

# LERA

Leslie E. Robertson Associates, R.L.L.P.  
Consulting Structural Engineers

40 Wall Street, 23<sup>rd</sup> Floor  
New York, NY 10005

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William J. Faschan  
[william.faschan@lera.com](mailto:william.faschan@lera.com)

25 April 2016  
File: P903

**Mr. Kenneth G. Cartelli**

50 Lex Development LLC  
c/o Ceruzzi Properties  
1720 Post Road  
Fairfield, CT 06824

Via e-mail: [kcartelli@ceruzziproperties.com](mailto:kcartelli@ceruzziproperties.com)

138 East 50<sup>th</sup> Street, New York, NY  
Structural Engineering Peer Review

Dear Mr. Cartelli:

At the request of Lex Development LLC, Leslie E. Robertson Associates International, PLLC has conducted a Structural Peer Review of the design of 138 East 50<sup>th</sup> Street as required by New York City Building Code Section 1617. This report summarizes the extent and findings of our review.

We have reviewed the plans listed in Appendix A, as well as the available wind tunnel and geotechnical reports, copies of which are attached to this report as Appendix B.

We have reviewed the Structural Design Criteria prepared by WSP Group, dated 30 March 2016 and a copy is attached as Appendix C.

Through our review, we have confirmed the following aspects of the structural design, as required by Section 1617.5.1:

- The design loads conform to the Building Code.
- The other structural design criteria and design assumptions conform to the code and are in accordance with generally accepted engineering practice.
- The design properly incorporates the results and recommendations of the wind tunnel and geotechnical investigations.
- We have reviewed the structural frame and the load supporting parts of floors, roofs, walls and foundations and based on our independent calculations for a representative fraction of systems, members and details, we find that the structure has adequate strength.
- The structure has a complete load path.
- The design engineer of record complied with the structural integrity provisions of the code.

- The structural plans are in general conformance with the architectural plans regarding loads and other conditions that may affect the structural design.
- Major mechanical items are accommodated in the structural plans.
- The structural plans are generally complete.

Accordingly, we find the design of the structure to be in general conformance with the structural design provisions of the Building Code.

The opinions expressed in this letter represent our professional view, based on the information made available to us. In developing these opinions, we have exercised a degree of care and skill commensurate with that exercised by professional engineers licensed in the State of New York for similar types of projects. No other warranty, expressed or implied, is made as to the professional advice included in this letter.

Very truly yours,

LESLIE E. ROBERTSON ASSOCIATES, R.L.L.P.



William J. Faschan  
Member

Enclosure

Cc: Mr. Hezi Mena, WSP, via e-mail: Hezi.Mena@WSPGroup.com

**STRUCTURAL PEER REVIEW STATEMENT**

This structural peer review and report, dated April 25, 2016, is complete for the superstructure.

**Structural Peer Reviewer Name:** William J. Faschan  
Leslie E. Robertson Associates

**Structural Peer Reviewer Address:** 40 Wall Street, FL 23  
New York, NY 10005

**Project Address:** 138 East 50<sup>th</sup> Street, Block #1304, Lot 45.

**Department Application Number for Structural Work:** # 121186028

**Structural Peer Reviewer Statement:**

I, William J. Faschan, am a qualified and independent NYS licensed and registered engineer in accordance with BC Section 1627.4, and I have reviewed the structural plans, specifications, and supplemental reports for 138 50<sup>th</sup> Street, New York, NY, Block # 1304, Lot # 45, Application # 121186028 and found that the structural design shown on the plans and specifications generally conforms to the foundation and structural requirements of Title 28 of the Administrative Code and the 2008 NYC Construction Codes. The Structural Peer Review Report is attached.

**New York State Registered Design Professional**  
(for Structural Peer Review only)

Name William J. Faschan



Signature \_\_\_\_\_ Date 4/25/16

CC: Project Owner: 50 Lex Development LLC, c/o Ceruzzi Properties  
Project Registered Design Professional: Sylvian Marcus

## APPENDIX A

138 EAST 50<sup>TH</sup> STREET

### STRUCTURAL DRAWING LIST

<b>DRAWING NUMBER</b>	<b>DRAWING TITLE</b>	<b>DATE</b>	<b>SUBMISSION</b>
FO-001 to FO-310	FOUNDATION DRAWINGS	03-22-2016	DOB SUBMISSION
S-001 to S-990	SUPERSTRUCTURE DRAWINGS	03-22-2016	DOB SUBMISSION

## APPENDIX B

138 EAST 50<sup>TH</sup> STREET

GEOTECHNICAL REPORT

WIND TUNNEL REPORT

**SUBSOIL  
INVESTIGATIONS**



## **SOIL MECHANICS DRILLING CORP.**

3770 MERRICK ROAD • SEAFORD, L. I., NEW YORK 11783  
(516) 221-2333 • FAX (516) 221-0254

August 9, 2013

50 Lex Development LLC  
c/o Ceruzzi Properties  
1720 Post Road  
Fairfield, CT 06824  
Att: Kenneth Cartelli, Sr. Vice President

Re: 238 E. 50<sup>th</sup> St. &  
151 E. 49<sup>th</sup> St.  
New York, NY  
Our Job #13-294

Gentlemen:

Forwarded herewith are copies of the boring logs for drilling work completed at the above referenced site.

The purpose of the subsurface investigation was to determine the nature and extent of the underlying soil deposits and determine the structural engineering characteristics of the soil at the site. A 2" diameter, 2'0" long split spoon sampler was advanced into the subsurface by the use of an automatic 140 lb. hammer with a 30" drop. From the drops of the hammer, blow counts required to advance the split spoon sampler over each 6" interval were recorded and is shown on the boring logs.

Our investigation revealed that the areas drilled are blanketed by from 2 ft. to 4 ft. of loose to moderately dense soil and rubble fill, underlain, generally, by a moderately dense to dense silty sand with traces of gravel and rock fragments extending to decomposed rock or rock. Decomposed rock was encountered between 3-1/2 ft. to 15 ft. below the existing basement floor.

Water was encountered in three or the five borings at depths ranging from 4'-5" to 6'-4" at the time the work was done and is not considered reliable due to the impervious nature of the soils encountered.

The natural sand below the fill is capable of supporting foundation loads of 2 to 4 tons per square foot. The decomposed rock is capable of supporting 8 tons per square foot and the hard rock (1C) is capable of supporting 20 tons per square foot.

With respect to liquefaction, the site is classified as Category "C", liquefaction unlikely.

# SOIL MECHANICS DRILLING CORP.

3770 MERRICK ROAD • SEAFORD, L. I., NEW YORK 11783  
(516) 221-2333 • FAX (516) 221-0254

50 Lex Development LLC  
c/o Ceruzzi Properties  
Att: Kenneth Cartelli, Sr. Vice President

August 9, 2013  
Page 2

With respect to seismic, the site is classified as Site Class "C" per the New York City Code.

Frost penetration in this area is 4 feet. All exterior foundations must have a minimum of 4 foot of cover.

It would appear, due to the high loads and the configuration of the building, you may need to install rock sockets into the lower hard rock. We recommend taking some additional borings and test pits to better define the rock profile and condition.

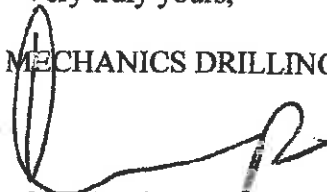
Soil samples recovered during drilling operations will be stored in our lab for a period of 30 days after which they will be destroyed. During this period we will deliver these samples to any prescribed location upon request.

If after you examine the enclosed you have any further questions, please feel free to call and discuss them with us.

Billing is enclosed.

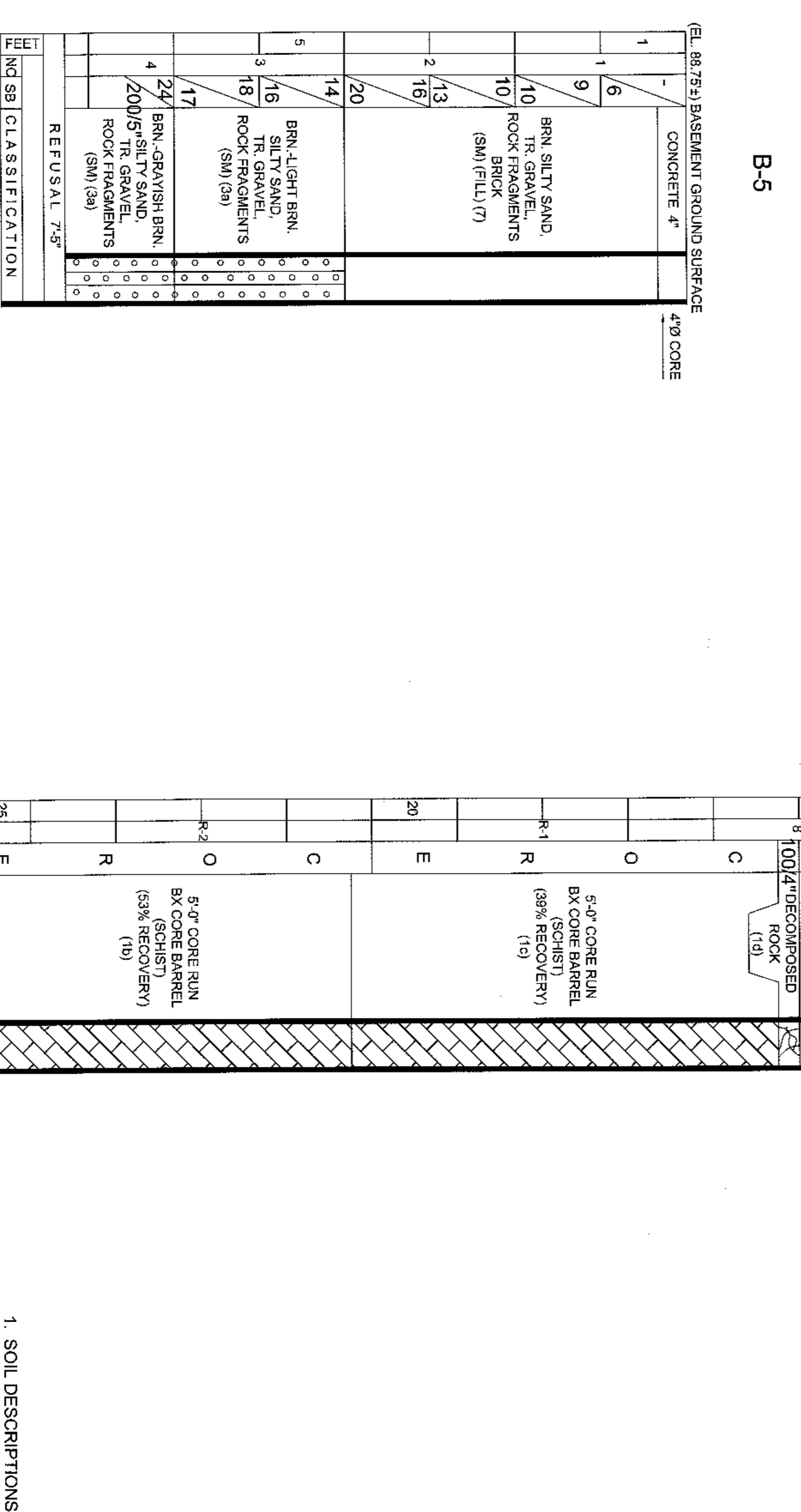
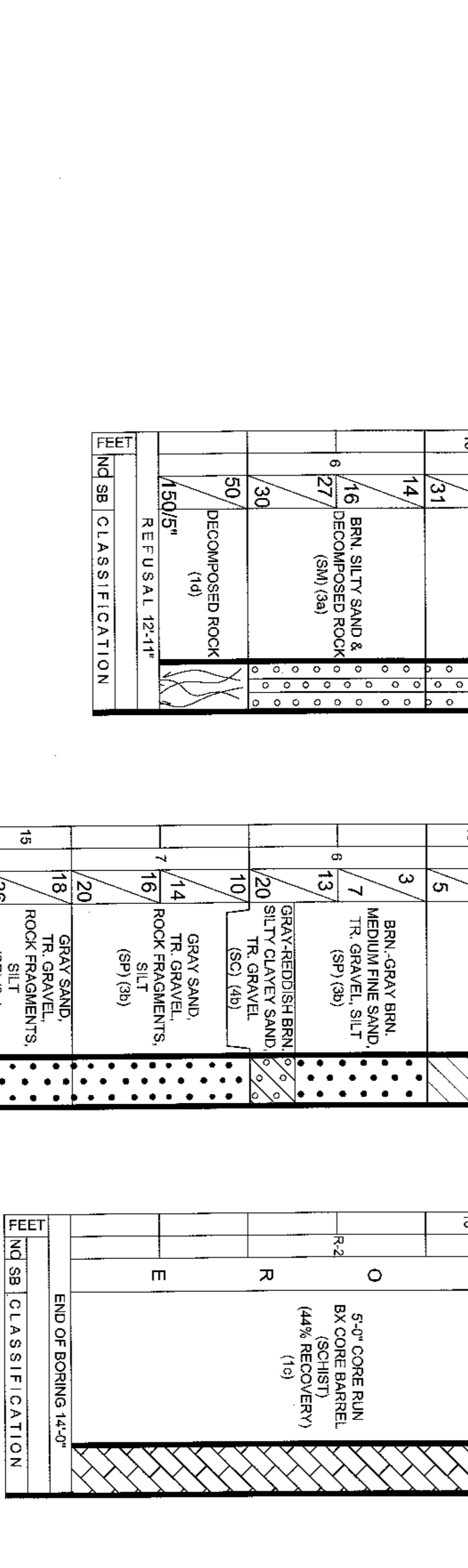
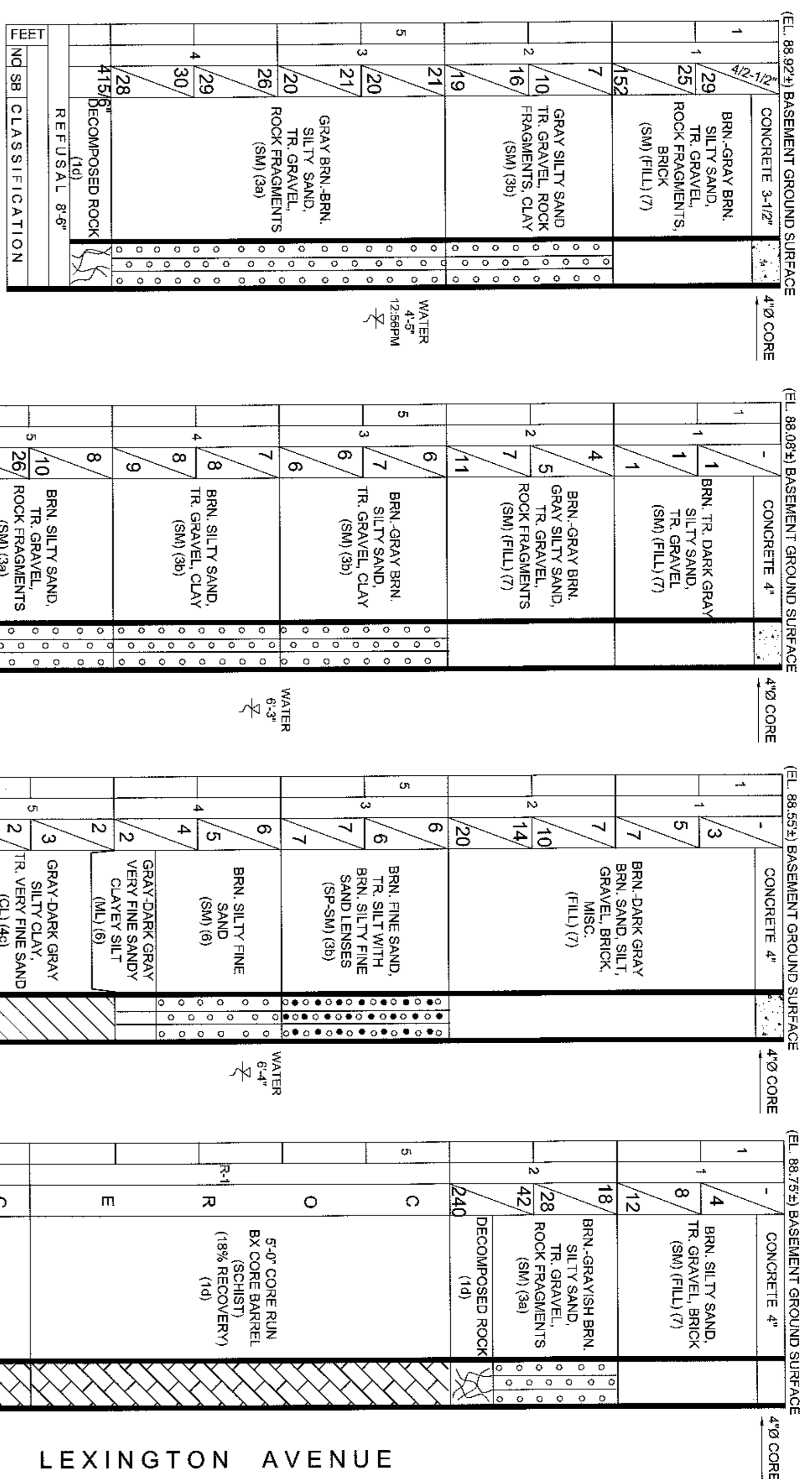
Very truly yours,

SOIL MECHANICS DRILLING CORP.

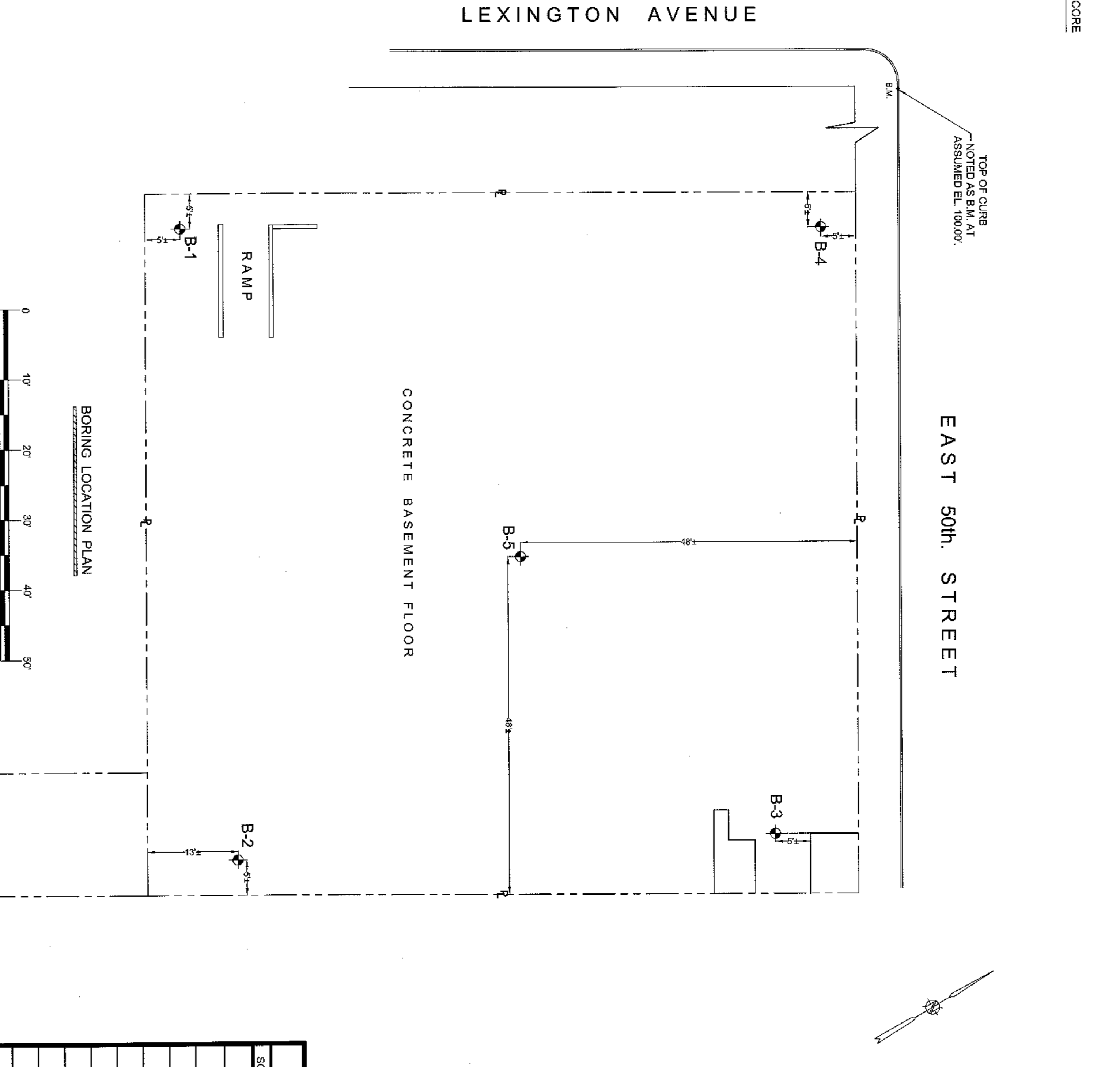
A handwritten signature in black ink, appearing to read 'Carl Vernick', written over the company name.

Carl Vernick, P.E.  
President

CV:mlf  
Encls.



1. SOIL DESCRIPTIONS ARE BY VISUAL EXAMINATION OF SOIL SAMPLES RECOVERED DURING DRILLING OPERATIONS.
2. SOIL DESCRIPTIONS ARE IN ACCORD WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM.
3. WATER WHERE ENCOUNTERED AT THIS SITE WAS MEASURED INSIDE THE DRILL CASING AT THE COMPLETION OF EACH BOREHOLE.
4. SOIL STRATIFICATIONS ARE ACCURATE TO WITHIN TWO FEET VERTICALLY.
5. SOIL SAMPLES WERE OBTAINED USING PORTABLE EQUIPMENT STANDARD PENETRATION TRIPPOD MOUNTED ROPE & CATHEAD 140lb. HAMMER 2-Ø SPLIT SPOON SAMPLER AT 30" FALL.
6. BORING GROUND SURFACE ELEVATIONS SHOWN ARE REFERENCED TO TOP OF CURB AT ASSUMED B.M. EL. 100.00'.
7. BORINGS DRILLED IN ACCORD WITH THE NEW YORK CITY BUILDING CODE.



**NOTES**

1. SOIL DESCRIPTIONS ARE BY VISUAL EXAMINATION OF SOIL SAMPLES RECOVERED DURING DRILLING OPERATIONS.
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7. BORINGS DRILLED IN ACCORD WITH THE NEW YORK CITY BUILDING CODE.

**UNIFIED SOIL CLASSIFICATION**

SOIL GROUPS	TYPICAL NAMES AND SOIL SYMBOLS	BED ROCK	ALLOWABLE SOIL BEARING PRESSURES, NYC BLDG CODE TABLE 1804.1
14 THROUGH 18	GRAVELS		6,000
19	SANDS		4,000
20	SILTS		2,000
21	CLAYS		1,000
22	PEATS		500
		CONCRETE	10,000
		BRICK	3,000
		ROCK	10,000
		GLASS	5,000
		CEMENT	10,000
		ASPHALT	2,000
		PAVEMENT	1,000
		FOUNDATION PRESSURE	10,000
		FOUNDATION PRESSURE	10,000

**SOIL MECHANICS DRILLING CORP.**  
 228 EAST 50th STREET  
 MANHATTAN, NEW YORK

PROJECT: 228 EAST 50th STREET, MANHATTAN, NEW YORK

DATE: AUGUST 2, 2013

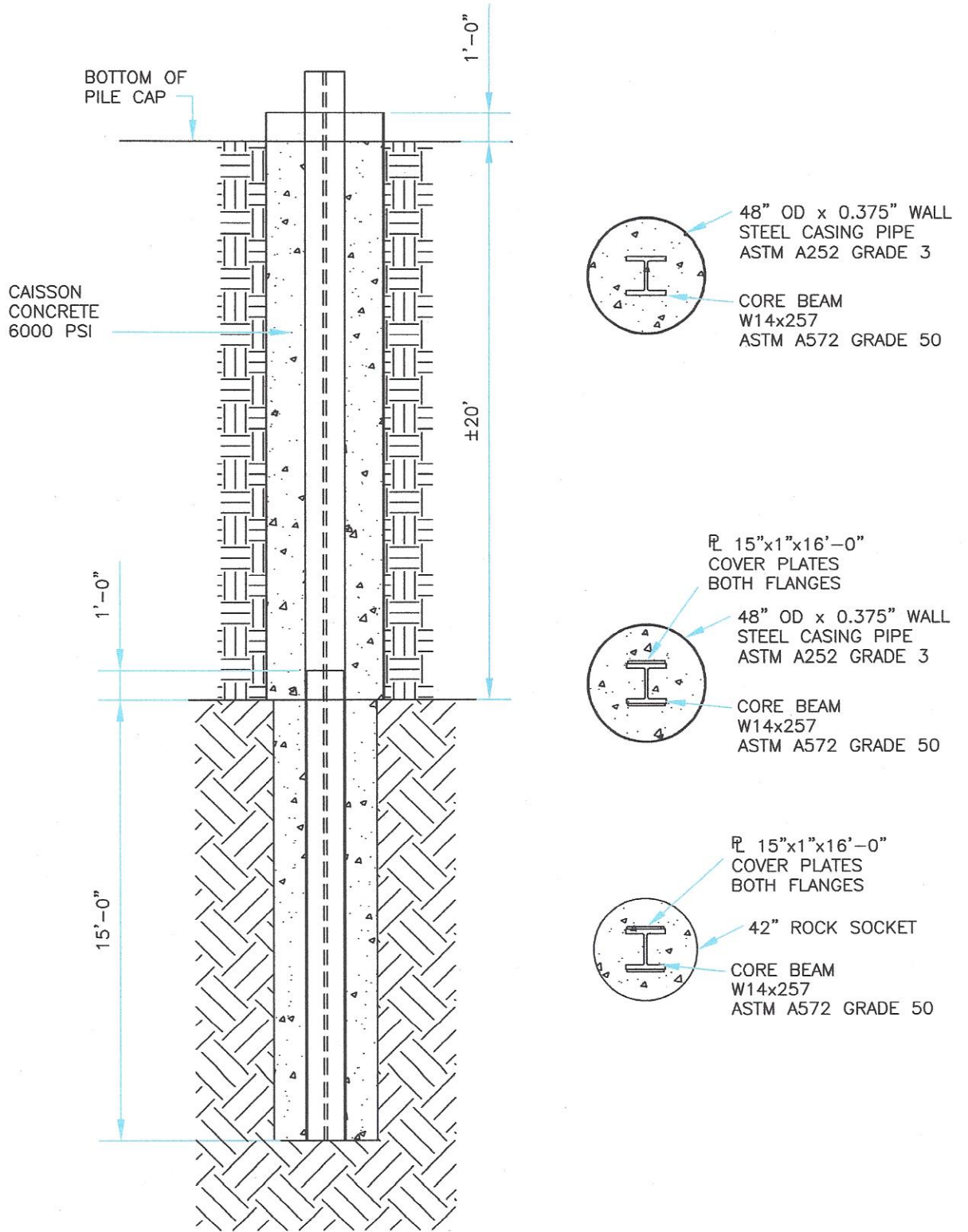
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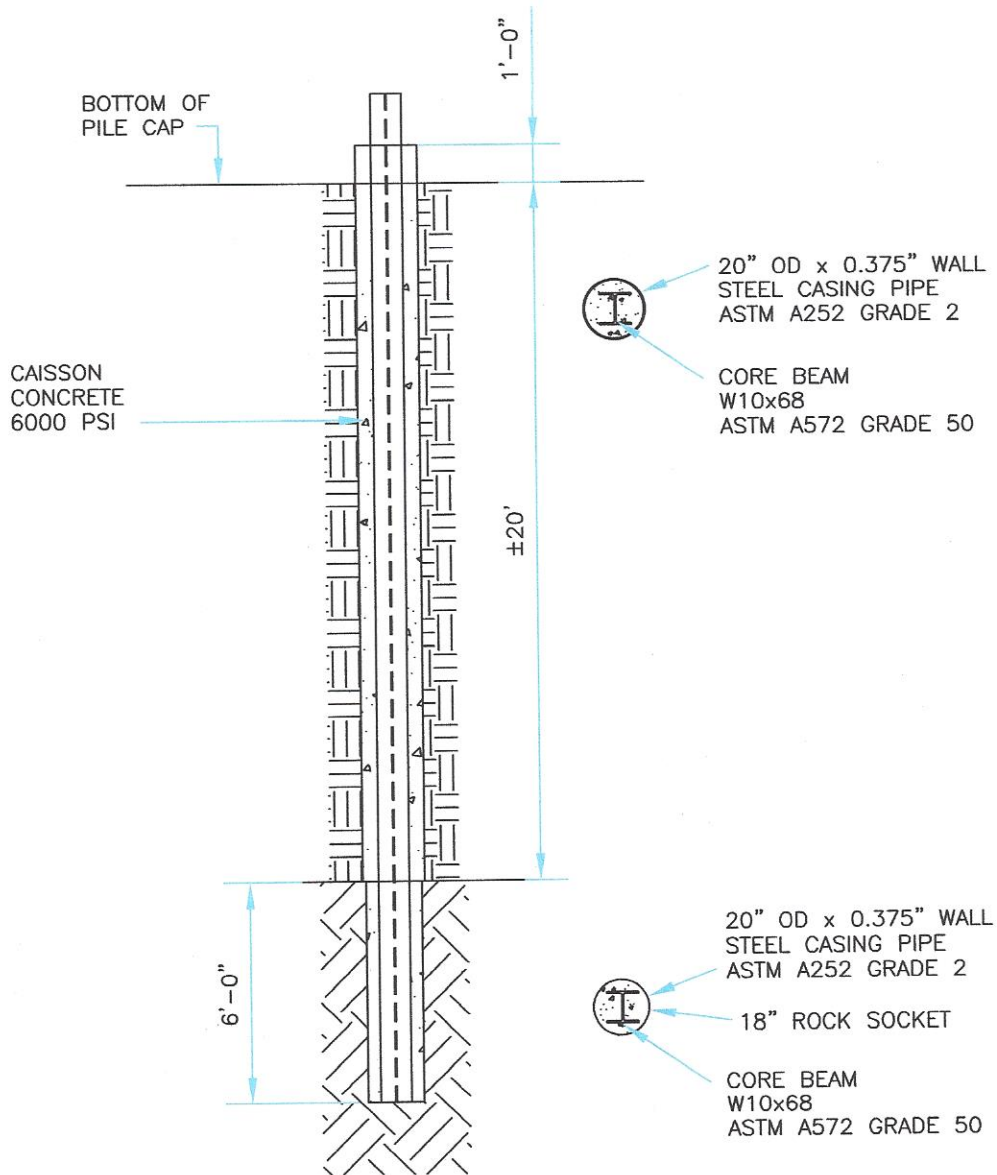
CHECKED BY: [Name]

PROJECT NUMBER: B-001.00





**CAISSONS AT COLUMN FOOTINGS**  
**5100 KIPS COMP.**



**CAISSONS UNDER SHEAR WALLS  
 AT 4'-0" CC  
 920 KIPS COMP.  
 440 KIPS TEN.**

The wind loads provided in this report include the effects of directionality in the local wind climate. These loads do not contain safety or load factors and are to be applied to the building's structural system in the same manner as would wind loads calculated by code analytical methods.

Table 2a: Summary of Predicted Peak Overall Structural Wind Loads

My (lb-ft)	Mx (lb-ft)	Mz (lb-ft)	Fx (lb)	Fy (lb)
7.83E+08	9.64E+08	1.31E+07	1.45E+06	1.72E+06

Notes:

- The above loads are the cumulative summation of the wind-induced loads at the Structural level "GROUND" (i.e. grade) centered about the reference axis shown in Figure 4, exclusive of combination factors.
- A total damping ratio of 2.0% of critical was used for structural load calculations.
- The above loads are based on the structural properties as provided on December 3, 2015. The natural building periods were as follows:
  - Mode 1: 8.30 sec (primarily X coupled with Y & Torsion)
  - Mode 2: 7.85 sec (primarily Y coupled with X & torsion)
  - Mode 3: 3.45 sec (primarily torsion).
- The above loads correspond to a 50-year return period basic wind speed (3-second gust) of 98 mph.

Table 3a: Effective Static Floor-by-Floor Wind Loads

Floor Level	Height (ft) Above "GROUND"	Fx (lb)	Fy (lb)	Mz (lb-ft)
GROUND	0.00	10000	12600	150000
2	40.00	12700	15200	168000
3-AMEN	53.00	9000	11500	116000
4-MECH	81.00	12300	12400	137000
5	103.58	9200	9000	105000
6	114.25	6100	5800	68000
7	124.92	6400	5900	71000
8	135.58	6600	5900	72000
9	146.25	6900	6000	74000
10	156.92	6100	6100	68000
11	167.58	6400	6100	69000
12	178.25	6700	6100	67000
13	188.92	6900	6200	76000
14	199.58	7100	6300	85000
15	210.25	8000	7200	98000
16	222.08	8600	7900	103000
17	232.92	7400	6500	62000
18	244.25	7900	6900	64000
19	255.08	8500	7500	70000
20	265.92	9100	8200	78000
21	276.75	9800	9000	86000
22	287.58	10400	9800	93000
23	298.42	11100	10600	101000
24	309.25	11800	11400	109000
25	320.08	12500	12300	117000
26-MECH	331.25	16400	16400	160000
27	345.08	22100	22700	193000
28	356.08	15100	15700	134000
29	367.08	15900	16700	141000
30	378.08	16500	17600	148000
31	389.08	17700	19000	161000
32	401.08	18300	19700	164000
33	412.08	18200	20000	164000
34	423.08	18800	21000	171000
35	434.08	19600	22100	179000
36	445.08	20400	23100	187000
37	456.08	21200	24100	195000
38	467.08	21900	25200	204000
39	478.08	22700	26200	212000
40	489.08	23500	27200	220000
41	500.08	24300	28300	228000
42	511.08	25500	29900	241000
43	523.08	26200	30900	243000
44	534.08	25900	30800	240000
45	545.08	26500	31700	246000
46	556.08	27300	32800	253000
47-MECH	567.25	37400	45800	359000
48	581.08	39900	49400	370000
49	592.58	32800	40800	286000
50	604.08	33400	41900	291000
51	615.58	34200	43000	297000
52	627.08	35000	44200	303000
53	638.58	35800	45300	309000
54	650.08	36600	46400	315000
55	661.58	37300	47500	321000
56	673.08	38100	48600	327000
57	684.58	39600	50500	340000
58	697.08	39900	51100	337000
59	708.58	39100	50700	330000
60	720.58	40900	52700	348000
61-RES	734.08	42200	54700	362000
62-MECH	746.75	58600	78900	464000
63-DAMP	761.25	68500	90200	584000
64-ROOF	788.75	81700	109200	621000
65-TOB	803.00	15200	19500	167000
<b>SUMS</b>		<b>1.45E+06</b>	<b>1.72E+06</b>	<b>1.31E+07</b>

Notes:

- The loads given in this table should be used with the load combination factors given in Table 4a.
- The loads given in this table are centered about the reference axis shown in Figure 4.
- The above loads correspond to a 50-year return period basic wind speed (3-second gust) of 98 mph.

Table 4a: Recommended Wind Load Combination Factors

Factor for Simultaneous Application of Loads in Table 3a			
Load Case	X Forces (Fx)	Y Forces (Fy)	Torsion (Mz)
1	+100%	+45%	+35%
2	+100%	+45%	-50%
3	+100%	-45%	+35%
4	+100%	-45%	-50%
5	-90%	+35%	+60%
6	-90%	+35%	-30%
7	-90%	-65%	+60%
8	-90%	-65%	-30%
9	+60%	+95%	+35%
10	+60%	+95%	-40%
11	+50%	-100%	+30%
12	+55%	-100%	-45%
13	-30%	+95%	+35%
14	-30%	+95%	-40%
15	-50%	-100%	+30%
16	-50%	-100%	-40%
17	+30%	+30%	+100%
18	+55%	+35%	-100%
19	+30%	-30%	+100%
20	+55%	-40%	-100%
21	-55%	+30%	+100%
22	-30%	+35%	-100%
23	-55%	-30%	+100%
24	-30%	-40%	-100%

Note:

- Load combination factors have been produced through consideration of the structure's response to various wind directions, modal coupling, correlation of wind gusts and the directionality of strong winds in the local wind climate.

The wind loads provided in this report include the effects of directionality in the local wind climate. These loads do not contain safety or load factors and are to be applied to the building's structural system in the same manner as would wind loads calculated by code analytical methods.

Table 2b: Summary of Predicted Peak Overall Structural Wind Loads

Cases	Damping	My (lb-ft)	Mx (lb-ft)	Mz (lb-ft)	Fx (lb)	Fy (lb)
1	2%	6.48E+08	8.50E+08	1.06E+07	1.21E+06	1.53E+06
2	3%	5.56E+08	7.61E+08	9.49E+06	1.04E+06	1.38E+06

Notes:

- Above damping ratios were used along with the following periods:  
 Mode 1: 8.30 sec (primarily X coupled with Y & Torsion)  
 Mode 2: 7.85 sec (primarily Y coupled with X & torsion)  
 Mode 3: 3.45 sec (primarily torsion).
- The above loads are the cumulative summation of the wind-induced loads at the Structural level "GROUND" (i.e. grade) centered about the reference axis shown in Figure 4, exclusive of combination factors.
- The above loads are based on the structural properties as provided on December 3, 2015.
- The above loads correspond to a 50-year return period basic wind speed (3-second gust) of 90 mph.

Table 3b: Effective Static Floor-by-Floor Wind Loads

Floor Level	Height (ft) Above "GROUND"	Fx (lb)	Fy (lb)	Mz (lb-ft)
GROUND	0.00	10000	9200	119000
2	40.00	12200	13300	143000
3-AMEN	53.00	8500	10100	98000
4-MECH	81.00	11400	12600	124000
5	103.58	8500	8700	93000
6	114.25	5900	5600	60000
7	124.92	5800	5700	62000
8	135.58	6000	5700	63000
9	146.25	6200	5700	64000
10	156.92	5600	5800	59000
11	167.58	5800	5800	60000
12	178.25	6000	5800	59000
13	188.92	6100	5900	66000
14	199.58	6100	5900	73000
15	210.25	6800	6800	83000
16	222.08	7300	7400	87000
17	232.92	6200	6200	54000
18	244.25	6600	6400	54000
19	255.08	7000	7000	59000
20	265.92	7500	7600	65000
21	276.75	8100	8300	71000
22	287.58	8600	9000	77000
23	298.42	9100	9700	83000
24	309.25	9700	10400	89000
25	320.08	10300	11200	96000
26-MECH	331.25	13500	14700	130000
27	345.08	18600	19900	155000
28	356.08	12400	14200	109000
29	367.08	13000	15000	115000
30	378.08	13600	15800	121000
31	389.08	14500	17000	131000
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33	412.08	15000	18000	132000
34	423.08	15500	18800	137000
35	434.08	16100	19700	144000
36	445.08	16800	20600	150000
37	456.08	17400	21500	157000
38	467.08	18000	22400	163000
39	478.08	18700	23300	170000
40	489.08	19300	24200	176000
41	500.08	19900	25100	182000
42	511.08	20900	26500	193000
43	523.08	21500	27400	194000
44	534.08	21200	27200	191000
45	545.08	21800	28100	196000
46	556.08	22400	29000	202000
47-MECH	567.25	31200	39800	285000
48	581.08	33300	42800	294000
49	592.58	27100	35700	228000
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59	708.58	32400	44400	262000
60	720.58	33600	46600	277000
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62-MECH	746.75	49800	67800	366000
63-DAMP	761.25	56300	79800	464000
64-ROOF	788.75	68100	95200	493000
65-TOB	803.00	11700	18400	134000
<b>SUMS</b>		<b>1.21E+06</b>	<b>1.53E+06</b>	<b>1.06E+07</b>

Notes:

- The loads given in this table should be used with the load combination factors given in Table 4b.
- The loads given in this table are centered about the reference axis shown in Figure 4.
- The above loads correspond to a 50-year return period basic wind speed (3-second gust) of 90 mph.

Table 4b: Recommended Wind Load Combination Factors

Factor for Simultaneous Application of Loads in Table 3b

Load Case	X Forces (Fx)	Y Forces (Fy)	Torsion (Mz)
1	+100%	+45%	+35%
2	+100%	+45%	-45%
3	+100%	-45%	+35%
4	+100%	-45%	-45%
5	-100%	+35%	+60%
6	-100%	+35%	-30%
7	-100%	-65%	+60%
8	-100%	-65%	-30%
9	+60%	+90%	+35%
10	+60%	+90%	-45%
11	+60%	-100%	+30%
12	+60%	-100%	-45%
13	-35%	+90%	+35%
14	-35%	+90%	-45%
15	-55%	-100%	+30%
16	-55%	-100%	-45%
17	+30%	+30%	+100%
18	+55%	+35%	-95%
19	+30%	-30%	+100%
20	+55%	-40%	-95%
21	-60%	+30%	+100%
22	-30%	+35%	-95%
23	-60%	-30%	+100%
24	-30%	-40%	-95%

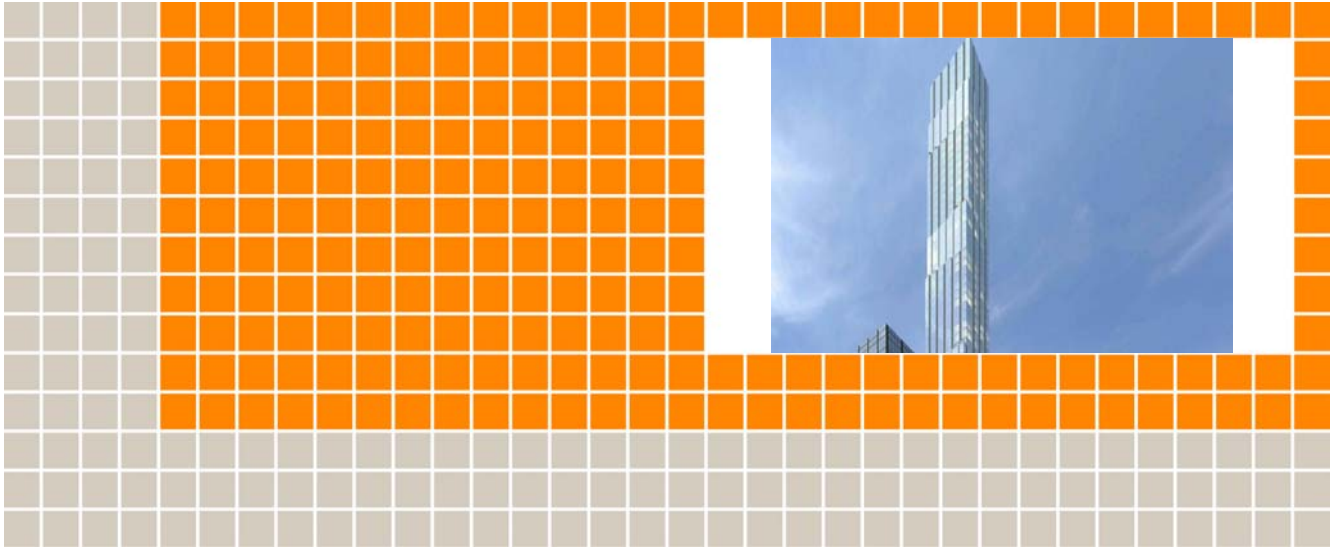
Note:

- Load combination factors have been produced through consideration of the structure's response to various wind directions, modal coupling, correlation of wind gusts and the directionality of strong winds in the local wind climate.

## APPENDIX C

138 EAST 50<sup>TH</sup> STREET

STRUCTURAL DESIGN CRITERIA



138 East 50<sup>th</sup> Street  
Ceruzzi Properties, LLC  
SLCE Architects

March 30, 2016





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# QM

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks				
Date	03-30-2016			
Prepared by	HM			
Signature				
Checked by	HM			
Signature				
Authorized by	SM			
Signature				
Project number	B1590-031			
File reference				

WSP USA  
228 E45th St.  
New York, NY 10017

<http://www.wsp-usa.com>

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STRUCTURAL DESIGN CRITERIA

# 1 Design Criteria

## DESIGN LOADS

### 1.1 DESIGN DEAD LOADS

Dead loads are calculated from the known self-weight of the materials used for the construction of the frame.

### 1.2 DESIGN SUPERIMPOSED DEAD LOADS

Additional allowance is made for fixed finishes and services as follows:

Residential Floors (ceiling, partitions, finishes)	15 psf
Balconies	30 psf
Lobby/public spaces (ceiling, dense finishes)	30 psf
Retail (ceiling, dense finishes)	30 psf
Mechanical room (ceiling, suspended services, partitions)	30 psf
Elevator/stair lobbies within core (Ceiling, suspended services and dense finishes)	30 psf
Roof (Finishes, insulation, tapered slab, ceiling)	30 psf

### 1.3 DESIGN LIVE LOADS

The following loads have been adopted in the design:

Residential	40 psf
Balconies	100 psf
Staircases	100 psf
Main roof (access for maintenance only)	40 psf
Mechanical areas	150 psf
Public areas (lobby)	100 psf

The building structure will be checked for the loadings applied from the proposed temporary cranes and hoists by the Contractor, with the capacity of the structure being adjusted where necessary.

### 1.4 WIND LOADS

Wind loads acting on the main building frame and the various elements of cladding were determined by wind tunnel testing as described in RWDI's wind tunnel testing report.



### 1.5 EARTHQUAKE LOADS

Static Analysis using New York City Building Code – 2014 Edition

$S_s = 0.365 \text{ g}$

$S_1 = 0.071 \text{ g}$

Seismic Importance Factor = 1.0

Site Class = B

Ordinary Reinforced Concrete Shearwalls

R = 5

### 1.6 CLADDING LOADS

Unitised window wall 25 psf

### 1.7 TEMPORARY HOIST AND CRANE LOADS

The permanent structure will be designed to support the design loads provided by the Contractor from the temporary cranes and hoists.

### 1.8 ELEVATOR LOADS

All elevator shaft walls and elevator machine room slabs will be designed for elevator loadings provided by the elevator consultant.

### 1.9 FAÇADE ACCESS EQUIPMENT LOADS

The structures will be designed to support the window cleaning equipment loads to be provided by the façade access consultant.

### 1.10 MECHANICAL EQUIPMENT REPLACEMENT LOADS

All equipment replacement in and around the building is to be undertaken in such a manner as not to exceed the imposed loadings indicated on the WSP PB loading plans.

### 1.11 CONSTRUCTION LOADS

To be determined by the Contractor.



## 2 Other Design Criteria

### 2.1 DEFLECTION, GENERALLY

Vertical floor deflections for concrete floor construction:

Calculation of deflections includes long-term effects after installation of partitions/façade:

Spandrel beam/slab edge live load + super-imposed dead load deflection: 1/2"

Super-imposed + live load deflection: span / 480 (beam supported at each end)  
span / 240 (cantilever beam)

### 2.2 HORIZONTAL SWAY

#### Wind

Sway deflection of any one story (to be accommodated by the perimeter cladding and interior partitions) for a 1 in 50 year design wind speed: 1/2"

#### Earthquake

Sway deflection of any one story: 1/2"

### 2.3 VIBRATION LIMITS ON STEEL FRAMED FLOORS

The floor structures will be designed in accordance with the American Institute of Steel Construction's Design Guide 11 – Floor Vibrations Due To Human Activity.

Floor designs will meet the criteria specified for walking excitation and rhythmic excitation. Acceptance levels of acceleration vary based on occupancy use and type of structural element.

Vibratory isolation of equipment at mechanical levels will be designed by others.

### 2.4 DURABILITY OF THE STRUCTURE

The structure is to have a design life of 50 years. Some structural elements, such as those with concrete wearing surfaces and corrosion protection will require periodic inspection and maintenance.

### 2.5 FIRE RESISTANCE PERIODS

The following fire resistance periods are adopted in the design of the building:

Beams and slabs:	2 hours
Columns:	3 hours



**Material Properties**

**Concrete**

Shearwalls:	$f'c = 14,000\text{psi to }10,000\text{psi}$	$E = 7,080\text{ksi to }6,270\text{ksi}$
Columns:	$f'c = 14,000\text{psi to }10,000\text{psi}$	$E = 7,080\text{ksi to }6,270\text{ksi}$
Link Beams:	$f'c = 14,000\text{psi to }10,000\text{psi}$	$E = 7,080\text{ksi to }6,270\text{ksi}$
Floor Slabs:	$f'c = 6,000\text{psi to }10,000\text{psi}$	$E = 4,415\text{ksi to }5,700\text{ksi}$
Bearing Foundations:	$f'c = 10,000\text{psi}$	$E = 5,700\text{ksi}$
Foundation Walls:	$f'c = 14,000\text{psi to }10,000\text{psi}$	$E = 7,080\text{ksi to }5,700\text{ksi}$

**Grout:**

Grout around anchor bolts and under base plates is to be a non-metallic non-shrink or expansive grout.

**Reinforcement:**

Deformed reinforcing bars                      ASTM A615 Gr.60

**Structural Steelwork:**

Hot rolled steel sections                      ASTM A992 Gr.50  
HSS sections                                      ASTM A500 Gr.B  
Plate and misc. steel                            ASTM A572 Gr.50  
Channels and angles                            ASTM A36



## 3 Design Standards

### 3.1 STATUTORY CODES OF PRACTICE

New York City Building Code - 2014

ACI-318 Building Code Requirements for Structural Concrete and Commentary

ACI-530-08: Building Code Requirements and Specifications for Masonry Structures and Related Commentaries

AISC-13<sup>th</sup> ed.: LRFD Manual of Steel Construction



## 4 Design References

Other publications used include:

IBC-2009: International Building Code

ASCE7-05 Minimum Design Loads for Buildings and Other Structures

AISC Design Guide 11 – Floor Vibrations Due To Human Activity

### 4.1 COMPUTER PROGRAMS

RAM Structural System Version 14.02.01

SAFE Version 12.0

ETABS non-linear Version 9.7.4

### 4.2 UNITS

The structural calculations will be completed using the following units.

Length:	feet and inches
Mass:	Kip / g
Force:	Kip
Stress:	K/in <sup>2</sup>
Moment:	Kip-ft
Velocity:	Miles/hour
Acceleration:	ft/s <sup>2</sup> and milli-g