

STRUCTURAL CONDITION ASSESSMENT
1210 Michigan Ave
Miami Beach, Florida

Prepared for
Bercow Radell Fernandez Larkin + Tapanes

December 5, 2024
H241960

PREPARED BY



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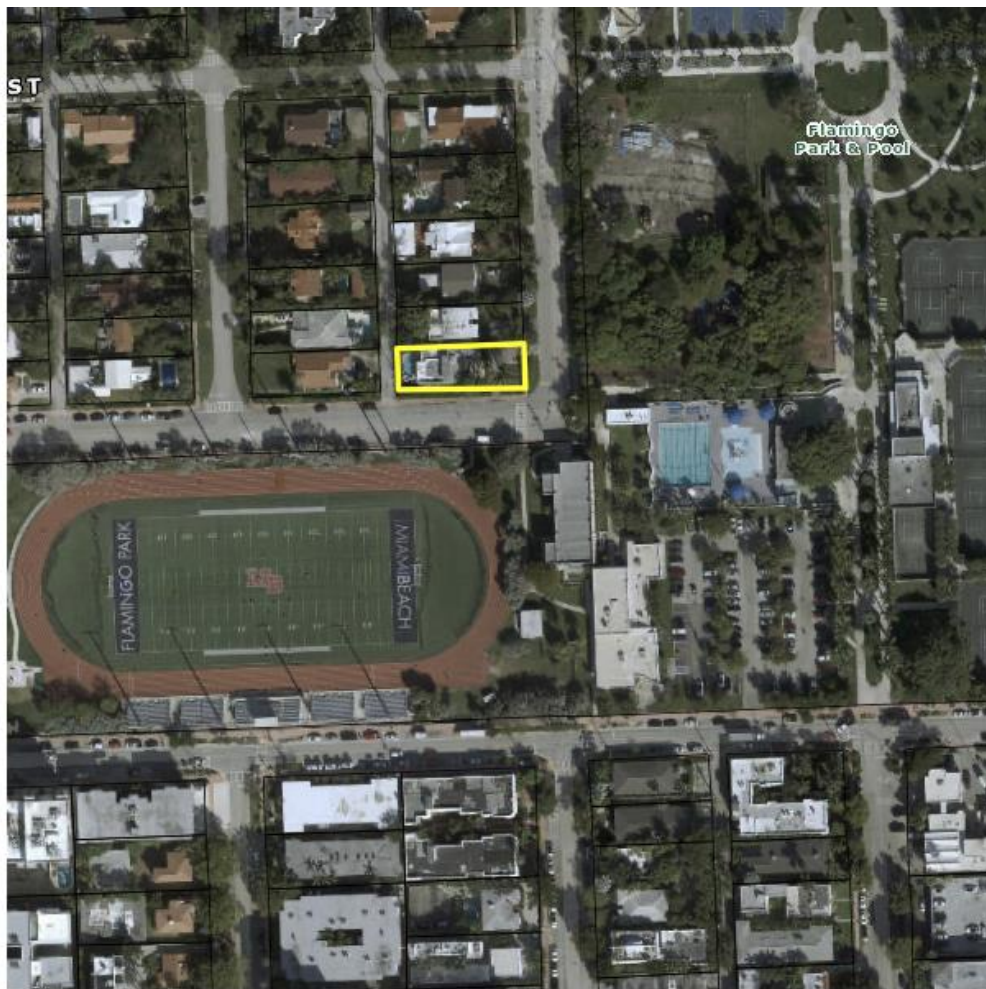
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STRUCTURAL CONDITION ASSESSMENT for
1210 Michigan Ave
Miami Beach, Florida

I. INTRODUCTION

General

Per the request of Bercow Radell Fernandez Larkin + Tapanes, we have conducted a visual structural condition assessment on the existing structure located at 1210 Michigan Ave in Miami Beach, Florida.

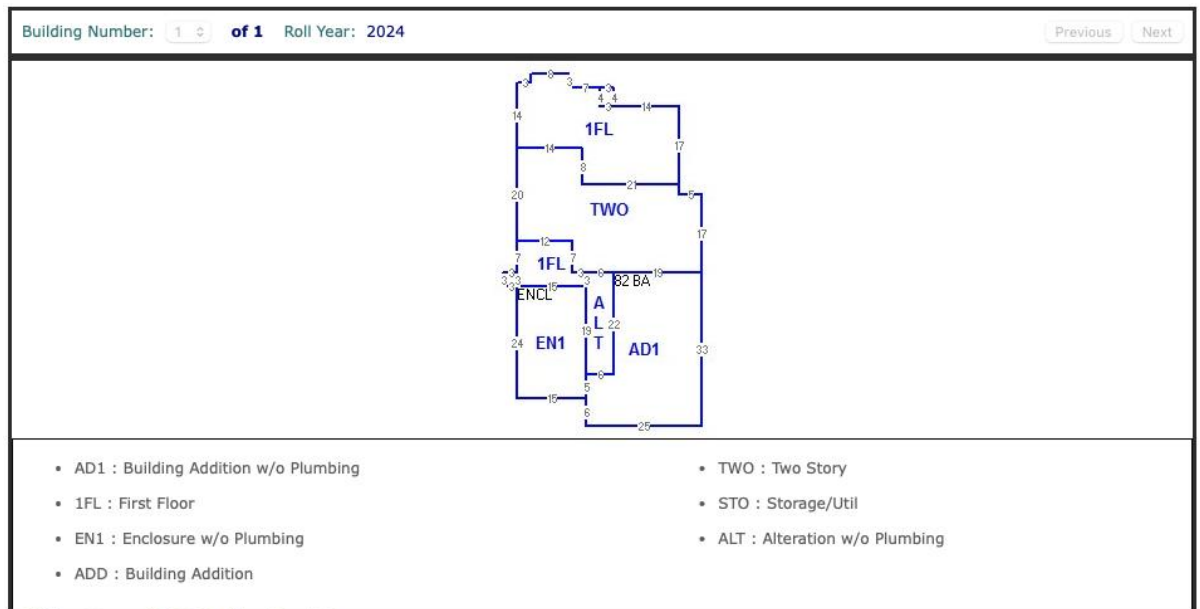


The purpose of the inspection is to assess the structural condition of the property.

Structural System

The Structure is a two story masonry building, that was built in three phases.

BUILDING INFORMATION ⓘ			
Building Number	Sub Area	Year Built	Actual Sq.Ft.
1	1	1940	2,759
1	2	1982	693
1	3	1995	21



The original building was built in 1940, with 2,759 square feet per Miami Dade Property Tax office. Subsequent additions were in 1982 and 1995.

The Building Structural System is as follows:

Original Construction

- First Floor:
 - Elevated wood floor framing, with wood planking supported by 2x12 wood joists at 24" o/c
 - Shallow foundations 10"x24" around the perimeter of the structure
 - Exterior unreinforced masonry bearing walls
 - Interior wood load bearing stud walls
- Second Floor:
 - Wood floor framing, with wood planking

- Exterior wood bearing walls
- Interior wood load bearing stud walls
- Roof:
 - Gabled roof with Slate

Additional Construction

- First Floor:
 - Part of elevated wood floor framing, with wood planking supported by 2x6 wood joists at 16" o/c, and slab on grade
 - Shallow foundations 10"x246" around the perimeter of the structure
 - Exterior unreinforced masonry bearing walls
 - Interior wood load bearing stud walls
- Roof:
 - Flat roof Pre-engineered Wood truss system 18" deep at 24" o/c.
 - Built up roofing waterproofing system

The components and cladding of the house, such as doors, windows and roof waterproofing are not addressed in this report.

II. METHODOLOGY

This inspection was visual in nature from the exterior and interior of the building. Our office did not perform any destructive or non-destructive testing, however previous engineering reports were provided to this office and they are as follows (provided in Appendix C):

- 1- Calc Engineering report dated 9/16/24 for Concrete compressive strength
- 2- Calc Engineering report dated 9/7/24 for Structural Analysis and Calculations for Existing House Condition
- 3- Calc Engineering report dated 7/21/24 for Engineering Inspection Report

Currently, there are several locations in the building that has decayed wood framing which made a full inspection in parts of the building challenging. Every attempt was made to access all portions of the building to observe any signs of distress in the structural members of the building, which includes masonry, wood, and concrete. Distress signs are cracking, spalling, water damage, and termite damage.

III. STRUCTURAL SYSTEMS

Foundations: The building is built on shallow foundations about 24" wide x 12" thick. The foundations support a concrete stem walls (interior and exterior). The interior stem walls support the interior wood stud walls and the exterior stem walls support the exterior masonry walls.

Exterior Walls: The exterior walls of the building are unreinforced masonry block with stucco.

Interior Walls: There are two types of interior walls, load bearing and non-load bearing. Both types are wood 2"x4" stud walls. The load bearing walls support the floor joists system extending from the exterior walls. These stud walls are in turn supported by the concrete stem walls and foundations.

Floors: For the original construction, the wood floor joists are 2"x12" spaced at 24" on center, and spanning from the exterior CMU wall over the interior load bearing wood stud walls. The joists system is supporting the wood decking wood which makes up the 1st and 2nd floor system. All wood joists are "Fire Cut" into the wood wall, meaning the wood joists are resting in openings in the wood wall and are not connected to the walls via strapping or any other mechanism.

As for the new construction the floor system is 2"x6" joists spanning between bearing walls.

Roof: Wood Rafter roof is on the original construction and flat pre-engineered rood flat trusses are on the addition.

IV. SITE OBSERVATIONS

We have inspected the structure on several occasions, and our summary of the evaluation of the existing conditions of the structural components are as follows:

Wood members; The roof of the structure has failed in multiple locations, and the moisture intrusion had caused severe and extensive damage to all the wood members of the building (please see photos). There is moisture damage (rot) of wood, that has caused wood members to deflect, sag, and fail.





Roof Deflections and moisture intrusion



Roof Deflection and moisture intrusion



Moisture intrusion



Moisture intrusion



Moisture Intrusion

The foundations are severely deteriorated, and reinforcing rebars are corroded. The damage is accelerated by the fact that the house is affected by continuous flooding as the top of floor elevation is 5.68' NGVD which is lower than FEMA flood elevation of 8.00' NGVD.

The house first floor joists have been supported in a rudimentary fashion due to the floor sagging and settlement.



Floor Deflection and sagging



Damaged foundations



Damaged foundations



Previous repairs



Foundation Settlement



Wall Cracking Due to Settlement



Vertical members cracking

V. STRUCTURAL EVALUATION

There are several factors to be considered in the structural evaluation of this building;

Initial Construction:

Building construction and standards of the 1940's are considered deficient in today's standards. This applies to this structure and other structures built in the 1940's. This building under current building code is deemed deficient. The structure's roof connections for wind uplift forces, and for wind lateral resistance are non-existent. Moreover, openings protection, and wood reinforcing is also non-existent. To develop this building, it has to undergo level III alteration of the Florida Building Code 2023 for existing structures. This means that the building has to be strengthened to comply with the current Florida Building Code. Which means that the roof connection tie downs have to be implemented to strengthen the roof, and lateral load structural systems have to be installed such as shearwalls. Wall openings such as doors and windows and the exterior wood walls have to be reinforced. Hence, the foundations also have to be strengthened to resist such lateral loads.

Materials Status:

Site Conditions

Based on the visual observation in the field, all the wood members of the building such as the roof, floor joists on all floors, and interior stud walls are in poor and failing condition. There are no wood connectors present and wood members are not connected structurally.

The structural elements of the house including foundations, floor joists, floor beams, walls, stairs are compromised and vary in deterioration from 60%-80% and are no longer supporting their intended use, and cannot be depended on for safety and are in imminent danger of collapse.

Based on the Calcs reports, the results of the calculations reports show that the structure is unstable and is under-reinforced and does not sustain code required loads.

VI. LIFTING DUE TO FLOODING

The current house foundations are in poor condition, and cannot support the house based on the continuous water intrusion, and the lack of inappropriate support.

The Top of first floor elevation is at 5.42' NGVD (see survey in appendix).
FEMA flood elevation is 8.00' NGVD.



Hence to comply with flood elevations the house has to be lifted so the first floor slab elevation has to be raised to elevation 9.00' NGVD.

The difference in elevation is $9.00' - 5.42' = 3.58'$ of hydrostatic pressure that will be subjected on the ground floor slab, which is approximately 360 Punds per square foot. To avoid the stresses, we would raise the house. However, due to the concrete spalling and rebar corrosion, we are not confident that the foundations will not fail during the lifting process.

VII. RECOMMENDATIONS

Based on the site observations of the conditions of structural members of the building and level III alteration required by the Florida Building Code, the structural members of this building need to be replaced rather than repaired. Hence, in order to do so, these structural members need to be demolished.

The structure is in poor condition, leading to deficient structural conditions. The structural members which are mainly wood are deteriorated and moisture damaged and rotting. Most of the structural members cannot be replaced.

We are not confident that the replacement process will not damage the structure, even furthermore due to the connectivity between the members.

Structure does not comply with today's building code, and even when certain parts of it were built.

Based on the Calc reports (please see appendix), the structure is failing under code required loads, hence its not safe.

It is in imminent danger of collapse as it lacks any lateral support system, proper design and construction when portions of it were constructed, and current decay conditions of the structural member deem it unstable to support load conditions of the current permitted use.

APPENDIX A

PHOTOS



Overall view of structure



Overall view of structure



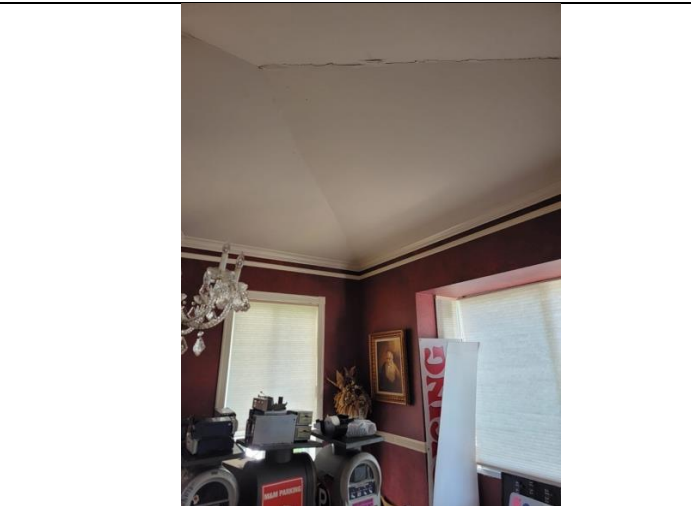
House elevation



Flat roof view



Flat roof view



Roof sagging and finish cracking



Roof sagging and finish cracking



Floor sagging



Moisture intrusion



Wall settlement and finish cracking



Moisture intrusion



Concrete spalling and rebar corrosion



Floor sagging and previous repairs



Foundation cracking



Foundation cracking and spalling



Concrete spalling and rebar corrosion

Appendix B Calculations



Concrete Compressive Testing

Regarding:
1210 Michigan Ave Miami Beach, FL 33139

Date: 9/16/2024

TO WHOM IT MAY CONCERN

CALC ENGINEERING performed an inspection and concrete compressive test at property located at 1210 Michigan Ave Miami Beach, FL 33139. CALC ENGINEERING performed concrete testing in concrete foundation and tie beam at the top level in exterior of the building. Five testing performed around exterior of the building facing east and west side of the property. Below is an average of the results of those areas. Testing performed using Digital Schmidt Hammer Concrete Ultrasonic Tester.

East side reading concrete compressive strength average 2670 psi

West side reading concrete compressive strength average 2667 psi

All five readings are less than 3000 psi as required by Florida Building Code,

Transmitted herewith is the inspection letter and testing and stating my professional opinion and if needed repair or replacement solution on existing work. Our recommendation in this letter is proper and applicable for the time of inspection, and not for future. It is our purpose to provide information on the condition of the structure on the day of the inspection, and not to provide discussions or recommendations concerning the future maintenance of the structure. Thank you for asking Calc Engineering to perform this important inspection work for you. If you have any questions after reviewing this report, please feel free to call me at my office with 305-898-9995. Please do not hesitate to contact me, if you have any question regarding this report.

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1210 MICHIGAN AVE

1210 MICHIGAN AVE, MIAMI BEACH, FL 33139, USA
FOR: Andrew Mirmelli

Structural Analysis and Calculations for Existing House Condition



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	Date	Prepared by	Project Number:	Rev.
	07-Sep-24	SRS	S-24119	0
Filepath:				

 Calc Engineering LLC 2000 NW 89 PL UNIT 102 DORAL FL 33172 masood@calceng.com Phone +1 (305) 898-9995 www.calceng.com	1210 MICHIGAN AVE		Rev.	0
	Job: Structural Calculations		Page	of
	Description: Table of Contents		Sheet	of
	Project No. S-24119		Date	07-Sep-24
	Computed by: SRS		Date	07-Sep-24
	Checked by: CDP			

			Reference
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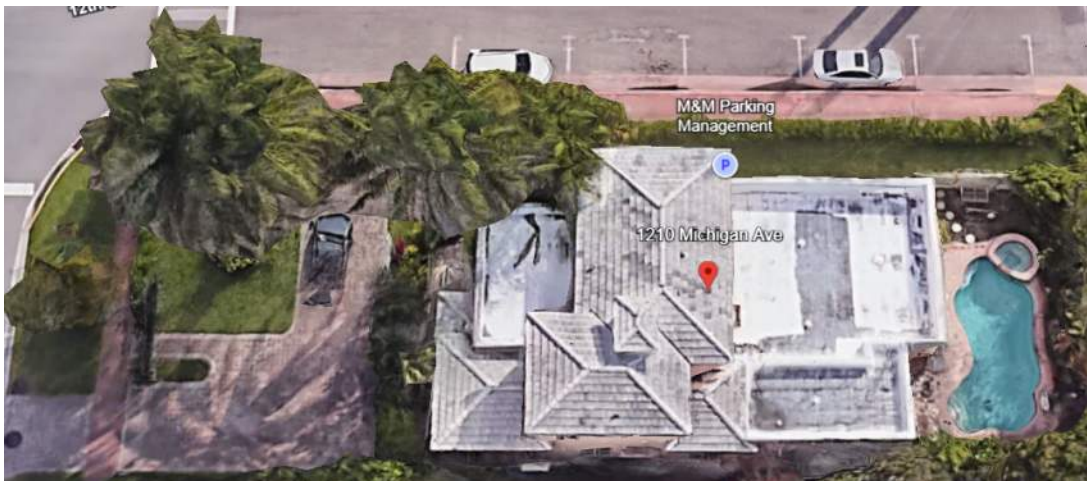
Chapter 1: Design Criteria

1.1 Introduction

Scope of this calculation report is to provide preliminary assessment of an as-built residential structure. Project is located at "1210 Michigan Ave, Miami Beach, FL 33139, USA"

All calculations are with in reference to 8TH Edition of FBC-2023, and ASCE 7-22, ACI 318-19(22), TMS 402/602-16(22) based on the existing house components.

Refer below snips of mentioned structure.



This report examines the single-story flat and tile roofed area, due to its status as the most recent component of the structure.

Refer following pages for design loadings.

Chapter 1: Design Criteria Cont'd...

1.2 Design Loads

A. Dead Load:

Roof Load:

Roofing	4.0psf
Insulation	3.0psf
Self-Weight of Roof Deck	3.0psf
Self-Weight of Wooden Framing	4.0psf
MEP	2.0psf
Misc.	2.0psf
Total	18.0psf

Wall Load:

8" CMU WALL	81.0psf
Stucco Finish	18.0psf
Total	99.0psf

(Refer Architectural Drawings)

B. Live Load:

Roof Load:

20.0psf

(Table-1607.1,FBC-2023)

Chapter 1: Design Criteria Cont'd...

C. Wind Load:

Building Data:

Type of Roof :	Flat
Length of Building (L) :	32 ft
Width of Building (B) :	40 ft
Height of Building/Eaves (H) :	9 ft
Parapet Height (h) :	3 ft

General Wind Requirements:

Basic Wind Speed (V_b) :	170.00 mph	(Refer ASCE hazard tool report)
Risk Category :	II	
Wind Exposure Category :	D	

Design Wind Pressure (DD):

Pressure Along N-S Direction :

Windward pressure, P.mww :	45.96 psf
Leeward pressure, P.mlw :	-10.82 psf

Pressure Along E-W Direction :

Windward pressure, P.mww :	45.96 psf
Leeward pressure, P.mlw :	-13.09 psf

**Refer Attached Detailed Report of Wind Pressure calculation*

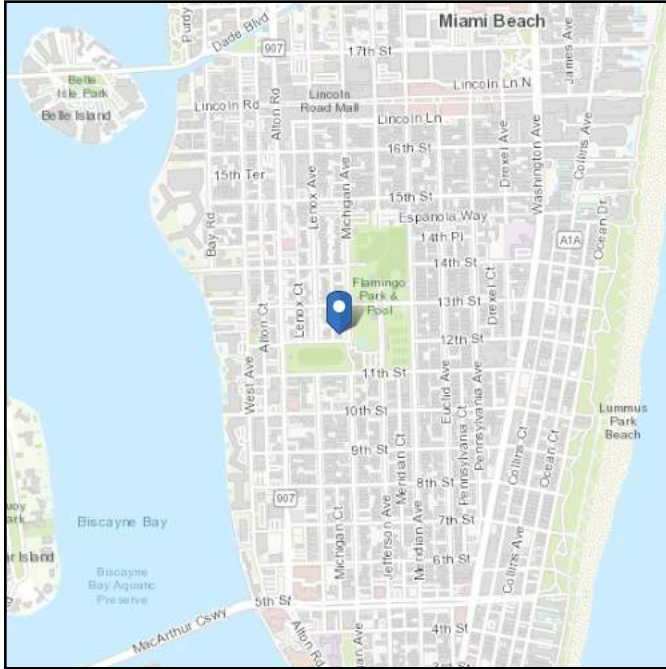
Refer following pages for wind loading reports.

ASCE Hazards Report

Address:
1210 Michigan Ave
Miami Beach, Florida
33139

Standard: ASCE/SEI 7-22
Risk Category: II
Soil Class: DE

Latitude: 25.783042
Longitude: -80.138949
Elevation: 3.54531332539228 ft (NAVD 88)



Wind

Results:

Wind Speed	170 Vmph
10-year MRI	77 Vmph
25-year MRI	113 Vmph
50-year MRI	129 Vmph
100-year MRI	140 Vmph
300-year MRI	158 Vmph
700-year MRI	170 Vmph
1,700-year MRI	183 Vmph
3,000-year MRI	191 Vmph
10,000-year MRI	203 Vmph
100,000-year MRI	230 Vmph
1,000,000-year MRI	257 Vmph

Data Source: ASCE/SEI 7-22, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Fri Sep 06 2024

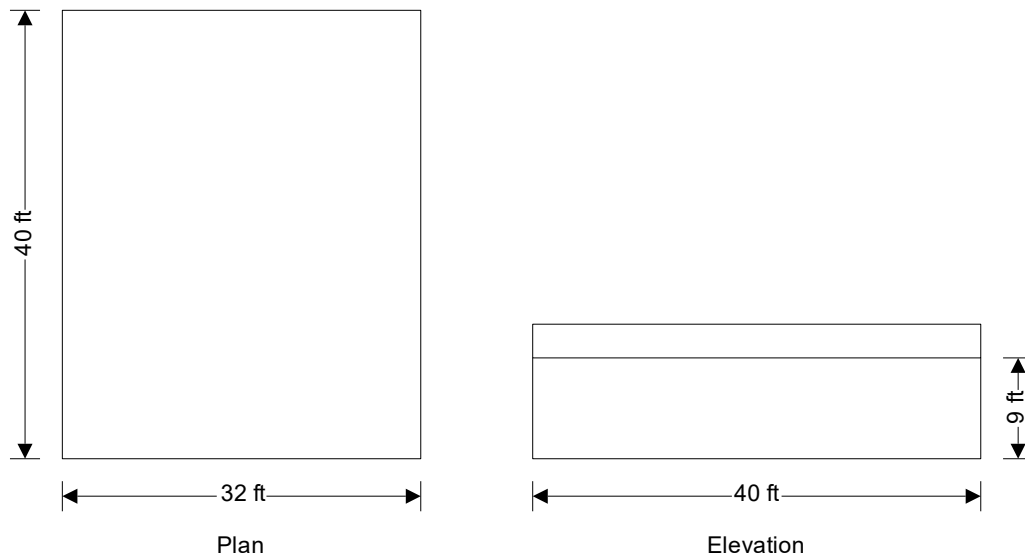
Chapter 1: Design Criteria Cont'd...

WIND LOADING

In accordance with ASCE7-22

Using the directional design method

Tedds calculation version 2.1.16



Building data

Type of roof	Flat
Length of building	b = 32.00 ft
Width of building	d = 40.00 ft
Height to eaves	H = 9.00 ft
Height of parapet	h _p = 3.00 ft
Mean height	h = 9.00 ft

General wind load requirements

Basic wind speed	V = 170.0 mph	Refer A
Risk category	II	
Velocity pressure exponent coef (Table 26.6-1)	K _d = 0.85	
Ground elevation above sea level	z _{gl} = 3 ft	
Ground elevation factor	K _e = exp(-0.0000362 × z _{gl} /1ft) = 1.00	
Exposure category (cl 26.7.3)	C	
Enclosure classification (cl.26.12)	Enclosed buildings	
Internal pressure coef +ve (Table 26.13-1)	GC _{pi_p} = 0.18	
Internal pressure coef -ve (Table 26.13-1)	GC _{pi_n} = -0.18	
Gust effect factor	G _f = 0.85	
Minimum design wind loading (cl.27.1.5)	p _{min_r} = 8 lb/ft ²	

Topography

Topography factor not significant	K _{zt} = 1.0
Velocity pressure equation	q = 0.00256 × K _z × K _{zt} × V ² × 1psf/mph ²

Chapter 1: Design Criteria Cont'd...

Velocity pressures table

z (ft)	K _z (Table 26.10-1)	q _z (psf)
9.00	0.85	62.88
12.00	0.85	62.88

Peak velocity pressure for internal pressure

Peak velocity pressure – internal (as roof press.) $q_i = 62.88$ psf

Parapet pressures and forces

Velocity pressure at top of parapet $q_p = 62.88$ psf

Combined net pressure coefficient, leeward $GC_{pnl} = -1.0$

Combined net parapet pressure, leeward $p_{pl} = K_d \times q_p \times GC_{pnl} = -53.45$ psf

Combined net pressure coefficient, windward $GC_{pnw} = 1.5$

Combined net parapet pressure, windward $p_{pw} = K_d \times q_p \times GC_{pnw} = 80.17$ psf

Wind direction 0 deg:

Leeward parapet force $F_{w,wpl_0} = p_{pl} \times h_p \times b = -5.1$ kips

Windward parapet force $F_{w,wpw_0} = p_{pw} \times h_p \times b = 7.7$ kips

Wind direction 90 deg:

Leeward parapet force $F_{w,wpl_90} = p_{pl} \times h_p \times d = -6.4$ kips

Windward parapet force $F_{w,wpw_90} = p_{pw} \times h_p \times d = 9.6$ kips

Pressures and forces

Net pressure $p = K_d \times q \times G_f \times C_{pe} - K_d \times q_i \times GC_{pi}$

Net force $F_w = p \times A_{ref}$

Roof load case 1 - Wind 0, GC_{pi} 0.18, $-C_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A (-ve)	9.00	-0.90	62.88	-50.51	144.00	-7.27
B (-ve)	9.00	-0.90	62.88	-50.51	144.00	-7.27
C (-ve)	9.00	-0.50	62.88	-32.34	288.00	-9.31
D (-ve)	9.00	-0.30	62.88	-23.25	704.00	-16.37

Total vertical net force $F_{w,v} = -40.23$ kips

Total horizontal net force $F_{w,h} = 0.00$ kips

Walls load case 1 - Wind 0, GC_{pi} 0.18, $-C_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A	9.00	0.80	62.88	26.72	288.00	7.70
B	9.00	-0.45	62.88	-30.06	288.00	-8.66
C	9.00	-0.70	62.88	-41.42	360.00	-14.91
D	9.00	-0.70	62.88	-41.42	360.00	-14.91

Overall loading

Projected vertical plan area of wall $A_{vert_w_0} = b \times (H + h_p) = 384.00$ ft²

Chapter 1: Design Criteria Cont'd...

Projected vertical area of roof $A_{vert_r_0} = 0.00 \text{ ft}^2$
 Minimum overall horizontal loading $F_{w,total_min} = p_{min_w} \times A_{vert_w_0} + p_{min_r} \times A_{vert_r_0} = 6.14 \text{ kips}$
 Leeward net force $F_l = F_{w,wB} + F_{w,wpl_0} = -13.8 \text{ kips}$
 Windward net force $F_w = F_{w,wA} + F_{w,wpw_0} = 15.4 \text{ kips}$
 Overall horizontal loading $F_{w,total} = \max(F_w - F_l + F_{w,h}, F_{w,total_min}) = 29.2 \text{ kips}$

Roof load case 2 - Wind 0, $GC_{pi} -0.18$, $-0c_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A (+ve)	9.00	-0.18	62.88	1.44	144.00	0.21
B (+ve)	9.00	-0.18	62.88	1.44	144.00	0.21
C (+ve)	9.00	-0.18	62.88	1.44	288.00	0.42
D (+ve)	9.00	-0.18	62.88	1.44	704.00	1.02

Total vertical net force $F_{w,v} = 1.85 \text{ kips}$

Total horizontal net force $F_{w,h} = 0.00 \text{ kips}$

Walls load case 2 - Wind 0, $GC_{pi} -0.18$, $-0c_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A	9.00	0.80	62.88	45.96	288.00	13.24
B	9.00	-0.45	62.88	-10.82	288.00	-3.12
C	9.00	-0.70	62.88	-22.18	360.00	-7.99
D	9.00	-0.70	62.88	-22.18	360.00	-7.99

Overall loading

Projected vertical plan area of wall $A_{vert_w_0} = b \times (H + h_p) = 384.00 \text{ ft}^2$
 Projected vertical area of roof $A_{vert_r_0} = 0.00 \text{ ft}^2$
 Minimum overall horizontal loading $F_{w,total_min} = p_{min_w} \times A_{vert_w_0} + p_{min_r} \times A_{vert_r_0} = 6.14 \text{ kips}$
 Leeward net force $F_l = F_{w,wB} + F_{w,wpl_0} = -8.2 \text{ kips}$
 Windward net force $F_w = F_{w,wA} + F_{w,wpw_0} = 20.9 \text{ kips}$
 Overall horizontal loading $F_{w,total} = \max(F_w - F_l + F_{w,h}, F_{w,total_min}) = 29.2 \text{ kips}$

Roof load case 3 - Wind 90, $GC_{pi} 0.18$, $-c_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A (-ve)	9.00	-0.90	62.88	-50.51	180.00	-9.09
B (-ve)	9.00	-0.90	62.88	-50.51	180.00	-9.09
C (-ve)	9.00	-0.50	62.88	-32.34	360.00	-11.64
D (-ve)	9.00	-0.30	62.88	-23.25	560.00	-13.02

Total vertical net force $F_{w,v} = -42.84 \text{ kips}$

Total horizontal net force $F_{w,h} = 0.00 \text{ kips}$

Chapter 1: Design Criteria Cont'd...

Walls load case 3 - Wind 90, GC_{pi} 0.18, $-c_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A	9.00	0.80	62.88	26.72	360.00	9.62
B	9.00	-0.50	62.88	-32.34	360.00	-11.64
C	9.00	-0.70	62.88	-41.42	288.00	-11.93
D	9.00	-0.70	62.88	-41.42	288.00	-11.93

Overall loading

Projected vertical plan area of wall

$$A_{vert_w_90} = d \times (H + h_p) = 480.00 \text{ ft}^2$$

Projected vertical area of roof

$$A_{vert_r_90} = 0.00 \text{ ft}^2$$

Minimum overall horizontal loading

$$F_{w,total_min} = p_{min_w} \times A_{vert_w_90} + p_{min_r} \times A_{vert_r_90} = 7.68 \text{ kips}$$

Leeward net force

$$F_l = F_{w,wB} + F_{w,wpl_90} = -18.1 \text{ kips}$$

Windward net force

$$F_w = F_{w,wA} + F_{w,wpw_90} = 19.2 \text{ kips}$$

Overall horizontal loading

$$F_{w,total} = \max(F_w - F_l + F_{w,h}, F_{w,total_min}) = 37.3 \text{ kips}$$

Roof load case 4 - Wind 90, GC_{pi} -0.18, $+c_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A (+ve)	9.00	-0.18	62.88	1.44	180.00	0.26
B (+ve)	9.00	-0.18	62.88	1.44	180.00	0.26
C (+ve)	9.00	-0.18	62.88	1.44	360.00	0.52
D (+ve)	9.00	-0.18	62.88	1.44	560.00	0.81

Total vertical net force

$$F_{w,v} = 1.85 \text{ kips}$$

Total horizontal net force

$$F_{w,h} = 0.00 \text{ kips}$$

Walls load case 4 - Wind 90, GC_{pi} -0.18, $+c_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A	9.00	0.80	62.88	45.96	360.00	16.55
B	9.00	-0.50	62.88	-13.09	360.00	-4.71
C	9.00	-0.70	62.88	-22.18	288.00	-6.39
D	9.00	-0.70	62.88	-22.18	288.00	-6.39

Overall loading

Projected vertical plan area of wall

$$A_{vert_w_90} = d \times (H + h_p) = 480.00 \text{ ft}^2$$

Projected vertical area of roof

$$A_{vert_r_90} = 0.00 \text{ ft}^2$$

Minimum overall horizontal loading

$$F_{w,total_min} = p_{min_w} \times A_{vert_w_90} + p_{min_r} \times A_{vert_r_90} = 7.68 \text{ kips}$$

Leeward net force

$$F_l = F_{w,wB} + F_{w,wpl_90} = -11.1 \text{ kips}$$

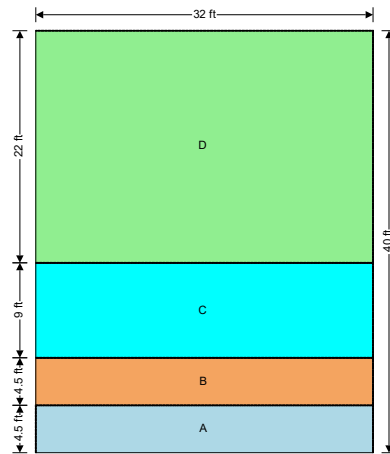
Windward net force

$$F_w = F_{w,wA} + F_{w,wpw_90} = 26.2 \text{ kips}$$

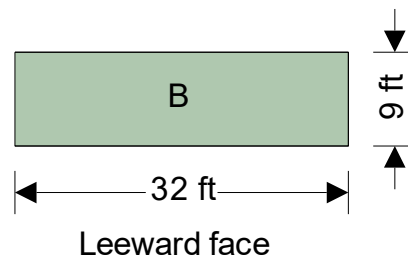
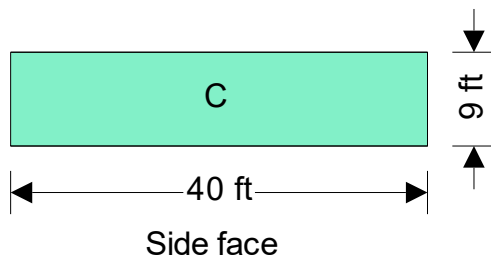
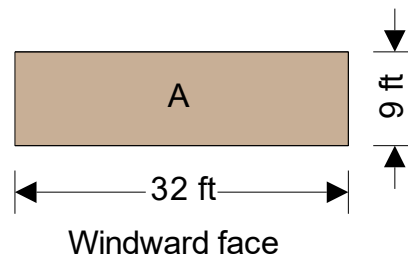
Overall horizontal loading

$$F_{w,total} = \max(F_w - F_l + F_{w,h}, F_{w,total_min}) = 37.3 \text{ kips}$$

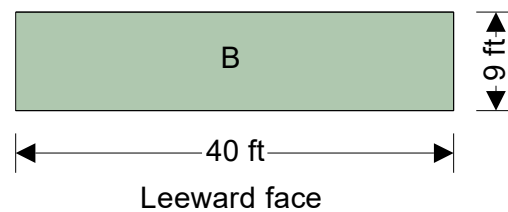
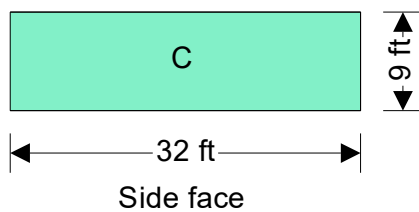
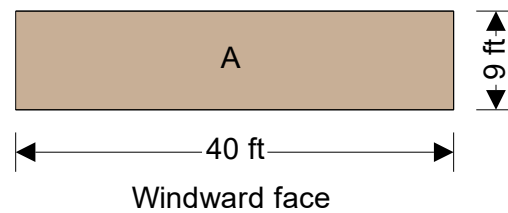
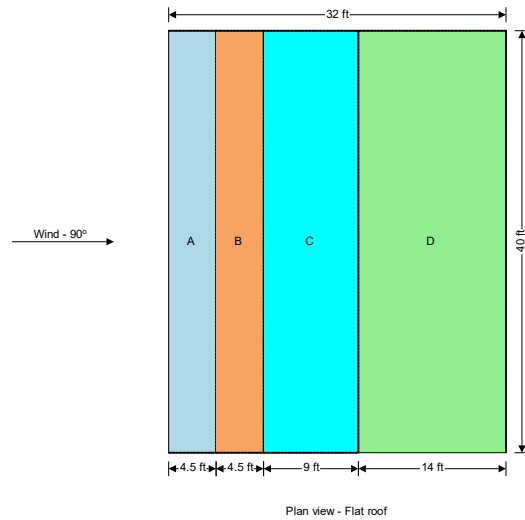
Chapter 1: Design Criteria Cont'd...



Wind - 0°
Plan view - Flat roof



Chapter 1: Design Criteria Cont'd...

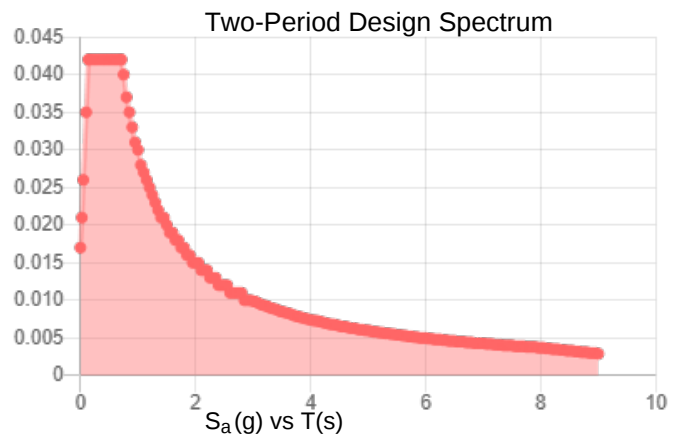
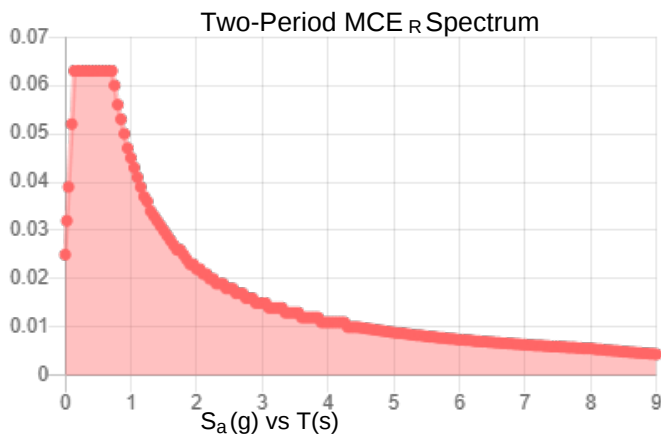
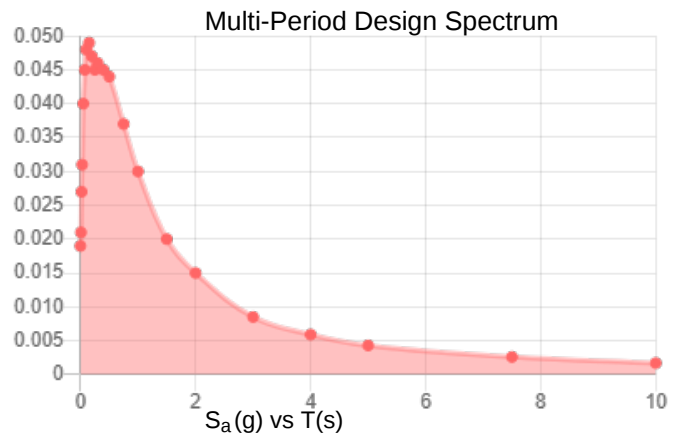
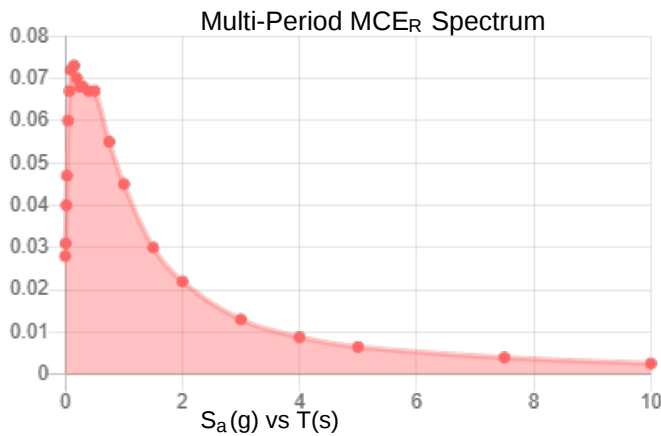


Site Soil Class: DE

Results:

PGA _M :	0.024	T _L :	8
S _{MS} :	0.063	S _S :	0.048
S _{M1} :	0.045	S ₁ :	0.021
S _{DS} :	0.042	V _{S30} :	185
S _{D1} :	0.03		

Seismic Design Category: A *Due to lower seismicity in this region, Wind force will act as governing lateral design force.*



MCE_R Vertical Response Spectrum
Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum
Vertical ground motion data has not yet been made available by USGS.

Results:

Ground Snow Load, p_g :	3 lb/ft ²
20-year MRI Value:	1 lb/ft ²
Winter Wind Parameter:	0.45
Mapped Elevation:	1.1 ft
Data Source:	ASCE/SEI 7-22, Figures 7.6-1 and 7.6-2 A-D
Date Accessed:	Fri Sep 06 2024

Values provided are ground snow loads. In areas designated "case study required," extreme local variations in ground snow loads preclude mapping at this scale. Site-specific case studies are required to establish ground snow loads at elevations not covered.

Snow load values are mapped to a 0.5 mile resolution. This resolution can create a mismatch between the mapped elevation and the site-specific elevation in topographically complex areas. Engineers should consult the local authority having jurisdiction in locations where the reported 'elevation' and 'mapped elevation' differ significantly from each other.

Ground Snow Loads for IRC only, $p_{g(asd)}$:	2.1 lb/ft ²
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The ASCE Hazard Tool is provided for your convenience, for informational purposes only, and is provided "as is" and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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Chapter 1: Design Criteria Cont'd...

1.3 Wind Load Calculation

Wind Force in N-S Direction = $[(45.96+10.82)*4.5*32]+(7.7+5.1)] = 20.9$ kips
(0° as reference to calculation report)



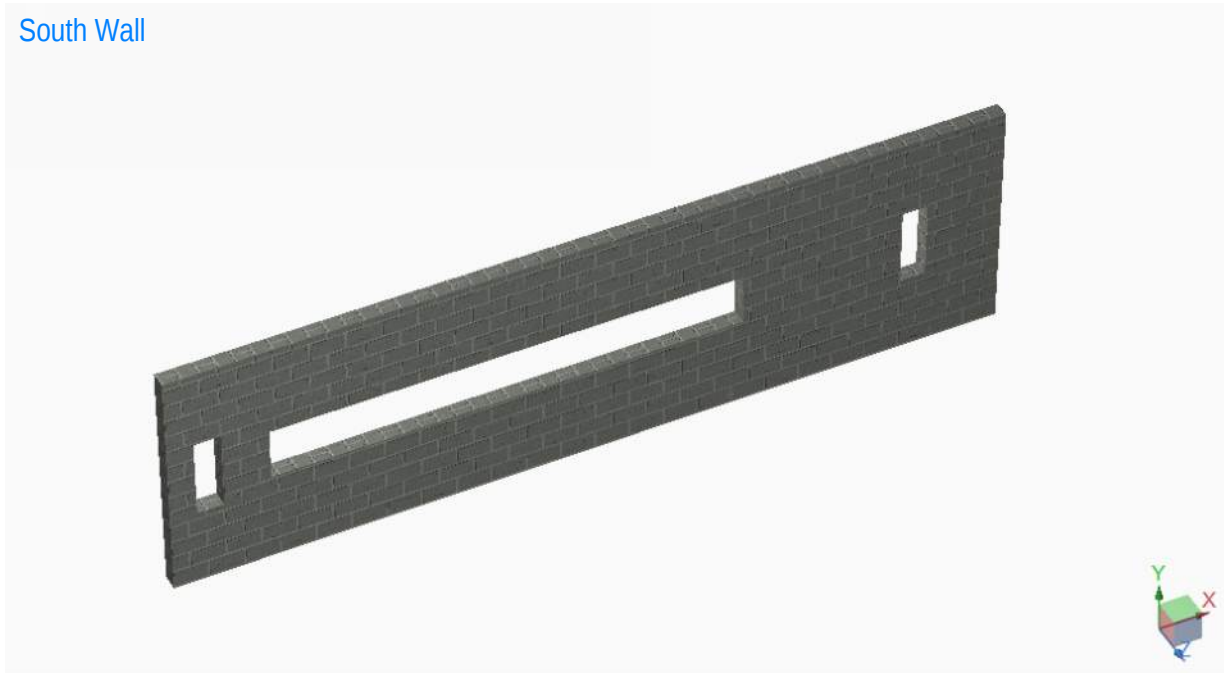
Wind Force in E-W Direction = $[(45.96+13.09)*4.5*40]+(9.6+6.4)] = 26.6$ kips
(90° as reference to calculation report)

Chapter 2: Analytical Model

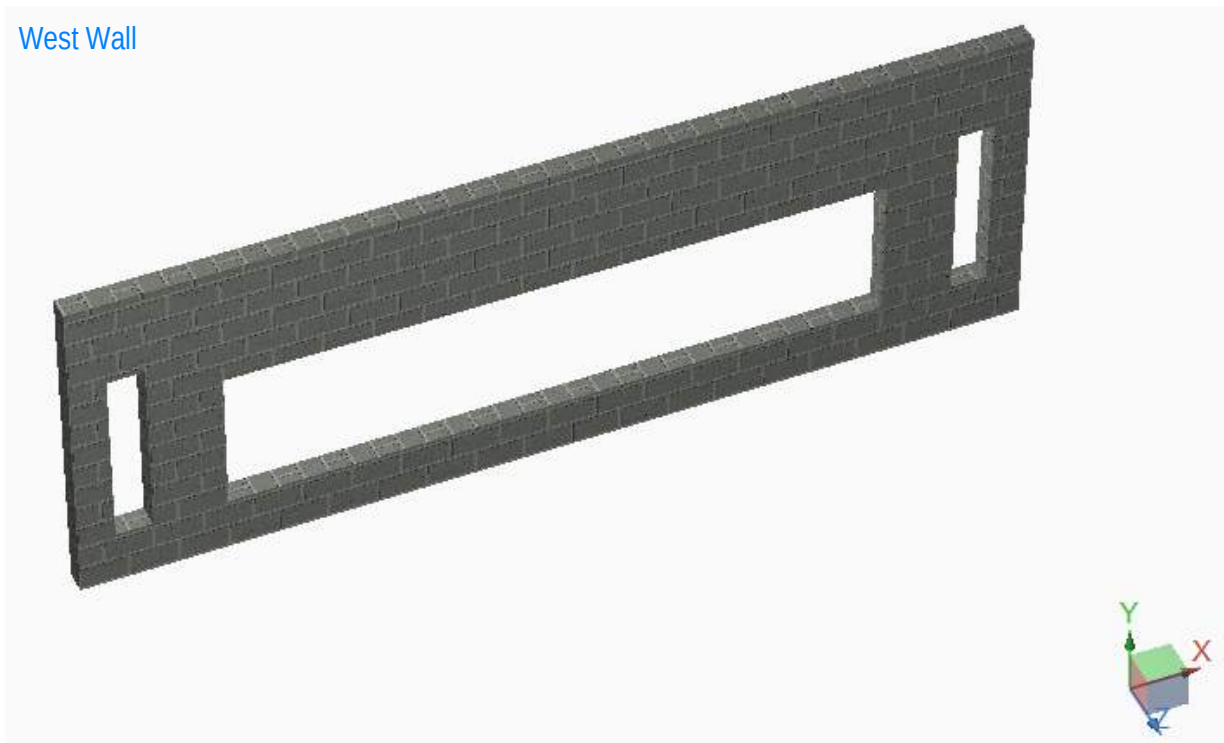
2.1 Model Information

In order to analyze the behavior of wind-facing walls under varying loads, two analytical models have been formulated.

South Wall



West Wall



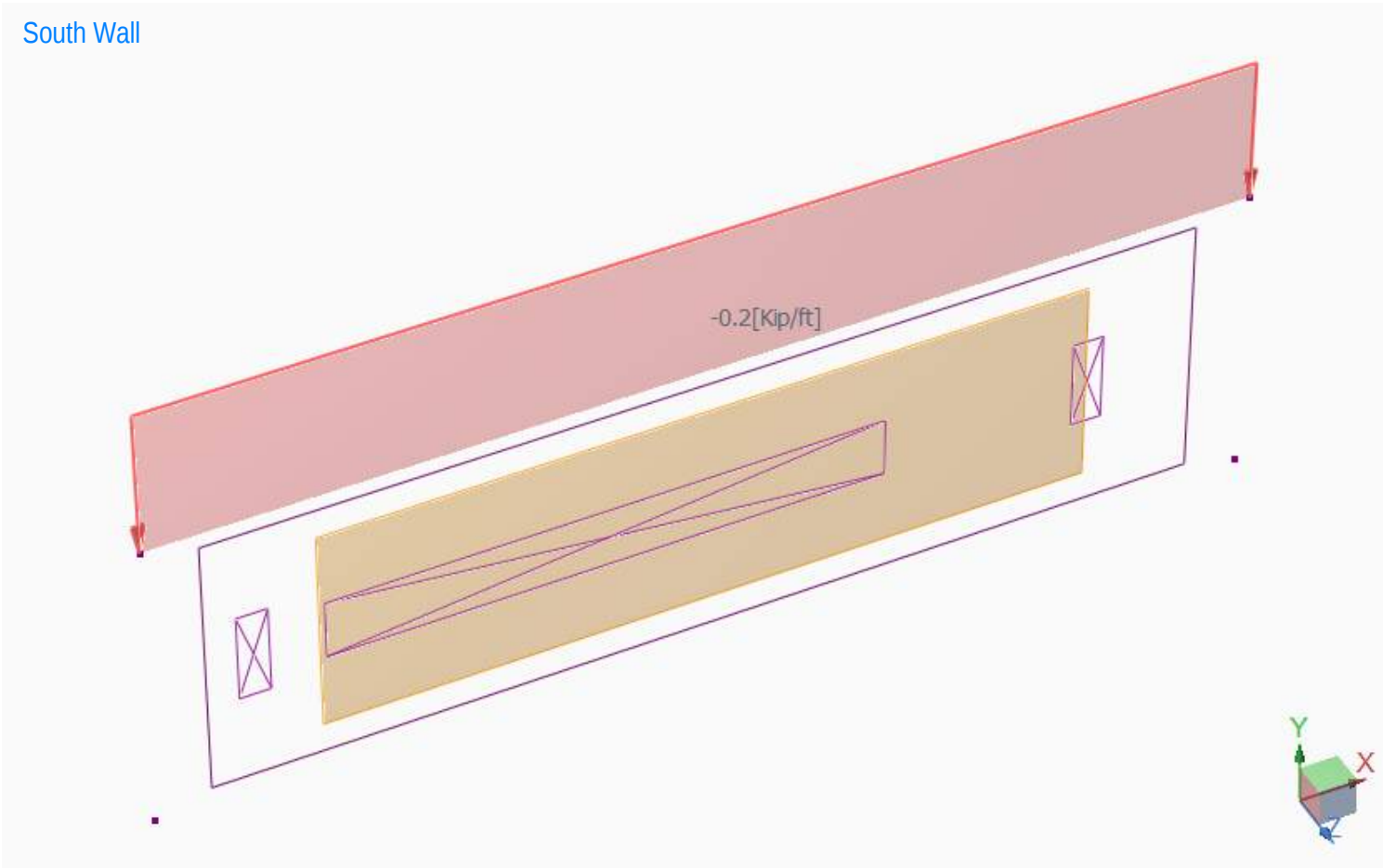
Appendix-A contains references pertaining to the empirical 8" CMU wall

Chapter 2: Analytical Model Cont'd...

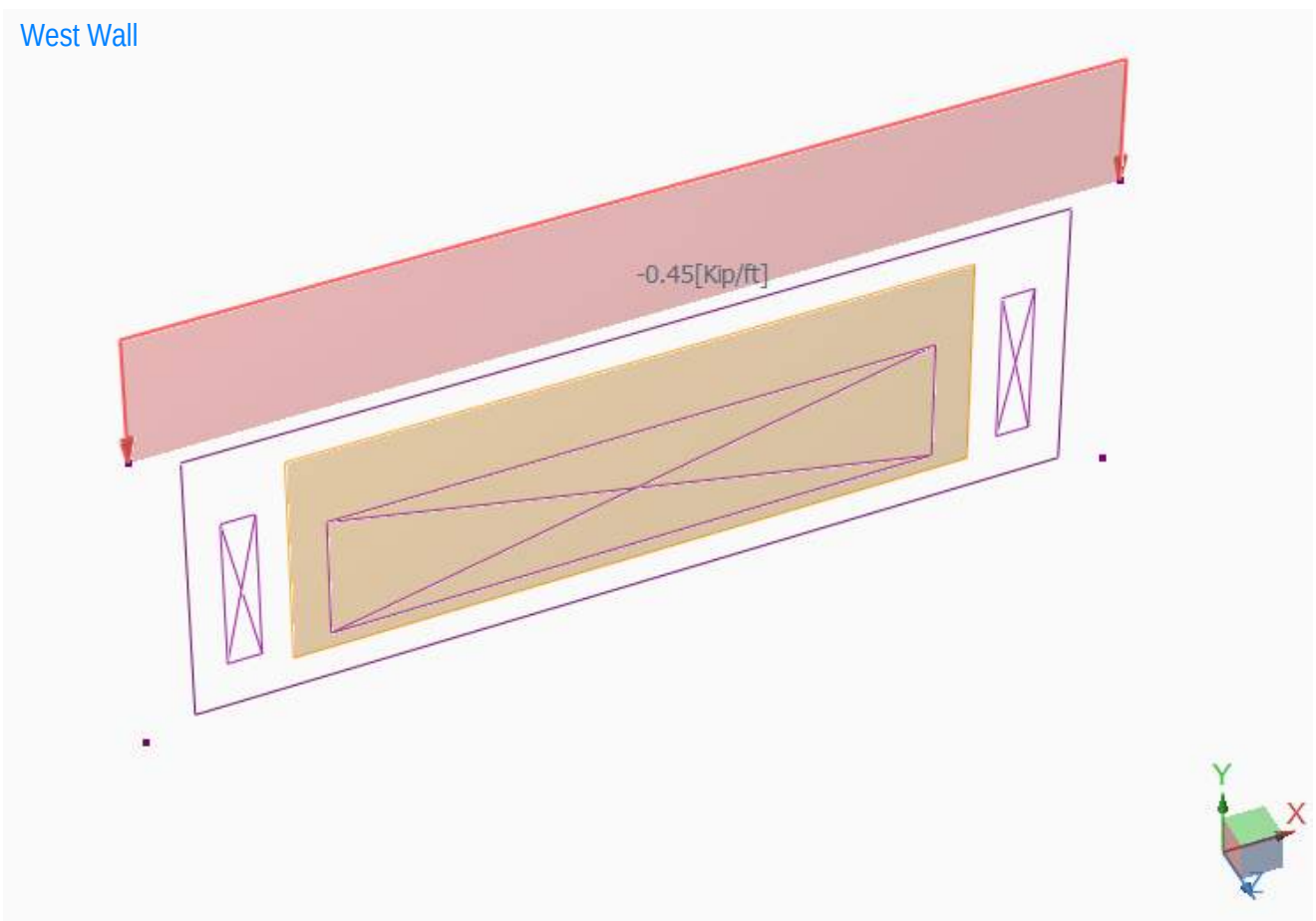
2.2 Loadings

2.2.1 Dead Load

South Wall



West Wall



NodesMembersShellsAreasConnGen



Self weight vector

X multiplier

Y multiplier

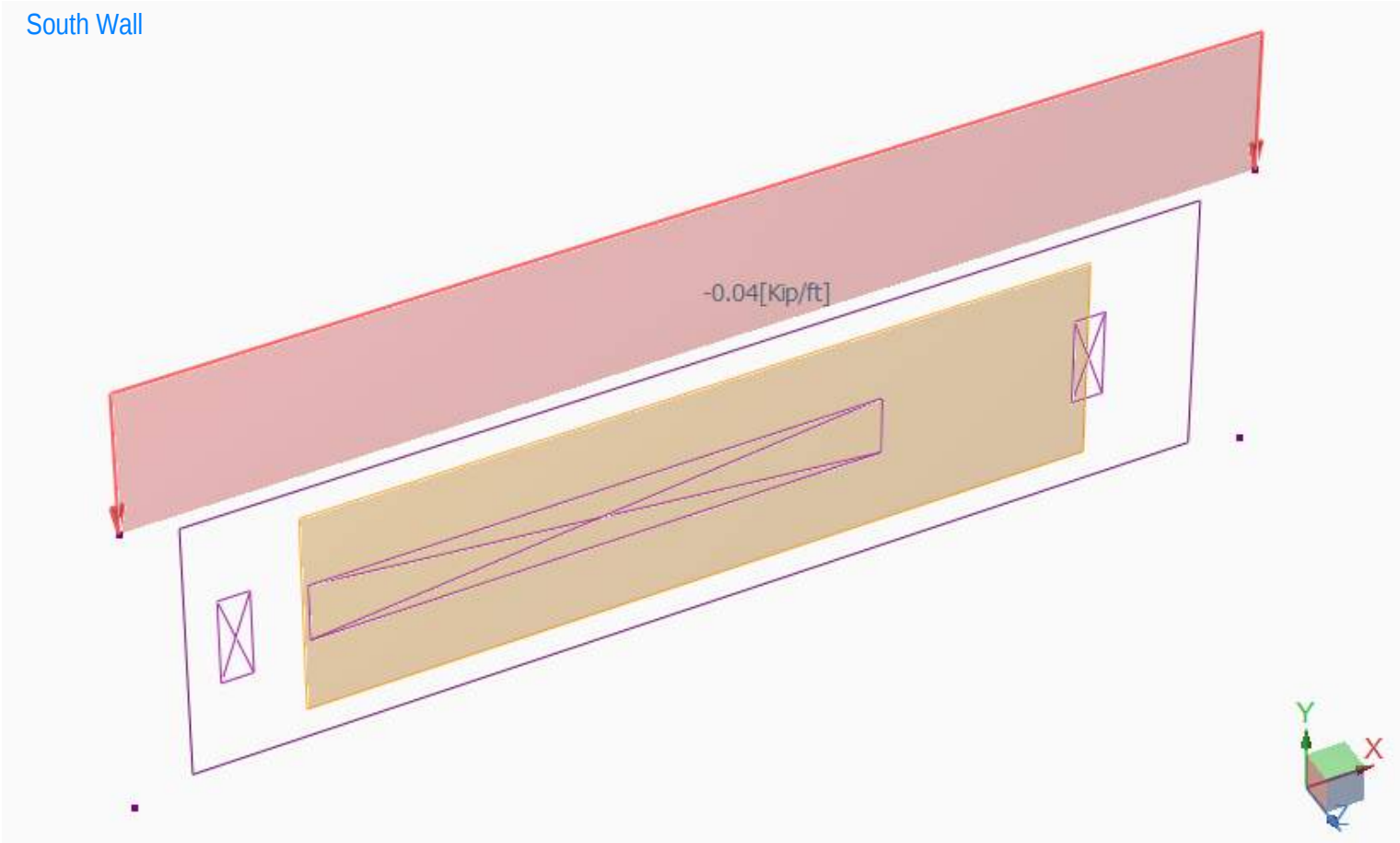
Z multiplier

Chapter 2: Analytical Model Cont'd...

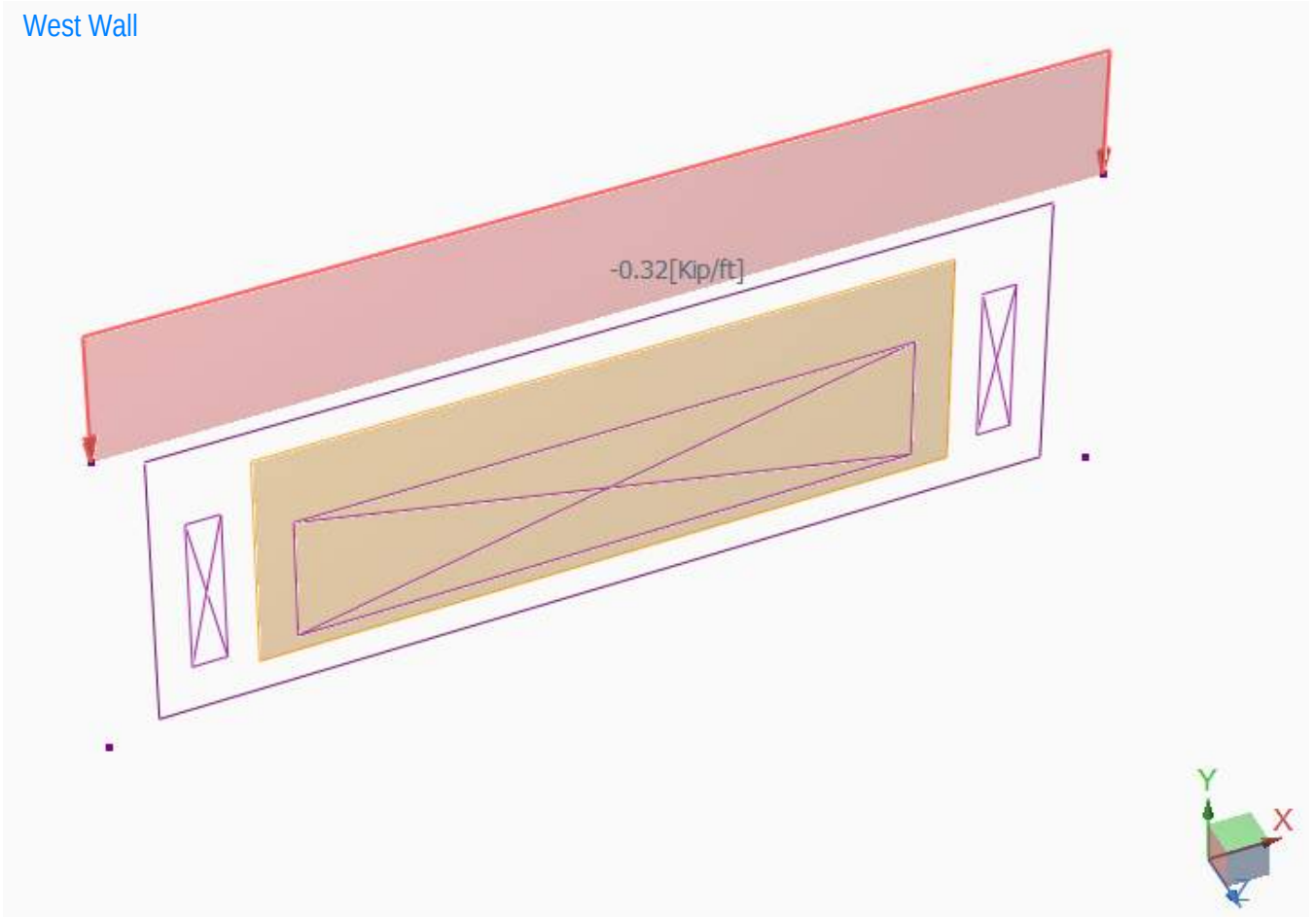
2.2 Loadings

2.2.2 Roof Live Load

South Wall



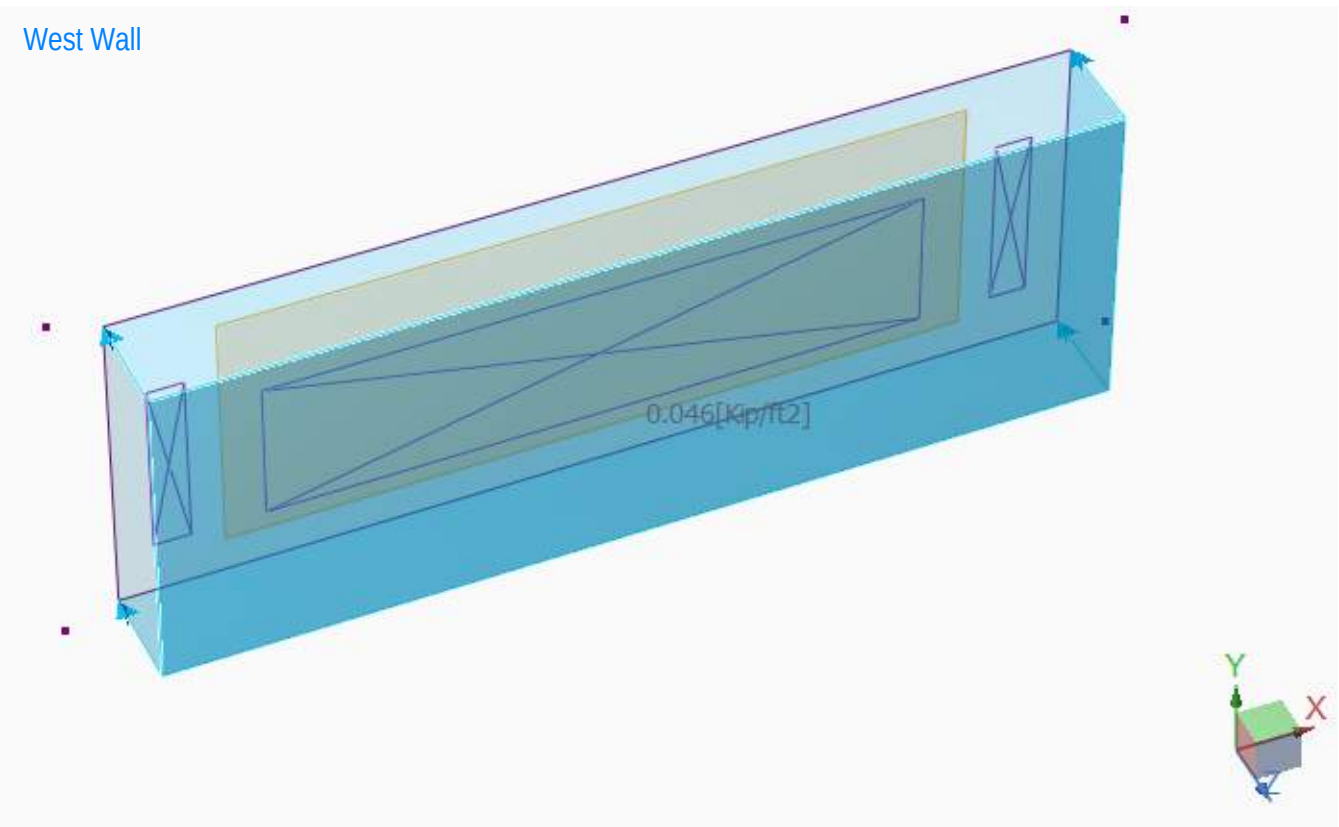
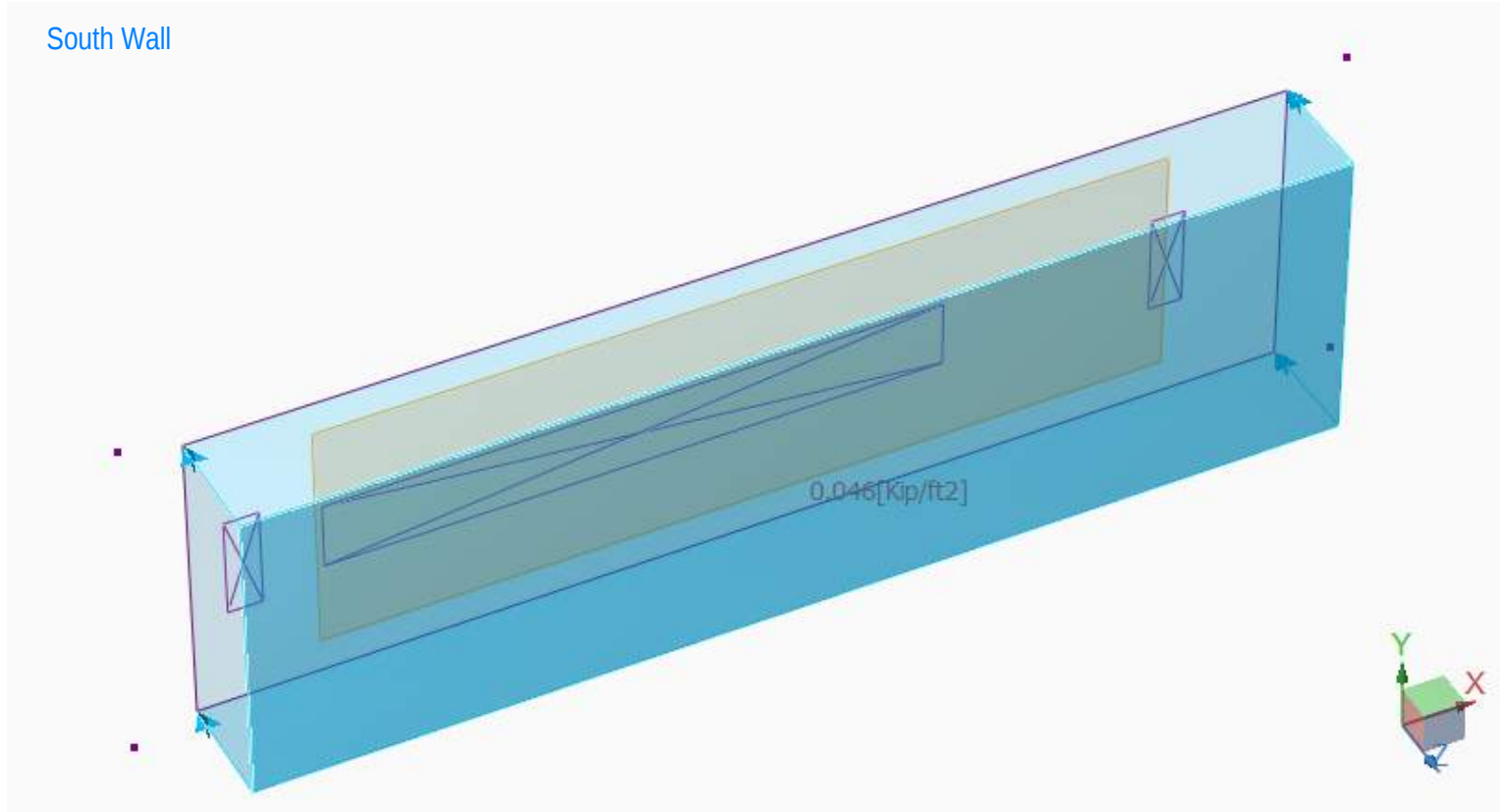
West Wall



Chapter 2: Analytical Model Cont'd...

2.2 Loadings

2.2.3 Out-of-plane Wind Load

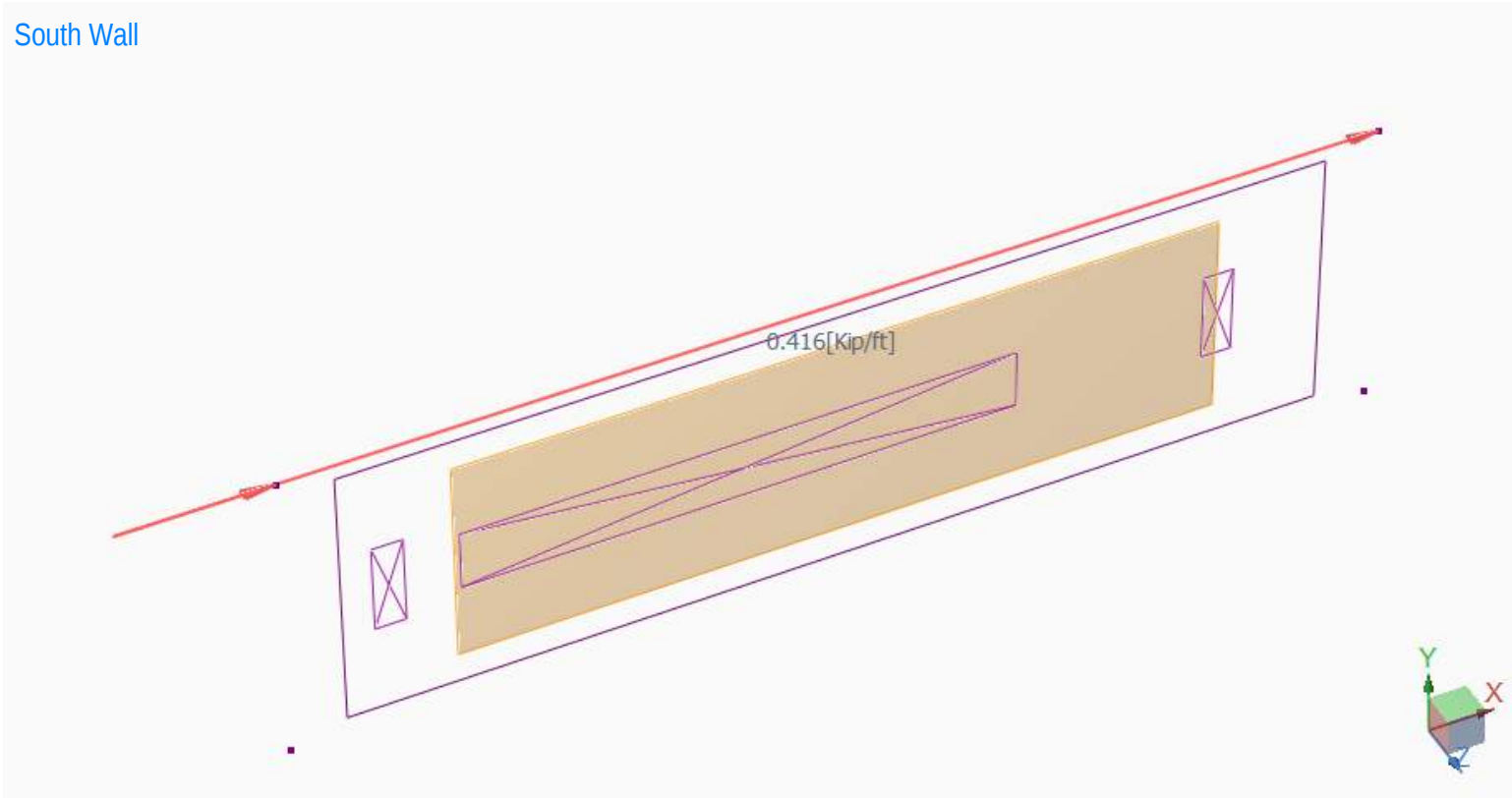


Chapter 2: Analytical Model Cont'd...

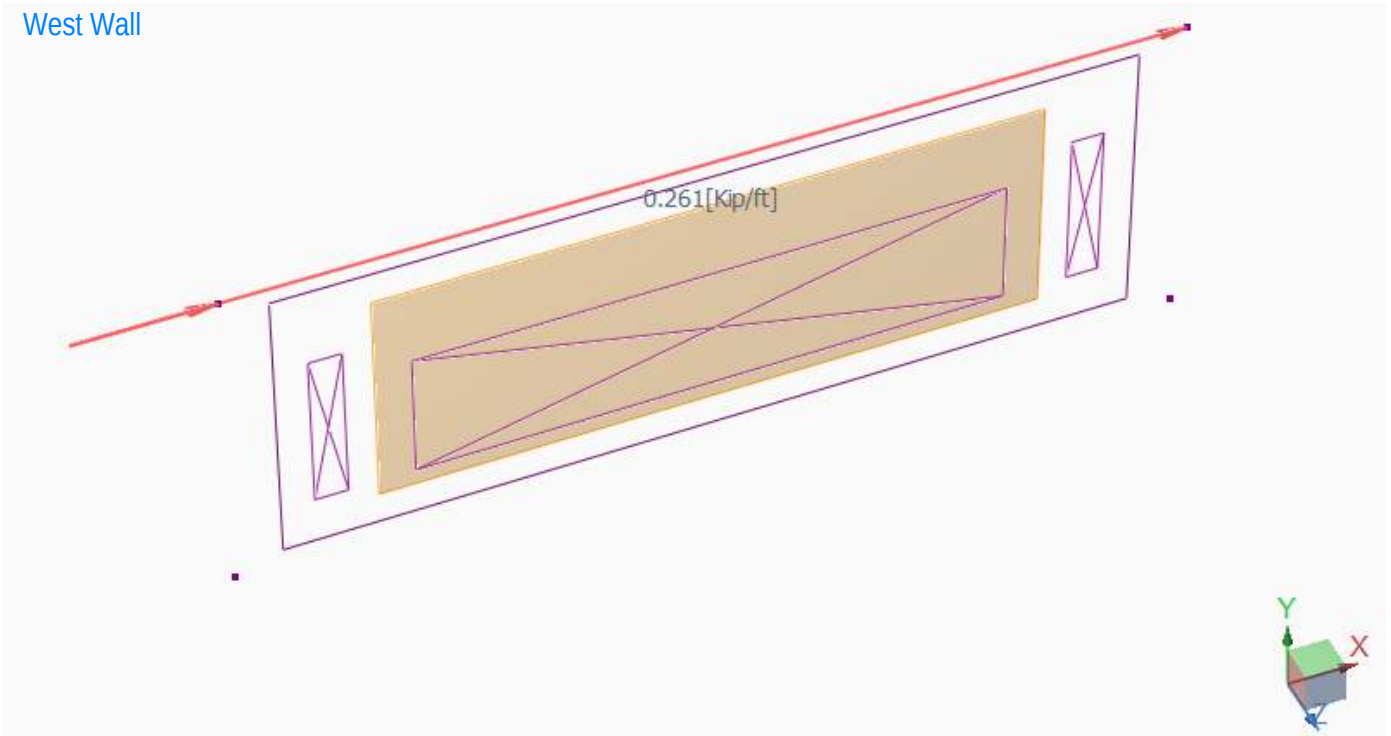
2.2 Loadings

2.2.4 In-plane Wind Load

South Wall

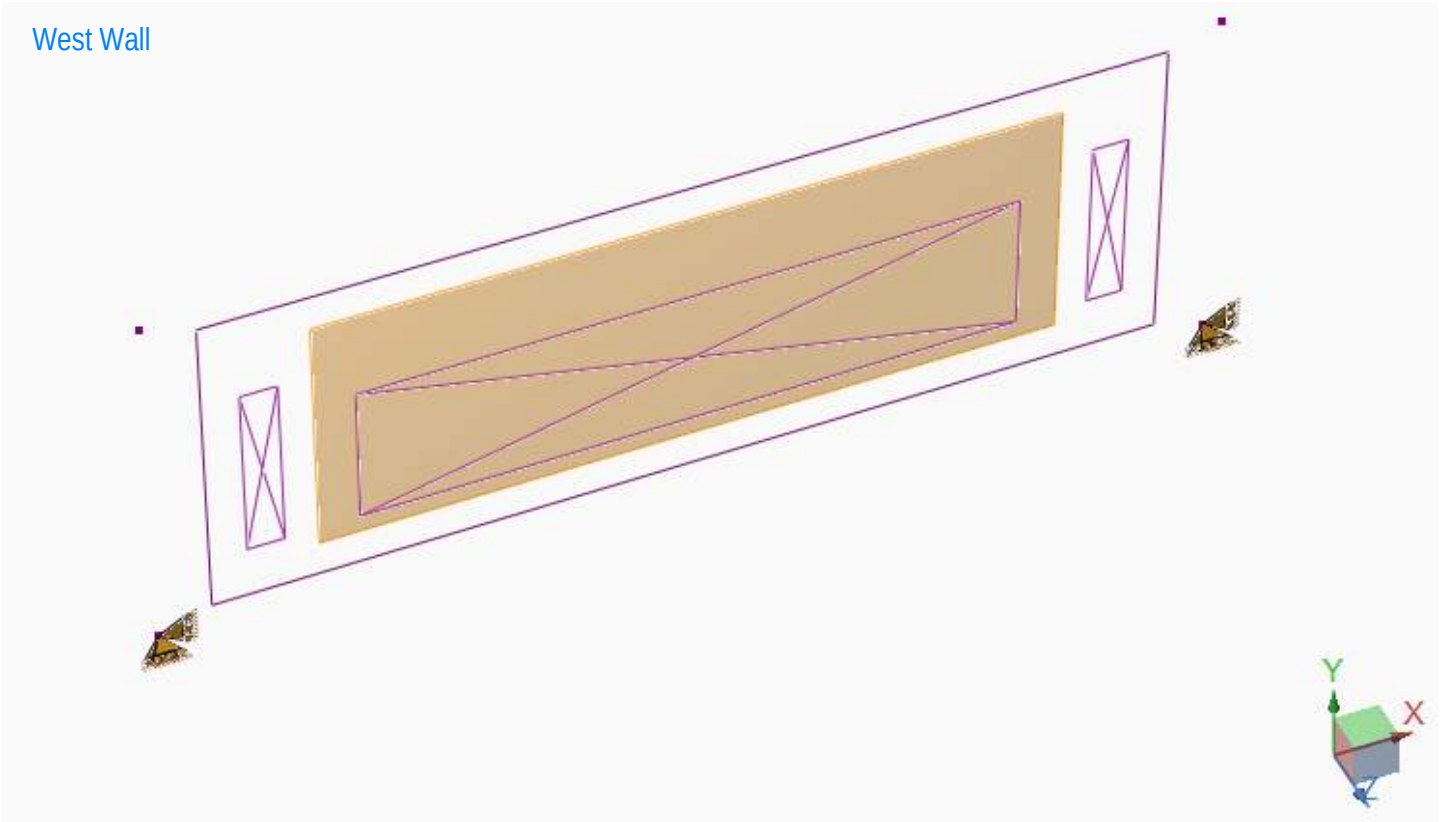
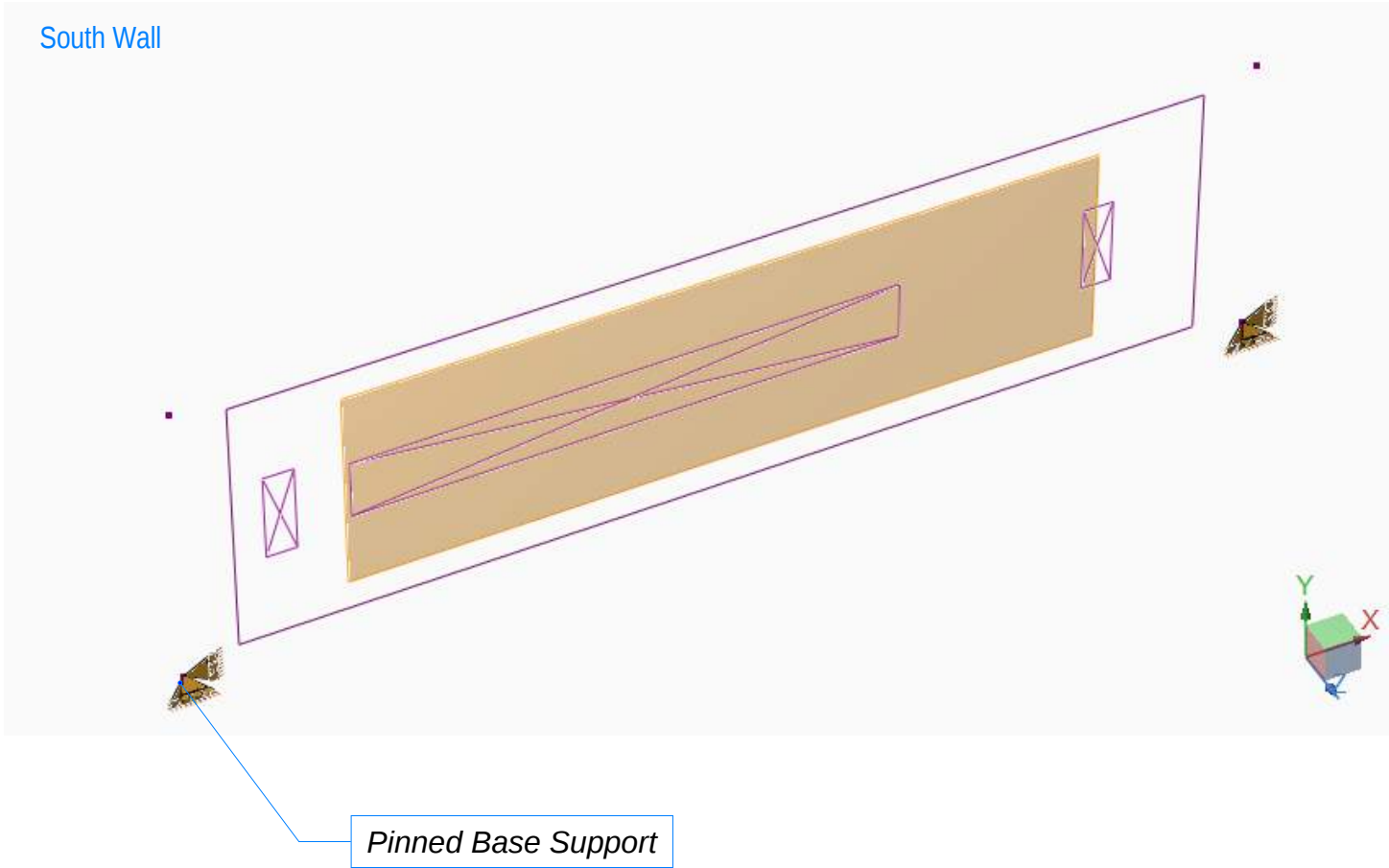


West Wall



Chapter 2: Analytical Model Cont'd...

2.3 Support Conditions



Appendix-B contains design reports of the South & West Walls.

Chapter 3: Foundation Design

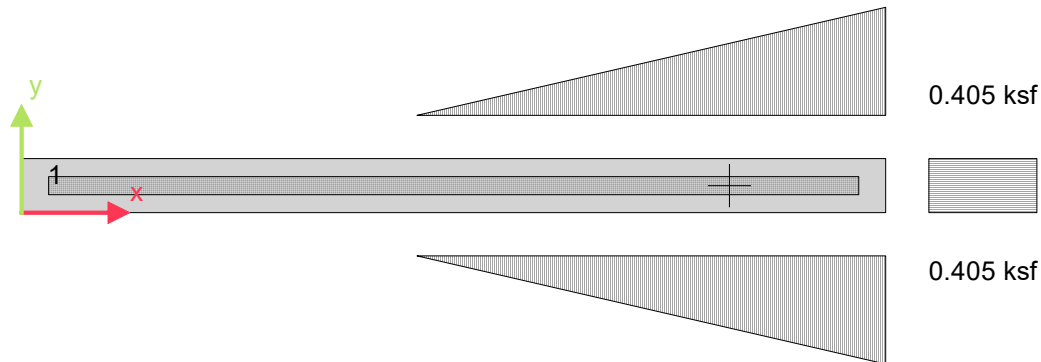
F1 - SOUTH WALL FOOTING

Footing analysis in accordance with ACI318-

Tedds calculation version 3.3.08

Pad footing details

Length of footing	$L_x = 32 \text{ ft}$
Width of footing	$L_y = 2 \text{ ft}$
Footing area	$A = L_x \times L_y = 64 \text{ ft}^2$
Depth of footing	$h = 10 \text{ in}$
Depth of soil over footing	$h_{\text{soil}} = 8 \text{ in}$
Density of concrete	$\gamma_{\text{conc}} = 150.0 \text{ lb/ft}^3$



Column no.1 details

Length of column	$l_{x1} = 360.00 \text{ in}$
Width of column	$l_{y1} = 8.00 \text{ in}$
position in x-axis	$x_1 = 192.00 \text{ in}$
position in y-axis	$y_1 = 12.00 \text{ in}$

Soil properties

Net allowable bearing pressure	$q_{\text{allow_Net}} = 2 \text{ ksf}$ using a soil factor of safety, FS_{soil} , of 3
Density of soil	$\gamma_{\text{soil}} = 120.0 \text{ lb/ft}^3$
Angle of internal friction	$\phi_b = 30.0 \text{ deg}$
Design base friction angle	$\delta_{bb} = 30.0 \text{ deg}$
Coefficient of base friction	$\tan(\delta_{bb}) = 0.577$

Footing loads

Self weight	$F_{\text{swt}} = h \times \gamma_{\text{conc}} = 125 \text{ psf}$
Soil weight	$F_{\text{soil}} = h_{\text{soil}} \times \gamma_{\text{soil}} = 80 \text{ psf}$

Column no.1 loads

Dead load in z	$F_{Dz1} = 0.2 \text{ kips}$
Live roof load in z	$F_{Lr21} = 0.0 \text{ kips}$
Wind load moment in x	$M_{Wx1} = 119.7 \text{ kip_ft}$

Footing analysis for soil and stability

Chapter 3: Foundation Design Cont'd...

Load combinations per ASCE 7-16

1.0D (0.107)
 1.0D + 1.0L (0.107)
 1.0D + 1.0Lr (0.106)
 1.0D + 1.0S (0.107)
 1.0D + 1.0R (0.107)
 1.0D + 0.75L + 0.75Lr (0.106)
 1.0D + 0.75L + 0.75S (0.107)
 1.0D + 0.75L + 0.75R (0.107)
 1.0D + 0.6W (0.449)
 1.0D + 0.75L + 0.75Lr + 0.45W (0.362)
 1.0D + 0.75L + 0.75S + 0.45W (0.363)
 1.0D + 0.75L + 0.75R + 0.45W (0.363)
 0.6D + 0.6W (0.677)

Combination 15 results: 0.6D + 0.6W

Forces on footing

Force in z-axis

$$F_{dz} = \gamma_D \times A \times (F_{swt} + F_{soil}) + \gamma_D \times (F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil}) = 7.0 \text{ kips}$$

Moments on footing

Moment in x-axis, about x is 0

$$M_{dx} = \gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_x / 2) + \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times x_1) + \gamma_W \times (M_{Wx1}) = 184.3 \text{ kip_ft}$$

Moment in y-axis, about y is 0

$$M_{dy} = \gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_y / 2) + \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times y_1) = 7.0 \text{ kip_ft}$$

Uplift verification

Vertical force

$$F_{dz} = 7.032 \text{ kips}$$

PASS - Footing is not subject to uplift

Stability against overturning in x direction, moment about x is 0

Overturning moment

$$M_{OTx0} = \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times x_1) = -13.44 \text{ kip_ft}$$

Resisting moment

$$M_{Rx0} = \gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_x / 2) + \gamma_W \times (M_{Wx1}) = 197.77 \text{ kip_ft}$$

Factor of safety

$$\text{abs}(M_{Rx0} / M_{OTx0}) = 14.715$$

PASS - Overturning moment safety factor exceeds the minimum of 1.50

Stability against overturning in x direction, moment about x is L_x

Overturning moment

$$M_{OTxL} = \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times (x_1 - L_x)) + \gamma_W \times (M_{Wx1}) = 85.26 \text{ kip_ft}$$

Resisting moment

$$M_{RxL} = -1 \times (\gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_x / 2)) = -125.95 \text{ kip_ft}$$

Factor of safety

$$\text{abs}(M_{RxL} / M_{OTxL}) = 1.477$$

FAIL - Minimum overturning moment safety factor, 1.50, exceeds the actual safety factor

Stability against overturning in y direction, moment about y is 0

Overturning moment

$$M_{OTy0} = \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times y_1) = -0.84 \text{ kip_ft}$$

Resisting moment

$$M_{Ry0} = \gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_y / 2) = 7.87 \text{ kip_ft}$$

Factor of safety

$$\text{abs}(M_{Ry0} / M_{OTy0}) = 9.371$$

PASS - Overturning moment safety factor exceeds the minimum of 1.50

Chapter 3: Foundation Design Cont'd...

Stability against overturning in y direction, moment about y is L_y

Overturning moment $M_{OTyL} = \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times (y_1 - L_y)) = 0.84 \text{ kip_ft}$

Resisting moment $M_{RyL} = -1 \times (\gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_y / 2)) = -7.87 \text{ kip_ft}$

Factor of safety $\text{abs}(M_{RyL} / M_{OTyL}) = 9.371$

PASS - Overturning moment safety factor exceeds the minimum of 1.50

Bearing resistance

Eccentricity of base reaction

Eccentricity of base reaction in x-axis $e_{dx} = M_{dx} / F_{dz} - L_x / 2 = 122.56 \text{ in}$

Eccentricity of base reaction in y-axis $e_{dy} = M_{dy} / F_{dz} - L_y / 2 = 0 \text{ in}$

Length of bearing in x-axis $L'_{xd} = \min(L_x, 3 \times (L_x / 2 - \text{abs}(e_{dx}))) = 208.321 \text{ in}$

Pad base pressures

$q_1 = 0 \text{ ksf}$

$q_2 = 0 \text{ ksf}$

$q_3 = 0.405 \text{ ksf}$

$q_4 = 0.405 \text{ ksf}$

Minimum base pressure $q_{\min} = \min(q_1, q_2, q_3, q_4) = 0 \text{ ksf}$

Maximum base pressure $q_{\max} = \max(q_1, q_2, q_3, q_4) = 0.405 \text{ ksf}$

Allowable bearing capacity

Allowable bearing capacity $q_{\text{allow}} = q_{\text{allow_Net}} + ((h + h_{soil}) \times \gamma_{soil}) / FS_{soil} = 2.06 \text{ ksf}$

$q_{\max} / q_{\text{allow}} = 0.197$

PASS - Allowable bearing capacity exceeds design base pressure

Chapter 3: Foundation Design Cont'd...

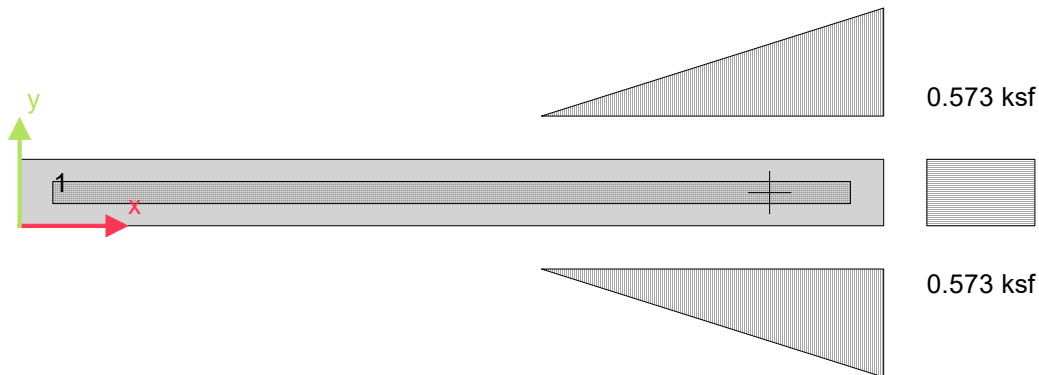
F2 - WEST WALL FOOTING

Footing analysis in accordance with ACI318-

Tedds calculation version 3.3.08

Pad footing details

Length of footing	$L_x = 26 \text{ ft}$
Width of footing	$L_y = 2 \text{ ft}$
Footing area	$A = L_x \times L_y = 52 \text{ ft}^2$
Depth of footing	$h = 10 \text{ in}$
Depth of soil over footing	$h_{\text{soil}} = 8 \text{ in}$
Density of concrete	$\gamma_{\text{conc}} = 150.0 \text{ lb/ft}^3$



Column no.1 details

Length of column	$l_{x1} = 288.00 \text{ in}$
Width of column	$l_{y1} = 8.00 \text{ in}$
position in x-axis	$x_1 = 156.00 \text{ in}$
position in y-axis	$y_1 = 12.00 \text{ in}$

Soil properties

Net allowable bearing pressure	$q_{\text{allow_Net}} = 2 \text{ ksf}$ using a soil factor of safety, FS_{soil} , of 3
Density of soil	$\gamma_{\text{soil}} = 120.0 \text{ lb/ft}^3$
Angle of internal friction	$\phi_b = 30.0 \text{ deg}$
Design base friction angle	$\delta_{bb} = 30.0 \text{ deg}$
Coefficient of base friction	$\tan(\delta_{bb}) = 0.577$

Footing loads

Self weight	$F_{\text{swt}} = h \times \gamma_{\text{conc}} = 125 \text{ psf}$
Soil weight	$F_{\text{soil}} = h_{\text{soil}} \times \gamma_{\text{soil}} = 80 \text{ psf}$

Column no.1 loads

Dead load in z	$F_{Dz1} = 0.5 \text{ kips}$
Live roof load in z	$F_{Lz1} = 0.3 \text{ kips}$
Wind load moment in x	$M_{Wx1} = 94.1 \text{ kip_ft}$

Footing analysis for soil and stability

Chapter 3: Foundation Design Cont'd...

Load combinations per ASCE 7-16

1.0D (0.092)
 1.0D + 1.0L (0.092)
 1.0D + 1.0Lr (0.095)
 1.0D + 1.0S (0.092)
 1.0D + 1.0R (0.092)
 1.0D + 0.75L + 0.75Lr (0.094)
 1.0D + 0.75L + 0.75S (0.092)
 1.0D + 0.75L + 0.75R (0.092)
 1.0D + 0.6W (0.485)
 1.0D + 0.75L + 0.75Lr + 0.45W (0.375)
 1.0D + 0.75L + 0.75S + 0.45W (0.383)
 1.0D + 0.75L + 0.75R + 0.45W (0.383)
 0.6D + 0.6W (INVALID)

Combination 15 results: 0.6D + 0.6W

Forces on footing

Force in z-axis

$$F_{dz} = \gamma_D \times A \times (F_{swt} + F_{soil}) + \gamma_D \times (F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil}) = 5.9 \text{ kips}$$

Moments on footing

Moment in x-axis, about x is 0

$$M_{dx} = \gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_x / 2) + \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times x_1) + \gamma_W \times (M_{Wx1}) = 133.1 \text{ kip_ft}$$

Moment in y-axis, about y is 0

$$M_{dy} = \gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_y / 2) + \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times y_1) = 5.9 \text{ kip_ft}$$

Uplift verification

Vertical force

$$F_{dz} = 5.898 \text{ kips}$$

PASS - Footing is not subject to uplift

Stability against overturning in x direction, moment about x is 0

Overturning moment

$$M_{OTx0} = \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times x_1) = -6.47 \text{ kip_ft}$$

Resisting moment

$$M_{Rx0} = \gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_x / 2) + \gamma_W \times (M_{Wx1}) = 139.58 \text{ kip_ft}$$

Factor of safety

$$\text{abs}(M_{Rx0} / M_{OTx0}) = 21.560$$

PASS - Overturning moment safety factor exceeds the minimum of 1.50

Stability against overturning in x direction, moment about x is L_x

Overturning moment

$$M_{OTxL} = \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times (x_1 - L_x)) + \gamma_W \times (M_{Wx1}) = 62.9 \text{ kip_ft}$$

Resisting moment

$$M_{RxL} = -1 \times (\gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_x / 2)) = -83.15 \text{ kip_ft}$$

Factor of safety

$$\text{abs}(M_{RxL} / M_{OTxL}) = 1.322$$

FAIL - Minimum overturning moment safety factor, 1.50, exceeds the actual safety factor

Stability against overturning in y direction, moment about y is 0

Overturning moment

$$M_{OTy0} = \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times y_1) = -0.5 \text{ kip_ft}$$

Resisting moment

$$M_{Ry0} = \gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_y / 2) = 6.4 \text{ kip_ft}$$

Factor of safety

$$\text{abs}(M_{Ry0} / M_{OTy0}) = 12.843$$

PASS - Overturning moment safety factor exceeds the minimum of 1.50

Chapter 3: Foundation Design Cont'd...

Stability against overturning in y direction, moment about y is L_y

Overturning moment $M_{OTyL} = \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times (y_1 - L_y)) = 0.5 \text{ kip_ft}$

Resisting moment $M_{RyL} = -1 \times (\gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_y / 2)) = -6.4 \text{ kip_ft}$

Factor of safety $\text{abs}(M_{RyL} / M_{OTyL}) = 12.843$

PASS - Overturning moment safety factor exceeds the minimum of 1.50

Bearing resistance

Eccentricity of base reaction

Eccentricity of base reaction in x-axis $e_{dx} = M_{dx} / F_{dz} - L_x / 2 = 114.812 \text{ in}$

Eccentricity of base reaction in y-axis $e_{dy} = M_{dy} / F_{dz} - L_y / 2 = 0 \text{ in}$

Length of bearing in x-axis $L'_{xd} = \min(L_x, 3 \times (L_x / 2 - \text{abs}(e_{dx}))) = 123.565 \text{ in}$

Pad base pressures

$q_1 = 0 \text{ ksf}$

$q_2 = 0 \text{ ksf}$

$q_3 = 0.573 \text{ ksf}$

$q_4 = 0.573 \text{ ksf}$

Minimum base pressure $q_{\min} = \min(q_1, q_2, q_3, q_4) = 0 \text{ ksf}$

Maximum base pressure $q_{\max} = \max(q_1, q_2, q_3, q_4) = 0.573 \text{ ksf}$

Allowable bearing capacity

Allowable bearing capacity $q_{\text{allow}} = q_{\text{allow_Net}} + ((h + h_{soil}) \times \gamma_{soil}) / FS_{soil} = 2.06 \text{ ksf}$

$q_{\max} / q_{\text{allow}} = 0.278$

PASS - Allowable bearing capacity exceeds design base pressure

WARNING - Uplift occurs under a column. Concrete design is beyond scope.

WARNING - Uplift occurs under a column. Concrete design is beyond scope.

Appendix - A

A.1 : Empirical CMU References

A.1 : Empirical CMU References

#1 Standard Building Code

<https://archive.org/details/standardbuilding00unse>

#2 Structural Details for Masonry Construction

https://archive.org/details/structuraldetail0000newm_a7g0/page/12/mode/2up

#3 Concrete Masonry Construction Details

<https://archive.org/details/nationalconcretemasonryassociation/page/n5/mode/2up?q=mortar>

#4 Facts About Concrete Masonry: With Construction Details And Suggested Specifications

<https://archive.org/details/NationalCementMasonryAssocFactsAboutConcreteMason0001/page/n7/mode/2up?view=theater>

#5 Concrete Masonry Manual

<https://archive.org/details/ExpandedShaleClaySlateInstituteConcreteMasonryManu0001/page/n17/mode/2up>

Appendix - B

B.1 : South Wall Design Reports

B.2 : West Wall Design Reports

Design Results

Masonry wall

General Information

Global status : **N. G.**

Design code : TMS 402-16 ASD

Materials:

Material : CMU 1.5-60
 Mortar type : Port/Mort - M/S
 Grouting type : Full grouting
 Masonry compression strength (F'm) : 1.5 [Kip/in2]
 Steel tension strength (fy) : 60 [Kip/in2]
 Steel allowable tension strength (Fs) : 32 [Kip/in2]
 Steel elasticity modulus (Es) : 29000 [Kip/in2]
 Masonry elasticity modulus (Em) : 1350 [Kip/in2]
 Masonry unit weight : 0.135 [Kip/ft3]

Geometry

Total height : 9.00 [ft]
 Total length : 32.00 [ft]
 Foundation type : Continuous
 Wall bottom restraint : Pinned
 Column bottom restraint : Pinned
 Rigidity elements : None

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]	Effective unit weight [Kip/ft3]
1	9.00	7.63	0.14

Openings:

Reference	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
Lower left	10.25	3.50	18.00	2.00
Lower left	30.00	3.00	1.00	3.00
Lower left	3.00	3.00	1.00	3.00

Load Conditions

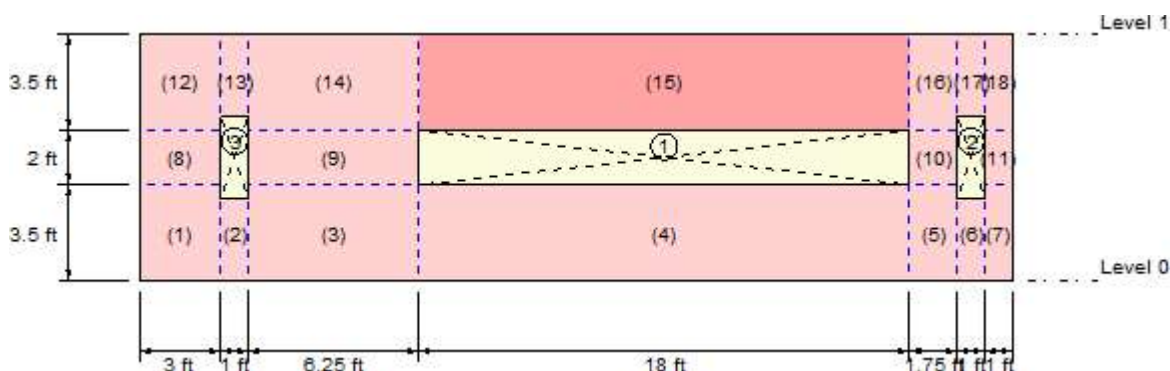
ID	Comb.	Category	Description
DL	No	DL	Dead Load
LLR	No	LLR	Live Load Roof
WLz	No	WIND	Wind Load - Z
WLx	No	WIND	Wind load - X
D1	Yes		DL
D2	Yes		DL+LLR
D3	Yes		DL+0.75LLR

D4	Yes	DL+0.6WLz
D5	Yes	DL+0.6WLx
D6	Yes	DL+0.45WLz+0.75LLR
D7	Yes	DL+0.45WLx+0.75LLR
D8	Yes	0.6DL+0.6WLz
D9	Yes	0.6DL+0.6WLx
S1	Yes	DL
S2	Yes	DL+LLR
S3	Yes	DL+0.75LLR
S4	Yes	DL+0.6WLz
S5	Yes	DL+0.6WLx
S6	Yes	DL+0.45WLz+0.75LLR
S7	Yes	DL+0.45WLx+0.75LLR
S8	Yes	0.6DL+0.6WLz
S9	Yes	0.6DL+0.6WLx

Bearing Wall Design

Status : **N. G.**

- Insufficient combined axial-flexural strength, TMS 402-16 ASD, 8.3.4.2.2, 8.3.4.1 (Segment 1)
- Insufficient shear strength, TMS 402-16 ASD, 8.2.6, 8.3.5 (Segment 2)



Geometry

Level	Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
0	1	0.00	0.00	3.00	3.50
	2	3.00	0.00	1.00	3.50
	3	4.00	0.00	6.25	3.50
	4	10.25	0.00	18.00	3.50
	5	28.25	0.00	1.75	3.50
	6	30.00	0.00	1.00	3.50
	7	31.00	0.00	1.00	3.50
	8	0.00	3.50	3.00	2.00
	9	4.00	3.50	6.25	2.00
	10	28.25	3.50	1.75	2.00
	11	31.00	3.50	1.00	2.00
	12	0.00	5.50	3.00	3.50
	13	3.00	5.50	1.00	3.50
	14	4.00	5.50	6.25	3.50
	15	10.25	5.50	18.00	3.50
	16	28.25	5.50	1.75	3.50
	17	30.00	5.50	1.00	3.50
	18	31.00	5.50	1.00	3.50

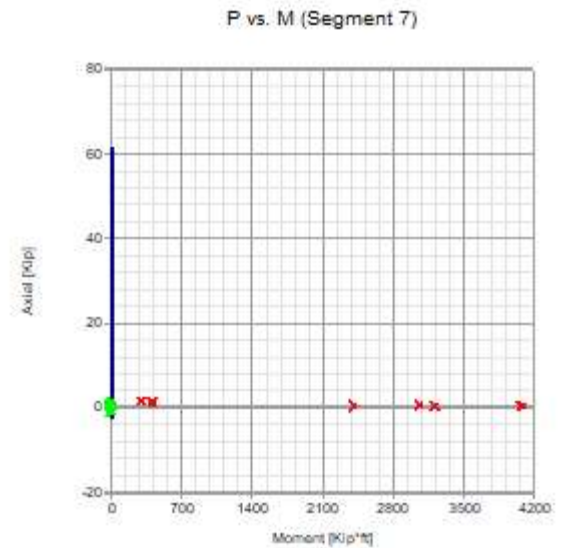
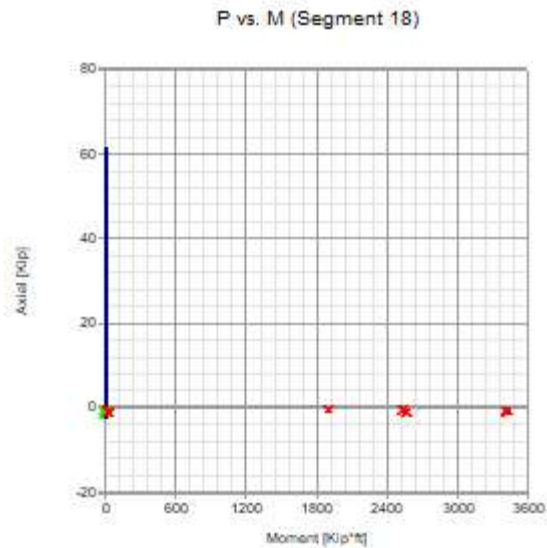
Vertical reinforcement

Segment	Bars	Spacing [in]	Ld [in]
1	2-#4	32.00	25.17
2	1-#4	32.00	25.17
3	3-#4	32.00	25.17
4	7-#4	32.00	25.17
5	1-#4	32.00	25.17
6	1-#4	32.00	25.17
7	1-#4	32.00	25.17
8	2-#4	32.00	25.17
9	3-#4	32.00	25.17
10	1-#4	32.00	25.17
11	1-#4	32.00	25.17
12	2-#4	32.00	25.17
13	1-#4	32.00	25.17
14	3-#4	32.00	25.17
15	7-#4	32.00	25.17
16	1-#4	32.00	25.17
17	1-#4	32.00	25.17
18	1-#4	32.00	25.17

Combined axial flexure

Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D8(Top)	0.93	-22.17	2.37	9.34	
2	D8(Max)	0.32	-4.12	0.79	5.19	
3	D8(Top)	5.79	-168.44	6.02	27.98	
4	D8(Max)	3.69	-6272.53	13.71	NPC	
5	D8(Max)	2.35	-3666.96	1.89	NPC	
6	D8(Max)	1.14	3667.45	1.02	NPC	
7	D8(Max)	0.36	4076.50	0.80	NPC	
8	D8(Bottom)	0.93	-22.03	2.37	9.28	
9	D8(Max)	4.77	-220.82	5.74	38.49	
10	D8(Bottom)	3.84	1746.55	2.30	NPC	
11	D4(Top)	-0.43	-2252.35	0.58	NPC	
12	D8(Bottom)	0.54	-16.84	2.26	7.44	
13	D8(Max)	0.03	-3.80	0.71	5.34	
14	D8(Max)	3.19	-170.34	5.30	32.17	
15	D8(Top)	6.32	-599.92	14.45	41.52	
16	D8(Bottom)	2.68	1053.93	1.98	NPC	
17	D8(Max)	0.28	-3110.15	0.78	NPC	
18	D4(Max)	-1.06	3417.80	0.40	NPC	

Interaction diagrams, P vs. M



Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio	
1	D5(Bottom)	4.34	90.30	0.05	
2	D5(Bottom)	1.49	30.10	0.05	
3	D2(Top)	10.35	188.12	0.05	
4	D2(Bottom)	9.06	541.77	0.02	
5	D2(Top)	6.49	52.67	0.12	
6	D6(Max)	2.00	30.10	0.07	
7	D2(Bottom)	1.60	30.10	0.05	
8	D5(Bottom)	3.94	90.30	0.04	
9	D2(Bottom)	10.46	188.12	0.06	
10	D2(Bottom)	6.89	52.67	0.13	
11	D2(Bottom)	0.43	30.10	0.01	
12	D5(Bottom)	2.32	90.30	0.03	
13	D2(Top)	0.10	30.10	0.00	
14	D2(Bottom)	5.75	188.12	0.03	
15	D2(Top)	11.70	541.77	0.02	
16	D7(Bottom)	5.15	52.67	0.10	
17	D6(Max)	0.50	30.10	0.02	
18	D1(Top)	-1.16	30.10	0.00	

Axial tension

Segment	Condition	ft [Kip/in ²]	Fs [Kip/in ²]	Ratio	
1	D1(Top)	0.00	32.00	0.00	
2	D1(Top)	0.00	32.00	0.00	
3	D1(Top)	0.00	32.00	0.00	
4	D1(Top)	0.00	32.00	0.00	
5	D1(Top)	0.00	32.00	0.00	
6	D1(Top)	0.00	32.00	0.00	
7	D9(Max)	16.38	32.00	0.51	
8	D1(Top)	0.00	32.00	0.00	
9	D1(Top)	0.00	32.00	0.00	
10	D1(Top)	0.00	32.00	0.00	

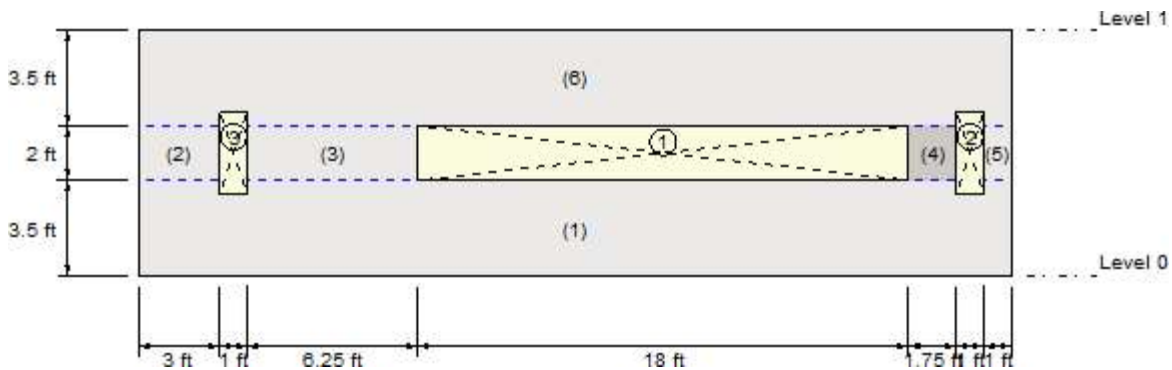
11	D5(Top)	15.81	32.00	0.49	
12	D1(Top)	0.00	32.00	0.00	
13	D9(Max)	0.97	32.00	0.03	
14	D1(Top)	0.00	32.00	0.00	
15	D1(Top)	0.00	32.00	0.00	
16	D4(Top)	1.78	32.00	0.06	
17	D2(Max)	10.22	32.00	0.32	
18	D5(Max)	19.81	32.00	0.62	

Shear

Segment	Condition	f_v [Kip/in ²]	F_v [Kip/in ²]	Ratio	
1	D8(Bottom)	0.038	0.056	0.68	
2	D8(Max)	0.217	0.057	3.81	
3	D8(Bottom)	0.128	0.081	1.58	
4	D8(Max)	12.356	0.046	NPC	
5	D8(Max)	222.859	0.074	NPC	
6	D8(Max)	167.150	0.058	NPC	
7	D8(Top)	287.142	0.066	NPC	
8	D8(Top)	0.028	0.045	0.63	
9	D8(Top)	0.277	0.047	5.95	
10	D8(Max)	29.669	0.056	NPC	
11	D8(Bottom)	254.701	0.066	NPC	
12	D8(Top)	0.027	0.044	0.61	
13	D8(Max)	0.150	0.048	3.12	
14	D8(Max)	0.308	0.046	6.65	
15	D8(Bottom)	0.618	0.046	13.57	
16	D4(Top)	3.308	0.044	75.92	
17	D8(Max)	77.704	0.045	NPC	
18	D8(Max)	324.802	0.065	NPC	

Shear Wall Design

Status : OK



Geometry

Level	Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
0	1	0.00	0.00	32.00	3.50
	2	0.00	3.50	3.00	2.00
	3	4.00	3.50	6.25	2.00
	4	28.25	3.50	1.75	2.00
	5	31.00	3.50	1.00	2.00
	6	0.00	5.50	32.00	3.50

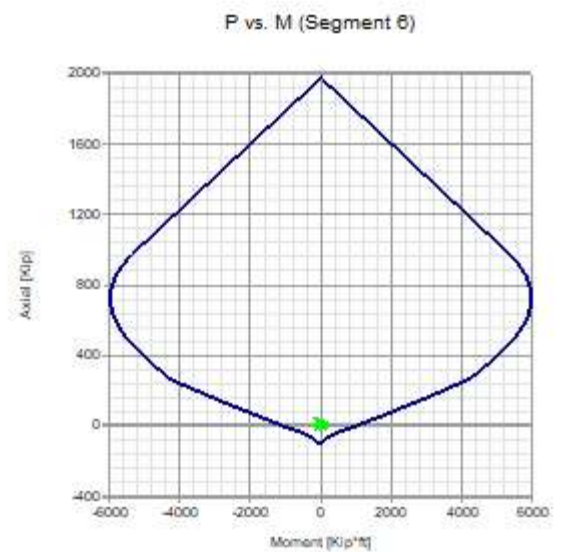
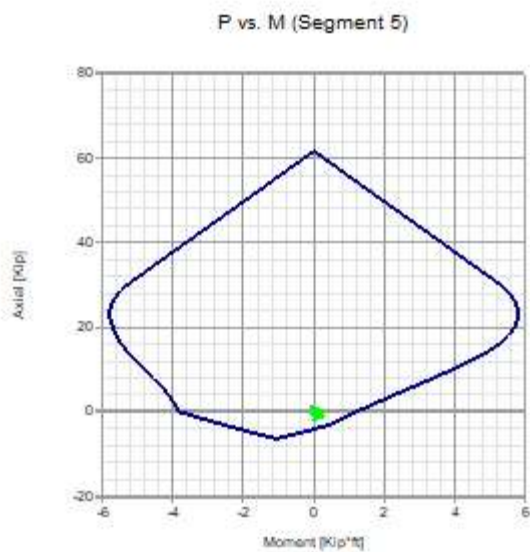
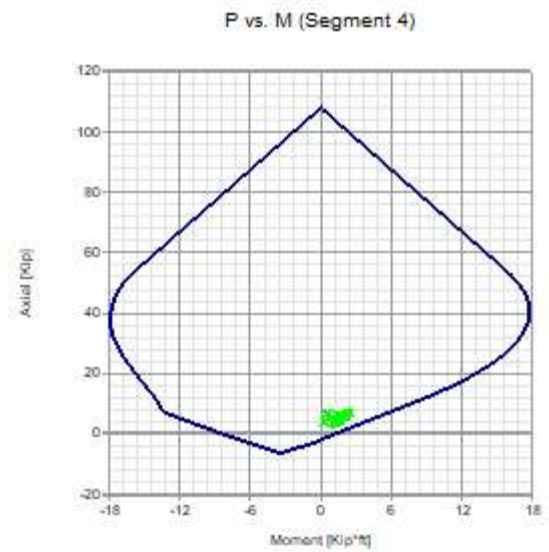
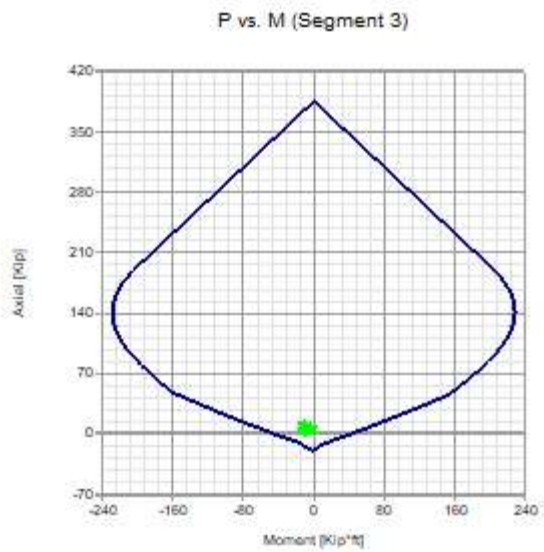
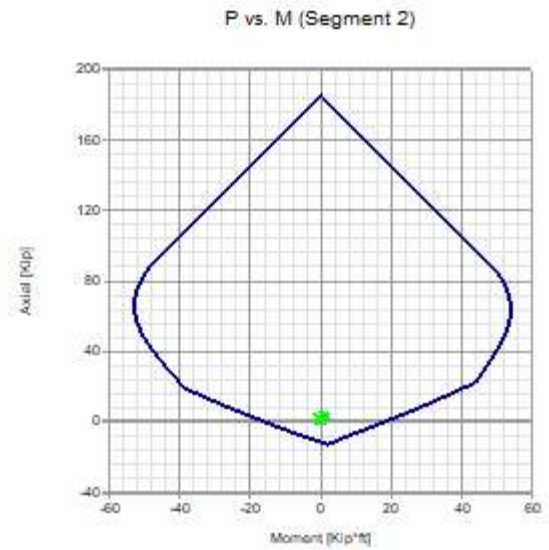
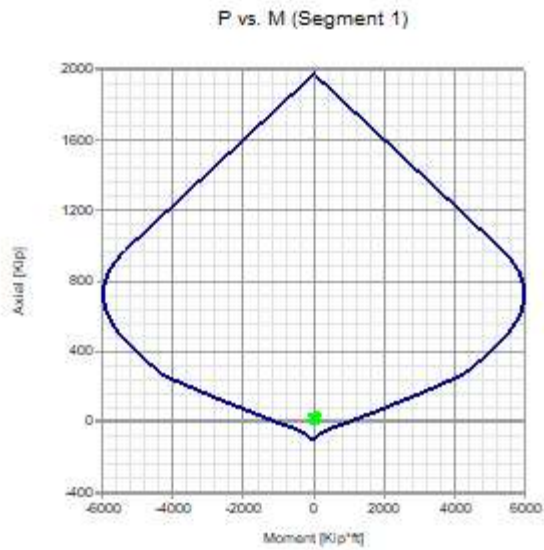
Reinforcement

Segment	Vertical reinforcement			Horizontal reinforcement		
	Bars	Spacing [in]	Ld [in]	Bars	Spacing [in]	Ld [in]
1	2-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	3-#4	32.00	25.17	--	0.00	0.00
	7-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
2	2-#4	32.00	25.17	--	0.00	0.00
3	3-#4	32.00	25.17	--	0.00	0.00
4	1-#4	32.00	25.17	--	0.00	0.00
5	1-#4	32.00	25.17	--	0.00	0.00
6	2-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	3-#4	32.00	25.17	--	0.00	0.00
	7-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00

Combined axial flexure

Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D5(Max)	22.27	106.99	1290.06	0.08	
2	D9(Max)	3.13	1.34	22.05	0.06	
3	D2(Max)	8.55	-12.75	67.19	0.19	
4	D2(Top)	5.57	2.21	4.81	0.46	
5	D7(Top)	-1.02	0.15	0.96	0.16	
6	D2(Max)	3.34	59.92	1040.55	0.06	

Interaction diagrams, P vs. M



Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio	
1	D2(Bottom)	28.39	962.89	0.03	
2	D5(Bottom)	3.94	90.24	0.04	
3	D2(Bottom)	10.46	188.07	0.06	
4	D7(Max)	7.17	52.65	0.14	
5	D2(Bottom)	0.43	30.06	0.01	
6	D2(Bottom)	22.66	962.89	0.02	

Axial tension

Segment	Condition	ft [Kip/in2]	Fs [Kip/in2]	Ratio	
1	D1(Top)	0.00	32.00	0.00	
2	D1(Top)	0.00	32.00	0.00	
3	D1(Top)	0.00	32.00	0.00	
4	D1(Top)	0.00	32.00	0.00	
5	D5(Top)	5.93	32.00	0.19	
6	D1(Top)	0.00	32.00	0.00	

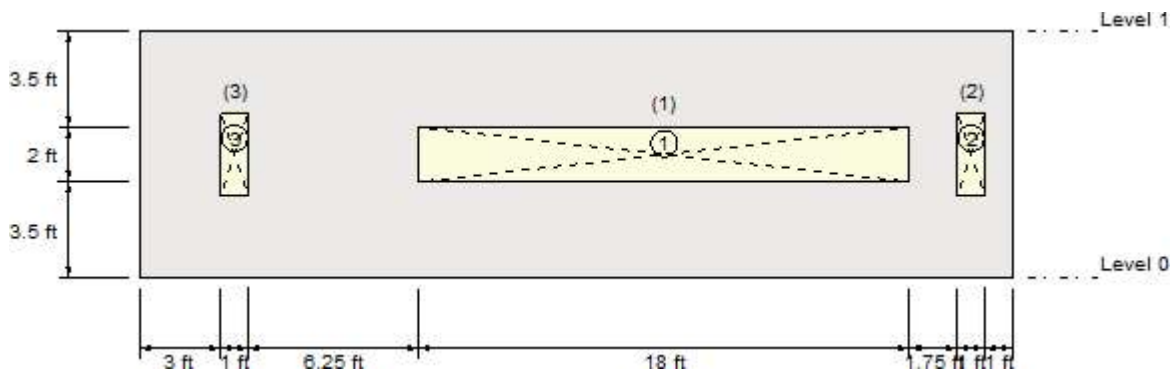
Shear

Segment	Condition	f _v [Kip/in2]	F _v [Kip/in2]	Ratio	
1	D5(Max)	0.003	0.066	0.05	
2	D9(Max)	0.004	0.063	0.06	
3	D5(Max)	0.019	0.076	0.24	
4	D2(Max)	0.016	0.068	0.24	
5	D2(Max)	0.004	0.059	0.07	
6	D5(Top)	0.003	0.076	0.05	

Lintel Design

Status : Warnings in design

- Insufficient clear spacing between bars, TMS 402-16 ASD, 6.1.3.1 (Lintel 1)
- Insufficient development length, TMS 402-16 ASD, 6.1.5.1 (Lintel 1)

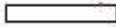
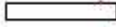
**Geometry**

Lintel	X Coordinate [ft]	Y Coordinate [ft]	Length [ft]	Depth [in]
1	10.25	3.50	18.00	26.00
2	30.00	3.00	1.00	26.00
3	3.00	3.00	1.00	26.00

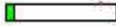
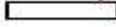
Reinforcement

Lintel	Top long. reinforcement		Bottom long. reinforcement		Transverse reinforcement		Ld [in]
	Bars	Extent [in]	Bars	Extent [in]	Bars	Spacing [in]	
1	2-#7	7.00	2-#9	0.00	#3	12.00	4.98
2	1-#4	0.00	--	0.00	--	0.00	0.00
3	2-#7	7.00	2-#9	0.00	#3	12.00	4.98

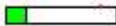
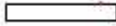
Bending

Lintel	Condition	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D1(Top)	17.90	62.71	0.29	
2	D2(Bottom)	-0.05	11.84	0.00	
3	D5(Bottom)	-0.01	62.08	0.00	

Shear

Lintel	Condition	f _v [Kip/in ²]	F _v [Kip/in ²]	Ratio	
1	D2(Top)	0.029	0.077	0.37	
2	D2(Bottom)	0.003	0.044	0.08	
3	D9(Top)	0.002	0.077	0.02	

Deflection

Lintel	Condition	δ _s [in]	δ _{max} [in]	Ratio	
1	S1(Top)	0.08	0.36	0.22	
2		0.00	0.00	0.00	
3		0.00	0.00	0.00	

Notes

- * P = Axial load
- * P_a = Allowable compressive force due to axial load.
- * M = Moment at the section under consideration.
- * M_a = Wall allowable moment due to axial force or lintel pure flexure allowable moment
- * f_a = Calculated compressive stress due to axial load only
- * f_b = Calculated compressive stress due to axial flexure only
- * f_t = Calculated axial tension
- * F_a = Allowable compressive stress due to axial load only

- * F_b = Allowable compressive stress due to axial flexure only
- * f_v = Calculated shear stress
- * F_s = Allowable tensile or compressive stress
- * F_v = Allowable shear stress
- * l_d = Embedment length
- * A_s = Effective cross sectional area of reinforcement
- * δ_s = Calculated deflection
- * δ_{max} = Maximum allowable deflection

Design Results

Masonry wall

General Information

Global status : **N. G.**

Design code : TMS 402-16 ASD

Materials:

Material : CMU 1.5-60
 Mortar type : Port/Mort - M/S
 Grouting type : Full grouting
 Masonry compression strength (F'm) : 1.5 [Kip/in2]
 Steel tension strength (fy) : 60 [Kip/in2]
 Steel allowable tension strength (Fs) : 32 [Kip/in2]
 Steel elasticity modulus (Es) : 29000 [Kip/in2]
 Masonry elasticity modulus (Em) : 1350 [Kip/in2]
 Masonry unit weight : 0.135 [Kip/ft3]

Geometry

Total height : 9.00 [ft]
 Total length : 26.00 [ft]
 Foundation type : Continuous
 Wall bottom restraint : Pinned
 Column bottom restraint : Pinned
 Rigidity elements : None

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]	Effective unit weight [Kip/ft3]
1	9.00	7.63	0.14

Openings:

Reference	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
Lower left	4.00	1.50	18.00	4.00
Lower left	24.00	1.50	1.00	5.00
Lower left	1.00	1.50	1.00	5.00

Load Conditions

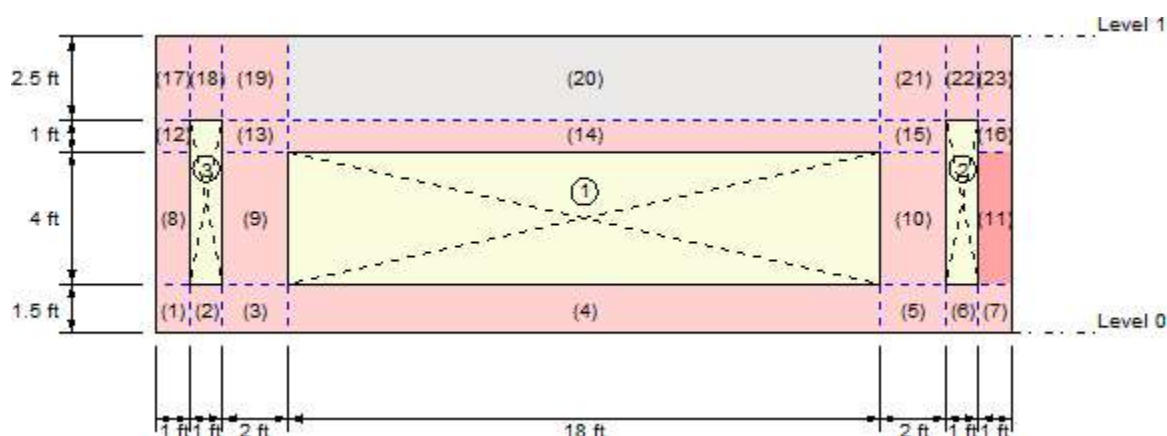
ID	Comb.	Category	Description
DL	No	DL	Dead Load
LLR	No	LLR	Live Load Roof
WLz	No	WIND	Wind Load - Z
WLx	No	WIND	Wind load - X
D1	Yes		DL
D2	Yes		DL+LLR
D3	Yes		DL+0.75LLR

D4	Yes	DL+0.6WLz
D5	Yes	DL+0.6WLx
D6	Yes	DL+0.45WLz+0.75LLR
D7	Yes	DL+0.45WLx+0.75LLR
D8	Yes	0.6DL+0.6WLz
D9	Yes	0.6DL+0.6WLx
S1	Yes	DL
S2	Yes	DL+LLR
S3	Yes	DL+0.75LLR
S4	Yes	DL+0.6WLz
S5	Yes	DL+0.6WLx
S6	Yes	DL+0.45WLz+0.75LLR
S7	Yes	DL+0.45WLx+0.75LLR
S8	Yes	0.6DL+0.6WLz
S9	Yes	0.6DL+0.6WLx

Bearing Wall Design

Status : **N. G.**

- Insufficient combined axial-flexural strength, TMS 402-16 ASD, 8.3.4.2.2, 8.3.4.1 (Segment 1)
- Insufficient shear strength, TMS 402-16 ASD, 8.2.6, 8.3.5 (Segment 2)



Geometry

Level	Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
0	1	0.00	0.00	1.00	1.50
	2	1.00	0.00	1.00	1.50
	3	2.00	0.00	2.00	1.50
	4	4.00	0.00	18.00	1.50
	5	22.00	0.00	2.00	1.50
	6	24.00	0.00	1.00	1.50
	7	25.00	0.00	1.00	1.50
	8	0.00	1.50	1.00	4.00
	9	2.00	1.50	2.00	4.00
	10	22.00	1.50	2.00	4.00
	11	25.00	1.50	1.00	4.00
	12	0.00	5.50	1.00	1.00
	13	2.00	5.50	2.00	1.00
	14	4.00	5.50	18.00	1.00
	15	22.00	5.50	2.00	1.00
	16	25.00	5.50	1.00	1.00
	17	0.00	6.50	1.00	2.50
	18	1.00	6.50	1.00	2.50
	19	2.00	6.50	2.00	2.50
	20	4.00	6.50	18.00	2.50

21	22.00	6.50	2.00	2.50
22	24.00	6.50	1.00	2.50
23	25.00	6.50	1.00	2.50

Vertical reinforcement

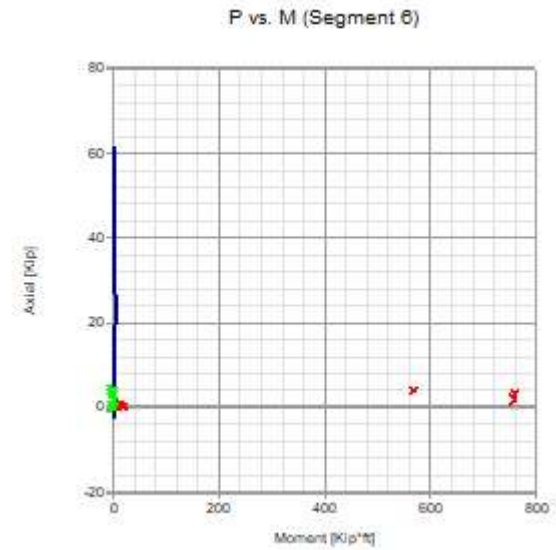
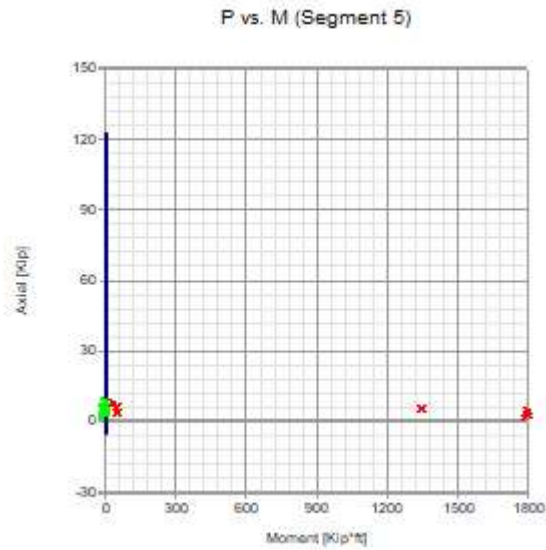
Segment	Bars	Spacing [in]	Ld [in]
1	1-#4	32.00	25.17
2	1-#4	32.00	25.17
3	1-#4	32.00	25.17
4	7-#4	32.00	25.17
5	1-#4	32.00	25.17
6	1-#4	32.00	25.17
7	1-#4	32.00	25.17
8	1-#4	32.00	25.17
9	1-#4	32.00	25.17
10	1-#4	32.00	25.17
11	1-#4	32.00	25.17
12	1-#4	32.00	25.17
13	1-#4	32.00	25.17
14	7-#4	32.00	25.17
15	1-#4	32.00	25.17
16	1-#4	32.00	25.17
17	1-#4	32.00	25.17
18	1-#4	32.00	25.17
19	1-#4	32.00	25.17
20	7-#4	32.00	25.17
21	1-#4	32.00	25.17
22	1-#4	32.00	25.17
23	1-#4	32.00	25.17

Combined axial flexure

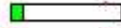
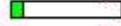
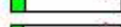
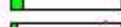
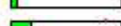
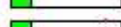
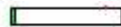
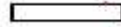
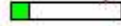
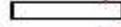
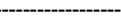
Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D8(Max)	0.05	-3.99	0.72	5.56	
2	D8(Max)	1.01	-1.79	0.99	1.81	
3	D8(Max)	4.06	-4.69	2.53	1.85	
4	D8(Bottom)	2.36	3066.20	13.34	NPC	
5	D8(Max)	2.57	-1796.90	2.13	NPC	
6	D8(Bottom)	1.88	-758.23	1.23	NPC	
7	D8(Max)	1.72	-387.09	1.18	NPC	
8	D4(Top)	-0.47	-5.53	0.57	9.71	
9	D8(Max)	5.02	-24.79	2.77	8.94	
10	D8(Max)	5.92	73.00	2.91	25.09	
11	D8(Max)	0.19	-65.19	0.76	85.94	
12	D4(Bottom)	-0.49	-5.46	0.57	9.65	
13	D8(Bottom)	4.72	-23.35	2.71	8.61	
14	D8(Max)	7.79	-15.79	14.86	1.06	
15	D8(Max)	5.57	42.28	2.86	14.80	
16	D4(Top)	-0.76	22.07	0.49	45.41	
17	D4(Bottom)	-0.64	-4.54	0.52	8.70	
18	D8(Bottom)	0.50	-2.97	0.84	3.52	
19	D8(Max)	2.07	-10.44	1.99	5.26	
20	D4(Max)	-3.23	8.92	11.76	0.76	
21	D8(Max)	1.74	-15.84	1.90	8.36	
22	D4(Top)	-0.43	-5.36	0.58	9.22	

23 D4(Max) -0.80 22.07 0.48 46.30 

Interaction diagrams, P vs. M



Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio	
1	D7(Bottom)	3.61	30.10	0.12	
2	D7(Bottom)	4.00	30.10	0.13	
3	D2(Top)	9.41	60.20	0.16	
4	D2(Bottom)	4.77	541.77	0.01	
5	D2(Top)	8.47	60.20	0.14	
6	D2(Bottom)	4.35	30.10	0.14	
7	D2(Bottom)	3.96	30.10	0.13	
8	D5(Bottom)	1.62	30.10	0.05	
9	D2(Bottom)	13.42	60.20	0.22	
10	D6(Max)	12.87	60.20	0.21	
11	D2(Bottom)	0.37	30.10	0.01	
12	D9(Bottom)	0.44	30.10	0.01	
13	D2(Bottom)	11.19	60.20	0.19	
14	D2(Bottom)	43.86	541.77	0.08	
15	D2(Top)	13.28	60.20	0.22	
16	D1(Top)	-0.76	30.10	0.00	
17	D9(Bottom)	0.25	30.10	0.01	
18	D2(Bottom)	1.23	30.10	0.04	
19	D2(Bottom)	5.00	60.20	0.08	
20	D2(Bottom)	16.07	541.77	0.03	
21	D2(Bottom)	11.15	60.20	0.19	
22	D7(Bottom)	0.84	30.10	0.03	
23	D1(Top)	-0.99	30.10	0.00	

Axial tension

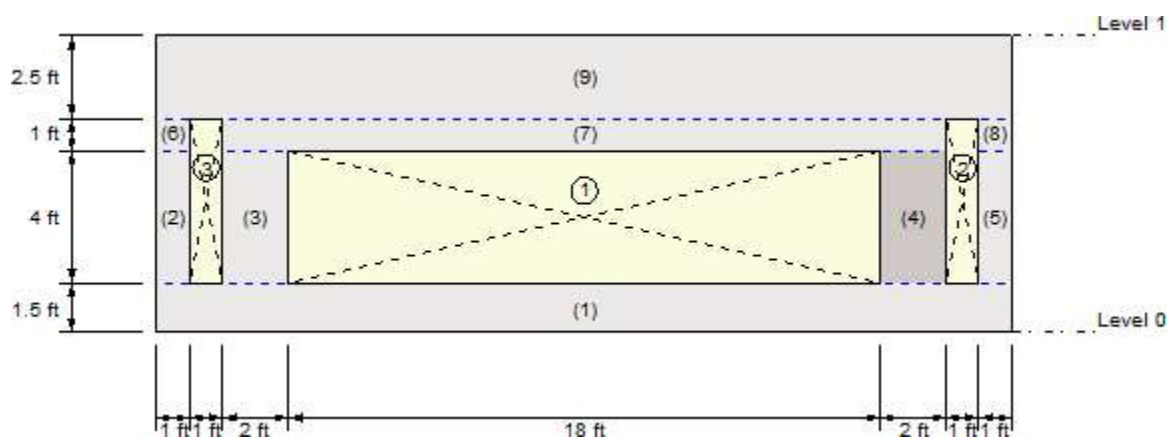
Segment	Condition	ft [Kip/in2]	Fs [Kip/in2]	Ratio	
1	D2(Max)	17.62	32.00	0.55	
2	D1(Top)	0.00	32.00	0.00	
3	D1(Top)	0.00	32.00	0.00	
4	D2(Top)	0.66	32.00	0.02	
5	D1(Top)	0.00	32.00	0.00	
6	D9(Max)	1.00	32.00	0.03	
7	D9(Max)	19.39	32.00	0.61	
8	D2(Top)	8.42	32.00	0.26	
9	D1(Top)	0.00	32.00	0.00	
10	D1(Top)	0.00	32.00	0.00	
11	D9(Max)	20.48	32.00	0.64	
12	D2(Top)	11.07	32.00	0.35	
13	D1(Top)	0.00	32.00	0.00	
14	D1(Top)	0.00	32.00	0.00	
15	D1(Top)	0.00	32.00	0.00	
16	D7(Max)	19.41	32.00	0.61	
17	D2(Max)	24.89	32.00	0.78	
18	D7(Max)	12.48	32.00	0.39	
19	D9(Top)	4.06	32.00	0.13	
20	D1(Max)	2.39	32.00	0.07	
21	D4(Top)	1.57	32.00	0.05	
22	D7(Top)	7.86	32.00	0.25	
23	D7(Max)	30.46	32.00	0.95	

Shear

Segment	Condition	fv [Kip/in2]	Fv [Kip/in2]	Ratio	
1	D8(Top)	0.021	0.044	0.48	
2	D8(Max)	0.051	0.049	1.04	
3	D8(Max)	0.099	0.061	1.63	
4	D8(Max)	10.933	0.060	NPC	
5	D8(Bottom)	29.249	0.051	NPC	
6	D8(Bottom)	63.663	0.074	NPC	
7	D8(Max)	57.614	0.079	NPC	
8	D8(Bottom)	0.026	0.044	0.59	
9	D8(Max)	0.100	0.057	1.75	
10	D8(Max)	1.901	0.071	26.68	
11	D8(Max)	1.160	0.045	25.98	
12	D4(Top)	0.025	0.044	0.57	
13	D8(Top)	0.097	0.050	1.95	
14	D8(Max)	0.041	0.055	0.75	
15	D8(Top)	0.720	0.059	12.26	
16	D4(Top)	0.853	0.047	18.02	
17	D8(Bottom)	0.024	0.044	0.55	
18	D8(Bottom)	0.092	0.046	1.99	
19	D8(Bottom)	0.093	0.049	1.90	
20	D8(Bottom)	0.051	0.077	0.66	
21	D8(Bottom)	0.303	0.056	5.39	
22	D8(Bottom)	0.562	0.074	7.61	
23	D4(Max)	0.796	0.045	17.62	

Shear Wall Design

Status : OK



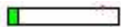
Geometry

Level	Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
0	1	0.00	0.00	26.00	1.50
	2	0.00	1.50	1.00	4.00
	3	2.00	1.50	2.00	4.00
	4	22.00	1.50	2.00	4.00
	5	25.00	1.50	1.00	4.00
	6	0.00	5.50	1.00	1.00
	7	2.00	5.50	22.00	1.00
	8	25.00	5.50	1.00	1.00
	9	0.00	6.50	26.00	2.50

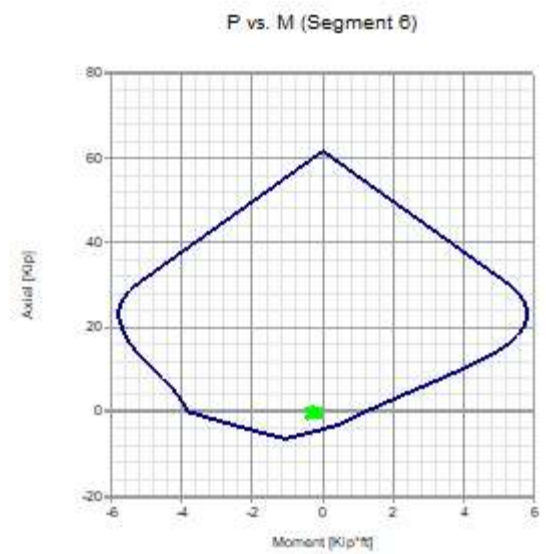
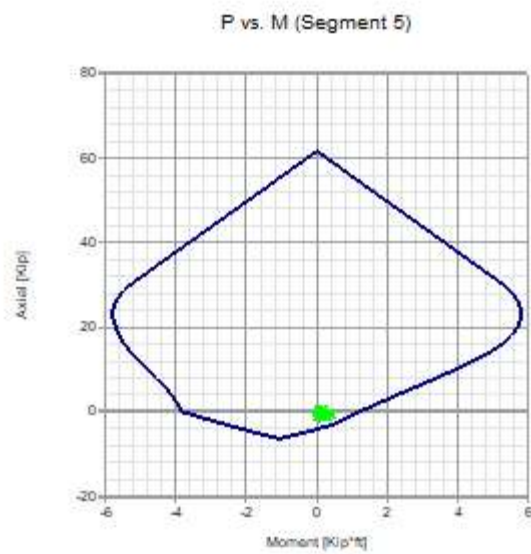
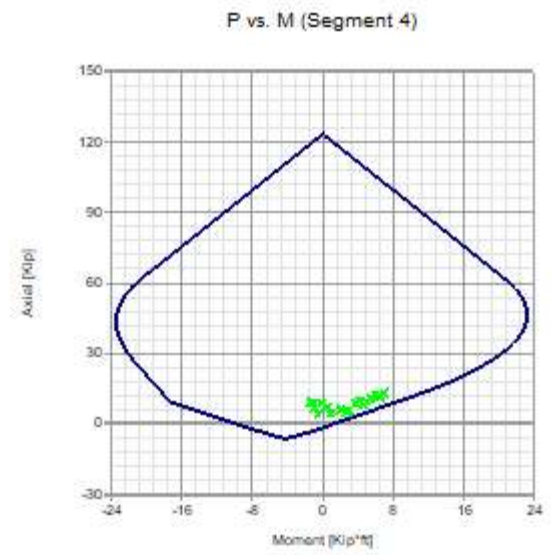
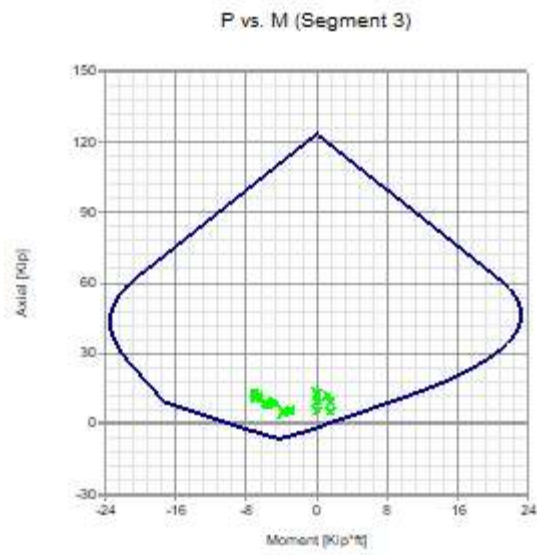
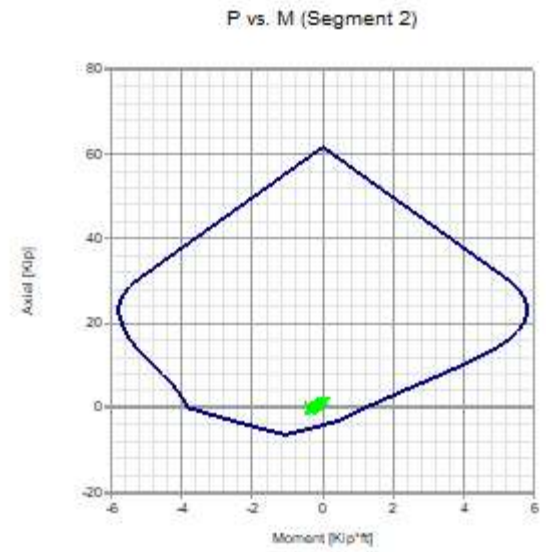
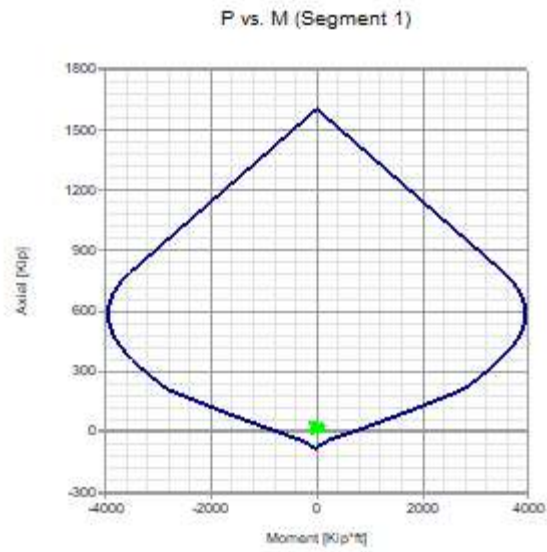
Reinforcement

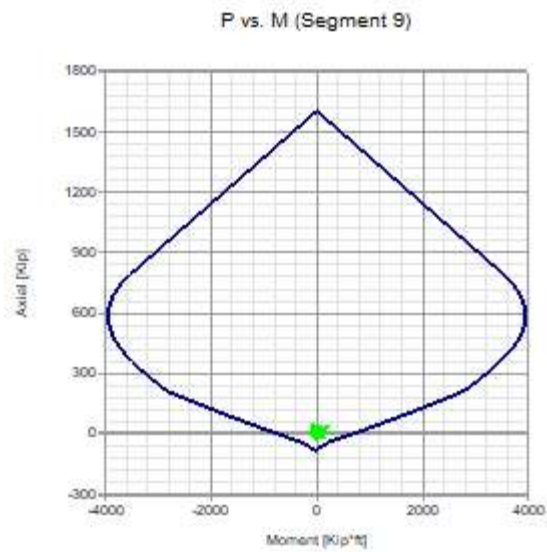
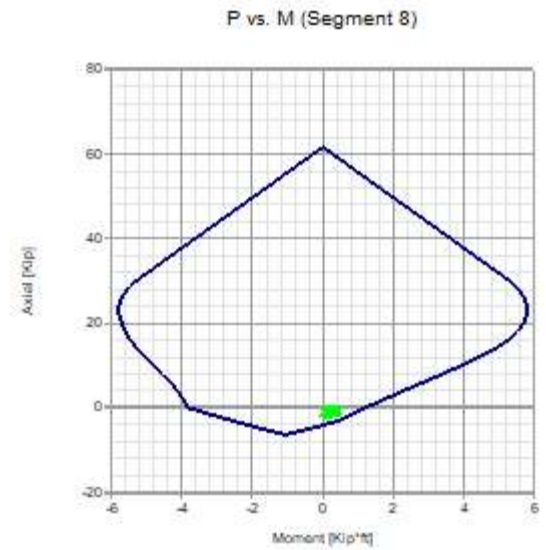
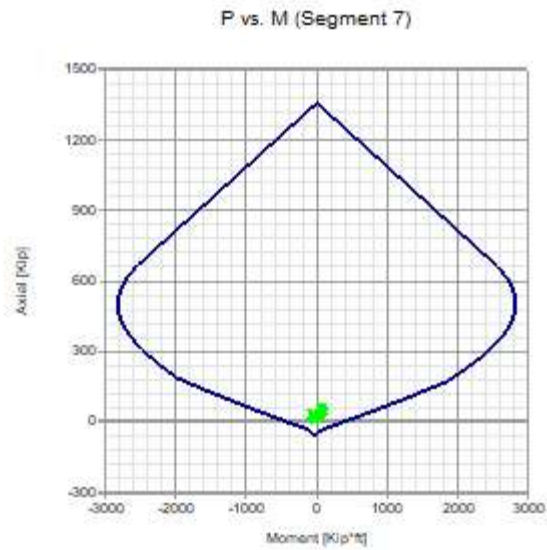
Segment	Vertical reinforcement			Horizontal reinforcement		
	Bars	Spacing [in]	Ld [in]	Bars	Spacing [in]	Ld [in]
1	1-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	7-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
2	1-#4	32.00	25.17	--	0.00	0.00
3	1-#4	32.00	25.17	--	0.00	0.00
4	1-#4	32.00	25.17	--	0.00	0.00
5	1-#4	32.00	25.17	--	0.00	0.00
6	1-#4	32.00	25.17	--	0.00	0.00
7	1-#4	32.00	25.17	--	0.00	0.00
7	7-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
8	1-#4	32.00	25.17	--	0.00	0.00
9	1-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	7-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00
	1-#4	32.00	25.17	--	0.00	0.00

Combined axial flexure

Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D7(Max)	24.09	91.97	933.72	0.10	
2	D2(Top)	-0.63	-0.34	3.57	0.10	
3	D7(Top)	10.51	-7.05	17.70	0.40	
4	D2(Top)	11.46	6.48	10.04	0.65	
5	D2(Top)	-0.76	0.41	1.02	0.41	
6	D2(Bottom)	-0.65	-0.34	3.56	0.10	
7	D7(Max)	43.05	99.79	772.22	0.13	
8	D2(Top)	-1.04	0.41	0.95	0.43	
9	D7(Max)	22.48	138.21	916.74	0.15	

Interaction diagrams, P vs. M





Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio	
1	D7(Bottom)	32.83	782.35	0.04	
2	D5(Max)	1.72	30.06	0.06	
3	D2(Max)	13.55	60.18	0.23	
4	D2(Max)	13.21	60.18	0.22	
5	D2(Max)	0.55	30.06	0.02	
6	D9(Bottom)	0.44	30.06	0.01	
7	D2(Bottom)	65.71	662.12	0.10	
8	D1(Top)	-0.76	30.06	0.00	
9	D2(Bottom)	32.23	782.35	0.04	

Axial tension

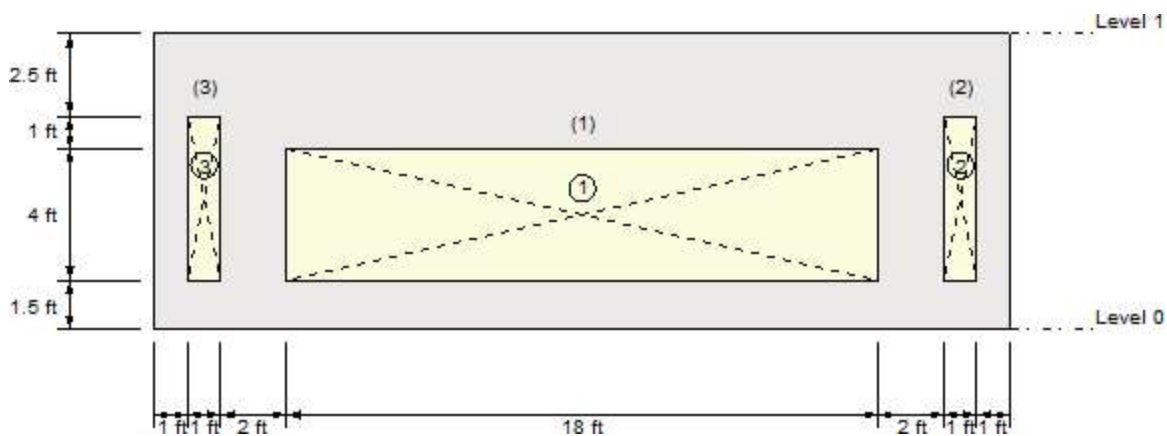
Segment	Condition	ft [Kip/in2]	Fs [Kip/in2]	Ratio	
1	D1(Top)	0.00	32.00	0.00	
2	D2(Top)	3.16	32.00	0.10	
3	D1(Top)	0.00	32.00	0.00	
4	D1(Top)	0.00	32.00	0.00	
5	D9(Max)	6.77	32.00	0.21	
6	D2(Top)	4.15	32.00	0.13	
7	D1(Top)	0.00	32.00	0.00	
8	D7(Top)	7.28	32.00	0.23	
9	D1(Top)	1.52	32.00	0.05	

Shear

Segment	Condition	fv [Kip/in2]	Fv [Kip/in2]	Ratio	
1	D5(Max)	0.003	0.066	0.05	
2	D7(Max)	0.015	0.078	0.19	
3	D7(Max)	0.036	0.075	0.48	
4	D2(Max)	0.034	0.077	0.45	
5	D2(Max)	0.013	0.074	0.17	
6	D2(Max)	0.004	0.044	0.09	
7	D5(Max)	0.002	0.056	0.04	
8	D7(Max)	0.003	0.044	0.07	
9	D7(Max)	0.003	0.051	0.05	

Lintel Design

Status : Warnings in design
- Insufficient development length, TMS 402-16 ASD, 6.1.5.1 (Lintel 1)



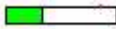
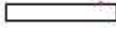
Geometry

Lintel	X Coordinate [ft]	Y Coordinate [ft]	Length [ft]	Depth [in]
1	4.00	1.50	18.00	26.00
2	24.00	1.50	1.00	26.00
3	1.00	1.50	1.00	26.00

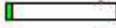
Reinforcement

Lintel	Top long. reinforcement		Bottom long. reinforcement		Transverse reinforcement		Ld [in]
	Bars	Extent [in]	Bars	Extent [in]	Bars	Spacing [in]	
1	2-#7	17.00	2-#9	0.00	--	0.00	0.00
2	1-#4	0.00	--	0.00	--	0.00	0.00
3	1-#4	0.00	--	0.00	--	0.00	0.00

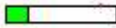
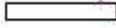
Bending

Lintel	Condition	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D2(Top)	19.22	48.60	0.40	
2	D2(Bottom)	-0.05	11.84	0.00	
3	D7(Bottom)	-0.11	11.84	0.01	

Shear

Lintel	Condition	f _v [Kip/in ²]	F _v [Kip/in ²]	Ratio	
1	D2(Top)	0.039	0.044	0.90	
2	D7(Bottom)	0.003	0.044	0.07	
3	D7(Top)	0.005	0.044	0.12	

Deflection

Lintel	Condition	δ _s [in]	δ _{max} [in]	Ratio	
1	S2(Top)	0.08	0.36	0.23	
2		0.00	0.00	0.00	
3		0.00	0.00	0.00	

Notes

- * P = Axial load
- * P_a = Allowable compressive force due to axial load.
- * M = Moment at the section under consideration.
- * M_a = Wall allowable moment due to axial force or lintel pure flexure allowable moment
- * f_a = Calculated compressive stress due to axial load only
- * f_b = Calculated compressive stress due to axial flexure only
- * f_t = Calculated axial tension
- * F_a = Allowable compressive stress due to axial load only
- * F_b = Allowable compressive stress due to axial flexure only
- * f_v = Calculated shear stress
- * F_s = Allowable tensile or compressive stress
- * F_v = Allowable shear stress
- * l_d = Embedment length
- * A_s = Effective cross sectional area of reinforcement
- * δ_s = Calculated deflection
- * δ_{max} = Maximum allowable deflection

Conclusion

Conclusion

The analysis and design of the structure, in accordance with the current building code, reveal that the structure is not structurally sound in reference to the latest Building Design code.

The analysis confirms that while the most recently constructed section is failing, the older sections of the structure are also at risk of failure, leading to overall instability and demanding immediate attention.

ENGINEERING INSPECTION REPORT

Subject Property: 1210 Michigan Ave Miami Beach, FL 33139
Prepared By: Masood Hajali, PE FL License: 82038
Date: 7/21/2024
Ref: Structural Condition Inspection

TO WHOM IT MAY CONCERN

Please be advised that our office at Calc Engineering has performed an Engineering Inspection of the single-family house located at 1210 Michigan Ave Miami Beach, FL 33139. The Property consists of a concrete shell single family structure located at Miami Beach FL. The inspection was done on 7/3/2024. The purpose of the field inspection was to visually evaluate any structural or building Issues. Calc Engineering confirms that the building is structurally unsafe due to all structural cracks and damages that was seen around the house. The inspection was done on the exterior and interior of the house.

Calc Engineering confirms that the house has been involved with flood issue because of the current NGVD elevation in respect to the base flood elevation. The house has been damaged due to previous flood events. There are lot of areas in the house that have evidence of previous flood issue. Figures 4 and Figures 5 shows the change of color and evidence that how much water comes up during the heavy rain that causes change of color on exterior walls and on the wooden fence as well.

Existing house has structural cracks on the exterior concrete wall of the house and also has sign of termites and water damage on the wood part of the house including house wood joists and trusses. Calc Engineering confirms that the sub-floor is damaged and requires it to be completely

replaced. Calc Engineering confirms that there is concrete spalling with exposed rebars inside the crawl space of the house. Calc Engineering also observed a lot of exterior walls with damaged and bumps on the stucco walls that shows structural damages on the exterior walls. With all the issues mentioned above, Calc Engineering believes that the house is not safe for occupation, and it requires demolition of the house and building a new under story structure house that complies with new flood elevation regulations.

Figures 48 to 52 is for interior of the house. There is clear evidence that the back of the home has been submerged extensively. At the highest point of the home, the rooms have been submerged approximately 18" as evidenced by the furniture staining as reflected in the attached pictures.

Our recommendation in this letter is proper and applicable for the time of inspection, and not for the future. It is our purpose to provide information on the condition of the structure on the day of the inspection, and not to provide discussions or recommendations concerning the future maintenance of the house. Thank you for asking Calc Engineering to perform this important inspection work for you.

Should you have any questions, or require additional information, please do not hesitate in contacting us.

Enclosures: (52) Photographs

Masood Hajali, PhD, P.E.

Florida Reg.: 82038

CALC ENGINEERING

2000 NW 8th PL, Unit 102, Doral, FL 33172

Ph: 305-898-9995

CA 32566



This item has been digitally signed and sealed by MASOOD HAJALI, PE, on date above. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Digitally signed
by MASOOD

HAJALI

Date: 2024.07.26

08:31:15 -04'00'



Figure 1



Figure 2



Figure 3



Figure 4

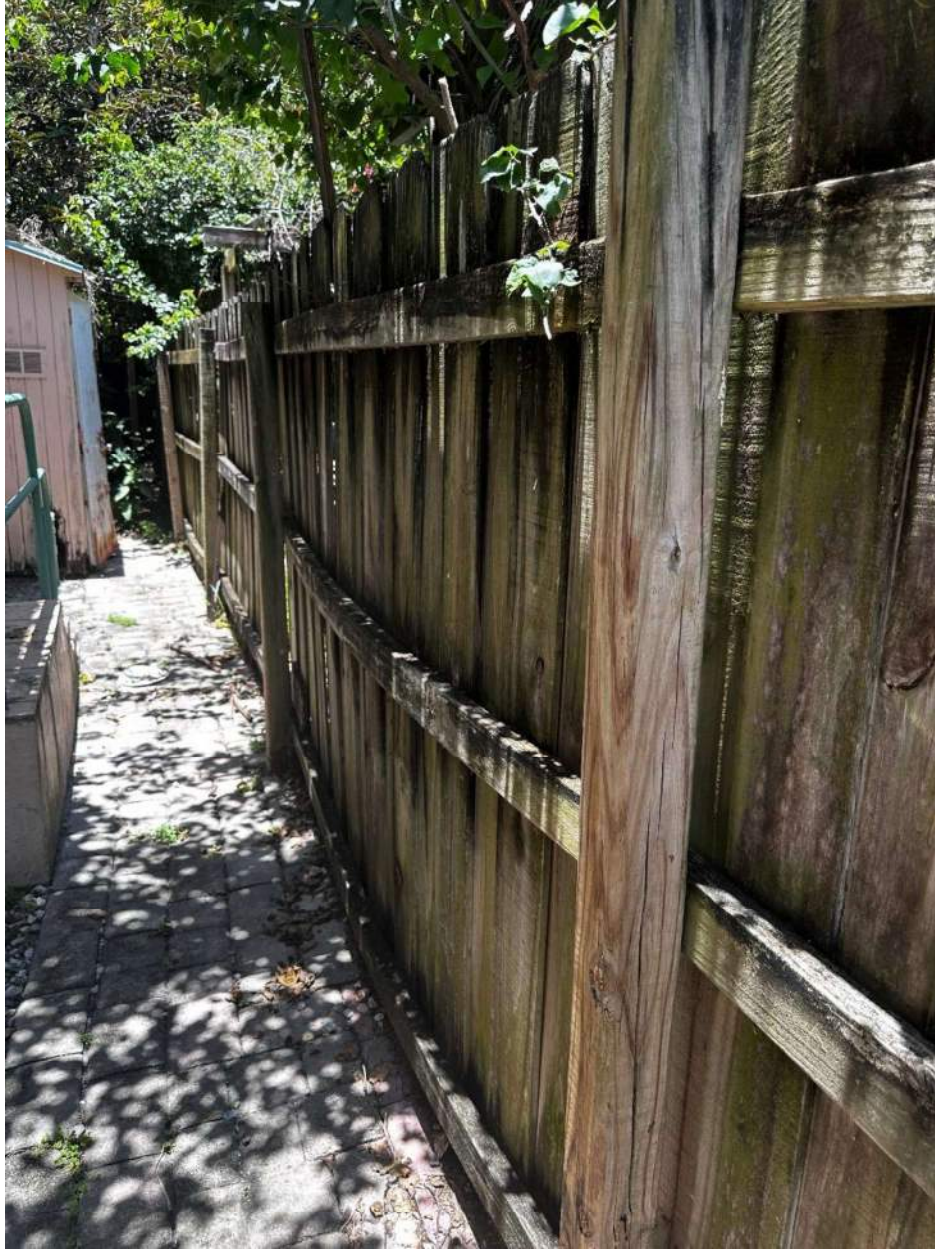


Figure 5



Figure 6



Figure 7



Figure 8

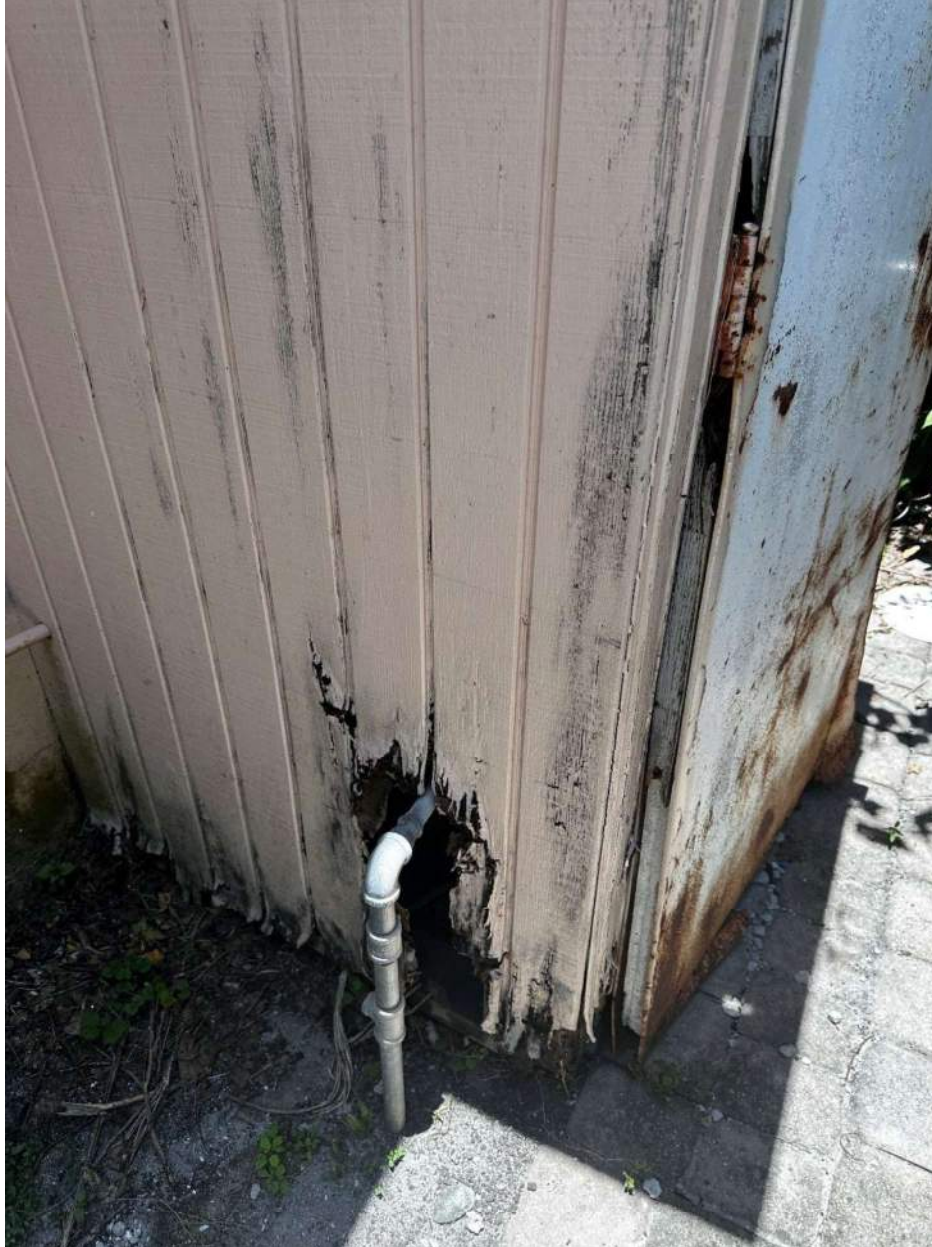


Figure 9

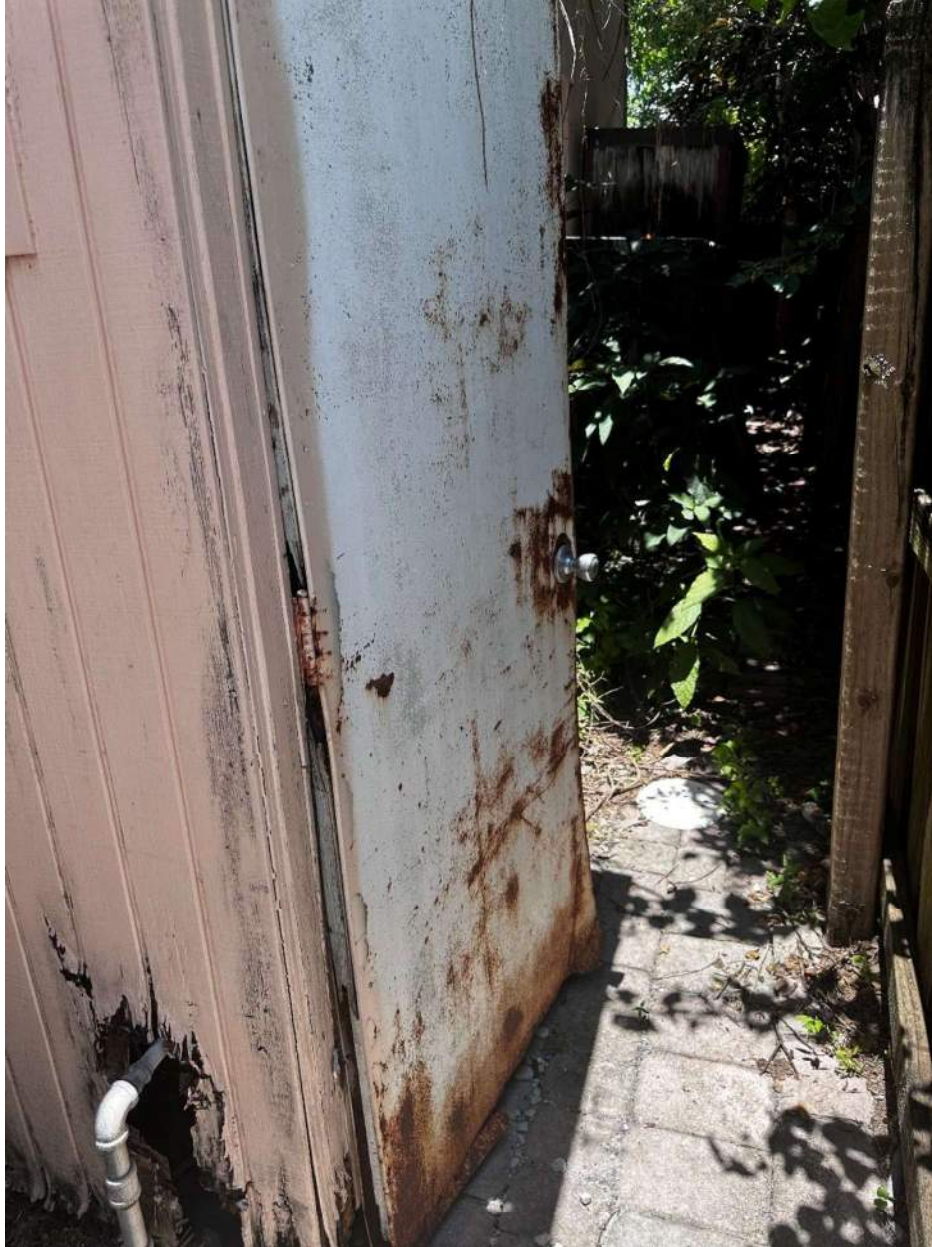


Figure 10



Figure 11



Figure 12

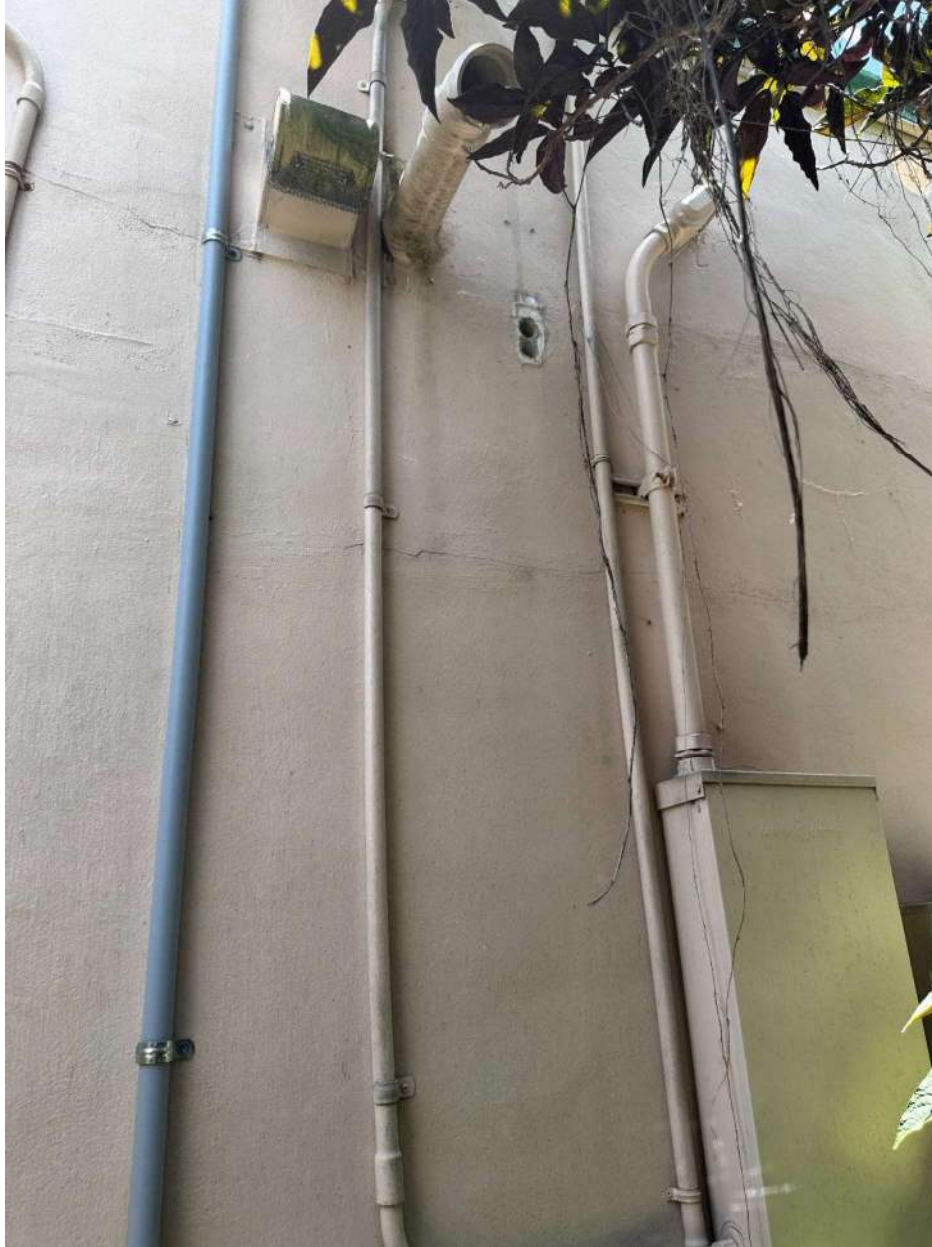


Figure 13



Figure 14



Figure 15



Figure 16



Figure 17



Figure 18



Figure 19



Figure 20



Figure 21



Figure 22



Figure 23



Figure 24



Figure 25



Figure 26



Figure 27



Figure 28



Figure 29



Figure 30



Figure 31



Figure 32



Figure 33



Figure 34



Figure 35



Figure 36



Figure 37



Figure 38



Figure 39



Figure 40



Figure 41



Figure 42



Figure 43



Figure 44



Figure 45



Figure 46



Figure 47



Figure 48



Figure 49

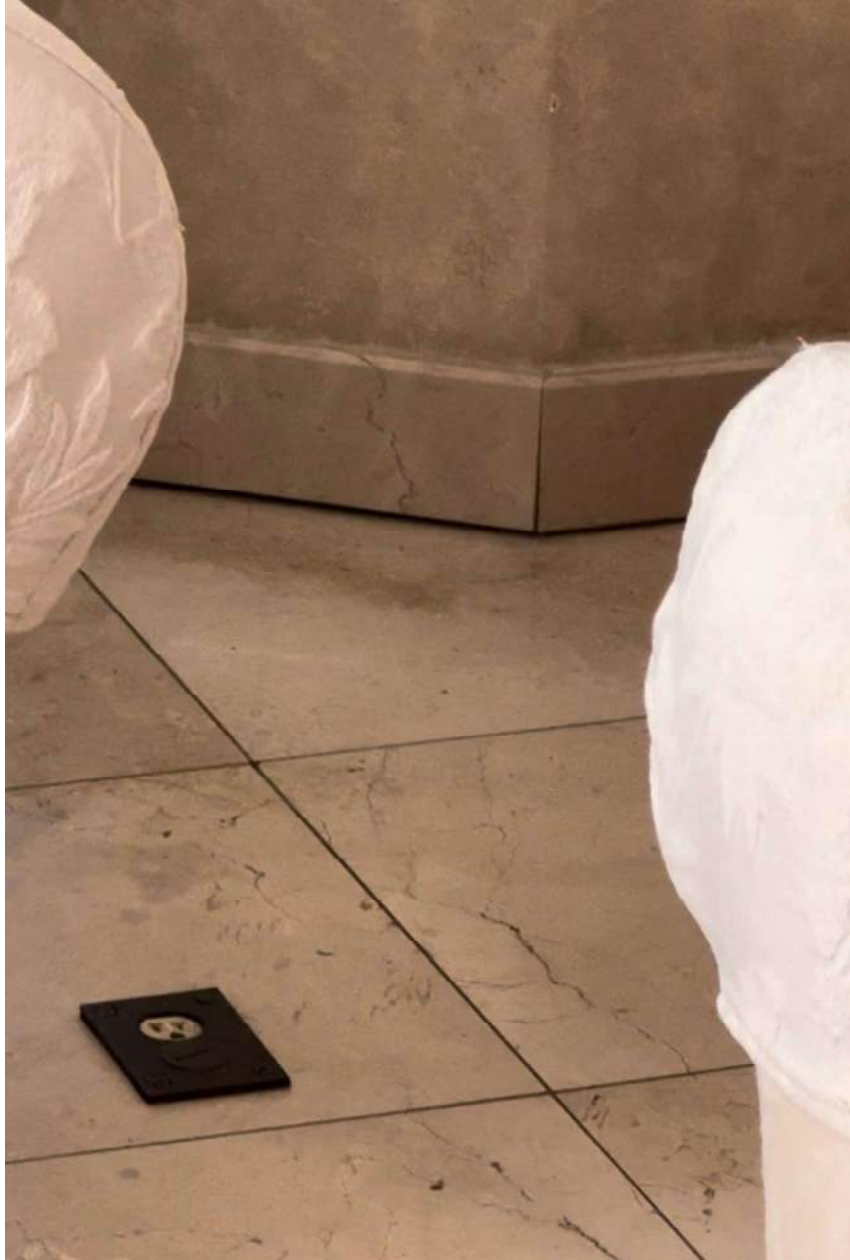


Figure 50



Figure 51

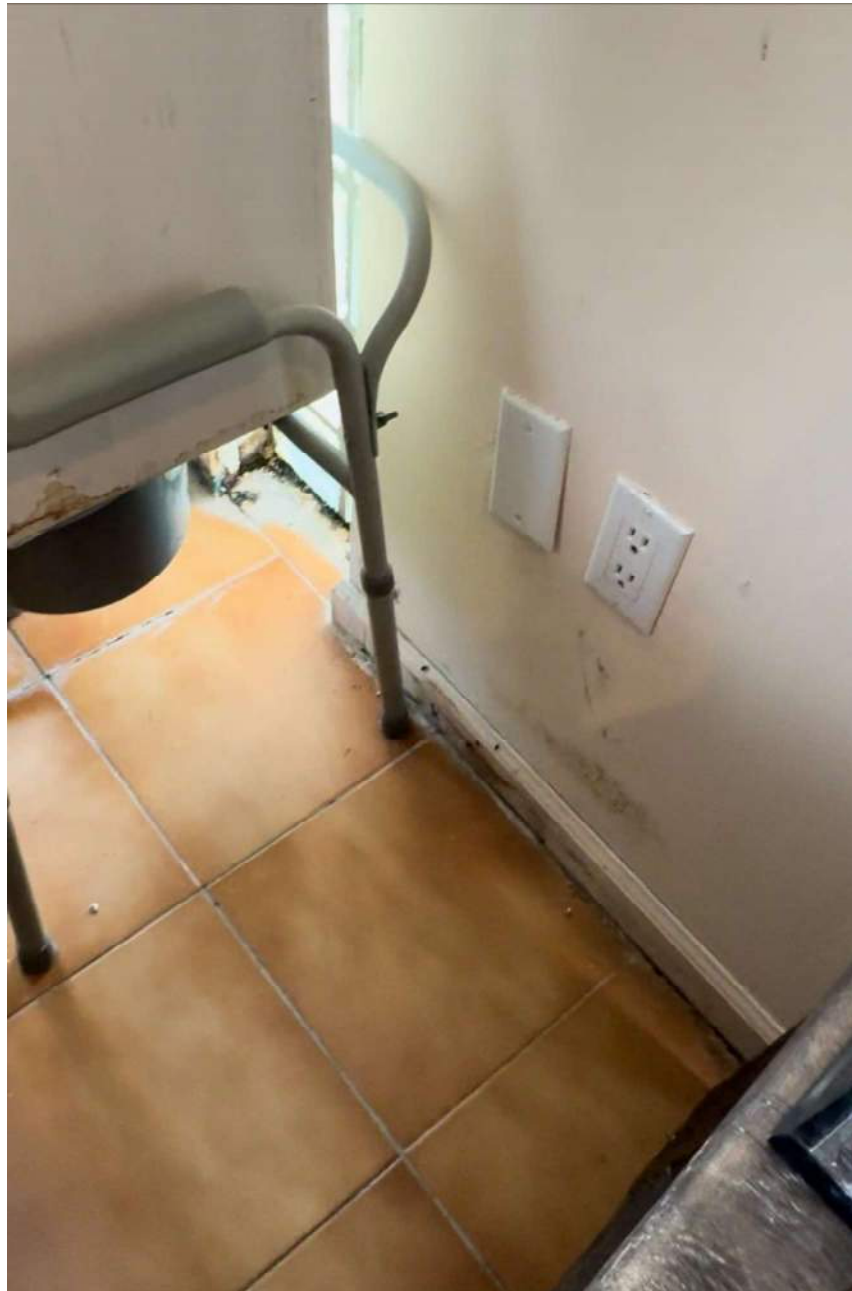


Figure 52



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**SUBSURFACE EXPLORATION REPORT
AND ENGINEERING RECOMMENDATION
PROPOSED FOR
1210 Michigan Ave, Miami Beach, FL 33139**

To: Mr. Andrew Mirmelli

Gentlemen:

We transmit our soil investigation and geotechnical report on the completed subsurface soil exploration for your current condition structure as requested and authorized by you. The scope of the study is required to evaluate the subsurface conditions and provide information about the soil layers and type of the soils up to 20 feet depth into ground. Since the house has no piles under the existing exterior walls, soil investigation was performed to determine if piles needed or not based on the existing soil condition.

The data and recommendations presented in this report are based on information obtained from one (1) Standard Penetration Test (SPT).

We thank you for allowing us to serve you. Please do not hesitate to contact our office with any questions regarding this report.

Yours truly,

CALC ENGINEERING LLC
WWW.CALCENG.COM
2000 NW 89 PL UNIT 102
DORAL FL 33172



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Scope and Purpose:

The purposes of performing this exploration were to evaluate the general subsurface conditions and the groundwater level variations due to climatic changes within the proposed building area and provide recommendations for its foundation support.

Site Location and Site Description:

The site for the proposed facility is located at 1210 Michigan Ave, Miami Beach, FL 33139 for Andrew Mirmelli residents. The subsurface exploration was performed on 8/22/2024. Soil boring test was performed up to 20 feet underground. This investigation was conducted to analyze the existing subsurface soil condition and specify the water table level. A detailed exploration and subsequent analysis undertaken are discussed and included in this report.

Field Exploration Program:

The field exploration program performed one Standard Penetration test (SPT) boring. The SPT borings were performed within the proposed area of the building. The borings were advanced to a depth of 20 feet below the actual ground surface using the methodology outlined in ASTM D-1586. Split-spoon soil samples recovered during the performance of the borings were visually classified in the Field. The groundwater level at my boring locations was measured upon completion of the drilling.

Procedure Method

The penetration testing and soil sampling are accomplished simultaneously using procedures according to ASTM D-1586, the Standard Penetration Test (S.P.T.). A 2-inch O.D by 1.4-inch I.D. split-spoon samplers is driven with a 140 pounds hammer falling 30 inches. The number of hammer blows required to drive was counted.

The sampler is recorded on the Soil Standard Penetration Test Result on the borehole logs. Where possible, the sampler is driven 24 inches, with the hammer blows being recorded for each



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of four 6-inch intervals. The "Penetration Resistance" or "N" value is the sum of the blows recorded for the second and third six-inch intervals. The geotechnical Engineer widely accepts this value as an indication of the relative density and strength of the soil being sampled. Following Table shows N value for different soil types.

SOIL AND ROCK CLASSIFICATION CRITERIA

SAND/SILT		CLAY/SILTY CLAY		
N-VALUE (bpf)	RELATIVE DENSITY	N-VALUE (bpf)	UNCONFINED COMP. STRENGTH (tsf)	CONSISTENCY
0 – 4	Very Loose	<2	<0.25	v. Soft
5 – 10	Loose	2 – 4	0.25 – 0.50	Soft
11 – 29	Medium	5 – 8	0.50 – 1.00	Medium
30 – 49	Dense	9 – 15	1.00 – 2.00	Stiff
>50	Very dense	16 – 30	2.00 – 4.00	v. Stiff
100	Refusal	>30	>4.00	Hard

ROCK		
N-VALUE (bpf)	RELATIVE HARDNESS	ROCK CHARACTERISTICS
$N \geq 100$	Hard to v. hard	Local rock formations vary in hardness from soft to very hard within short vertical and horizontal distances and often contain vertical solution holes of 3 to 36 inch diameter to varying depths and horizontal solution features. Rock may be brittle to split spoon impact, but more resistant to excavation.
$25 \leq N \leq 100$	Medium hard to hard	
$5 \leq N \leq 25$	Soft to medium hard	

PARTICLE SIZE		DESCRIPTION MODIFIERS	
Boulder	>12 in.	0 – 5%	Slight trace
Cobble	3 to 12 in.	6 – 10%	Trace
Gravel	4.76 mm to 3 in.	11 – 20%	Little
Sand	0.074 mm to 4.76 mm	21 – 35%	Some
Silt	0.005 mm to 0.074 mm	>35%	And
Clay	<0.005 mm		

Groundwater Monitoring:

The groundwater level was measured in the boreholes after the downhole water level stabilization. The water levels measured at the testing time were average 5' below the ground surface. Groundwater levels may vary throughout the year primarily due to seasonal rainfall. These levels may be modified at any time a hurricane hits the area and



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groundwater level may top the ground surface level.

The boring logs information shows that most of the areas up to 20 feet is sand and silt which is a very weak soil for structure above; these soft layers of low "N" values are running to a Depth of 20' from the ground level elevation. N values of SPT tests are very low values up to 20 feet, see page 5 and 6 from the soil test results. Any future construction has to be on pile. Even existing structure has to be on helical or auger cast piles.

Conclusion:

The above findings are based on our soil standard penetration data and information obtained at the test location. Therefore, uniformity of soil strata in the immediate vicinity may be assumed. However, it is not guaranteed, and this office assumes no responsibility for areas other than those where the sub-soil investigation was made and reported herein.

Layers of soil determined in the soil boring log. Water table is 5 feet as specified in the report. Any future construction has to be on pile. There are soft sand layers up to a depth of 20 feet. Even existing condition of the house with no pile is not safe condition because of the weak layers of the soils found under the house.



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BORING LOG REPORT

BORING #1

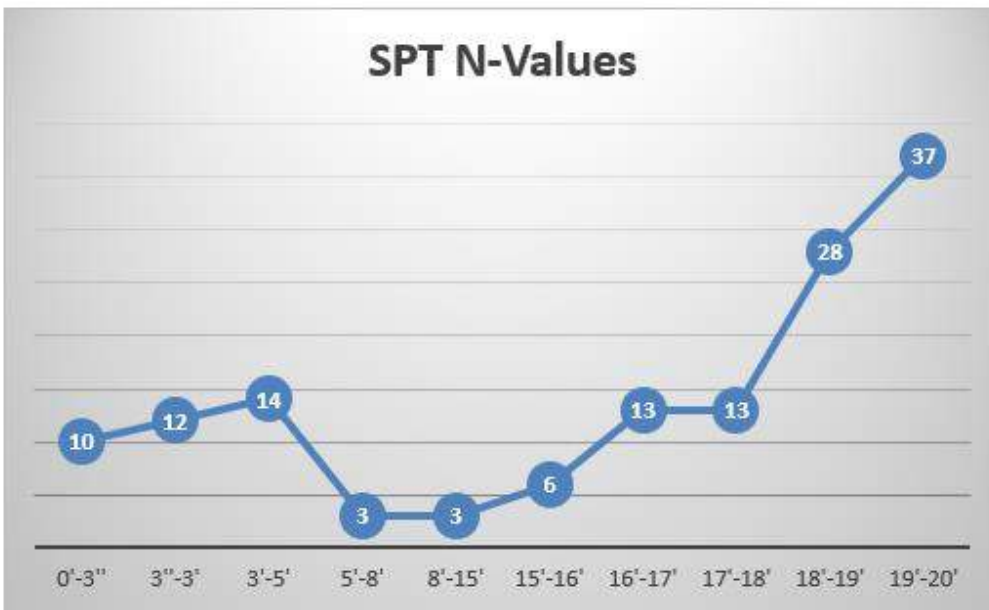
SOIL BORING LOG

CLIENT		Order No	2
ADDRESS	1210 Michigan Ave Miami Beach, FL 33139	Report No.	1
PROJECT		Boring No.	B2
ADDRESS	1210 Michigan Ave Miami Beach, FL 33139	Date	8/22/2024
LOCATION		Driller/Helper	Tim

Sample No.	DESCRIPTION OF MATERIALS	Depth (feet)	Hammer blows on sampler		"N"	"N" Curve
	Soil Boring from 0' to 30'					10 20 30 40 50
1	DARK GRAY SAND	0'-2'	4	5	10	
			5	6		
2	DARK GRAY SAND WITH ROCK PIECES	2'-4'	6	6	12	
			6	7		
3	BEACH SAND	4'-8'	7	7	14	
			7	6		
4			1	2	3	
			1	2		
5	BEACH SAND	8'-10'	1	1	3	
			2	1		
6	GRAY SILT WITH BEACH SAND	10'-20'	2	2	6	
			4	2		
7			9	3	13	
			10	8		
8			11	1	13	
			12	11		
9			12	13	28	
			15	14		
10			19	16	37	
			21	17		
	End of boring @ 20'-0"					



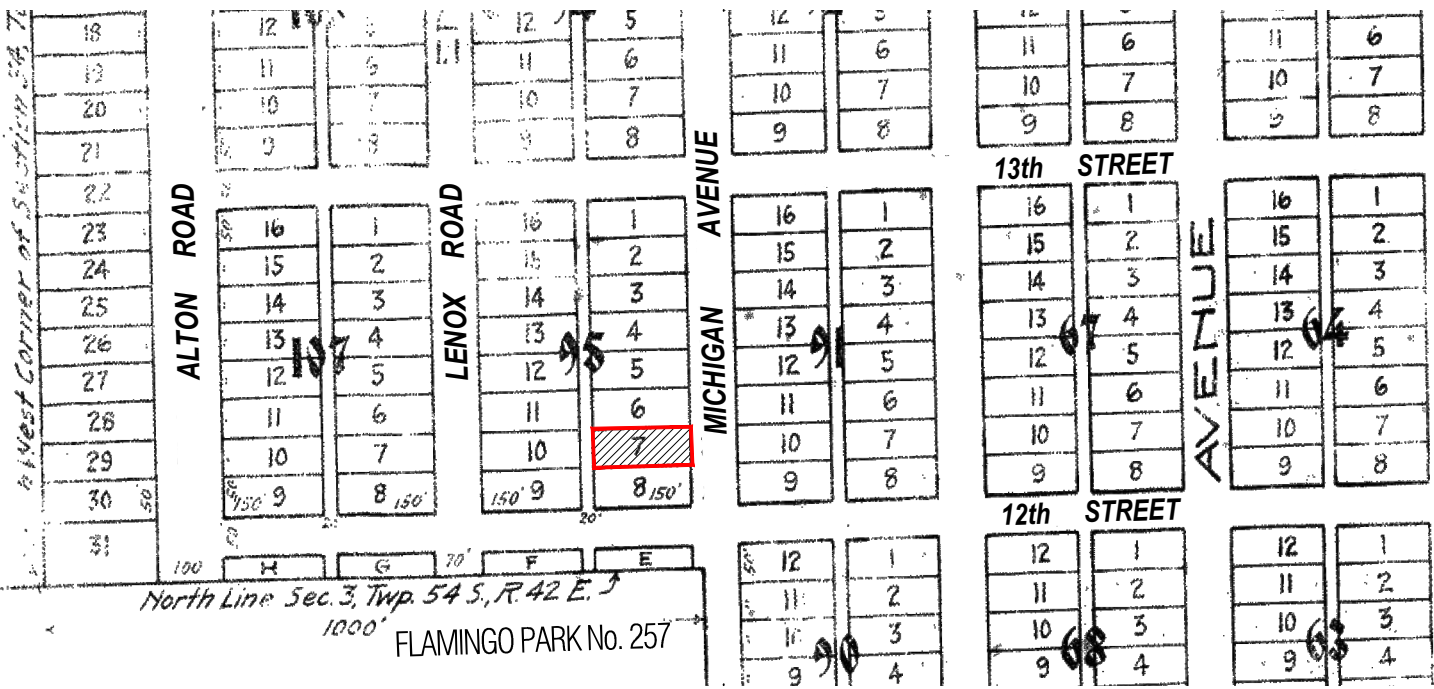
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As a mutual protection to clients, the public, and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions, or extracts from or regarding our reports is reserved pending our written approval.



LOCATION SKETCH:
SCALE: N.T.S.



SURVEYOR'S REPORT :

1. MAP OF BOUNDARY SURVEY FOR:

1210 MICHIGAN AVENUE, MIAMI BEACH, FLORIDA 33139

2. LEGAL DESCRIPTION :

Lot 7, Block 95 of "OCEAN BEACH ADD. No. 3"; according to the Plat Thereof as Recorded in Plat Book 2 at Page 81 of the Public Record of Miami Dade County, Florida.

3. SOURCES OF DATA (HORIZONTAL CONTROL):

The North Arrow and Bearings as shown hereon are based on bearings value S02°01'07"E, along the center line of Michigan Avenue; according to Plat Book 2, Page 81 of the Public Records of Miami Dade County, Florida.

4. SOURCES OF DATA (VERTICAL CONTROL):

FLOOD INFORMATION BASED ON THE FLOOD INSURANCE RATE MAP OF THE FEDERAL EMERGENT MANAGEMENT AGENCY: (NGVD29)

F.I.R.M. date	Flood Zone	Base elevation	Community	Panel No.	Suffix	BM Used
09-11-2014	AE	8.0'	120651	0317	L	V 310 ELEV. 4.57 NGVD29

5. ACCURACY :

The accuracy obtained by measurement and calculation of closed geometric figures was found to exceed this requirement.

6. LIMITATIONS :

■ This survey was performed for the sole and exclusive benefit of the parties to whom it was certified. ■ Likewise, any reuse of this survey for any purpose other than which was originally intended, without the written permission of the undersigned surveyor, will be done so at the risk of the reusing party and without any liability to the undersigned surveyor. ■ Since no other information other than what is cited in the Sources of Data were furnished, the Client is hereby advised that there may be legal restrictions on the Subject Property that are not shown on the Survey Map or contained within this Report that may be found in the Public Records of County, or the records of any other public and private entities as their jurisdictions may appear. ■ Land shown hereon were not abstracted for easements and/or right-of-way of record except as shown on the Record Plat if any. ■ The Surveyor makes no representation as to ownership or possession of the Subject Property by any entities or individual who may appear of public record. ■ This survey may be subject to dedications, limitations, restrictions, reservations, encumbrances or easements of record the same that may not be noted or depicted hereon. ■ No improvements were located, other than those shown. ■ This survey does not purport to show ownership of walls and/ or fences along property lines. ■ Unless otherwise noted, this firm has not attempted to locate underground footings and/or foundations. ■ The elevations (if any) were measured to an estimated vertical positional accuracy of 1/10 foot for natural ground surfaces and 1/100 foot for hardscape surfaces, including pavement, curbs, sidewalks and other manmade structures. ■ Wall ties are to the face of the same. ■ Fence ties are from the nearest face of the same to the property line. ■ Public Records have not been researched by the surveyor to determined the accuracy of these descriptions nor have adjoining properties been researched to determine overlaps and hiatus. ■ The survey depicted here is not covered by professional liability insurance. ■ **Notice:** Sunshine State One Call of Florida, Inc. must be contacted at least 48 hours in advance of any construction, excavation or demolition activity within, upon, abutting or adjacent to the Subject Property. Pursuant to Chapter 556.101-111 of the Fl. Statutes.

ABBREVIATIONS AND LEGEND:

A =arc	HT =high (height)	PRM =permanent reference monument	+ X.XX' elevation NGVD29	— board fence
ADJ =adjacent	L.F.E.=lowest floor elevation	PT =point of tangency	+ (X.XX') elevation NAVD88	— CBS wall / fence
A.E. =anchor easement	LME =lake maintenance easement	R =radius	— fire hydrant	— chain link fence
BBQ =barbecue	LS =land surveyor	R/R =railroad	— pre-cast fence	— picket fence
BOB =basis of bearings	M =measured distance	R/W =right-of-way	— wooden fence	
BM =bench mark	NA =not applicable	Sec =section		
BC =block corner	N&D =nail & disc	S =south		
CME =canal maintenance easement.	NAVD=national american vertical datum	T =tangent		
C =calculated	NGVD=national geodetic vertical datum	U.E. =utility easement		
Ch =chord	N =north	W =west		
CBS =concrete block structure	NTS =not to scale			
Ø =diameter	OH =overhang			
D =central angle	O/S =offset			
DH =drill hole	ORB =official record book			
DME =drainage maintenance easement	P =plat			
E =east	P.B. =plat book			
F.I.P. =found iron pipe no id	P.C. =point of curvature			
F.I.R. =found iron rebar no id	PG =page			
F.N&D=found nail and disc	PCP =permanent control point			
F.F.E.=finish floor elevation	P/L =property line			
	POB =point of beginning			
	POC =point of commencement			

CERTIFY TO : SHARON MIRMELLI.

SURVEYOR'S CERTIFICATE : I hereby certify: That this "Boundary and Topographic Survey" and Report resulting therefor was performed under my direction and is true and correct to the best of my knowledge and belief and further, that said "Boundary and Topographic Survey" meets the intent of the applicable provisions of the "Standards of Practice for Land Surveying in the State of Florida", pursuant to Section 5J-17.050 through 5J-17.052 of the Florida Administrative Code and it's implementing law, chapter 472.027 of the Florida Statutes.

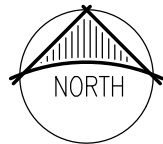
NOTICE: Not valid without the signature and original raised seal of a Florida Licensed Surveyor and Mapper. Additions or deletions to Survey Maps and Reports by other than the signing party are prohibited without the written consent of the signing party.

By: **Miguel J. Garay**
Professional Surveyor and Mapper
No. 6594 State of Florida

8801 NW 176th Street Miami Lakes, Fl. 33018
P. 305_362_7926 P. 305_305_4143
M. madelin @surveyinflorida.com

Date: 04-22-2024
Job No.24-12843F
Sheet No. 1 of 1

PRISMA LAND SURVEYORS LLC
SURVEYOR AND MAPPERS LB. 8036
north central and south florida



MAP OF BOUNDARY SURVEY:

SCALE 1" : 20'

