The New York Times Building

ARCH 631 Case Study

Group: Fangfei Li | Jiyuan Li | Shunan Zhao | Shuyao Su | Yingzi Zhang

Overview

Location: Manhattan , New York
Owner: The New York Times Company
Architect:Renzo Piano Building Workshop/FXFOWLE ARCHITECTS, P.C.
Structural Engineer:Thornton Tomasetti
Area: 1,700,000 sf
Completion Date: 2007

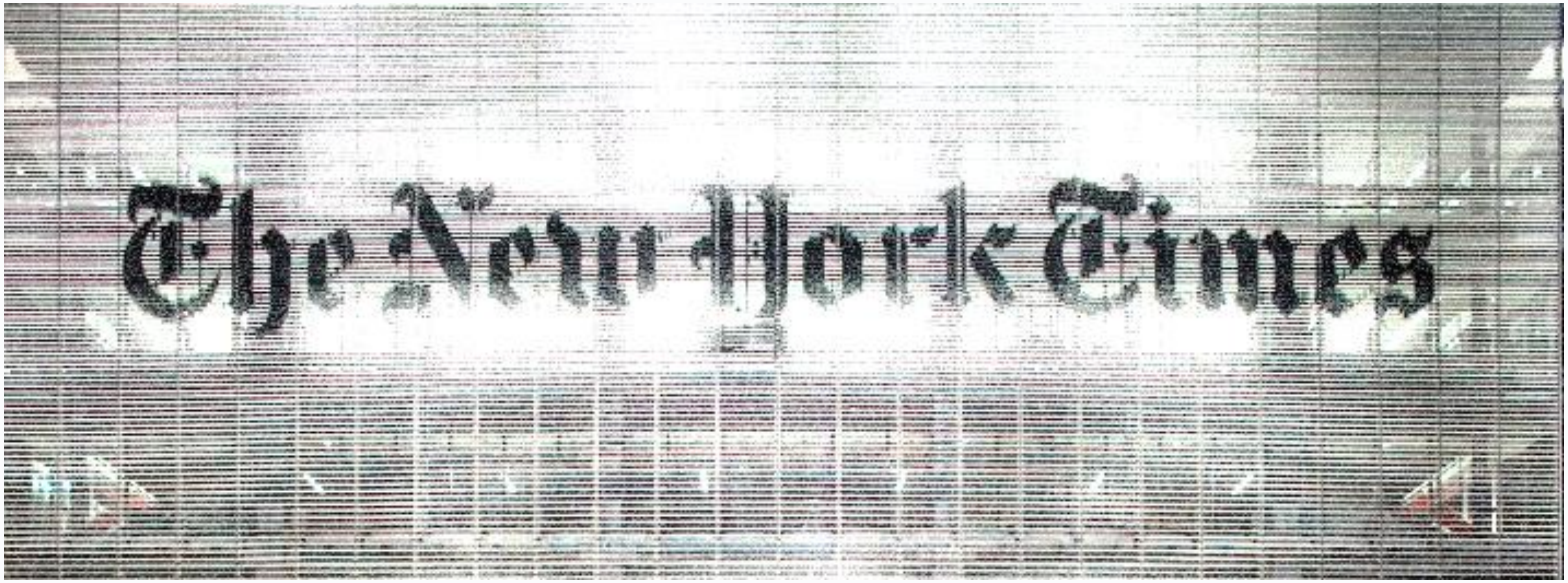
Prospective

a signature building in the New York City skyline

a fitting home for a 21st-century media company

reinforcing the values of the Times Company and its culture of transparency and openess

a flagship building promoting sustainability, lightness, and transparency



Architect
Renzo Piano

Design Competition in 2000
Featured proposals from today's most renowned architects
Italian architect Renzo Piano won the competition
Partnered with FXFOWLE ARCHITECTS NYC office

Design feature

The New York Times building is a 52-story high-rise office tower of lightness and transparency topped by a mast that disappears into the sky.

Concept
Exemplify transparency and lightness through every detail

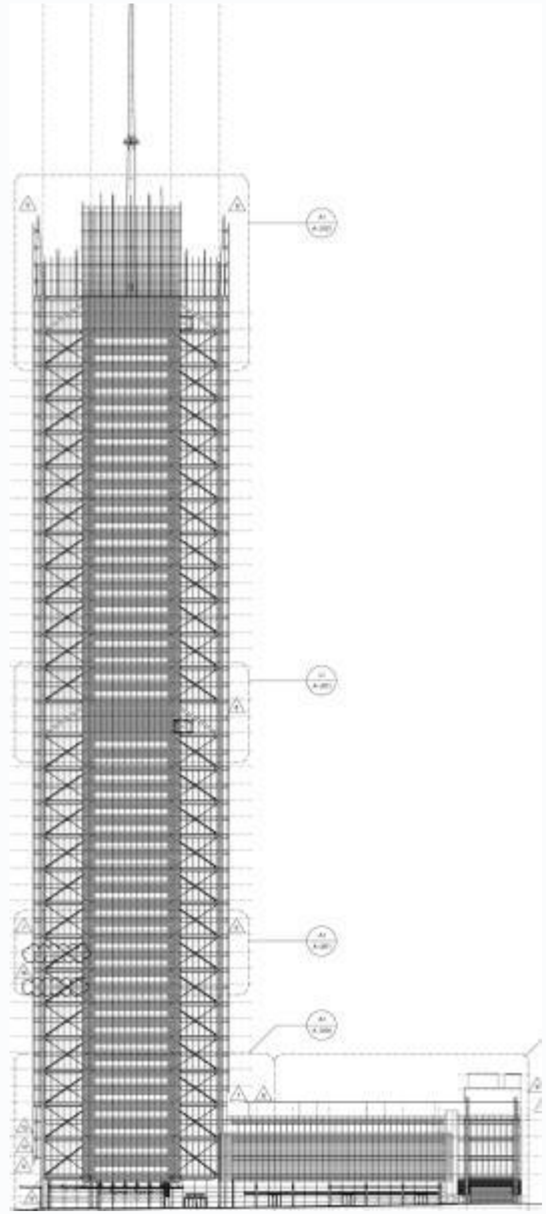
Elements
elegant structural steel exoskeleton
a glass and ceramic curtain wall

Layout

mast tops off at 1,046 feet

curtain wall ends at 819 feet

52 stories 746 feet tall



Elevation © Thornton Tomasetti **2005**

Mechanical 51 story

FCRC 29-52stories

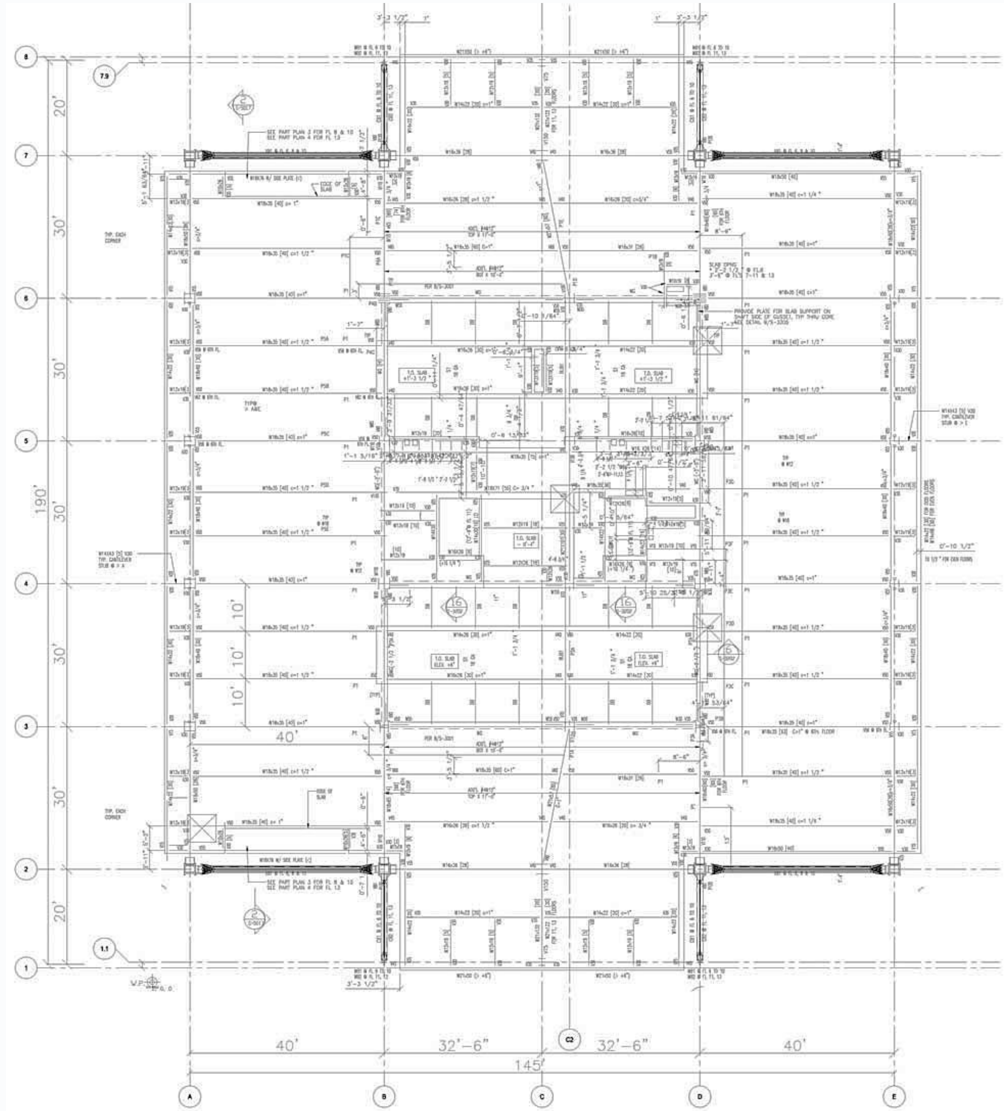
Mechanical 28 story

NY Times 27 stories

NY Times 5-story podium

lobby, retail space and a glassenclosed garden

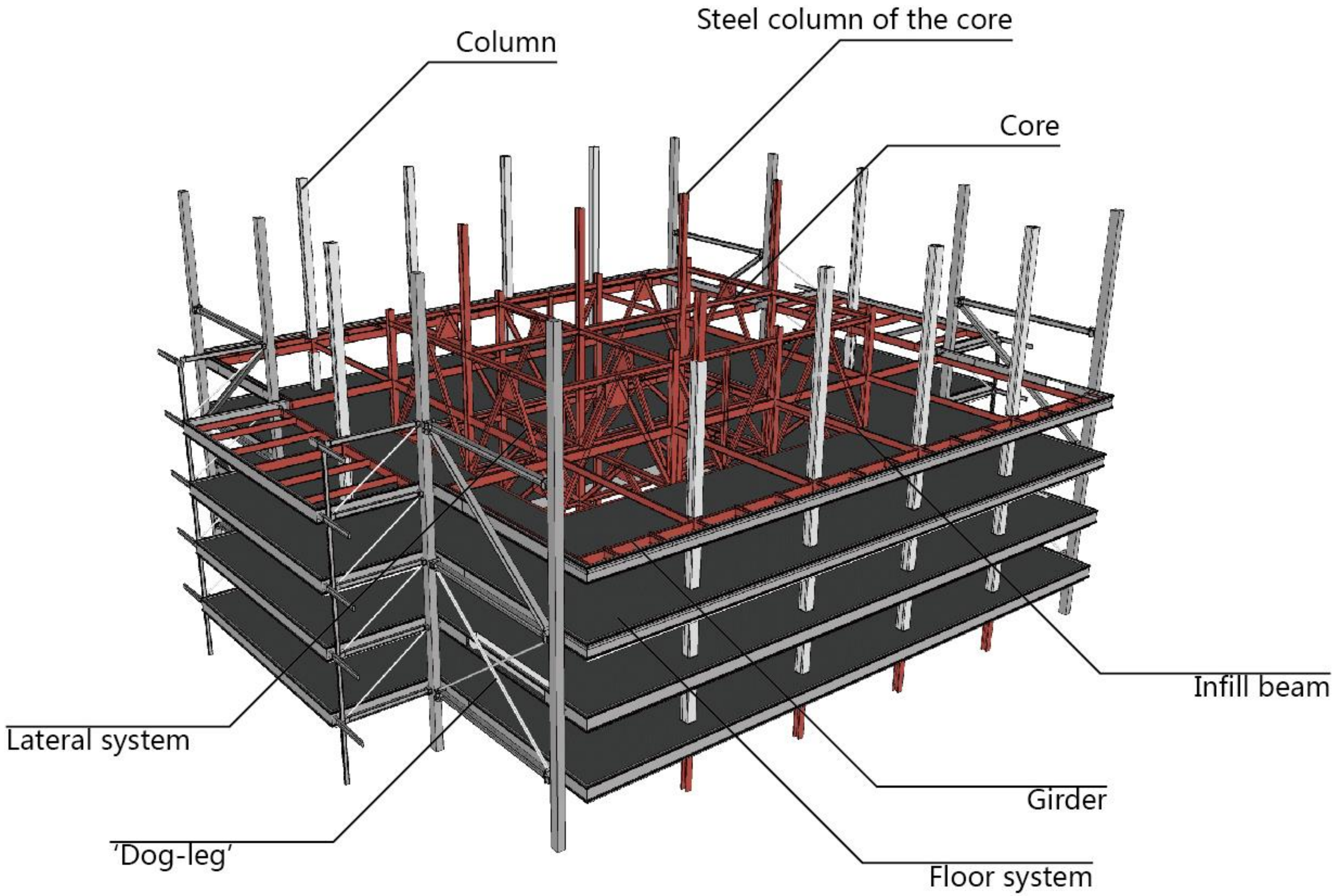
Layout



Typical Tower Framing Plan
(Benjamin and Erika & Andres, 2009)

Floorplate
Approximately 32,000 rentable square feet with 30-foot column spacing

Main Structural System



Foundation

The ground floor plan is consisted by a tower portion and a podium portion.

In structure studying, we will focus on the tower portion which is 1,046 ft high.

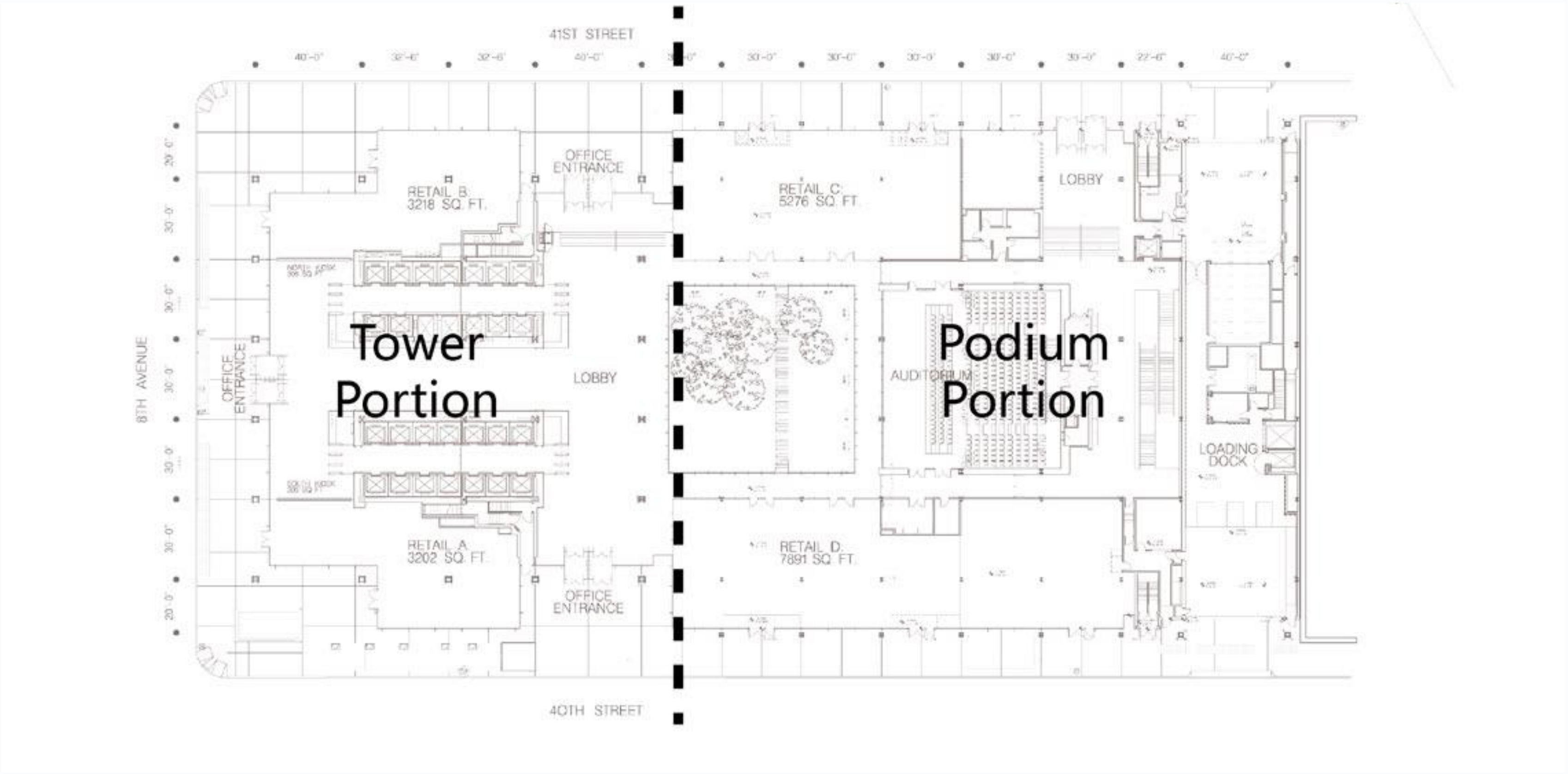


Figure 2 Ground plan portions

Two different kinds of foundation constructions

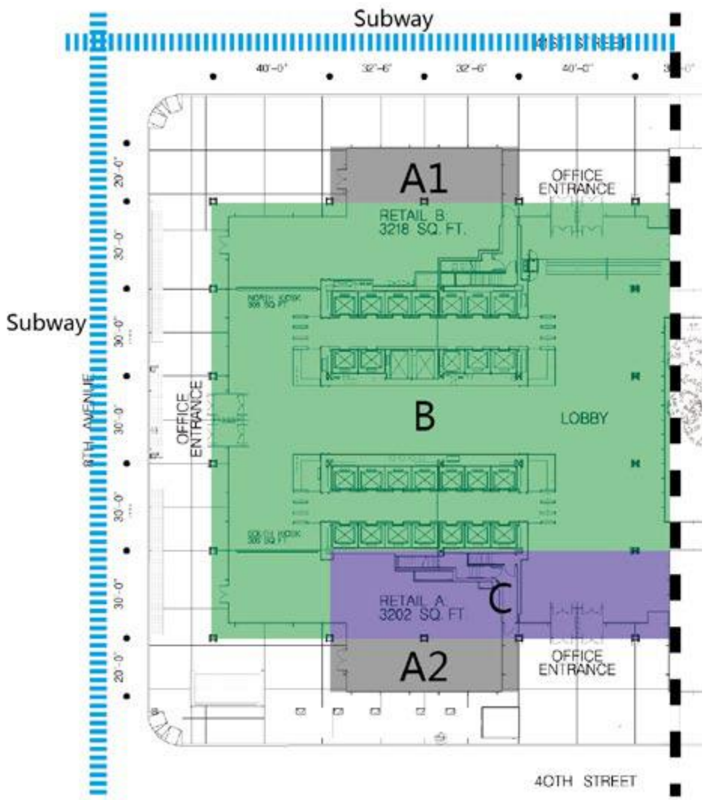


Figure 3 Foundation location diagram

The main portion showed on Figure 3-B
Beared on stronger rocks
21 of the columns : **spread footings**

The portion showed on Figure 3-C
7 columns: concrete-filled steel **caisson**

The portion A1 and A2 are cantilevered structure and do not need a foundation.

Floor System

The floor system includes aurrounding bays to a centeral core.
The bay sizes are varied

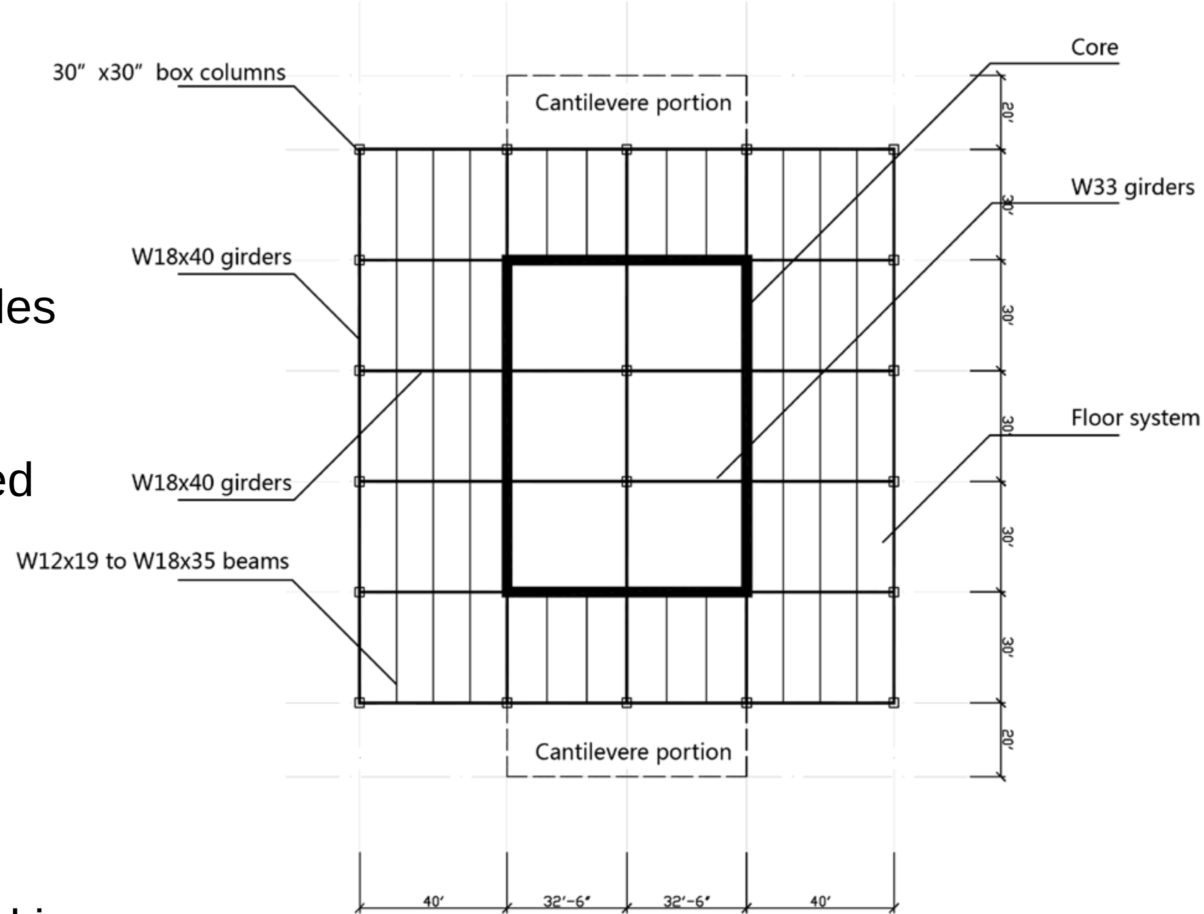


Figure 4 Floor structure system

concrete and metal decking

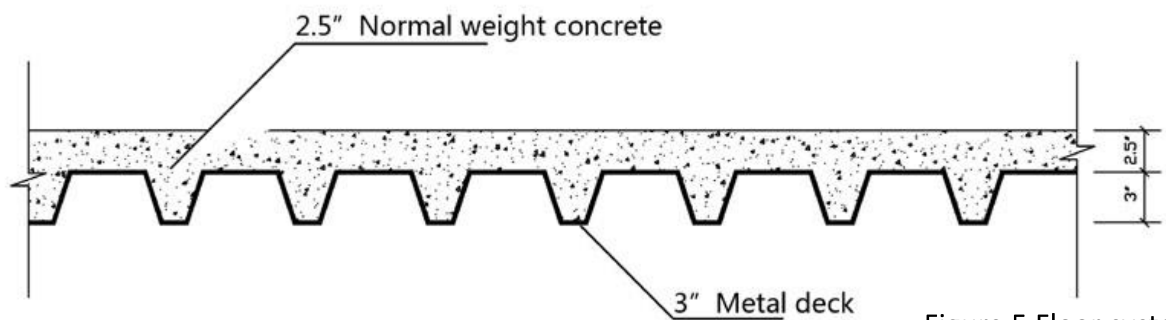


Figure 5 Floor system

'Dog-leg' connection

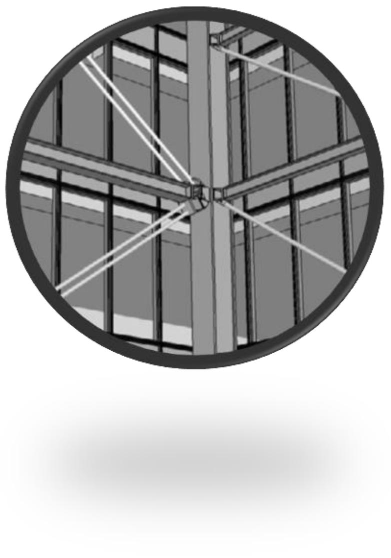


Figure 6 Exposed connection

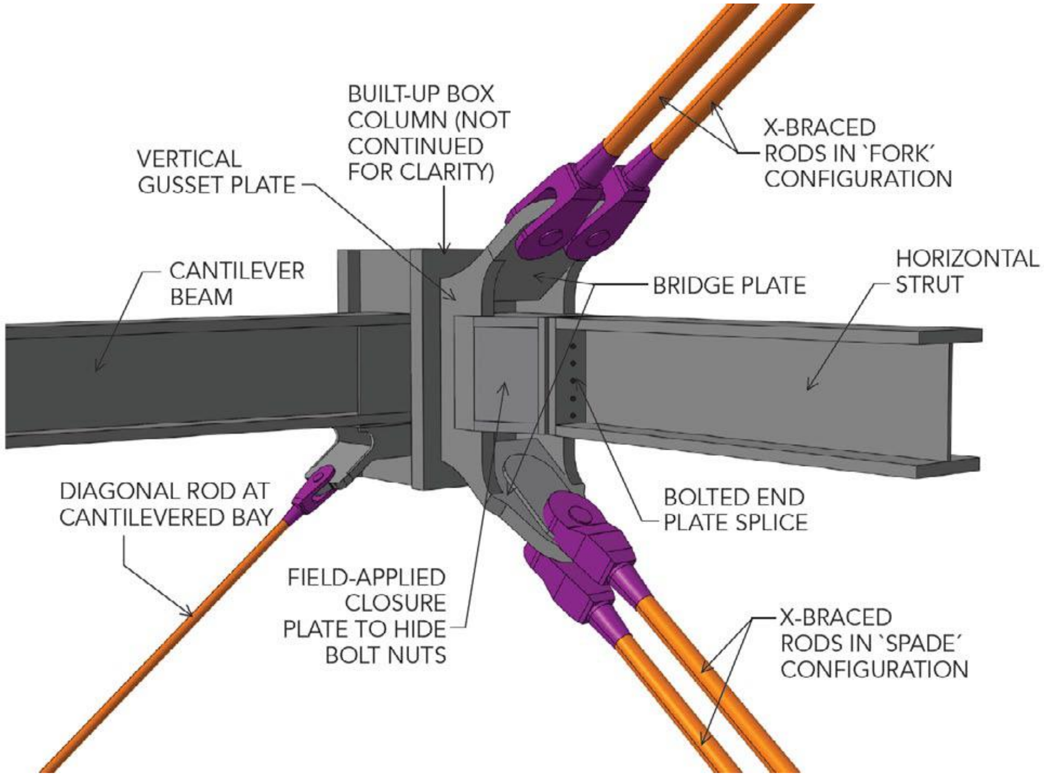


Figure 7 Connection(Jeffrey ,Kyle, and Thomas, 2009)

Lateral System

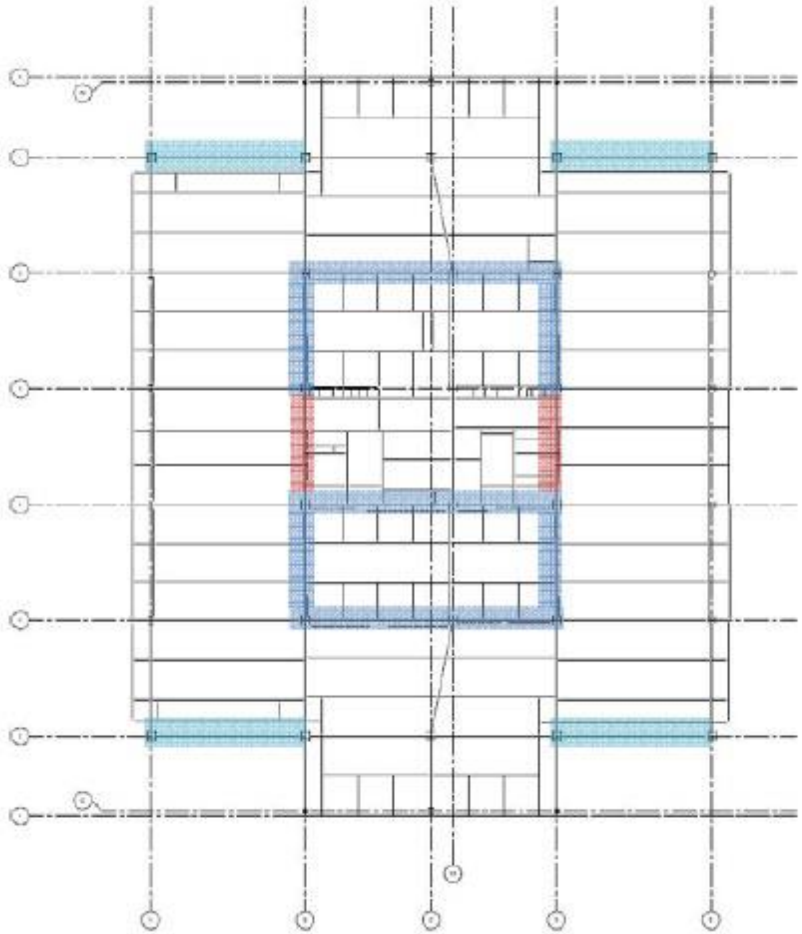


Figure 8 Typical lateral system, 1F-27F
(Benjamin and Erika & Andres, 2009)

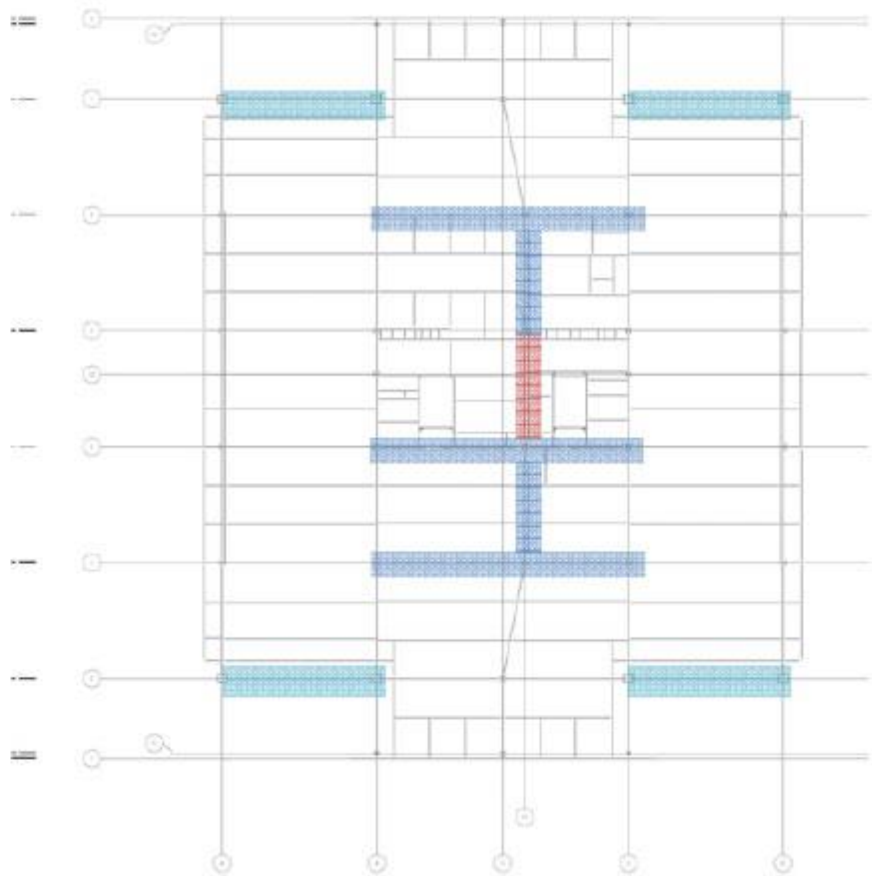


Figure 8 Typical lateral system, 29F-50F
(Benjamin and Erika & Andres, 2009)

Key:

Single Diagonal Bracing

Pre-Tensioned Steel Rod X-Bracing

Chevron & Open Knee Bracing

Loadings

Load Types

Gravity loads: dead loads,live loads and snow loads
Lateral loads: wind loads, seismic loads

A.Gravity loads:

1' Dead loads

It contain the typical tower floor dead load 93psf,typical tower mechanical floor dead loads 110psf, the exterior tower wall system dead load 25psf, total mechanical area roof dead load 100psf and nomal roof dead load 100psf（all above when for seismic should be larger)

2' Live loads

Because we cannot know the weight of the mechanical equipment on the mechanical roof and the mechanical floor ,and no minimum live load is provided in ASCE7-05 and the Building Code of the City of New York, the equipments' self weight was assumed to be equivalent to light manufacturing therefore we can get a minimum live load should be 125 psf.

3' Snow loads

From the ASCE7-05,since the weight of snow on the roof and snow drift is almost 2 times smaller of the controlling roof live load and mechanical area roof live load, we can get a total snow loads 35.28 psf.

Loadings

B. Lateral Loads

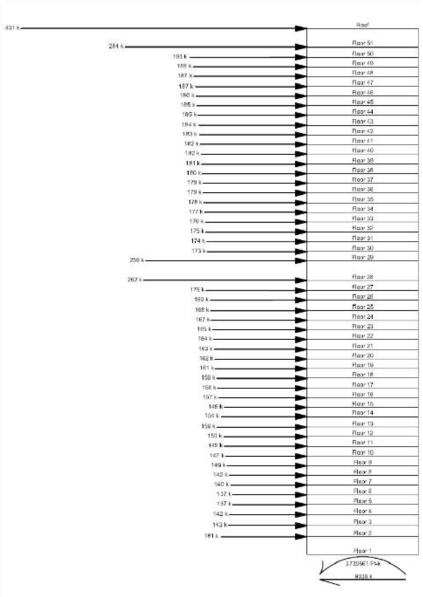
1' Wind load

During the time of the building’ s design, this code permitted the use of a simplified approach for calculating the wind loads of all buildings not more that 300 ft within the Borough of Manhattan. ASCE7-05 was used to analyse the wind load as a method.To simplify the caculation the tower was analyzed with a rectangular foot print instead of a cruciform shape.the screens around each face of the roof top allow air flow through them.After the windward pressure was calculated on this“solid face”, a multiplier of 0.5 was implemented to account for the permeability of the screen.

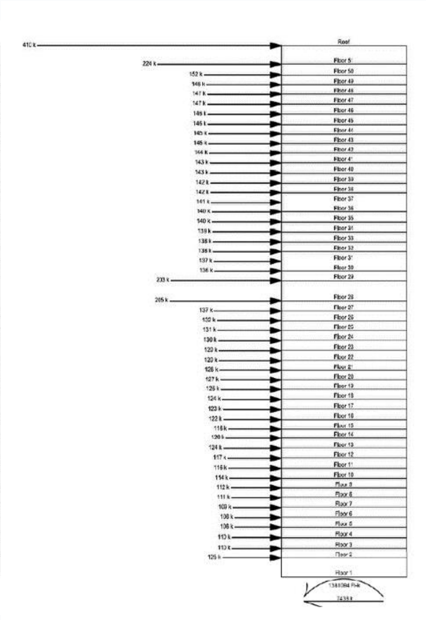
Method Wind Load Design Variables Summary

Variable	Value	Unit	Reference
$V =$	110	miles/hr	ASCE 7-05 6.5.4
$K_d =$	0.85	---	ASCE 7-05 6.5.4.4
Occupancy Category =	III	---	IBC Table 1604.5
Importance factor =	1.15	---	ASCE 7-05 6.5.5
Surface Roughness Category =	B	---	ASCE 7-05 6.5.2
Exposure Category =	B	---	ASCE 7-05 6.5.6
$K_{zt} =$	1	---	ASCE 7-05 6.5.7
$B =$	194	Feet	
$L =$	157	Feet	
$G_f =$	1.032		West-East Direction
	1.048		North-South Direction

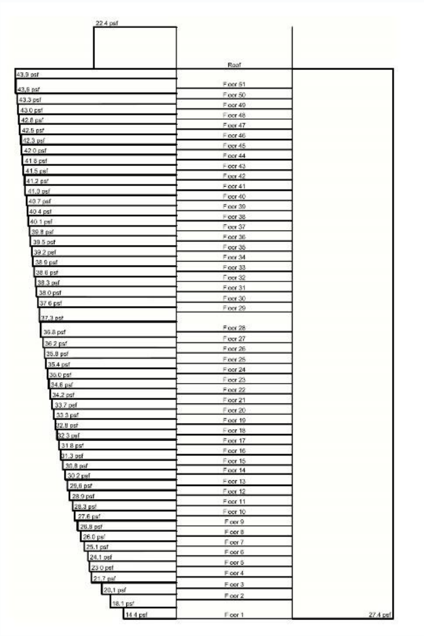
Loadings



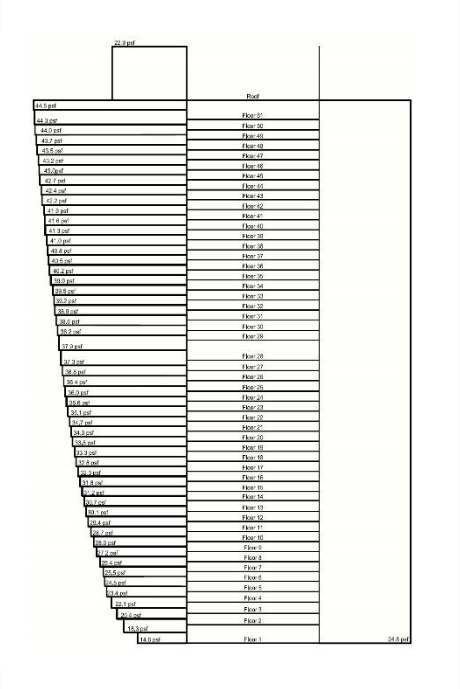
West-East Wind Force



North-South Wind Force



West-East Wind Pressure



North-South Wind Pressure

Conclusion Of wind loads

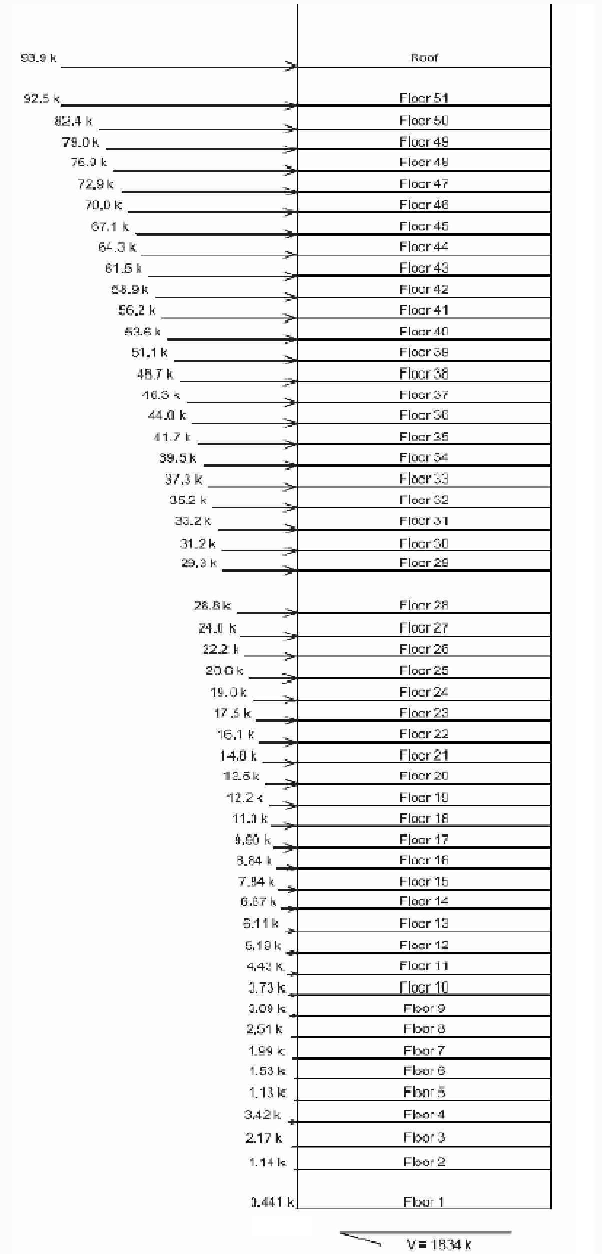
The anaysis shows that the controlling wind loads are in the East/West direction with a base shear of 9336 kips and overturning moment of 3.7 million ft-kips. This direction was expected to control due to its wider façade face.Please note that the base shears and overturning moments calculated in this report only consider the direct loading from windward and leeward pressures.

Loadings

2' Seismic load

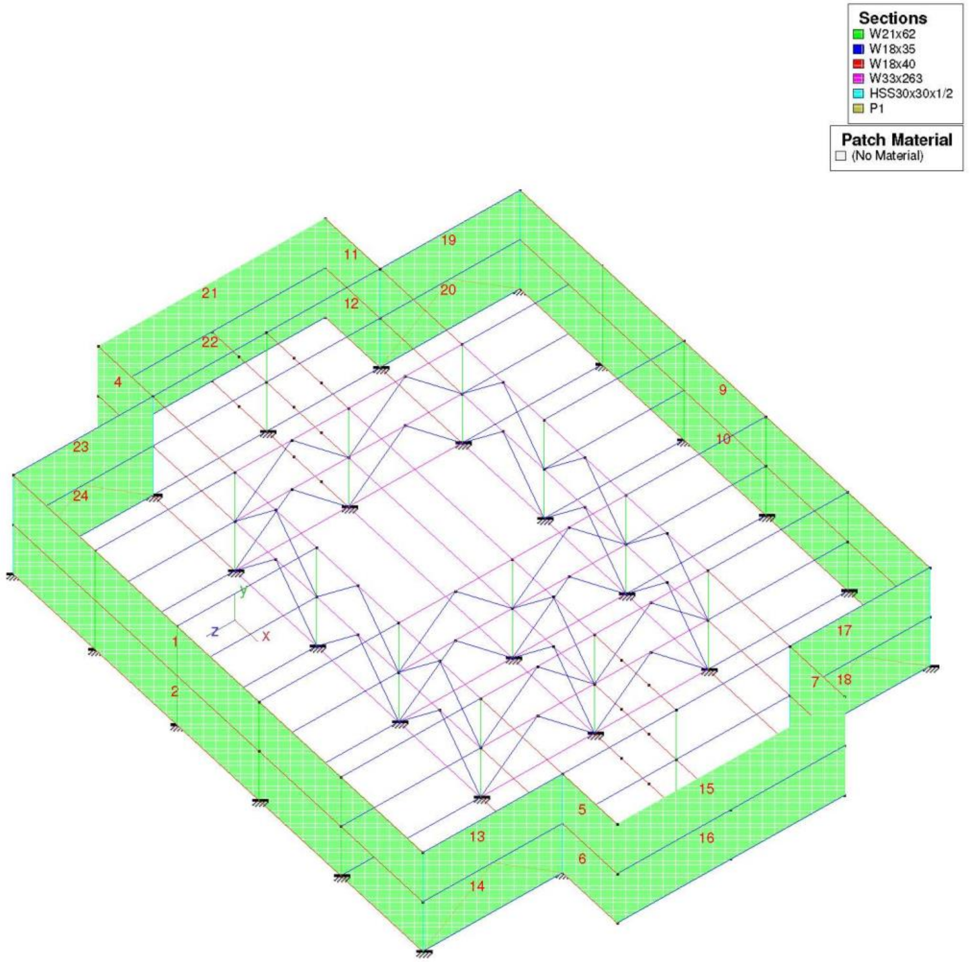
To caculate the seismic loads condition we need to use the New York City Building Code as a basis for calculation. The base shear was determined to be 1834 kips, calculated from the effective seismic weight, including the assumed dead loads and partition loads.The lateral seismic forces at each level increase with elevation, and range from 1.1 kips to 94 kips.Due to the height and location of the New York Times building, it was expected that the lateral loading due to wind pressure would control over seismic loadings.

Seismic Factors Summary		
Site Class	=	C
Occupancy Category	=	III
Importance Factor, I	=	1.25
Latitude	=	40.756
Longitude	=	-73.990
F_a	=	1.20
F_v	=	1.70
S_S	=	0.363g
S_1	=	0.070g
Seismic Design Cat.	=	B

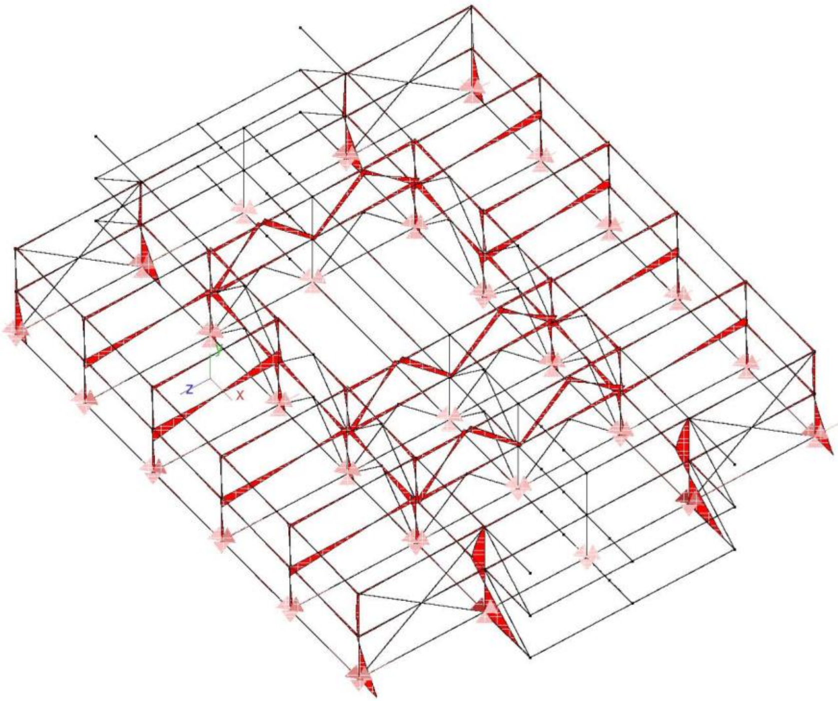


Lateral Seismic Forces, N/S and E/W

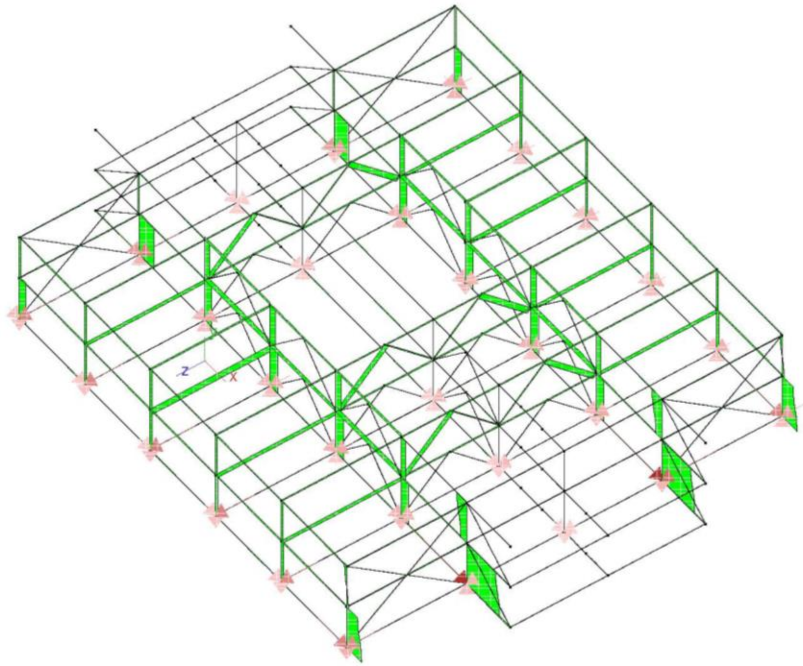
Muliframe Analysis



Floor 23 & 24 Multi-frame



Moment Diagram



Shear Diagram

THANK YOU!

Fangfei Li | Jiyuan Li | Shunan Zhao | Shuyao Su | Yingzi Zhang

Reference List:

The New York Times Company, 2006. *"Ground Level Plan"*, http://newyorktimesbuilding.com/

Benjamin R. Barben, Erika L. Bonfanti, & Anders R. Perez, 2009.
The New York Times Building Technical Report

Jeffrey A. Callow, P.E., Kyle E. Krall, P.E., and Thomas Z. Scarangello, P.E., 2009, "Inside and out",
Modern Steel Construction, Jan 2009