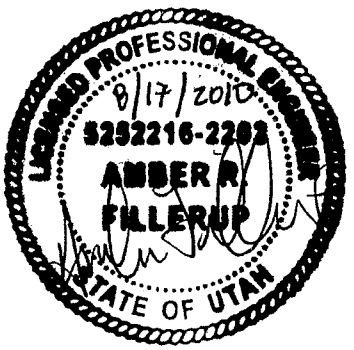
Camp William IED Defeat Lanes

CONEX Structures
Design Calculations



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Project No. _____ Page No. _____

Subject C-1ED
Conex Containers Calculations

Computed by A Fillemp Date 8/9/10
Checked by BB Date 8-16-10
Approved by _____ Date _____

Sheet No. 1 of 3

Design Criteria

For Certified Conex Box - 8' x 8' x 20'

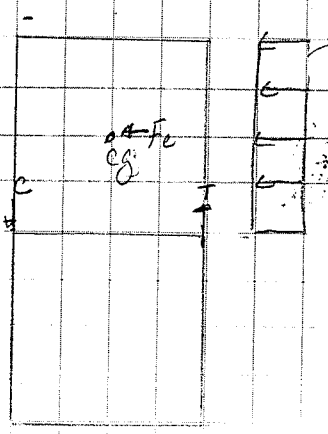
Gross Weight = 20,000 lbs
Tare Weight = 5,500 lbs max - 5,000 lb min
Racking Load = 33,700 lbs (Floor : Rear Panel Loads - Transverse)

Wind Load (ASCE 7-05 6.4)

Basic Wind Speed = 90 mph
Importance Factor (I) = 0.87 (Category I) (Table 6-1)
$K_{zt} = 1.0$
ps 30 = 12.8 psf (Fig 6-2)
$\lambda = 1.23$ h = 16 ft Exposure C (Figure 6-2)
$p_s = \lambda K_{zt} I p_{s30} = 1.23(1.0)(0.87)(12.8) = 13.7$ psf

Seismic $C_s = 0.30$

Check Conteuvie Loads



Wind
$F_w = 13.7(8)(20) = .212^k$ ← controls

Seismic
$F_e = C_s W = 0.30(5.5) = 1.7^k$

$T = (2.2)(4)/8 = 1.1^k$

Racking Check - $2.2^k << 33.7^k$ ∴ okay

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Subject C-TED
Conex Containers Calculations

Computed by A. Fillerup Date 8/9/10
Checked by _____ Date 8-16-10
Approved by _____ Date _____

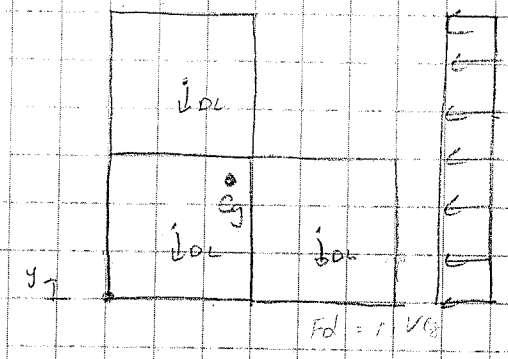
Sheet No. 2 of 3

Check Weld Connection - 3/16" x 4" fillet weld E70

$\phi R_n = \phi(0.707 w L F_w)$

$= 0.75(0.707)(3/16")(4")(0.60 \times 70) = 16.7^{k} > 1.1^{k} \therefore$ ok ✓

Check Overturning



$C_g = \frac{5.5(12) + 2(5.5)(4)}{3(5.5)} = 6.67'$

$M_w = \frac{137(16)^2}{2} = 1.8^{k\text{-ft}/ft}$

$M_{DL} = \frac{5^{k}}{20'}(4)(2) + \frac{5^{k}}{20}(12) = 5^{\frac{k\text{-ft}}{ft}}$

Worst Case

Overturning $\frac{5^{k\text{-ft}/ft}}{1.8^{k\text{-ft}/ft}} = 2.7 > 1.5 \therefore$ ok ✓

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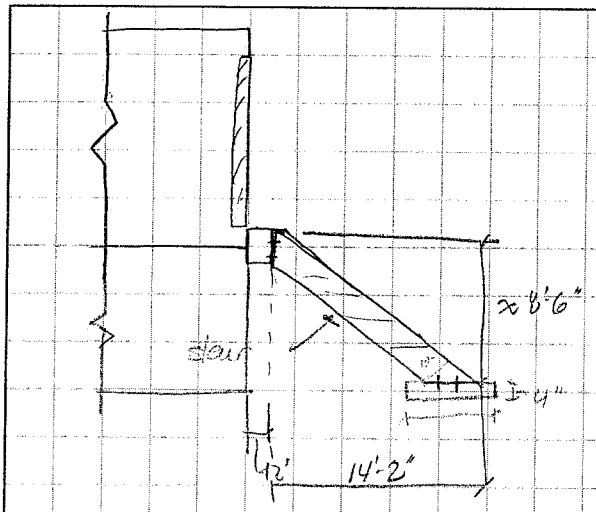
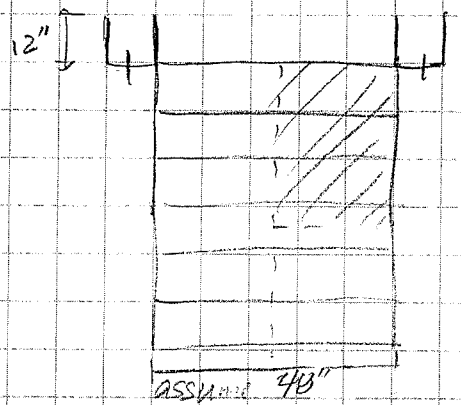
Subject CIED
Conex Containers Calculations

Computed by A Fillenup Date 8/9/10
Checked by BB Date 8-16-10
Approved by _____ Date _____

Sheet No. 3 of 3





code only req's 36"

Per IBC 2009 - 100 psf design weight for stairs
assume ~ 40 psf for stair weight

Length of Stairs = $\sqrt{8.5^2 + 14.167^2}$ = 16.52'

Trib Area per connection = $\frac{16.52'}{2} \times \frac{48''}{2}$ = 16.5 ft²

P_E = 1.2(16.5)(40) + 1.6(16.5)(100) = 3.4 k

Check Weld Connection @ Conex Box

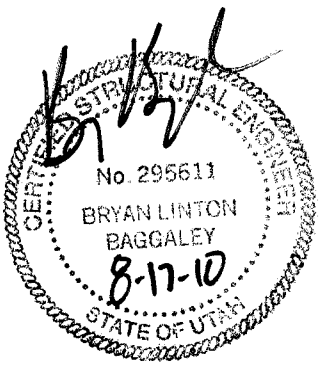
$\phi R_n = \phi\, 0.707\, w L F_w$
= 0.75(0.707)(3/16")4"(0.6)(70) = 16.7 k > 3.4 k ∴ OK ✓

Check base material -
$\phi R_n = \phi F_{BM} \times t$ = 0.75(0.54)(36)t ⇒ 3.4 k
min thickness t = 1/4"

Structural Calculations

For

Camp Williams IED Defeat Lane



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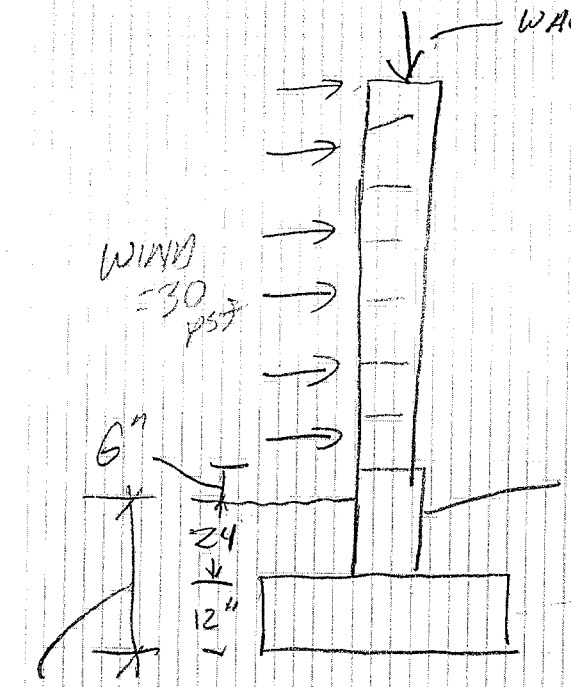
WALL HT = 104" = 8.66'



OVERTUNING MOMENT DUE TO WIND = 9'(29#)(7')

= 1827 lb-ft.

ASSUME 36" FROST DEPTH @ 6000' ELEV.

TRY A 4'0" WIDE FTG

FTG WT = 4(150) = 600 plf

SOIL WT = 20(125)(2.33) = 832 plf

$M_R = [650 + 200 + 600 + 832](0.6)(2')$

= 2738 lb-ft

S.F = 1.50 O.K

MASONRY WALL MUST BE DESIGNED FOR

1827 lb-Ft = 21,924 lb-IN

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WALL IS TOBE A CANTILEVER WALL WITH NO BEARING SUPPORT FOR ROOF

SEISMIC FOR NON-STRUCT WALL

$$F_p = \frac{0.4(3.5)(.912)(W_p)}{\left(\frac{2.5}{1.0}\right)}\left(1+2\frac{0}{11}\right)$$

$$F_p = .365\,(W_p) \quad (\text{FACTORED})$$

$$F_p = (.7)(.365)\,W_p \quad (\text{ALLOW}) = .26\,W_p$$

TYPICAL WALL WT = 75 psf =

$.365(75) = 27.4$ psf

$.26(75) \sim 19.5$ psf.

WIND = 29 psf

ALLOWABLE STRESS DESIGN:

WIND: $D + W$ or $.6D + W$ ⟸ WIND WILL CONTROL.

EQ: $D + .7E$ or $0.6D + .7E$

ASCE 7-05 (IBC 2006) WIND: BUILDING DATA:

Basic wind speed (3 sec gust) = 90 MPH

Exposure C

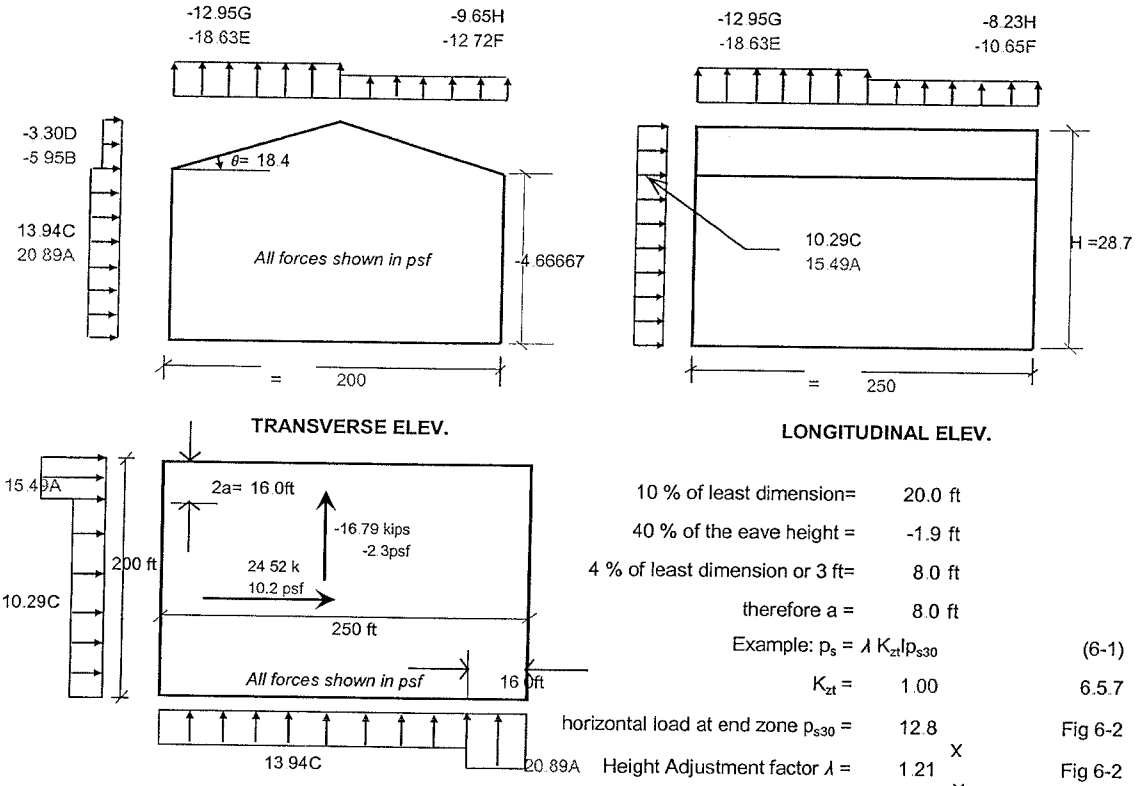
Roof Pitch = 4.00 :12

Mean Roof Height h = 12 ft

Importance factor I_w = 1.00 T-6-1

6.4 MOTHOD 1- SIMPLIFIED PROCEDURE (LOW-RISE, 60 FT)

Height Adjustment factor λ = 1.21 Fig 6-2



10 % of least dimension=	20.0 ft	
40 % of the eave height =	-1.9 ft	
4 % of least dimension or 3 ft=	8.0 ft	
therefore a =	8.0 ft	
Example: $p_s = \lambda K_{zt} I p_{s30}$		(6-1)
K_{zt} =	1.00	6.5.7
horizontal load at end zone p_{s30} =	12.8	Fig 6-2
X Height Adjustment factor λ =	1.21	Fig 6-2
X Importance factor Iw =	1.00	6.2
	15.49psf	

FIGURE 6.2, Main Wind Force System

MWFRS

Load Direction	Roof Angle	Horizontal Loads				Vertical Loads					
		End Zone		Interior zone		End Zone		Interior zone		Overhang	
		Wall (A)	Roof (B)	Wall (C)	Roof (D)	WW (E)	LW (F)	WW (G)	LW (H)	E_{OH}	G_{OH}
Transverse	18.4	20.89	-5.95	13.94	-3.30	-18.63	-12.72	-12.95	-9.65	-26.14	-20.45
Longitudinal	All	15.488	-8.107	10.285	-4.84	-18.634	-10.648	-12.947	-8.228	-26.136	-20.449

* If roof pressure under horizontal loads is less than zero, use zero

Plus and minus signs signify pressures acting toward and away from projected surfaces, respectively.

For the design of the longitudinal MWFRS use Θ = 0°, and locate the zone E/F, G/H boundary at the mid-length of the building

FIGURE 6-3, COMPONENT AND CLADDING

Roof effective area = 30 sq. ft, θ= 18.4

Interior Zone 1 = 11.43 -15.57 psf

End Zone 2 = 11.43 -21.75 psf

Conner Zone 3 = 11.43 -28.92 psf

Roof Overhang effective area = 6 sq. ft

Interior Zone 2 = -31.62 psf

End Zone 3 = -44.42 psf

Effective Area for wall element = 20 Sq. ft

Wall, Interior Zone 4 = 16 82 -18.27 psf

End Zone 5 = 16 82 -22.02 psf

DESIGN WALLS FOR 29 PSF WIND.

IBC 1605.2.1(LRFD) U = 0.9D + 1.6W

IBC 1605.3.1(ASD), U = 06D + W, increase in allowable shall not be used.

IBC 1605.3.2(ASD), U = D + 1.3 W, allowable stress are permit to be increased.

Conterminous 48 States
2003 NEHRP Seismic Design Provisions
Zip Code = 84065
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Data are based on a 0.009999999776482582 deg grid spacing

Period (sec)	Centroid Sa (g)	
0.2	1.136	(Ss)
1.0	0.467	(S1)

Period (sec)	Maximum Sa (g)	
0.2	1.368	(Ss)
1.0	0.575	(S1)

Period (sec)	Minimum Sa (g)	
0.2	0.783	(Ss)
1.0	0.295	(S1)

Conterminous 48 States
2003 NEHRP Seismic Design Provisions
Zip Code = 84065
Spectral Response Accelerations SMs and SM1
SMs = Fa x Ss and SM1 = Fv x S1
Site Class D

Period (sec)	Centroid Sa (g)	
0.2	1.188	(SMs, Fa = 1.045)
1.0	0.716	(SM1, Fv = 1.533)

Period (sec)	Maximum Sa (g)	
0.2	1.368	(SMs, Fa = 1.000)
1.0	0.863	(SM1, Fv = 1.500)

Period (sec)	Minimum Sa (g)

0.2	0.929	(SMs, Fa = 1.187)
1.0	0.534	(SM1, Fv = 1.809)

Conterminous 48 States
2003 NEHRP Seismic Design Provisions
Zip Code = 84065
Spectral Response Accelerations SDs and SD1
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class D

Period (sec)	Centroid Sa (g)	
0.2	0.792	(SDs)
1.0	0.477	(SD1)

Period (sec)	Maximum Sa (g)	
0.2	0.912	(SDs)
1.0	0.575	(SD1)

Period (sec)	Minimum Sa (g)	
0.2	0.619	(SDs)
1.0	0.356	(SD1)

Design of CMU Masonry Walls per IBC 2006
By Bryan Baggaley

Typical Wall

f'm =	2000	Fs =	24
Wall Thickness =	7.625	Effective Wall Height	19.6
Wall Height =	19.36	Vertical Bar Spacing	32
Distance "d":	5	Wall Weight	75
Size of Rebar =	5	Wall (pillaster) Length	12
Opening Width	0	Solid Grout? (1=yes)	2
Opening Height	0	CMU (1) or Brick (2)	1
Parapet Height	0	Wt of Opening Infill	0
		Equiv Solid Thickness	4.9

EXCESSIVE WALL HT USED TO CREATE SAME MOMENT AS A 8½' HIGH CANTILEVER WALL.

As =	0.31	r =	2.59
Em =	1800	h/r =	90.810811
Fb =	667	Fa =	289.62747
n =	16.1	Rho =	0.0019375
Fv =	44.72	n*Rho =	0.0312153
k =	0.2205881	j =	0.9264706

Unfactored Gravity Loads at the top of the wall / Pilaster

Tributary Length =	0	Tributary Length =	0
Eccentric Loads	Area Loads	Concentric Loads:	Area Loads
Snow Load:	0	Snow Load:	0
Live Load:	0	Live Load:	0
Dead Load:	0	Dead Load:	0
Eccentricity:	0		

Unfactored Out of Plane Lateral Loads

Wind In:	30	Wind Out:	30
Earthquake:	20	%Snow W/ Eq:	20
Earthquake load at infill:	0	Sds:	0.784

Gravity loads on Wall

Eccentric Loads

Snow	0
Live	0
Dead	0
EQ (Vert)	0

Concentric Loads

Snow	0
Live	0
Dead	0
EQ (Vert)	0

Lateral Loads over the Wall/Column Length

Wind-in (plf)	30.00
Wind-Out	30.00
EQ	20.00

Load Cases	fa (base)	fa (mid ht)	fb (psi)	fs (psi)	fa/Fa	(fa+fb)/Fb	fs/Fs	M (lb-in) ecc	M (lb-in) Lateral	M total
Gravity Load Case:								0	0	0
16-16 D+L+S	24.69	12.35	0.00	0	0.09	0.04	0.00			
Gravity + Wind										
16-17 D+L+(w)W-out	24.69	12.35	715.26	40717	0.09	1.11	1.70	0	21926.36	21926.36
D+L+(w)W-in	24.69	12.35	-715.26	40717	0.09	1.11	1.70	0	-21926.4	-21926.4
16-18 D+L+(w)W-out+S/2	24.69	12.35	715.26	40717	0.09	1.11	1.70	0	21926.36	21926.36
D+L+(w)W-in+S/2	24.69	12.35	-715.26	40717	0.09	1.11	1.70	0	-21926.4	-21926.4
16-19 D+L+S+(w)W-out/2	24.69	12.35	357.63	20358	0.09	0.57	0.85	0	10963.18	10963.18
D+L+S+(w)W-in/2	24.69	12.35	-357.63	20358	0.09	0.57	0.85	0	-10963.2	-10963.2
Gravity + Earthquake										
16-21 .9D+Eq-in	18.74	9.37	366.80	20880	0.06	0.58	0.87	0	11244.29	11244.29
.9D+Eq-out	18.74	9.37	-366.80	20880	0.06	0.58	0.87	0	-11244.3	-11244.3
16-20 D+L+S+Eq-out	28.57	14.28	366.80	20880	0.10	0.59	0.87	0	11244.29	11244.29
D+L+S+Eq-in	28.57	14.28	-366.80	20880	0.10	0.59	0.87	0	-11244.3	-11244.3

MOMENT IN WALL IS EQ TO A 8½' HIGH CANTILEVER

Design of CMU Masonry Walls per IBC 2006

By Bryan Baggaley

Typical Wall

f'm =	2000	Fs =	24
Wall Thickness =	7.625	Effective Wall Height	19.6
Wall Height =	19.36	Vertical Bar Spacing	8
Distance "d":	5	Wall Weight	75
Size of Rebar =	5	Wall (pillaster) Length	40
Opening Width	6.333	Solid Grout? (1=yes)	2
Opening Height	4	CMU (1) or Brick (2)	1
Parapet Height	0	Wt of Opening Infill	0
		Equiv Solid Thickness	7.625

As =	0.31	r =	2.19
Em =	1800	h/r =	107.39726
Fb =	667	Fa =	212.41231
n =	16.1	Rho =	0.00775
Fv =	44.72	n*Rho =	0.1248611
k =	0.3902239	j =	0.8699254

Unfactored Gravity Loads at the top of the wall / Pilaster

Tributary Length =	0	Tributary Length =	0
Eccentric Loads	Area Loads	Concentric Loads:	Area Loads
Snow Load:	0	Snow Load:	0
Live Load:	0	Live Load:	0
Dead Load:	0	Dead Load:	0
Eccentricity:	0		

Unfactored Out of Plane Lateral Loads

Wind In:	30	Wind Out:	30
Earthquake:	20	%Snow W/ Eq:	20
Earthquake load at infill:	0	Sds:	0.784

Gravity loads on Wall

Eccentric Loads

Snow	0
Live	0
Dead	0
EQ (Vert)	0

Concentric Loads

Snow	0
Live	0
Dead	3647.808
EQ (Vert)	571.9763

Lateral Loads over the Wall/Column Length

Wind-in (plf)	195.00
Wind-Out	195.00
EQ	116.91

Load Cases	fa (base)	fa (mid ht)	fb (psi)	fs (psi)	fa/Fa	(fa+fb)/Fb	fs/Fs	M (lb-in) ecc	M (lb-in) Lateral	M total
Gravity Load Case:										
16-16 D+L+S	27.83	19.89	0.00	0	0.13	0.04	0.00	0	0	0
Gravity + Wind										
16-17 D+L+(w)W-out	27.83	19.89	839.66	21139	0.13	1.30	0.88	0	142517.7	142517.7
D+L+(w)W-in	27.83	19.89	-839.66	21139	0.13	1.30	0.88	0	-142518	-142518
16-18 D+L+(w)W-out+S/2	27.83	19.89	839.66	21139	0.13	1.30	0.88	0	142517.7	142517.7
D+L+(w)W-in+S/2	27.83	19.89	-839.66	21139	0.13	1.30	0.88	0	-142518	-142518
16-19 D+L+S+(w)W-out/2	27.83	19.89	419.83	10570	0.13	0.67	0.44	0	71258.85	71258.85
D+L+S+(w)W-in/2	27.83	19.89	-419.83	10570	0.13	0.67	0.44	0	-71258.8	-71258.8
Gravity + Earthquake										
16-21 .9D+Eq-in	21.12	15.10	387.25	9749	0.10	0.61	0.41	0	65729.59	65729.59
.9D+Eq-out	21.12	15.10	-387.25	9749	0.10	0.61	0.41	0	-65729.6	-65729.6
16-20 D+L+S+Eq-out	32.19	23.01	387.25	9749	0.15	0.63	0.41	0	65729.59	65729.59
D+L+S+Eq-in	32.19	23.01	-387.25	9749	0.15	0.63	0.41	0	-65729.6	-65729.6

Design of CMU Masonry Walls per IBC 2006

By Bryan Baggaley

Typical Wall

f'm =	2000	Fs =	24
Wall Thickness =	7.625	Effective Wall Height	19.6
Wall Height =	19.36	Vertical Bar Spacing	8
Distance "d":	5	Wall Weight	75
Size of Rebar =	5	Wall (pillaster) Length	24
Opening Width	4	Solid Grout? (1=yes)	2
Opening Height	4	CMU (1) or Brick (2)	1
Parapet Height	0	Wt of Opening Infill	0
		Equiv Solid Thickness	7.625

As =	0.31	r =	2.19
Em =	1800	h/r =	107.39726
Fb =	667	Fa =	212.41231
n =	16.1	Rho =	0.00775
Fv =	44.72	n*Rho =	0.1248611
k =	0.3902239	j =	0.8699254

Unfactored Gravity Loads at the top of the wall / Pilaster

Tributary Length =	0		Tributary Length =	0
Eccentric Loads	Area Loads		Concentric Loads:	Area Loads
Snow Load:	0		Snow Load:	0
Live Load:	0		Live Load:	0
Dead Load:	0		Dead Load:	0
Eccentricity:	0			

Unfactored Out of Plane Lateral Loads

Wind In:	30	Wind Out:	30
Earthquake:	20	%Snow W/ Eq:	20
Earthquake load at infill:	0	Sds:	0.784

Gravity loads on Wall

Eccentric Loads

Snow	0
Live	0
Dead	0
EQ (Vert)	0

Concentric Loads

Snow	0
Live	0
Dead	2304
EQ (Vert)	361.2672

Lateral Loads over the Wall/Column Length

Wind-in (plf)	120.00
Wind-Out	120.00
EQ	71.74

Load Cases	fa (base)	fa (mid ht)	fb (psi)	fs (psi)	fa/Fa	(fa+fb)/Fb	fs/Fs	M (lb-in) ecc	M (lb-in) Lateral	M total
Gravity Load Case:								0	0	0
16-16 D+L+S	28.46	20.52	0.00	0	0.13	0.04	0.00			
Gravity + Wind										
16-17 D+L+(w)W-out	28.46	20.52	861.21	21682	0.13	1.33	0.90	0	87705.45	87705.45
D+L+(w)W-in	28.46	20.52	-861.21	21682	0.13	1.33	0.90	0	-87705.4	-87705.4
16-18 D+L+(w)W-out+S/2	28.46	20.52	861.21	21682	0.13	1.33	0.90	0	87705.45	87705.45
D+L+(w)W-in+S/2	28.46	20.52	-861.21	21682	0.13	1.33	0.90	0	-87705.4	-87705.4
16-19 D+L+S+(w)W-out/2	28.46	20.52	430.61	10841	0.13	0.69	0.45	0	43852.72	43852.72
D+L+S+(w)W-in/2	28.46	20.52	-430.61	10841	0.13	0.69	0.45	0	-43852.7	-43852.7
Gravity + Earthquake										
16-21 .9D+Eq-in	21.60	15.58	396.02	9970	0.10	0.63	0.42	0	40330.75	40330.75
.9D+Eq-out	21.60	15.58	-396.02	9970	0.10	0.63	0.42	0	-40330.8	-40330.8
16-20 D+L+S+Eq-out	32.92	23.74	396.02	9970	0.15	0.64	0.42	0	40330.75	40330.75
D+L+S+Eq-in	32.92	23.74	-396.02	9970	0.15	0.64	0.42	0	-40330.8	-40330.8