Caroline Klatman
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September 26, 2014

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

Dear Dr. Boothby:

Enclosed is Technical Report 2, a technical report intended to indicate the relevant structural loads imposed on 181 Fremont by using the building codes specified for its structural design. Through a combination of hand calculations and excel spreadsheets, this report illustrates the determination of various design loads.

Included in this report is an abstract describing primary building systems, a list of building codes and specifications used, and detailed calculations of various loads on the structure, including gravity, wind, and seismic.

Thank you for taking the time to review this report.

Sincerely,

Caroline Klatman

181 Fremont
San Francisco, CA

Tech Report 2

9/26/2014

Caroline Klatman

Structural Option

Advisor: Dr. Thomas Boothby

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Executive Summary

181 Fremont is a 54 story high-rise in the South of Market neighborhood in San Francisco, California. Its construction is a part of the San Francisco Transit Center District Plan – a redevelopment plan that allows for greater building heights within that area of the city. As such, the building rises to 700 feet, the maximum height allowed per the limitations on the site.

In response to the high seismic loading brought about by the site location, the structure expresses a unique and complicated design solution. A mega-frame system, expressed on the exterior of the building, acts as the primary lateral system of the structure into which all other lateral forces are carried.

Buckling restrained brace frames in the interior of upper stories of the structure and moment frames at the lower story exteriors supplement the mega-frame in providing lateral-force-resistance. Other contributors to the lateral system include collectors at each floor and viscous dampers in the exterior braces of the structure.

Because the mega-frame system is not defined in ASEC 7-05, an in depth seismic analysis was completed that conforms to the San Francisco Department of Building Inspection Administrative Bulletin on the Seismic Design & Review of Tall Buildings Using Non-Prescriptive Procedures (SF AB-083, 2010) and the PEER Guidelines for Performance-based Seismic Design of Tall Buildings (PEER TBI, 2010).

181 Fremont

San Francisco, California

General Information

Dates of Construction | Nov 2013 - 2016
Project Delivery Method | Design-Bid-Build
Cost | $375 Million
Number of Stories | 54 Stories
Height | 700 ft.
Size | 411,000 sq. ft.

Project Team

Owner | Jay Paul Company
Architect | Heller Manus
General Contractor | Level 10 Construction
Construction Manager | Jay Paul Company
Structural Engineer | Arup
MEP Engineer | Arup
Waterproofing Consultant | Simpson Gumpertz & Heger

Architecture

Transbay Connection

Construction

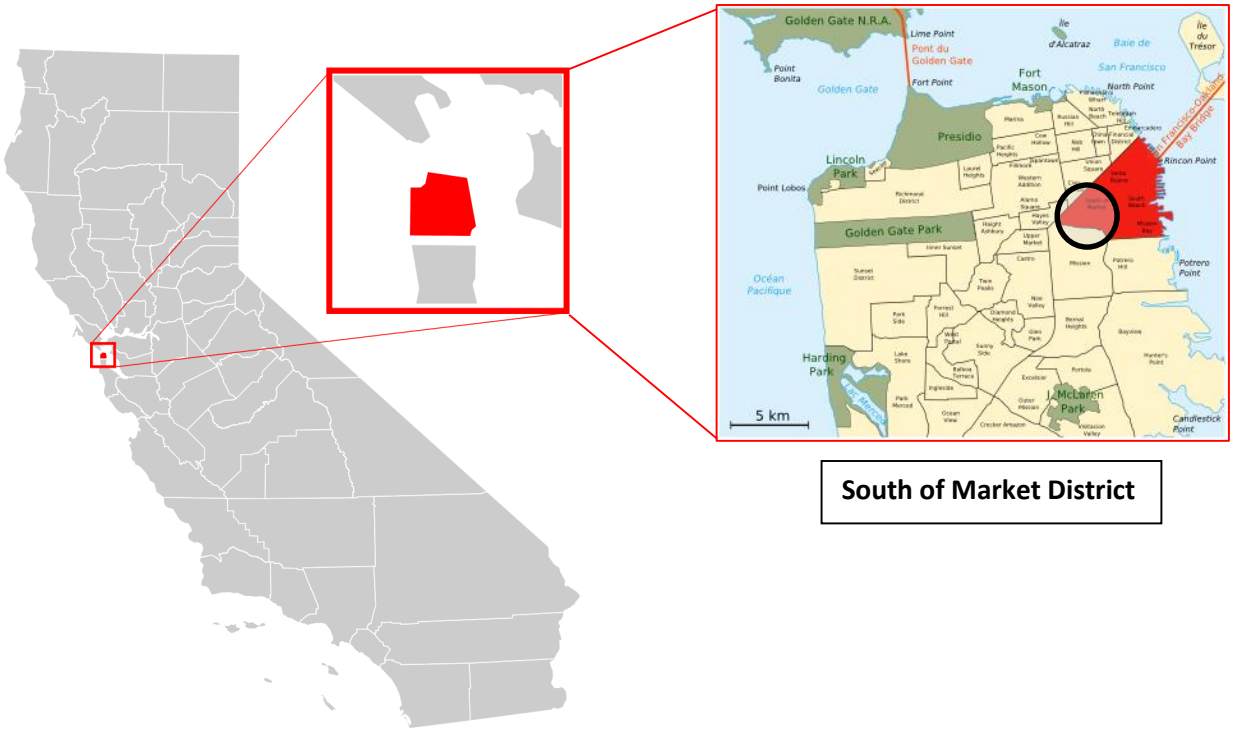
Mechanical Systems

Structural Systems

Sustainability

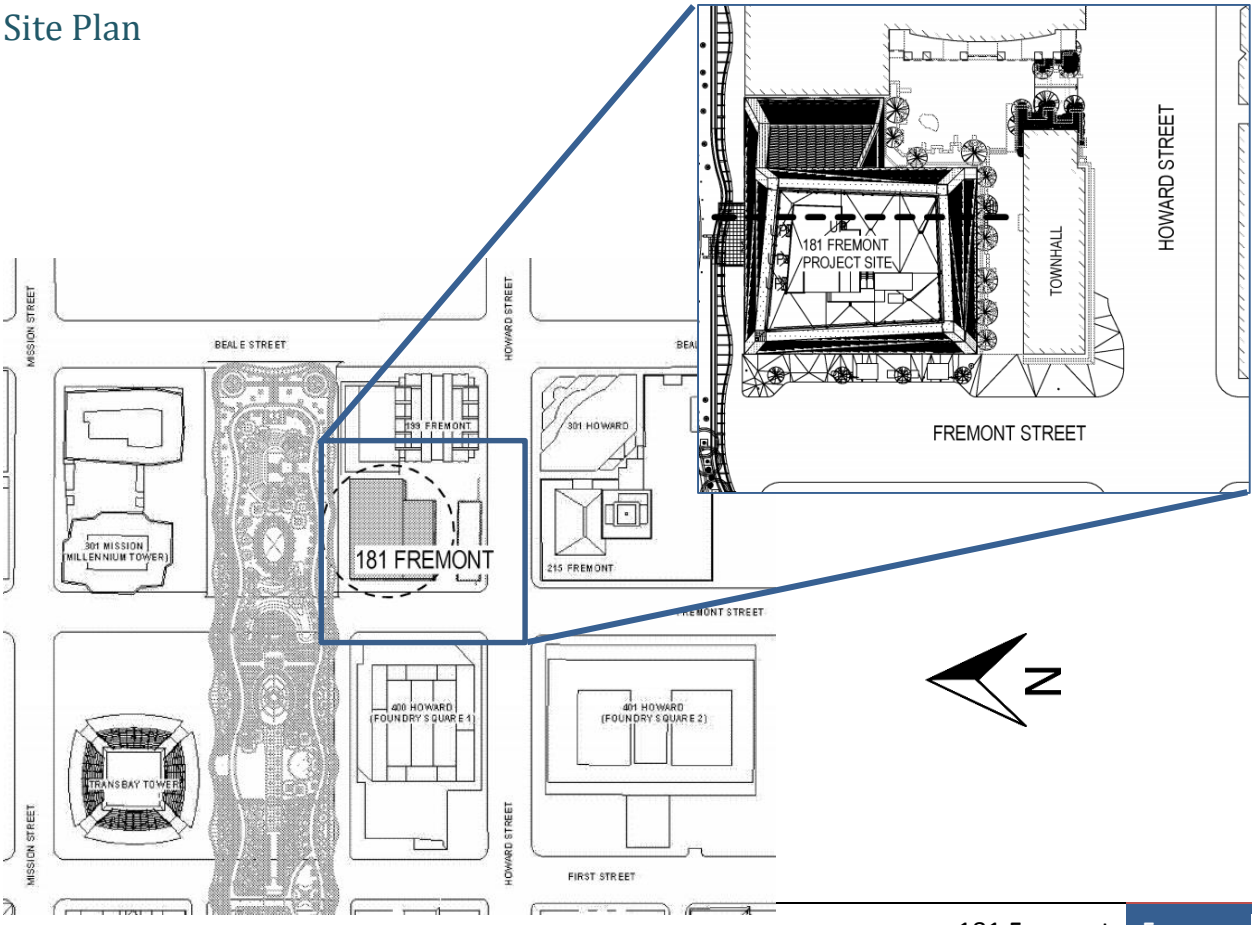
Building Location and Site Plan

Building Location



South of Market District

Site Plan



Documents Used in Preparation of This Report

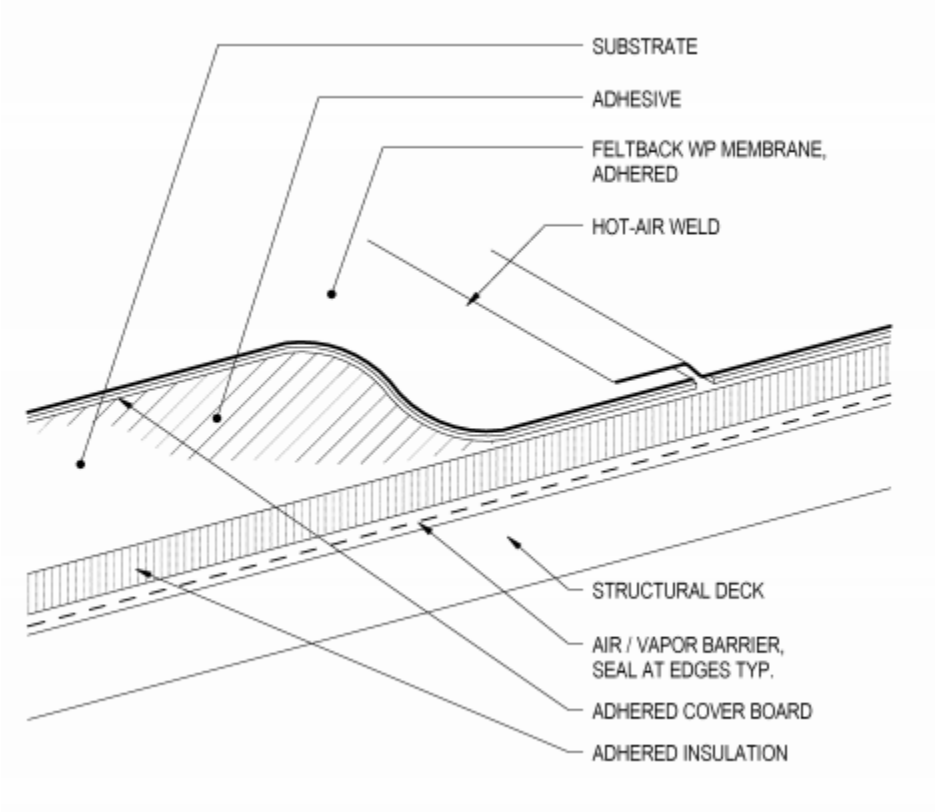
2010 California Building Code

- ASCE 7-05

2010 San Francisco Building Code

Gravity Load Calculations

Typical Roof Bay Cross Section



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Typical Roof Bay

Dead Load:

6" NW conc. on 2" metal deck	- 91 psf → use for entire roof to be conservative
Membrane + Air/Vapor barrier + cover board	- 5 psf
Rigid Insulation	- 1.5 per (4") = 6 psf
Steel Framing	- 10 psf
MEP	- 3 psf
Ceilings	- 5 psf
Sprinklers	- 3 psf
	123 psf

This is higher than the 107 psf load on S-019

Live Load:

20 psf per ASCE 7-05 table 4-1

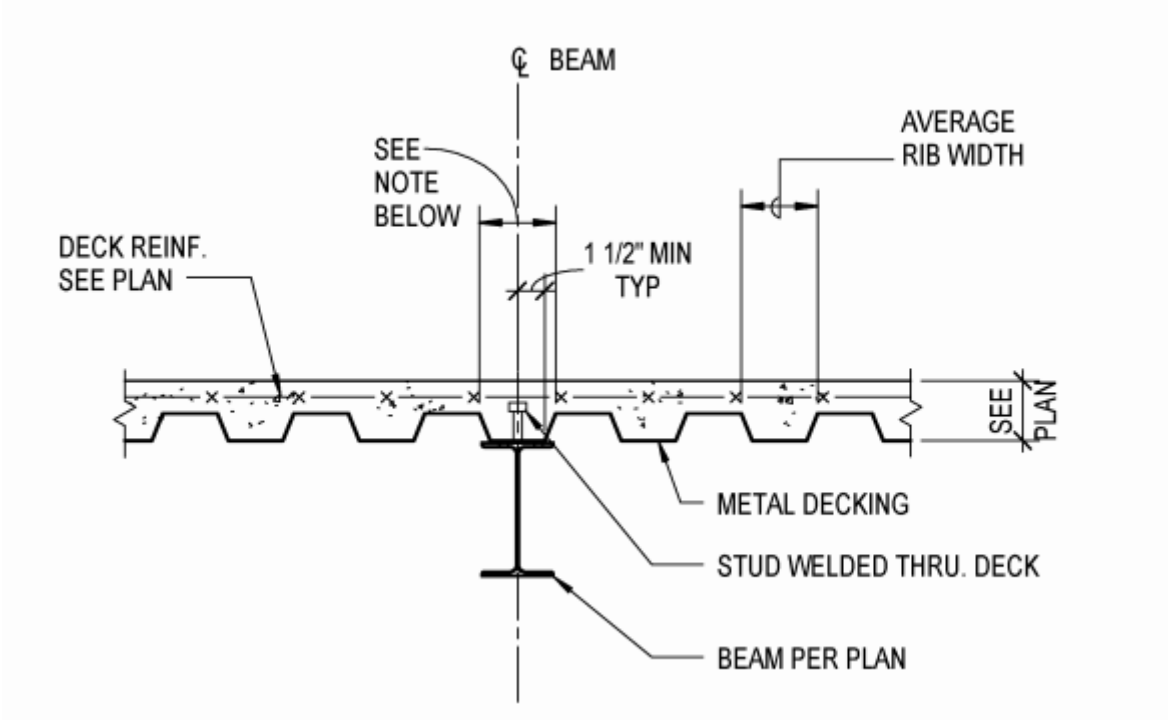
Snow Load: (ASCE 7-05)

$P_f = 0.7 C_e C_t I P_g$ (eqn 7-1)

$P_g = 0$ (Fig 7-1)

$\therefore P_f = 0$

Typical Floor Cross Section, Deck Parallel to Beam



Gravity Loads 10

Typical Residential Floor

Dead:

3¼" NW conc. on 2" Epicore Metal Deck	- 65 psf
MEP	- 15 psf
Ceilings	- 5 psf
Sprinklers	- 3 psf
Additional concrete	- 5 psf
Steel Framing	- 10 psf
	103 psf = typical residential load on S-019, but different allowances used

(ASCE 7-05)

Live:

Residential, Private Rooms and areas serving them	- 40 psf	(table 4-1)
Partitions	- 15 psf	
	55 psf	

Typical Office Floor

Dead:

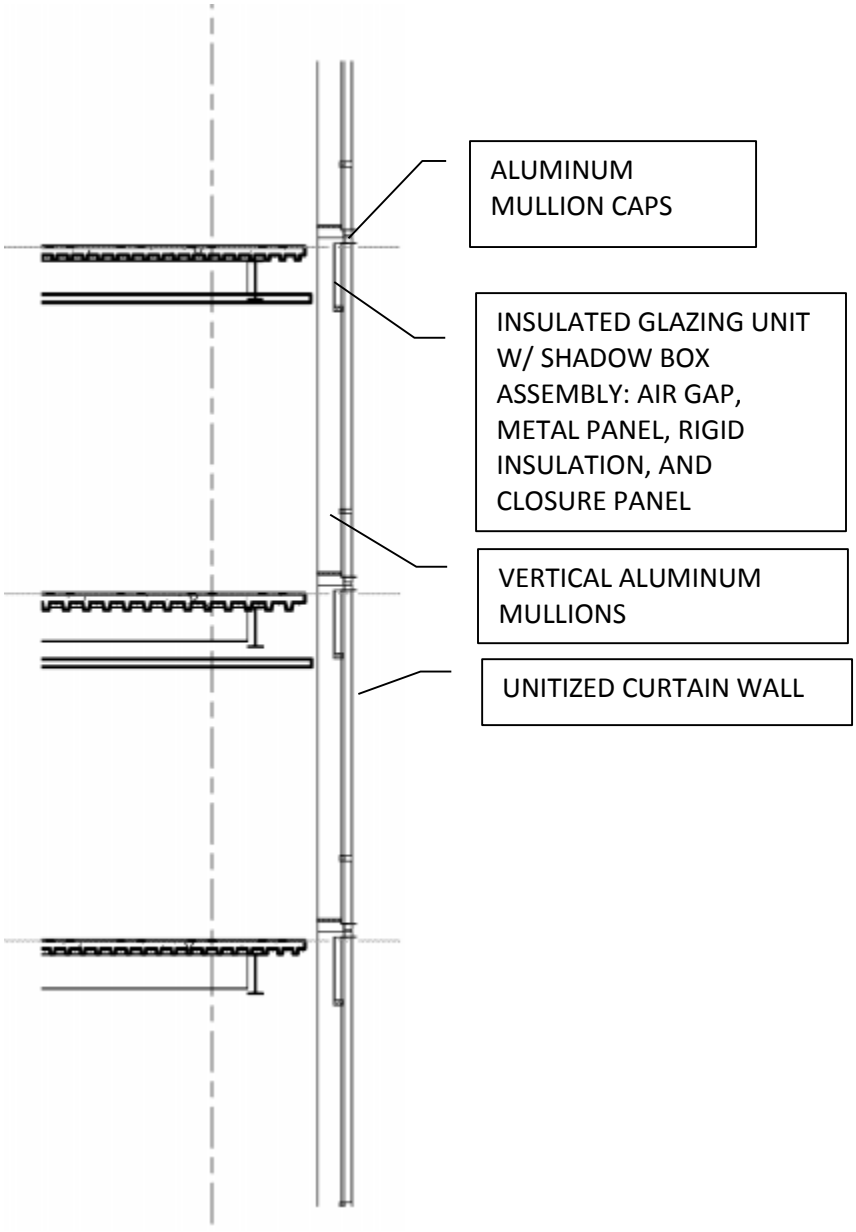
3¼" LWC on 2" metal deck	- 44 psf
MEP	- 15 psf
Ceilings	- 5 psf
sprinklers	- 3 psf
additional concrete	- 5 psf
steel framing	- 10 psf
	82 psf < typical office load of 160 psf on S-019

(ASCE 7-05)

Live:

Offices	- 50 psf	
Partitions	- 15 psf	
	65 psf	= design load on S-019
corridors	- 80 psf	= design load on S-019

Typical Exterior Wall Detail Cross-Section



Gravity Loads 12

Typical Exterior Wall

Dead Load:

Curtain Wall System - 13 psf

Load Path:

The curtain wall anchors into the concrete slabs at each level using angles embedded in the slab edges. Through these connections, the lateral loads experienced by the curtain wall and the walls self-weight are transferred to the structure's diaphragm.

Non-typical Dead Loads:

Roof Mechanical Equipment - actual weight (2 chillers, waiting on size)

Mechanical Floors - 100 (deck) psf + typical allowances
Levels 2, 38 + 25 psf allowance for concrete curbs and housekeeping

Retail Space - extra 16 psf for ceramic floors
Level 5

Lobby - 150 psf (12" slab) + typical allowances = 163 psf

Non-Typical Live Loads:

Roof Mechanical Room - 150 psf (ASCE Armories & Drill Rooms)

Mechanical Floors - 125 psf (ASCE light manufacturing)
Level 2, 38

Storage - 125 psf (ASCE light storage)
Level 2

Retail - 100 psf (ASCE store retail)
Level 5

Lobby - 100 psf

Wind Loads

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*Note: 181 Fremont was analyzed using wind tunnel testing and selective use of ASCE 7-10. This report, however, will instead only use ASCE 7-05 per the California Building Code requirements (CBC 2010).

ASCE 7-05:

Analysis Method

high rise building greater than 60 ft → Method 2 used (§6.5)

Assumption:

This report assumes items in condition 2 of §6.5.1 are not present. In reality, the building is likely to be susceptible to one or more of these items, such as across wind loading, and a wind tunnel procedure would be the necessary analysis method.

Basic wind speed, V

V = 85 mph (Fig. 6-1)

Importance Factor

Occupancy Category II (table 1-1)

I = 1.00 (table 6-1)

Exposure

Surface Roughness B (§ 6.5.6.2)

Exposure B, case 2 in table 6-3

$K_z = 2.01 (z/z_g)^{2/\alpha}$

where z_g = 1200 ft α = 7.0 (table 6-2)

*see table on page 15 for values of K_z

K_{zt} = 1.0 K_d = 0.85 (table 6-4)

Gust Effect Factor

Use G = 0.85 (§ 6.5.8.1)

Enclosed Building

Wind Loads

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Internal Pressure Coefficient

$GC_{pi} = +/- 0.18$ (Fig. 6-5)

External Pressure Coefficients

roof slope = 1/4"/1' = 1.2°

h/L = 700/137.5 = 5.1 L/B = 137.5/125 = 1

Windward Roof: Leeward Roof: $\frac{(14-10)(-.6--.7)}{(15-10)} + -.7$ (Fig. 6-6)

0 to h/2, C_p: -1.3(.9) : +.04, -0.18 C_p = -0.62

≥ h/2, C_p: -.7, -0.18

Windward Wall: Leeward Wall: Side Wall: (Fig. 6-6)

C_p = 0.8 C_p = -0.5 C_p = -0.7

Velocity Pressure

$q_h = 0.00256 K_z K_{zt} K_d V^2 I$

$= 0.00256 (1.7)(1.0)(0.85)(85^2)(1.0) = 26.7$ psf

$q_z = 0.00256 K_z K_{zt} K_d V^2 I$ (eqn. 6-15)

* see table table on page 15 for q_z values

Design Wind Pressure

$p = q G C_p - q_i (GC_{pi})$ (eqn. 6-17)

* see table on page 15 for p values

Wind Loads in N-S and E-W directions

* see table on page 17 for wind loads

Building Level	Height above ground level, z (ft)	Kz	qz (psf)	qzGCp	+qhGCpi	-qhGCpi	p (psf)
1	0	0.57	8.961312	6.09369216	4.806	-4.806	10.89969
1A	7.5	0.57	8.961312	6.09369216	4.806	-4.806	10.89969
1B	17.91666667	0.604649192	9.506052736	6.46411586	4.806	-4.806	11.27012
2	29.83333333	0.699476862	10.99689543	7.47788889	4.806	-4.806	12.28389
3	46.33333333	0.793230805	12.47085742	8.48018305	4.806	-4.806	13.28618
4	58.83333333	0.849252216	13.35160363	9.07909047	4.806	-4.806	13.88509
5	71.33333333	0.89730923	14.1071368	9.59285302	4.806	-4.806	14.39885
6	83.83333333	0.939674898	14.77319288	10.0457712	4.806	-4.806	14.85177
7	96.33333333	0.977739809	15.37163418	10.4527112	4.806	-4.806	15.25871
8	108.8333333	1.012422917	15.91690814	10.8234975	4.806	-4.806	15.6295
9	121.3333333	1.044366376	16.41911042	11.1649951	4.806	-4.806	15.971
10	133.8333333	1.074038342	16.8856012	11.4822088	4.806	-4.806	16.28821
11	146.3333333	1.101791688	17.3219282	11.7789112	4.806	-4.806	16.58491
12	158.8333333	1.127899642	17.732387	12.0580232	4.806	-4.806	16.86402
13	171.3333333	1.152578515	18.12037838	12.3218573	4.806	-4.806	17.12786
14	183.8333333	1.176002778	18.48864528	12.5722788	4.806	-4.806	17.37828
15	196.3333333	1.198315402	18.83943543	12.8108161	4.806	-4.806	17.61682
16	208.8333333	1.21963516	19.17461613	13.038739	4.806	-4.806	17.84474
17	221.3333333	1.240061904	19.49575722	13.2571149	4.806	-4.806	18.06311
18	233.8333333	1.259680461	19.80419233	13.4668508	4.806	-4.806	18.27285
19	246.3333333	1.278563568	20.10106499	13.6687242	4.806	-4.806	18.47472
20	259.4166667	1.297608452	20.40048104	13.8723271	4.806	-4.806	18.67833
21	271.9166667	1.315173595	20.67663319	14.0601106	4.806	-4.806	18.86611
22	284.4166667	1.332171073	20.94386075	14.2418253	4.806	-4.806	19.04783
23	296.9166667	1.34864302	21.2028261	14.4179217	4.806	-4.806	19.22392
24	309.4166667	1.364626819	21.454117	14.5887996	4.806	-4.806	19.3948
25	321.9166667	1.380155814	21.69825764	14.7548152	4.806	-4.806	19.56082
26	334.4166667	1.395259876	21.93571767	14.916288	4.806	-4.806	19.72229
27	346.9166667	1.409965888	22.1669197	15.0735054	4.806	-4.806	19.87951
28	359.4166667	1.424298133	22.39224552	15.226727	4.806	-4.806	20.03273
29	371.9166667	1.438278629	22.61204129	15.3761881	4.806	-4.806	20.18219
30	384.4166667	1.451927409	22.82662196	15.5221029	4.806	-4.806	20.3281
31	396.9166667	1.465262758	23.03627498	15.664667	4.806	-4.806	20.47067
32	409.4166667	1.478301414	23.24126351	15.8040592	4.806	-4.806	20.61006
33	421.9166667	1.491058742	23.44182911	15.9404438	4.806	-4.806	20.74644
34	434.4166667	1.503548884	23.63819413	16.073972	4.806	-4.806	20.87997
35	446.9166667	1.515784889	23.8305637	16.2047833	4.806	-4.806	21.01078

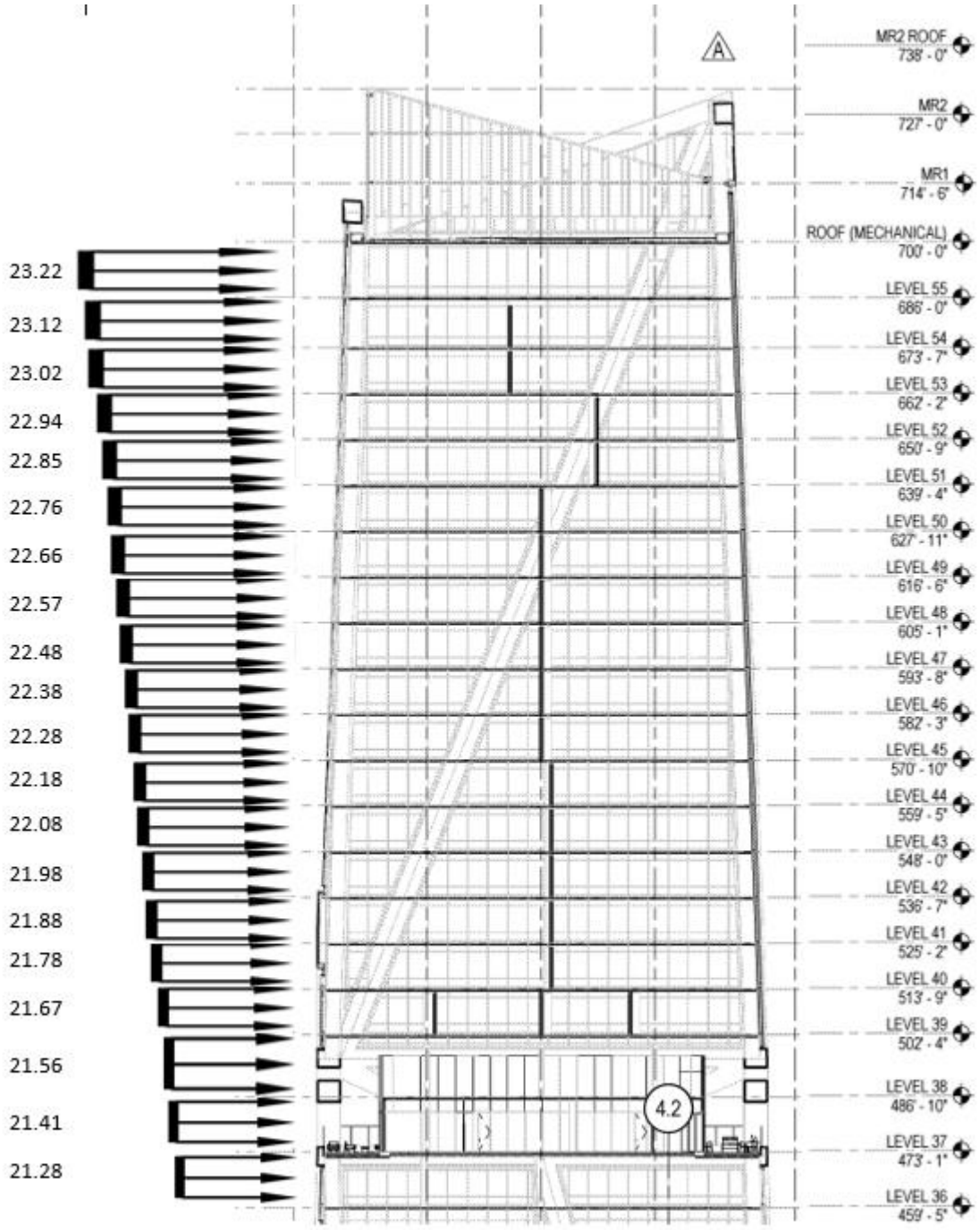
36	459.4166667	1.527778824	24.01912756	16.3330067	4.806	-4.806	21.13901
37	473.0833333	1.540628355	24.22114274	16.4703771	4.806	-4.806	21.27638
38	486.8333333	1.553291379	24.42022574	16.6057535	4.806	-4.806	21.41175
39	502.3333333	1.567263381	24.63988797	16.7551238	4.806	-4.806	21.56112
40	513.75	1.577358867	24.79860516	16.8630515	4.806	-4.806	21.66905
41	525.1666667	1.587295354	24.95482264	16.9692794	4.806	-4.806	21.77528
42	536.5833333	1.597078724	25.10863286	17.0738703	4.806	-4.806	21.87987
43	548	1.606714519	25.26012298	17.1768836	4.806	-4.806	21.98288
44	559.4166667	1.616207972	25.40937525	17.2783752	4.806	-4.806	22.08438
45	570.8333333	1.625564028	25.55646741	17.3783978	4.806	-4.806	22.1844
46	582.25	1.634787363	25.70147301	17.4770016	4.806	-4.806	22.283
47	593.6666667	1.64388241	25.8444617	17.574234	4.806	-4.806	22.38023
48	605.0833333	1.652853369	25.98549953	17.6701397	4.806	-4.806	22.47614
49	616.5	1.661704227	26.12464917	17.7647614	4.806	-4.806	22.57076
50	627.9166667	1.670438772	26.26197019	17.8581397	4.806	-4.806	22.66414
51	639.3333333	1.679060606	26.39751922	17.9503131	4.806	-4.806	22.75631
52	650.75	1.687573158	26.53135016	18.0413181	4.806	-4.806	22.84732
53	662.1666667	1.695979695	26.66351438	18.1311898	4.806	-4.806	22.93719
54	673.5833333	1.704283332	26.79406083	18.2199614	4.806	-4.806	23.02596
55	686	1.713200947	26.93426001	18.3152968	4.806	-4.806	23.1213
56	700	1.723118485	27.09017957	18.4213221	4.806	-4.806	23.22732

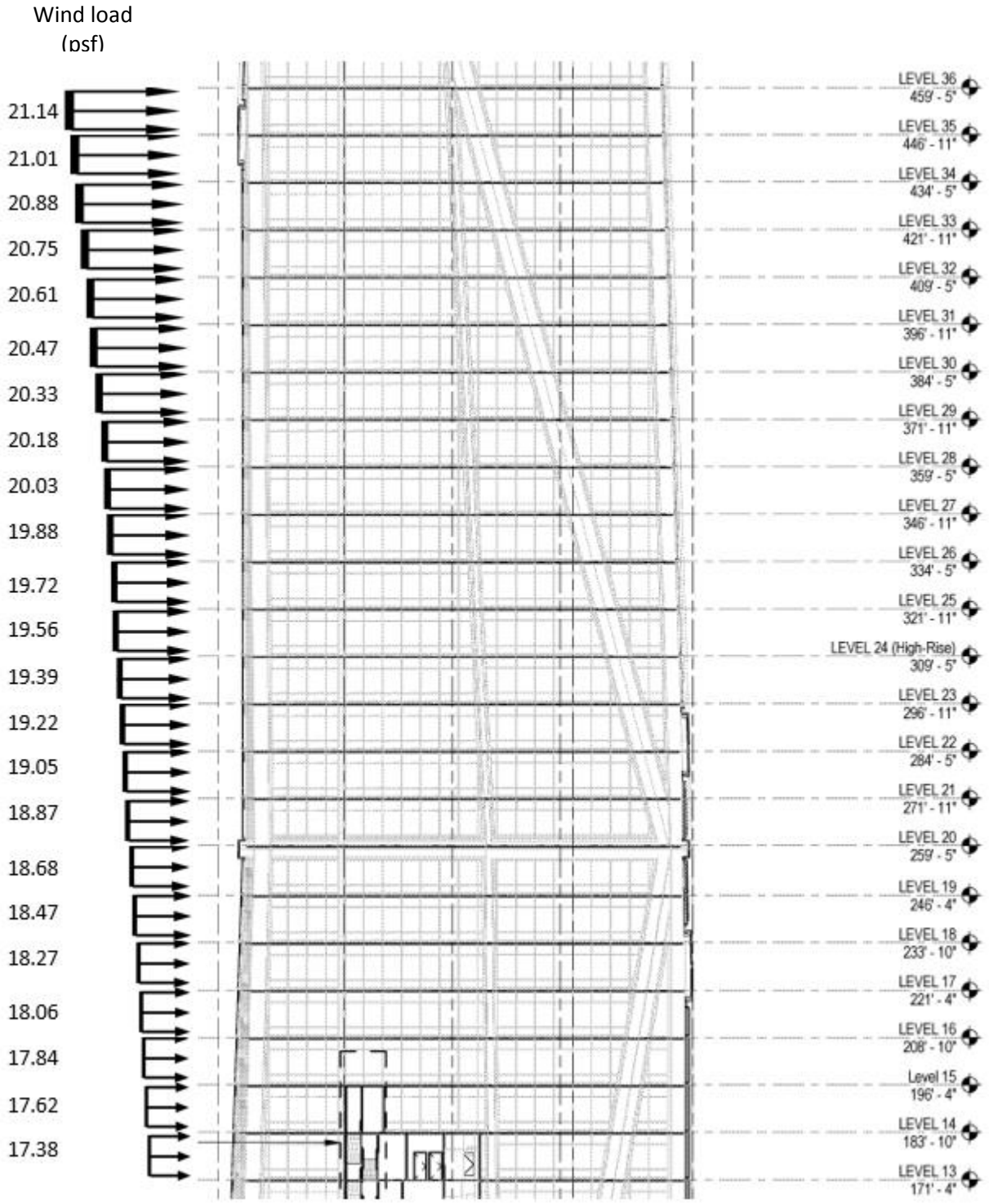
Design Wind Loads

Level	N-S Story Forces (kips)	E-W Story Forces (kips
1	11.24030754	10.2184614
1A	16.14209303	14.67463003
1B	20.12766378	18.29787617
2	30.14302779	27.40275253
3	23.86499925	21.69545386
4	24.74802863	22.49820785
5	25.52648168	23.20589244
6	26.22590995	23.84173632
7	26.86319889	24.4210899
8	27.4501478	24.95467982
9	27.99535891	25.45032628
10	28.50531608	25.91392371
11	28.98503981	26.35003619
12	29.43850474	26.76227703
13	29.86891667	27.15356061
14	30.27890266	27.52627514
15	30.6706451	27.88240464
16	31.04597876	28.22361705
17	31.40646229	28.55132936
18	31.75343221	28.86675655
19	33.6015322	30.54684745
20	32.42612754	29.47829776
21	32.73844975	29.76222704
22	33.0411155	30.03737773
23	33.33481175	30.30437432
24	33.62015112	30.56377374
25	33.89768253	30.81607502
26	34.1678999	31.06172718
27	34.43124945	31.30113587
28	34.68813576	31.53466887
29	34.93892691	31.76266083
30	35.18395888	31.98541717
31	35.42353923	32.20321748
32	35.65795027	32.41631843
33	35.88745189	32.62495626
34	36.11228383	32.82934894
35	36.33266783	33.02969803
36		

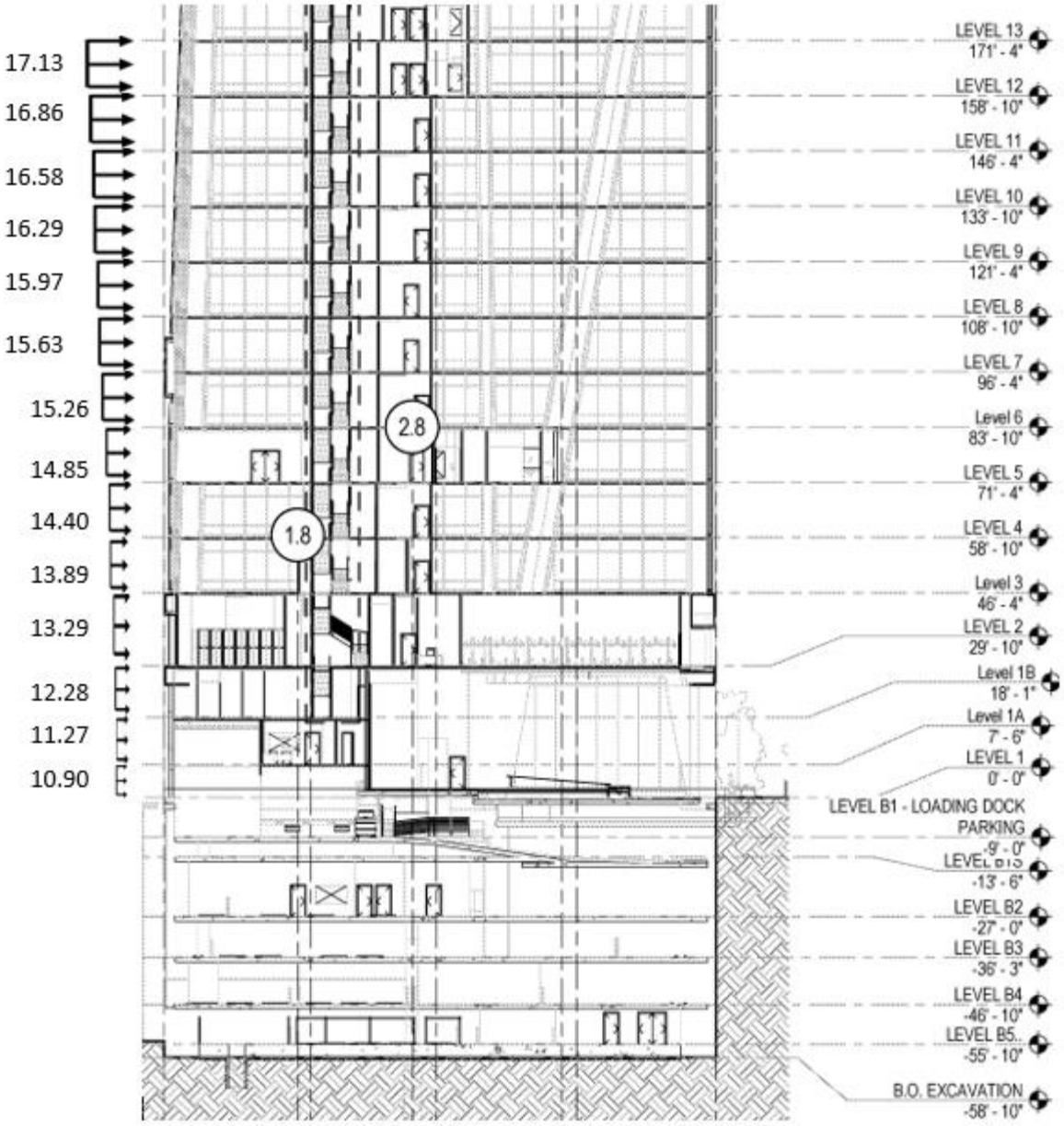
Level	N-S Story Forces (kips)	E-W Story Forces (kips)
37	39.98185856	36.34714415
38	40.48159647	36.80145134
39	45.95214514	41.7746774
40	34.01589648	30.92354225
41	34.18265213	31.0751383
42	34.34683813	31.2243983
43	34.50854752	31.37140684
44	34.66786811	31.51624373
45	34.82488286	31.65898442
46	34.9796703	31.79970027
47	35.13230476	31.93845888
48	35.28285676	32.07532433
49	35.43139321	32.21035747
50	35.57797768	32.34361607
51	35.72267062	32.47515511
52	35.86552958	32.60502689
53	36.00660937	32.73328124
54	36.14596226	32.85996569
55	39.47479737	35.88617942
56	44.71259506	40.64781369
BASE SHEAR	1855.059002	1686.417275

Wind Loading Graphics




Wind load (psf)
21.14
21.01
20.88
20.75
20.61
20.47
20.33
20.18
20.03
19.88
19.72
19.56
19.39
19.22
19.05
18.87
18.68
18.47
18.27
18.06
17.84
17.62
17.38
LEVEL 36 459' - 5"
LEVEL 35 446' - 11"
LEVEL 34 434' - 5"
LEVEL 33 421' - 11"
LEVEL 32 409' - 5"
LEVEL 31 396' - 11"
LEVEL 30 384' - 5"
LEVEL 29 371' - 11"
LEVEL 28 359' - 5"
LEVEL 27 346' - 11"
LEVEL 26 334' - 5"
LEVEL 25 321' - 11"
LEVEL 24 (High-Rise) 309' - 5"
LEVEL 23 296' - 11"
LEVEL 22 284' - 5"
LEVEL 21 271' - 11"
LEVEL 20 259' - 5"
LEVEL 19 246' - 4"
LEVEL 18 233' - 10"
LEVEL 17 221' - 4"
LEVEL 16 208' - 10"
Level 15 196' - 4"
LEVEL 14 183' - 10"
LEVEL 13 171' - 4"

Wind load
(psf)



Seismic Loads

Seismic Loads

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Floor area = 125(137.5') - (37.5)(50')
= 15,312.5 ft²

Effective Seismic Weight

Level 1a & 1b have 50% of floor open to below, so total weight = 1 floor

Floor:	dead load:	partitions:	floor area:	# of floors:	weight:
1a & 1b	163 psf	0	15,312.5	1	2,496 k
2-4	82 psf	0	15,312.5	3	3,767 k
5	98 psf	0	15,312.5	1	1501 k
6-37	82 psf	15 psf	15,312.5	32	47,530 k
38	138 psf	0	15,312.5	1	2,113 k
39-56	103 psf	0	15,312.5	18	28,889 k
					85,796,000 k

(Steel framing allowance included in above values)

Curtain wall:

13 psf (700') [2(137.5) + 2(125)] = 3675 k

Total Seismic Weight = 86,164 k

Parameters: (ASCE 7-05)

$S_s = 1.5$ $S_1 = 0.6$ (Fig 22-1, 22-2)

Site Class D

$S_{MS} = F_a S_s = 1.0(1.5) = 1.5$ (eqn 11.4-1)

$S_{M1} = F_v S_1 = 1.5(0.6) = 0.9$ (eqn 11.4-2)

$S_{DS} = 2/3\ S_{MS} = 1.0$ (eqn 11.4-3)

$S_{D1} = 2/3\ S_{M1} = 0.6$ (eqn 11.4-4)

Seismic Design Category

$I = 1$ (table 11.5-1)

$S_{DS} \geq 0.5 \rightarrow$ Seismic Design Category D (table 11.6-1)

Seismic Loads 23

Equivalent Lateral Force Procedure (§ 12.8)

$V = C_s W$ (eqn. 12.8-1)

$C_s = \frac{S_{DS}}{\left(\frac{R}{I}\right)}$ (eqn 12.8-2)

$R = 4.5$
*actual structural system not in code, so equivalency to C4 assumed

$= 1.0/4.5$

$= 0.22$

$0.22 \geq \frac{0.5 S_1}{\frac{R}{I}}$? (eqn 12.8-6)

$\geq 0.5(0.6)/4.5 = 0.067$ ✓ ∴ ok

$T_a = C_t h_n^x$ (12.8-7)

$= 0.02\,(700)^{0.75} = 2.72$

$T_L = 12\text{s}$ (Fig 22-15)

$T < T_L \Rightarrow C_s \leq \frac{S_{D1}}{T(R/I)} = \frac{0.6}{(2.72)(4.5)} = 0.05$

$\therefore C_s = 0.05$

$V = 0.05(86,164) = 4308^k$

Distribution of Seismic Forces

$F_x = C_{vx} V$ (12.8-11)

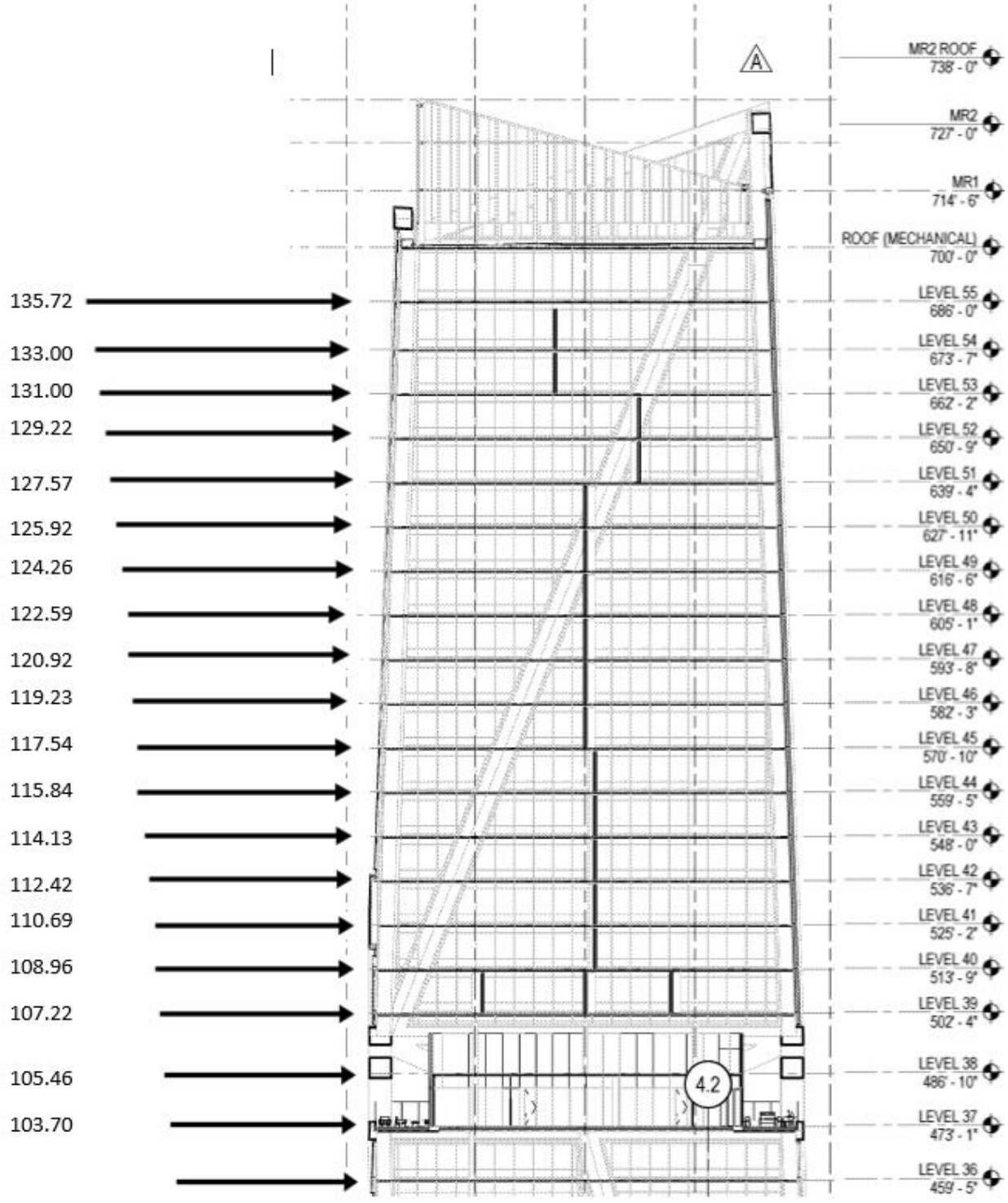
$C_{vx} = \frac{w_x h_x^k}{\sum_{i=1} w_i h_i^k}$ (12.8-12)

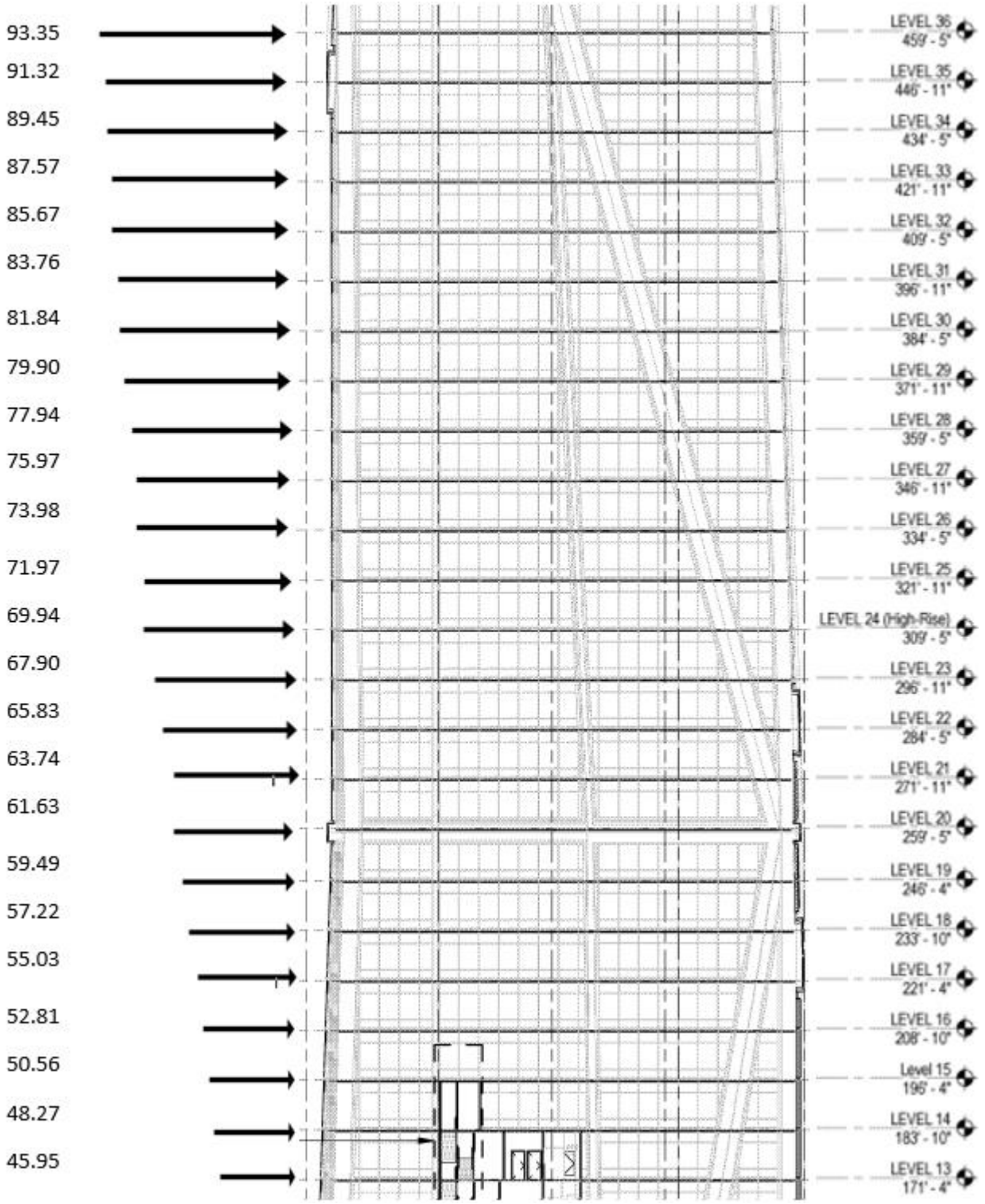
$k = 2$

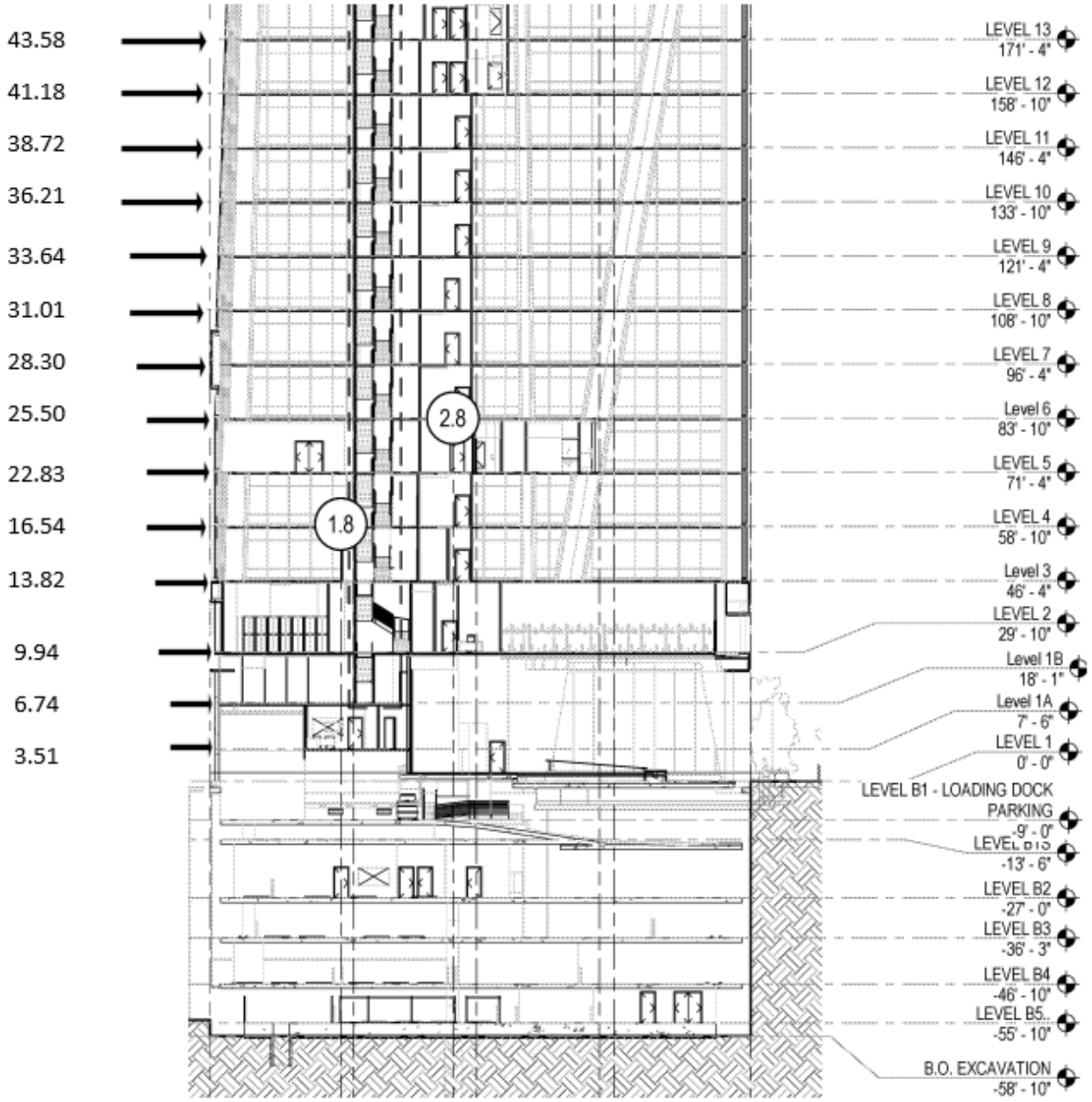
* see table on next page for story forces

Building Level	Height above ground level (ft)	hi (ft)	w (kip)	wxhx	Cvx	Story Forces (kips)
1	0.00					
1A	7.50	7.50	1248.00	5656.01	0.0008	3.51
1B	17.92	10.42	1248.00	10868.20	0.0016	6.74
2	29.83	11.92	1256.00	16033.04	0.0023	9.94
3	46.33	16.50	1256.00	22305.39	0.0032	13.82
4	58.83	12.50	1256.00	26681.32	0.0038	16.54
5	71.33	12.50	1501.00	36842.58	0.0053	22.83
6	83.83	12.50	1485.00	41142.34	0.0059	25.50
7	96.33	12.50	1485.00	45662.42	0.0066	28.30
8	108.83	12.50	1485.00	50037.76	0.0072	31.01
9	121.33	12.50	1485.00	54288.96	0.0078	33.64
10	133.83	12.50	1485.00	58431.86	0.0084	36.21
11	146.33	12.50	1485.00	62478.98	0.0090	38.72
12	158.83	12.50	1485.00	66440.47	0.0096	41.18
13	171.33	12.50	1485.00	70324.69	0.0101	43.58
14	183.83	12.50	1485.00	74138.65	0.0107	45.95
15	196.33	12.50	1485.00	77888.26	0.0112	48.27
16	208.83	12.50	1485.00	81578.61	0.0117	50.56
17	221.33	12.50	1485.00	85214.12	0.0123	52.81
18	233.83	12.50	1485.00	88798.63	0.0128	55.03
19	246.33	12.50	1485.00	92335.53	0.0133	57.22
20	259.42	13.08	1485.00	95989.75	0.0138	59.49
21	271.92	12.50	1485.00	99438.22	0.0143	61.63
22	284.42	12.50	1485.00	102847.26	0.0148	63.74
23	296.92	12.50	1485.00	106219.04	0.0153	65.83
24	309.42	12.50	1485.00	109555.51	0.0158	67.90
25	321.92	12.50	1485.00	112858.44	0.0162	69.94
26	334.42	12.50	1485.00	116129.46	0.0167	71.97
27	346.92	12.50	1485.00	119370.04	0.0172	73.98
28	359.42	12.50	1485.00	122581.55	0.0176	75.97
29	371.92	12.50	1485.00	125765.26	0.0181	77.94
30	384.42	12.50	1485.00	128922.32	0.0185	79.90
31	396.92	12.50	1485.00	132053.82	0.0190	81.84
32	409.42	12.50	1485.00	135160.75	0.0194	83.76
33	421.92	12.50	1485.00	138244.06	0.0199	85.67
34	434.42	12.50	1485.00	141304.60	0.0203	87.57
35	446.92	12.50	1485.00	144343.21	0.0208	89.45

36	459.42	12.50	1485.00	147360.64	0.0212	91.32
37	473.08	13.67	1485.00	150636.32	0.0217	93.35
38	486.83	13.75	2113.00	218995.27	0.0315	135.72
39	502.33	15.50	1577.00	167330.72	0.0241	103.70
40	513.75	11.42	1577.00	170174.93	0.0245	105.46
41	525.17	11.42	1577.00	173003.37	0.0249	107.22
42	536.58	11.42	1577.00	175816.48	0.0253	108.96
43	548.00	11.42	1577.00	178614.66	0.0257	110.69
44	559.42	11.42	1577.00	181398.31	0.0261	112.42
45	570.83	11.42	1577.00	184167.79	0.0265	114.13
46	582.25	11.42	1577.00	186923.46	0.0269	115.84
47	593.67	11.42	1577.00	189665.65	0.0273	117.54
48	605.08	11.42	1577.00	192394.69	0.0277	119.23
49	616.50	11.42	1577.00	195110.89	0.0281	120.92
50	627.92	11.42	1577.00	197814.54	0.0285	122.59
51	639.33	11.42	1577.00	200505.92	0.0288	124.26
52	650.75	11.42	1577.00	203185.32	0.0292	125.92
53	662.17	11.42	1577.00	205852.99	0.0296	127.57
54	673.58	11.42	1577.00	208509.19	0.0300	129.22
55	686.00	12.42	1577.00	211385.30	0.0304	131.00
56	700.00	14.00	1577.00	214612.60	0.0309	133.00
			SUM	6951390.15		


A
MR2 ROOF
738' - 0"
MR2
727' - 0"
MR1
714' - 6"
ROOF (MECHANICAL)
700' - 0"
LEVEL 55
686' - 0"
LEVEL 54
673' - 7"
LEVEL 53
662' - 2"
LEVEL 52
650' - 9"
LEVEL 51
639' - 4"
LEVEL 50
627' - 11"
LEVEL 49
616' - 6"
LEVEL 48
605' - 1"
LEVEL 47
593' - 8"
LEVEL 46
582' - 3"
LEVEL 45
570' - 10"
LEVEL 44
559' - 5"
LEVEL 43
548' - 0"
LEVEL 42
536' - 7"
LEVEL 41
525' - 2"
LEVEL 40
513' - 9"
LEVEL 39
502' - 4"
LEVEL 38
486' - 10"
LEVEL 37
473' - 1"
LEVEL 36
459' - 5"
4.2
135.72
133.00
131.00
129.22
127.57
125.92
124.26
122.59
120.92
119.23
117.54
115.84
114.13
112.42
110.69
108.96
107.22
105.46
103.70


93.35
91.32
89.45
87.57
85.67
83.76
81.84
79.90
77.94
75.97
73.98
71.97
69.94
67.90
65.83
63.74
61.63
59.49
57.22
55.03
52.81
50.56
48.27
45.95
LEVEL 36 459' - 5"
LEVEL 35 446' - 11"
LEVEL 34 434' - 5"
LEVEL 33 421' - 11"
LEVEL 32 409' - 5"
LEVEL 31 396' - 11"
LEVEL 30 384' - 5"
LEVEL 29 371' - 11"
LEVEL 28 359' - 5"
LEVEL 27 346' - 11"
LEVEL 26 334' - 5"
LEVEL 25 321' - 11"
LEVEL 24 (High-Rise) 309' - 5"
LEVEL 23 296' - 11"
LEVEL 22 284' - 5"
LEVEL 21 271' - 11"
LEVEL 20 259' - 5"
LEVEL 19 246' - 4"
LEVEL 18 233' - 10"
LEVEL 17 221' - 4"
LEVEL 16 208' - 10"
Level 15 196' - 4"
LEVEL 14 183' - 10"
LEVEL 13 171' - 4"


43.58
41.18
38.72
36.21
33.64
31.01
28.30
25.50
22.83
16.54
13.82
9.94
6.74
3.51
2.8
1.8
LEVEL 13
171' - 4"
LEVEL 12
158' - 10"
LEVEL 11
146' - 4"
LEVEL 10
133' - 10"
LEVEL 9
121' - 4"
LEVEL 8
108' - 10"
LEVEL 7
96' - 4"
Level 6
83' - 10"
LEVEL 5
71' - 4"
LEVEL 4
58' - 10"
Level 3
46' - 4"
LEVEL 2
29' - 10"
Level 1B
18' - 1"
Level 1A
7' - 6"
LEVEL 1
0' - 0"
LEVEL B1 - LOADING DOCK
PARKING
-9' - 0"
-13' - 6"
LEVEL B2
-27' - 0"
LEVEL B3
-36' - 3"
LEVEL B4
-46' - 10"
LEVEL B5..
-55' - 10"
B.O. EXCAVATION
-58' - 10"