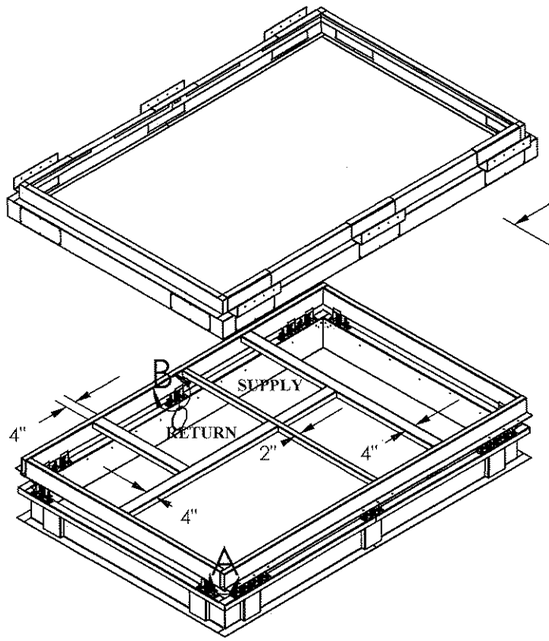
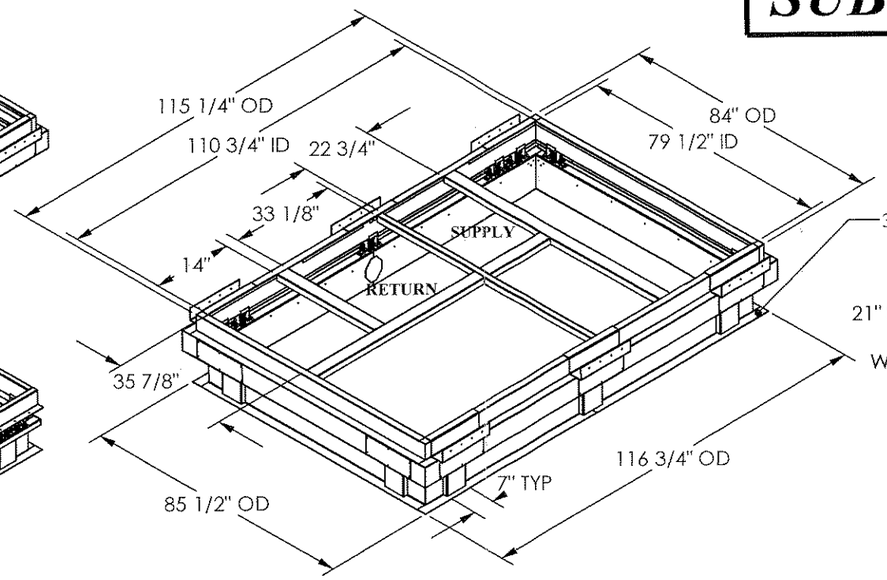
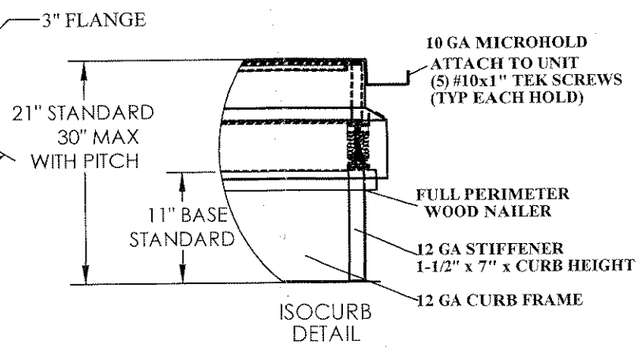
SUBMITTAL | 0403-622A SERIES

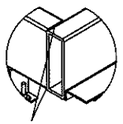
* WELDED CONSTRUCTION
* PERIMETER WOOD NAILER
* GASKET PACKAGE
* FACTORY INSTALLED HOLDDOWNS
* OSHPD PRE-APPROVED 2" DEF SEISMIC RESTRAINTS (OPA#0070)





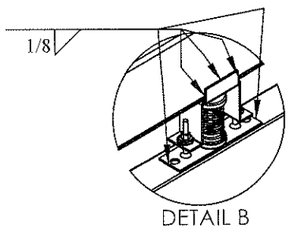


ISOCURB DETAIL



SEAM WELD TOP AND SIDES
(TYP. 4 CORNERS)

DETAIL A
SCALE 1 : 10



DETAIL B
SCALE 1 : 8

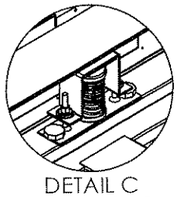
2X6 TUBE STEEL
SUPPORT ASSY DETAILS

FOR BOLTED ON ISOLATORS

FOR BOLTED ON ISOLATORS ADD "BOLT" TO PART#
EX: 0403-622A-01CBC-BOLT

IF BOLTED RESTRAINTS ARE PREFERRED, IT MUST BE NOTED AT TIME OF ORDER.

BOLTS WILL BE 1/2" X 2", 2 PER ISOLATOR
1/2" FLAT WASHER, 2 PER BOLT,
1/2" NUT
1/4" THICK NEOPRENE PAD IS PLACED BETWEEN RESTRAINT AND CURB
NEOPRENE CUP WILL BE UNDER SPRING.



DETAIL C
SCALE 1 : 8

REGISTERED PROFESSIONAL ENGINEER
CLIFFORD H. JOHNSON
No. 2602
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

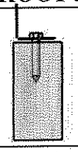
PRODUCT NUMBER:		
0403-622A ISOLATION CURBS	*0403-622A-8B-01CBC*	*18" TALL*
	0403-622A-01CBC	*21" TALL*
	0403-622A-14B-01CBC	*14" TALL*

STRUCTURALLY CALCULATED VIBRATION ISOLATION CURB FOR YORK DCE, DCG,DM, BCH, DEG, DEE 180

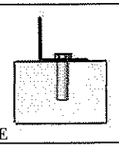
ANCHORAGE DETAILS TO ROOF:

STEEL ATTACHMENT:
SEE STEEL ATTACHMENT DETAIL SHEETS.

WOOD ATTACHMENT:
(DOUGLAS FIR)
(76) 1/4 x 3" SIMPSON SDS W/WASHER CENTER ON CURB FLANGE, EVENLY SPACED, (20) EACH LONG SIDE, (18) EACH SHORT SIDE



CONCRETE ATTACHMENT:
(3000 PSI MINIMUM, 4" MIN THICKNESS)
(6" MIN EDGE DISTANCE)
(26) 1/2"SIMPSON TITEN HD EVENLY SPACED,CENTER ON CURB FLANGE 8" MIN SPACING
(7) EACH LONG SIDE, (6) EACH SHORT SIDE



DATE: 07/2007
DRAWN BY: MAC
WEIGHT 960/1020/1080
MEETS SEISMIC REQUIREMENTS FOR FOLLOWING CODES:
2001 CBC
2006 IBC

ENG007

BJG ARCHITECTURE + ENGINEERING

Structural Calculations
BJG# 20070133

Project:

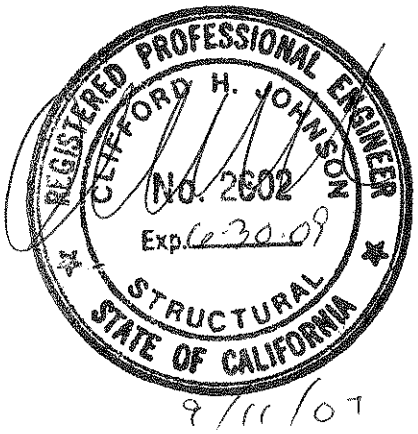
0403-622A

Prepared for:

MicroMetl Corporation
905 Southern Way
Sparks, NV 89431

Date:

August 2007



9/11/07

6995 Sierra Center Parkway Suite 200 Reno Nevada 89511 Phone 775.827.1010 Fax 775.827.1663 www.bjginc.com

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By:	**TRH**
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Frame and Support Curb Information **Product Number 0403-622A-01CBC**

h_{FRAME} =	**30**	in - Overall height from support substrate to top of curb
$h_{SUPPORT}$ =	**6**	in - Height of support curb from top of isolators to bottom of unit
L_{CURB} =	**110.75**	in - Longitudinal distance from center-to-center of transverse curb members
W_{CURB} =	**79.5**	in - Transverse distance from center-to-center of longitudinal curb members
h_i =	**4.5**	in - Height of isolator
d_i =	**7.5**	in - Dist. off long member end to isolator
d_{HD} =	**7.5**	in - Dist. off short member end to holddown

Unit Information

W_P =	**3085**	lbs - Max. unit weight
h_{UNIT} =	**52.625**	in - Overall unit height above curb
h_{CM} =	**35.1**	in - Height above curb to center of mass
L_{UNIT} =	**136.25**	in - Overall unit length (longitudinal direction)
W_{UNIT} =	**92**	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} =	7051	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} =	8726	lb (ASD) - ASD values will be used throughout unless noted otherwise

Controlling Seismic Loads

Fp_{MAX} =	2.83	Wp (ASD)
Fp_{MAX} =	8726	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} =	**7170**	in^2
=	**49.8**	ft^2

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

P_{EQ} = **175** psf (ASD) **OKAY BY INSPECTION: P > 60 PSF**

Connectors from Unit to Support:

Use Self-drilling, Self Tapping Steel Screws, allowable load per Table IV-7A of the cold formed steel manual
#10 screw allowable load in 16 gage minimum material is 463 lbs each

Transverse or Longitudinal Loading

$V_{each\ side} = 2/3 * Fp_{MAX}$ (ASD)

V_{HD} = 5817 lb per side (where applicable)

Transverse Loading

Holddowns:

N_{HD} = 3 Number of holddowns per long side

$R_{HD1} = (Fp_{MAX} * h_{CM}) / (N_{HD} * W_{CURB}) - 1/3 * W_P$

R_{HD1} = 255 lb per HD uplift

V_{HD} = 0 lb per HD

Max Resultant Force = 255 lb per HD
Min Screws Required = 2 per HD

Isolators:

$R_{MAX} = (Fp_{MAX} * (h_{cm} + h_s)) / W_{CURB} + 2/3 * W_P$

R_{MAX} = 6566 lb per side - Downward

$RISO_{MIN} = (Fp_{MAX} * (h_{cm} + h_s)) / W_{CURB} - 1/3 * W_P$

$R_{ISO\ MIN}$ = 3481 lb per side uplift

$V_{ISO} = F_{pMAX}/(\#\ Iso)$

V_{ISO} = 0 lb per side

Longitudinal Loading

Holddowns:

$R_{HD1} = (F_{pmax} * h_{cm}) / (2*(L_{UNIT} - d_{HD}) - 1/6*W_P$

R_{HD1} = 675 lb per HD Assume all uplift into end holddowns

V_{HD} = 1939 lb per HD

Max Resultant Force = 2053 lb per HD
Min Screws Required = 5 per HD

Isolators:

$R_{MAX} = (Fp_{MAX} * (h_{cm} + h_s)) / (L_{CURB} - 2d_i) + 2/3 * W_P$

R_{MAX} = 5801 lb per side - Downward

$R_{ISO\ MIN} = (Fp_{MAX} * (h_{cm} + h_s)) / (L_{CURB} - 2d_i) - 1/3 * W_P$

$R_{ISO\ MIN}$ = 2716 lb per side uplift

$V_{ISO} = V_{each\ side}$

V_{ISO} = 5817 lb per side

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Isolator Load Summary

USE | 5 | TYPE **OPA0070** Isolator restraints each long side for shear and vertical

USE | 2 | TYPE **OPA0070** Isolator restraints each short side for shear

Max. $V_{ISO} \leftrightarrow$ = V_{ISO} max. due to transverse or longitudinal loading

Max. $V_{ISO} \leftrightarrow$ = **5817** lb per side Max. $V_{ISO} \leftrightarrow$ = **831** lb each isolator

Max. $R_{ISO} \downarrow$ = max. downward force due to transverse or longitudinal loading

Max. $R_{ISO} \downarrow$ = **6566** lb per side Max. $R_{ISO} \downarrow$ = **1313** lb each isolator

Max. $R_{ISO} \uparrow$ = max. uplift force due to transverse or longitudinal loading

Max. $R_{ISO} \uparrow$ = **3481** lb per side Max. $R_{ISO} \uparrow$ = **696** lb each isolator

PRE-APPROVED MAXIMUM ALLOWABLE LOADS

Allowable Horizontal =	1000	lb each isolator	OKAY
Allowable Vertical =	1600	lb each isolator	OKAY

Tube Steel Support Assembly

Use 10GA cold-formed overlapping channels, 6" tall, 1.125" wide; Use properties for hollow rectangle

Conditions and formulas per AISI Cold-Formed Steel Specification (2001) Analyze as a beam

Bending: (Per C3.1)

t =	0.134	in
Fy =	33	ksi
b =	1.125	in
d =	6	in
C_b =	1.14	AISC 13th ed. Table 3-1
E =	29000	ksi
G =	11500	ksi
I_y =	0.41	in^4
J =	1.71	in^4
S_x =	2.057	in^3
Ax =	1.61	in^2
$b_1 = b - 2 * t$ =	0.857	in
$d_1 = d - 2 * t$ =	5.732	in
$L = (L_{CURB} - 2 * d_{ij})/2$ =	47.875	in
$L_u = L / 2$ =	23.94	in
$b_{eff} = b - 3 * t$ =	0.723	in
$h_{eff} = d - 3 * t$ =	5.598	in

Allowed Lateral Unbraced Length, L_A

$L_A = 0.36 * C_b \pi / (F y S_y) * (E G J I y)^{1/2}$

L_A = **291.2** in (Eq. C3.1.2.2-1)

Ω_b = **1.67**

If laterally unbraced length is less than or equal to L_u, then the nominal moment M_n shall be used

Lu < La OKAY

$M_n = S_e F_y$

M_n / Ω_b = **40.6** k-in (Eq. C3.1.1-1)

Max moment due to center holddown, M_u

$M_u = WL^2/8$

M_u = **39293.94** lb-in

M_u = **39.29** k-in

BENDING OKAY

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Shear: (Per C3.2.1)

Ω_v =	1.60	
h / t =	44.8	
k_v =	5.34	
$\sqrt{(Ek_v / F_y)}$ =	68.5	
Aw =	1.61	in^2
F_v =	19.80	ksi

F_v per Eqs. C3.2.1-2, 3, 4

Nominal Shear Strength

$V_n = A_w F_v$

V_n =	31.8	kips	(Eq. C3.2.1-1)
V_n / Ω_v =	19.9	kips	

Max Shear Force

$V_u = R_{MAX} / 2$

V_u =	3.28	kips	OKAY

Web Crippling: (Per C3.4.1)

C =	7.5	
C_h =	0.048	
C_N =	0.12	
C_R =	0.08	
Ω_w =	1.75	
N =	4	in.
R =	0.25	in.
θ =	90	°

Note: N = Bearing length per isolator

Nominal Web Crippling Strength

$P_n = Ct^2F_y \sin\theta(1-C_R(R/t)^{1/2})(1+C_N(N/t)^{1/2})(1-C_h(h/t)^{1/2})$

P_n =	4.45	kips / web	(Eq. C3.4.1-1)
P_n =	8.90	kips	
P_n / Ω_w =	5.084	kips	

$P_u = R_{MAX}$ / # of isolators per side

P_u =	1.313	kips	(long side)
P_u =	2.90	kips	(short side)

OKAY

Frame Assembly Stiffeners

Use 12 gage stiffener material

Conditions and formulas per AISI Cold-Formed Steel Specification (2001)

t =	0.105	in
Fy =	33	ksi
Length =	7	in
Width =	1.5	in
Height =	20	in
Ω_C =	1.8	
A =	1.03	in^2
r_1 =	0.65	in
r_2 =	2.51	in
kl/r_{min} =	30.8	

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

F_e =	301.18	ksi	(Eq. C4.1-1)

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

λ_c =	0.33		(Eq. C4-4)
F_n =	25.01	ksi	(Eq. C4-2,3)

$P_n = A_e F_n$

P_n =	25.71	kips	(Eq. C4-1)
P_n/Ω_c =	14.28	kips	

$P_U = R_{MAX} / 2$

P_U =	3283.04	lbs	
P_U =	3.28	kips	STIFFENER OKAY

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Anchorage to Supporting Structure

Shear to each long side = **5817** lbs
Shear to each short side = **5817** lbs

$R_{ISO\ MIN} = (Fp_{MAX} * (h_{cm} + h_{frame})) / W_{CURB} - 1/3 * W_P$
Uplift to each long side = **6115** lbs
$R_{ISO\ MIN} = (Fp_{MAX} * (h_{cm} + h_{frame})) / (L_{CURB} - 2 * d_i) - 1/3 * W_P$
Uplift to each short side = **4903** lbs

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 **7** Titen HD's per long side at a minimum
Try **6** Titen HD's per short side

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

Elliptical Interaction Equation = **0.962** at the long sides **OK, less than 1.0**
Elliptical Interaction Equation = **0.993** 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)

7 screws required for uplift long side
5 screws required for uplift short side

13 screws required for shear both sides

20 **total screws required long side** **5.80** inches maximum spacing
18 **total screws required short side** **4.6** 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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Anchorage to Steel

Note: Connection evaluated without consideration of bolt hole deformation.

With A307 1/2" Bolts...

t =	0.060	in
F_y =	33	ksi
F_u =	45	ksi
e=	1	in.
d=	1/2	in.
width=	3	in.

$R_{ISO\ MIN} = (Fp_{MAX} * (h_{cm} + h_{frame})) / W_{CURB} - 1/3 * W_P$

Uplift to each long side = **6115** lbs

$R_{ISO\ MIN} = (Fp_{MAX} * (h_{cm} + h_{frame})) / (L_{CURB} - 2 * d_i) - 1/3 * W_P$

Uplift to each short side = **4903** lbs

Shear to each long side = **5817** lbs

Shear to each short side = **5817** lbs

Design strength based on spacing and edge distance:

P_n=	2.7	kips/bolt
F_u/F_y=	1.36	
Ω=	2.00	
Φ=	0.70	
P_n/Ω=	1.35	kips/bolt
ΦP_n=	1.89	kips/bolt
3d=	1 1/2	NOTE: Distance between bolt hole centers must be greater than 3d.
1.5d=	3/4	NOTE: Distance from edge of connection to bolt hole center must be greater than 1.5d

Design strength based on bearing:

NOTE: bolt hole deformation is not considered

C=	3	in^2
m_f=	0.75	Table E3.3.1-2
Ω=	2.50	
Φ=	0.60	
P_n=	3.0375	kips/bolt
P_n/Ω=	1.215	kips/bolt
ΦP_n=	1.82	kips/bolt

Design strength based on bolt shear:

P_n=	5.3	kips/bolt	(Table IV-6)
Ω=	2.40		
Φ=	0.65		
P_n/Ω=	2.21	kips/bolt	
ΦP_n=	3.45	kips/bolt	

Governing limit state:

			Governing Limit State
P_n/Ω=	1.22	kips/bolt	Bearing Strength
ΦP_n=	1.82	kips/bolt	Bearing Strength

6	# of bolts for the long side
5	# of bolts for the short side