36 West 66th Street
New York, NY

Peer Review Report
Phase I (Foundation) V.2

Rosenwasser/Grossman Consulting Engineers, P.C.

April 18, 2018

Prepared for

West 66th Investor, LLC
c/o Paul Hastings, LLP
75 East 55th Street
New York, NY 10022

Prepared by

Chandra Dinata, PE
Steven Liao, PE
Ben Pimentel, PE

I hereby certify that I have performed the peer review in accordance with the New York City Building Code and requirements set forth therein.

Name: Ben Pimentel

License No.: 086645

Table of Contents

<Appendix>

A. Code Compliant check list

B. Sample of ETABS output

C. Drawing List

1. Project Introduction and Executive Summary

The project site is located between West 65th and West 66th Streets and is bordered by a 3-story NYC-Landmarked building to the northwest, a 6-story building to the southwest and two 32-story buildings to the east. The site is approximately 37,100 ft^2 and the proposed building is designed to be a residential tower consisting of 50 structural levels above grade and two levels below grade. The building height is 720 ft to the Main Roof (approximately 775 ft to the crown).

Rosenwasser/Grossman Consulting Engineers P.C. was retained by the owner, **West 66th Investors LLC**, to provide a peer review on the basis of the 2014 New York City building Code Section BC 1617. Our peer review is divided into two phases: 1) Review of the foundation design and 2) Review of the superstructure design. The clients request these two phases to accommodate the construction schedule. At phase I (Review of foundation), the overall performance of the structure, the adequacy of the estimated design loads, the selected design criteria, the appropriate interpretation of geo-technical engineering report and the preliminary wind tunnel testing report, and the adequacy of foundation structural members are reviewed. Design of the remaining structural members will be reviewed at the phase II (Review of Superstructure).

The ETABS structural finite element model was developed by RGCE based on the latest available geometry and structural drawings provided by the Engineer of Record. During our review, there is a constant dialogue between the Engineer of Record and our office for clarification of the design intent where it may be unclear in the submitted drawings. Please note that this peer review report is only based on the documentations available to RGCE. Below is the list of documents Rosenwasser/Grossman Consulting Engineers P.C. received from the Engineer of Record:

1) Supplemental CD Progress Set Structural drawings dated March 19th, 2018. See Appendix C for the drawing list.
2) 100% DD Structural drawings (DOB Filing Set) dated November 14th, 2017.
3) Progress Set Architectural drawings dated October 27th, 2017

4) Geotechnical report prepared by Langan dated November 18th, 2015
5) Supplemental geotechnical report prepared by Langan dated November 29th, 2017
6) Preliminary structural wind loadings prepared by RWDI dated April 20th, 2017
7) Memorandum of supplementary damping system by RWDI dated April 20th, 2017

The peer-reviewed items of the building by this office are summarized as follows:

- Accumulated axial loads for columns and shear wall piers are independently computed and checked;
- The seismic design loads and wind design loads used in the structural design are verified;
- Overall behavior of the structure was reviewed and compared with code criteria;
- The representative structural members were spot-checked using the results from our independent ETABS and SAFE analysis;

It is understood and accepted that the superstructure drawings are "In-Progress". Our review found that the drawings were sufficient to model to tower with supplemental information provided by the E.O.R**.** The designs of the main outrigger wall between 15th - 16th floor and the outrigger wall/beam between 18th - 20th floor has been updated on the CD Progress set dated March 19th, 2018. Based on our overall review of current drawings and our independent checks of some representative structural members, it is our opinion that the designs are in general conformance with the structural design provisions of the NYCBC 2014. The details of our findings are provided at Chapter 4 of this report. Our office will perform the follow-up review of the final construction set to ensure that the designs are compliance with the design code. The Code Compliance of the design according to NYCBC 2014 section BC 1617 is summarized in the checklist (See appendix A)

It shall be noted that Rosenwasser/Grossman Consulting Engineers P.C reports its own opinion and functions solely as a peer reviewer regarding the design by the Engineer of Record (McNamara Salvia Structural Engineer) and this report makes no warranty that the project as a whole is code compliant or safe or that all members are designed properly. The structural Engineer of Record shall retain sole responsibility for the structural design of the entire building.

2. Design Parameters and Building System

2.1 Design Codes and References

- 2014 New York City Building Code
- ACI 318-11 Building Code Requirements for Structural Concrete and Commentary
- ASCE 7-05 and ASCE 7-10 Minimum Design Loads for Buildings and Other Structures

2.2 Material Properties

The following materials are specified in the structural drawings.

- Concrete shear walls and columns: 12,000 psi to 8,000 psi
- Concrete Slabs: 10,000 psi to 6,000 psi
- Reinforcing bars: Grade 75 for #11, #14 and #18, Grade 60 for #11 and smaller

2.3 Design loads

2.3.1 Floor Uniform Gravity Loads (based on the loading schedule on S-001 drawing)

LOADING SCHEDULE				
Occupancy	Superimposed Dead Load (psf)	Live Load (psf)	Live Load Reduction	Concentrated Load (lbs)
Residential	15	40	Yes	
First Floor Lobbies and Public Areas	30	100	No	
Residential Storage	5	125	No	
Mechanical Areas	30	150	No	
Elevator Machine Rooms	30	75+Equip but not less than 150	No	300 (Grating, on area of 4in²)
Driveway	50	50	No	
Roof	40	40	No	
Corridors above 1st floor	15	100	No	
Amenity	30	100	No	
Terraces	50	100	No	or specific landscaping loads
Offices	15	50	Yes	
Classroom	15	40	Yes	
Public Assembly - synagogue	30	100	No	
Stairs	5	100	No	

The façade load for typical floors is 20 psf x story height.

RGCE: The superimposed dead load (SDL) and live load indicated are code compliant and in conformance with conventional practice. However, based on our design experiences, we believe that the 15 psf SDL for the typical luxury residential floors (20^{th} Floor and above) is the lower bound value and we recommended that the design team and developer consider to increase the SDL to 30 psf at minimum particularly for the slab design to better serve the lifecycle of the slab. The E.O.R. has agreed that the 30 psf SDL will be used for floor 20 and above. The foundation designs were reviewed considering the larger SDL and found to be acceptable.

2.3.2 Snow Loads

The ground snow loads, Pg = 25 psf, the flat roof snow loads, Pf =21 psf and the Ct = 1.2 are indicated on drawing S-001.

2.3.3 Wind Loads

Wind tunnel testing was done by RWDI in order to estimate the design wind loads (50-year recurrence) for design of structural members.

The perception to motion at the topmost residential floor was evaluated using the acceleration criteria provided by ISO 10137: 2007 for building at 1-year return period

- Basic Wind Speed
  - 50-year recurrence interval - as per NYCBC 2014: 98mph measured at 33 ft above ground as a 3 second gust (Based on local wind climate with annual probability with 0.02) in all directions.
- Importance Factor: $I_W = 1.0$ (Structural Occupancy Category II)
- Assumed damping ratio
  - For estimation of wind loads for strength design: 1.5% of critical damping
  - For evaluation of perception to motion: 1.5% of critical damping were assumed for estimating accelerations. The top occupied floors of the tower are expected to experience accelerations that exceed both the 1-year and 10-year motion comfort criteria for a residential occupancy. The peak 1-year

and 10-year accelerations are 13 milli-g and 30 milli-g, respectively. The implementation of Tuned Sloshing Damper (TSD) on the roof has been studied to reduce accelerations to acceptable levels. The TSD system of two-stacked bi-directional tanks with dimensions of 40’ L x 38’ W x 11’ H is currently being proposed. With this proposed TSD (4.3% damping), the peak 1-year and 10-year accelerations are approximately 8 milli-g and 18 milli-g, respectively.

RGCE: The TSD will be reviewed on Phase II (Review of Superstructure)

- Design wind loads for 50 years recurrence wind (wind tunnel testing)
  - Maximum wind load in E-W direction: 2090 kips (Wind load case 1 to 4)
  - Maximum wind load in N-S direction: 3440 kips (Wind load case 9-16)

As required by code, the comparison of the wind tunnel load, the ASCE-7 wind load and the seismic load are listed on the table below. The wind tunnel overturning moment is greater than 80% ASCE 7-05 Wind Load.

	X-direction (E-W)		Y-direction (N-S)	
	Shear (kips)	Moment (k-ft)	Shear (kips)	Moment (k-ft)
Wind Tunnel 50-year	2,090	1,057,450	3,440	1,749,360
Wind ASCE 7-05	2,800	1,160,000	4,430	2,003,000
Seismic ASCE 7-05 (Ultimate)	1,908	1,129,630	1,908	1,129,630

RGCE: The seismic base shear was updated on CD Progress set dated March 19th, 2018 and we noted that the wind design loads need to be updated prior to the next CD issuance. Our analysis is based on the wind tunnel loads indicated on the table above.

2.3.4 Seismic loads

- Site: New York City ($S_s = 0.281\ g, S_1 = 0.073\ g$).
- Site Class: B ($F_a = 1.0$ & $F_v = 1.0$)
- Importance Factor: $I_E = 1.0$ (Occupancy category II)
- Load Resisting System: "Ordinary Reinforced Concrete Shear Wall"
- Response Modification Factor: $R = 5.0$
- Spectral acceleration at short period (S_{DS}) = 0.1873 g
- Spectral acceleration at 1 second period (S_{D1}) = 0.048 g
- Seismic Design Category: B
- Seismic Base Shear: 1,978 kips
- RGCE: Our independent analysis resulted in
  1. Building Effective Weight: 190,850 kips (approximately)
  2. Seismic Base Shear: 190,850 kips × 0.01 = 1,908 kips
  3. Seismic Overturning Moment: 1,129,630 kip-ft (approximately)

2.4 Structural System

2.4.1 Gravity Load Resisting System

Concrete flat slabs and beams supported by cast-in-place concrete columns and shear walls are utilized to resist the gravity loads.

2.4.2 Lateral Load Resisting System

- Wind loads: Core shear walls in conjunction with full height outrigger wall at 15th floor is utilized to resist the wind loads. The concrete slabs above 20th floor only are considered as part of the lateral system to resist the wind loads.
- Seismic loads: Core shear walls in conjunction with full height outrigger at 15th floor is utilized to resist the seismic loads. The frame is not considered to resist the seismic loads.

2.5 Foundation System

2.5.1 Footings

For the northern portion of the site, the top of sub-cellar floor (approximately EL. 49'-11") is well below the lowest approximate elevation of NYC bedrock Class 1b or better (EL. 51'-6"), therefore the allowable bearing pressure of 40 TSF is recommended to design the tower columns and shear walls.

For the southern portion of the site, the top of sub-cellar floor varies at elevation 44'-5" to 55'-9" and at one of the boring, the top of NYCBC Class 1b or better rock was encountered at about EL. 44. As noted in the Langan supplemental report dated 11/29/17, it was recommended that an alternate footing design be prepared for the southern half of the site using an allowable rock bearing pressure of 20 TSF, in case the contractor chooses not to over-excavate the rock subgrade to achieve 40 TSF.

2.5.2 Mat foundation underneath shear walls

A greater portion of the lateral loads are resisted by shear walls at the base of the building. A continuous 66" and 84" deep mat foundation was designed to transfer the loads from shear walls to bedrock. The uplift forces at the mat foundation were resisted by rock anchors.

2.5.3 Lowest level structural slab resting on rock

The recommended design ground water level is at EL 63'-0" (Approximately 17'-0" below grade level). The site is located in Zone X and is outside of the 100-year and 500-year flood zones (per FEMA/Flood Zone Maps-12/5/2013). Therefore, additional consideration of flood design is not necessary. The lowest level structural slab varies at EL. +44'-5" to EL. 55'-9" and is designed as slab-on-grade. The under-slab drainage will be utilized as recommended by Geotechnical engineer to drain the water.

2.5.4 Uplift control

In order to resist uplift forces on the mat foundations under the shear walls, tie-down anchors were added. A total 13 rock anchors were located in the mat foundation. The required design tension force of each rock anchor was estimated to be 467 kips. 2½" diameter 150 KSI threaded bars were used to achieve the design tension loads.

3. Building Analysis

3.1 Building periods

In our independent ETABS analysis models, the concrete slabs below 20th floor are not considered as part of the lateral system.

The first three preliminary building natural periods are obtained as:

- 1st Mode: 5.9 sec (Primary East-West direction)
- 2nd Mode: 5.5 sec (Primary North-South direction)
- 3rd Mode: 3.7 sec (Primary Torsion)

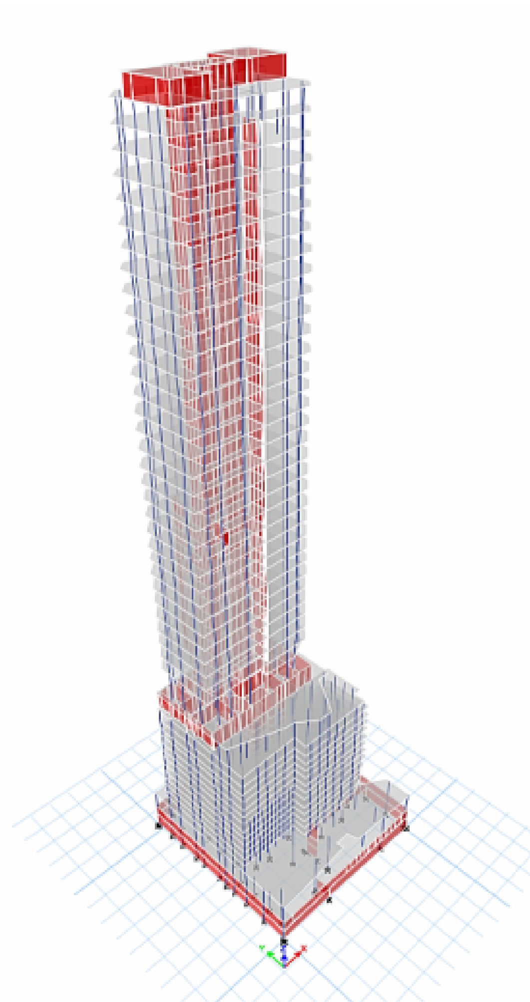


Figure 3.1 Independent ETABS model

3.2 Maximum Drift

A. Wind loads:

The maximum wind overall drift based on 50-year wind tunnel load

- East-West direction: 13.7” due to Wind case 2 (H/630)
- North-South direction: 21.2” due to Wind case 12 (H/410)
- Maximum resultant: 23” (H/375)

The maximum wind inter-story drift based on 10-year wind load (Converted from 50-year wind load)

- East-West direction: h/600 (~ 3/8”) due to Wind case 2 at 32nd floor
- North-South direction: h/375 (~ 9/16”) due to Wind case 16 at 32nd floor
- North-South direction: h/450 (~7/16”) due to Wind case 16 at 32nd floor when considering the movement due to rotation.

<u>RGCE:</u>

1. <u>Our office has calculated the overall drift for 50-year wind load and the inter-story drift for 10-year wind loads.</u>
2. <u>We noted that the 50-year overall drift is exceeding the H/400 which is common design industry practice for buildings of this height and slenderness.</u>
3. <u>For the 10-year inter-story drift, we also noted the maximum computed inter-story drift. Following the conversation with E.O.R, our office has taken into account the effect of the rotational deformation of the building. When considering the rotational deformation, we believe that the inter-story drift is within the common design industry practice for buildings of this height and slenderness. Additionally, since the inter-story drift is closely related to the serviceability, all cladding and non-structural elements in the building shall be designed to accommodate these calculated potential movement of the building.</u>

B. Seismic loads

The maximum seismic elastic inter-story drift

- East-West direction: 0.45 inch (h/425)
- North-South direction: 0.43inch (h/445)

The amplified inter-story drift with $C_d = 4.5$ is less than the allowable maximum drift of (h/50). The seismic deflections were also within the code prescribed limit.

3.3 Human Perception and Occupant Comfort

A high-rise building tends to constantly move under the wind loads and excessive occupant discomfort shall be avoided by limiting the peak accelerations (peak torsional velocities) at the topmost occupied floor of the building. Some design codes specify an approximate formula to estimate the building peak accelerations, but the results are not reliable due to the complexity and uncertainty of wind loading. In current design practice the peak acceleration value based on wind tunnel testing is typically used to check if the human discomfort can be controlled. The wind tunnel testing report indicates that the accelerations at the top occupied floors are exceeding the 18 milli-g upper bound limit of the standard for residential building. The Tuned Sloshing Damper is being proposed to reduce the 1-year and 10-year peak accelerations to the acceptable levels.

4. Structural Members Design and Discussion

The design for the main types of structural members in this building are reviewed and discussed in this section. Note that the discussion is based on the 100% Design Development structural drawings with the understanding that the 100% Construction Document is still underway.

4.1 Foundations walls

- The typical 1'-6" thick wall (Cellar to Ground floor) and 1'-10" thick wall (Sub-cellar to Cellar Floor) along the west, north and east sides have adequate strength to support lateral soil/rock pressure, hydrostatic pressure and surcharge from the sidewalk.

- The approximately 30 ft high unbraced foundation wall along the south side (Section 8/FO-301) and the east side (Section 6/FO-300) are generally sufficient to resist the lateral loads.
- The approximately 30 ft high unbraced foundation wall along the south side with giant horizontal beam (Section 7/FO-301). The wall and beam were checked and found to be conservative.

4.2 Footings supporting tower columns

Column load take down was done for six sampled columns (Interior Column #155, #186 and Exterior Column #103, #106, #160, #183). The accumulated gravity loads are combined with the lateral loads in order to review the adequacy of column footings. The total combined loads are also compared with the foundation loads provided shown in the column schedule.

RGCE: The March 19th, 2018 CD Progress set included elevations of outrigger walls. We have reviewed some large outrigger wall penetrations shown on the set and incorporated in the analysis and we believe that the column footings are properly designed.

4.3 Mat foundation supporting shear wall

The loads from our ETABS independent model was exported to SAFE structural model in order to analyze the foundations. Our analysis indicates that the maximum bearing pressures under (Dead + Live) and (Dead +Wind) loads were acceptable within the allowable bearing pressures of 80 KSF. The bearing pressures are shown on the Figure 4.3.1 and 4.3.2 below.

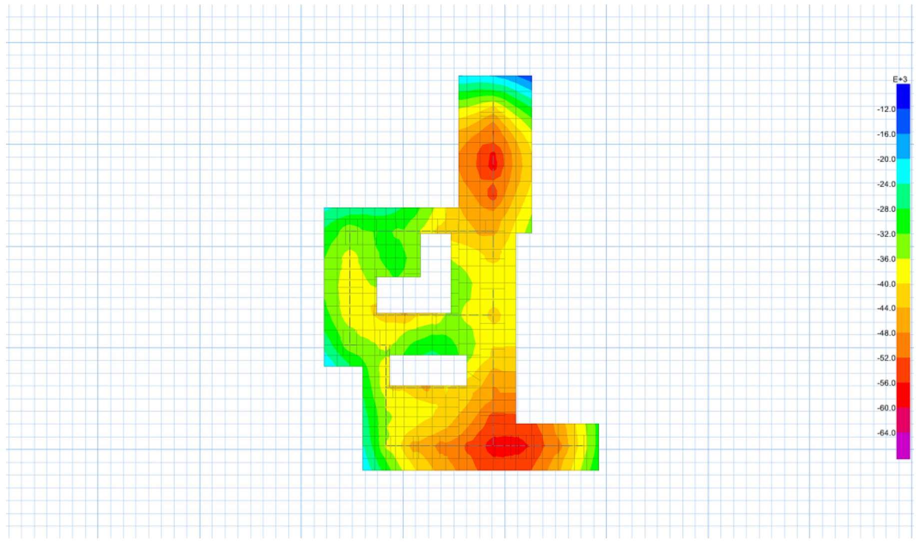


Figure 4.3.1 Maximum Bearing Pressure under (Dead + Live) loads

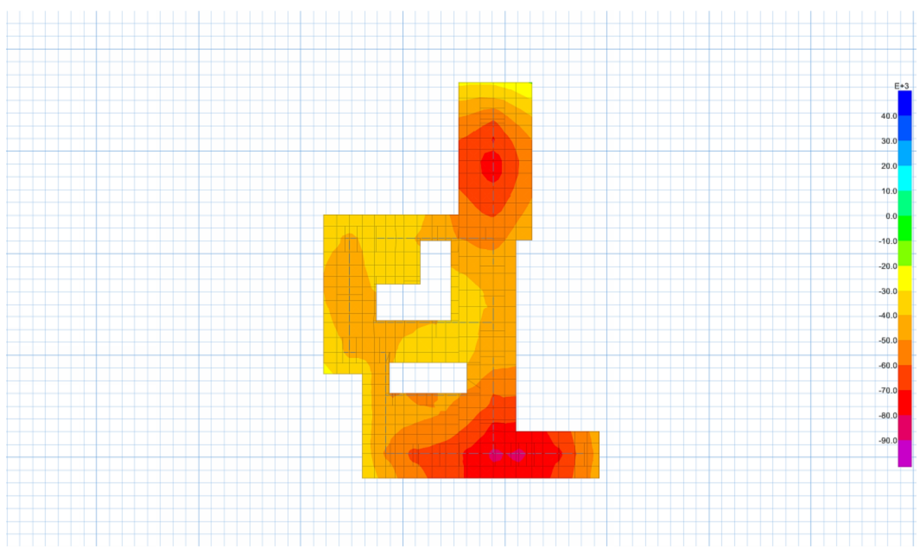


Figure 4.3.2 Maximum Bearing Pressure under (Dead + Wind) loads.

The mat reinforcement was also reviewed and found to be acceptable. Our office will perform the final check once the final construction set is available to ensure that the designs are fully compliance with the design code.

5. Reviewer's Opinions

Rosenwasser/Grossman Consulting Engineers, P.C. has completed the peer review of the design documents prepared by the Engineer of Record (McNamara Salvia Structural Engineer). Based on our overall review of current drawings and our independent checks of only some representative structural members, we have summarized the following:

1. The building design gravity loads and wind design loads used in the structural design are in conformance with the 2014 New York City Building Code and the ACI 318-2011. We have noted our recommendation for the design superimposed load.
2. The layout of the primary structural system is well distributed. The structural plans are generally consistent with the architectural drawings.
3. There are complete load paths for gravity loads in the building structure.
4. The foundation wall drawing has a clear load path of soil lateral loads.
5. The current foundation design is in compliance with the recommendations by the geo-technical engineers.
6. Our analysis shows that the reviewed representative foundation members have been appropriately designed.
7. It is understood and accepted that the superstructure drawings are "In-Progress". Our office will perform the follow-up review of the final construction set to ensure that the designs are fully compliance with the design code.
8. It shall be noted that Rosenwasser/Grossman Consulting Engineers P.C reports its own opinion and functions solely as a peer reviewer regarding the design by the Engineer of Record (McNamara Salvia Structural Engineer) and this report makes no warranty that the project as a whole is code compliant or safe or that all members are designed properly. The structural Engineer of Record shall retain sole responsibility for the structural design of the entire building.

Appendix A. Code Compliant Check List

Peer Review – Code Compliance Check List as per NYCBC 2014 BC section 1617.5.1 Scope of the structural peer review

Item	Referenced Code section	Referenced document	Detail	Remarks (Code compliance)	
1. Design Loads					
1) Gravity loads	NYCBC BC 1606 and BC 1607 Table 1607.1	Loading Schedule on Dwg. S-001		√	
2) Snow loads	NYCBC BC 1608			√	The thermal factor, Ct, needs to be updated. However, the snow loads will not govern the design. (Updated on March 19, 2018 drawing)
3) Wind loads	NYCBC BC 1609	Wind tunnel report by RWDI dated April 20th, 2017	50-year design wind loads were provided by RWDI from the wind tunnel testing.	√	The wind design data needs to be updated on S-001.
4) Soil lateral loads	NYCBC BC 1610	Geotechnical report by Langan dated November 18th, 2015 and November 29th, 2017		√	
5) Seismic loads	NYCBC BC 1613				The seismic design data needs to be updated on S-001. (Updated on March 19, 2018 drawing)

Item	Referenced Code section	Referenced document	Detail	Remarks (Code compliance)	
2. Structural Design Criteria and Assumptions					
1) Serviceability					
A. Lateral displacement	NYCBC BC 1604.3 and ASCE 7-10 Section 12.12	Structural drawings	• Story drift due to wind loads: 25-year recurrence wind loads were used by E.O.R to estimate story drift for evaluation of serviceability. • Inter-story drift due to earthquake loads: less than 0.02hn (maximum allowable story drift for seismic use group I).	√	The lateral inter-story drift is a performance issue, the acceptable drift criteria should be determined by E.O.R and the owner. All non-structural elements such as cladding and components, partitions and mechanical equipment must be properly designed to accommodate these estimated building movements.
B. Perception to motion	ISO 10137 (Selected by the wind tunnel testing lab)	Structural drawings	• The wind tunnel report indicates that 1-year and 10-year peak acceleration are exceeding the acceptable criteria for residential buildings. • The Tuned Sloshing Damper is being studied to reduce the accelerations to acceptable levels.	√	

Peer Review – Code Compliance Check List as per NYCBC 2014 BC section 1617.5.1 Scope of the structural peer review

Item	Referenced Code section	Referenced document	Detail	Remarks (Code compliance)	
2) Analysis	NYCBC BC 1604.4	Structural drawings	• An independent structural analysis models was generated to analyze and design the representative foundation members. • The overall behavior of the structure and internal forces at members were reviewed and compared with the original design.	√	The follow-up foundation review will be performed for the final construction set to ensure that the designs are compliance with the design code. The review of the superstructure will be done at phase II (Review of Superstructure).
3) Anchorage to foundation	NYCBC BC 1604.8	• Foundation drawings (FO-series)	• Axial loads at shear walls and columns were independently calculated from base (foundation) to top (main roof). • Shear walls and columns are designed to resist both the gravity and the lateral loads. • Adequacy of column sizes and shear wall thicknesses were reviewed.	√	The follow-up foundation review will be performed for the final construction set to ensure that the designs are compliance with the design code. The review of the superstructure will be done at phase II (Review of Superstructure).

Peer Review – Code Compliance Check List as per NYCBC 2014 BC section 1617.5.1 Scope of the structural peer review

Item	Referenced Code section	Referenced document	Detail	Remarks (Code compliance)	
3. Conformity of structural design with engineering investigation					
1) Geo-technical engineering report		• Structural drawings • Geotechnical report dated November 18th, 2015 and November 29th, 2017			
A. Protection of adjacent and on-site structures			• Construction vibrations shall be monitored within the adjacent structures during demolition, excavation, and foundation construction • Pre-construction condition documentation is recommended to be performed for the adjacent, existing structures to remain.	√	The detail is provided on the geotechnical report dated November 18th, 2015.
B. Deep footings Caissons				N/A	
C. Ground water level and waterproofing			• Design ground water level is assumed to be at EL +63'-0". • New below-grade walls and lowest level slab are recommended to be	√	

Item	Referenced Code section	Referenced document	Detail	Remarks (Code compliance)	
			fully waterproofed using a positive-side membrane type waterproofing system and water-stops to be placed at all below-grade joints.		
D. Additional investigation & protection of adjacent and on-site structure			• Laterally braced concrete pier and/ or drilled soldier piles and lagging temporary excavation support can be used along the sidewalks, driveway, and yard areas. • Conventional jacked and laterally braced underpinning pier system can be used along the adjacent buildings.	√	The detail is provided on the geotechnical report dated November 18th, 2015.
E. Uplift			• Rock anchors are recommended to resist uplift at mat foundation under shear walls.	√	Rock anchors (2 ½/inch diameter 150 KSI threaded bars) with 467 kips of uplift capacity are used at mat foundations below shear walls.
2) Wind tunnel testing report		• Wind tunnel report by RWDI dated April 20th, 2017	• Wind forces and moments are based on a 50-year recurrence wind. 24 wind load cases in consideration of directionality of wind and structural dynamic properties of the building are	√	

Item	Referenced Code section	Referenced document	Detail	Remarks (Code compliance)	
			provided. • The wind tunnel report indicates that 1-year and 10-year peak acceleration are exceeding the acceptable criteria for residential buildings.		
4. Review the structural frame and the load supporting parts of floors, roofs, walls, and foundations.		Structural drawings			Other secondary structural items are excluded.
5. Complete load path					
1) Gravity loads		Structural drawings	• Gravity loads are resisted by cast-in-place flat plate (horizontal elements) and cast-in-place columns and shear walls (vertical elements).	√	Load path for the gravity loads is complete
2) Wind loads		Structural drawings	• Wind loads are transferred to shear walls and columns by rigid diaphragm (typically 8”/11” thick flat plate) • Lateral load resisting system consists of flat plate (8”/11” inch thick) with columns and core shear	√	Load path for the wind loads is complete

Peer Review – Code Compliance Check List as per NYCBC 2014 BC section 1617.5.1 Scope of the structural peer review

Item	Referenced Code section	Referenced document	Detail	Remarks (Code compliance)	
			walls in conjunction with full height outrigger walls connected to columns at 15th floor. • Ground floor was assumed to be the base for the lateral loads.		
3) Seismic loads		Structural drawings	• Seismic loads are transferred to shear walls by rigid diaphragm (typically 8"/11" thick flat plate). • Lateral load resisting system consists of core shear walls in conjunction with full height outrigger walls at 15th floor. Frames are not considered to resist seismic loads. • Ground floor was assumed to be the base for the lateral loads.	√	Load path for the seismic loads is complete
4) Soil lateral load	NYCBC BC 1610	Ground floor framing plan and cellar floor framing plan	• Support condition of foundation walls at floors (ground floor and cellar floor) is reviewed.	√	Load path for the soil lateral load is complete
6. Design of members		Structural drawings	Sampled structural elements (shear walls, columns, spread footings, mat foundation and foundation walls) were checked based on our analysis results.		

Peer Review – Code Compliance Check List as per NYCBC 2014 BC section 1617.5.1 Scope of the structural peer review

Item	Referenced Code section	Referenced document	Detail	Remarks (Code compliance)	
1) Shear walls		Shear wall reinforcement plan	• Shear wall reinforcing at various locations were spot-checked.		Will be reviewed at Phase II (Review of Superstructure)
2) Columns		Column schedule	• Sampled columns (Column xx, xx, and xx) were checked.		Will be reviewed at Phase II (Review of Superstructure)
3) Flat plate		Typical floor framing plans	• Adequacy of slab thickness was reviewed. • Slab reinforcing due to gravity load and the punching shear ratio were checked using the SAFE software.		Will be reviewed at Phase II (Review of Superstructure)
4) Link Beams		Link beam schedule	• Design of link beams (cast-in-place concrete and embedded steel beams) at various locations were spot-checked.		Will be reviewed at Phase II (Review of Superstructure)
5) Mat foundation supporting shear walls		• Foundation drawings (FO-series) • Ground floor framing plan (Dwg. S-201)	• Adequacy of layout of rock anchors was reviewed. • Adequacy of thickness and configuration of mat foundation was reviewed. • Adequacy of mat reinforcement was reviewed. • Adequacy of bearing pressure was reviewed. • Stability subject to transfer of lateral shear forces was reviewed.	√	

Item	Referenced Code section	Referenced document	Detail	Remarks (Code compliance)	
6) Lowest structural slab at cellar floor		• Geotechnical report for design ground water level • Foundation plan (Dwg. FO-101)	• Slab was designed as slab-on-grade	√	
7) Foundation walls		• Geo-technical report for design ground water level • Foundation drawings (FO-series) • Ground floor framing plan (Dwg. S-201)	• Design of foundation walls for 30 ft of story height story are reviewed.	√	
7. Performance-specified structural components					
1) Supplementary damping system					Supplementary damping is being studied and will be reviewed at Phase II (Review of Superstructure).
2) Cladding					Cladding design and performance and their connections are excluded in this review.

Peer Review – Code Compliance Check List as per NYCBC 2014 BC section 1617.5.1 Scope of the structural peer review

Item	Referenced Code section	Referenced document	Detail	Remarks (Code compliance)	
8. Structural Integrity					
1) Prescriptive requirement	NYCBC BC 1615				Will be reviewed at Phase II (Review of Superstructure)
A. Continuity and ties					Will be reviewed at Phase II (Review of Superstructure)
• Slab reinforcing	NYCBC BC 1916.2.1		Continuous mat of bottom reinforcement is provided in two perpendicular directions at all levels		Will be reviewed at Phase II (Review of Superstructure)
• Peripheral ties	NYCBC BC 1916.2.2				Will be reviewed at Phase II (Review of Superstructure)
• Horizontal ties	NYCBC BC 1916.2.3				Will be reviewed at Phase II (Review of Superstructure)
• Vertical ties	NYCBC BC 191.2.4				Will be reviewed at Phase II (Review of Superstructure)
B. Lateral bracing	NYCBC BC 1615.3		Floor slabs at each floor are connected to the columns and shear walls.		Will be reviewed at Phase II (Review of Superstructure)
C. Vehicular impact	NYCBC BC 1615.5				Will be reviewed at Phase II (Review of Superstructure)
2) Key Element analysis					Will be reviewed at Phase II (Review of Superstructure)

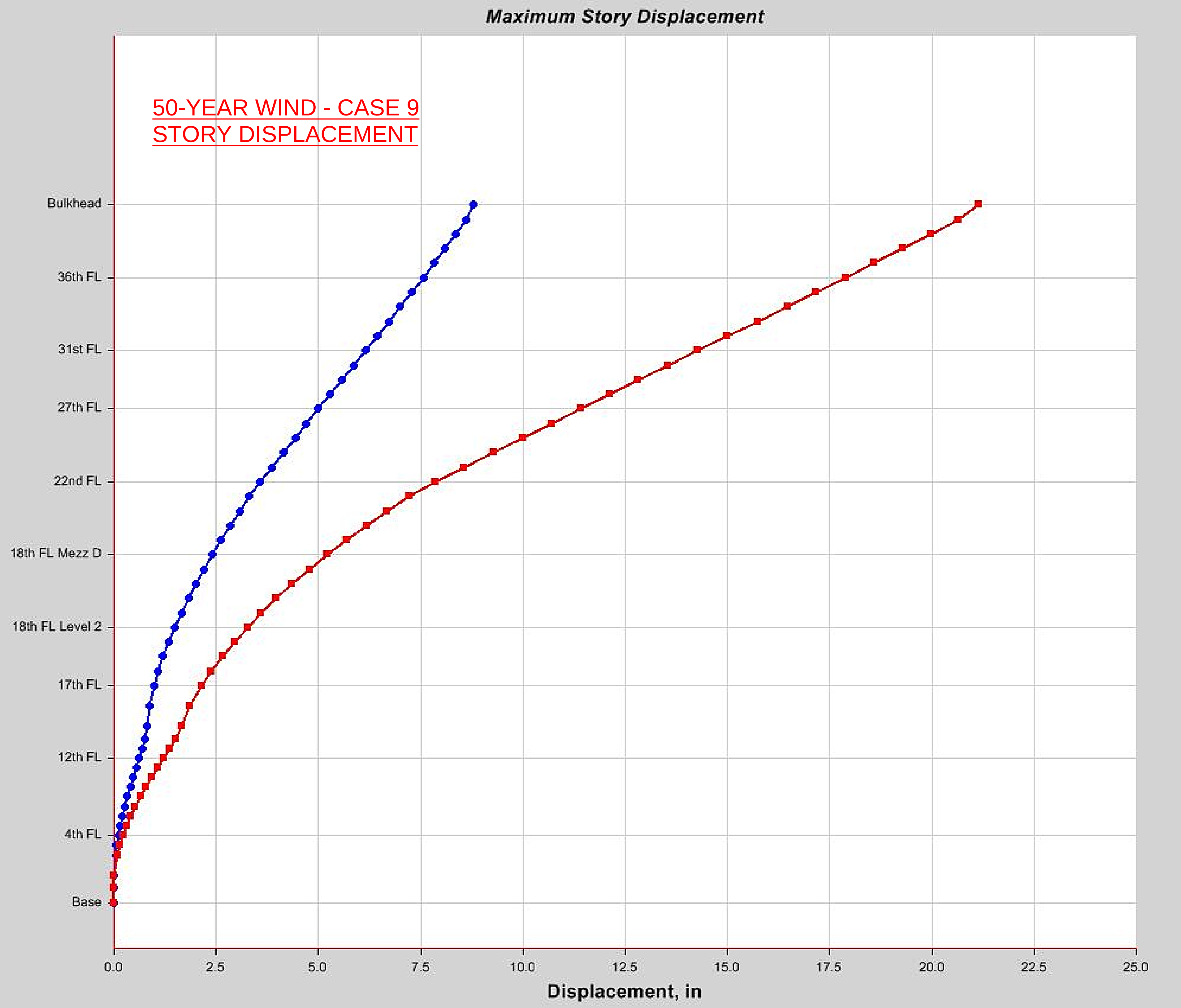
Peer Review – Code Compliance Check List as per NYCBC 2014 BC section 1617.5.1 Scope of the structural peer review

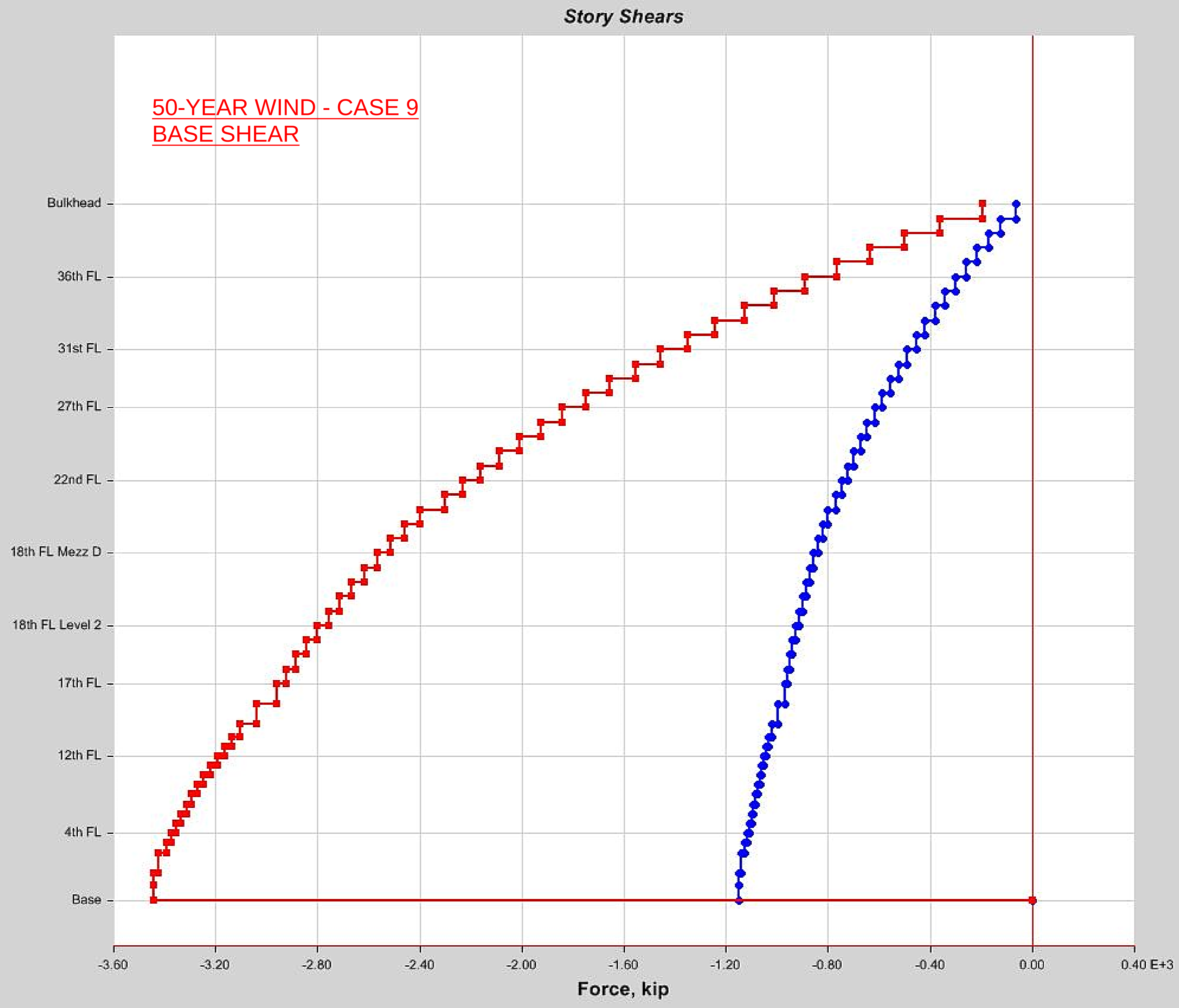
Item	Referenced Code section	Referenced document	Detail	Remarks (Code compliance)	
9. General conformance of structural plans with architectural plans		• Structural drawing – 100 D.D Set dated November 14th, 2017 • Architectural Document – Progress Set dated October 27th, 2017			In general, the geometry, the size, the locations of the primary structural members are consistent with the architectural drawing.
10. Major mechanical items					
1) Water tank					Not indicated in the structural drawing. Will be reviewed at Phase II (Review of Superstructure)
2) Emergency generator					Not indicated in the structural drawing. Will be reviewed at Phase II (Review of Superstructure)
3) Cooling tower					Not indicated in the structural drawing. Will be reviewed at Phase II (Review of Superstructure)
4) Fuel oil tank					Not indicated in the structural drawing. Will be reviewed at Phase II (Review of Superstructure)
5) Supplementary damping system					Supplementary damping is being studied and will be

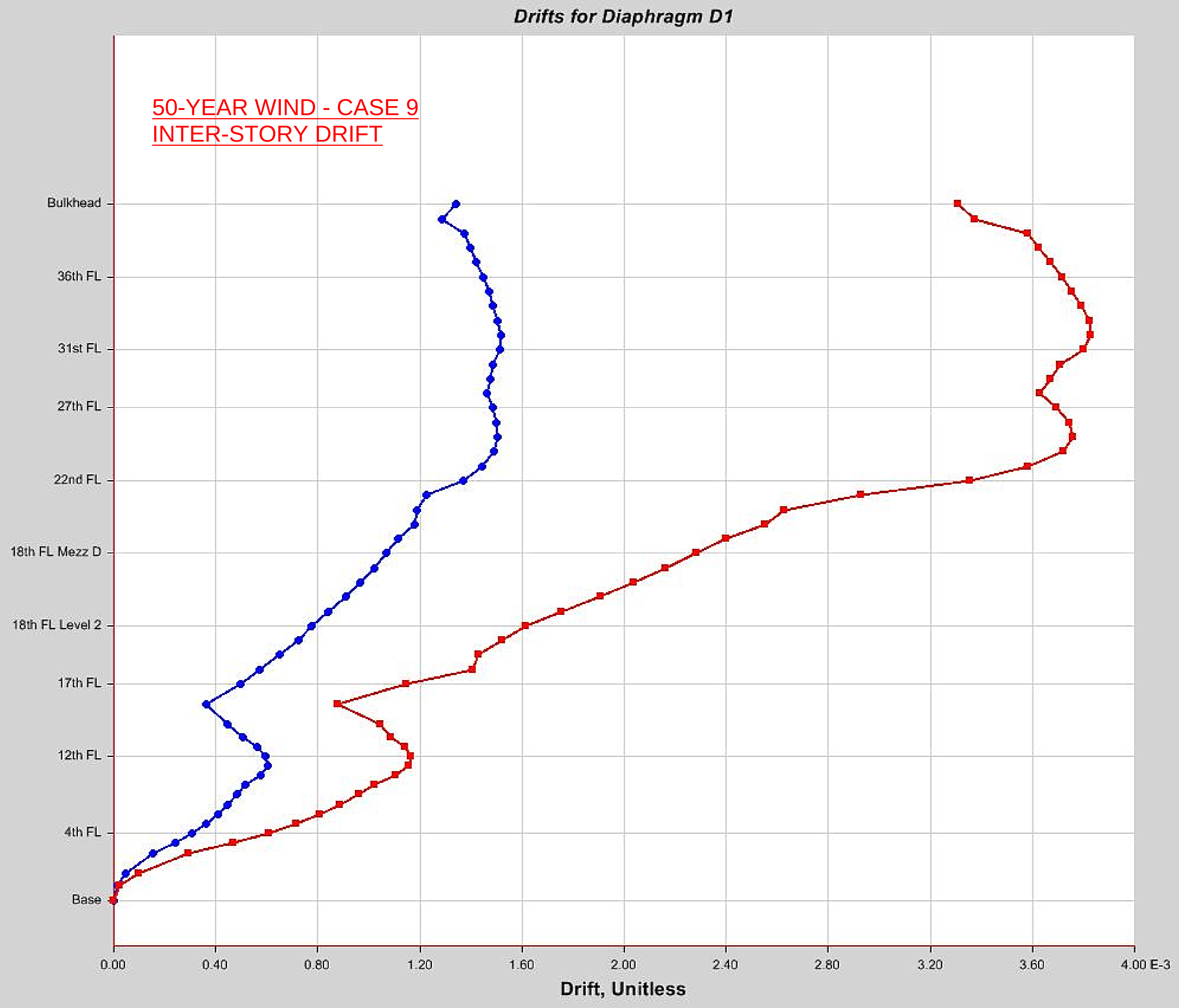
Peer Review – Code Compliance Check List as per NYCBC 2014 BC section 1617.5.1 Scope of the structural peer review

Item	Referenced Code section	Referenced document	Detail	Remarks (Code compliance)	
					reviewed at Phase II (Review of Superstructure)
11. General completeness of structural drawings		Structural drawing – 100% Construction Document dated T.B.D			Will be reviewed at Phase II (Review of Superstructure)

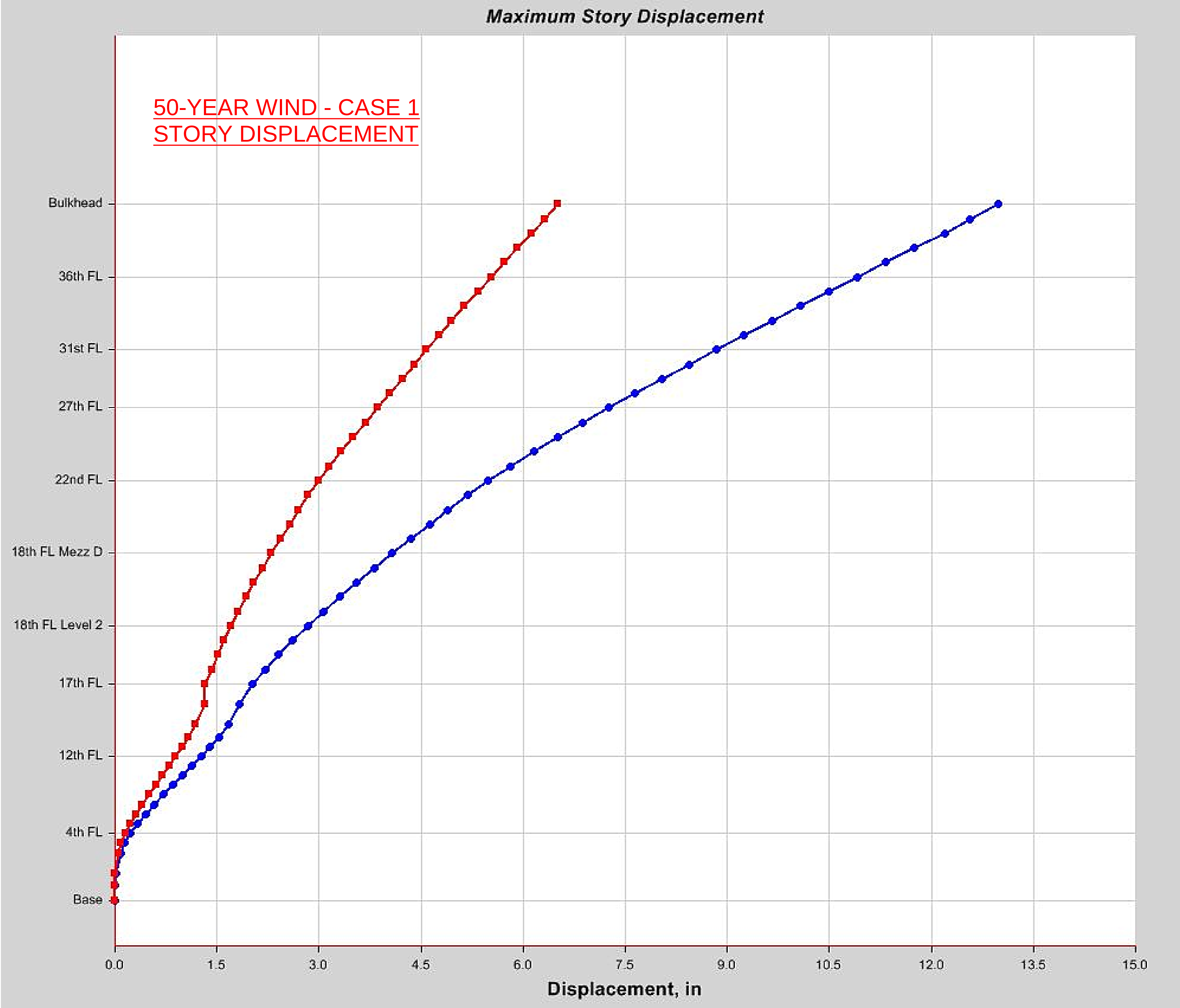
Appendix B. Sample of ETABS Output

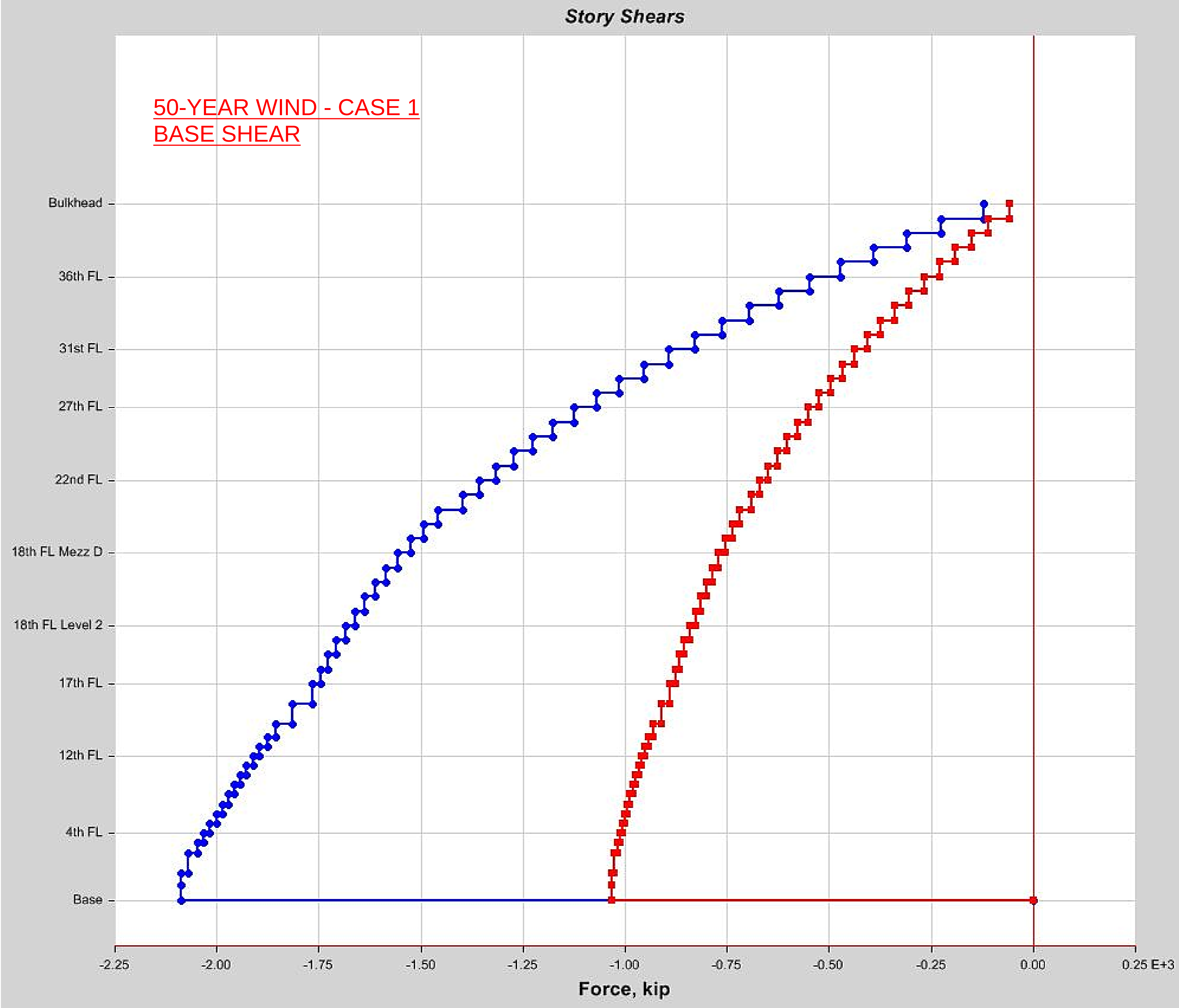

Maximum Story Displacement
50-YEAR WIND - CASE 9
STORY DISPLACEMENT
Bulkhead
36th FL
31st FL
27th FL
22nd FL
18th FL Mezz D
18th FL Level 2
17th FL
12th FL
4th FL
Base
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
Displacement, in

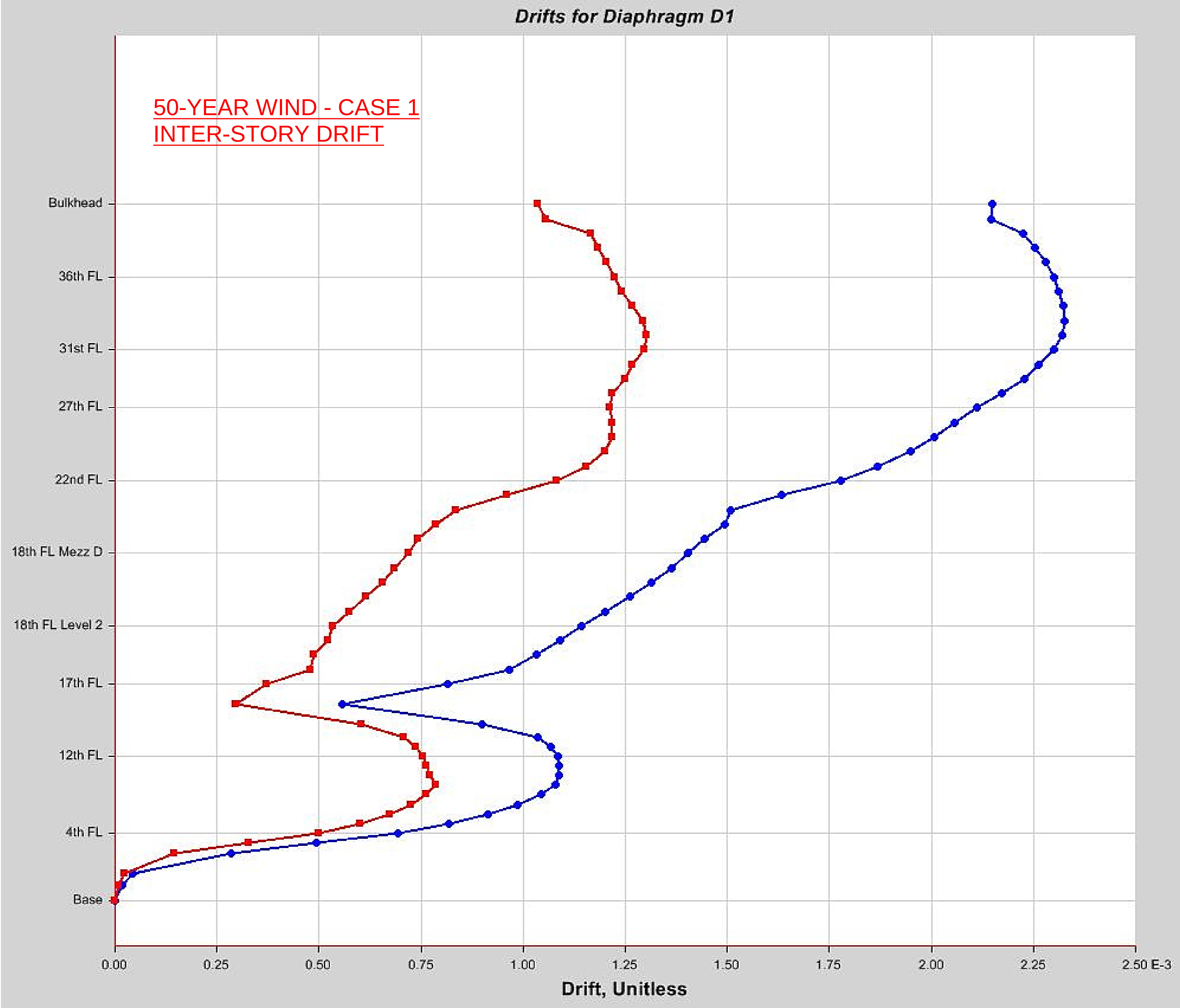

Story Shears
50-YEAR WIND - CASE 9
BASE SHEAR
Bulkhead
36th FL
31st FL
27th FL
22nd FL
18th FL Mezz D
18th FL Level 2
17th FL
12th FL
4th FL
Base
-3.60
-3.20
-2.80
-2.40
-2.00
-1.60
-1.20
-0.80
-0.40
0.00
0.40 E+3
Force, kip



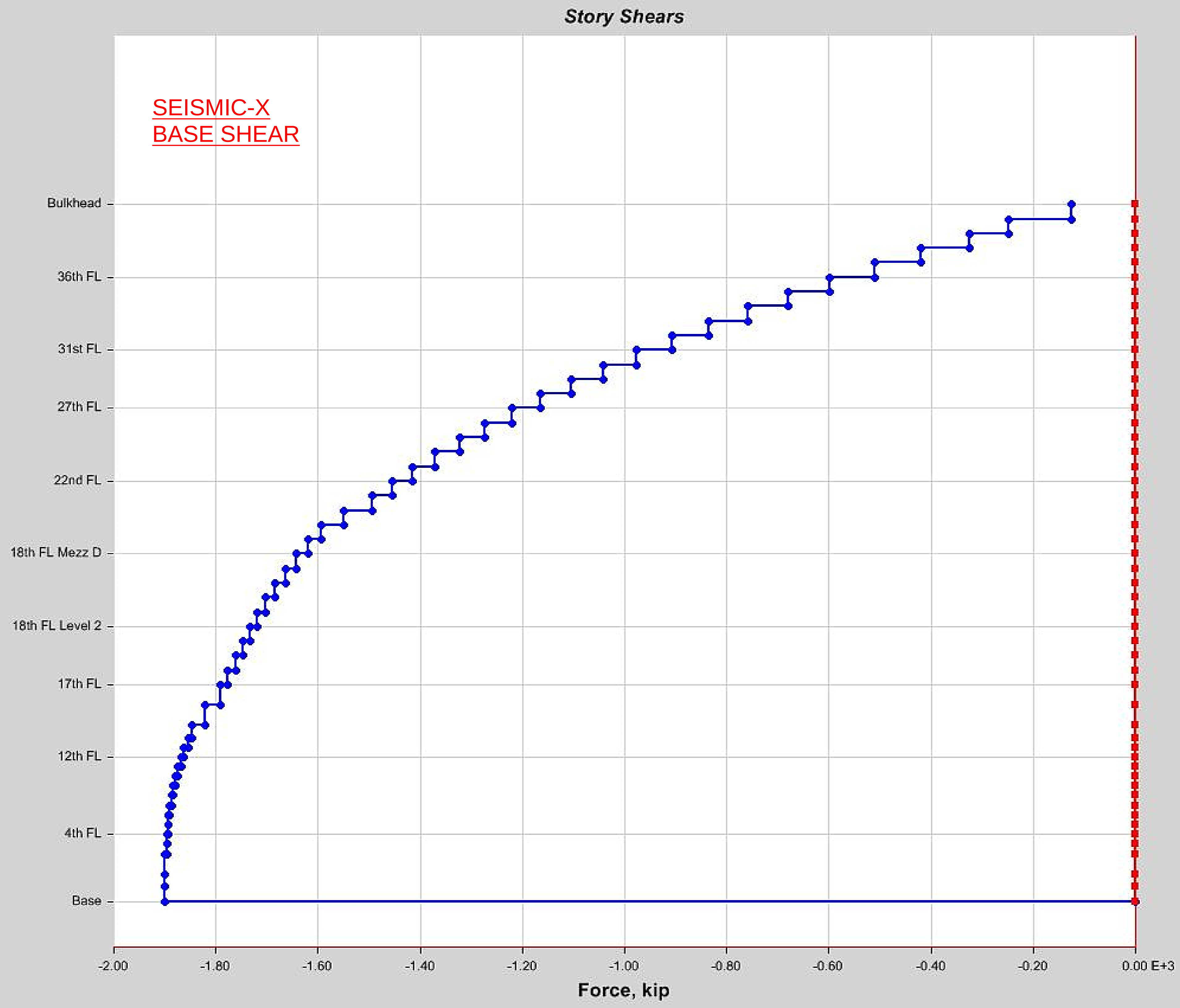
Drifts for Diaphragm D1
50-YEAR WIND - CASE 9
INTER-STORY DRIFT
Bulkhead
36th FL
31st FL
27th FL
22nd FL
18th FL Mezz D
18th FL Level 2
17th FL
12th FL
4th FL
Base
0.00
0.40
0.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00 E-3
Drift, Unitless

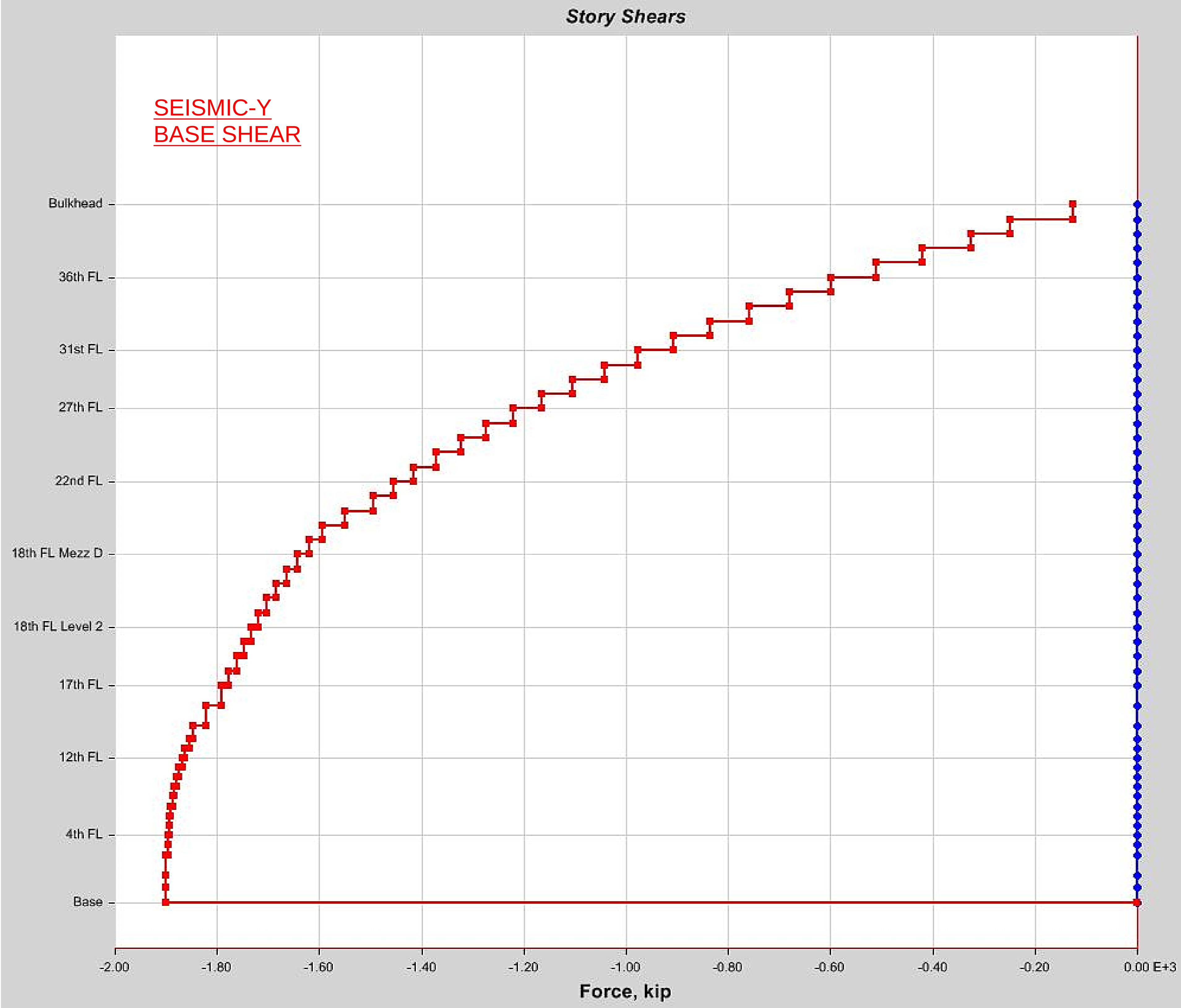

Maximum Story Displacement
50-YEAR WIND - CASE 1
STORY DISPLACEMENT
Bulkhead
36th FL
31st FL
27th FL
22nd FL
18th FL Mezz D
18th FL Level 2
17th FL
12th FL
4th FL
Base
0.0
1.5
3.0
4.5
6.0
7.5
9.0
10.5
12.0
13.5
15.0
Displacement, in

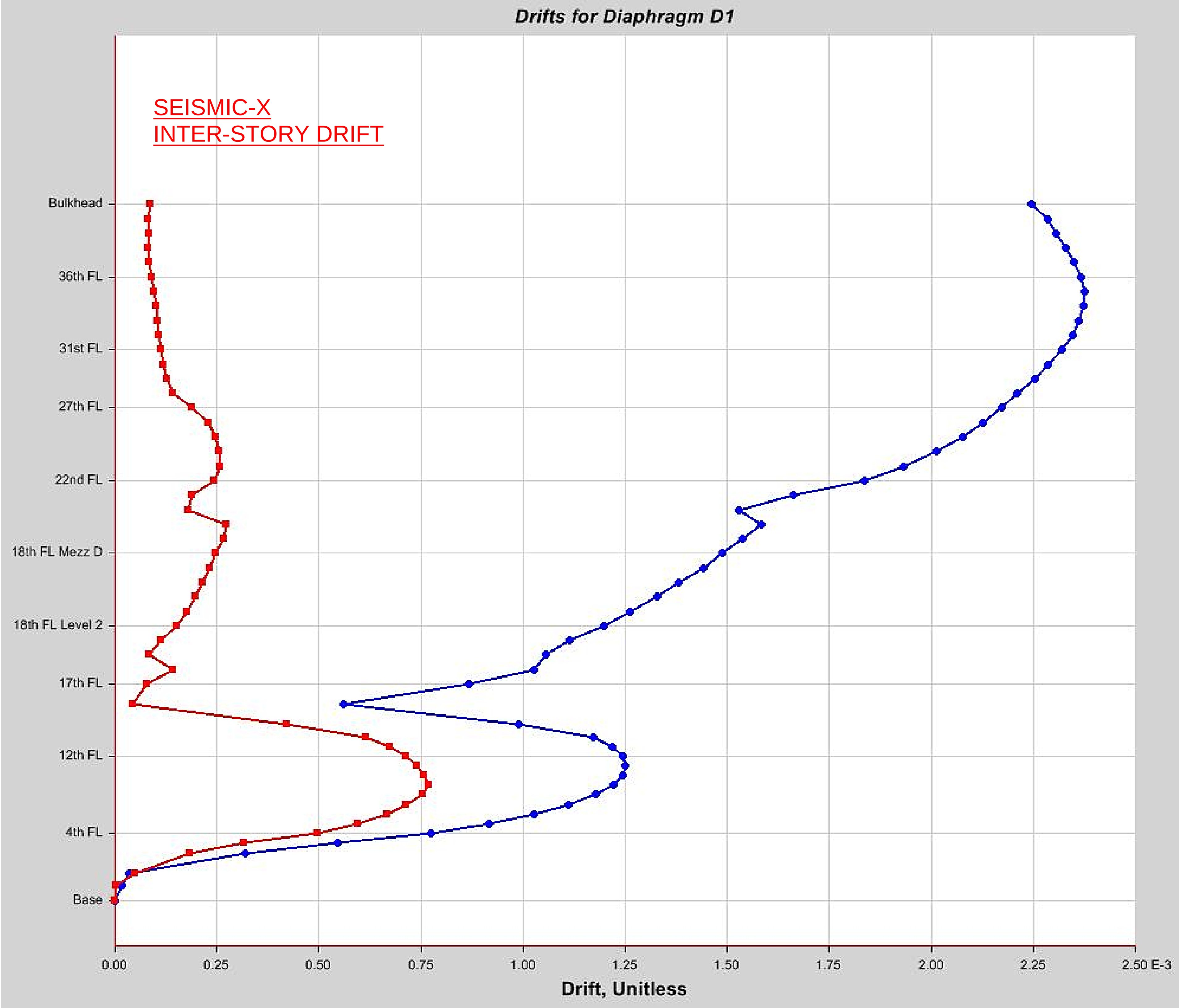

Story Shears
50-YEAR WIND - CASE 1
BASE SHEAR
Bulkhead
36th FL
31st FL
27th FL
22nd FL
18th FL Mezz D
18th FL Level 2
17th FL
12th FL
4th FL
Base
-2.25
-2.00
-1.75
-1.50
-1.25
-1.00
-0.75
-0.50
-0.25
0.00
0.25 E+3
Force, kip



Drifts for Diaphragm D1
50-YEAR WIND - CASE 1
INTER-STORY DRIFT
Bulkhead
36th FL
31st FL
27th FL
22nd FL
18th FL Mezz D
18th FL Level 2
17th FL
12th FL
4th FL
Base
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50 E-3
Drift, Unitless

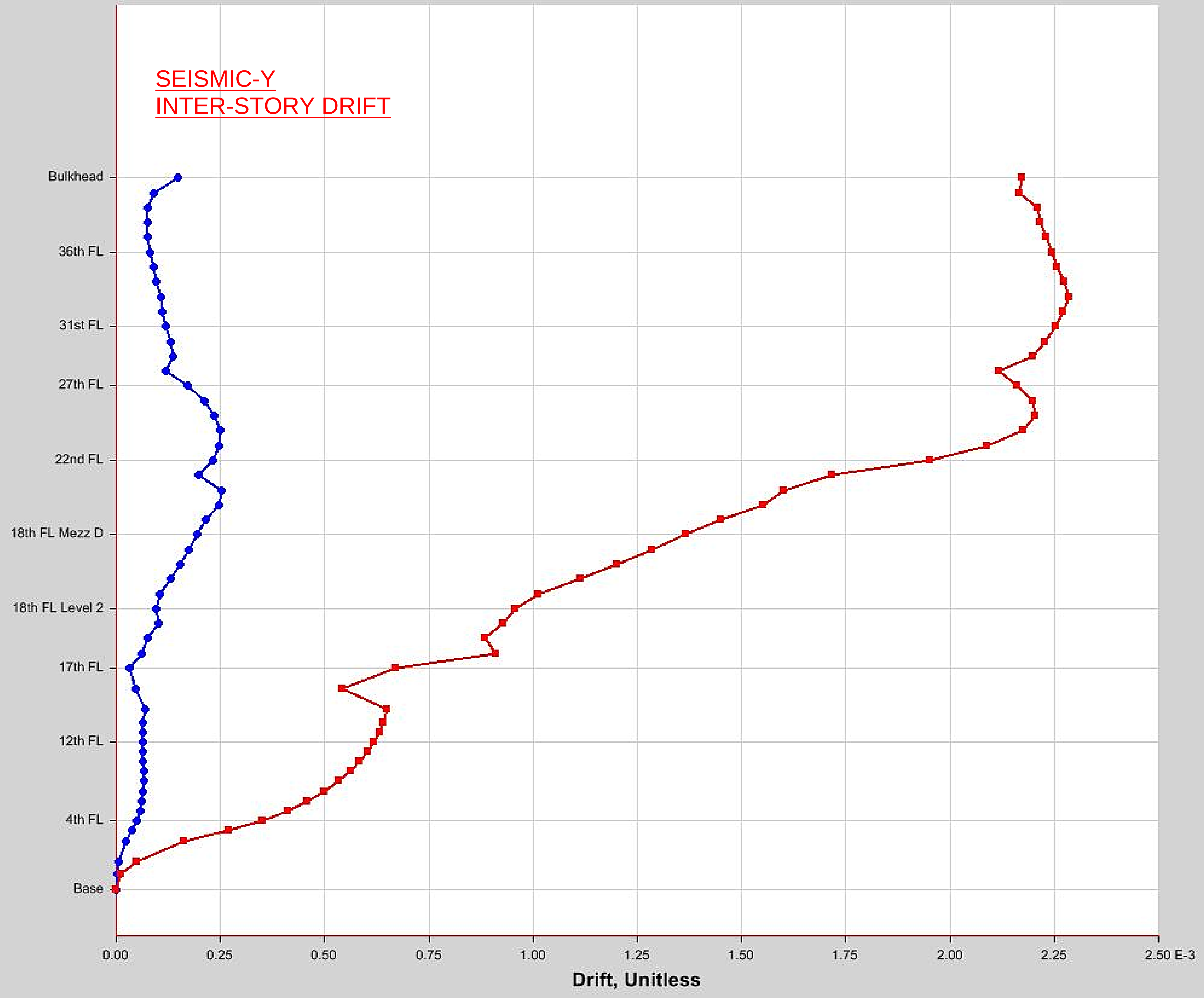

Story Shears
SEISMIC-X
BASE SHEAR
Bulkhead
36th FL
31st FL
27th FL
22nd FL
18th FL Mezz D
18th FL Level 2
17th FL
12th FL
4th FL
Base
-2.00
-1.80
-1.60
-1.40
-1.20
-1.00
-0.80
-0.60
-0.40
-0.20
0.00 E+3
Force, kip


Story Shears
SEISMIC-Y
BASE SHEAR
Bulkhead
36th FL
31st FL
27th FL
22nd FL
18th FL Mezz D
18th FL Level 2
17th FL
12th FL
4th FL
Base
-2.00
-1.80
-1.60
-1.40
-1.20
-1.00
-0.80
-0.60
-0.40
-0.20
0.00 E+3
Force, kip



Drifts for Diaphragm D1
SEISMIC-X
INTER-STORY DRIFT
Bulkhead
36th FL
31st FL
27th FL
22nd FL
18th FL Mezz D
18th FL Level 2
17th FL
12th FL
4th FL
Base
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50 E-3
Drift, Unitless

Drifts for Diaphragm D1



Appendix C. Drawing List of

CD Progress Set (March 19, 2018)

Structural Sheet List	
Sheet Number	Sheet Name
S-000	COVER SHEET
S-001	GENERAL NOTES
S-002	PLAN NOTES AND LEGENDS
FO-100	FOUNDATION PLAN
FO-200	MAT FOUNDATION REINFORCEMENT
FO-201	SPECIAL FOOTING DETAILS
FO-202	TYPICAL FOUNDATION DETAILS
FO-203	TYPICAL FOUNDATION DETAILS
FO-210	REINF DEVELOPMENT LENGTH/LAP SPLICE SCHEDULE
FO-301	FOUNDATION SECTIONS
FO-302	FOUNDATION SECTIONS
FO-303	FOUNDATION SECTIONS
FO-304	FOUNDATION SECTIONS
FO-305	FOUNDATION SECTIONS (E) WALL ALTERNATE
FO-300	FOUNDATION SECTIONS
S-004	CELLAR FRAMING PLAN
S-005	CELLAR GENERAL ARRANGEMENT PLAN
S-010	1ST FLOOR FRAMING PLAN
S-011	1ST FLOOR GENERAL ARRANGEMENT PLAN
S-012	1ST FLOOR MEZZANINE FRAMING PLAN
S-013	1ST FLOOR MEZZANINE GENERAL ARRANGEMENT PLAN
S-020	2ND FLOOR FRAMING PLAN
S-021	2ND FLOOR GENERAL ARRANGEMENT PLAN
S-030	3RD FLOOR FRAMING PLAN
S-031	3RD FLOOR GENERAL ARRANGEMENT PLAN
S-040	4TH FLOOR FRAMING PLAN
S-041	4TH FLOOR GENERAL ARRANGEMENT PLAN
S-050	5TH FLOOR FRAMING PLAN
S-051	5TH FLOOR GENERAL ARRANGEMENT PLAN
S-060	6TH FLOOR FRAMING PLAN
S-061	6TH FLOOR GENERAL ARRANGEMENT PLAN
S-070	7TH - 8TH FLOOR FRAMING PLAN
S-071	7TH - 8TH FLOOR GENERAL ARRANGEMENT PLAN
S-090	9TH FLOOR FRAMING PLAN
S-091	9TH FLOOR GENERAL ARRANGEMENT PLAN
S-100	10TH - 13TH FLOOR FRAMING PLAN
S-101	10TH - 13TH FLOOR GENERAL ARRANGEMENT PLAN
S-140	14TH FLOOR FRAMING PLAN
S-141	14TH FLOOR GENERAL ARRANGEMENT PLAN
S-150	15TH FLOOR FRAMING PLAN
S-151	15TH FLOOR GENERAL ARRANGEMENT PLAN
S-152	15TH FLOOR MEZZANINE (MEP) FRAMING PLAN
S-153	15TH FLOOR MEZZANINE (MEP) GENERAL ARRANGEMENT PLAN
S-160	16TH FLOOR AMENITY/MEP FRAMING PLAN
S-161	16TH FLOOR AMENITY/MEP GENERAL ARRANGEMENT PLAN
S-170	17TH FLOOR (MEP) FRAMING PLAN
S-171	17TH FLOOR (MEP) GENERAL ARRANGEMENT PLAN
S-180	18TH FLOOR (MEP SLAB) FRAMING PLAN
S-181	TOP OF BEAM FRAMING PLAN (EL.+319.31')
S-182	TOP OF BEAM FRAMING PLAN (EL.+335.31')
S-183	TOP OF BEAM FRAMING PLAN (EL.+351.31')
S-184	TOP OF BEAM FRAMING PLAN (EL.+367.31')
S-185	TOP OF BEAM FRAMING PLAN (EL.+383.31')
S-186	TOP OF BEAM FRAMING PLAN (EL.+399.31')
S-187	TOP OF BEAM FRAMING PLAN (EL.+415.31')
S-188	TOP OF BEAM FRAMING PLAN (EL.+431.31')
S-189	TOP OF BEAM FRAMING PLAN (EL.+447.31')
S-190	19TH FLOOR FRAMING PLAN
S-191	19TH FLOOR GENERAL ARRANGEMENT PLAN
S-200	20TH FLOOR FRAMING PLAN
S-201	20TH FLOOR GENERAL ARRANGEMENT PLAN
S-210	21ST - 26TH FLOOR FRAMING PLAN
S-211	21ST - 26TH FLOOR GENERAL ARRANGEMENT PLAN
S-270	27TH - 33RD FLOOR FRAMING PLAN

Structural Sheet List	
Sheet Number	Sheet Name
S-271	27TH - 33RD FLOOR GENERAL ARRANGEMENT PLAN
S-340	34TH FLOOR FRAMING PLAN
S-341	34TH FLOOR GENERAL ARRANGEMENT PLAN
S-350	35TH - 37TH FLOOR FRAMING PLAN
S-351	35TH - 37TH FLOOR GENERAL ARRANGEMENT PLAN
S-380	38TH FLOOR FRAMING PLAN
S-381	38TH FLOOR GENERAL ARRANGEMENT PLAN
S-390	39TH FLOOR FRAMING PLAN
S-391	39TH FLOOR GENERAL ARRANGEMENT PLAN
S-400	MAIN ROOF FRAMING PLAN
S-401	MAIN ROOF GENERAL ARRANGEMENT PLAN
S-410	EMR FRAMING PLAN
S-411	EMR GENERAL ARRANGEMENT PLAN
S-420	ROOF OVER EMR FRAMING PLAN
S-421	ROOF OVER EMR GENERAL ARRANGEMENT PLAN
S-430	STEEL ROOF CROWN
S-500	18TH FLOOR (MEP) GENERAL ARRANGEMENT PLAN
S-501	TOP OF BEAM GENERAL ARRANGEMENT PLAN (EL.+319.31')
S-502	TOP OF BEAM GENERAL ARRANGEMENT PLAN (EL.+335.31')
S-503	TOP OF BEAM GENERAL ARRANGEMENT PLAN (EL.+351.31')
S-504	TOP OF BEAM GENERAL ARRANGEMENT PLAN (EL.+367.31')
S-505	TOP OF BEAM GENERAL ARRANGEMENT PLAN (EL.+383.31')
S-506	TOP OF BEAM GENERAL ARRANGEMENT PLAN (EL.+399.31')
S-507	TOP OF BEAM GENERAL ARRANGEMENT PLAN (EL.+415.31')
S-508	TOP OF BEAM GENERAL ARRANGEMENT PLAN (EL.+431.31')
S-509	TOP OF BEAM GENERAL ARRANGEMENT PLAN (EL.+447.31')
S-910	COLUMN SCHEDULE I
S-911	COLUMN SCHEDULE II
S-912	COLUMN SCHEDULE III
S-915	TYPICAL COLUMN DETAILS
S-920	TYPICAL SHEAR WALLS AND LINK BEAM DETAILS
S-921	LINK BEAM SCHEDULE
S-922	SHEAR WALL REINFORCEMENT PLAN
S-923	SHEAR WALL REINFORCEMENT PLAN
S-924	SHEAR WALL REINFORCEMENT PLAN
S-925	SHEAR WALL REINFORCEMENT PLAN
S-926	SHEAR WALL REINFORCEMENT PLAN
S-927	SHEAR WALL REINFORCEMENT PLAN
S-928	SHEAR WALL REINFORCEMENT PLAN
S-929	SHEAR WALL REINFORCEMENT PLAN
S-930	SHEAR WALL REINFORCEMENT PLAN
S-931	SHEAR WALL ELEVATION
S-932	SHEAR WALL ELEVATION
S-933	SHEAR WALL ELEVATION
S-934	SHEAR WALL ELEVATION
S-935	SHEAR WALL ELEVATION
S-936	BELT & OUTRIGGER WALL ELEVATIONS
S-937	BELT & OUTRIGGER WALL ELEVATIONS
S-938	BELT & OUTRIGGER WALL ELEVATIONS
S-939	BELT & OUTRIGGER WALL DETAIL
S-940	TYPICAL CONCRETE DETAILS I
S-941	TYPICAL CONCRETE DETAILS II
S-942	TYPICAL CONCRETE DETAILS III
S-943	TYPICAL CONCRETE DETAILS IV
S-944	TYPICAL CONCRETE DETAILS V
S-950	ELEVATIONS
S-951	ROOF STEEL ELEVATIONS I
S-952	ROOF STEEL ELEVATIONS II
S-960	TYPICAL MASONRY DETAILS
S-961	TYPICAL MASONRY DETAILS
S-970	SECTIONS
S-971	SECTIONS II
S-972	SECTION III
S-980	TYPICAL STAIR DETAILS