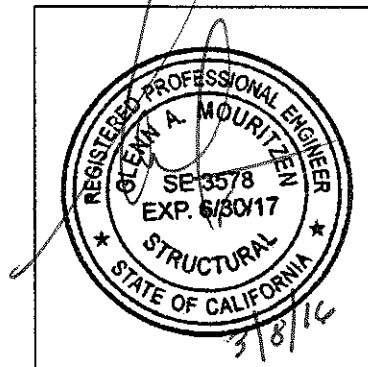


	NO. OF ANCHORAGE SCREWS REQUIRED		
CURB KIT	LONG SIDE *	SHORT SIDE *	UNIT
80-266-49	12	10	LXS
80-266-50	12	10	LXL
80-266-45	12	10	PRESTIGE SMALL
80-266-46	16	14	PRESTIGE LARGE

CONCRETE OVER METAL DECK



NOTE: FOR CONC OVER METAL DECK OVER STEEL FRAMING USE STEEL ATTACHMENT



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

FORM NO:		
CB-26		
DATE:	REV:	DRAWN BY:
03/02/16	2	CNG

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San Diego, CA 92120

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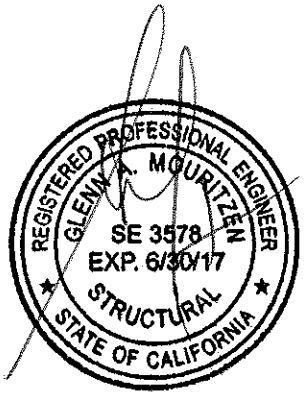
Structural Calculations

for

Prestige Hurricane Small Curb



Prepared for:

PROVENT

3847 Wabash Drive
Mira Loma, CA 91725

Date: March 7, 2016

Project Number: PV1602

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ENGINEERING + DESIGN
6595 Riverdale Street
San Diego, CA 92120
619-727-4800

JOB PV1602
SHEET NO. 1 OF 12
CALCULATED BY CD DATE 3/3/16
CHECKED BY _____ DATE _____
SCALE _____

Provent Curb

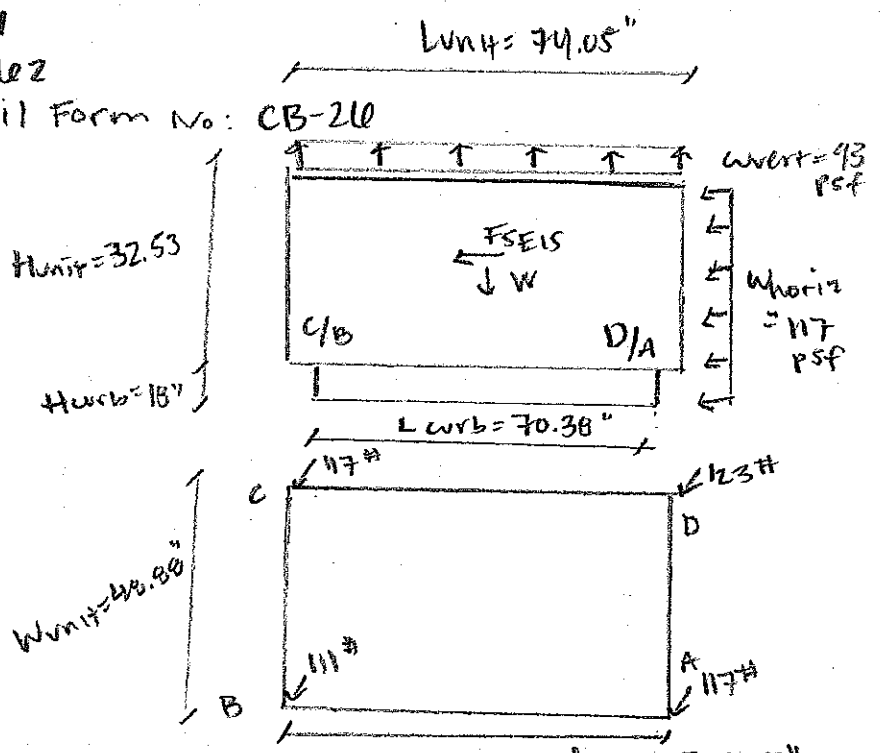
Description: ZXE04
Form No.: CBKD-1602
Roof Anchorage Detail Form No: CB-20

Curb Info

$H_{curb} = 18"$
$L_{curb} = 70.38"$
$W_{curb} = 40.19"$

Unit Info

Wt Unit = 469#
Wt Crn A = 117#
Wt Crn B = 111#
Wt Crn C = 117#
Wt Crn D = 123#
$H_{unit} = 32.53"$
$H_{c.o.m.} = 16.27"$
$L_{unit} = 74.05"$
$W_{unit} = 48.88"$



Seismic Info

$S_S = 0.05$ $F_a = 1.6$ (ASCE Tab. 11.4-1)
Site Class: D $I_p = 1.5$ (ASCE 13.1.3)
$S_{MS} = 0.08$
$S_{DS} = 0.05$

$F_{P\,MAX\,ASD} = F_{SEIS\,ASD}$
$F_{P\,MAX\,ASD} = 0.7(1.6)\,S_{DS}\,I_P\,W_P$
(ASCE Eq 13.3-2)
$F_{P\,MAX\,ASD} = 0.7(1.6)(0.05)(1.5)(469\#)$
$F_{P\,MAX\,ASD} = 42\#$

CONTROLS →

Wind Info

V = 190 mph
Exposure D Risk Cate. IV
$K_z = K_h = 1.31$ (ASCE Tab. 29.3-1 @ 60')
$K_{zt} = 1.0$
$K_d = 0.85$ (ASCE Tab. 26.6-1)
GCr horizontal = 1.9 (ASCE 29.5.1)
GCr vertical = 1.5 (ASCE 29.5.1)
$q_h = 0.00256\,K_z\,K_{zt}\,K_d\,V^2$
(ASCE Eq. 29.3-1)
$q_h = 103$ psf
$F_{h\,ASD} = 0.6(1.9)\,q_h(A)$
$= 0.6(1.9)\,103\,(50.53)(74)/144$
$F_{h\,ASD} = 3048\#$
$F_{V\,ASD} = 0.6(1.5)\,q_h(A)$
$= 0.6(1.5)\,103(74)(48.88)/144$
$F_{V\,ASD} = 2328\#$

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JOB PV1602
SHEET NO. 2 OF 12
CALCULATED BY CD DATE 3/3/16
CHECKED BY DATE
SCALE

Provent Curb Ctd.

Curb Loading:

Transverse:

$F_{h\,ASD} = 3048\#$

$\omega_{h\,ASD} = 0.4(103)(1.9) = 117 psf$

$F_{v\,ASD} = 2328\#$

$\omega_{v\,ASD} = 0.6(103)(1.5) = 93 psf$

$M_{OT\,Transv.} = \text{Max of } F_{seis\,ASD}(H_{c.o.m.})$ or $\left[0.6\omega_h (L_{unit})(H_{unit})^2/2 + 0.6\omega_v (L_{unit})(W_{unit})(W_{curb}/2)\right]$

$M_{OT\,Transv\,seis.} = 42(16.27") = 683\#\cdot in$

or

$M_{OT\,Transv\,wind} = 0.6/144\left[117(74.05)(32.53)^2/2 + 93(74.05)(48.88)(40.19/2)\right] = 47{,}285\#\cdot in$

$M_{OT\,Transv} = 47{,}285\#\cdot in$

$M_{res\,Transv.} = 0.6 W_{curb}(111\# + 117\#) = 5498\#\cdot in$

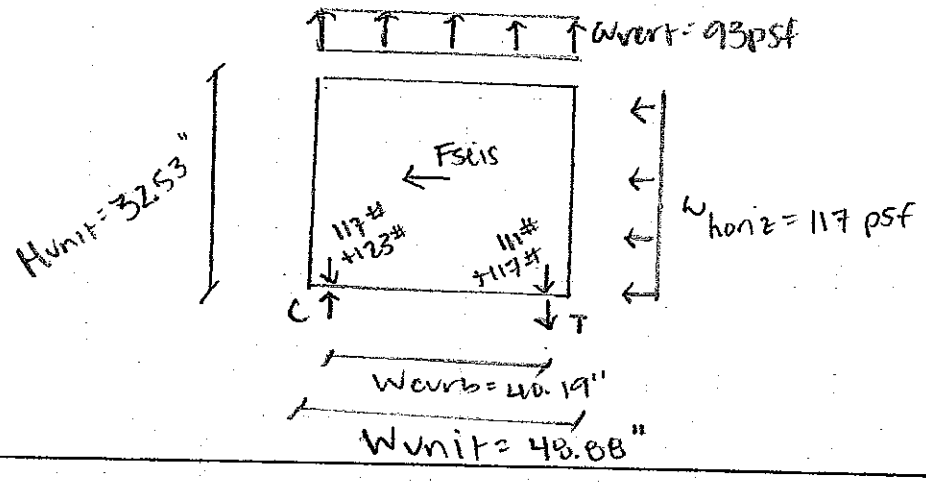
$M_{res} = 5498\#\cdot in$

$C = \text{Max comp.} = \dfrac{(M_{OT} - M_{res}) + (117\# + 123\#)(48.88)}{W_{curb}} = 1332\#/side$

$C = 1332\#/side$

$T = \text{Max Tens.} = \dfrac{(M_{OT} - M_{res}) - (117\# + 123\#)(.6)(48.88)}{W_{curb}} + \dfrac{F_v}{2} = 2029\#/side$

$T = 2029\#/side$



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JOB PV1602
SHEET NO. 3 OF 12
CALCULATED BY CD DATE 3/3/16
CHECKED BY DATE
SCALE

Prevent Curb Ctd

Curb Loading

Longitudinal:

$M_{OT\ Longit.} = F_{SEIS}\ \text{Max of}\ \begin{matrix}\text{ASD}\ (H_{c.o.M.}) \\ \text{or}\end{matrix} = 42^{\#}(16.27") = 683\ \#\cdot in$

$$\begin{bmatrix} 0.6\,\omega_h\,(W_{unit})\,(H_{unit})^2/2 \\ +\ 0.6\,\omega_v\,(L_{unit})(W_{unit})(L_{curb}/2) \end{bmatrix} = \frac{0.6}{144}\begin{bmatrix} 117(48.88)(32.53)^2/2 \\ +\ 93(48.88)(74.05)\left[\frac{70.38}{2}\right] \end{bmatrix}$$

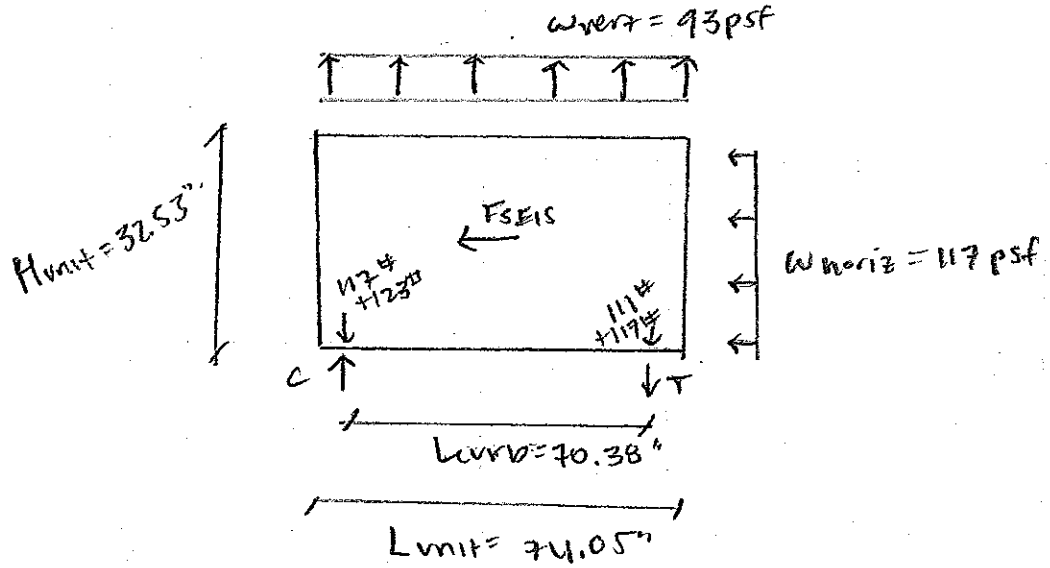
$= 61{,}965\ \#\cdot in$

$M_{OT\ Longitud} = 61{,}965\ \#\cdot in.$

$M_{res\ Longit.} = 0.6\,L_{curb}(111^{\#} + 117^{\#}) = 9628\ \#\cdot in$

$$C = \frac{(M_{OT} - M_{res}) + (117^{\#} + 123^{\#})(74.05)}{L_{curb}} = 996\ \#/side$$

$$T = \frac{(M_{OT} - M_{res}) + (117^{\#} + 123^{\#})(.6)(74.05)}{L_{curb}} + \frac{F_v}{2} = 1756\ \#/side$$



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JOB PV1602
SHEET NO. 4 OF 12
CALCULATED BY CD DATE 3/3/16
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Provent Curb Ctd.

Properties of Curb (AISI 3.3.2)

$E = 29500$ ksi $\quad F_y = 50$ ksi $\quad F_u = 60$ ksi

14 GA. $t = 0.0713"$

$A' = 18"$
$B' = 1"$
$C' = 3"$
$R = 0.125"$
$r = R + \frac{t}{2} = 0.161"$
$\alpha = 1.0$ (1.0 if lips, 0.0 if not)
$v = \pi r/2 = 0.252"$

$a = A' - [r + t/2 + \alpha(r + t/2)] = 18 - 2\left(.161 + \frac{.0713}{2}\right)$
$a = 17.607"$
$a' = A' - (t/2 + \alpha\, t/2) = 18 - 2\left(\frac{0.0713"}{2}\right)$
$a' = 17.929"$
$b = B' - (r + t/2) = 1" - 0.161" - \frac{0.0713"}{2}$
$b = 0.607"$
$b' = B' - t/2 = 1" - 0.0713"/2$
$b' = 0.929"$
$c = \alpha[C' - (r + t/2)] = 3" - 0.161" - \frac{0.0713"}{2}$
$c = 2.804"$
$c' = \alpha[C' - t/2] = 3" - \frac{0.0713"}{2}$
$c' = 2.964"$

$A = t[a + 2b + 2v + \alpha(2c + 2v)] = 0.0713"[17.607" + 2(.607 + 2.804) + 4(0.252)] = 1.81\ in^2$
$= 1.81\ in^2$

$\bar{x} = \frac{2t}{A}\{b(b/2 + r) + v(0.363r) + \alpha[v(b + 1.637r)^2 + c(b + 2r)]\}$
$\bar{x} = 2(.0713)/1.81\{.607\left(\frac{.607}{2} + .161\right) + .252(.363(.161) + .252(.607 + 1.637(.161))^2 + 2.804(.607 + 2(.161)\}$
$\bar{x} = 0.245"$

$I_x = 2t\{0.0417a^3 + b\left(a/2 + r\right)^2 + v(a/2 + 0.637r)^2 + 0.149r^3 + \alpha[0.0833c^3 + \frac{c}{4}(a - c)^2 + v\left(\frac{a}{2} + 1.363r\right)^2 + 0.149r^3]\}$

$I_x = 67.295\ in^4$

$I_y = 2t\{b(b/2 + r)^2 + b^3/12 + 0.356r^3 + \alpha[c(b + 2r)^2 + v(b + 1.637r)^2 + 0.149r^3]\} - A\bar{x}^2$
$I_y = 0.285\ in^4$

$S_x = I_x/\bar{y} = 67.295/9 = 7.48\ in^3$
$S_y = I_y/\bar{y} = 0.285/9 = 0.032\ in^3$

$r_x = \sqrt{\frac{I_x}{A}} = \sqrt{\frac{67.295}{1.81}} = 6.09 \quad r_y = \sqrt{\frac{I_y}{A}} = \sqrt{\frac{.285}{1.81}} = 0.40"$

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JOB PV1602
SHEET NO. 5 OF 12
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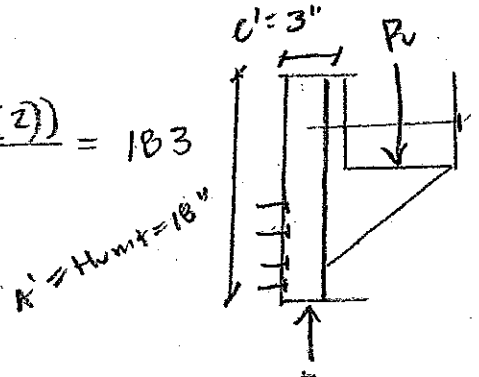
Provent Curb Ctd.

Compression of Curb (AISI C4.1)

$P_n/\Omega = A_e F_n/\Omega$ (AISI Eq. C4.1-1)

$\Omega = 1.80$

$\frac{KL}{r_{min}} = \frac{0.8\,(L_{curb} + \frac{1}{4}(W_{curb})(2))}{0.40} = 183$



$F_y = 50$ ksi

$\lambda = \sqrt{\frac{F_y}{F_e}}$

$F_e = \frac{\pi^2 E}{(KL/r_{min})^2} = \frac{\pi^2 (29500\text{ ksi})}{183^2} = 8.72$ ksi

$\lambda = \sqrt{\frac{50}{8.72}} = 2.39$

$F_n = (0.658^{\lambda_c^2})\,F_y$ if $\lambda \le 1.5$

$F_n = \left[\frac{0.877}{\lambda_c^2}\right] F_y$ if $\lambda > 1.5$ ←

$F_n = 7.65$ ksi

$P_n/\Omega = 1.81\,(7.65)/1.8 = 7.71^K$

P_u = Max comp. = $1.332^K < 7.71^K$ OK ✓

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JOB PV1602
SHEET NO. 6 OF 12
CALCULATED BY CD DATE 3/3/16
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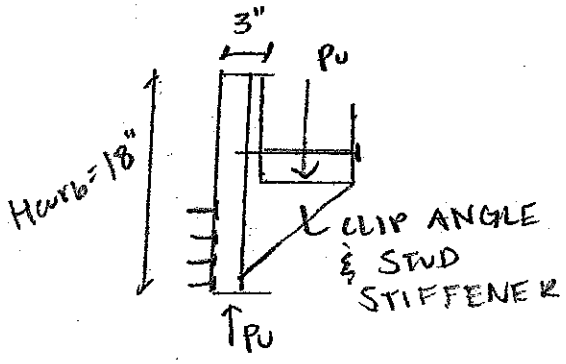
SCALE

Provent Curb ctd.

Check Web Crippling (AISI C3.4.1)

$h = 18"$
$t = 0.0713"$
$N = 27"$
$F_y = 50\ ksi$
$\theta = 90°$
$\Omega = 1.75$
$R = 0.125"$
$C = 4.00$
$C_R = 0.14$
$C_N = 0.35$
$C_h = 0.02$



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

$$P_n/\Omega = \frac{1}{1.75}(4)(.0713)^2(50)(1)\left(1 - .14\sqrt{\frac{.125}{.0713}}\right)\left(1 + .35\sqrt{\frac{27}{.0713}}\right)\left(1 - .02\sqrt{\frac{18}{.0713}}\right) = 2.52$$

$P_n/\Omega = 2.52^k$

$P_u = 1.332^k < 2.52^k$ OK ✓

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JOB PV1602
SHEET NO. 7 OF 12
CALCULATED BY CO DATE 3/3/16
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SCALE

Provent Curb Ctd.

Corner Connections

$V_{corner\ max}$ = 2029#/side / 2 corners = 1014#

$T_{corner\ max}$ = 3048#/4 corners = 762#

Use 1/4"Ø SAE Grade 8 Bolt w/ 1/4-20 UNC thrd'd inserts

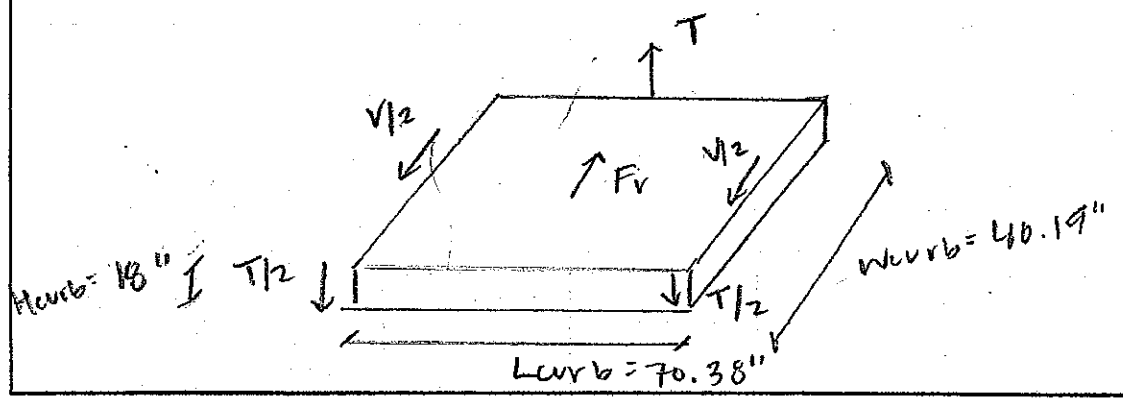
Bolt: Tallowable = 1990#/2.25 = 884# (AISI Tab. IV 6)
Vallowable = 1180#/2.4 = 492# (AISI Tab IV 7)
Bearing allowable = 2530#/2.5 = 1012# (AISI Tab IV 8C)
Insert: clamp Load allowable = 2860#

No. Bolts Req'd for Tension = $\frac{762\#}{884\#} = 0.86$

No. Bolts Req'd for Shear = $\frac{1014\#}{492\#} = 2.06$

Combined Loading: $\frac{762\#}{4(884)} + \frac{1014\#}{4(492)} = 0.73 < 1$ ✓

Use 4 Bolts ea. corner



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JOB PV1602
SHEET NO. 8 OF 12
CALCULATED BY CD DATE 3/3/10
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SCALE

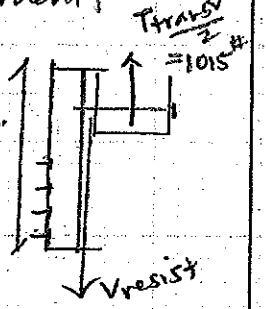
Provent Curb Ctd.

Connection of Curb to Unit

Use # 12 SMS
$V_{allowable}$ = 730 #
$T_{allowable}$ = 285 #

Transverse: $V_{transv\ SMS} = T_{transv\ unit} = 2029\#$ / 2 attachments

$= 1015\#$



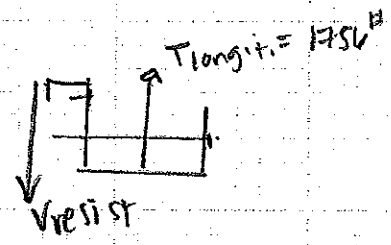
No. SMS req'd tension: $\frac{1015\#}{730} = 1.39$

Use 3 SMS on long side (per attachment)

Longitudinal: $V_{longitud.\ SMS} = T_{longitud\ unit} = 1756\#$

No. SMS req'd shear: $\frac{1756\#}{730\#} = 2.41$

Use 4 SMS on short side



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JOB PV11602
SHEET NO. 9 OF 12
CALCULATED BY CD DATE 3/3/16
CHECKED BY DATE
SCALE

Provent Curb Ctd

Connection of Curb to Supporting Structure

Wood Attachment

Use 1/4"ø x 3" Simpson SDS Screw

Tallowable = 172#/in (3" - t curb) = 504#

Vallowable = 420#

Transverse:

$$\text{Uplift WIND} = \frac{[F_h(H_{unit} + H_{curb})/2 - M_{res}]}{W_{curb}} + \frac{F_v}{2} = \frac{3048\,(50.53/2) - 5498}{40.19} + \frac{2328}{2}$$

Uplift WIND = 2943# ← CONTROLS

$$\text{Uplift SEISMIC} = \frac{F_{seis\ ASD}\,(H_{curb} + H_{c.o.m.}) - M_{res}}{W_{curb}} + \frac{F_v}{2} = \frac{42(34.27) - 5498}{40.19} + \frac{2328}{2}$$

Uplift seismic = 1063#

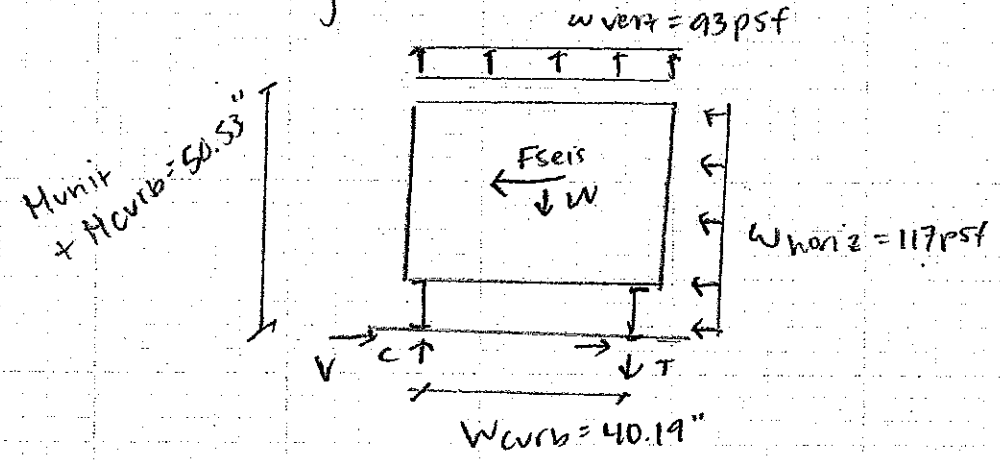
No. screws req'd Tension: 2943#/504 = 5.84

Shear = Max of F_h & F_{seis} = 3048#

No. screws req'd shear: 3048#/420 = 7.26 (whole curb)

COMBINED Loading: $\frac{2943}{10\,(504)} + \frac{3048/2}{10\,(420)} = 0.95 < 1$ ✓

Use 10 screws on long side



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JOB PV1602
SHEET NO. 10 OF 12
CALCULATED BY CO DATE 3/3/16
CHECKED BY DATE
SCALE

Provent Curb Ctd.

Connection of Curb to supporting structure

Wood Attachment

Use 1/4"ø x 3" SIMPSON SDS SCREW

$T_{allowable} = 172\#/in\,(3" - t_{curb}) = 504\#$

$V_{allowable} = 420\#$

Longitudinal:

$$Uplift_{WIND} = \frac{[F_h(H_{unit} + H_{curb})/2 - M_{res}]}{L_{curb}} + \frac{F_v}{2} = \frac{3048(50.53/2) - 9628}{70.38} + \frac{2328}{2}$$

$Uplift_{WIND} = 2121\#$ ← CONTROLS

$$Uplift_{SEISMIC} = \frac{F_{SEIS\,ASD}(H_{curb} + H_{c.o.m.}) - M_{res}}{L_{curb}} + \frac{F_v}{2} = \frac{42(34.27) - 9628}{70.38} + \frac{2328}{2}$$

$Uplift_{SEISMIC} = 1048\#$

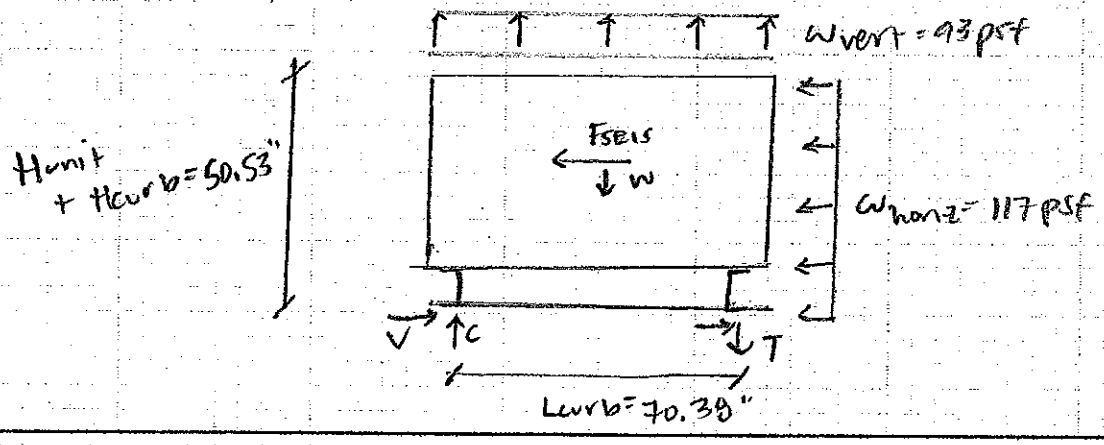
No. screws req'd Tension: $\frac{2121\#}{504} = 4.21$

Shear = Max of F_h & $F_{SEIS} = 3048\#$

No. screws req'd shear: $\frac{3048\#}{420} = 7.26$ (whole curb)

COMBINED Loading: $\frac{2121}{8(504)} + \frac{3048/2}{8(420)} = 0.98 < 1$ ✓

Use 8 SDS on short side



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SHEET NO. 4 OF 12
CALCULATED BY CD DATE 3/3/16
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SCALE

Provent curb ctd.

Connection of curb to supporting structure

Concrete Attachment

use 1/2"ϕ Simpson Titen HD w/ 3" min embed

Tallowable = 1155#

Vallowable = 1605#

Transverse: T = 2943# (see wood Attachment calcs)

V = 3048#

No. Fasteners req'd Tension = $\frac{2943}{1155} = 2.54$

No. Fasteners req'd Shear = $\frac{3048}{1605} = 1.90$ (whole curb)

COMBINED Loading: $\frac{2943}{4(1155)} + \frac{3048/2}{4(1605)} = 0.87 < 1$ ✓

Use 4 fasteners on long side

Longitudinal: T = 2121# (see wood Attachment Calcs)

V = 3048#

No. Fasteners req'd Tension = $\frac{2121}{1155} = 1.84$

No. Fasteners req'd Shear = $\frac{3048}{1605} = 1.90$ (whole curb)

COMBINED Loading: $\frac{2121}{3(1155)} + \frac{3048/2}{3(1605)} = 0.93 < 1$ ✓

use 3 fasteners on short side

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SHEET NO. 12 OF 12
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Provent Curb Ctd.

Connection of Curb to Supporting Structure

Steel Deck Attachment

Use 1/2" Ø A307 Bolt to L5x5x1/4 below deck @ each conn.

Tallowable = 4420#

Vallowable = 2650#

Transverse: T = 2943# (see wood Attachment calcs)

V = 3048#

No. Bolts req'd Tension = $\frac{2943}{4420} = 0.67$

No. Bolts req'd shear = 3048/2650 = 1.15 (whole curb)

COMBINED Loading: $\frac{2943}{2(4420)} + \frac{3048/2}{2(2650)} = 0.62 < 1$ ✓

Use 2 Bolts on long side

Longitudinal: T = 2121# (see wood Attachment calcs)

V = 3048#

No. Bolts req'd Tension = $\frac{2121}{4420}$

No. Bolts req'd shear = 3048/2650 = 1.15 (whole curb)

COMBINED Loading: $\frac{2121}{2(4420)} + \frac{3048/2}{2(2650)} = 0.53 < 1$ ✓

Use 2 Bolts on short side