

APPENDIX

REFERENCES:

“Steel Construction Manual.” *American Institute of Steel Construction*. AISC,. Fall 2013.

“Design Guide 6- LRFD of W-Shapes Encased in Concrete.” *American Institute of Steel Construction*. AISC,. Fall 2013.

“2013 California Building Code.” *International Code Council*. California Building Standards Commission, n.d. Web. Fall 2013.

GLL Properties. *Geotechnical Investigation 350 Mission Street San Francisco, California*. Tech. no. 730466502. N.p.: n.p., 2012. Print. GLL Properties (2012). *Geotechnical Investigation 350 Mission Street San Francisco, California*

APPENDIX A

TABLE 1-1 OCCUPANCY CATEGORY OF BUILDINGS AND OTHER STRUCTURES FOR FLOOD, WIND, SNOW, EARTHQUAKE, AND ICE LOADS

Nature of Occupancy	Occupancy Category
Buildings and other structures that represent a low hazard to human life in the event of failure, including, but not limited to: • Agricultural facilities • Certain temporary facilities • Minor storage facilities	I
All buildings and other structures except those listed in Occupancy Categories I, III, and IV	II
Buildings and other structures that represent a substantial hazard to human life in the event of failure, including, but not limited to: • Buildings and other structures where more than 300 people congregate in one area • Buildings and other structures with daycare facilities with a capacity greater than 150 • Buildings and other structures with elementary school or secondary school facilities with a capacity greater than 250 • Buildings and other structures with a capacity greater than 500 for colleges or adult education facilities • Health care facilities with a capacity of 50 or more resident patients, but not having surgery or emergency treatment facilities • Jails and detention facilities Buildings and other structures, not included in Occupancy Category IV, with potential to cause a substantial economic impact and/or mass disruption of day-to-day civilian life in the event of failure, including, but not limited to: • Power generating stations^a • Water treatment facilities • Sewage treatment facilities • Telecommunication centers Buildings and other structures not included in Occupancy Category IV (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing sufficient quantities of toxic or explosive substances to be dangerous to the public if released. Buildings and other structures containing toxic or explosive substances shall be eligible for classification as Occupancy Category II structures if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.2 that a release of the toxic or explosive substances does not pose a threat to the public.	III
Buildings and other structures designated as essential facilities, including, but not limited to: • Hospitals and other health care facilities having surgery or emergency treatment facilities • Fire, rescue, ambulance, and police stations and emergency vehicle garages • Designated earthquake, hurricane, or other emergency shelters • Designated emergency preparedness, communication, and operation centers and other facilities required for emergency response • Power generating stations and other public utility facilities required in an emergency • Ancillary structures (including, but not limited to, communication towers, fuel storage tanks, cooling towers, electrical substation structures, fire water storage tanks or other structures housing or supporting water, or other fire-suppression material or equipment) required for operation of Occupancy Category IV structures during an emergency • Aviation control towers, air traffic control centers, and emergency aircraft hangars • Water storage facilities and pump structures required to maintain water pressure for fire suppression • Buildings and other structures having critical national defense functions Buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, or hazardous waste) containing highly toxic substances where the quantity of the material exceeds a threshold quantity established by the authority having jurisdiction. Buildings and other structures containing highly toxic substances shall be eligible for classification as Occupancy Category II structures if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.2 that a release of the highly toxic substances does not pose a threat to the public. This reduced classification shall not be permitted if the buildings or other structures also function as essential facilities.	IV

^aCogeneration power plants that do not supply power on the national grid shall be designated Occupancy Category II.

This is table 1-1 from ASCE 7-05 which explains the different occupancy categories.

2.3 COMBINING FACTORED LOADS USING STRENGTH DESIGN

2.3.1 Applicability. The load combinations and load factors given in Section 2.3.2 shall be used only in those cases in which they are specifically authorized by the applicable material design standard.

2.3.2 Basic Combinations. Structures, components, and foundations shall be designed so that their design strength equals or exceeds the effects of the factored loads in the following combinations:

1. $1.4(D + F)$
2. $1.2(D + F + T) + 1.6(L + H) + 0.5(L_r \text{ or } S \text{ or } R)$
3. $1.2D + 1.6(L_r \text{ or } S \text{ or } R) + (L \text{ or } 0.8W)$
4. $1.2D + 1.6W + L + 0.5(L_r \text{ or } S \text{ or } R)$
5. $1.2D + 1.0E + L + 0.2S$
6. $0.9D + 1.6W + 1.6H$
7. $0.9D + 1.0E + 1.6H$

To the left is an Excerpt from ASCE 7-05 which shows the different load combinations that are required by the code.

D. DUAL SYSTEMS WITH SPECIAL MOMENT FRAMES CAPABLE OF RESISTING AT LEAST 25% OF PRESCRIBED SEISMIC FORCES	12.2.5.1								
1. Steel eccentrically braced frames	14.1	8	$2\frac{1}{2}$	4	NL	NL	NL	NL	NL
2. Special steel concentrically braced frames	14.1	7	$2\frac{1}{2}$	$5\frac{1}{2}$	NL	NL	NL	NL	NL
3. Special reinforced concrete shear walls	14.2	7	$2\frac{1}{2}$	$5\frac{1}{2}$	NL	NL	NL	NL	NL
4. Ordinary reinforced concrete shear walls	14.2	6	$2\frac{1}{2}$	5	NL	NL	NP	NP	NP
5. Composite steel and concrete eccentrically braced frames	14.3	8	$2\frac{1}{2}$	4	NL	NL	NL	NL	NL
6. Composite steel and concrete concentrically braced frames	14.3	6	$2\frac{1}{2}$	5	NL	NL	NL	NL	NL
7. Composite steel plate shear walls	14.3	$7\frac{1}{2}$	$2\frac{1}{2}$	6	NL	NL	NL	NL	NL
8. Special composite reinforced concrete shear walls with steel elements	14.3	7	$2\frac{1}{2}$	6	NL	NL	NL	NL	NL
9. Ordinary composite reinforced concrete shear walls with steel elements	14.3	6	$2\frac{1}{2}$	5	NL	NL	NP	NP	NP
10. Special reinforced masonry shear walls	14.4	$5\frac{1}{2}$	3	5	NL	NL	NL	NL	NL
11. Intermediate reinforced masonry shear walls	14.4	4	3	$3\frac{1}{2}$	NL	NL	NP	NP	NP
12. Buckling-restrained braced frame	14.1	8	$2\frac{1}{2}$	5	NL	NL	NL	NL	NL
13. Special steel plate shear walls	14.1	8	$2\frac{1}{2}$	$6\frac{1}{2}$	NL	NL	NL	NL	NL

This is Table 12.2-1 from ASCE7-05 where we got our seismic design coefficients and used to determine that we would need special moment frames around the perimeter in conjunction with the braced frames and steel plate shear walls.

TABLE 12.12-1 ALLOWABLE STORY DRIFT, $\Delta_a^{a,b}$

Structure	Occupancy Category		
	I or II	III	IV
Structures, other than masonry shear wall structures, 4 stories or less with interior walls, partitions, ceilings and exterior wall systems that have been designed to accommodate the story drifts.	$0.025h_{sx}^c$	$0.020h_{sx}$	$0.015h_{sx}$
Masonry cantilever shear wall structures ^d	$0.010h_{sx}$	$0.010h_{sx}$	$0.010h_{sx}$
Other masonry shear wall structures	$0.007h_{sx}$	$0.007h_{sx}$	$0.007h_{sx}$
All other structures	$0.020h_{sx}$	$0.015h_{sx}$	$0.010h_{sx}$

^a h_{sx} is the story height below Level x .

^b For seismic force-resisting systems comprised solely of moment frames in Seismic Design Categories D, E, and F, the allowable story drift shall comply with the requirements of Section 12.12.1.1.

^c There shall be no drift limit for single-story structures with interior walls, partitions, ceilings, and exterior wall systems that have been designed to accommodate the story drifts. The structure separation requirement of Section 12.12.3 is not waived.

^d Structures in which the basic structural system consists of masonry shear walls designed as vertical elements cantilevered from their base or foundation support which are so constructed that moment transfer between shear walls (coupling) is negligible.

Shown above is the table found in ASCE 7-05 used to determine the new drift limit based on the height of the building.

9.6.3 Site-Specific Site Coefficients

Because site-specific procedure was used to determine the recommended MCE and DE response spectra, the corresponding values of S_{MS} , S_{M1} , S_{DS} and S_{D1} per Section 21.4 of ASCE 7-05 should be used as shown in Table 7.

TABLE 7
Design Spectral Acceleration Value

Parameter	Spectral Acceleration Value (g's)
S_{MS}	1.500
S_{M1}	0.748*
S_{DS}	1.000
S_{D1}	0.498*

* 2.0 second spectral values govern

9.6.1 2010 SFBC Mapped Values

On the basis of the results of our subsurface investigation, the site is classified as stiff soil with an average shear wave velocity in top 30 meters (100 feet), V_{s30} of 243 m/s (797 ft/sec). This is consistent with site class S_D . The site coefficients, F_a and F_v are 1.0 and 1.5, respectively. For an S_D site and a Maximum Considered Earthquake (MCE), the mapped values S_{MS} and S_{M1} are 1.5 and 0.91, respectively. The Design Earthquake (DE) mapped values S_{DS} and S_{D1} are, 1.0 and 0.61, respectively.

These are excerpts from the Geo tech report. They both are in regards to seismic design values.

TABLE 4
Surcharge Lateral Pressures

	Pressures (psf)
North Basement Wall (adjacent to 45 Fremont Street)	12H (H in feet, triangular distribution)
East Basement Wall (adjacent to 50 Beale Street)	20H (H in feet, triangular distribution)
Traffic Surcharge	100 (rectangular distribution)

9.5 Basement Walls

Basement walls should be waterproofed. We recommend all below-grade and retaining walls be designed to resist lateral pressures imposed by the adjacent soil and vehicles. Lateral earth pressures on basement walls will depend partially on the restraint at the top of the walls. Accordingly, walls should be designed for the equivalent fluid weights presented below, where H is the height of the wall in feet.

TABLE 3
Lateral Earth Pressures Restrained Wall Condition

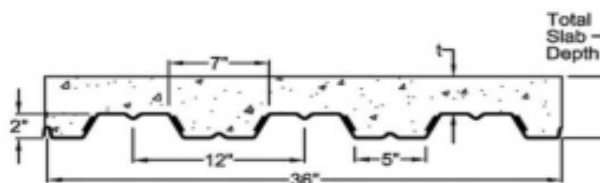
	Static	Seismic
Above the water table ¹⁰	60 pcf	40 pcf + 30 pcf
Below the water table	90 pcf	80 pcf + 30 pcf

These are excerpts from the Geo tech report. They depict information needed for the design of the foundation and basement level walls

VULCRAFT

2 VLI

Maximum Sheet Length 42'-0"
Extra Charge for Lengths Under 6'-0"
ICBO Approved (No. 3415)



Interlocking side lap is not drawn to show actual detail.

STEEL SECTION PROPERTIES

Deck Type	Design Thickness in	Deck Weight psf	Section Properties				V_s lbs/ft	F_u ksi
			I_x in ⁴ /ft	S_x in ³ /ft	I_y in ⁴ /ft	S_y in ³ /ft		
2VLI22	0.0295	1.62	0.324	0.263	0.321	0.266	1832	50
2VLI20	0.0358	1.97	0.409	0.341	0.406	0.346	2698	50
2VLI19	0.0418	2.30	0.492	0.420	0.489	0.426	3190	50
2VLI18	0.0474	2.61	0.559	0.495	0.558	0.504	3608	50
2VLI16	0.0598	3.29	0.704	0.653	0.704	0.653	3618	40

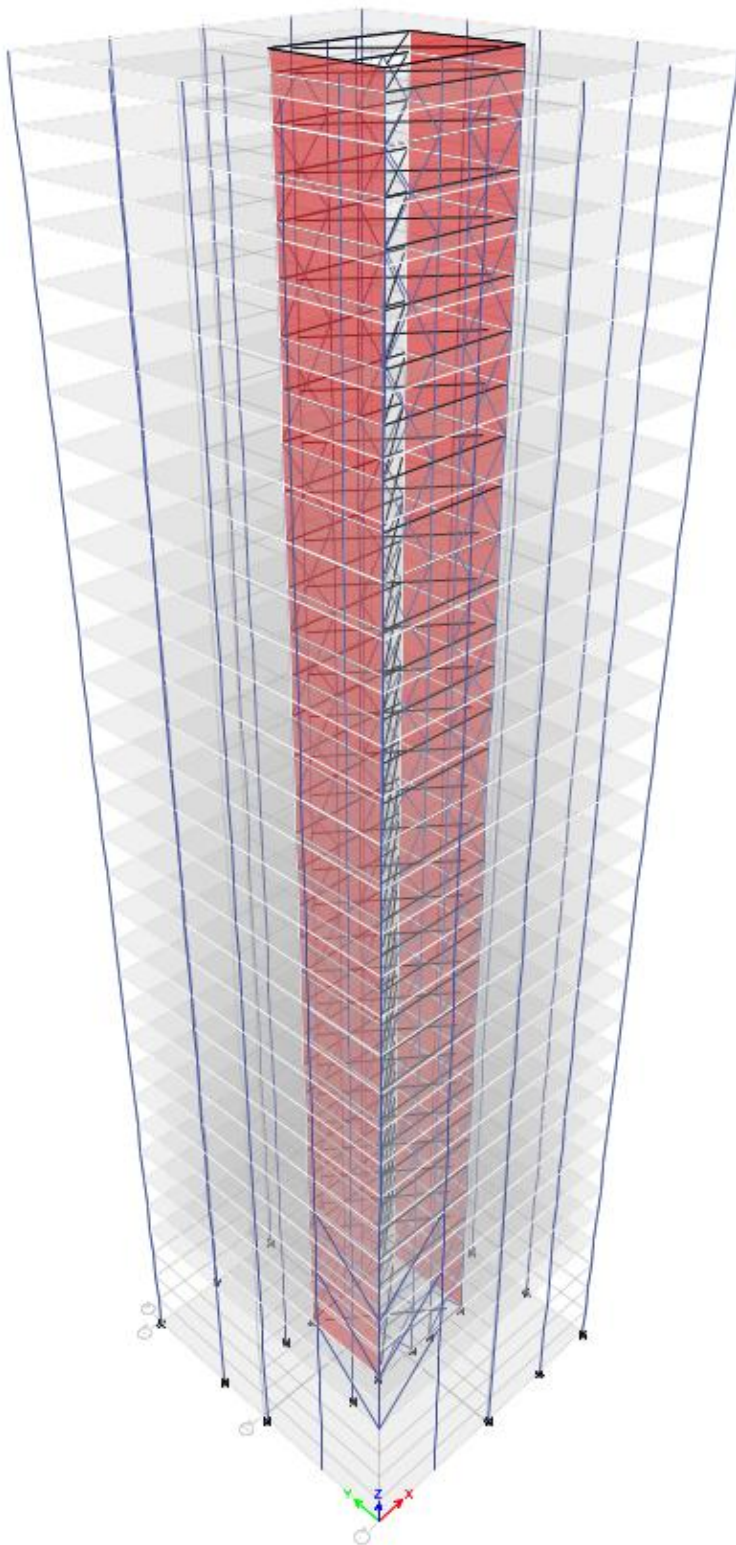
(N=9.35) NORMAL WEIGHT CONCRETE (145 PCF)

TOTAL SLAB DEPTH	DECK TYPE	SDI Max. Unshored Clear Span			Superimposed Live Load, PSF															
		1 SPAN	2 SPAN	3 SPAN	Clear Span (ft.-in.)															
		5'-6"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"	11'-6"	12'-0"	12'-6"	13'-0"	13'-6"	14'-0"	14'-6"
4.00 (t=2.00) 39 PSF	2VLI22	7'-4"	9'-6"	9'-9"	274	239	211	188	145	129	115	104	94	85	78	71	65	59	54	54
	2VLI20	8'-7"	10'-10"	11'-2"	310	269	236	210	188	170	155	117	106	96	87	80	73	67	61	61
	2VLI19	9'-9"	11'-11"	12'-4"	344	298	261	231	207	186	169	155	142	106	97	88	81	74	68	68
	2VLI18	10'-9"	12'-9"	12'-9"	373	324	285	253	228	206	186	172	159	147	137	103	95	87	81	81
4.50 (t=2.50) 45 PSF	2VLI16	11'-1"	13'-2"	13'-5"	400	376	330	292	261	235	214	195	180	166	154	143	109	100	93	93
	2VLI22	8'-11"	9'-0"	9'-4"	319	278	245	190	168	150	134	121	109	99	90	83	76	69	63	63
	2VLI20	8'-2"	10'-3"	10'-7"	361	313	275	244	219	198	152	136	123	112	102	93	85	78	72	72
	2VLI19	9'-2"	11'-5"	11'-9"	400	346	303	268	240	216	196	180	136	124	113	103	94	86	79	79
5.00 (t=3.00) 51 PSF	2VLI18	10'-2"	12'-4"	12'-4"	400	376	331	295	264	239	218	200	184	171	130	119	110	102	94	94
	2VLI16	10'-5"	12'-6"	12'-11"	400	400	383	339	303	274	248	227	209	193	150	137	126	117	108	108
	2VLI22	8'-7"	8'-7"	8'-11"	364	317	279	217	192	171	153	138	125	113	103	94	86	79	72	72
	2VLI20	7'-8"	9'-10"	10'-2"	400	356	313	278	249	193	173	156	141	128	116	106	97	89	82	82
5.50 (t=3.50) 57 PSF	2VLI19	8'-9"	10'-11"	11'-3"	400	394	345	306	273	247	224	172	156	141	128	117	107	99	91	91
	2VLI18	8'-7"	11'-10"	11'-11"	400	400	377	336	301	273	249	228	210	162	148	136	126	116	107	107
	2VLI16	9'-11"	12'-0"	12'-4"	400	400	400	386	346	312	283	259	236	187	171	157	144	133	123	123
	2VLI22	8'-4"	8'-0"	8'-6"	400	355	278	244	216	192	172	155	140	127	116	106	97	89	81	81
6.00 (t=4.00) 63 PSF	2VLI20	7'-5"	9'-5"	9'-9"	400	400	351	312	244	217	194	175	158	143	131	119	109	100	92	92
	2VLI19	8'-4"	10'-5"	10'-9"	400	400	368	343	307	277	215	193	175	159	144	132	121	111	102	102
	2VLI18	9'-2"	11'-4"	11'-7"	400	400	400	377	338	306	279	256	199	182	167	153	141	130	121	121
	2VLI16	9'-5"	11'-6"	11'-10"	400	400	400	400	388	350	318	290	230	210	192	176	162	150	138	138
6.50 (t=4.50) 69 PSF	2VLI22	8'-1"	7'-5"	8'-2"	400	394	308	270	239	213	191	172	156	141	129	118	108	99	90	90
	2VLI20	7'-1"	9'-1"	9'-4"	400	400	390	346	271	241	215	194	175	159	145	132	121	111	102	102
	2VLI19	8'-0"	10'-1"	10'-5"	400	400	400	381	340	307	239	215	194	176	160	146	134	123	113	113
	2VLI18	8'-10"	10'-11"	11'-3"	400	400	400	400	375	339	309	243	221	202	185	170	157	145	134	134
7.00 (t=5.00) 75 PSF	2VLI16	8'-1"	11'-1"	11'-5"	400	400	400	400	400	388	352	322	255	233	213	195	180	166	154	154
	2VLI22	5'-11"	6'-11"	7'-11"	400	390	339	297	263	234	210	189	171	155	141	129	118	108	99	99
	2VLI20	6'-11"	8'-9"	8'-0"	400	400	400	337	297	264	237	213	193	175	158	145	133	122	112	112
	2VLI19	7'-10"	9'-8"	10'-0"	400	400	400	400	374	293	262	236	213	193	176	161	147	135	124	124
7.50 (t=5.50) 81 PSF	2VLI18	8'-7"	10'-6"	10'-11"	400	400	400	400	400	373	340	268	243	222	203	187	172	159	147	147
	2VLI16	8'-10"	10'-8"	11'-0"	400	400	400	400	400	400	387	309	280	256	234	215	198	183	169	169

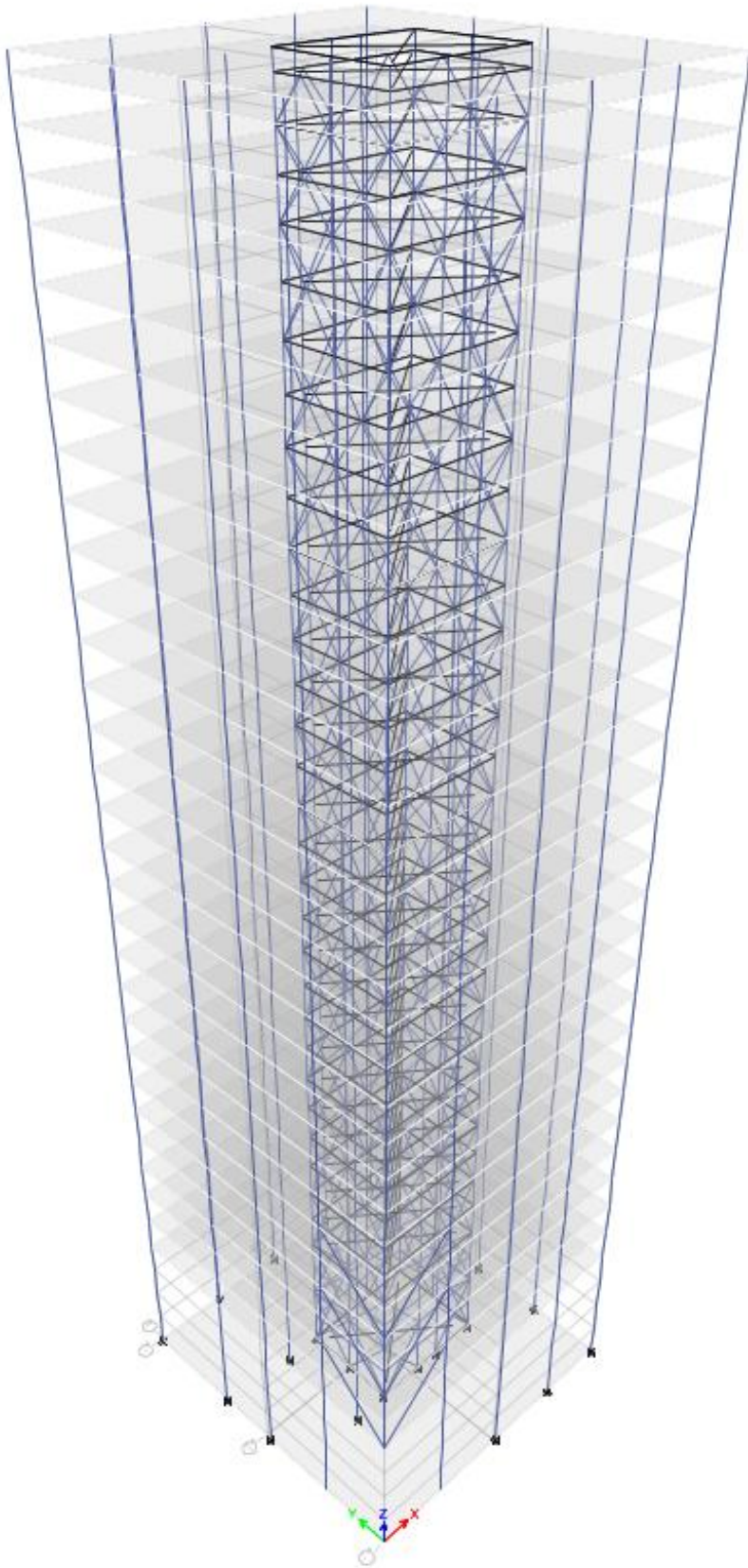
- Notes: 1. Minimum exterior bearing length required is 2.00 inches. Minimum interior bearing length required is 4.00 inches. If these minimum lengths are not provided, web crippling must be checked.
2. Always contact Vulcraft when using loads in excess of 200 psf. Such loads often result from concentrated, dynamic, or long term load cases for which reductions due to bond breakage, concrete creep, etc. should be evaluated.
3. All fire rated assemblies are subject to an upper live load limit of 250 psf.



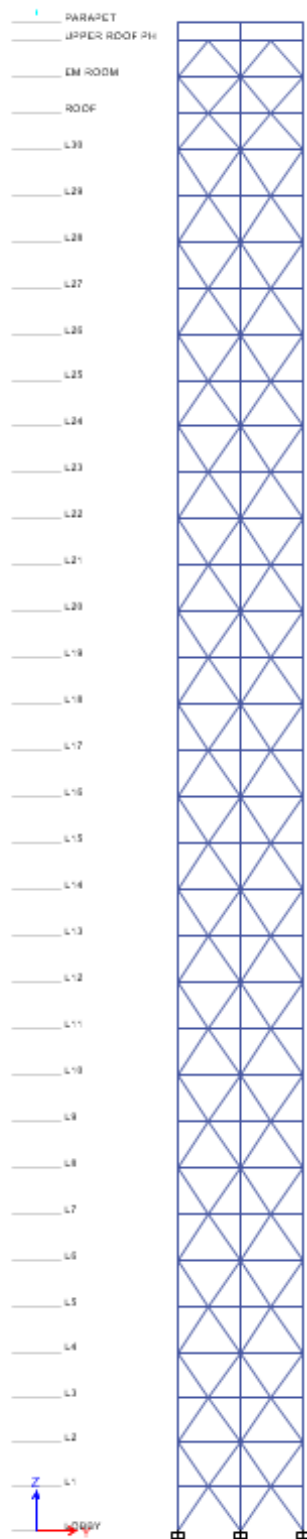
APPENDIX B



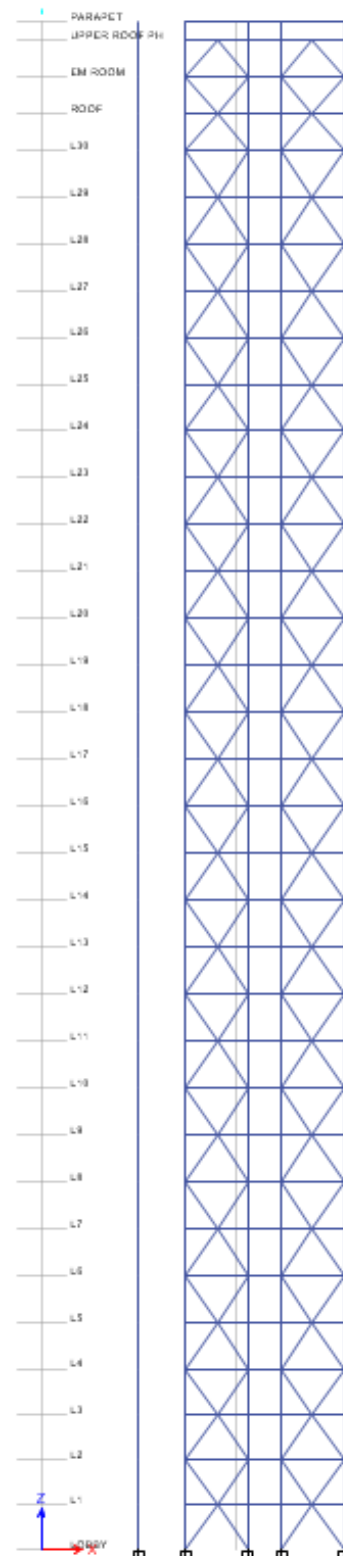
Shown left is the preliminary design of the lateral system of the building. The core composed of a steel plate shear wall and braced frames can be seen in the core in the center of the building.



Shown left is the final design of the lateral system of the building. The core composed of two different configurations of braced frames can be seen in the core in the center of the building.



Shown left is the final design of the lateral system of the building. This image shows the configuration of the east and west faces of the core.



Shown right is the final design of the lateral system of the building. This image shows the configuration of the north and south faces of the core.

APPENDIX C

Composite Beam. Check

loads: Live: 100 psf
 Dead: 20 psf.
 Self: 55 psf.
Deck: 69 psf.

$$1.6(100) + 1.2(89) = 267 \text{ psf}$$

$$1.2(55) = 66 \text{ psf}$$

Trjb: 10'
 $W_u = 2.75 \text{ klf}$

Beam: Typical Floor - 24 x 55

$$M_u = \frac{2.75(42^2)}{8} = \underline{606.375 \text{ k}}$$

assumed $V_2 = 2$.

$$\leq Q_n = 810 \text{ k}$$

$$a = \frac{810}{.85(3)120} = 2.64" \rightarrow \text{ok to use } \underline{V_2 = 2}$$

$$\frac{810 \text{ k}}{17.2} = 47 \text{ studs} \rightarrow \text{we have } 48 \checkmark$$

$$48(17.2) = 825.6 \text{ k} \rightarrow a = \frac{825.6}{.85(3)(120)} = 2.7"$$

$$V_2 = 4.5 - \frac{2.7}{2} = 3.15" \rightarrow \text{use } \underline{3"} \checkmark$$

$$I = 3120 \text{ in}^4$$

$$\frac{f}{360} = 1.4"$$

$$A_u = \frac{5\left(\frac{1600}{1600}\right)(42^4)(1728)}{384(3120)(29000)} = 1.23" < 1.4" \checkmark$$

Column check + Transfer Brace check

Column check: column line: A-4
level: 6

load: D = 665 k
L = 441 k

$$P_u = 1.6(441) + 1.2(665) = 1503 \text{ k}$$

Type: W 14 x 211

$$L_u = 14'$$

$$K L = 14'$$

$$\phi P_n = 2460 \text{ k} \quad \checkmark$$

Transfer Brace

2 levels of load: D = 84 k
L = 50 k

$$P_u = 1.6(50) + 1.2(84) = 180 \text{ k}$$

Type: W 14 x 257

$$L_u = 20'$$

$$K L = 20'$$

$$\phi P_n = 2660 \text{ k} \quad \checkmark$$

Column encased in Concrete

load: Dead: 1890 k
live: 1260 k

$$P_u = 1.6(1260) + 1.2(1890) = 4284 \text{ k}$$

column type chosen

W 14 x 398

36" x 36" 8000 psi concrete

(12) #18 Bars

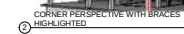
#4 STIR @ 24"

$$K L = 54'$$

at $K L = 40$ $\phi P_n = 8830 \text{ k}$ works by inspection.

LEVEL	W	h	h^k	$w \cdot h^k$	C	Fx	M	
Roof	2000	444	38016.54	76033071	0.105083	258.12	114603.37	
30	1599	429	35822.11	57279548	0.079164	194.45	83419.72	
29	1599	414	33682.99	53859095	0.074437	182.84	75695.71	
28	1599	399	31599.71	50527938	0.069833	171.53	68441.00	
27	1599	384	29572.84	47286969	0.065354	160.53	61643.12	
26	1633	369	27602.96	45075629	0.062298	153.02	56465.09	
25	1633	354	25690.68	41952885	0.057982	142.42	50417.00	
24	1633	339	23836.66	38925273	0.053798	132.14	44796.41	
23	1633	324	22041.59	35993912	0.049746	122.19	39590.04	
22	1680	309	20306.18	34114378	0.047149	115.81	35785.56	
21	1680	294	18631.20	31300420	0.043259	106.26	31239.88	
20	1680	279	17017.48	28589368	0.039513	97.05	27078.25	
19	1680	264	15465.89	25982688	0.03591	88.21	23286.27	
18	1689	249	13977.35	23607746	0.032628	80.14	19955.64	
17	1689	234	12552.88	21201817	0.029302	71.98	16842.28	
16	1689	219	11193.56	18905927	0.026129	64.18	14055.75	
15	1689	204	9900.57	16722062	0.023111	56.77	11580.62	
14	1732	189	8675.19	15025427	0.020766	51.01	9640.52	
13	1732	174	7518.83	13022612	0.017998	44.21	7692.35	
12	1732	159	6433.05	11142045	0.015399	37.82	6014.15	
11	1732	144	5419.60	9386745	0.012973	31.87	4588.70	
10	1748	129	4480.44	7831801	0.010824	26.59	3429.76	
9	1748	114	3617.81	6323927	0.00874	21.47	2447.39	
8	1748	99	2834.32	4954391	0.006847	16.82	1665.09	
7	1748	84	2133.06	3728590	0.005153	12.66	1063.25	
6	1834	69	1517.78	2783609	0.003847	9.45	652.03	
5	1834	54	993.21	1821548	0.002518	6.18	333.92	
rest	1160	18	148.46	172218.3	0.000238	0.58	10.52	
Lobby	3190	0	0.00	0	0	0.00	0	
	50342			7.24E+08	1	2456.3	812433.396	OTM

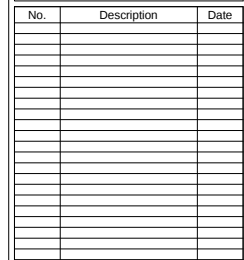
These are the forces and moments attained from the seismic equivalent lateral force system as performed with the new proposed steel system.



350 Mission

PERSPECTIVE
VIEWS

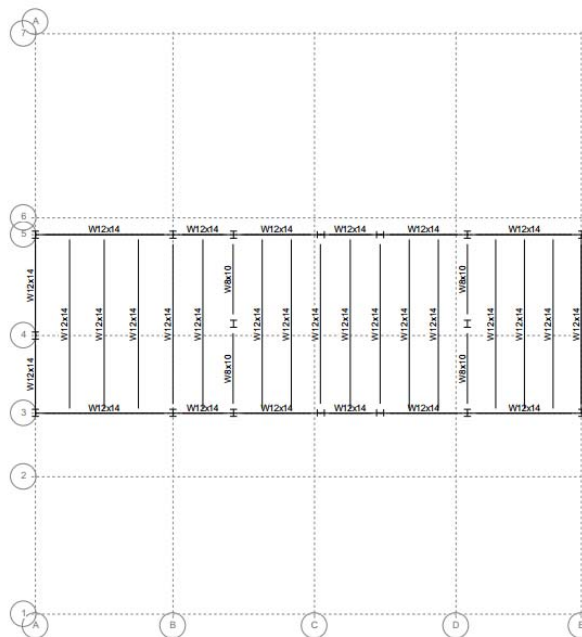
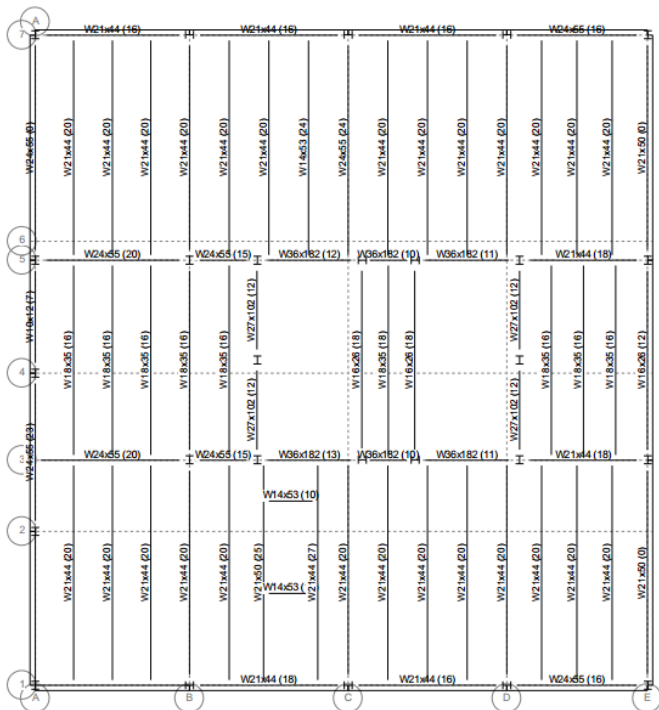
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DIMENSIONED TYPICAL FLOOR FRAMING PLANS

Scale	1/8" = 1'-0"
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350 Mission

ROOF FRAMIMNG
PLAN

Project Number	Project Number
Date	Issue Date
Drawn By	
Checked By	
S-104	
Scale	



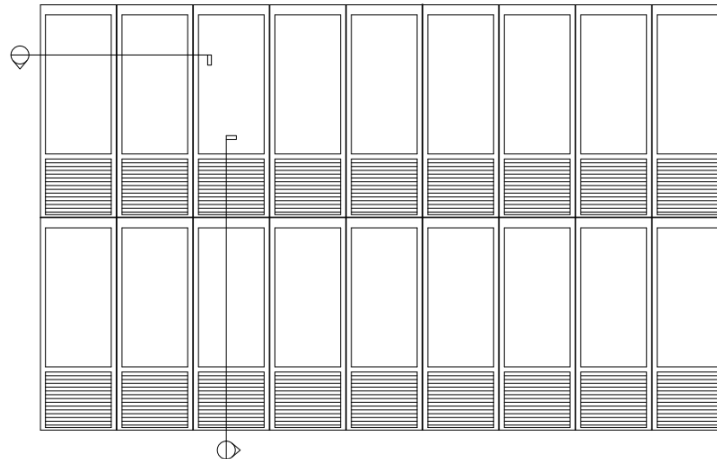
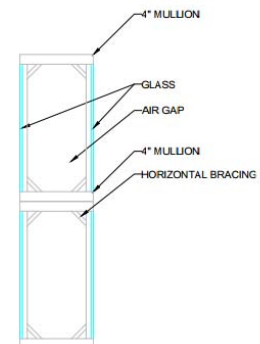
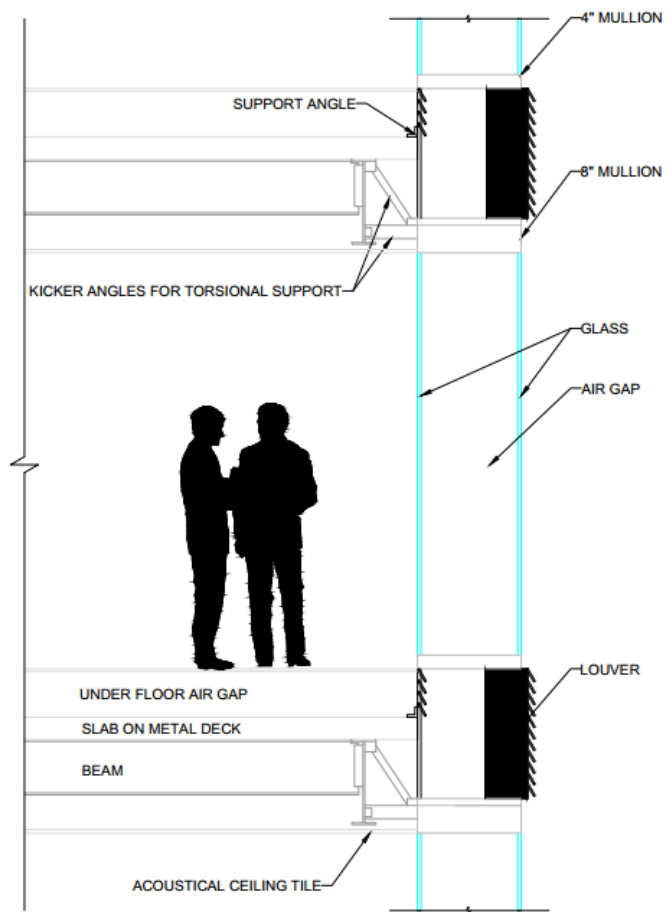
Project Number	Project Number
Date	Issue Date
Drawn By	
Checked By	
S-105	
Scale	3/64" = 1'-0"



350 Mission

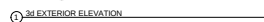
CORE ELEVATIONS

2/10/2014 11:17:04 AM

[illegible]

350 Mission
FACADE

Project Number	Project Number
Date	Issue Date
Drawn By	
Checked By	
S-107	
Scale	



350 Mission
MORE 3D VIEWS

Project Number	Project Number
Date	Issue Date
Drawn By	
Checked By	
S-108	
Scale	