

# SUBMITTAL

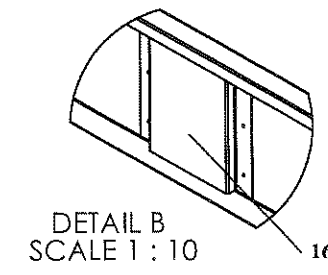
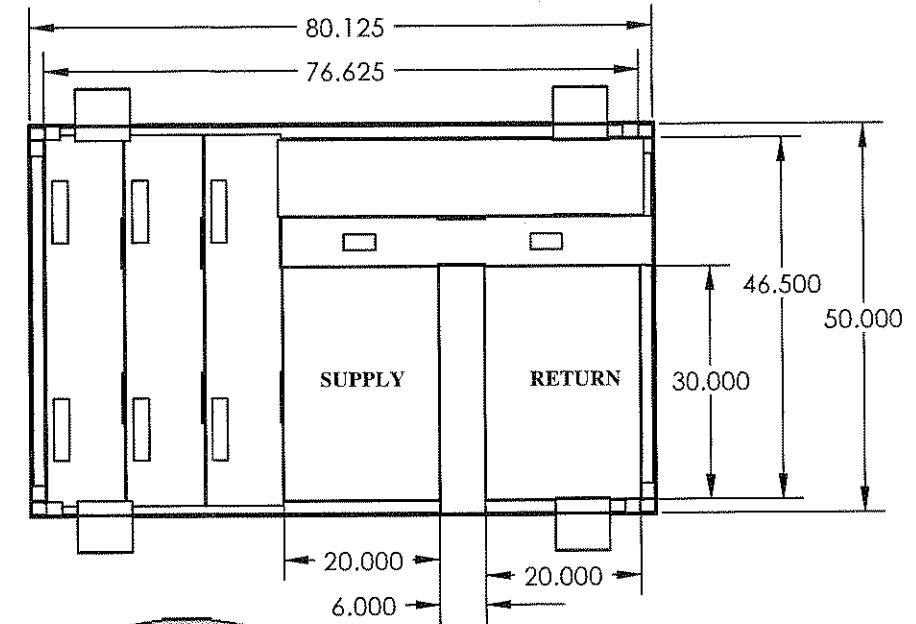
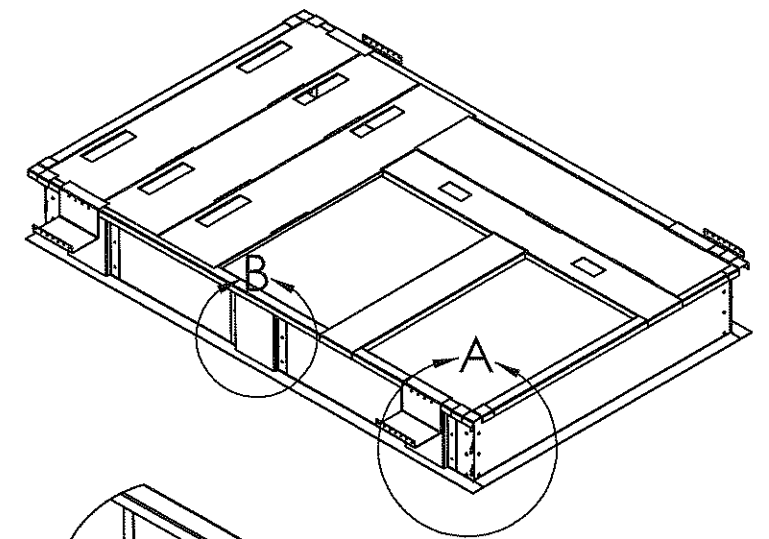
## KD 564 120-150

KITS FOR STANDARD CURB

0564CBC01KIT08  
GOOD FOR 8" ONLY

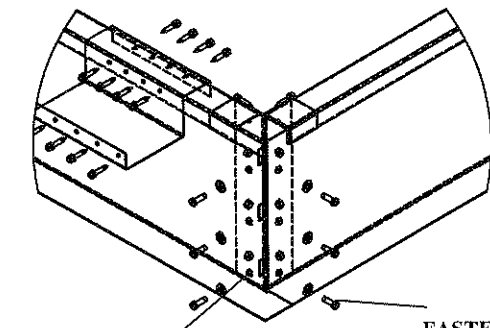
0564PESPLKIT11  
GOOD FOR 11" ONLY  
(120 TO 150 UNITS)

\*KNOCKED DOWN CONSTRUCTION  
\*GASKET PACKAGE INCLUDED  
\*PERIMETER WOOD NAILER



FASTEN STIFFENER TO CURB WITH #10-1/2" TEK SCREWS (6 EACH PER STIFFENER)

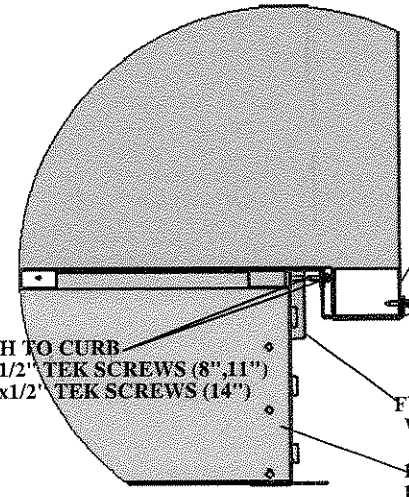
DETAIL B SCALE 1 : 10



14" HAS (6) HOLES  
11" HAS (6) HOLES  
8" HAS (4) HOLES

DETAIL A SCALE 1 : 8

FASTEN TO CORNER BRACKET WITH 1/4"-20 X 3/4" LOCKNUTS AND BOLTS

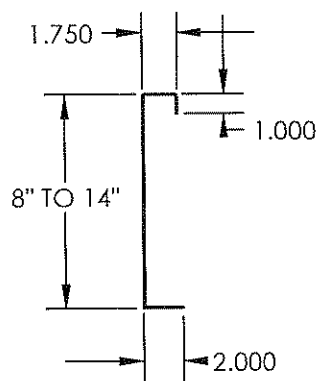


ATTACH TO CURB (8) #10x1/2" TEK SCREWS (8", 11") (10) #10x1/2" TEK SCREWS (14")

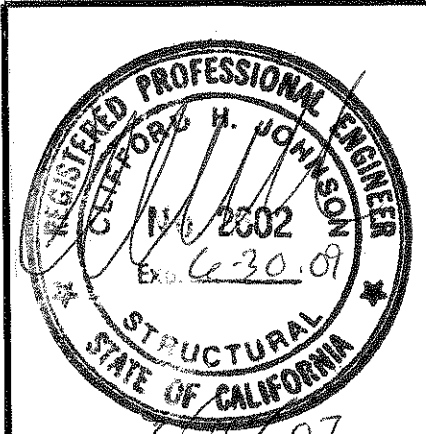
HOLDDOWN DETAIL

UNIT BASE RAIL  
16 GA MICROHOLD  
ATTACH TO UNIT (6) #10x1" TEK SCREWS (8", 11") (6) #10x1" TEK SCREWS (14")

FULL PERIMETER WOOD NAILER  
16 GA CURB FRAME (8", 11")  
14 GA CURB FRAME (14") ≤ 1500 LBS



CURB DETAIL



### MicroMetl Corporation

PRODUCT NUMBER: 0564-A008-01CBC 8" TALL  
KD 564 SERIES 0564-A011-01CBC 11" TALL  
ASSEMBLED CURBS 0564-A014-01CBC 14" TALL

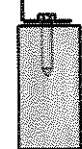
STRUCTURALLY CALCULATED KNOCKED DOWN CURB FOR YORK ZH, DH, DM, BP, 120-150, DR 120-150 DF 120, DJ 150 UNITS

Sparks, NV. (800) 884-4662  
Indianapolis, IN. (800) 662-4822  
Longview, TX. (903) 248-4800

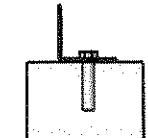
STEEL ATTACHMENT:  
SEE STEEL ATTACHMENT DETAIL SHEETS.

#### ANCHORAGE DETAILS TO ROOF:

WOOD ATTACHMENT:  
(DOUGLAS FIR)  
(34) 1/4 x 3" SIMPSON SDS W/WASHER CENTER ON CURB FLANGE, EVENLY SPACED, (12) EACH LONG SIDE, (5) EACH SHORT SIDE



CONCRETE ATTACHMENT:  
(3000 PSI MINIMUM, 4" MIN THICKNESS) (6" MIN EDGE DISTANCE)  
(14) 1/2" SIMPSON TITEN HD EVENLY SPACED, CENTER ON CURB FLANGE 8" MIN SPACING (4) EACH LONG SIDE, (3) EACH SHORT SIDE



DATE: 07/2007  
DRAWN BY: MAC  
WEIGHT: 130/143/182  
MEETS SEISMIC REQUIREMENTS FOR FOLLOWING CODES:  
2001 CBC  
2006 IBC

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# Structural Calculations

## BJG# 20070133

Project:

KD 564

Prepared for:

MicroMetl Corporation

905 Southern Way  
Sparks, NV 89431

Date:

August 2007



9/11/07



**ARCHITECTURE + ENGINEERING**

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Job#: 20070133  
By: TRH  
Date: 9/10/2007  
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**Curb Information Product Number 0564**

$h_{CURB} = 14$  in - Overall height from support substrate to top of curb  
 $L_{CURB} = 76.625$  in - Longitudinal distance from center-to-center of transverse curb members  
 $W_{CURB} = 46.5$  in - Transverse distance from center-to-center of longitudinal curb members

**Unit Information**

$W_p = 1500$  lbs - Max. unit weight  
 $W_{C_{MAX}} = 383$  lbs - Max. corner weight  
 $W_{C_{MIN}} = 224$  lbs - Min. corner weight  
 $h_{UNIT} = 50.7$  in - Overall unit height above curb  
 $h_{CM} = 33.8$  in - Height above curb to center of mass  
 $L_{UNIT} = 89$  in - Overall unit length (longitudinal direction)  
 $W_{UNIT} = 59$  in - Overall unit length (transverse direction)

**Seismic Loading - 2006 International Building Code (2006 IBC)**

$F_{P_{MAX}} = 1.6 * S_{DS} * I_p * W_p$   
 $S_s = 2$  (2 is worst case in NV, OR, WA, AZ)  
 $F_a = 1$  (1.0 at worst case Site D,  $S_s \geq 1.25$ )  
 $S_{ms} = 2 = F_a S_s$   
 $S_{DS} = 1.33 = 2/3 S_{ms}$   
 $I_p = 1.5$  (1.5 at worst case Occupancy)  
 $F_{P_{MAX}} = 3.20 W_p$   
 $F_{P_{MAX}} = 2.29 W_p$  (ASD)  
 $F_{P_{MAX}} = 3429$  lb (ASD) - ASD values will be used throughout unless noted otherwise

**Seismic Loading - 2001 California Building Code (2001 CBC)**

$F_{P_{MAX}} = 4 * C_a * I_p * W_p$   
 $C_a = 0.44$  (.44 at worst case at Zone 4, Soil Type Sd)  
 $N_a = 1.5$  (1.5 at worst case Seismic Source Type A <= 2km)  
 $I_p = 1.5$  (1.5 at worst case Occupancy)  
 $F_{P_{MAX}} = 3.96 W_p$   
 $F_{P_{MAX}} = 2.83 W_p$  (ASD)  
 $F_{P_{MAX}} = 4243$  lb (ASD) - ASD values will be used throughout unless noted otherwise

**Controlling Seismic Loads**

$F_{P_{MAX}} = 2.83 W_p$  (ASD)  
 $F_{P_{MAX}} = 4243$  lb (ASD) - ASD values will be used throughout unless noted otherwise

**Wind Loading Check**

Max. Projected Area ( $A_{MAX}$ ) =  $h_{UNIT} * MAX(L_{UNIT} \text{ or } W_{UNIT})$   
 $A_{MAX} = 4512$  in<sup>2</sup>  
 $= 31.3$  ft<sup>2</sup>  
Equivalent wind pressure required to equal seismic loading ( $P_{EQ}$ ) =  $F_{P_{MAX}} / A_{MAX}$   
 $P_{EQ} = 109$  psf (ASD) OKAY BY INSPECTION:  $P > 60$  PSF



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$$V_{MAX} = 2 W_{C MAX} * \text{Seismic Coeff. (ASD)}$$

$$V_{MAX} = 2167 \text{ lb per side}$$

**Transverse Loading**

$$\text{Max } \downarrow = 2 W_{C MAX} + Fp \text{ max} * (hcm + hcurb) / Wcurb$$

$$\text{Max } \downarrow = 5127 \text{ lb per side}$$

$$\text{Max } \uparrow = Fp \text{ max} * (hcm + hcurb) / Wcurb - 2 * W_{C MIN}$$

$$\text{Max } \uparrow = 3913 \text{ lb - Uplift per side}$$

**Longitudinal Loading**

$$\text{Max } \downarrow = 2 W_{C MAX} + Fp \text{ max} * (hcm + hcurb) / Lcurb$$

$$\text{Max } \downarrow = 3413 \text{ lb per end}$$

$$\text{Max } \uparrow = Fp \text{ max} * (hcm + hcurb) / (Lcurb - 9") - 2 * W_{C MIN}$$

$$\text{Max } \uparrow = 2551 \text{ lb - Uplift per end}$$

**Curb Design - 2001 AISI (ASD)**

$$F_y = 33 \text{ ksi} \quad F_u = 48 \text{ ksi} \quad \text{Gage No.} = 14$$

$$t = 0.0747 \text{ in}$$

**Compression**

Maintain  $P \leq P_n / \Omega$

$P_n = A_e * F_n$ ;  $\Omega = 1.80$ ; therefore  $P_{allow} = 1.33 * A_e * F_n / 1.8$  with a 1/3 Increase for wind/seismic

$$\lambda_c = \sqrt{(F_y / F_e)}$$

$$F_e = \pi^2 * E / (kl/r)^2$$

$$\lambda_c \leq 1.5 ; F_n = [0.658 * \lambda_c^2] F_y$$

$$\lambda_c > 1.5 ; F_n = [0.877 / \lambda_c^2] F_y$$

Entire curb length plus 1/4 span return each end resists compression.

Assume  $k = 0.8$  for web with connected flanges top and bottom.

$$kl/r = 519$$

$$F_e = 1061 \text{ psi}$$

$$\lambda_c = 5.58$$

$$F_n = 931 \text{ psi}$$

**Longitudinal Curbs (Transverse Loading)**

$$A_e = 7.461 \text{ in}^2$$

$$P_{allow} = 5130 \text{ lb} \quad \text{OKAY}$$

**Transverse Curbs (Longitudinal Loading)**

$$A_e = 6.335 \text{ in}^2$$

$$P_{allow} = 4356 \text{ lb} \quad \text{OKAY}$$

**Connections**

Use Self-drilling, Self Tapping Steel Screws typical & use A307 bolts

Use fastener type #10 in No. 16 gage materials minimum at hold-down to unit and curb.

$$\text{Allowable Shear} = 403 \text{ lb per each}$$

Use 1/4" diam. bolts in No. 16 gage materials minimum at corner connectors.

$$\text{Allowable Shear} = 654 \text{ lb per each}$$

$$\text{Allowable Tension} = 1176 \text{ lb per each}$$

**Hold-down Connectors**

$$\text{Resultant Force from } V_{max} \text{ and } \text{Max } \uparrow = 4474 = ((V_{max})^2 + (\text{Max } \uparrow)^2)^{1/2}$$

$$\text{Total Screws required at connectors} = 6 = \text{Resultant} / 2 \text{ connectors per side} / \text{allowable Shear}$$

**Corner Connectors**

$$\text{Resultant Force from } V_{max} \text{ and } \text{Max } \uparrow = 4474 = ((V_{max})^2 + (\text{Max } \uparrow)^2)^{1/2}$$

$$\text{Bolts required for uplift} = 4 = \text{Max } \uparrow / 2 \text{ connectors per side} / \text{Allowable Shear}$$

**Anchorage to Supporting Structure**

Shear to each long side =  lbs  
 Shear to each short side =  lbs

**Transverse Loading**

Max ↑ =  $F_p \max * (h_{cm} + h_{curb}) / W_{curb} - 2 * W_{C_{MIN}}$   
 Max ↑ = 3913 lb - Uplift per side

**Longitudinal Loading**

Max ↑ =  $F_p \max * (h_{cm} + h_{curb}) / (L_{curb} - 9") - 2 * W_{C_{MIN}}$   
 Max ↑ = 2551 lb - Uplift per end

**Anchorage to Concrete Pad**

4 in. thick concrete pad - min. embedment of 3 in., min. spacing of 8 in. and min. edge distance of 6 in.

w/ 1/2" Simpson Titen HD, allow =  lbs in shear  
 w/ 1/2" Simpson Titen HD, allow =  lbs in tension

Try  Titen HD's per long side at a minimum  
 Try  Titen HD's per short side

$(\text{Actual Shear} / \text{Allowable Shear})^{5/3} + (\text{Actual Tension} / \text{Allowable Tension})^{5/3} \leq 1.0$

Elliptical Interaction Equation =  at the long sides      OK, less than 1.0  
 Elliptical Interaction Equation =  at the short sides      OK, less than 1.0

**Anchorage to Wood sub-Structure**

With Simpson 1/4 x 3" SDS screws...

Allow Shear =  lb per simpson catalog  
 Allow Tension =  lb assuming 2" penetration per NDS Table 11.2B (#14 wood screw)

screws required for uplift long side  
 screws required for uplift short side

screws required for shear both sides

total screws required long side       inches maximum spacing  
 total screws required short side       inches maximum spacing

**Anchorage to Steel sub-Structure**

The steel sub-structure will have wood blocking in place between flutes of metal deck, therefore the required number of SDS screws will be the same as for the wood sub-structure.



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**Curb Information**

**Product Number 0564**

$h_{CURB} = 11$  in - Overall height from support substrate to top of curb  
 $L_{CURB} = 76.625$  in - Longitudinal distance from center-to-center of transverse curb members  
 $W_{CURB} = 46.5$  in - Transverse distance from center-to-center of longitudinal curb members

**Unit Information**

$W_p = 1200$  lbs - Max. unit weight  
 $W_{C_{MAX}} = 383$  lbs - Max. corner weight  
 $W_{C_{MIN}} = 224$  lbs - Min. corner weight  
 $h_{UNIT} = 50.7$  in - Overall unit height above curb  
 $h_{CM} = 33.8$  in - Height above curb to center of mass  
 $L_{UNIT} = 89$  in - Overall unit length (longitudinal direction)  
 $W_{UNIT} = 59$  in - Overall unit length (transverse direction)

**Seismic Loading - 2006 International Building Code (2006 IBC)**

$F_{p_{MAX}} = 1.6 * S_{DS} * I_p * W_p$   
 $S_s = 2$  (2 is worst case in NV, OR, WA, AZ)  
 $F_a = 1$  (1.0 at worst case Site D,  $S_s \geq 1.25$ )  
 $S_{ms} = 2 = F_a S_s$   
 $S_{DS} = 1.33 = 2/3 S_{ms}$   
 $I_p = 1.5$  (1.5 at worst case Occupancy)  
 $F_{p_{MAX}} = 3.20 W_p$   
 $F_{p_{MAX}} = 2.29 W_p$  (ASD)  
 $F_{p_{MAX}} = 2743$  lb (ASD) - ASD values will be used throughout unless noted otherwise

**Seismic Loading - 2001 California Building Code (2001 CBC)**

$F_{p_{MAX}} = 4 * C_a * I_p * W_p$   
 $C_a = 0.44$  (.44 at worst case at Zone 4, Soil Type Sd)  
 $N_a = 1.5$  (1.5 at worst case Seismic Source Type A  $\leq 2$ km)  
 $I_p = 1.5$  (1.5 at worst case Occupancy)  
 $F_{p_{MAX}} = 3.96 W_p$   
 $F_{p_{MAX}} = 2.83 W_p$  (ASD)  
 $F_{p_{MAX}} = 3394$  lb (ASD) - ASD values will be used throughout unless noted otherwise

**Controlling Seismic Loads**

$F_{p_{MAX}} = 2.83 W_p$  (ASD)  
 $F_{p_{MAX}} = 3394$  lb (ASD) - ASD values will be used throughout unless noted otherwise

**Wind Loading Check**

Max. Projected Area ( $A_{MAX}$ ) =  $h_{UNIT} * \text{MAX}(L_{UNIT} \text{ or } W_{UNIT})$

$$A_{MAX} = 4512 \text{ in}^2$$

$$= 31.3 \text{ ft}^2$$

Equivalent wind pressure required to equal seismic loading ( $P_{EQ}$ ) =  $F_{p_{MAX}} / A_{MAX}$

$$P_{EQ} = 88 \text{ psf (ASD) OKAY BY INSPECTION: } P > 60 \text{ PSF}$$



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$$V_{MAX} = 2 W_{C MAX} * \text{Seismic Coeff. (ASD)}$$

$$V_{MAX} = 2167 \text{ lb per side}$$

**Transverse Loading**

$$\text{Max } \downarrow = 2 W_{C MAX} + Fp \text{ max } * (hcm + hcurb) / Wcurb$$

$$\text{Max } \downarrow = 4036 \text{ lb per side}$$

$$\text{Max } \uparrow = Fp \text{ max } * (hcm + hcurb) / Wcurb - 2 * W_{C MIN}$$

$$\text{Max } \uparrow = 2822 \text{ lb - Uplift per side}$$

**Longitudinal Loading**

$$\text{Max } \downarrow = 2 W_{C MAX} + Fp \text{ max } * (hcm + hcurb) / Lcurb$$

$$\text{Max } \downarrow = 2751 \text{ lb per end}$$

$$\text{Max } \uparrow = Fp \text{ max } * (hcm + hcurb) / (Lcurb - 9") - 2 * W_{C MIN}$$

$$\text{Max } \uparrow = 1801 \text{ lb - Uplift per end}$$

**Curb Design - 2001 AISI (ASD)**

$$F_y = 33 \text{ ksi}$$

$$F_u = 48 \text{ ksi}$$

$$\text{Gage No.} = 16$$

$$t = 0.0598 \text{ in}$$

**Compression**

$$\text{Maintain } P \leq P_n / \Omega$$

$$P_n = A_e * F_n ; \Omega = 1.80 ; \text{therefore } P_{allow} = 1.33 * A_e * F_n / 1.8 \text{ with a } 1/3 \text{ Increase for wind/seismic}$$

$$\lambda c = \sqrt{(F_y / F_e)}$$

$$F_e = \pi^2 * E / (kl/r)^2$$

$$\lambda c \leq 1.5 ; F_n = [0.658 * F_y]$$

$$\lambda c > 1.5 ; F_n = [0.877 / \lambda c^2] * F_y$$

Entire curb length plus 1/4 span return each end resists compression.

Assume k = 0.8 for web with connected flanges top and bottom.

$$kl/r = 510$$

$$F_e = 1101 \text{ psi}$$

$$\lambda c = 5.47$$

$$F_n = 966 \text{ psi}$$

**Longitudinal Curbs (Transverse Loading)**

$$A_e = 5.973 \text{ in}^2$$

$$P_{allow} = 4263 \text{ lb OKAY}$$

**Transverse Curbs (Longitudinal Loading)**

$$A_e = 5.072 \text{ in}^2$$

$$P_{allow} = 3620 \text{ lb OKAY}$$

**Connections**

Use Self-drilling, Self Tapping Steel Screws typical & use A307 bolts

Use fastener type #10 in No. 16 gage materials minimum at hold-down to unit and curb.

$$\text{Allowable Shear} = 403 \text{ lb per each}$$

Use 1/4" diam. bolts in No. 16 gage materials minimum at corner connectors.

$$\text{Allowable Shear} = 654 \text{ lb per each}$$

$$\text{Allowable Tension} = 1176 \text{ lb per each}$$

**Hold-down Connectors**

$$\text{Resultant Force from } V_{max} \text{ and } \text{Max } \uparrow = 3558 = ((V_{max})^2 + (\text{Max } \uparrow)^2)^{1/2}$$

$$\text{Total Screws required at connectors} = 5 = \text{Resultant} / 2 \text{ connectors per side} / \text{allowable Shear}$$

**Corner Connectors**

$$\text{Resultant Force from } V_{max} \text{ and } \text{Max } \uparrow = 3558 = ((V_{max})^2 + (\text{Max } \uparrow)^2)^{1/2}$$

$$\text{Total Screws required at connectors} = 3 = \text{Resultant} / 2 \text{ connectors per side} / \text{allowable Shear}$$

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**Anchorage to Supporting Structure**

Shear to each long side =  lbs  
Shear to each short side =  lbs

**Transverse Loading**

Max ↑ =  $F_p \max * (h_{cm} + h_{curb}) / W_{curb} - 2 * W_{c_{MIN}}$   
Max ↑ = 2822 lb - Uplift per side

**Longitudinal Loading**

Max ↑ =  $F_p \max * (h_{cm} + h_{curb}) / (L_{curb} - 9") - 2 * W_{c_{MIN}}$   
Max ↑ = 1801 lb - Uplift per end

**Anchorage to Concrete Pad**

4 in. thick concrete pad - min. embedment of 3 in., min. spacing of 8 in. and min. edge distance of 6 in.

w/ 1/2" Simpson Titen HD, allow =  lbs in shear  
w/ 1/2" Simpson Titen HD, allow =  lbs in tension

Try  Titen HD's per long side at a minimum  
Try  Titen HD's per short side

$(\text{Actual Shear} / \text{Allowable Shear})^{5/3} + (\text{Actual Tension} / \text{Allowable Tension})^{5/3} \leq 1.0$

Elliptical Interaction Equation =  at the long sides      OK, less than 1.0  
Elliptical Interaction Equation =  at the short sides      OK, less than 1.0

**Anchorage to Wood sub-Structure**

With Simpson 1/4 x 3" SDS screws...

Allow Shear =  lb per simpson catalog  
Allow Tension =  lb assuming 2" penetration per NDS Table 11.2B (#14 wood screw)

screws required for uplift long side  
 screws required for uplift short side

screws required for shear both sides

total screws required long side       inches maximum spacing  
 total screws required short side       inches maximum spacing

**Anchorage to Steel sub-Structure**

The steel sub-structure will have wood blocking in place between flutes of metal deck, therefore the required number of SDS screws will be the same as for the wood sub-structure.





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**Curb Information**

**Product Number 0564**

- $h_{CURB} = 8$  in - Overall height from support substrate to top of curb
- $L_{CURB} = 76.625$  in - Longitudinal distance from center-to-center of transverse curb members
- $W_{CURB} = 46.5$  in - Transverse distance from center-to-center of longitudinal curb members

**Unit Information**

- $W_p = 1597$  lbs - Max. unit weight
- $W_{C_{MAX}} = 383$  lbs - Max. corner weight
- $W_{C_{MIN}} = 224$  lbs - Min. corner weight
- $h_{UNIT} = 50.7$  in - Overall unit height above curb
- $h_{CM} = 33.8$  in - Height above curb to center of mass
- $L_{UNIT} = 89$  in - Overall unit length (longitudinal direction)
- $W_{UNIT} = 59$  in - Overall unit length (transverse direction)

**Seismic Loading - 2006 International Building Code (2006 IBC)**

- $F_{p_{MAX}} = 1.6 * S_{DS} * I_p * W_p$
- $S_s = 2$  (2 is worst case in NV, OR, WA, AZ)
- $F_a = 1$  (1.0 at worst case Site D,  $S_s \geq 1.25$ )
- $S_{ms} = 2 = F_a S_s$
- $S_{DS} = 1.33 = 2/3 S_{ms}$
- $I_p = 1.5$  (1.5 at worst case Occupancy)
- $F_{p_{MAX}} = 3.20 W_p$
- $F_{p_{MAX}} = 2.29 W_p$  (ASD)
- $F_{p_{MAX}} = 3650$  lb (ASD) - ASD values will be used throughout unless noted otherwise

**Seismic Loading - 2001 California Building Code (2001 CBC)**

- $F_{p_{MAX}} = 4 * C_a * I_p * W_p$
- $C_a = 0.44$  (.44 at worst case at Zone 4, Soil Type Sd)
- $N_a = 1.5$  (1.5 at worst case Seismic Source Type A  $\leq 2$ km)
- $I_p = 1.5$  (1.5 at worst case Occupancy)
- $F_{p_{MAX}} = 3.96 W_p$
- $F_{p_{MAX}} = 2.83 W_p$  (ASD)
- $F_{p_{MAX}} = 4517$  lb (ASD) - ASD values will be used throughout unless noted otherwise

**Controlling Seismic Loads**

- $F_{p_{MAX}} = 2.83 W_p$  (ASD)
- $F_{p_{MAX}} = 4517$  lb (ASD) - ASD values will be used throughout unless noted otherwise

**Wind Loading Check**

- Max. Projected Area ( $A_{MAX}$ ) =  $h_{UNIT} * \text{MAX}(L_{UNIT} \text{ or } W_{UNIT})$
- $A_{MAX} = 4512 \text{ in}^2$
- $= 31.3 \text{ ft}^2$
- Equivalent wind pressure required to equal seismic loading ( $P_{EQ}$ ) =  $F_{p_{MAX}} / A_{MAX}$
- $P_{EQ} = 116 \text{ psf (ASD) OKAY BY INSPECTION: } P > 60 \text{ PSF}$



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$V_{MAX} = 2 W_{C MAX} * \text{Seismic Coeff. (ASD)}$   
 $V_{MAX} = 2167 \text{ lb per side}$

**Transverse Loading**

$\text{Max } \downarrow = 2 W_{C MAX} + Fp \text{ max} * (hcm + hcurb) / W_{curb}$   
 $\text{Max } \downarrow = 4827 \text{ lb per side}$   
 $\text{Max } \uparrow = Fp \text{ max} * (hcm + hcurb) / W_{curb} - 2 * W_{C MIN}$   
 $\text{Max } \uparrow = 3613 \text{ lb - Uplift per side}$

**Longitudinal Loading**

$\text{Max } \downarrow = 2 W_{C MAX} + Fp \text{ max} * (hcm + hcurb) / L_{curb}$   
 $\text{Max } \downarrow = 3230 \text{ lb per end}$   
 $\text{Max } \uparrow = Fp \text{ max} * (hcm + hcurb) / (L_{curb} - 9") - 2 * W_{C MIN}$   
 $\text{Max } \uparrow = 2344 \text{ lb - Uplift per end}$

**Curb Design - 2001 AISI (ASD)**

$F_y = 33 \text{ ksi}$        $F_u = 48 \text{ ksi}$       Gage No. = 16  
 $t = 0.0598 \text{ in}$

**Compression**

Maintain  $P \leq P_n / \Omega$

$P_n = A_e * F_n$ ;  $\Omega = 1.80$ ; therefore  $P_{allow} = 1.33 * A_e * F_n / 1.8$  with a 1/3 increase for wind/seismic

$\lambda_c = \sqrt{(F_y / F_e)}$

$F_e = \pi^2 * E / (kl/r)^2$

$\lambda_c \leq 1.5$ ;  $F_n = [0.658 * \lambda_c^2] F_y$

$\lambda_c > 1.5$ ;  $F_n = [0.877 / \lambda_c^2] F_y$

Entire curb length plus 1/4 span return each end resists compression.

Assume  $k = 0.8$  for web with connected flanges top and bottom.

$kl/r = 371$   
 $F_e = 2082 \text{ psi}$   
 $\lambda_c = 3.98$   
 $F_n = 1826 \text{ psi}$

**Longitudinal Curbs (Transverse Loading)**

$A_e = 5.973 \text{ in}^2$   
 $P_{allow} = 8059 \text{ lb}$       OKAY

**Transverse Curbs (Longitudinal Loading)**

$A_e = 5.072 \text{ in}^2$   
 $P_{allow} = 6844 \text{ lb}$       OKAY

**Connections**

Use Self-drilling, Self Tapping Steel Screws typical & use A307 bolts

Use fastener type #10 in No. 16 gage materials minimum at hold-down to unit and curb.

Allowable Shear = 403 lb per each

Use 1/4" diam. bolts in No. 16 gage materials minimum at corner connectors.

Allowable Shear = 654 lb per each

Allowable Tension = 1176 lb per each

**Hold-down Connectors**

Resultant Force from  $V_{max}$  and  $\text{Max } \uparrow = 4213 = ((V_{max})^2 + (\text{Max } \uparrow)^2)^{1/2}$   
 Total Screws required at connectors = 6 = Resultant/ 2 connectors per side / allowable Shear

**Corner Connectors**

Resultant Force from  $V_{max}$  and  $\text{Max } \uparrow = 4213 = ((V_{max})^2 + (\text{Max } \uparrow)^2)^{1/2}$   
 Total Screws required at connectors = 4 = Resultant/ 2 connectors per side / allowable Shear

**Anchorage to Supporting Structure**

Shear to each long side =  lbs  
 Shear to each short side =  lbs

**Transverse Loading**

Max ↑ =  $F_p \max * (h_{cm} + h_{curb}) / W_{curb} - 2 * W_{c_{MIN}}$   
 Max ↑ = 3613 lb - Uplift per side

**Longitudinal Loading**

Max ↑ =  $F_p \max * (h_{cm} + h_{curb}) / (L_{curb} - 9") - 2 * W_{c_{MIN}}$   
 Max ↑ = 2344 lb - Uplift per end

**Anchorage to Concrete Pad**

4 in. thick concrete pad - min. embedment of 3 in., min. spacing of 8 in. and min. edge distance of 6 in.

w/ 1/2" Simpson Titen HD, allow =  lbs in shear  
 w/ 1/2" Simpson Titen HD, allow =  lbs in tension

Try  Titen HD's per long side at a minimum  
 Try  Titen HD's per short side

$(\text{Actual Shear} / \text{Allowable Shear})^{5/3} + (\text{Actual Tension} / \text{Allowable Tension})^{5/3} \leq 1.0$

Elliptical Interaction Equation =  at the long sides      OK, less than 1.0  
 Elliptical Interaction Equation =  at the short sides      OK, less than 1.0

**Anchorage to Wood sub-Structure**

With Simpson 1/4 x 3" SDS screws...

Allow Shear =  lb per simpson catalog  
 Allow Tension =  lb assuming 2" penetration per NDS Table 11.2B (#14 wood screw)

screws required for uplift long side  
 screws required for uplift short side

screws required for shear both sides

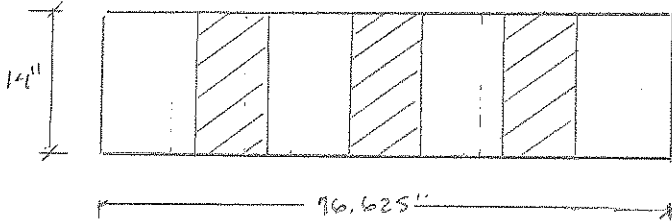
total screws required long side       inches maximum spacing  
 total screws required short side       inches maximum spacing

**Anchorage to Steel sub-Structure**

The steel sub-structure will have wood blocking in place between flutes of metal deck, therefore the required number of SDS screws will be the same as for the wood sub-structure.

KD-0564

TRANSVERSE LOADING



MAX ↓ = 5410 lb / side

MAX ↓ =  $\frac{5410 \text{ lb}}{b + \frac{1}{2}W} = \frac{5410 \text{ lb}}{(76.625'')}$  = 70.6 lb/in

TRY 24" Spacing  
w/ 16 gage stiffener 3/4" x 7"

$t = 0.060 \text{ in}$        $L = 7''$       Height = 14"  
 $F_y = 33 \text{ ksi}$       Width = 3/4"  
 $\Omega = 1.8$        $A = .5 \text{ in}^2$        $E = 29000$   
 $r_1 = \sqrt{\frac{I}{A}} = .34 \text{ in}$

$r_2 = 2.32 \text{ in}$

$\frac{KL}{r_{min}} = \frac{14''}{.34''} = 41.2$

$F_e = \frac{\pi^2 E}{\left(\frac{KL}{r}\right)^2} = 168.6 \text{ ksi}$

$\lambda_c = \sqrt{F_y / F_e} = \sqrt{33 / 168.6} = .44 < 1.5$

∴ USE

$F_n = (0.658^{2.0}) F_y = 30.4 \text{ ksi}$   
 $P_n = A_c F_n = 15.2 \text{ kips}$   
 $P_n / \Omega = 8.45 \text{ kips}$

$$P_u = w(\text{spacing}) = 70.6 \text{ lb/IN} \cdot 24" = 1.7 \text{ K}$$

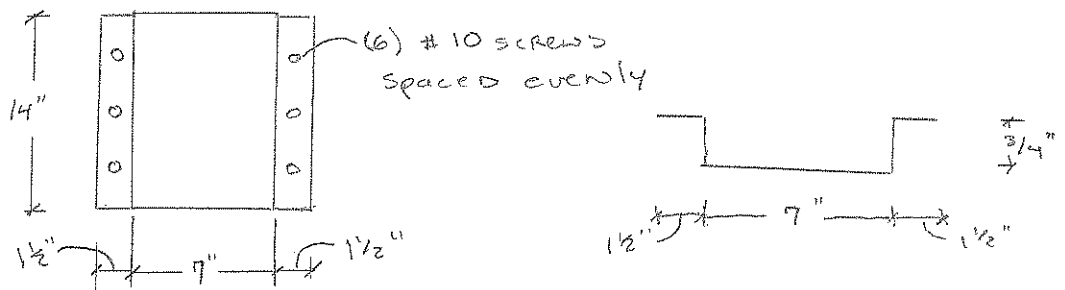
$$P_u / \phi > P_u \therefore \text{OK}$$

Check Attachment

#10 screws

$$\phi V_n = 403 \text{ lb/screw}$$

$$\frac{P_u}{\phi V_n} = \frac{1.7 \text{ K}}{403 \text{ lb/screws}} = 4.2 \rightarrow \text{USE 6 SCREWS EACH SIDE}$$



Shear Spacing & Distance

$$\text{CEN TO CEN} = 2.5d = 2.5(.19) = .475$$

$$\text{EDGE DISTANCE} = 1.5D = .285$$

USE 1 1/2" SIDE FOR SCREWS