SUBMITTAL

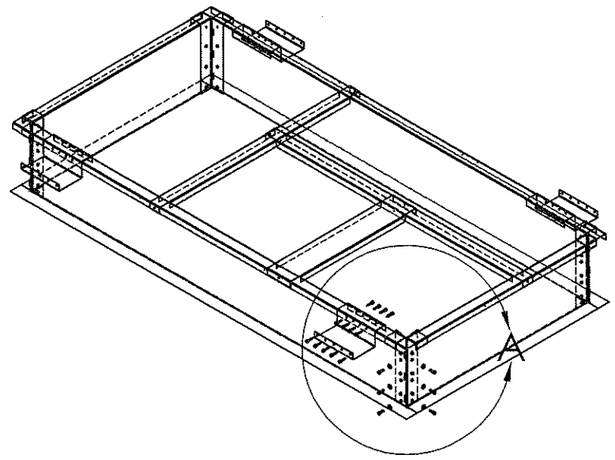
KD 560 SERIES

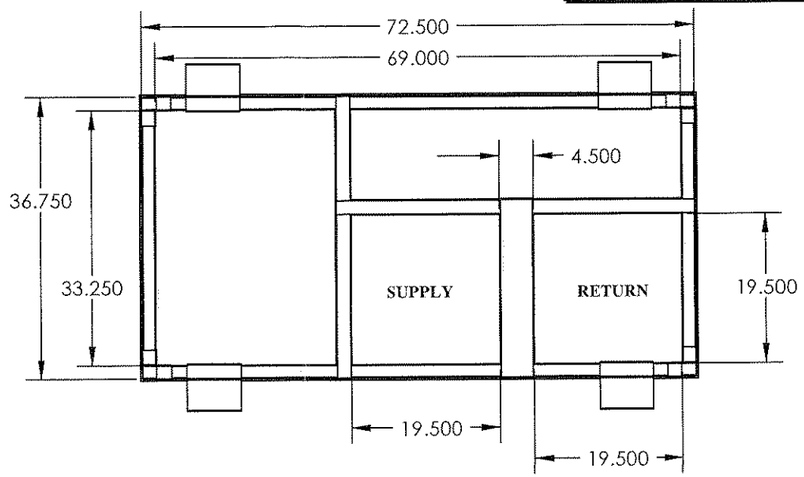
KITS FOR STANDARD CURB

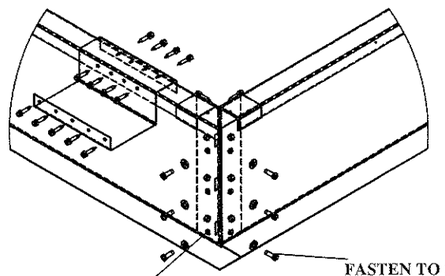
0560CBC01KIT08
GOOD FOR 8" ONLY

0560CBC01KIT11
GOOD FOR 11" ONLY

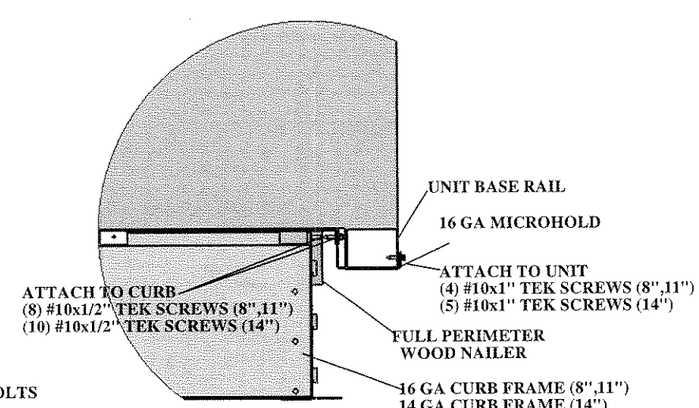
***KNOCKED DOWN CONSTRUCTION**
***GASKET PACKAGE INCLUDED**
***PERIMETER WOOD NAILER**



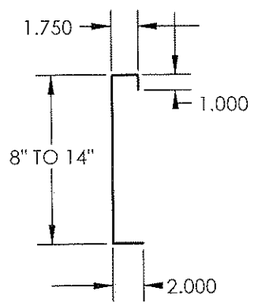




DETAIL A
SCALE 1 : 8



HOLDDOWN
DETAIL



CURB
DETAIL

REGISTERED PROFESSIONAL ENGINEER
CLIFFORD H. JOHNSON
No. 2802
Exp 6-30-09
STRUCTURAL
STATE OF CALIFORNIA
7/11/07

MicroMetl Corporation

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

PRODUCT NUMBER:
KD 560 SERIES ASSEMBLED CURBS

0560-A008-01CBC 8" TALL
0560-A011-01CBC 11" TALL
0560-A014-01CBC 14" TALL

STRUCTURALLY CALCULATED KNOCKED DOWN CURB FOR YORK ZJ, DJ, XP, ZP, 036-060, DR 036-072 DHG, DHE 036-060, DF 072 UNITS

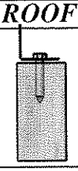
ANCHORAGE DETAILS TO ROOF:

STEEL ATTACHMENT:

SEE STEEL ATTACHMENT DETAIL SHEETS.

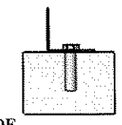
WOOD ATTACHMENT:
(DOUGLAS FIR)

(22) 1/4 x 3" SIMPSON SDS W/WASHER CENTER ON CURB FLANGE, EVENLY SPACED, (7) EACH LONG SIDE, (4) EACH SHORT SIDE



CONCRETE ATTACHMENT:
(3000 PSI MINIMUM, 4" MIN THICKNESS)
(6" MIN EDGE DISTANCE)

(12) 1/2"SIMPSON TITEN HD EVENLY SPACED,CENTER ON CURB FLANGE
8" MIN SPACING
(3) EACH LONG SIDE, (3) EACH SHORT SIDE



DATE: 07/2007
DRAWN BY: MAC
WEIGHT: 80/92/124
MEETS SEISMIC REQUIREMENTS FOR FOLLOWING CODES:
2001 CBC
2006 IBC

ENG007

BJG ARCHITECTURE + ENGINEERING

Structural Calculations
BJG# 20070133

Project:

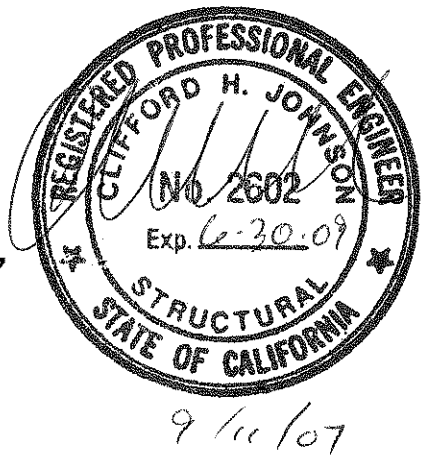
KD 560

Prepared for:

MicroMetl Corporation
905 Southern Way
Sparks, NV 89431

Date:

August 2007



9/11/07

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By: TRH
Date: 9/7/2007
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Curb Information **Product Number 0560**

h_{CURB} =	14	in - Overall height from support substrate to top of curb
L_{CURB} =	69	in - Longitudinal distance from center-to-center of transverse curb members
W_{CURB} =	33.25	in - Transverse distance from center-to-center of longitudinal curb members

Unit Information **YORK ZJ, DJ, XP, ZP, BP 036-060, DR 036-060, DHG, DHE 036-060,**

Wp =	1052	lbs - Max. unit weight
Wc_{MAX} =	190	lbs - Max. corner weight
Wc_{MIN} =	138	lbs - Min. corner weight
h_{UNIT} =	35.125	in - Overall unit height above curb
h_{CM} =	23.416667	in - Height above curb to center of mass
L_{UNIT} =	82.25	in - Overall unit length (longitudinal direction)
W_{UNIT} =	44.875	in - Overall unit length (transverse direction)

Seismic Loading - 2006 International Building Code (2006 IBC)

$Fp_{MAX} = 1.6 * S_{DS} * Ip * Wp$

Ss =	2	(2 is worst case in NV, OR, WA, AZ)
Fa =	1	(1.0 at worst case Site D, Ss ≥ 1.25)
Sms =	2	= FaSs
S_{DS} =	1.33	= 2/3 Sms
Ip =	1.5	(1.5 at worst case Occupancy)
Fp_{MAX} =	3.20	Wp
Fp_{MAX} =	2.29	Wp (ASD)
Fp_{MAX} =	2405	lb (ASD) - ASD values will be used throughout unless noted otherwise

Seismic Loading - 2001 California Building Code (2001 CBC)

$Fp_{MAX} = 4 * Ca * Ip * Wp$

Ca =	0.44	(.44 at worst case at Zone 4, Soil Type Sd)
Na =	1.5	(1.5 at worst case Seismic Source Type A <= 2km)
Ip =	1.5	(1.5 at worst case Occupancy)
Fp_{MAX} =	3.96	Wp
Fp_{MAX} =	2.83	Wp (ASD)
Fp_{MAX} =	2976	lb (ASD) - ASD values will be used throughout unless noted otherwise

Controlling Seismic Loads

Fp_{MAX} =	2.83	Wp (ASD)
Fp_{MAX} =	2976	lb (ASD) - ASD values will be used throughout unless noted otherwise

Wind Loading Check

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

A_{MAX} =	2889	in^2
=	20.1	ft^2

Equivalent wind pressure required to equal seisimic loading (P_{EQ}) = Fp_{MAX} / A_{MAX}

P_{EQ} = 120 psf (ASD) OKAY BY INSPECTION: P > 60 PSF

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

V_{MAX} = 1075 lb per side

Transverse Loading

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

Max ↓ = 3729 lb per side

Max ↑ = Fp max * (hcm + hcurb) / Wcurb - 2 * Wc_{MIN}

Max ↑ = 3073 lb - Uplift per side

Longitudinal Loading

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

Max ↓ = 1994 lb per end

Max ↑ = Fp max * (hcm + hcurb) / (Lcurb - 9") - 2 * Wc_{MIN}

Max ↑ = 1580 lb - Uplift per end

Curb Design - 2001 AISI (ASD)

Fy = 33 ksi Fu = 48 ksi Gage No.= 14 t = 0.0747 in

Compression

Maintain P ≤ Pn / Ω

Pn = Ae * Fn ; Ω = 1.80 ; therefore P_{allow} = 1.33 * Ae * Fn / 1.8 with a 1/3 increase for wind/seismic

$\lambda c = \sqrt{(Fy/Fe)}$

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

$\lambda c \leq 1.5$; $Fn = [0.658 ^ {\lambda c^2}] Fy$

$\lambda c > 1.5$; $Fn = [0.877 / \lambda c^2] Fy$

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

Fe = 1061 psi

λc = 5.58

Fn = 931 psi

Longitudinal Curbs (Transverse Loading)

Ae = 6.396 in^2

P_{allow} = 4398 lb OKAY

Transverse Curbs (Longitudinal Loading)

Ae = 5.061 in^2

P_{allow} = 3480 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 Vmax and Max ↑ = 3256 = $((Vmax)^2 + (Max\ ↑)^2)^{1/2}$

Total Screws required at connectors = 5 =Resultant/ 2 connectors per side / allowable Shear

Corner Connectors

Resultant Force from Vmax and Max ↑ = 3256 = $((Vmax)^2 + (Max\ ↑)^2)^{1/2}$

Total Screws required at connectors = 3 =Resultant/ 2 connectors per side / allowable Shear

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Anchorage to Supporting Structure

Shear to each long side = 1075 lbs
Shear to each short side = 1075 lbs

Transverse Loading

Max ↑ = Fp max * (hcm + hcurb) / Wcurb - 2 * Wc_{MIN}

Max ↑ = 3073 lb - Uplift per side

Longitudinal Loading

Max ↑ = Fp max * (hcm + hcurb) / (Lcurb - 9") - 2 * Wc_{MIN}

Max ↑ = 1580 lb - Uplift per end

Anchorage to Concrete Pad

4 in. thick conrete 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 = 1605 lbs in **shear**
w/ 1/2" Simpson Titen HD, allow = 1155 lbs in **tension**

Try 3 Titen HD's per long side at a minimum
Try 3 Titen HD's per short side

(Actual Shear / Allowable Shear)^(5/3) + (Actual Tension / Allowable Tension)^(5/3) ≤1.0

Elliptical Interaction Equation = 0.901 at the long sides **OK, less than 1.0**
Elliptical Interaction Equation = 0.352 at the short sides **OK, less than 1.0**

Anchorage to Wood sub-Structure

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

Allow Shear = 470 lb per simpson catalog
Allow Tension = 550 lb assuming 2" penetration per NDS Table 11.2B (#14 wood screw)

4 screws required for uplift long side
0 screws required for uplift short side

3 screws required for shear both sides

7 **total screws required long side** 11.50 inches maximum spacing
3 **total screws required short side** 16.6 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 0560**

h_{CURB} =	11	in - Overall height from support substrate to top of curb
L_{CURB} =	69	in - Longitudinal distance from center-to-center of transverse curb members
W_{CURB} =	33.25	in - Transverse distance from center-to-center of longitudinal curb members

Unit Information **YORK ZJ, DJ, XP, ZP, BP 036-060, DR 036-060, DHG, DHE 036-060,**

Wp =	1052	lbs - Max. unit weight
Wc_{MAX} =	190	lbs - Max. corner weight
Wc_{MIN} =	138	lbs - Min. corner weight
h_{UNIT} =	35.125	in - Overall unit height above curb
h_{CM} =	23.416667	in - Height above curb to center of mass
L_{UNIT} =	82.25	in - Overall unit length (longitudinal direction)
W_{UNIT} =	44.875	in - Overall unit length (transverse direction)

Seismic Loading - 2006 International Building Code (2006 IBC)

$Fp_{MAX} = 1.6 * S_{DS} * Ip * Wp$

Ss =	2	(2 is worst case in NV, OR, WA, AZ)
Fa =	1	(1.0 at worst case Site D, Ss ≥ 1.25)
Sms =	2	= FaSs
S_{DS} =	1.33	= 2/3 Sms
Ip =	1.5	(1.5 at worst case Occupancy)
Fp_{MAX} =	3.20	Wp
Fp_{MAX} =	2.29	Wp (ASD)
Fp_{MAX} =	2405	lb (ASD) - ASD values will be used throughout unless noted otherwise

Seismic Loading - 2001 California Building Code (2001 CBC)

$Fp_{MAX} = 4 * Ca * Ip * Wp$

Ca =	0.44	(.44 at worst case at Zone 4, Soil Type Sd)
Na =	1.5	(1.5 at worst case Seismic Source Type A <= 2km)
Ip =	1.5	(1.5 at worst case Occupancy)
Fp_{MAX} =	3.96	Wp
Fp_{MAX} =	2.83	Wp (ASD)
Fp_{MAX} =	2976	lb (ASD) - ASD values will be used throughout unless noted otherwise

Controlling Seismic Loads

Fp_{MAX} =	2.83	Wp (ASD)
Fp_{MAX} =	2976	lb (ASD) - ASD values will be used throughout unless noted otherwise

Wind Loading Check

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

A_{MAX} =	2889	in^2
=	20.1	ft^2

Equivalent wind pressure required to equal seisimic loading (P_{EQ}) = Fp_{MAX} / A_{MAX}

P_{EQ} =	120	psf (ASD) OKAY BY INSPECTION: P > 60 PSF

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

V_{MAX} = 1075 lb per side

Transverse Loading

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

Max ↓ = 3460 lb per side

Max ↑ = Fp max * (hcm + hcurb) / Wcurb - 2 * Wc_{MIN}

Max ↑ = 2804 lb - Uplift per side

Longitudinal Loading

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

Max ↓ = 1864 lb per end

Max ↑ = Fp max * (hcm + hcurb) / (Lcurb - 9") - 2 * Wc_{MIN}

Max ↑ = 1431 lb - Uplift per end

Curb Design - 2001 AISI (ASD)

Fy = 33 ksi Fu = 48 ksi Gage No.= 16 t = 0.0598 in

Compression

Maintain P ≤ Pn / Ω

Pn = Ae * Fn ; Ω = 1.80 ; therefore P_{allow} = 1.33 * Ae * Fn / 1.8 with a 1/3 Increase for wind/seismic

$\lambda c = \sqrt{(Fy/Fe)}$

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

$\lambda c \leq 1.5$; $Fn = [0.658 ^ {\lambda c^2}] Fy$

$\lambda c > 1.5$; $Fn = [0.877 / \lambda c^2] Fy$

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

Fe = 1101 psi

λc = 5.47

Fn = 966 psi

Longitudinal Curbs (Transverse Loading)

Ae = 5.120 in^2

P_{allow} = 3655 lb OKAY

Transverse Curbs (Longitudinal Loading)

Ae = 4.051 in^2

P_{allow} = 2892 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 Vmax and Max ↑ = 3004 = $((Vmax)^2 + (Max\ ↑)^2)^{1/2}$

Total Screws required at connectors = 4 =Resultant/ 2 connectors per side / allowable Shear

Corner Connectors

Resultant Force from Vmax and Max ↑ = 3004 = $((Vmax)^2 + (Max\ ↑)^2)^{1/2}$

Total Screws required at connectors = 3 =Resultant/ 2 connectors per side / allowable Shear

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Anchorage to Supporting Structure

Shear to each long side = **1075** lbs
Shear to each short side = **1075** lbs

Transverse Loading

Max ↑ = Fp max * (hcm + hcurb) / Wcurb - 2 * Wc_{MIN}

Max ↑ = 2804 lb - Uplift per side

Longitudinal Loading

Max ↑ = Fp max * (hcm + hcurb) / (Lcurb - 9") - 2 * Wc_{MIN}

Max ↑ = 1431 lb - Uplift per end

Anchorage to Concrete Pad

4 in. thick conrete 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 = **1605** lbs in **shear**
w/ 1/2" Simpson Titen HD, allow = **1155** lbs in **tension**

Try **3** Titen HD's per long side at a minimum
Try **3** Titen HD's per short side

(Actual Shear / Allowable Shear)^(5/3) + (Actual Tension / Allowable Tension)^(5/3) ≤1.0

Elliptical Interaction Equation = **0.785** at the long sides **OK, less than 1.0**
Elliptical Interaction Equation = **0.311** at the short sides **OK, less than 1.0**

Anchorage to Wood sub-Structure

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

Allow Shear = **470** lb per simpson catalog
Allow Tension = **550** lb assuming 2" penetration per NDS Table 11.2B (#14 wood screw)

4 screws required for uplift long side
0 screws required for uplift short side

3 screws required for shear both sides

7 **total screws required long side** **11.50** inches maximum spacing
3 **total screws required short side** **16.6** 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 0560**

h_{CURB} =	8	in - Overall height from support substrate to top of curb
L_{CURB} =	69	in - Longitudinal distance from center-to-center of transverse curb members
W_{CURB} =	33.25	in - Transverse distance from center-to-center of longitudinal curb members

Unit Information **YORK ZJ, DJ, XP, ZP, BP 036-060, DR 036-060, DHG, DHE 036-060,**

Wp =	1052	lbs - Max. unit weight
Wc_{MAX} =	190	lbs - Max. corner weight
Wc_{MIN} =	138	lbs - Min. corner weight
h_{UNIT} =	35.125	in - Overall unit height above curb
h_{CM} =	23.416667	in - Height above curb to center of mass
L_{UNIT} =	82.25	in - Overall unit length (longitudinal direction)
W_{UNIT} =	44.875	in - Overall unit length (transverse direction)

Seismic Loading - 2006 International Building Code (2006 IBC)

$Fp_{MAX} = 1.6 * S_{DS} * Ip * Wp$

Ss =	2	(2 is worst case in NV, OR, WA, AZ)
Fa =	1	(1.0 at worst case Site D, Ss ≥ 1.25)
Sms =	2	= FaSs
S_{DS} =	1.33	= 2/3 Sms
Ip =	1.5	(1.5 at worst case Occupancy)
Fp_{MAX} =	3.20	Wp
Fp_{MAX} =	2.29	Wp (ASD)
Fp_{MAX} =	2405	lb (ASD) - ASD values will be used throughout unless noted otherwise

Seismic Loading - 2001 California Building Code (2001 CBC)

$Fp_{MAX} = 4 * Ca * Ip * Wp$

Ca =	0.44	(.44 at worst case at Zone 4, Soil Type Sd)
Na =	1.5	(1.5 at worst case Seismic Source Type A <= 2km)
Ip =	1.5	(1.5 at worst case Occupancy)
Fp_{MAX} =	3.96	Wp
Fp_{MAX} =	2.83	Wp (ASD)
Fp_{MAX} =	2976	lb (ASD) - ASD values will be used throughout unless noted otherwise

Controlling Seismic Loads

Fp_{MAX} =	2.83	Wp (ASD)
Fp_{MAX} =	2976	lb (ASD) - ASD values will be used throughout unless noted otherwise

Wind Loading Check

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

A_{MAX} =	2889	in^2
=	20.1	ft^2

Equivalent wind pressure required to equal seisimic loading (P_{EQ}) = Fp_{MAX} / A_{MAX}

P_{EQ} = 120 psf (ASD) OKAY BY INSPECTION: P > 60 PSF

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

V_{MAX} = 1075 lb per side

Transverse Loading

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

Max ↓ = 3192 lb per side

Max ↑ = Fp max * (hcm + hcurb) / Wcurb - 2 * Wc_{MIN}

Max ↑ = 2536 lb - Uplift per side

Longitudinal Loading

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

Max ↓ = 1735 lb per end

Max ↑ = Fp max * (hcm + hcurb) / (Lcurb - 9") - 2 * Wc_{MIN}

Max ↑ = 1282 lb - Uplift per end

Curb Design - 2001 AISI (ASD)

Fy = 33 ksi Fu = 48 ksi Gage No.= 16 t = 0.0598 in

Compression

Maintain P ≤ Pn / Ω

Pn = Ae * Fn ; Ω = 1.80 ; therefore P_{allow} = 1.33 * Ae * Fn / 1.8 with a 1/3 Increase for wind/seismic

$\lambda c = \sqrt{(Fy/Fe)}$

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

$\lambda c \leq 1.5$; $Fn = [0.658 ^ \lambda c^2] Fy$

$\lambda c > 1.5$; $Fn = [0.877 / \lambda c^2] Fy$

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
Fe = 2082 psi
λc = 3.98
Fn = 1826 psi

Longitudinal Curbs (Transverse Loading)

Ae = 5.120 in^2
P_{allow} = 6909 lb OKAY

Transverse Curbs (Longitudinal Loading)

Ae = 4.051 in^2
P_{allow} = 5467 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 Vmax and Max ↑ = 2754 = $((Vmax)^2 + (Max\ ↑)^2)^{1/2}$
Total Screws required at connectors = 4 =Resultant/ 2 connectors per side / allowable Shear

Corner Connectors

Resultant Force from Vmax and Max ↑ = 2754 = $((Vmax)^2 + (Max\ ↑)^2)^{1/2}$
Total Screws required at connectors = 2 =Resultant/ 2 connectors per side / allowable Shear

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Anchorage to Supporting Structure

Shear to each long side = **1075** lbs
Shear to each short side = **1075** lbs

Transverse Loading

Max ↑ = Fp max * (hcm + hcurb) / Wcurb - 2 * Wc_{MIN}

Max ↑ = 2536 lb - Uplift per side

Longitudinal Loading

Max ↑ = Fp max * (hcm + hcurb) / (Lcurb - 9") - 2 * Wc_{MIN}

Max ↑ = 1282 lb - Uplift per end

Anchorage to Concrete Pad

4 in. thick conrete 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 = **1605** lbs in **shear**
w/ 1/2" Simpson Titen HD, allow = **1155** lbs in **tension**

Try **3** Titen HD's per long side at a minimum
Try **3** Titen HD's per short side

(Actual Shear / Allowable Shear)^(5/3) + (Actual Tension / Allowable Tension)^(5/3) ≤1.0

Elliptical Interaction Equation = **0.676** at the long sides **OK, less than 1.0**
Elliptical Interaction Equation = **0.273** at the short sides **OK, less than 1.0**

Anchorage to Wood sub-Structure

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

Allow Shear = **470** lb per simpson catalog
Allow Tension = **550** lb assuming 2" penetration per NDS Table 11.2B (#14 wood screw)

4 screws required for uplift long side
0 screws required for uplift short side

3 screws required for shear both sides

7 **total screws required long side** **11.50** inches maximum spacing
3 **total screws required short side** **16.6** 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.