

Vila Structural Consulting Engineers, Inc.

Structural Calculations for

***New Residence for
Eliges Investors Construction
at
9841 SW 73rd Court
Pinecrest, FL***

Pages Volume I

1 to 13

Project Number: 22CB006



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FL PE# 89027

June 21, 2022

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Project Name: 9941 5th / 7th Court - Main Structure

Date: 3/3/2022

Project No. 7706066

Engineer: J. Mita

Risk Category II
 Wind Speed 175 mph
 $K_z = 0.85$
 Exposure C
 $K_{d1} = 1.00$
 Enclosure Classification Enclosed
 $GCF_{enc} = 0.50$
 $r = 0.85$
 $K_1 = 1.00$
 $q_s = 97.95$ psf

z = 25.5 ft
 Length = 82 ft
 Width = 18 ft
 Height = 12 ft
 h/B = 0.44
 a = 5.8 ft
 Pitch = 0.25 in 12'
 G = 1.19

Service	Wind Permeability to Bridge (Use Table A)									
	Windward Wall				Leeward Wall				Side Wall	
	Zone	GCp	p (-60p)	p (+60p)	Zone	GCp	p (-60p)	p (+60p)		
	1E	0.61	15.32	29.98	4E	0.45	25.15	9.49	N/A	
	2	0.43	8.35	10.25	4	0.45	17.84	17.17		

Service	Wind Permeability to Bridge (Use Table A)									
	Windward Roof				Leeward Roof				Side Roof	
	Zone	GCp	p (-60p)	p (+60p)	Zone	GCp	p (-60p)	p (+60p)		
	2E	1.07	47.44	52.78	3E	0.55	25.05	15.25	N/A	
	2	0.63	15.50	19.56	3	0.47	10.87	17.71		

Service	Wind Permeability to Bridge (Use Table B)											
	Windward Wall				Leeward Wall				Side Wall			
	Zone	GCp	p (-60p)	p (+60p)	Zone	GCp	p (-60p)	p (+60p)	Zone	GCp	p (-60p)	p (+60p)
	1E	0.43	25.05	11.55	4E	0.43	25.05	11.55	3E	0.61	15.32	29.98
	2	0.45	17.84	10.25	4	0.45	17.84	10.25	2	0.4	8.35	10.25

Service	Wind Permeability to Bridge (Use Table B)											
	Windward Roof				Leeward Roof				Side Roof			
	Zone	GCp	p (-60p)	p (+60p)	Zone	GCp	p (-60p)	p (+60p)	Zone	GCp	p (-60p)	p (+60p)
	2E	1.07	47.44	52.78	3E	0.55	25.05	15.25	3E	0.43	25.15	9.49
	2	0.63	15.50	19.56	3	0.47	10.87	17.71	2	0.29	7.78	14.17



Project Name: 9871 SW 73rd Court Date: 5/3/2022

Project No: 22010436 Engineer: Vila

Risk Category: I
 Wind Speed: 173 mph
 $C_e =$ 0.85
 Exposure: C
 $K_z =$ 1.00
 Enclosure Classification: Enclosed
 $G C_p =$ 0.16
 $C_{pe} =$ 0.91
 $K_d =$ 1.00
 $q_z =$ 37.95 psf

$z =$ 25.5 ft
 Length = 81 ft
 Width = 58 ft
 Height = 25.5 ft
 F/B = 0.44
 $a =$ 5.8 ft
 Pitch = 0 in 12
 $\mu =$ 0.00

Service	Wall Pressure (PSF)											
	Exposure Wind Area = 12											
	10		20		50		100		200		>500	
W _q	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
Zone 1	44.78	-48.58	44.32	-48.12	43.62	-47.42	42.16	-46.26	40.14	-43.93	33.40	-37.19
Zone 5	44.78	-59.97	44.32	-59.04	43.62	-57.64	42.46	-55.32	40.14	-50.67	33.40	-37.19

Service	Roof Pressure - Ins. Roofs (PSF) - $C_{pe} = 0.8, C_{pi} = 0$											
	Effective Wind Area = 12											
	GCP	10	GCP	20	GCP	50	GCP	100	GCP	200	GCP	500
Zone 1'	-0.00	40.99	-0.00	40.99	-0.00	40.99	-0.00	40.99	-0.00	36.25	-0.00	22.01
Zone 1	-0.00	71.35	-0.00	70.81	-0.00	69.18	-0.00	66.47	-0.00	61.05	-0.00	44.78
Zone 2	-0.00	-94.12	-0.00	-93.43	-0.00	-91.34	-0.00	-87.85	-0.00	-80.88	-0.00	-59.97
Zone 2n	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00
Zone 2n	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00
Zone 2r	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00
Zone 3	-0.00	128.28	-0.00	126.89	-0.00	122.71	-0.00	115.73	-0.00	101.79	-0.00	59.97
Zone 3n	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00
Zone 3r	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00
Pos (-) Δ Zones	0.0	18.22	-0.00	17.80	-0.00	16.51	-0.00	14.42	0.0	14.42	0.0	14.42

Per Spread Sheet

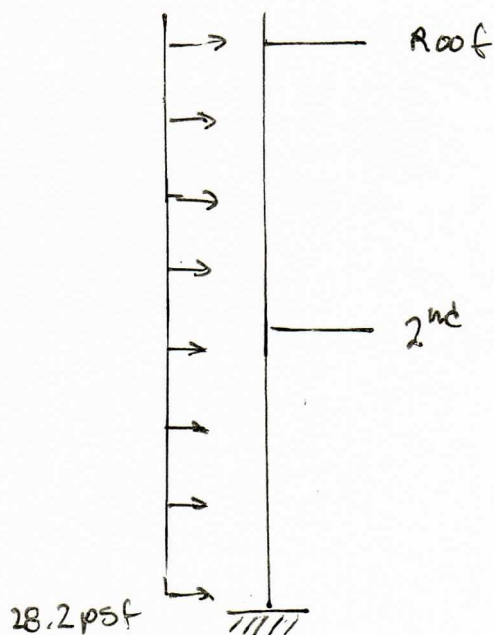
	windward	leeward	
Edge	29.98 psf	-9.49 psf	= 39.47 psf
	→	→	→

Field	22.01 psf	-4.17 psf	= 26.18 psf.
	→	→	→

Taking an average by wall length :

$$P_{ave} = \frac{39.47 \text{ psf} (2 \times 5.8 \text{ ft}) + 26.18 \text{ psf} (81.17 \text{ ft} - 2(5.8 \text{ ft}))}{81.17 \text{ ft}}$$

$$P_{ave} = 28.2 \text{ psf}$$



At Roof

$$28.2 \text{ psf} \times \frac{13'-0''}{2} = 183 \text{ plf}$$

At 2nd

$$28.2 \text{ psf} \times \frac{12'-6''}{2} + \frac{13'-0''}{2} = 360 \text{ plf.}$$

Analysis of Collector Load From Diaphragm Loading.

Diaphragm between GL A and B @ 2nd

$$360 \text{ plf} \times \left(\frac{33'-4''}{2} + \frac{38'-10''}{2} \right) = 13 \text{ K.}$$

Load happens @ collector along GL B.

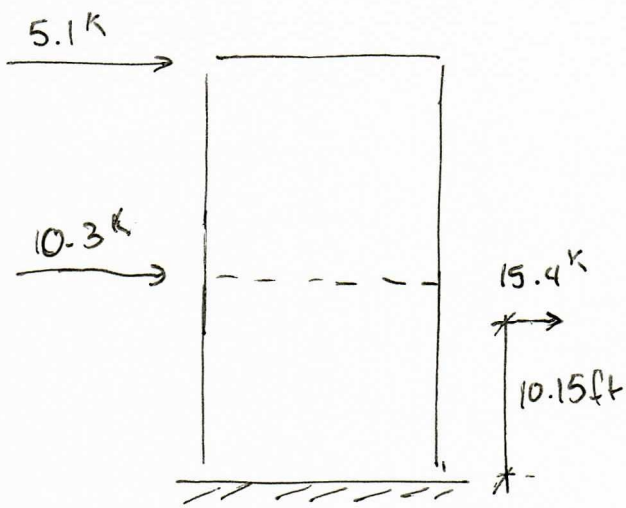
$$360 \text{ plf} \times \left(\frac{18'-2''}{2} + \frac{38'-10''}{2} \right) = 10.3 \text{ K}$$

Load happens @ collector along GL D.

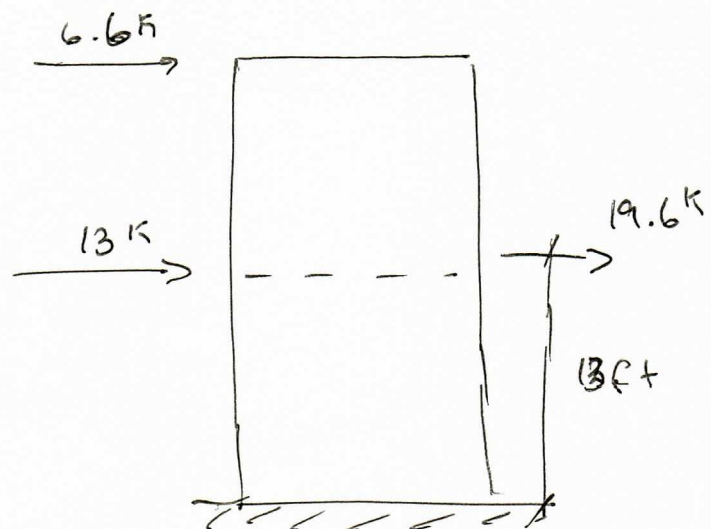
Diaphragm

$$183 \text{ plf} \times \left(\frac{33'-4''}{2} + \frac{38'-10''}{2} \right) = 6.6 \text{ K} \quad \text{Collector Along GL B}$$

$$183 \text{ plf} \times \left(\frac{18'-2''}{2} + \frac{38'-10''}{2} \right) = 5.1 \text{ K} \quad \text{Collector Along GL D}$$



Collector Along GL D



Collector Along GL B.

Critical Collector through the framing.

Collector B

CMU Properties

$f'_m =$ 2000 psi
 Grout Spacing 48"
 $A_n =$ 529.10 in²

Wall Geometry

Length = 13 ft
 Height = 25.5 ft
 End Reinf. = 1 cells
 $d_v =$ 12.67 ft

Horizontal Steel

Bar # = #3
 Bar Qnt. = 1
 $A_v =$ 0.11 in²
 $s =$ 96 in
 $f_y =$ 60 ksi

Limits

$\gamma_e =$ 0.75
 $M_u (V_u d_u) =$ 0.941
 $V_u <$ 73.77 <

Loads

$P_u =$ 0 k
 $V_u =$ 35.73 k
 $M_u =$ 426 k-ft

Capacities

$V_n =$ 55.67 <
 $\phi V_n =$ 44.54 <
 $V_c =$ 5.23 <
 $\phi / n =$ 48.72 <

Checks

S.W. Works YES
 CMU Only YES

 CMU + Steel YES

Collector D

CMU Properties

$f'_m =$ 2000 psi
 Grout Spacing Ungrouted
 $A_n =$ 360.00 in²

Wall Geometry

Length = 12 ft
 Height = 25.5 ft
 End Reinf. = 1 cells
 $d_v =$ 11.67 ft

Horizontal Steel

Bar # = #3
 Bar Qty. = 1
 $A_v =$ 0.11 in²
 $s =$ 96 in
 $f_y =$ 60 ksi

Limits

$\gamma_e =$ 0.75
 $M_u (V_u d_u) =$ 0.870
 $V_u <$ 32.49 <

Loads

$P_u =$ 0 k
 $V_u =$ 25.17 k
 $M_u =$ 261 k-ft

Capacities

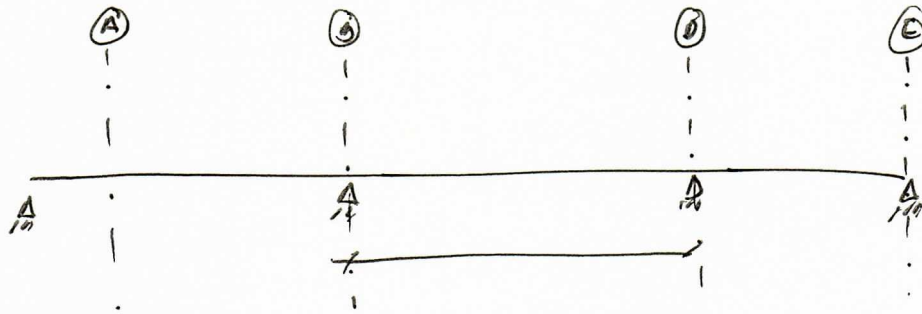
$V_n =$ 39.89 <
 $\phi V_n =$ 31.91 <
 $V_c =$ 4.81 <
 $\phi / n =$ 35.76 <

Checks

S.W. Works YES
 CMU Only YES

 CMU + Steel YES

Wood Roof Diaphragm



$$138 \text{ plf} \times \frac{38'-10''}{2} = 2680^{\#}$$

Collector Length (Critical @ GLO) = 22'-4"

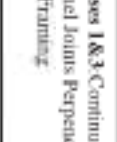
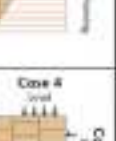
$$\frac{2680^{\#}}{22'-4''} = 120^{\#/\text{ft}}$$

See Diaphragm Capacity

$$\frac{600^{\#/\text{ft}}}{2} = \frac{600^{\#/\text{ft}}}{2.0} = 300^{\#/\text{ft}}$$

$$300^{\#/\text{ft}} \geq 120^{\#/\text{ft}} \quad \text{OK.}$$

Unblocked Wood Structural Panel Diaphragms^{1,2,3,4,5}

Low Stiffness Direction Perpendicular to Supports	Cases 1&3: Continuous Panel Joints Perpendicular to Framing  	Cases 2&4: Continuous Panel Joints Parallel to Framing  
Low Stiffness Direction Parallel to Supports	Cases 5&6: Continuous Panel Joints Perpendicular and Parallel to Framing  	Cases 7&8: Continuous Panel Joints Perpendicular and Parallel to Framing  

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GL 6 Between B and D Lateral Diaphragm Analysis.

$$22.01 \text{ psf} \times \left(\frac{12'-6''}{2} + \frac{13'-0''}{2} \right) \times \frac{38'-10''}{2} = 5.5 \text{ k} \text{ At each main concrete diaphragm.}$$

Note 22.01 psf is only windward since it does not connect to the back wall

See ENERCALC for Beam/Bridge Analysis loaded on its strong axis.

GL 5 Between GL C and D

Beam Dim. b x d
8" x 30"

$$22.01 \text{ psf} \times \left(\frac{12'-6''}{2} + \frac{13'-0''}{2} \right) \times \frac{26'-8''}{2} = 2.7 \text{ k}$$

See ENERCALC for Lateral Beam Analysis loaded on its weak axis.

Concrete Beam

File: New Testbeam.v06
Software copyright: INTCALC, INC. 1993-2020, Suite 1220024
GBEngInfo

File # : KW-06012775

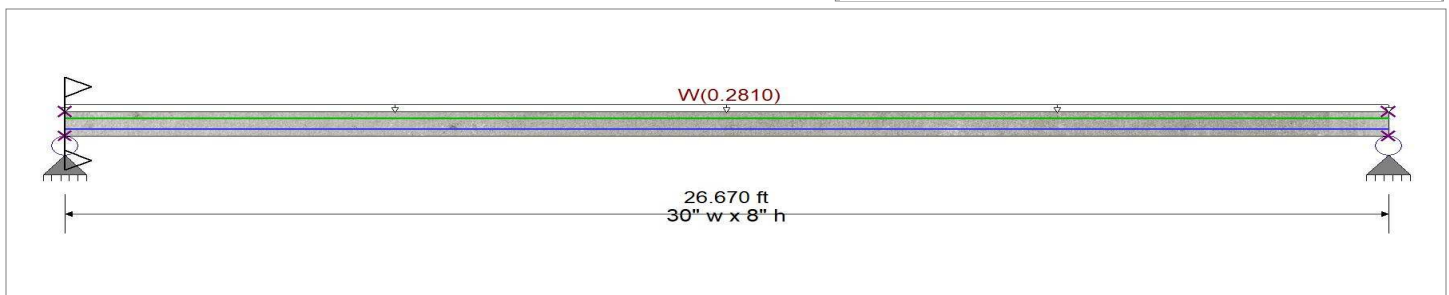
DESCRIPTION: 2B-1 LATERAL

CODE REFERENCES

Calculations per ACI 318-11, IBC 2012, CBC 2013, ASCE 7-10
Load Combination Set : ASCE 7-16

Material Properties

f'_c	=	1.0 ksi	ϕ Ph Values	Flexure :	0.90
$f'_s = f'_c^{1.2} \times 7.50$	=	474.347 psi		Shear :	0.750
γ Density	=	145.0 pcf	β	=	0.850
λ LW Factor	=	1.0			
Elastic Modulus	=	3,644.15 ksi	Fy - Stirrups		60.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups		29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup		2



Cross Section & Reinforcing Details

Rectangular Section: Width = 30.0 in, Height = 8.0 in

Span #1 Reinforcing....

2-#7 at 2.50 in from Bottom, from 0.0 to 26.670 ft in this span

2-#7 at 2.50 in from Top, from 0.0 to 26.670 ft in this span

Loads on all spans...

W = 0.2810

Uniform Load on ALL spans : W = 0.2810 k/ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	0.724 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.000 in Ratio = 0 < 360.0
Min Applied	24.984 k-ft	Max Upward Transient Deflection	0.000 in Ratio = 0 < 360.0
Min Phil Allowable	34.494 k-ft	Max Downward Total Deflection	0.560 in Ratio = 57 >= 360
Location of maximum on span	13.311 ft	Max Upward Total Deflection	0.000 in Ratio = 0 < 360.0
Span # where maximum occurs	Span # 1		

Cross Section Strength & Inertia

Top & Bottom references are for tension side of section

Cross Section	Bar Layout Description	Phi Mn (k-ft)		Moment of Inertia (in 4)		
		Bottom	Top	I gross	cr - Bottom	cr - Top
Section 1	2-#7 @ c=4.7" 2-#7 @ d=2.3"	34.49	34.49	1280.00	985.96	200.06

Vertical Reactions

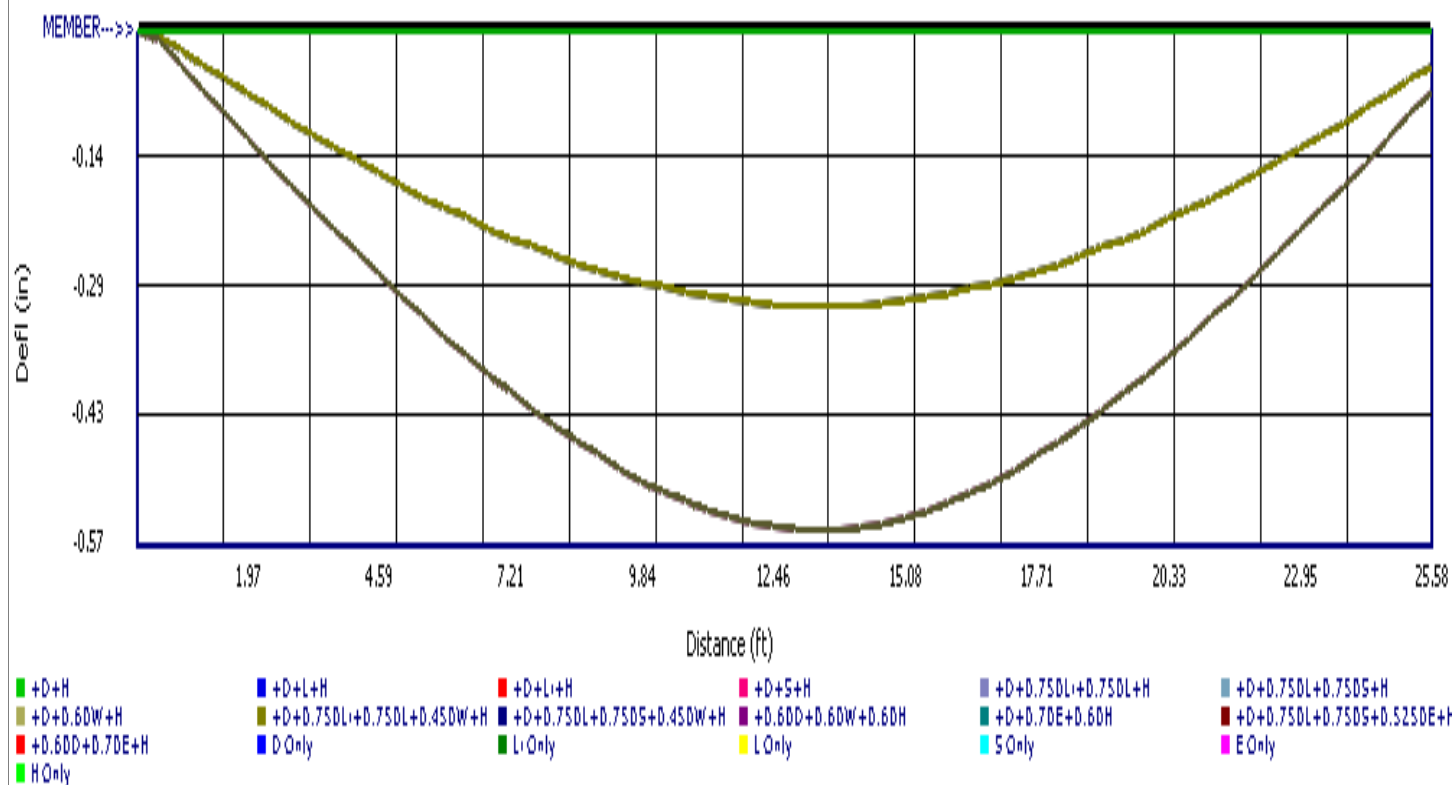
Support notation: 1=Left, 2=Right

Load Combination	Support 1	Support 2
Overall Maximum	3.747	3.747
Overall Minimum	1.686	1.686
D10 60W1H	2.248	2.248
-D10 750L10.750S10.450W1H	1.686	1.686
-D10 750L10.750S10.450W1H	1.686	1.686
-0.60D+0.60W+0.60L	2.248	2.248
W Only	3.747	3.747
H Only		

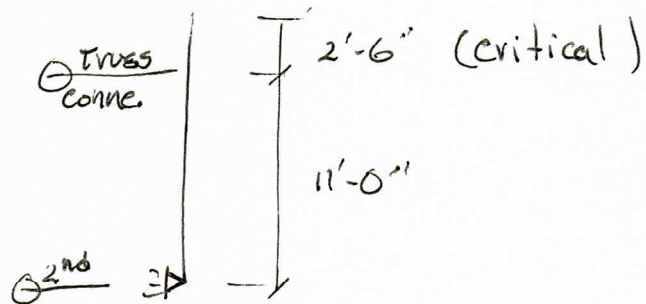
Lic. # : KW-06012775

Finite Beam Span Length: $V_u < \phi V_c/2$, Rebar V_g = Not Req'd 14.5.1, see #5 stirrups spaced at 0.000 ft

DESCRIPTION: 2B-1 LATERAL



Out of Plane CW wall Reaction @ Roof Diaphragm



Truss connection @ every truss

$$103.36 \text{ psf} \times 2'-6" \times 2'-0" = 517 \text{ \#}$$

$$57.64 \text{ psf} \times \frac{11'-0"}{2} \times 2'-0" = 634 \text{ \#}$$

$$1151 \text{ \#}$$

Note that, windward parapet pressure is higher; but, it does not create tension in the connection.

Zone 5 + Zone 5

$$44.32 \text{ psf} - 59.04 \text{ psf} \Rightarrow -44.32 - 59.04 = -103.36 \text{ psf}$$

where the negative sign means pulling away from the structure.