Kyle MacDonald
kym5182@psu.edu

September 28, 2015

Dr. Thomas Boothby
The Pennsylvania State University
209 Engineering Unit A
University Park, PA 16802

Dear Dr. Boothby,

The following document, Technical Report II – Building Codes, Specifications, and Loads, is a detailed account of the load determination process applied to the analysis and design of The Medical Center by means of applicable building codes and reference design standards. Through presentation of hand calculations as well as spreadsheet formulations, this report documents the relevant structural loads imposed on this building.

Additionally, this report includes a building abstract which illustrates general building information, outlines the primary project team, and provides a brief description of the architectural schemes as well as the essential engineering system criteria used to design The Medical Center. The hand calculations and spreadsheet formulations pertain to the determination of structural gravity, wind, seismic, and flood loads imposed on the building.

Thank you for your consideration and evaluation of this report.

Sincerely,

Kyle MacDonald

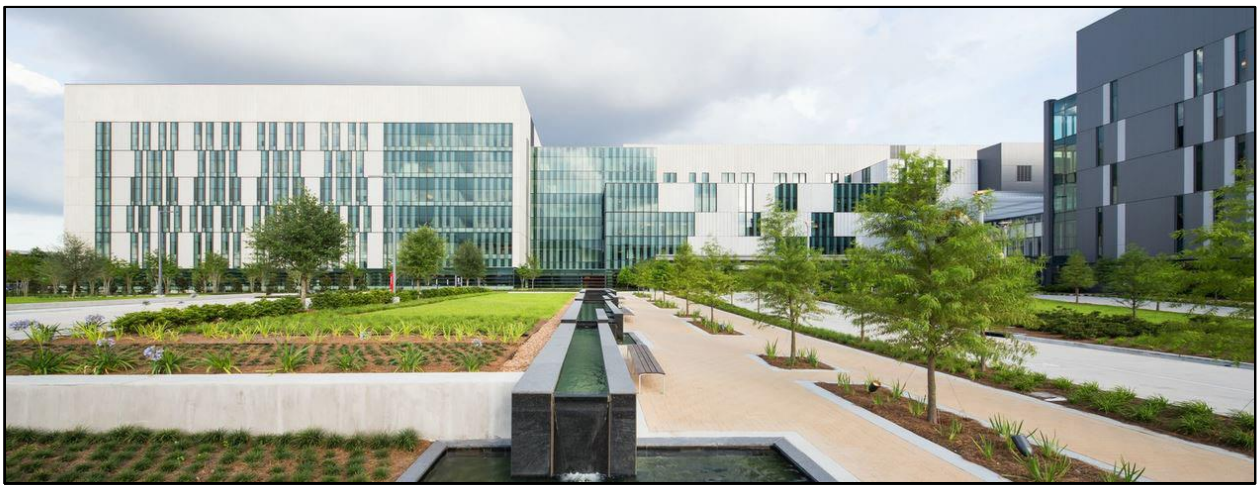
The Pennsylvania State University

Schreyer Honors College | Class of 2016

The Medical Center | Southeast, USA

Building Codes, Specifications, and Loads

Structural Notebook Submission A



Submitted to: Dr. Thomas Boothby, Advisor

Prepared by: Kyle M. MacDonald [Structural Option]

Prepared on: September 28th, 2015

Executive Summary

The Medical Center is a 570,000 square foot hospital located at the cornerstone of an expanding medical district. The building site is woven into the urban fabric of Southeast, USA. Due to the region's environmental characteristics, the building site's poor soil condition warrants the classification of seismic design category E.

Comprised of three identical L-shaped inpatient towers, The Medical Center is designed utilizing a reinforced concrete (RC) structural system. The structure features concrete slabs with pan joists, RC beams, RC girders, and vertical RC columns. These structural elements frame into composite timber piles and pre-cast, prestressed concrete piles, which are driven into the earth until a depth, below the original grade, of 62 ft. Concrete moment frames and concrete walls serve as the lateral force resisting system.

The Medical Center was designed based on the Southeast, USA Building Code, associated with the International Building Code (IBC), 2009 edition. The American Society of Civil Engineers (ASCE) 7-05 was utilized as a reference standard. The building is scheduled to be completed in August 2015.

THE MEDICAL CENTER | SOUTHEAST, USA

GENERAL INFORMATION

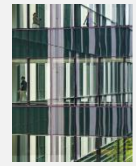
Full Height	113 ft.
Number of Stories	7 above grade
Size of Building	570,000 sq. ft.
Cost of Building	$190,000,000
Date of Construction	Dec. 2012-Nov. 2015
Project Delivery Method	Design-Bid-Build

PROJECT TEAM

Owner	State of Louisiana
Construction Manager (at risk)	Skanska
Architect	NBBJ Architects
Architect (Joint Venture)	Blitch Knevel Architects
Structural Engineers	URS Corporation (AECOM)
MEP Engineers	URS Corporation (AECOM)
Fire Protection	URS Corporation (AECOM)
Exterior Envelope	IBA Consultants

ARCHITECTURE

The inpatient towers feature a polished and refined design that influences the form and shape of the medical district of Southeast, USA. The L-shaped orthogonal design scheme introduces order and logic into the overall program of the building. A high degree of programmatic intuition is demonstrated through the relationship between the environmental concerns of the region and the location of the mission-critical components within the building.



IMAGES COURTESY OF NBBJ ARCHITECTS

MECHANICAL SYSTEMS

The indoor design conditions are defined as seen below:
Summer: 75°F db/50% RH | Winter: 70°F db/30% RH

LIGHTING AND ELECTRICAL SYSTEMS

The hospital is equipped with emergency power capable of sustaining mission-critical operation after a category 3 hurricane for up to a week with no outside support.

CONSTRUCTION

Due to the unfavorable and unpredictable conditions of the site soil, a 7.5% structural foundation allowance was allotted to account for any variability in pile length.

STRUCTURAL SYSTEMS

Foundation: Timber Composite Piles, Precast/Prestressed Concrete Piles, Pile Cap, Grade Beams

Framing: Concrete Frame Horizontal – Joist, Beam, Girder | Concrete Frame Vertical – Column | Concrete Slab

Lateral: Concrete Moment Frame – Detailed Lateral Connection at Column and Beam Interface

Kyle M. MacDonald | Structural Option | http://www.kym5182.wix.com/thesis

Table of Contents

[1] Introduction

1.1 Purpose

This report functions as a detailed description and analysis of the loading conditions on The Medical Center. The loads described and analyzed in this report will serve as a foundation of technical knowledge for an investigation of the existing structural system design of The Medical Center in subsequent reports.

1.2 Scope

The content of this report is divided into four major sections: gravity loads, wind loads, seismic loads, and flood loads. Additionally, this document discusses pertinent information with respect to site location and resource documentation. This information is framed by the context of the loading analysis and design of The Medical Center. Appendices are included at the end of the document in order to display original load calculations executed by URS Corporation (AECOM).

1.3 Site Location and Plan

The Medical Center sits at the cornerstone of an expanding medical district, contributing to an expansive network of hospitals in Southeast, USA. Nestled in between pockets of urban residential construction, The Medical Center briefly interrupts the major urban grid of the existing environment. Existing as a mission-critical facility, the building's proximity to a major network of highways enhances its public accessibility. The urban context of the site, totaling 37 acres in size, influences the boundaries of design of this building project (as seen in Figure 1 and Figure 2).

Figure 1 - Site Context (Macro)

Figure 2 - Site Context (Aerial)

1.4 Document List

- IBC 2009 (for design considerations)
- ASCE 7-05 (for load calculations)
- AISC Steel Manual, 14^{th} Edition
- ACI 301, ACI 315, ACI 318
- USGS Seismic Design Maps

[2] Gravity Loads

This section investigates the gravity loading of the structural system, inclusive of dead, live, and snow loads. Each load case is investigated separately but applied to the building structure in combination.

2.1 Dead Loads

Table 1 - Dead Loads

Dead Load	Load Value (psf)
Exterior Glazed Framing System	20
Exterior Precast Concrete Panel	50
Exterior Composite Metal Panel	15
Hospital Floor	60
Hung Load Allowance (Typical Floors)	8
Hung Load Allowance (Main Roof)	13
Roofing Allowance (W/O Pavers)	12
Roofing Allowance (W/ Pavers)	37

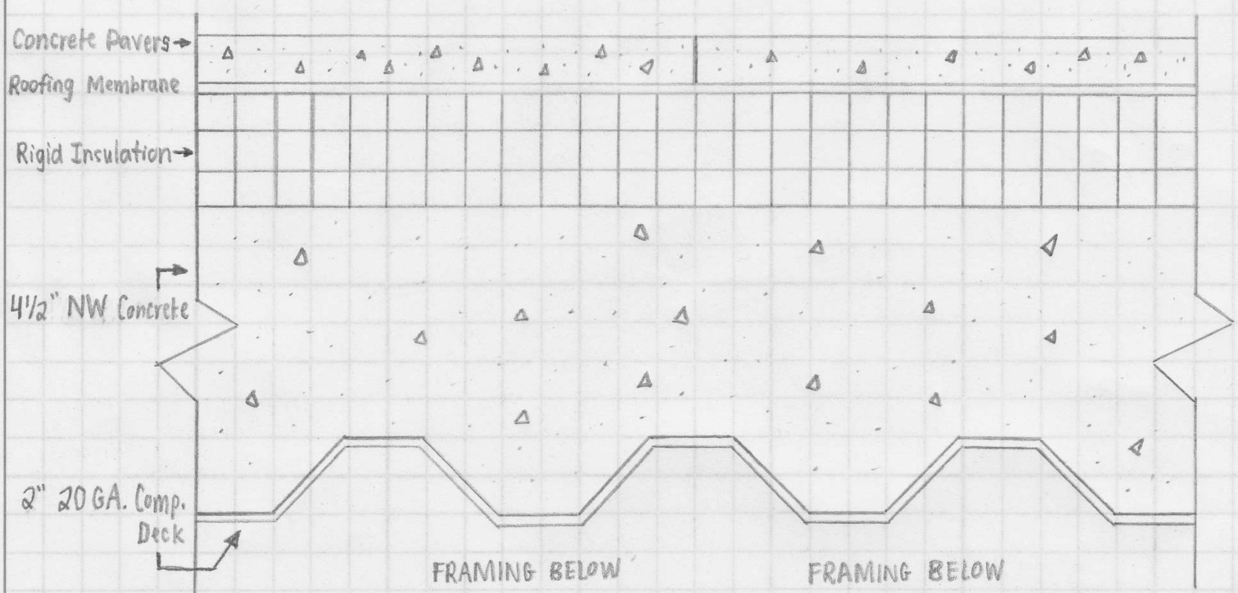
2.2 Live Loads

Table 2 - Live Loads

Live Load	Load Value (psf)
Offices	50
Corridors (1st Floor)	100
Corridors (Other)	80
Operating Rooms	60
Patient Rooms	40
Lobbies, Stair and Exit Ways	100
Mechanical Rooms	125 (or equipment weight)

GRAVITY LOADS

- Roof Construction (Diagram & Loading)



- Roof Loading (Dead)

Concrete Pavers	:	13 psf
Roofing Membrane	:	1 psf
Rigid Insulation	:	1½ psf
4½" NW Concrete	:	57 psf
2" 20GA Comp. Deck	:	2 psf
Framing	:	6½ psf
Miscellaneous	:	9 psf

Total Assembly Dead Load = 90psf

Framing per Typical Bay

Area : approx. 30' x 32' = 960 sf → 6½psf

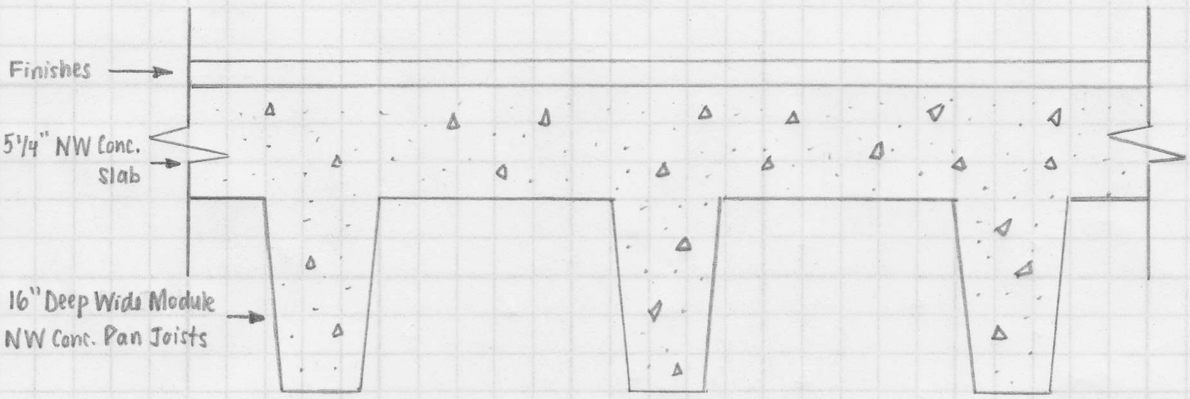
- Roof Loading (Live)

Roof Live Load : 20 psf

(according to ASCE 7-05 Table 4-1 → Minimum Uniformly Distributed Live Loads

GRAVITY LOADS (cont.)

- Floor Construction (Pan Joist System)



- Floor Loading (Pan Joist System)

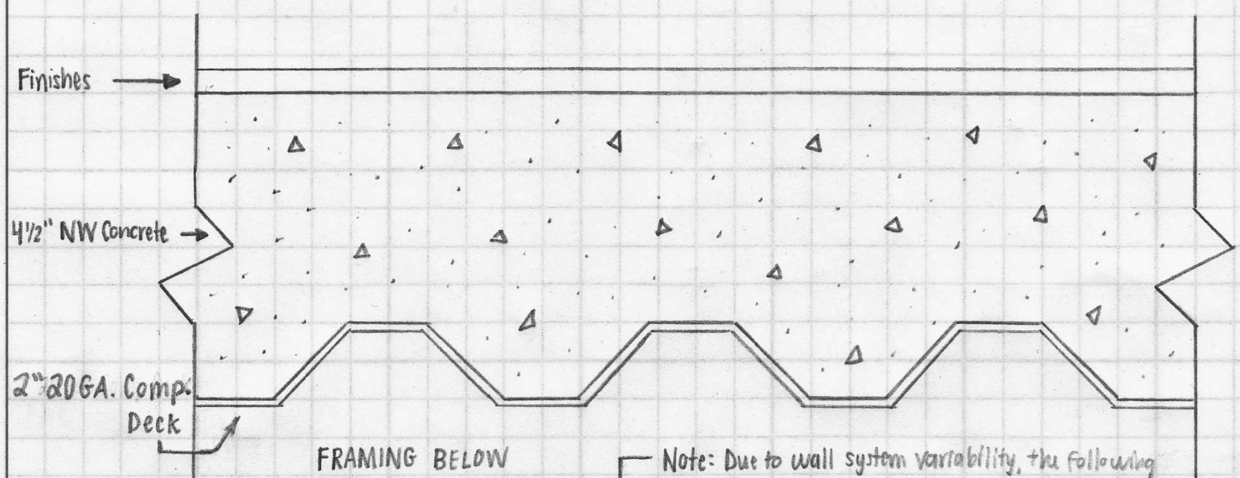
Finishes	:	2 psf
Conc. Slab	:	67 psf
Pan Joists	:	14 1/2 psf
Framing	:	6 1/2 psf
Ceiling	:	5 psf
Miscellaneous	:	15 psf

Total Assembly Dead Load = 110 psf

The pan joist floor assembly system relies on 16 inch deep pan joists, spaced at 66 inches apart, to provide sections of increased stiffness. The framed floor (structural) follows a defined module that dictates the framing pattern of the building.

GRAVITY LOADS (cont.)

- Floor Construction (Slab and Deck System)



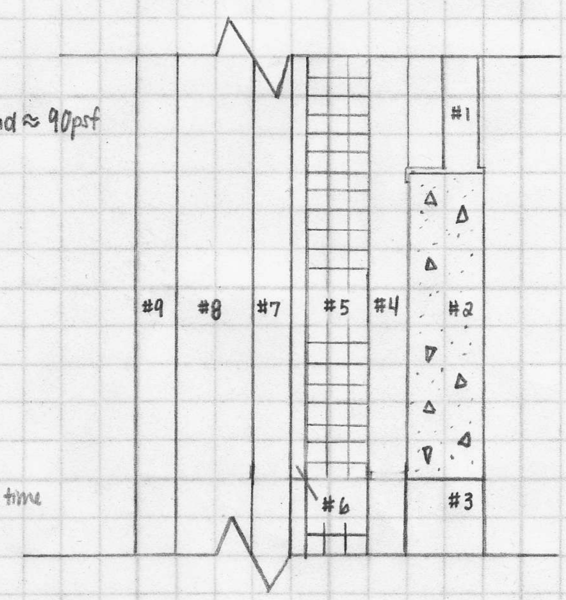
Note: Due to wall system variability, the following diagram is representative of the types of material included in exterior enclosure wall assemblies

- Floor Loading (Slab and Deck System)

Finishes	:	2 psf
Conc. Slab	:	57 psf
Steel Deck	:	2 psf
Framing	:	6½ psf
Ceiling	:	5 psf
Miscellaneous	:	15 psf

Total Dead Load ≈ 90 psf

- Exterior Enclosure Construction



#1 : Curtain Wall / Glazed Framing System (GFS)
#2 : Precast Concrete Wall Panel
#3 : Composite Metal Wall Panel
#4 : Air Gap
#5 : Rigid Insulation
#6 : Vapor Barrier
#7 : Gypsum Board
#8 : Metal Stud
#9 : Gypsum Board

- Exterior Enclosure Loading

Curtain Wall / GFS	:	20 psf
Precast Conc. Panel	:	50 psf
Comp. Metal Panel	:	15 psf
Air Gap	:	0 psf
Insulation	:	1½ psf
Vapor Barrier	:	½ psf
Gypsum Board	:	5½ psf (2¾ psf each)
Metal Stud Framing	:	5

(Curtain Wall / GFS, Precast Conc. Panel, Comp. Metal Panel:) only consider one at a time

Total Dead Load = 62½ psf

2.3 Snow Loads

Due to the climate region of the building site, the applicable reference standard dictates a ground snow load equal to zero pounds per square foot; therefore, snow conditions will not imposed any load on the building structure (and can be rightly omitted from design load considerations).

SNOW LOADS

- Flat Roof Snow Loads → $p_f = 0.7\,C_e\,C_t\,I_s\,p_g = 0.7(1.0)(1.0)(1.2)(0) = 0$ psf

$p_g = 0$ psf = ZERO (ASCE 7-05 Figure 7-1)

Terrain Category: C (ASCE 7-05 Table 7-2)

C_e ⟶ 1.0 (ASCE 7-05 Table 7-2)

C_t ⟶ 1.0 (ASCE 7-05 Table 7-3)

Occupancy Category: IV (ASCE 7-05 Table 1-1)

I_s ⟶ 1.2 (ASCE 7-05 Table 7-4)

Note: SNOW LOAD WILL NOT CONTROL IN ANY LOAD COMBINATION CASE

[3] Wind Loads

This section investigates the lateral loading, due to wind pressures, of the structural system. Figure 6 illustrates the various lateral force resisting systems used in the building. The original design wind load calculations are recorded in Appendix B.

3.1 Calculations

The following calculations follow the simplified procedure, as outlined in ASCE 7-05. The calculations that follow exist as a representative set of seismic design load calculations.

Table 3 - Wind Design Parameters

Design Parameter	Applicable Information
Occupancy Category	IV
Exposure Category	C
Basic Wind Speed (v)	150mph
Importance Factor (I)	1.15
Directionality Factor (K_d)	0.85
Topographic Factor (K_{zt})	1.0
Enclosure Classification	Enclosed Building

Gust Effect Factor

h =	113.0 ft
B =	62.5 ft
/z (0.6h) =	67.8 ft

Flexible structure if natural frequency < 1 Hz (T > 1 second).
However, if building h/B < 4 then probably rigid structure (rule of thumb).
h/B = 1.81 Therefore, probably rigid structure

Figure 3 - Building Dimensions vs. Rigidity

Rigid Structure

/ε =	0.20
l =	500 ft
z_{min} =	15 ft
c =	0.20
g_Q, g_v =	3.4
L_z =	577.4 ft
Q =	0.88
I_z =	0.18
G =	0.87 use G = 0.85

Figure 4 - Gust Effect Factor Parameters

Surface Pressures (psf) / Surface	Wind Normal to Ridge (psf) B/L = 0.28		h/L = 1.81		Wind Parallel to Ridge (psf)	L/B = 3.63		h/L = 0.50	
	Cp	q_hGC_p	w/+q_iGC_{pi}	w/-q_hGC_{pi}	Dist.*	Cp	q_hGC_p	w/ +q_iGC_{pi}	w/ -q_hGC_{pi}
Windward Wall (WW)	0.80	49.7	see table below			0.80	49.7	see table below	
Leeward Wall (LW)	-0.50	-31.1	-44.2	-17.9		-0.22	-13.6	-26.7	-0.4
Side Wall (SW)	-0.70	-43.5	-56.7	-30.3		-0.70	-43.5	-56.7	-30.3
Leeward Roof (LR)		**				Included in windward roof			
Windward Roof: 0 to h/2*	-1.04	-64.6	-77.8	-51.5	0 to h/2*	-0.90	-55.9	-69.1	-42.8
> h/2*	-0.70	-43.5	-56.7	-30.3	h/2 to h*	-0.90	-55.9	-69.1	-42.8
					h to 2h*	-0.50	-31.1	-44.2	-17.9
					> 2h*	-0.30	-18.6	-31.8	-5.5

Figure 5 - Wind Surface Pressure Parameters

Windward Wall Pressures at "z" (psf)			Windward Wall			Combined WW + LW Normal to Ridge	Combined WW + LW Parallel to Ridge
z	Kz	Kzt	q_zGC_p	w/+q_iGC_{pi}	w/-q_hGC_{pi}		
0 to 15'	0.85	1.00	32.5 psf	19.3 psf	45.7 psf	63.6 psf	46.1 psf
20.0 ft	0.90	1.00	34.5	21.4	47.7	65.6	48.1
25.0 ft	0.95	1.00	36.2	23.0	49.4	67.3	49.8
30.0 ft	0.98	1.00	37.6	24.4	50.8	68.7	51.2
40.0 ft	1.04	1.00	40.0	26.8	53.1	71.0	53.5
50.0 ft	1.09	1.00	41.9	28.7	55.0	73.0	55.5
60.0 ft	1.14	1.00	43.5	30.4	56.7	74.6	57.1
70.0 ft	1.17	1.00	45.0	31.8	58.1	76.0	58.5
80.0 ft	1.21	1.00	46.2	33.1	59.4	77.3	59.8
90.0 ft	1.24	1.00	47.4	34.2	60.6	78.5	61.0
100.0 ft	1.27	1.00	48.5	35.3	61.6	79.5	62.0
h= 113.0 ft	1.30	1.00	49.7	36.6	62.9	80.8	63.3

Figure 6 - Wind Pressures

<u>Note</u>: The above Figure 6 includes the windward wall pressures (in both the positive and negative interior pressure cases) as well as the combined windward wall and leeward wall pressures in both the (N-S) and (E-W) directions.

WIND LOADS

- Wind Design Criteria

Occupancy Category : IV (ASCE 7-05 Table 1-1)

Basic Wind Speed (3 sec. gust) : 150 mph (ASCE 7-05 Figure 6-1)

Exposure Category : C (ASCE 7-05 Chapter 6)

Importance Factor (I) : 1.15 (ASCE 7-05 Table 6-1)

Wind Directionality Factor (k_d) : 0.85 (ASCE 7-05 Table 6-4)

Topographic Factor (k_{zt}) : 1.0 (ASCE 7-05 6.5.7.2)

- Wind Parameter Investigation (calculate G)

Rigid or Flexible → Note: Rule of Thumb - if $h/B < 4$, then building probably rigid

$h/B = 113\text{ft.} / 62.5\text{ft} = 1.808 < 4 \therefore$ rigid

Due to rigidity, take $G = 0.85$ or calculate $G = 0.925\left((1 + 1.7 g_Q I_{\bar{z}} Q) / 1 + 1.7 g_v I_{\bar{z}}\right)$

$g_Q = g_v = 3.4$

$I_{\bar{z}} = c\left(33/\bar{z}\right)^{1/6} = 0.2\left(33/0.6(113)\right)^{1/6} = 0.177$

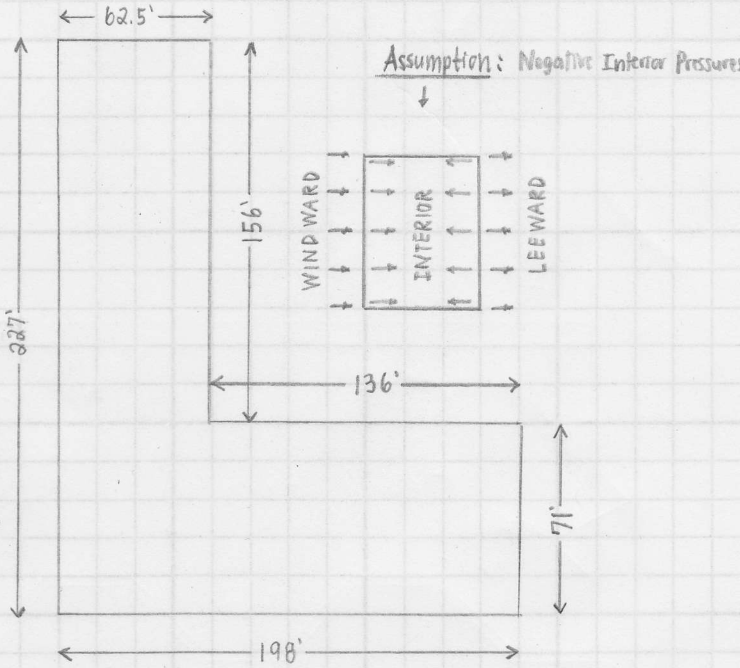
$Q = \sqrt{1/(1 + 0.63((B+h)/L_{\bar{z}})^{0.63})} = \sqrt{1/1 + 0.63((62.5 + 113)/577.45)^{0.63}} = 0.8779$

$L_{\bar{z}} = \ell\left(\bar{z}/33\right)^{\bar{\epsilon}} = 500\left(0.6(113)/33\right)^{(1/5.0)} = 577.45$

$G = 0.925\left((1 + 1.7(3.4)(0.177)(0.8779)) / 1 + 1.7(3.4)(0.177)\right) = 0.867$ → use $G = 0.85$

WIND LOADS (cont.)

Building Plan - Inpatient Tower



- Example Calculation of "P"

at $z = 113'$

$q_h = 0.00256\, k_z k_{zt} k_d V^2$ where $k_z = 1.2925$ interpolate between $z=100$, $k_z = 1.26$; $z=120$, $k_z = 1.31$

$= 0.00256(1.2925)(1)(0.85)(150)^2$

$= 63.3$

at $z = 93'$

$q_z = 0.00256\, k_z k_{zt} k_d V^2$ where $k_z = 1.246$ interpolate between $z=90$, $k_z = 1.24$; $z=100$, $k_z = 1.26$

$= 0.00256(1.246)(1)(0.85)(150)^2$

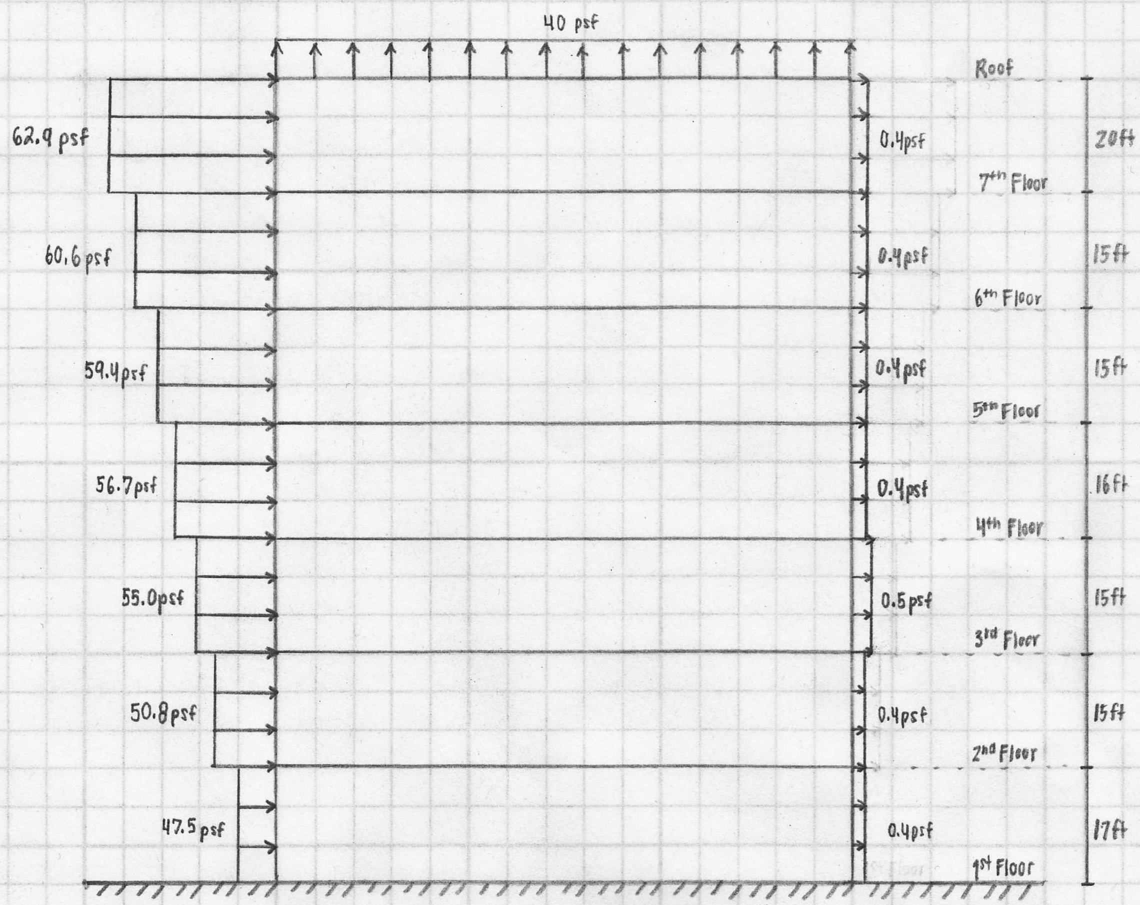
$= 61.0$

C_p, windward; enclosed building

$P = qGC_p - q_i(GC_{pi}) = 61(0.85)(0.8) - 63.3(-0.18) = 52.9\text{k}$

Note: See Wind Loading Diagram and Base Shear Calculations on next page.

WIND LOAD DIAGRAM



Wind Base Shear (E-W) → Representative Calculation

(47.9 psf)(227')(17') + (51.2psf)(227')(15') + (55.5psf)(227')(15') + (57.1psf)(227')(16')

+ (59.8psf)(227')(15') + (61.0psf)(227')(15') + (63.4 psf)(227')(20')

≃ 1468.55k → 1470k (Wind Loads control the lateral design of the building)

[4] Seismic Loads

This section investigates the lateral loading, due to seismic ground accelerations, of the structural system. Table 4 can be referenced for a list of lateral force resisting systems used in the building. The original design seismic load parameters and considerations are recorded in Appendix C.

Table 4 - Lateral Force Resisting Systems

LFRS	Direction of Resistance	R-Value
Intermediate Concrete Moment Frames	North-South	5
Intermediate Concrete Moment Frames	East-West	5

4.1 Calculations

The following calculations follow the Equivalent Lateral Force procedure, as outlined in ASCE 7-05. All ground motion parameters were determined referencing the USGS seismic design maps. The calculations that follow exist as a representative set of seismic design load calculations.

SEISMIC LOADS (ELF according to ASCE 7-05 Table 12.6-1)

- **Design Criteria**

Occupancy Category : IV (ASCE 7-05 Table 1-1)

Importance Factor (I_e) : 1.5 (ASCE 7-05 Table 11.5-1)

Soil Site Class : E (ASCE 7-05 11.4.2)

Seismic Design Category : C (ASCE 7-05 Table 11.6-2)

- **Ground Motion Parameters and Calculations**

$S_s = 11.0\%$ (USGS Ground Motion Parameter Application - verified by ASCE 7-05 EQ Ground Motion Maps)

$S_1 = 4.8\%$ (USGS Ground Motion Parameter Application - verified by ASCE 7-05 EQ Ground Motion Maps)

$F_a = 2.5$ (ASCE 7-05 Table 11.4-1)

$F_v = 3.5$ (ASCE 7-05 Table 11.4-2)

$S_{MS} = F_a S_s = (2.5)(0.11) = 0.275$

$S_{M1} = F_v S_1 = (3.5)(0.048) = 0.168$

$S_{DS} = (2/3) S_{MS} = (2/3)(0.275) = 0.183 \longrightarrow 18.3\%$

$S_{D1} = (2/3) S_{M1} = (2/3)(0.168) = 0.112 \longrightarrow 11.2\%$

- **Lateral System - Intermediate Reinforced Concrete Moment Frames**

Response Modification Factor (R) = 5 (ASCE 7-05 Table 12.2-1)

Overstrength Factor (Ω) = 3 (ASCE 7-05 Table 12.2-1)

Deflection Amplification Factor (C_d) = $4\frac{1}{2}$ (ASCE 7-05 Table 12.2-1)

- **Building Period Calculation**

$T = C_t h_n^x = (0.016)(113)^{0.9} = 1.127s$ (ASCE 7-05 Table 12.8-2)

$T_L = 12s$ (ASCE 7-05 Figure 22-15)

$T < T_L \therefore$ use $C_s = S_{DS}/(R/I_e) \leq S_{D1}/(R/I_e)(T)$

SEISMIC LOADS (continued)

- Seismic Response Coefficient

$C_s = S_{DS}/(R/I_e) = 0.183/(5/1.5) = 0.0549 \leq C_s = S_{D1}/(R/I_e)(T) = 0.112/(5/1.5)(1.127) = 0.0298$

Use $C_s = 0.0298$

- Total Dead Load (W) = Dead Load + 20% snow load (on roof) for $P_s \geq 30psf$ (in this case, snow load not relevant)

Roof Load: $W_{RF} = [(226.92' \times 62.41') + (136' \times 71.17')](90psf) + (226.92' + 62.41' + 155.75' + 136' + 71.17' + 198.41')(20'/2)(62.5psf)$
$= 2677353 lb = 2677.353k$

Floor Load: $W_{FL} = [(226.92' \times 62.41') + (136' \times 71.17')](110psf)(7) + (226.92' + 62.41' + 155.75' + 136' + 71.17' + 198.41')(103')(62.5psf)$
$= 23833693 lb = 23833.693k$

Total Load: $W_{RF} + W_{FL} = 2677.353k + 23833.693k = 26511k$

- Seismic Base Shear

$V = C_s W = (0.0298)(26511k) = 790k$ (Seismic Loads do not control the lateral design of the building)

For C_{vx} calculations:

$W_2 = [(226.92' \times 62.41') + (136' \times 71.17')](110psf) + (850.66')(17/2 + 15/2)(62.5psf) = 3473.170$

$W_3 = (23841 ft^2)(110 psf) + (850.66')(15/2 + 15/2)(62.5psf) = 3420.004k$

$W_4 = (23841 ft^2)(110 psf) + (850.66')(15/2 + 16/2)(62.5psf) = 3446.587k$

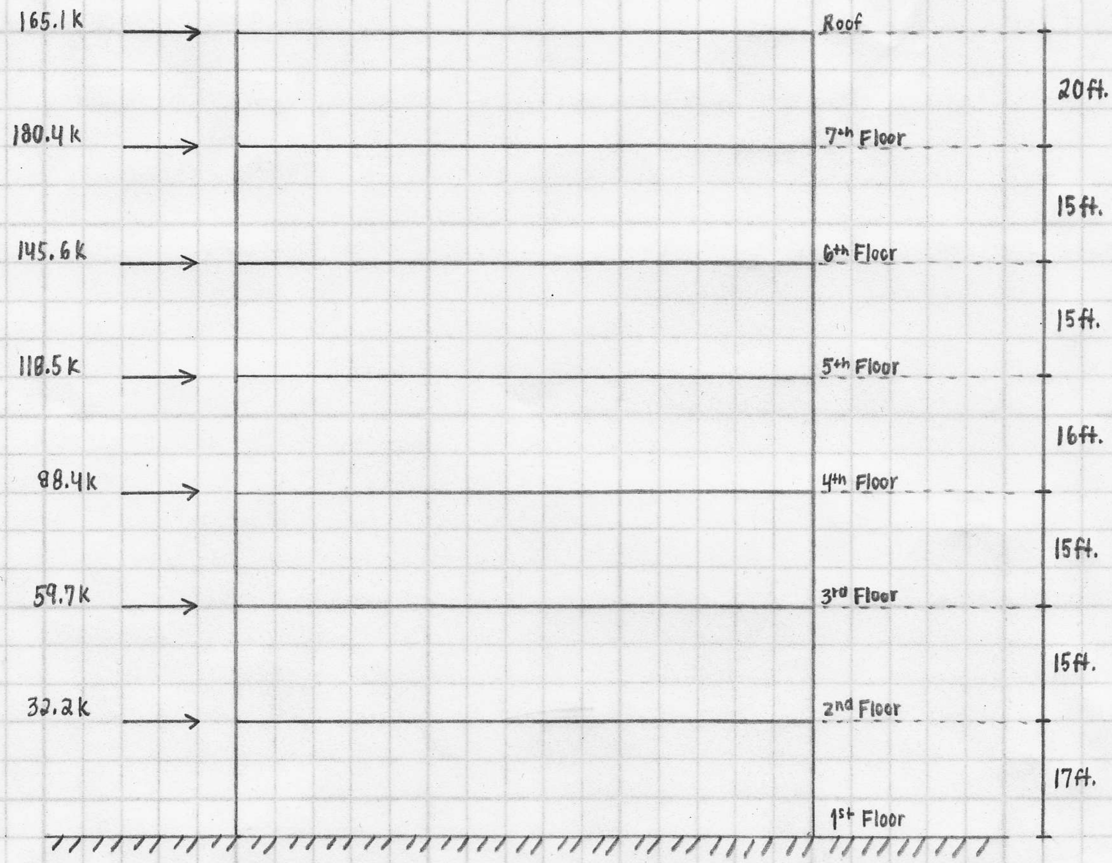
$W_5 = (23841 ft^2)(110 psf) + (850.66')(16/2 + 15/2)(62.5psf) = 3446.587k$

$W_6 = (23841 ft^2)(110psf) + (850.66')(15/2 + 15/2)(62.5psf) = 3420.004k$

$W_7 = (23841 ft^2)(110psf) + (850.66')(15/2 + 20/2)(62.5psf) = 3552.919k$

$W_{Roof} = (23841 ft^2)(90psf) + (850.66')(20/2)(62.5psf) = 2677.353k$

SEISMIC LOAD DIAGRAM



Find Story Weights

Level — $C_{vx} = W_x h_x^k / \sum_{i=1}^{n} w_i h_i^k$ where $\sum_{i=1}^{n} w_i h_i^k = 1447231$ (in this case)

Level					
2	$C_{vx} = (3473)(17)/1447231$	= 0.0408	× 790k	=	32.2k
3	$C_{vx} = (3420)(32)/1447231$	= 0.0756	× 790k	=	59.7k
4	$C_{vx} = (3446)(47)/1447231$	= 0.1119	× 790k	=	88.4k
5	$C_{vx} = (3446)(63)/1447231$	= 0.1500	× 790k	=	118.5k
6	$C_{vx} = (3420)(78)/1447231$	= 0.1843	× 790k	=	145.6k
7	$C_{vx} = (3553)(93)/1447231$	= 0.2283	× 790k	=	180.4k
Roof	$C_{vx} = (2677)(113)/1447231$	= 0.2090	× 790k	=	165.1k

[5] Flood Loads

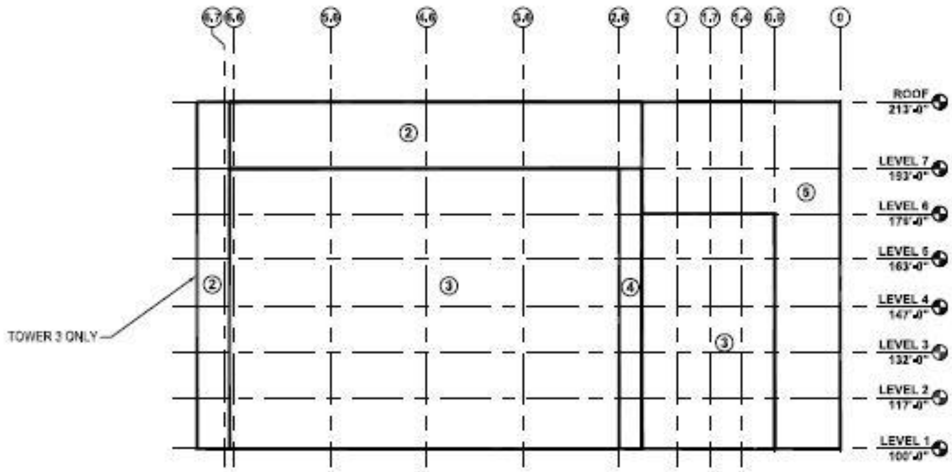
Due to the region's environmental conditions, the building is required to withstand flood design loads. The building was designed for hydrodynamic flow per ASCE 24-05. An assumed flood elevation was established at 15 ft. above mean sea level, and the flow velocity was considered to be 10 ft./sec. The advisory base flood elevation map as well as the flood insurance rate map were utilized in the consideration of imposed flood loading on the building.

Due to the scope of the report, no further discussion or consideration of flood loading will take place. The omission of flood loading is in direction response to the scope of the report and does not exist as a commentary on the importance of flood loading consideration within the design conditions of this building.

[6] Conclusion

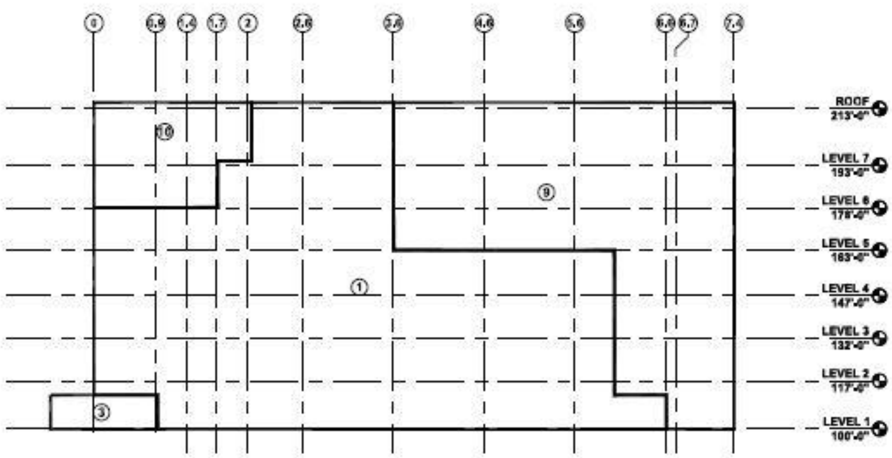
After extensive analysis of the loading conditions imposed on The Medical Center, it was determined that the wind forces will control the lateral design of the building. Due to the region's climate, snow loading can be rightly removed from consideration. Hydrostatic flood loads must be considered as the technical analysis of the existing building progresses.

[7] Appendix A: Wind Loads



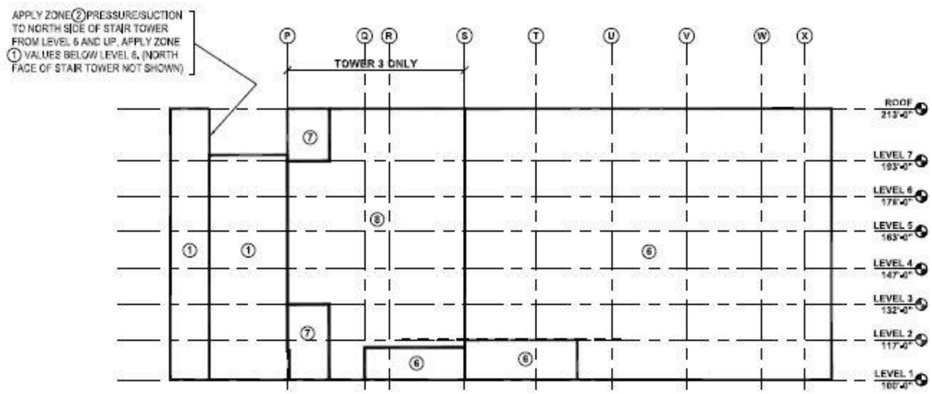
INPATIENT TOWER NORTH ELEVATION PRESSURE ZONES

NOTE:
COLUMN BUBBLES BASED ON
TOWER 1, PRESSURE ZONES ARE
IDENTICAL AT TOWERS 2 AND 3

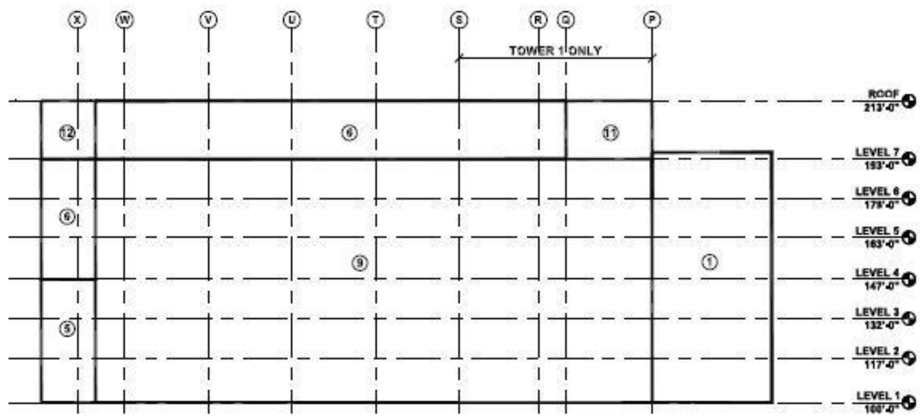


INPATIENT TOWER SOUTH ELEVATION PRESSURE ZONES

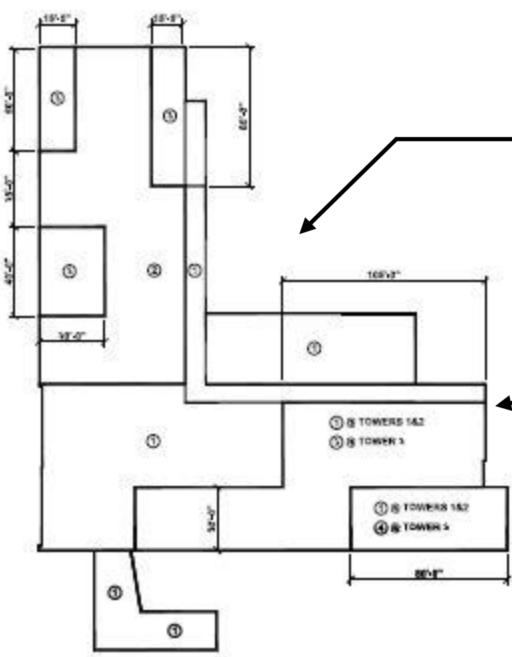
NOTE:
COLUMN BUBBLES BASED ON
TOWER 1, PRESSURE ZONES ARE
IDENTICAL AT TOWERS 2 AND 3



INPATIENT TOWER EAST ELEVATION PRESSURE ZONES



INPATIENT TOWER WEST ELEVATION PRESSURE ZONES



Inpatient Towers
Components and Cladding
Roof Pressure Zones

Wind Load Tables for Inpatient Tower

INPATIENT TOWER COMPONENTS AND CLADDING ROOF LOAD CRITERA (PSF)								
COMPONENT	ROOF ZONE 1		ROOF ZONE 2		ROOF ZONE 3		ROOF ZONE 4	
AREA (SQ FT)	PRESSURE	SUCTION	PRESSURE	SUCTION	PRESSURE	SUCTION	PRESSURE	SUCTION
10	38	82	38	-92	38	-104	38	-138
20	38	-77	38	-86	38	-97	38	-129
50	38	-71	38	-79	38	-90	38	-119
100	38	-65	38	-73	38	-82	38	-109
200	38	-62	38	-69	38	-78	38	-104
500	38	-53	38	-60	38	-67	38	-89
700	38	-53	38	-60	38	-67	38	-89

Wind Load Tables for Inpatient Tower

INPATIENT TOWER COMPONENTS AND CLADDING WALL LOAD CRITERIA (PSF)																								
COMPONENT	WALL ZONE 1		WAL. ZONE 2		WALL ZONE 3		WALL ZONE 4		WALL ZONE 5		WALL ZONE 6		WALL ZONE 7		WALL ZONE 8		WALL ZONE 9		WALL ZONE 10		WALL ZONE 11		WALL ZONE 12	
AREA (SQ FT)	PRESSURE	SUCTION	PRESSURE	SUCTION	PRESSURE	SUCTION	PRESSURE	SUCTION	PRESSURE	SUCTION	PRESSURE	SUCTION	PRESSURE	SUCTION	PRESSURE	SUCTION	PRESSURE	SUCTION	PRESSURE	SUCTION	PRESSURE	SUCTION	PRESSURE	SUCTION
10	64	-63	64	-82	64	-71	71	-63	71	-94	71	-82	71	-151	71	-117	71	-71	82	-71	71	-105	82	-82
20	64	-63	64	-82	64	-71	71	-63	71	-94	71	-82	71	-151	71	-117	71	-71	82	-71	71	-105	82	-82
50	59	-61	59	-79	59	-68	65	-61	65	-90	65	-79	65	-144	65	-112	65	-68	75	-68	65	-100	75	-79
100	56	-58	56	-75	56	-65	62	-58	62	-85	62	-75	62	-136	62	-106	62	-65	71	-65	62	-95	71	-75
200	53	-55	53	-71	53	-62	59	-55	59	-81	59	-71	59	-128	59	-100	59	-62	67	-62	59	-90	67	-71
500	47	-52	47	-67	47	-59	52	-52	52	-76	52	-67	52	-121	52	-94	52	-59	59	-59	52	-85	59	-67
700	47	-52	47	-67	47	-59	52	-52	52	-76	52	-67	52	-121	52	-94	52	-59	59	-59	52	-85	59	-67

[8] Appendix B: Seismic Loads

USGS Design Maps Summary Report

View Detailed Report Print

User–Specified Input

Building Code Reference Document ASCE 7-05 Standard
(which utilizes USGS hazard data available in 2002)

Site Coordinates

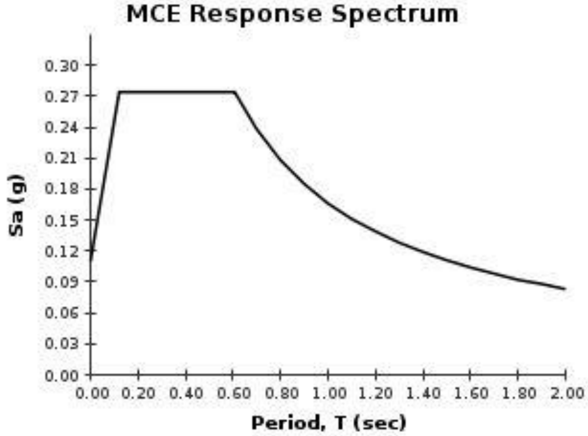
Site Soil Classification Site Class E – "Soft Clay Soil"

Occupancy Category IV

USGS–Provided Output

S_S = 0.110 g	S_{MS} = 0.274 g	S_{DS} = 0.183 g
S_1 = 0.048 g	S_{M1} = 0.166 g	S_{D1} = 0.111 g

MCE Response Spectrum



Design Response Spectrum