SSM – St. Clare Health Center: Fenton, Missouri

Technical Report 2

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Executive Summary

SSM St. Clare Health Center is a 420,000 square foot hospital located in a residential area of Fenton, Missouri. The building's site was previously a golf course, and the combination of sub-par soil conditions and proximity to the New Madrid fault line make the site a seismic design category D.

Structurally, the hospital is a composite steel frame building resting on massive concrete drilled piers which are connected by grade beams. The structure is broken up into several smaller buildings isolated by construction joints. These individual buildings each contain their own lateral force resisting systems which include special moment frames (SMF), special concentrically braced frames (SCBF), special reinforced concrete shear walls (SRCSW), and ordinary concentrically braced frames (OCBF).

The building was designed in 2004 and uses the 2003 Edition of the International Building Code and ASCE 7-02 as a reference standard. Design loads were determined based on these codes, additional St. Louis County Codes and Ordinances, and practical engineering judgments.

SSM St. Clare Health Center

Fenton, Missouri: St. Louis County

General Information

Full Height:	90 feet
Number of Stories:	6
Size:	427,000 square feet
Cost:	$223.5 million
Date of Construction:	Sept. 2006 – March 2009
Project Delivery Method:	Integrated "Lean" Project Delivery

Project Team

Owner:	SSM Health Care, St. Louis
Owner's Program Manager:	Hammes Company
Architect of Record:	HGA Architects and Engineers
Associate Architect:	Mackey Mitchel Associates
Structural Engineers:	HGA Architects and Engineers
MEP Engineers:	KJWW Engineering
Construction Manager:	Alberici Construction
Elevator Consultants:	Lerch, Bates & Associates Inc.

Architecture

The hospital program contains a wide variety of medical use spaces, including 158 emergency supported inpatient beds, diagnostic and surgical services, administrative offices, dietary facilities, and pharmaceutical dispensaries. The floor plans were developed using Lean process principles classically used in manufacturing facilities.

Structural Systems

Framing: Steel framing, composite deck and lightweight concrete over composite wide flange members

Foundation: Slab on grade, drilled concrete column piers connected by grade beams

Lateral: Various systems including special moment frames (SMF), special concentrically braced frames (SCBF), special reinforced concrete shear walls (SRCSW), and ordinary concentrically braced frames (OCBF)

Mechanical Systems

Fan coil units in each patient room fed by central boiler and chiller system for heating and cooling. VAV dedicated outside air for ventilation.

Lighting and Electrical Systems

Electrical system supported by back up generators designed to power the entire hospital for at least 90 minutes. Lighting controls include ultrasonic ceiling sensors and infrared wall switch sensors for energy savings.

Construction

Noise control procedures were specified to mitigate problems with surrounding residents. Smoking was prohibited on the site to comply with hospital policies and avoid contaminating the patient rooms.

Photos compliments of HGA Architects and Engineers

Christopher Brandmeier | Structural Option

https://www.engr.psu.edu/ae/thesis/portfolios/2015/aqb5205/index.html

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1 General Information

1.1 Purpose

This report is a detailed analysis of the loading conditions on SSM St. Clare Health Center. These loads will be used in subsequent reports to investigate the design of the gravity and lateral force resisting systems.

1.2 Scope

The major sections of this document discuss the gravity, wind, and seismic loads applied to the building. The building's location and relevant resource documents used in its design are also presented. The appendices to this document contain the original load calculations from HGA Architects and Engineers. The analysis focuses on the bed tower, labelled sections "A" and "B" on the record drawings.

1.3 Site Location and Plan

SSM St. Clare Health Center is located in Fenton, Missouri in a relatively open residential area. The site was previously a golf course, which provided open space and gently sloping terrain. Figure 1 shows the relative placement of the site in Missouri, while Figures 2 through 4 show the building's location on the site as dictated by zoning codes and city ordinances.

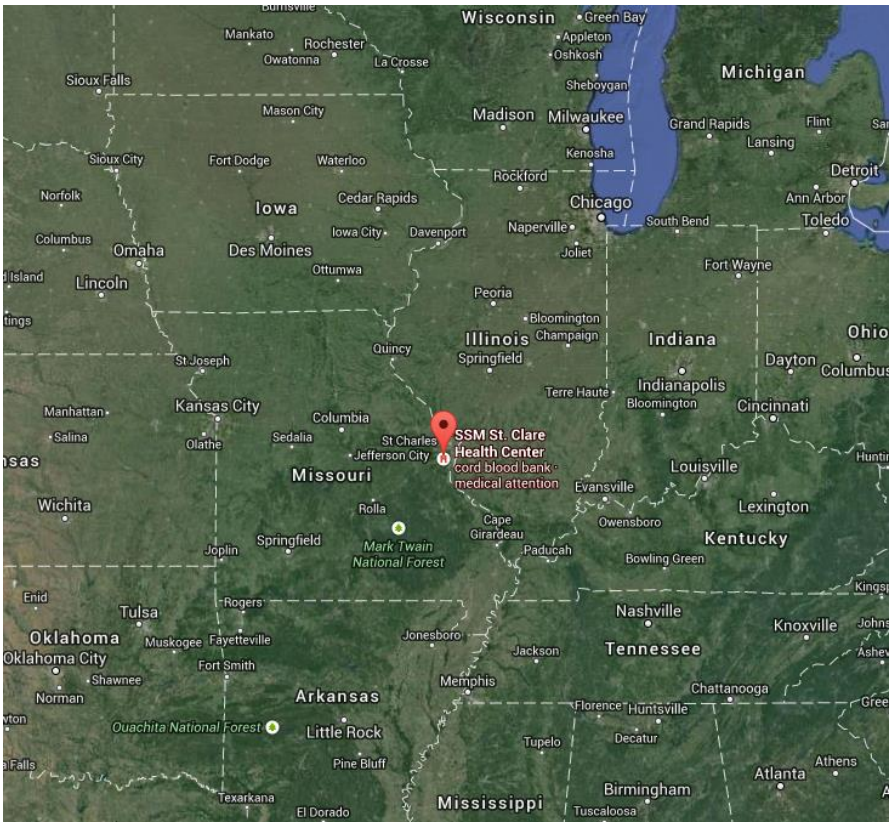


Figure 1: Building Location

Figure 2: Original Site, Golf Course

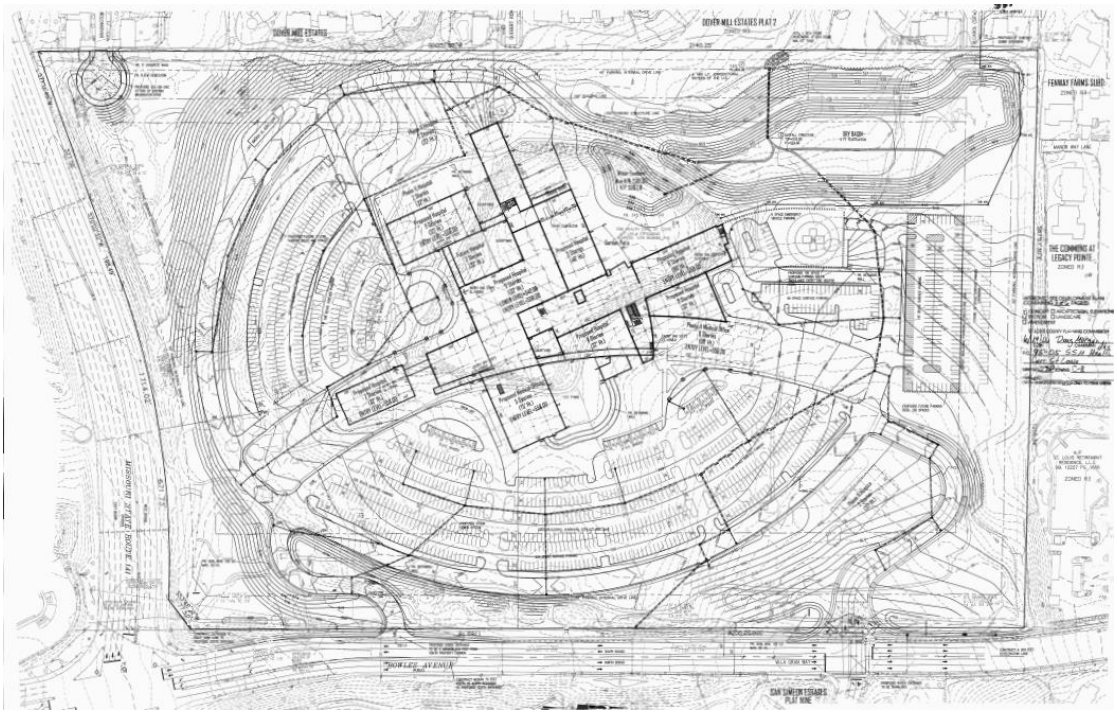


Figure 3: Building Orientation on Site

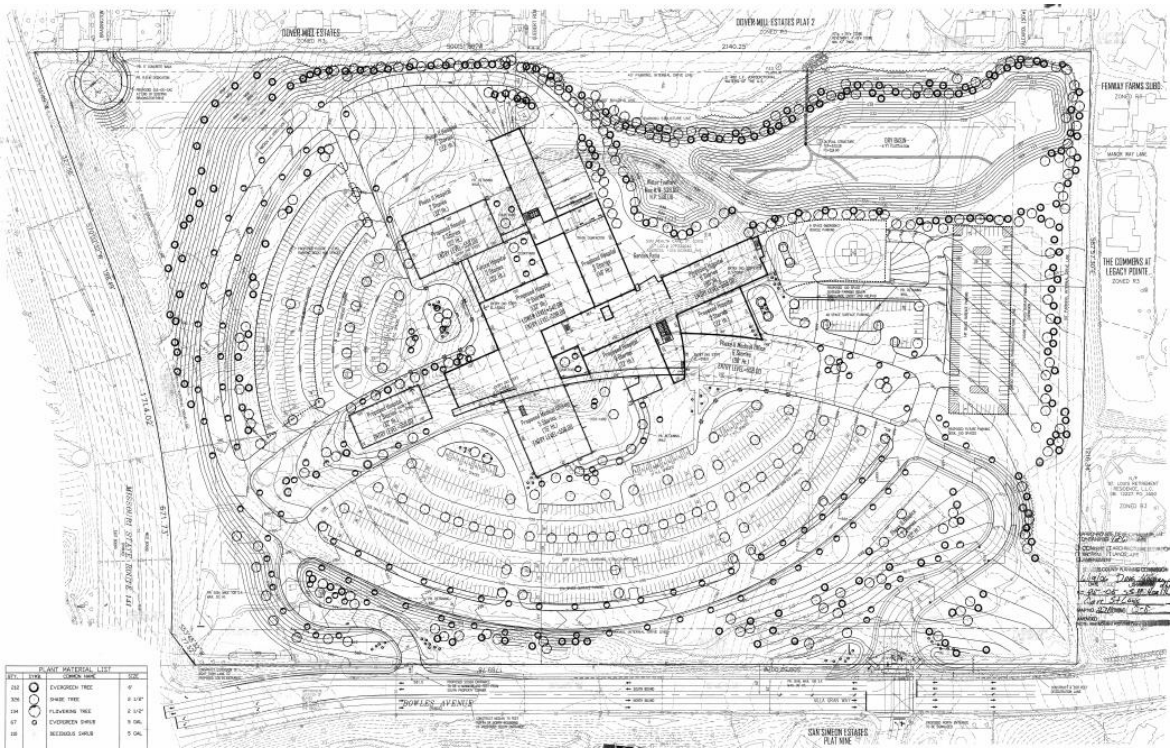


Figure 4: Site Landscaping

1.4 List of Preparatory Documents

- SSM St. Clare Health Center Site Development Plan
  - Produced by Stock & Associates Consulting Engineers Inc.
- SSM St. Clare Health Center Replacement Hospital Project Manual
  - CP-11 E/T Document Issuance
- IBC
  - 2003 Edition (as reference)
  - 2012 Edition (for further design studies)
- ASCE 7
  - ASCE 7-02 (as reference)
  - ASCE 7-10 (for further design studies and load calculations)
- Vulcraft Steel Deck Catalogue, 2008 Edition
- AISC Steel Manual 14th Edition
- USGS Seismic Design Maps

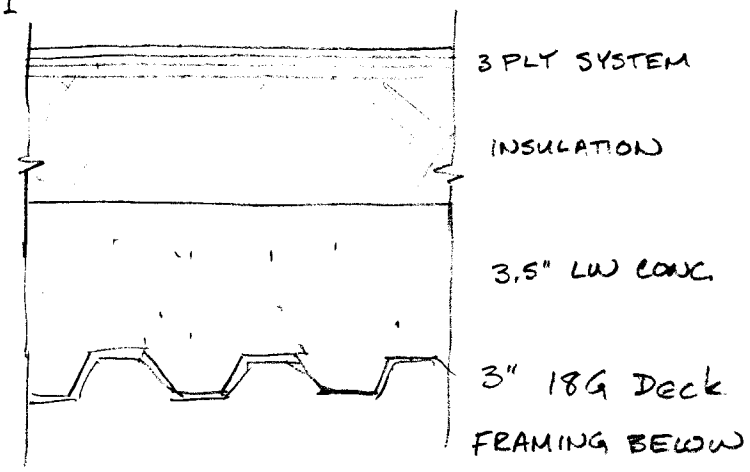
2 Gravity Loads

This section examines the dead, live, and snow loads used to design the building's gravity system. The original design calculations for gravity loads can be found in Appendix A.

Gravity Loads

ROOF CONSTRUCTION DEAD:
SEE A431

MBIT-1



PENTHOUSE ROOF

3PLY:	1 psf	
5¾" Ins:	1.5(5.75) =	8.625
3.5" Conc: }	48 psf	
3" Deck }		
FRAMING:	6 psf	
MISC:	6 psf	
	70 psf	

BEAMS	26×4×30' =	3120
GIRDERS	26×1×30' =	2280
AREA		900 sf
	=	6 psf

LOW ROOF

3PLY:	1 psf	
11" Ins:	1.5(11) =	16.5 psf
3.5" Conc:	48 psf	
3" Deck:		
FRAMING:	6 psf	
MISC:	6 psf	
	78 psf	

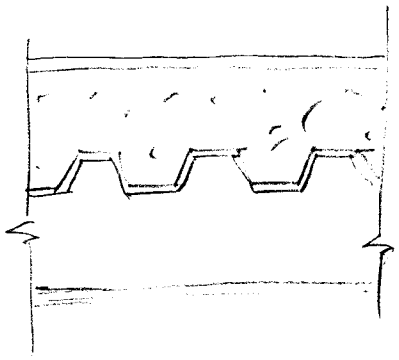
ROOF LIVE:

20 PSF (REQUIRED BY ASCE 7-10)

NOTE: LESS THAN SNOW LOAD

FLOOR CONSTRUCTION DEAD:

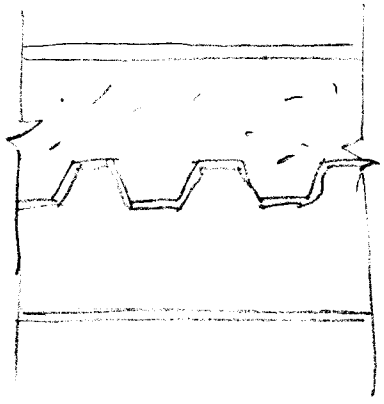
DECK 1



FINISHES
3½" LW CONC
18G 3" Metal Deck
FRAMING
ACOUSTICAL CEILING OR GYPSUM (TAKEN AS MISC)

FINISHES:	2	psf
DECK:	48	psf
FRAMING:	6	psf
CEILING:	5	psf
MISC/EQUIP	15	psf
	76	psf

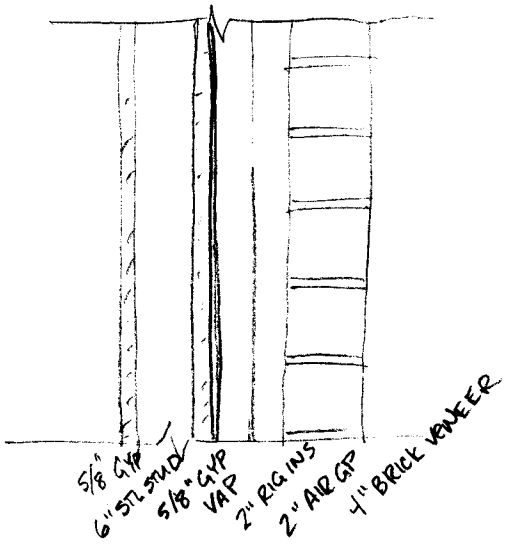
DECK 2:



FINISHES
5" NW CONC
18G 3" METAL DECK
FRAMING
ACOUSTICAL CEILING OR GYPSUM

FINISHES:	2	psf
DECK:	80	psf
FRAMING:	6	psf
CEILING:	5	psf
MISC/EQUIP:	15	psf
	108	psf

EXTERIOR ENCLOSURE



5/8" GYP	:	2.75	psf
6" STL STUD	:	3	psf
5/8" GYP	:	2.75	psf
VAP	:	0.5	psf
2" RGD INS	:	3.0	psf
AIR	:	0	psf
BRICK	:	39	psf
		51	psf

Wall is supported at each floor by a steel angle. Vertical loads are transferred through the steel structure into the foundations.

2.1 DEAD AND LIVE LOADS

Table 1: Typical Live Loads

Live Load	Value (psf)
Operating Room	60
Offices	50
Private Rooms	40
Corridors (1st Floor)	100
Corridors (other)	80
Stairs and Exits	100
Equipment Rooms	125

Table 2: Non-Typical Floor Dead Loads

Dead Load	Value (psf)
Hospital Floor	60
Hospital Roof	78
Power Plant Roof	133
Penthouse Floor	60
Penthouse Roof	28
Rooftop Mech. Unit Supp.	75
Piping Zone	115
MRI Zone	78
Piping and MRI Zone	103
MOB Floor	36
MOB Roof	28
Exterior Brick Wall	50
Exterior Curtain Wall	20
Exterior Metal Panel	15

2.2 SNOW LOADS

Snow Loads

- FLAT ROOF SNOW LOADS

$$p_f = 0.7\, C_e\, C_t\, I_s\, p_g$$

Terrain Category: B
C_e : 1.0
C_t : 1.0
I_s : 1.2 → OC IV
SNOW LOAD : 20 psf

$$p_f = 0.7(1.0)(1.0)(1.2)(20)$$
$$= 16.8 \text{ psf}$$

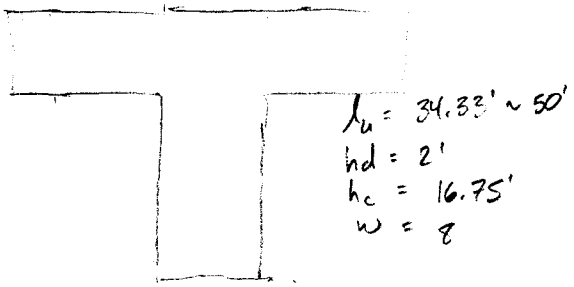
NOTE: RAIN ON SNOW SURCHARGE OF 5 PSF APPLIES.

$$p_m = I_s\, p_g \quad \text{for } p_g \leq 20 \text{ psf}$$
$$= 24 \text{ psf}$$

- DRIFTS ON LOWER ROOFS

PENTHOUSE ROOF:

$$\gamma = 0.13(20) + 14 = 16.6 \text{ pcf}$$
$$h_b = 24/16.6 = 1.4457'$$

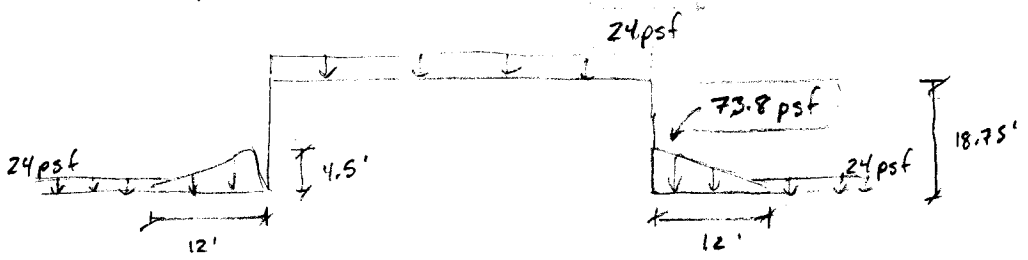


$l_u = 34.33' \sim 50'$
$h_d = 2'$
$h_c = 16.75'$
$w = 8$

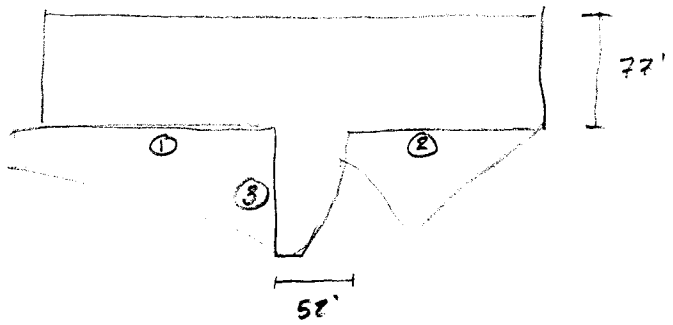
NOTE: N-S direction drifts truncated at 4'

$l_u = 97' \sim 100'$
$h_d = 3'$
$h_c = 16.75'$
$w = 12$

N-S ELEVATION



GARDEN LEVEL ROOFS:



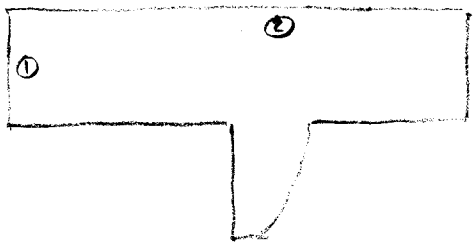
Area ① = Area ②

l_u = 77' ~ 100'
h_d = 3'
h_c = 53'
drift max = $\frac{24}{16.6}(16.6) + 3(16.6)$
= 73.8 psf

Area ③

l_u = 52' ~ 50'
h_d = 2'
h_c = 54'
drift max = $\frac{24}{16.6}(16.6) + 2(16.6)$
= 57.2 psf

PARAPET DRIFT



1) l_u = 400
h_d = 6.5'
h_c = -4.3'
drift max = 24 + 6.5(0.75)16.6
= 104.93 psf

2) l_u = 100
h_d = 3'
h_c = -0.83'
drift max = 24 + 3(0.75)16.6
= 61.35 psf

3 WIND LOADS

This section provides an overview of the wind loads on SSM St. Clare Health Center. Representative hand calculations are followed with more thorough excel spreadsheet tables. Wind loads do not control for the site and structure.

3.1 CALCULATIONS

Table 3: E-W Wind Loads

Location	z (ft)	Story Height (ft)	K_h	K_Z	K_{zt}	q_z	q_h	Cp	q_zGC_p (psf)	GC_{pi}	q_hGC_{pi} (psf)	q_zGC_p-q_h(+GC_{pi})	q_zGC_p-q_h(-GC_{pi})	(ft^2)	(kips/ft)
Windward	-16	16	0.96	0.57	1.00	16.54	27.60	0.8	10.63	0.18	4.97	5.66	15.59	2584.00	14.62
	0	16	0.96	0.57	1.00	16.54	27.60	0.8	10.63	0.18	4.97	5.66	15.59	5168.00	29.24
	16	14	0.96	0.59	1.00	16.85	27.60	0.8	10.82	0.18	4.97	5.86	15.79	4845.00	28.37
	30	14	0.96	0.70	1.00	20.16	27.60	0.8	12.95	0.18	4.97	7.98	17.92	4522.00	36.11
	44	14	0.96	0.78	1.00	22.49	27.60	0.8	14.45	0.18	4.97	9.48	19.42	4522.00	42.88
	58	14	0.96	0.85	1.00	24.34	27.60	0.8	15.64	0.18	4.97	10.67	20.60	4522.00	48.25
	72	18.75	0.96	0.90	1.00	25.89	27.60	0.8	16.63	0.18	4.97	11.67	21.60	5289.13	61.70
	90.75		0.96	0.96	1.00	27.66	27.60	0.8	17.77	0.18	4.97	12.80	22.74	3028.13	38.77
			0.00	0.00	1.00	0.00	0.00	0.8	0.00	0.18	0.00	0.00	0.00	0.00	0.00
Leeward	90.75	90.75	0.96	0.96	1.00	27.66	27.60	-0.5	-11.11	0.18	4.97	-16.07	-6.14	29312.25	-471.15
Sides	90.75	90.75	0.96	0.96	1.00	27.66	27.60	-0.7	-15.55	0.18	4.97	-20.52	-10.58	29312.25	-601.37
Parapet WW	93	2.166	0.96	0.97	1.00	27.86	27.60	0	0.00	1.5	41.39	-41.39	41.39	699.62	-28.96
Parapet LW	93	2.166	0.96	0.97	1.00	27.86	27.60	0	0.00	-1	-27.60	27.60	-27.60	699.62	19.31
Roof (0 to h/2)	90.75	45	0.96	0.96	1.00	27.66	27.60	-0.9	-19.99	0.18	4.97	-24.96	-15.02	14535.00	-362.77
Roof (h/2 to h)	90.75	90	0.96	0.96	1.00	27.66	27.60	-0.9	-19.99	0.18	4.97	-24.96	-15.02	29070.00	-725.54
Roof (h to 2h)	90.75	180	0.96	0.96	1.00	27.66	27.60	-0.5	-11.11	0.18	4.97	-16.07	-6.14	58140.00	-934.51
Roof (>2h)	90.75	323	0.96	0.96	1.00	27.66	27.60	-0.3	-6.66	0.18	4.97	-11.63	-1.70	104329.00	-1213.45

Table 4: N-S Wind Loads

Location	z (ft)	Story Height (ft)	K_h	K_Z	K_{zt}	q_z	q_h	Cp	q_zGC_p (psf)	GC_{pi}	q_hGC_{pi} (psf)	q_zGC_p-q_h(+GC_{pi})	q_zGC_p-q_h(-GC_{pi})	(ft^2)	(kips/ft)
Windward	-16	16	0.96	0.57	1.00	16.54	27.60	0.8	11.37	0.18	4.97	6.40	16.34	616.00	3.94
	0	16	0.96	0.57	1.00	16.54	27.60	0.8	11.37	0.18	4.97	6.40	16.34	1232.00	7.89
	16	14	0.96	0.59	1.00	16.85	27.60	0.8	11.58	0.18	4.97	6.61	16.55	1155.00	7.64
	30	14	0.96	0.70	1.00	20.16	27.60	0.8	13.86	0.18	4.97	8.89	18.83	1078.00	9.58
	44	14	0.96	0.78	1.00	22.49	27.60	0.8	15.46	0.18	4.97	10.49	20.43	1078.00	11.31
	58	14	0.96	0.85	1.00	24.34	27.60	0.8	16.73	0.18	4.97	11.76	21.70	1078.00	12.68
	72	18.75	0.96	0.90	1.00	25.89	27.60	0.8	17.80	0.18	4.97	12.83	22.76	1260.88	16.18
	90.75		0.96	0.96	1.00	27.66	27.60	0.8	19.01	0.18	4.97	14.05	23.98	721.88	10.14
			0.00	0.00	1.00	0.00	0.00	0.8	0.00	0.18	0.00	0.00	0.00	0.00	0.00
Leeward	90.75	90.75	0.96	0.96	1.00	27.66	27.60	-0.2	-4.75	0.18	4.97	-9.72	0.21	6987.75	-67.92
Sides	90.75	90.75	0.96	0.96	1.00	27.66	27.60	-0.7	-16.64	0.18	4.97	-21.60	-11.67	6987.75	-150.96
Parapet WW	93	2.166	0.96	0.97	1.00	27.86	27.60	0	0.00	1.5	41.39	-41.39	41.39	166.78	-6.90
Parapet LW	93	2.166	0.96	0.97	1.00	27.86	27.60	0	0.00	-1	-27.60	27.60	-27.60	166.78	4.60
Roof (0 to h/2)	90.75	45	0.96	0.96	1.00	27.66	27.60	-0.9	-21.39	0.18	4.97	-26.36	-16.42	3465.00	-91.33
Roof (h/2 to h)	90.75	90	0.96	0.96	1.00	27.66	27.60	-0.9	-21.39	0.18	4.97	-26.36	-16.42	6930.00	-182.65
Roof (h to 2h)	90.75	180	0.96	0.96	1.00	27.66	27.60	-0.5	-11.88	0.18	4.97	-16.85	-6.92	13860.00	-233.54
Roof (>2h)	90.75	323	0.96	0.96	1.00	27.66	27.60	-0.3	-7.13	0.18	4.97	-12.10	-2.16	24871.00	-300.86

Table 5: N-S Wind Loads on Projected Section

Location	z (ft)	Story Height (ft)	K_h	K_z	K_{zt}	q_z	q_h	Cp	$q_z GC_p$ (psf)	GC_{pi}	$q_h GC_{pi}$ (psf)	$q_z GC_p - q_h(+GC_{pi})$	$q_z GC_p - q_h(-GC_{pi})$	(ft^2)	(kips/ft)
Windward	-16	16	0.96	0.57	1.00	16.54	27.60	0.8	11.57	0.18	4.97	6.61	16.54	408.00	2.70
	0	16	0.96	0.57	1.00	16.54	27.60	0.8	11.57	0.18	4.97	6.61	16.54	816.00	5.39
	16	14	0.96	0.59	1.00	16.85	27.60	0.8	11.79	0.18	4.97	6.82	16.76	765.00	5.22
	30	14	0.96	0.70	1.00	20.16	27.60	0.8	14.11	0.18	4.97	9.14	19.08	714.00	6.53
	44	14	0.96	0.78	1.00	22.49	27.60	0.8	15.74	0.18	4.97	10.77	20.71	714.00	7.69
	58	14	0.96	0.85	1.00	24.34	27.60	0.8	17.03	0.18	4.97	12.07	22.00	714.00	8.62
	72	18.75	0.96	0.90	1.00	25.89	27.60	0.8	18.12	0.18	4.97	13.15	23.09	835.13	10.98
	90.75		0.96	0.96	1.00	27.66	27.60	0.8	19.36	0.18	4.97	14.39	24.32	478.13	6.88
			0.00	0.00	1.00	0.00	0.00	0.8	0.00	0.18	0.00	0.00	0.00	0.00	0.00
Leeward	90.75	90.75	0.96	0.96	1.00	27.66	27.60	-0.3	-7.26	0.18	4.97	-12.23	-2.29	4628.25	-56.59
Sides	90.75	90.75	0.96	0.96	1.00	27.66	27.60	-0.7	-16.94	0.18	4.97	-21.90	-11.97	4628.25	-101.38
Parapet WW	93	2.166	0.96	0.97	1.00	27.86	27.60	0	0.00	1.5	41.39	-41.39	41.39	110.47	-4.57
Parapet LW	93	2.166	0.96	0.97	1.00	27.86	27.60	0	0.00	-1	-27.60	27.60	-27.60	110.47	3.05
Roof (0 to h/2)	90.75	45	0.96	0.96	1.00	27.66	27.60	-0.9	-21.78	0.18	4.97	-26.74	-16.81	2295.00	-61.38
Roof (h/2 to h)	90.75	90	0.96	0.96	1.00	27.66	27.60	-0.9	-21.78	0.18	4.97	-26.74	-16.81	4590.00	-122.76
Roof (h to 2h)	90.75	180	0.96	0.96	1.00	27.66	27.60	-0.5	-12.10	0.18	4.97	-17.07	-7.13	9180.00	-156.66
Roof (>2h)	90.75	323	0.96	0.96	1.00	27.66	27.60	-0.3	-7.26	0.18	4.97	-12.23	-2.29	16473.00	-201.40

WIND LOADS

WIND DESIGN CRITERIA

RISK CATEGORY	: IV	
BASIC WIND SPEED	: 115	(originally 90 in ASCE 7-02)
EXPOSURE CATEGORY	: B	
IMPORTANCE FACTOR	: 1.15	

$K_d = 0.85$
$K_{zt} = 1.0$
$G = ?$

APPROXIMATE NATURAL FREQUENCY:

$L_{eff} = 393$

NOTE: THE PENTHOUSE ROOF IS ASSUMED TO BE THE MEAN ROOF HEIGHT

① $h = 90 < 300$ ✓
② $h = 90 < 4(393) = 1572$ ✓

USE EQUATION 26.9-4

$$n_a = 75/h = 75/90 = 0.8333$$

CALCULATE G:

$$L_{\bar{z}} = 320\left(\frac{54}{33}\right)^{0.333} = 377.09$$

$$Q = \sqrt{\frac{1}{1+0.63\left(\frac{77+90}{377.09}\right)^{0.63}}} = 0.85214$$

$$V_{\bar{z}} = 0.45\left(\frac{54}{33}\right)^{0.25}\left(\frac{88}{60}\right)(115) = 85.844$$

$$N_1 = \frac{0.833(377.09)}{85.844} = 3.66$$

$$R_n = \frac{7.47(3.66)}{(1+10.3(3.66))^{5/3}} = 0.0617$$

$$R_h = \frac{1}{4.02} - \frac{1}{2(4.02)^2}\left(1-e^{-2(4.02)}\right) = 0.2179$$

$R_B =$ $= 0.2486$

$R_L =$ $= 0.0554$

$$R = \sqrt{\frac{1}{0.05}(0.0617)(0.2179)(0.2486)(0.53+0.47(0.0554))}$$

$$= 0.1928$$

$$g_r = \sqrt{2\ln(3600(0.8333))} + \frac{0.577}{\sqrt{2\ln((3600)(0.8333))}}$$

$$= 4.1458$$

$$I_z = 0.3\left(\frac{33}{54}\right)^{1/6} = 0.2764$$

(E-W) $$G_f = 0.925\left(\frac{1+1.7(0.2764)\sqrt{3.4^2(0.852)^2+(4.146)^2(0.1928)^2}}{1+1.7(3.4)(0.2764)}\right)$$

$$= 0.925\left(\frac{2.412}{2.597}\right)$$

$$= 0.8591$$

REPRESENTATIVE CALCULATION OF "P"

at $z = 90'$

$q_h = 0.00256(0.96)(1.0)(0.85)(115)^2$

$= 27.626$

at $z = 58'$

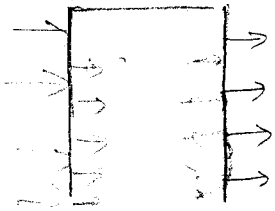
$q_z = 0.00256(0.85)(1.0)(0.85)(115)^2$

$= 24.46$

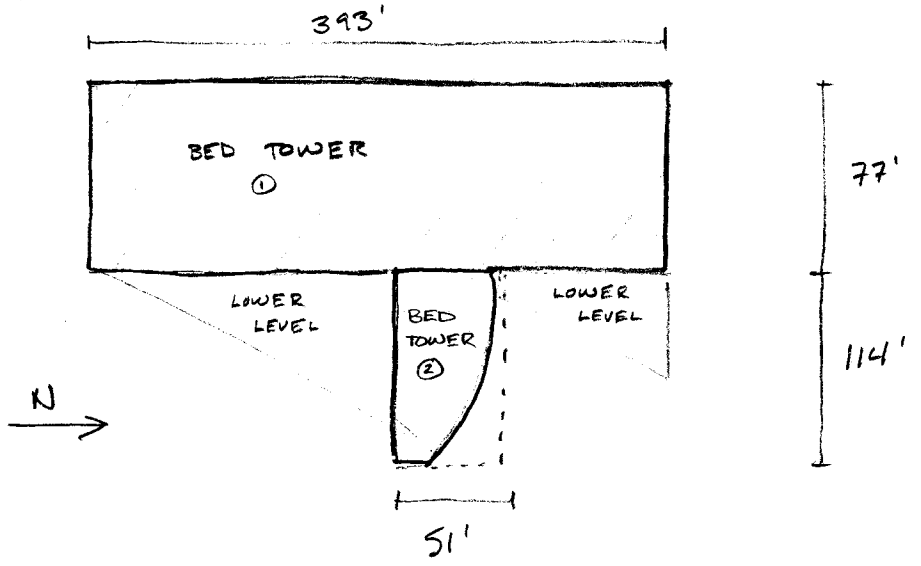
$p = 24.46(0.8)(0.859) - (-27.626(0.18))$

$= 21.78$

NOTE THAT THIS RESULT ASSUMES A NEGATIVE PRESSURE ON THE INTERIOR OF THE BUILDING



PLAN

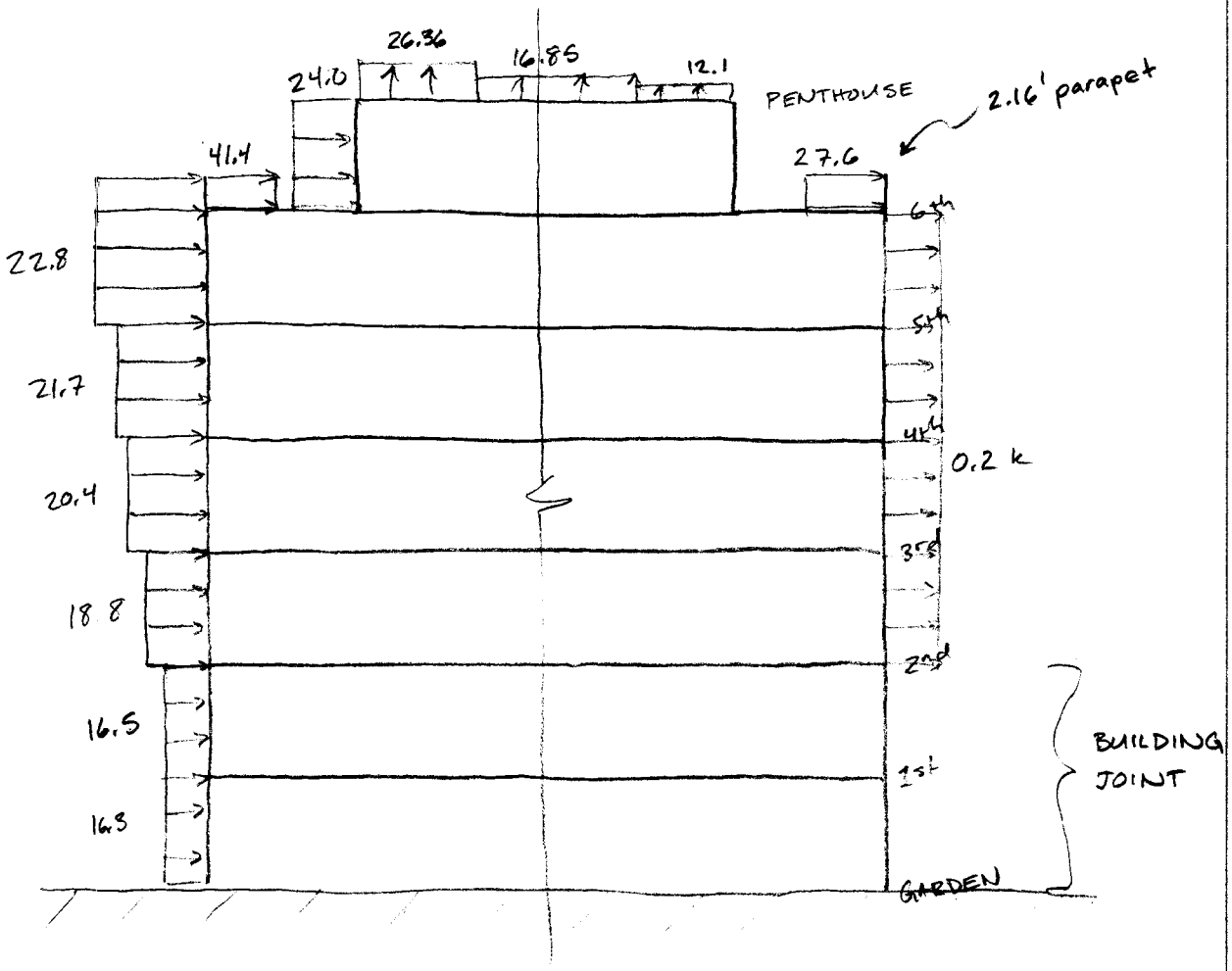


Assumptions:

- lower level dimensions have minimal effect on tower loads
- E-W winds on Bed Tower section 2 create only "side" loads.
- Building has negative internal pressure

WIND LOAD DIAGRAM

ALL VALUES IN KIPS.



WIND BASE SHEAR (E-W)

NOTE: ADD TOTAL E-W WIND, ASSUMING THE PROJECTED BUILDING SECTION IS NEGLIGIBLE. INCLUDE THE PROJECTED SECTION IN THE N-S DIRECTION

14.62 + 29.24 + 28.37 + 36.11 + 42.88 + 48.25 + 61.70 + 38.77 + 471.15 + 28.96 + 19.31 = **819.4 k**

WIND BASE SHEAR (N-S)

3.94 + 7.89 + 7.64 + 9.58 + 11.31 + 12.68 + 16.18 + 10.14 + 67.92 + 6.9 + 4.60 = 158.78

2.7 + 5.39 + 5.22 + 6.53 + 7.69 + 8.62 + 10.98 + 6.88 + 56.59 + 4.57 + 3.05 = 118.22

TOTAL: **277 k**

4 SEISMIC LOADS

This section provides an overview of the seismic loads on SSM St. Clare Health Center. Table 4 provides a summary of the lateral force resisting elements used in the building. This analysis focuses on the bed tower, sections "A," "B," and the Penthouse. The main lateral force resisting elements in the structure are special moment frames, special reinforced concrete shear walls, and special concentrically braced frames.

Seismic Design Criteria	Bed Tower	Interventional Care	Surgery	Penthouse
Ie	1.5	1.5	1.5	1.5
SUG	III	III	III	III
Site Class	D	D	D	D
SLRS N-S	SMF	SCBF	SMF	OCBF
SLRS E-W	SCBF + SRCSW	SCBF	SMF	OCBF

4.1 CALCULATIONS

Table 6: Seismic Loads and Story Forces

Story	Dia.	Wx (kips)	Hx (ft)	k	Hx^k	$Wx*Hx^k$	Cvx	Fx	0.2SdsIwpx	0.4SdsIwpx	Fpx (diaph.)
First Floor	1	3406.00	16.00	1.18	26.45	90097.80	0.06	41.22	276.00	552.00	276.00
Second Floor	2	3406.00	32.00	1.18	59.99	204329.74	0.13	93.47	276.00	552.00	276.00
Third Floor	3	2185.00	46.00	1.18	92.10	201245.47	0.13	92.06	177.06	354.12	177.06
Fourth Floor	4	2185.00	60.00	1.18	126.06	275451.05	0.18	126.01	177.06	354.12	177.06
Fifth Floor	5	2185.00	74.00	1.18	161.51	352891.35	0.23	161.43	177.06	354.12	177.06
Roof	6	2185.00	88.00	1.18	198.19	433049.59	0.28	198.10	177.06	354.12	198.10
Penthouse Roof	7	243.00	106.00	1.18	246.93	60002.83	0.04	27.45	19.69	39.38	27.45
				1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		15795.00	422.00	7.09	664.31	1557065.00	1.00	712.29			1308.72

Seismic Loads

DESIGN CRITERIA

I_e = 1.5
OC = III
Site Class = D
SDC = D

LATERAL SYSTEMS

- Special moment frames
- Special concentric braced frames
- Specially reinforced concrete shear walls

R = 6
Ω = 2 1/2
C_d = 5

NOTE: THESE VALUES CORRESPOND TO SRCSW IN ASCE 7-10 Table 12.2-1

FIND SEISMIC FORCES/BASE SHEAR

$V = C_s W$

$S_s = 0.414$
$S_1 = 0.163$

$F_a = 1.468$
$F_v = 2.148$

$S_{MS} = S_s F_a = 0.414\,(1.468) = 0.608$
$S_{M1} = S_1 F_v = 0.163(2.148) = 0.350$

$S_{DS} = S_{MS}(2/3) = 0.405$

$S_{D1} = S_{DS}(2/3) = 0.233$

$C_s = \dfrac{0.405}{\left(\frac{6}{1.5}\right)} = \boxed{0.1013}$

$\dfrac{X_1 - 1.6}{0.414 - 0.25} = \dfrac{1.4 - 1.6}{0.5 - 0.25}$

$X_1 = 1.468$

$\dfrac{X_2 - 2.4}{0.163 - 0.1} = \dfrac{2.0 - 2.4}{0.2 - 0.1}$

$X_2 = 2.148$

APPROXIMATE PERIOD

$C_t = 0.02$
$x = 0.75$

(TABLE 12.8-2)

$T_a = C_t h_n^x$

$= 0.02(90)^{0.75}$

$= 0.584$

$C_u = \frac{x - 1.5}{0.233 - 0.2} = \frac{1.4 - 1.5}{0.3 - 0.2}$

$= 1.467$

$T_L = 12$

$T \doteq C_u T_a$
$= 1.467(0.584)$
$= 0.857$

$T_L > T \quad \therefore$

$C_s \leq \frac{0.233}{0.857\left(\frac{6}{1.5}\right)} = 0.068$

$C_s \geq 0.044(0.405)(1.5) = 0.0267$

$S_1 < 0.6g$

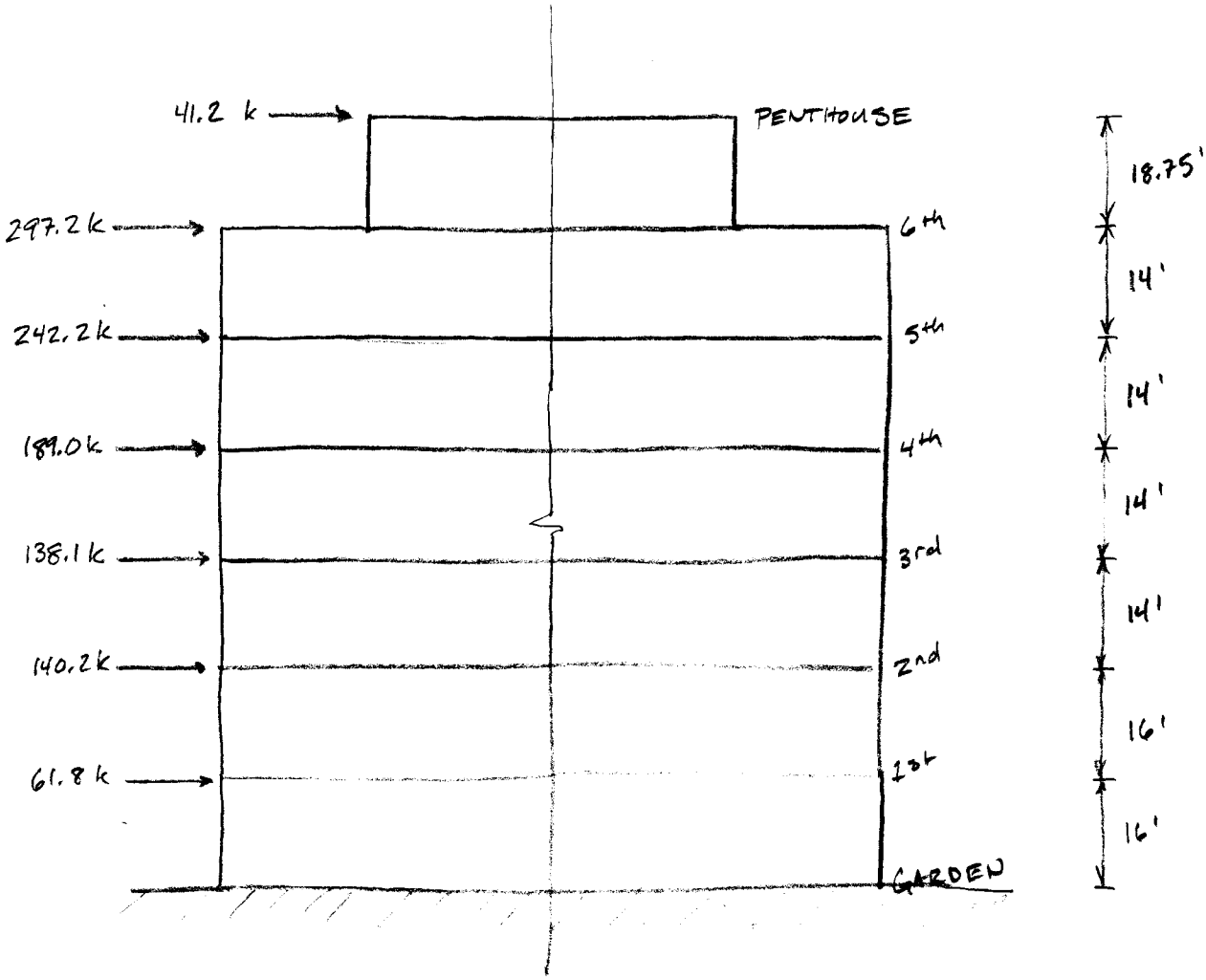
CHECK C_s

$0.1013 > 0.068 > 0.0267$ ✓

FIND STORY WEIGHTS

LEVEL	FLOOR AREA	ASSEMBLY WT.	TOTAL
1	$60(91)\frac{1}{2} + 135(91)\frac{1}{2} + 158(91)\frac{1}{2} + 28747 = 44808.5$	76 psf	3406 kips
2	"	"	"
3	$77(323) + 114(51)(\frac{2}{3}) = 28747$	76 psf	2185 kips
4	"	"	"
5	"	"	"
6	"	"	"
7	$33(97) = 3201$	76 psf	243 kips

SEISMIC LOAD DIAGRAM



SEISMIC BASE SHEAR

$V = C_s W$

$= 0.068 \cdot (15795\ k)$

$= \boxed{1068.4\ k}$

5 CONCLUSION

The lateral system design of SSM St. Clare Health Center is governed by seismic forces as was expected. As analysis progresses, particular attention must be paid to mechanical and medical equipment point loads on floor diaphragms, especially for Technical Report III.

6 APPENDIX A: GRAVITY LOADS

Design Criteria (Live Loads)

Hospitals

Operating rooms, labs	60 PSF *
Private rooms	40 PSF *
Wards	40 PSF *
Corridors (above 1st floor)	80 PSF *

* Design for uniform load indicated or 1000# concentrated load over 2.5 feet square, whichever produces the greater load effect.

Offices

Offices	50 PSF **
Lobbies & 1st floor corridors	100 PSF **
Corridors (above 1st floor)	80 PSF **

** Design for uniform load indicated or 2000# concentrated load over 2.5 feet square whichever produces the greater load effect.

Misc. Live Loads

Corridors, except as otherwise indicated	100 PSF
Stairs and Exits	100 PSF ***
Dining Rooms and Restaurants	100 PSF
Retail Stores (first floor)	100 PSF
Mechanical rooms	125 PSF (Includes allowance for equipment pads)
Storage – Light	125 PSF

*** Design for uniform load indicated or 300# concentrated load over 4 inches square whichever produces the greater load effect

Partition loads	20 PSF

(Offices & locations where partitions are subject to change)

Design Floor Live Loads (Typical unless noted otherwise in calculations)
Typical floors: 80 PSF (60 PSF + 20 PSF Partitions) or (80 PSF Corridors)
First floor (typical): 100 PSF (60 PSF + 20 PSF Partitions) or (100 PSF Corridors)
First floor (equip): 120 PSF (60 PSF + 20 PSF Partitions + 40 PSF Equipment)
Mechanical Rooms: 125 PSF
Elevator Machine Rooms: 500 PSF
Interstitial Level: 25 PSF
Roof Top Mechanical Unit Support: 50 PSF (Live Load + Snow Load)

Other Live Loads

Handrails and guards	50 PLF or 200# concentrated load @ top rail
Components	50# over 1 foot square
Grab bars, shower seats, dressing rm. seats	250# load in any direction at any point

Impact Loads

Elevator loads shall be increased by 100 percent for impact
Machinery weight shall be increased to allow for impact
Elevator machinery: 100 percent
Light machinery, shaft or motor driven: 20 percent
Reciprocating machinery or power driven units: 50 percent
Hangers for floors or balconies: 33 percent

Live Load Reduction
Live loads to columns will be reduced in accordance with IBC Section 1607.9.1. Live loads that exceed 100 PSF and roof live loads will not be reduced.

Distribution of Floor Loads
Uniform floor live loads shall be patterned to produce the greatest effect on continuous framing.

Roof Loads
Uniform roof live loads shall be patterned to produce the greatest effect on continuous framing.
Minimum roof load will be less than snow load
See section 1607.11 for other roof loads (roof gardens, landscaped roofs, canopies)

Interior Walls and Partitions

Interior Partitions	5 PSF horizontal pressure

Medical Equipment

MRI Equipment (four pt loads)	29000 lb/4 = 7250 lb
MRI Equip minus equip allowance	7250 lb – (40 PSF)*(25 ft2) = 6250 lb

Design Criteria (Dead Loads)

Hospital Floor (Composite slab, 2 Hour)	
3" Deck + 3 1/2" LW Conc	48 PSF
Beams/Girders/Columns	Self Wt (Assume = 9 PSF)
Ceiling/Mechanical/Misc	12 PSF
	60 PSF (Mass DL = 69 PSF + 10 PSF for Partition Mass)
Hospital Roof (Future Floor) (Composite slab, 2 Hour)	
3" Deck + 3 1/2" LW Conc	48 PSF
Beams/Girders/Columns	Self Wt (Assume = 9 PSF)
Ceiling/Mechanical/Misc	12 PSF
Roofing/Insulation/Ballast	18 PSF
	78 PSF (Mass DL = 87 PSF)
Hospital Roof (No future floors) (Composite slab, 2 Hour)	
3" Deck + 3 1/2" LW Conc	48 PSF
Beams/Girders/Columns	Self Wt (Assume 9 PSF)
Ceiling/Mechanical/Misc	12 PSF
Roofing/Insulation/Ballast	18 PSF
	78 PSF (Mass DL = 87 PSF)
Power Plant Roof (No future floors) (Composite slab, 2 Hour)	
3" Deck + 3 1/2" LW Conc	48 PSF
Beams/Girders/Columns	Self Wt (Assume 9 PSF)
Ceiling/Misc	7 PSF
Mechanical Piping	60 PSF
Roofing/Insulation/Ballast	18 PSF
	133 PSF (Mass DL = 142 PSF)
Penthouse Floor (Composite slab, 2 Hour)	
3" Deck + 3 ½" LW Conc	48 PSF
Beams/Girders/Columns	Self Wt (Assume = 9 PSF)
Mechanical/Misc	12 PSF
	60 PSF (Mass DL = 69 PSF + 10 PSF for Partition Mass)
Penthouse Roof (Steel Roof Deck)	
Steel Deck	3 PSF
Beams/Girders/Columns	Self Wt (Assume = 7 PSF)
Mechanical/Misc	7 PSF
Roofing/Insulation/Ballast	18 PSF
	28 PSF (Mass DL = 35 PSF)
Roof Top Mechanical Unit Support	
Beams/Girders/Columns	Self Wt (Assume = 7 PSF)
Mechanical Unit	60 PSF
Miscellaneous Pipes & Ducts 15 PSF	
	75 PSF (Mass DL = 82 PSF)
Hospital Floor – Piping Zone (Composite slab, 2 Hour)	
3" Deck + 3 1/2" LW Conc	48 PSF
Beams/Girders/Columns	Self Wt (Assume = 9 PSF)
Mechanical Piping	60 PSF
Ceiling/Misc	7 PSF
	115PSF (Mass DL = 94 PSF + 10 PSF for Partition Mass)
Hospital Floor/Power Plant (Composite slab, 2 Hour)	

3" Deck + 3 1/2" LW Conc	48 PSF
Beams/Girders/Columns	Self Wt (Assume = 9 PSF)
Mechanical Piping	60 PSF
Ceiling/Misc	7 PSF
	115PSF (Mass DL = 94 PSF + 10 PSF for Partition Mass)
Hospital Floor – MRI Zone (Composite slab, 2 Hour)	
3" Deck + 3 1/2" LW Conc	48 PSF
Beams/Girders/Columns	Self Wt (Assume = 9 PSF)
2" Concrete Topping	18 PSF
Mass for Permanent Equip	(15 PSF Mass DL)
Ceiling/Mechanical/Misc	12 PSF
	78 PSF (Mass DL = 102 PSF + 10 PSF for Partition Mass)
Hospital Floor – Piping Zone plus MRI Zone (Composite slab, 2 Hour)	
3" Deck + 3 1/2" LW Conc	48 PSF
Beams/Girders/Columns	Self Wt (Assume = 9 PSF)
2" Concrete Topping	18 PSF
Mass for Permanent Equip	(15 PSF Mass DL)
Mechanical	30 PSF
Ceiling/Misc	7 PSF
	103 PSF (Mass DL = 127 PSF + 10 PSF for Partition Mass)
MOB Floor (Non-Composite slab, 0 Hour)	
1 ½" Deck + 2" LW Conc	29 PSF
Beams/Girders/Columns	Self Wt (Assume 9 PSF)
Ceiling/Mechanical/Misc	7 PSF
	36 PSF (Mass DL = 45 PSF + 10 PSF for Partition M ass)

WIND LOAD TABLES FOR AREAS A,B,F & G

Zone (Note 1)	Area (sq ft) (Note 2)	Design Wind Loads (psf) 0' to 30' (Note 3)		Design Wind Loads (psf) 30' to 40' (Note 3)		Design Wind Loads (psf) 40' to 50' (Note 3)		Design Wind Loads (psf) 50' to 60' (Note 3)		Design Wind Loads (psf) 60' to 70' (Note 3)		Design Wind Loads (psf) 70' to 80' (Note 3)		Design Wind Loads (psf) 80' to 90' (Note 3)		Design Wind Loads (psf) 90' to 100' (Note 3)		Design Wind Loads (psf) 100' to 110' (Note 3)		Design Wind Loads (psf) 110' to 120' (Note 3)	
	10	10	-23.6	10	-25.3	10	-26.7	10	-27.8	10	-29.0	10.0	-30.1	10.0	-31.0	10.0	-31.8	10.0	-32.5	10.0	-33.2
1	20	10	-22.9	10	-24.5	10	-25.9	10	-27.0	10	-28.1	10.0	-29.2	10.0	-30.0	10.0	-30.8	10.0	-31.5	10.0	-32.2
ROOF	50	10	-20.7	10	-22.2	10	-23.4	10	-24.4	10	-25.4	10.0	-26.3	10.0	-27.1	10.0	-27.8	10.0	-28.4	10.0	-29.0
	100	10	-20.0	10	-21.4	10	-22.6	10	-23.5	10	-24.5	10.0	-25.4	10.0	-26.1	10.0	-26.8	10.0	-27.4	10.0	-28.0
	10	10	-36.4	10	-39.2	10	-41.5	10	-43.3	10	-45.2	10.0	-47.1	10.0	-48.5	10.0	-49.9	10.0	-51.0	10.0	-52.2
2	20	10	-34.9	10	-37.6	10	-39.8	10	-41.6	10	-43.4	10.0	-45.2	10.0	-46.5	10.0	-47.9	10.0	-49.0	10.0	-50.1
ROOF	50	10	-32.1	10	-34.5	10	-36.6	10	-38.2	10	-39.8	10.0	-41.4	10.0	-42.6	10.0	-43.9	10.0	-44.9	10.0	-45.9
	100	10	-30.7	10	-33.0	10	-34.9	10	-36.5	10	-38.0	10.0	-39.5	10.0	-40.7	10.0	-41.8	10.0	-42.8	10.0	-43.8
	10	10	-49.1	10	-53.0	10	-56.3	10	-58.9	10	-61.4	10.0	-64.0	10.0	-66.0	10.0	-67.9	10.0	-69.6	10.0	-71.2
3	20	10	-47.0	10	-50.7	10	-53.8	10	-56.3	10	-58.7	10.0	-61.2	10.0	-63.1	10.0	-64.9	10.0	-66.5	10.0	-68.0
ROOF	50	10	-44.2	10	-47.6	10	-50.5	10	-52.8	10	-55.1	10.0	-57.4	10.0	-59.2	10.0	-60.9	10.0	-62.4	10.0	-63.8
	100	10	-42.0	10	-45.3	10	-48.1	10	-50.2	10	-52.4	10.0	-54.6	10.0	-56.3	10.0	-57.9	10.0	-59.3	10.0	-60.6
	10	16.5	-22.3	17.6	-22.3	18.5	-22.3	19.2	-22.3	20.0	-22.3	20.7	-22.3	21.2	-22.3	21.8	-22.3	22.2	-22.3	22.7	-22.3
4	20	16.5	-22.3	17.6	-22.3	18.5	-22.3	19.2	-22.3	20.0	-22.3	20.7	-22.3	21.2	-22.3	21.8	-22.3	22.2	-22.3	22.7	-22.3
WALL	50	15.1	-21.3	16.0	-21.3	16.9	-21.3	17.5	-21.3	18.2	-21.3	18.8	-21.3	19.3	-21.3	19.8	-21.3	20.2	-21.3	20.6	-21.3
	100	14.4	-20.3	15.3	-20.3	16.0	-20.3	16.6	-20.3	17.3	-20.3	17.9	-20.3	18.3	-20.3	18.8	-20.3	19.2	-20.3	19.5	-20.3
	10	16.5	-40.9	17.6	-40.9	18.5	-40.9	19.2	-40.9	20.0	-40.9	20.7	-40.9	21.2	-40.9	21.8	-40.9	22.2	-40.9	22.7	-40.9
5	20	16.5	-40.9	17.6	-40.9	18.5	-40.9	19.2	-40.9	20.0	-40.9	20.7	-40.9	21.2	-40.9	21.8	-40.9	22.2	-40.9	22.7	-40.9
WALL	50	15.1	-36.8	16.0	-36.8	16.9	-36.8	17.5	-36.8	18.2	-36.8	18.8	-36.8	19.3	-36.8	19.8	-36.8	20.2	-36.8	20.6	-36.8
	100	14.4	-32.7	15.3	-32.7	16.0	-32.7	16.6	-32.7	17.3	-32.7	17.9	-32.7	18.3	-32.7	18.8	-32.7	19.2	-32.7	19.5	-32.7

WIND LOAD TABLES FOR AREAS A,B,F & G

Zone (Note 1)	Area (sq ft) (Note 2)	Design Wind Loads (psf) 0' to 30' (Note 3)	Design Wind Loads (psf) 30' to 40' (Note 3)	Design Wind Loads (psf) 40' to 50' (Note 3)	Design Wind Loads (psf) 50' to 60' (Note 3)	Design Wind Loads (psf) 60' to 70' (Note 3)	Design Wind Loads (psf) 70' to 80' (Note 3)	Design Wind Loads (psf) 80' to 90' (Note 3)	Design Wind Loads (psf) 90' to 100' (Note 3)	Design Wind Loads (psf) 100' to 110' (Note 3)	Design Wind Loads (psf) 110' to 120' (Note 3)
	10	-27.8	-29.9	-31.6	-33.0	-34.4	-35.8	-36.8	-37.8	-38.7	-39.6
2	20	-27.4	-29.4	-31.1	-32.5	-33.8	-35.2	-36.2	-37.2	-38.1	-38.9
ROOF OVERHANG	50	-26.8	-28.8	-30.5	-31.8	-33.1	-34.4	-35.4	-36.4	-37.3	-38.1
	100	-26.4	-28.4	-30.0	-31.3	-32.6	-33.9	-34.9	-35.8	-36.6	-37.4
	10	-43.4	-46.9	-49.7	-52.0	-54.2	-56.5	-58.2	-59.9	-61.3	-62.7
3	20	-34.9	-37.6	-39.8	-41.6	-43.4	-45.2	-46.5	-47.9	-49.0	-50.1
ROOF OVERHANG	50	-23.6	-25.3	-26.7	-27.8	-29.0	-30.1	-31.0	-31.8	-32.5	-33.2
	100	-15.1	-16.0	-16.9	-17.5	-18.2	-18.8	-19.3	-19.8	-20.2	-20.6

WIND LOAD TABLES FOR AREAS C & D

Zone (Note 1)	Area (sq ft) (Note 2)	Design Wind Loads (psf) 0' to 30' (Note 3)		Design Wind Loads (psf) 30' to 40' (Note 3)		Design Wind Loads (psf) 40' to 50' (Note 3)		Design Wind Loads (psf) 50' to 60' (Note 3)	
	10	10	-22.8	10	-24.5	10	-25.9	10	-27.1
1	20	10	-22.1	10	-23.8	10	-25.1	10	-26.2
ROOF	50	10	-20.0	10	-21.4	10	-22.7	10	-23.6
	100	10	-19.3	10	-20.7	10	-21.8	10	-22.8
	10	10	-35.6	10	-38.4	10	-40.7	10	-42.6
2	20	10	-34.2	10	-36.8	10	-39.1	10	-40.9
ROOF	50	10	-31.3	10	-33.8	10	-35.8	10	-37.4
	100	10	-29.9	10	-32.2	10	-34.1	10	-35.7
	10	10	-48.4	10	-52.3	10	-55.5	10	-58.1
3	20	10	-46.2	10	-49.9	10	-53.0	10	-55.5
ROOF	50	10	-43.4	10	-46.9	10	-49.7	10	-52.1
	100	10	-41.3	10	-44.5	10	-47.3	10	-49.5
	10	15.7	-17.7	16.8	-17.7	17.7	-17.7	18.5	-17.7
4	20	15.7	-17.7	16.8	-17.7	17.7	-17.7	18.5	-17.7
WALL	50	14.3	-16.9	15.3	-16.9	16.1	-16.9	16.7	-16.9
	100	13.6	-16.1	14.5	-16.1	15.3	-16.1	15.9	-16.1
	10	15.7	-32.5	16.8	-32.5	17.7	-32.5	18.5	-32.5
5	20	15.7	-32.5	16.8	-32.5	17.7	-32.5	18.5	-32.5
WALL	50	14.3	-29.2	15.3	-29.2	16.1	-29.2	16.7	-29.2
	100	13.6	-25.9	14.5	-25.9	15.3	-25.9	15.9	-25.9

NOTES:

1. ZONES ARE PORTIONS OF THE WALLS OR ROOFS WHERE WIND LOADS ARE APPLIED, AS SHOWN ON THE "COMPONENT AND CLADDING LOAD DIAGRAM". THE WIDTH OF THE EDGE STRIPS "a" SHALL BE 10 PERCENT OF THE LEAST HORIZONTAL DIMENSION OR 40 PERCENT OF THE EAVE HEIGHT "h", WHICHEVER IS LESS, BUT NOT LESS THAN EITHER 4 PERCENT OF THE LEAST HORIZONTAL DIMENSION OR 3 FEET.
2. AREA IS THE "EFFECTIVE WIND AREA" ON ELEMENTS OF THE COMPONENTS AND CLADDING, AND CLADDING FASTENERS, AS DEFINED IN IBC 1609.2.
3. BASIC WIND LOAD IS THE WIND LOAD ON COMPONENTS AND CLADDING FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B, AS SHOWN IN THE IBC TABLE 1609.6.2.1(2).
4. BASIC WIND LOAD IS THE WIND LOAD ON ROOF OVERHANG COMPONENTS AND CLADDING FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B, AS SHOWN IN IBC TABLE 1609.6.2.1(3).
5. DESIGN WIND LOADS ARE THE BASIC WIND LOADS, MULTIPLIED BY THE APPROPRIATE HEIGHT AND EXPOSURE COEFFICIENT FROM TABLE 1609.6.2.1(4) AND IMPORTANCE FACTOR FROM TABLE 1604.5.

WIND LOAD TABLES FOR AREAS C & D

Zone (Note 1)	Area (sq ft) (Note 2)	Design Wind Loads (psf) 0' to 30' (Note 3)	Design Wind Loads (psf) 30' to 40' (Note 3)	Design Wind Loads (psf) 40' to 50' (Note 3)	Design Wind Loads (psf) 50' to 60' (Note 3)
	10	-35.6	-38.4	-40.7	-42.6
2	20	-34.2	-36.8	-39.1	-40.9
ROOF OVERHANG	50	-31.3	-33.8	-35.8	-37.4
	100	-29.9	-32.2	-34.1	-35.7
	10	-48.4	-52.3	-55.5	-58.1
3	20	-46.2	-49.9	-53.0	-55.5
ROOF OVERHANG	50	-43.4	-46.9	-49.7	-52.1
	100	-41.3	-44.5	-47.3	-49.5

8 APPENDIX C: SEISMIC LOADS

USGS Design Maps Summary Report

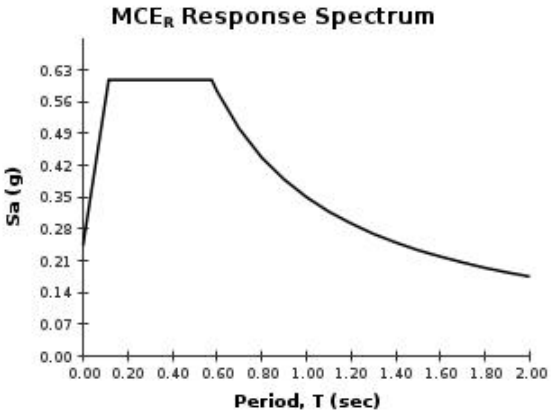
User-Specified Input

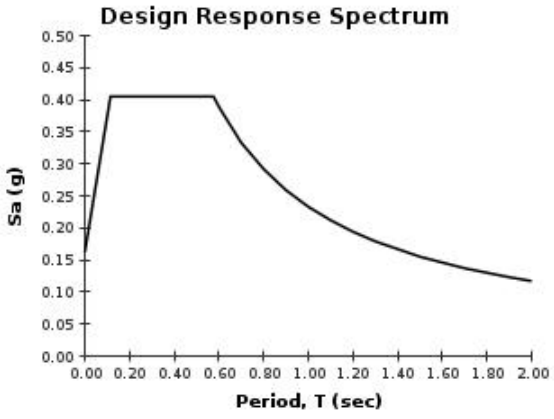
Building Code Reference Document	2012 International Building Code (which utilizes USGS hazard data available in 2008)
Site Coordinates	38.52197°N, 90.4727°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	IV (e.g. essential facilities)

USGS-Provided Output

S_S =	0.414 g	S_{MS} =	0.608 g	S_{DS} =	0.405 g
S_1 =	0.163 g	S_{M1} =	0.350 g	S_{D1} =	0.233 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





Note: In the calculations, Tb has been falsely entered as "999" so that the spreadsheet's formulas will not use the value. An actual Tb value has not been calculated at the date of this report's publication.

Design Parameters

Categories	Parameter	Value	Units	Description	Reference
Site Code Factors	Occ. Category	IV		Occupant Category	Table 1-1
	Site Class	D		Site Class (A, B, C, D, E, or F)	Chapter 20
	SDC	D		Seismic Design Category	11.6-11.7
	I_E	1.00		Seismic Importance Factor	Table 11.5-1
Seismic Response	S_S	0.414		Short Period MCE Spectral Response Acceleration (%g)	Figure 22-1
	S_1	0.163		One Second MCE Spectral Response Acceleration (%g)	Figure 22-1
	F_a	1.468		Site Coefficient at Short Periods	Table 11.4-1
	F_v	2.148		Site Coefficient at 1 Second Period	Table 11.4-2
Period	T_L	12.00	s	Long-period Transition Period	Figure 22-15
	T_b	999.00	s	Building Period determined from Modal Analysis	
	C_t	0.02		Building Period Coefficient	12.8.1.1
	x	0.75		Building Period Coefficient	
	h_n	90.75	ft	Height of building	
	C_u	1.47			
	N	0.00	#	Number of Stories (leave blank unless apprx Ta desired)	
SFRS Coefficients	R	6.00		Response Modification Coefficient	Table 12.2-1
	Ω	2.50		Overstrength Factor	Table 12.2-1
	C_d	5.00		Deflection Amplication Factor	Table 12.2-1
Shear Wall Data	Concrete/masonry shear walls?	NO			
	Direction	X		X or Y?	
	Ab	1200	sqft	Area of base of Structure	

Intermediate Calculations

Categories	Calculated Values	Value	Units	Description	Reference
Seismic Response	S_{MS}	0.608		Short Period MCE Spectral Response Acc., site adjusted	Eq. 11.4-1
	S_{M1}	0.350		One Second MCE Spectral Response Acc., site adjusted	Eq. 11.4-2
	S_{DS}	0.405		5% Damped Design Spectral Response Acc. at Short Periods	Eq. 11.4-3
	S_{D1}	0.233		5% Damped Design Spectral Response Acc. at 1 Second Period	Eq. 11.4-4
	S_a	3.764		Design Spectral Response Acceleration	11.4.5
Periods	T_a	0.59	s	Approximate Fundamental Period	12.8.2
	T_0	0.12	s		
	T_s	0.58	s		
	T	0.86	s	Period of the Structure	
Coefficients	C_w	0.00		Shear Wall Coefficient	12.8-10
	Cs	0.05		T<=TL	
	Cs	0.07		T>TL	
	Cs	0.07		S1>0.6g	
	$C_{s\ final}$	0.05		Seismic Response Coefficient	12.8.1.1
Base Shear	V	712.29		Base Shear	