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**Project:**

BMS Wall Mount

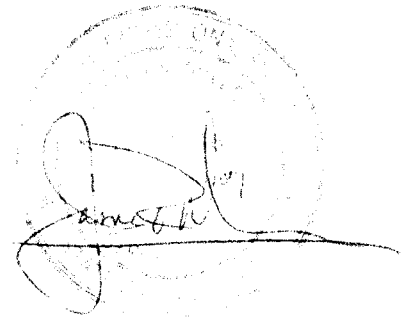
Steel Studs

**Job No.**

J051004

**Client:**

Business Machine Security



**Date:**

5/10/2004

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REV	DESCRIPTION	DATE
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## Structural Calculations

### Commentary

This mounting bracket is designed to support a piece of audio-visual equipment which weighs 200 lb and an additional hanging load of 150 lb. Anchorage design is provided for steel studs. All design is based on the latest edition of the Uniform Building Code and C.A.C. Title 24.

### Description

Model: **WVT-25** The attached drawings provide construction and erection details of the proposed mounting bracket.

### Specifications

Sheet metal screws (for steel stud installations): OSHPD, "Suggested Capacity for Screws Connecting Steel to Steel", August 16, 1994

### Seismic Loading

$$V = (3.0 * Ca / R) * W$$

For UBC Zone 4,

$$Na = 1.5 \quad (< 2 \text{ km from "A" fault})$$

$$Ca = 0.44 * Na$$

$$= 0.66 \quad R = 2.2$$

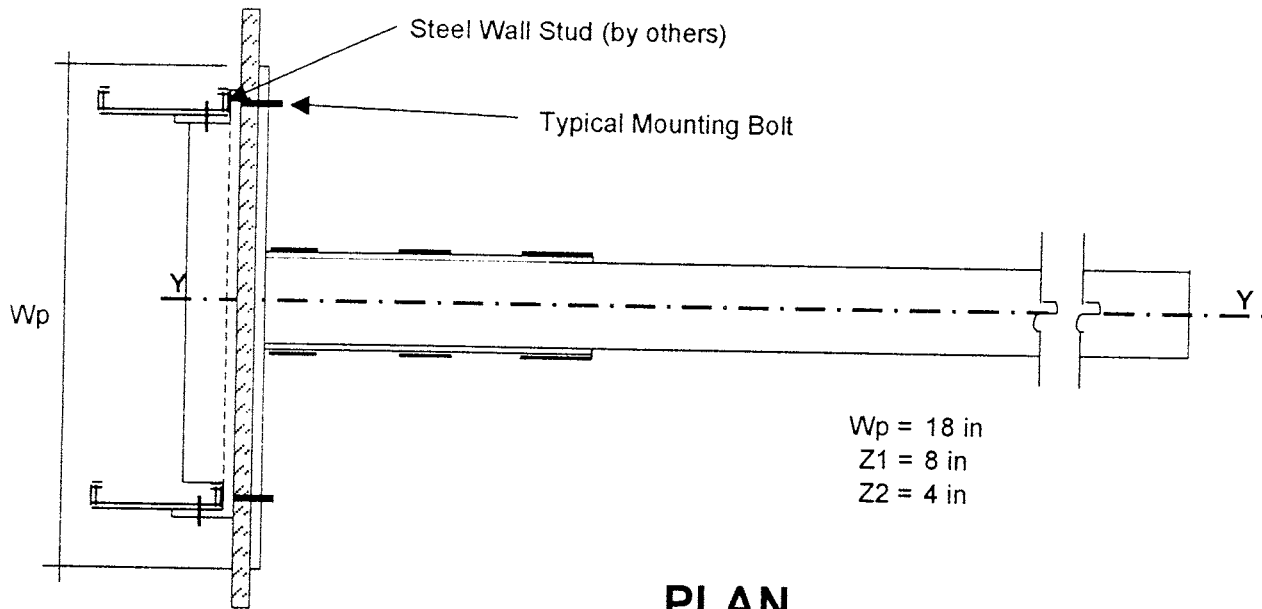
$$V = 0.90 * W$$

### Analysis

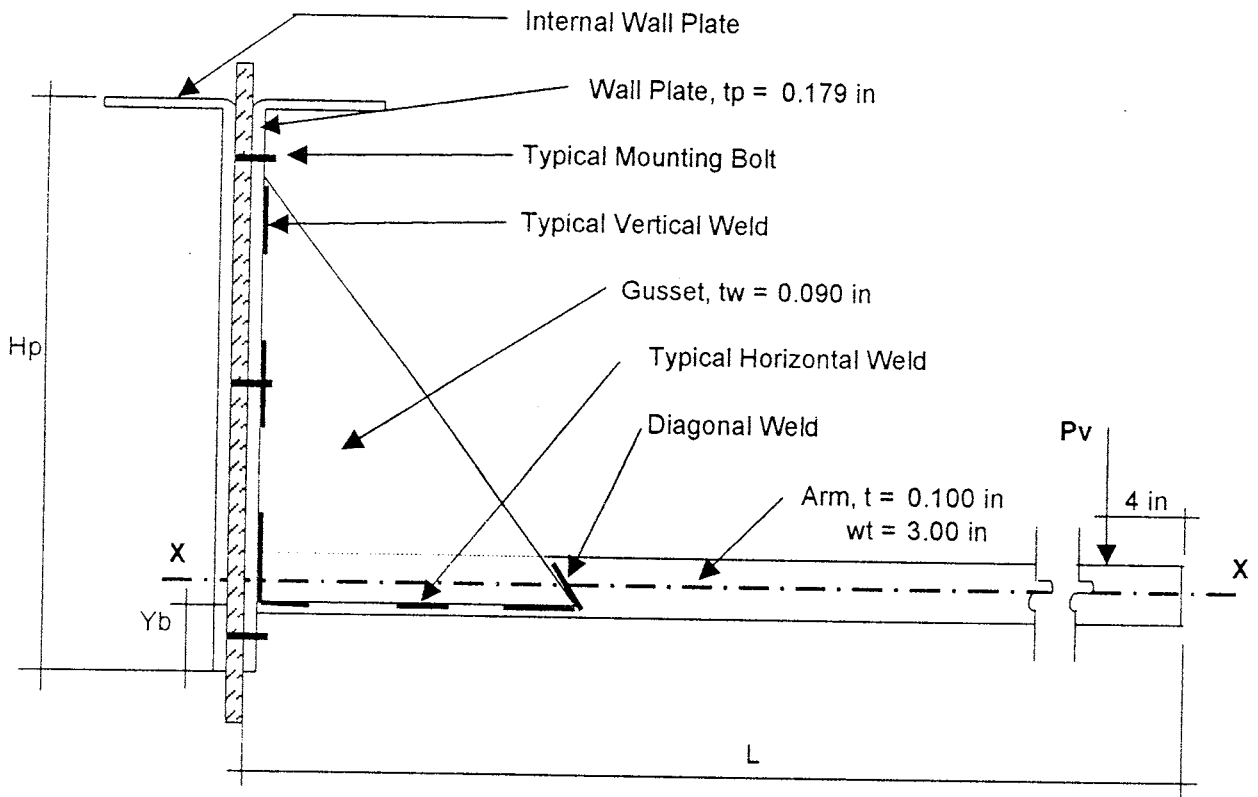
Load combination 1: Dead Load + Live Load

Load combination 2: Dead Load + Seismic Load

Comb 1	W = 350 lb	H = 0 lb
Comb 2	W = 200 lb	H = 180 lb



**PLAN**



Xp = 4.00 in  
Yb = 2.00 in  
Xt = 4.00 in

Hp = 13.00 in  
Yt = 11.00 in

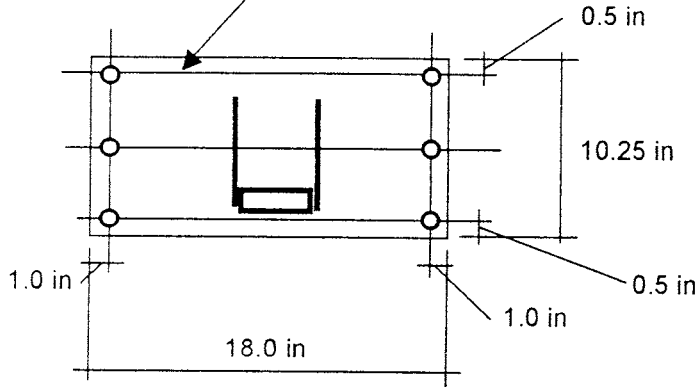
L = 22.00 in

**SIDE SECTION / ELEVATION**

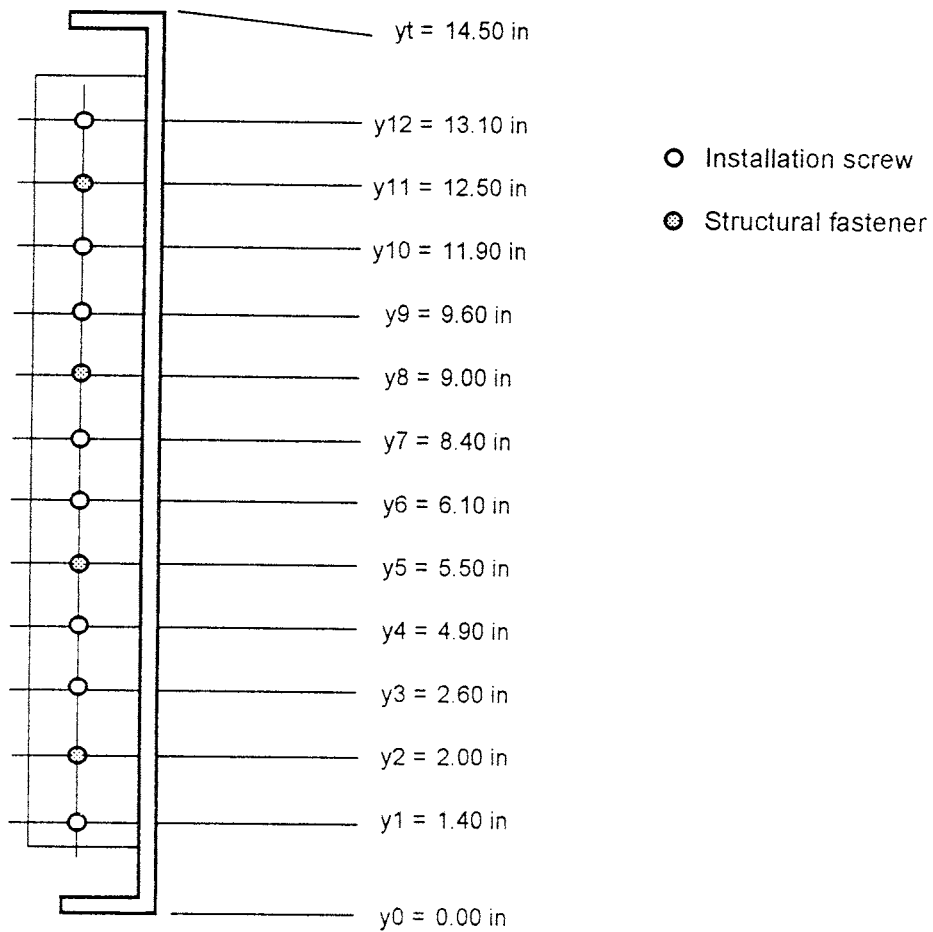
Date: 05/10/04

Sheet 3 of 5

Mounting Stud (typ)



### FRONT ELEVATION



### SIDE ELEVATION (Internal Wall Plate Flange)

**Center of gravity and moment of inertia of mounting bolt system**

For 3 / 8" dia machine bolt,  
 Bolt dia = 0.375 in                      Abolt = 0.11 in<sup>2</sup>  
 no. of rows = 3                      no. of bolts/row, n = 2  
 y1 = 0.50 in  
 y2 = 5.13 in  
 y3 = 9.75 in  
  
 tw = 0.090 in                      tc1 = 0.269 in  
 tt = 0.100 in                      tc2 = 0.279 in

Find neutral axis of configuration as shown:

$$Ay^2 + By + C = 0$$

A = tc1 = 0.269  
 B = -2tc1Yb + tc2wt + 4Ab = 0.469  
 C = -2Ab\*(Y3+Y2) + tc1Yb<sup>2</sup> - tc2wtYb = -3.34  
 y = 2.76 in

**Effective Section Properties:**

Element	Area	d (in)	Ad <sup>2</sup>	Ix
Gussets	0.408	0.379	0.059	0.01
Arm	0.300	0.758	0.173	
Bolts Row 2	0.221	2.367	1.237	
Bolts Row 3	0.221	6.992	10.798	
Sum =	1.15 in <sup>2</sup>		12.3 in <sup>4</sup>	

**Determine anchor forces**

Load Comb.	Tension	Shear	Mb	fv	Pa/A	Mb*(c/l)	ft	T
1	0.00 K	0.35 K	6.3 in-K	0.53 Ksi	0.00	3.59	3.59 ksi	0.40 K
2	0.18 K	0.20 K	3.6 in-K	0.30 Ksi	0.41	2.05	2.46 ksi	0.27 K

For 3/8" dia. A307 bolts, Fv = 10.00 ksi  
 Ft = 20.00 ksi

Comb 1      CSR = 0.23      < 1.0, OK  
 Comb 2      CSR = 0.15      < 1.0, OK

**Center of gravity and moment of inertia of internal bolt system**

For 1 / 4" dia machine bolt,

Bolt dia = 0.250 in                      Abolt = 0.05 in<sup>2</sup>

no. of rows = 4                      no. of bolts/row, n = 2

y2 = 2.00 in

y5 = 5.50 in

y8 = 9.00 in

y11 = 12.50 in

wf = 1.500 in

Find neutral axis of configuration as shown:

$$Ay^2 + By + C = 0$$

$$A = wf / 2 = 0.750$$

$$B = -wf * Y0 + 4Ab = 0.196$$

$$C = wf * Y0^2 / 2 - Ab * (Y2+Y5+Y8+Y11) = -1.424$$

$$y = 1.25 \text{ in}$$

Effective Section Properties:

Element	Area	d (in)	Ad <sup>2</sup>	x
Flanges	3.759	-0.37	0.524	0.25
Bolts Row 1	0.098	0.75	0.055	
Bolts Row 2	0.098	4.25	1.771	
Bolts Row 3	0.098	7.75	5.892	
Bolts Row 4	0.098	11.25	12.419	
Sum =	4.15 in <sup>2</sup>		20.7 in <sup>4</sup>	

Determine anchor forces

Load Comb.	Vhor	Vvert	Mb	fvert	Ph/A	Mb*(c/l)	fvhor	Vhor
1	0.00 K	0.35 K	6.3 in-K	44 lb	0.00	3.43	3.43 ksi	168 lb
2	0.18 K	0.20 K	3.6 in-K	25 lb	0.92	1.96	2.88 ksi	141 lb

For 1/4"dia. Sheet metal screws,

18 ga. studs    Vallow = 302 lb

Comb 1        Vres = 174 lb                      CSR = 0.58                      < 1.0, OK

Comb 2        Vres = 143 lb                      CSR = 0.47                      < 1.0, OK

20 ga. studs    Vallow = 203 lb

Comb 1        Vres = 174 lb                      CSR = 0.86                      < 1.0, OK

Comb 2        Vres = 143 lb                      CSR = 0.71                      < 1.0, OK