The Towers at Greenville Place

Tower 'B'

Wilmington, DE

Final Report

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Structural Option
Consultant: Dr Behr

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Building Statistics

- -Function Type: Apartment Building
- -Size: 180,000 Square Feet
- -Stories: 7 above grade/ 1 pariatlly below grade
- -Delivery Method: Design-Bid-Build
- -Construction Time: July 2006 - July 2007
- -Total Cost: $11.5 Million

Archtecture

- -89 Upscale residential Apartments
- -Facade is 8 inch decorative CMU
- -A rustice base of textured and darker CMU creates a solid -base of the larger, lighter colored upper sections
- -Flat roof; Fully adhered EPDM roofing over tappered rigid insulation

Project Team

Owner: Greenville Place, LLC.
Architect & General Contractor: Pettinaro Construction Co.
Structural Engineer: Baker, Ingram & Associates
Geotechnical Engineer: Advanced Geo Services Corp.
MEP Engineer: TJCI
Civil Engineer: Howard L. Robertson, Inc.

Structure

Foundation

- -Continuous 18 inch thick spread footing
- -4 inch slab on grade with 6x6 welded wire mesh

Gravity System

- -Load Bearing Decorative 8 inch CMU walls
- -8 inch think precast hollow core concrete floor plank

Lateral System

- -Reinforced, filled core, 8 inch CMU walls

MEP System

- -Thru-wall heat pumps, Completely self contained heating & cooling units service each upper floor living units at 1130 CFM
- -208/120 Volt, 3 Phase, 4 Wire primary feed
- -Recessed hi-hat corridor lighting
- -Each living unit is equipted with 52 gallon electrical hot water heaters (208 volts)

http://www.engr.psu.edu/ae/thesis/portfolios/2010/smb5104/index.html

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Executive Summary

Tower 'B' of The Towers at Greenville Place is a 180,000 square foot mid-rise apartment building. The 7-story is part of an upscale residential complex with 3 virtually identical towers. The existing structure is essentially made up of 8-inch load bearing CMU block and 8 inch precast hollow plank. The building proves to be very heavy, causing seismic to be the controlling lateral force. A lightweight structural system, known as *Infinity*, has been proposed in order to reduce the critical lateral load.

The Infinity Structural System uses lightweight metal stud construction and an economical slab on deck floor system. After extensive research, this proves to be a feasible, lightweight alternative to the heavy masonry construction of the existing structure.

Additionally a breath study was performed to investigate the options for making Tower 'B' more sustainable. It is not always easy to alleviate the environmental and economical stress that a building of this nature can cause. A rainwater collection system is discussed to uncover what benefits it can have when incorporated in a setting such as this apartment building. Also, the benefits of an extensive green roof are discussed.

Lastly, two very common questions are addressed in the construction management breadth. The cost and construction timeline of the existing and proposed structural systems are researched and compared. While it may appear as a win/lose situation on paper, it can been seen that the benefits of faster construction may outweigh the increased cost of an alternative system.

Acknowledgements

I would like to thank the following individuals and companies for their help throughout the duration of the project. It is because of all of you that this has been possible.

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Brian Abel
Nate Boczkowski

Pettinaro :

William Netta

Penn State Faculty:

Professor M. Kevin Parfitt
Dr. Richard Behr
Professor Robert Holland

A special thank you to my family, friends, and classmates for their continued and ongoing support. I couldn't have done this without you.

Introduction

Tower 'B' of The Towers at Greenville Place is one of three virtually identical buildings. The towers, 'A', 'B', and 'C', are all directly neighboring upscale apartment buildings in Wilmington, Delaware. The project was completed in May of 2008 at an overall cost of $11.5 Million by a Design-Bid-Build delivery method. It is owned and managed by Pettinaro Real Estate Development Company.

The 180,000 square foot building consists of 89 different apartment units. One level is partially below grade and, on top of that, there are seven. The partially below grade ground floor is 12' and houses the lobby, exercise room, game room/café, storage, housekeeping, and electrical room. The ground floor lobby entrance opens to ground level; where as the opposite side of the building is nearly entirely below grade. The first floor is 10' and begins the typical apartment unit layout. Floors two through seven are also typical in layout, but only rise 9 feet and 4 inches each. The roof, though accessible, is virtually bare and houses no mechanical equipment.

Figure 1: North-west view of Tower 'B', showing canopy entrance.

Building Overview

Architecture

Tower 'B' is made up nearly entirely of masonry and precast concrete construction. The exterior walls are structural 8-inch CMU supporting 8-inch precast hollow core concrete planks. The 8-story apartment building has a balcony for nearly every unit closed off by metal railing. As you can see in figure 2 the elevation of the building consists of three distinct sections defined by white strips of ledge, which are an assembly of metal flashing and decorative solid insulation. A rustic base of textured and dark CMU seems to create a solid foundation for the large, lighter colored middle portion. The top floor displays its final section with a profound parapet proudly marking its summit. Arched precast concrete lintels provide character for the uppermost balconies.

Building Façade

The façade of the building is 8-inch split face CMU. Three different colors of these decorative blocks provide both aesthetic and structural functionality (figures 2 & 4). The structure of the building is primarily 8 inch CMU and precast concrete planks. Precast concrete lintels span the width of all doorway and window openings. Almost every apartment in tower 'B' comes with a balcony closed off by metal railing. Throughout the building there are 4 different types of glazing used. The most common type is a clear low 'E' insulated glazing and is used for nearly all windows. The second type is just a clear glazing for hinged doors. The third type of glazing is same as used on the windows, but meant for door instead. The last type is a laminated glazing used in side doors and emergency exits. The roofing of this building is fully adhered EPDM Roofing over tapered rigid insulation. 22-gage metal flashing provides a drip edge from the parapet onto the EPDM flashing around the perimeter. Periodic scuppers consist of EPDM lap flashing overlapping 24-gage metal flashing with metal at the edge.

Electrical

Tower 'B' runs on a 208/120V 3 phase, 4 wire primary feed. Buildings electrical room is located on the ground floor and houses the panels for the elevators, corridor heat pumps, corridor lighting, and other building wide systems. The electrical room also houses the meters for the individual apartment units. From the ground level electrical room, the feeds to each apartment are 208/120V single phase, 3 wire systems on a 150A bus. Each unit has its own panel for its separate needs. There is a 400A automatic transfer switch for the emergency power. A 375KW/469KVA 3 phase, 4 wire generator supplies emergency back up at 208/120V.

Lighting

Recessed hi-hat lights illuminate the corridors and all other public spaces of Tower 'B'. 2x4 fluorescent lights illuminate housekeeping and service corridors. The apartments units have a variety of lighting types from closed to ceiling lights to pendant lighting in dining rooms.

Mechanical

Each apartment unit is serviced by a thru wall heat pump. These completely self-contained heating and cooling units operate at 1130 CFM with ductwork spread throughout the individual units. The heat pumps are located and vented directly adjacent to the balconies in each apartment. Public areas, such as lobbies, community rooms, and ground floor corridors are serviced but exterior pad mounted condenser units. They provide 14,600 BTU of cooling and 14,800 BTU of heating. These units run on a 208V single phase, 60 hertz feeder. Three condenser units are used for these ground floor applications. Upper floor corridors achieve their climate control by thru wall heat pumps mounted in wall sleeves. Tower 'B' consists of two of these units per floor. They are each capable of providing 15,000 BTU of cooling and 14,000 BTU heating. These too run on a 208V single phase, 60 hertz feeder.

Fire Protection

The Fire protection for Tower 'B' was design to the requirements and conditions of NFPA 13 and 14. It is a hydraulically designed, light hazard wet pipe sprinkler system. Each room except kitchens and bathrooms has smoke detectors. Each apartment unit has one centrally located fire alarm speaker. There are 6 inch diameter standpipe raisers in ach stairwell. It was designed to provide 0.15 gpm per square foot. There was also a requirement for a 250 gpm allowance to be taken off for the city water main.

Transportation

Each floor of Tower 'B' has two sets of stairs that run the entire height of the building. They are located at the polar opposites of each floor's corridors. Centrally, there are two elevators that service all floors.

Telecommunications

All telecommunications, such as phone, Internet, and television are services provide by a private company and enter through the ground floor. Lines are then run from the ground floor to each apartment unit.

Special Systems: Door Entry system:

Tower 'B' is equipped with a door entry system. It is a system that allows resident and service only access. The card access at the entrance is designed to work for up to 150 names and 900 access cards. Doors are secured by a magnetic power lock mechanism. An intercom provides communication between outside guests at the entrance and individual apartment units. Guest can call a desired apartment and the tenant in return can remotely unlock the entrance.

Structural System Overview

Foundation

Foundations were designed according to recommendations on the geotechnical engineer's reports prepared by Advanced Geoservices Corp. The building's foundation consisits of a combination of spread and continuous reinforced cast-in-place concrete footings. The design was based on an allowable soil bearing capacity of 3000 psf and calls for 3000 psi concrete.

The ground floor slab is 4 inch slab on grade laid on 4 mil poly vapor barrier and 4 inches of crushed stone. It is reinforced with 6x6 W1.4xW1.4 welded wire fabric (WWF). The slab on grade is designed to have a strength of 3500 psi.

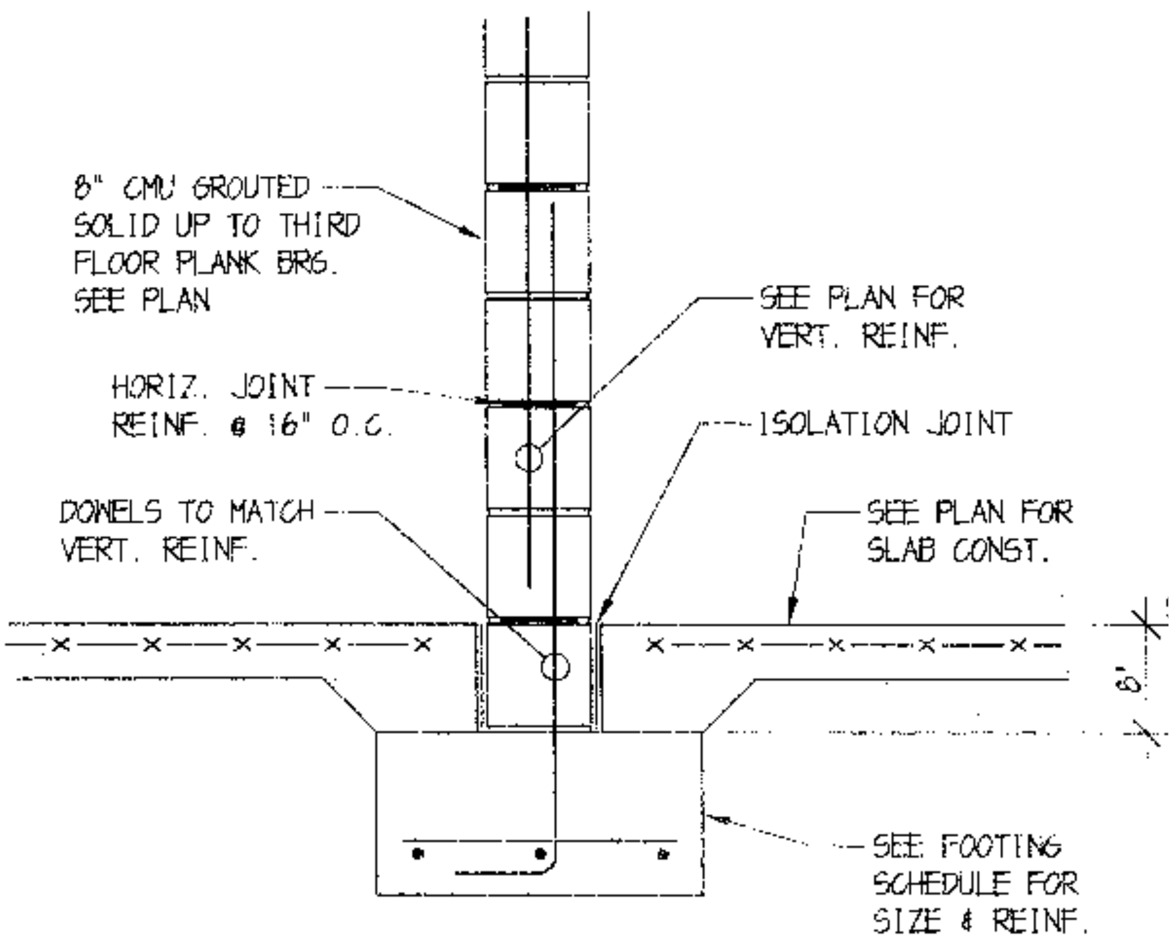


Figure 2: Typical interior foundation sections.

Lateral System

The shear walls are 8 inch CMU with reinforced grouted cells that go all the way down to the foundation. Tower 'B' has three different strengths of shear walls. Each shear wall is essentially constructed the same, only differing slightly by the size and spacing of steel reinforcing used, depending on which level they reside. These walls each have two different spacing criteria. As you can see in Figure 3, the reinforcing at the ends of the walls are spaced more tightly than that compared to the middle portion.

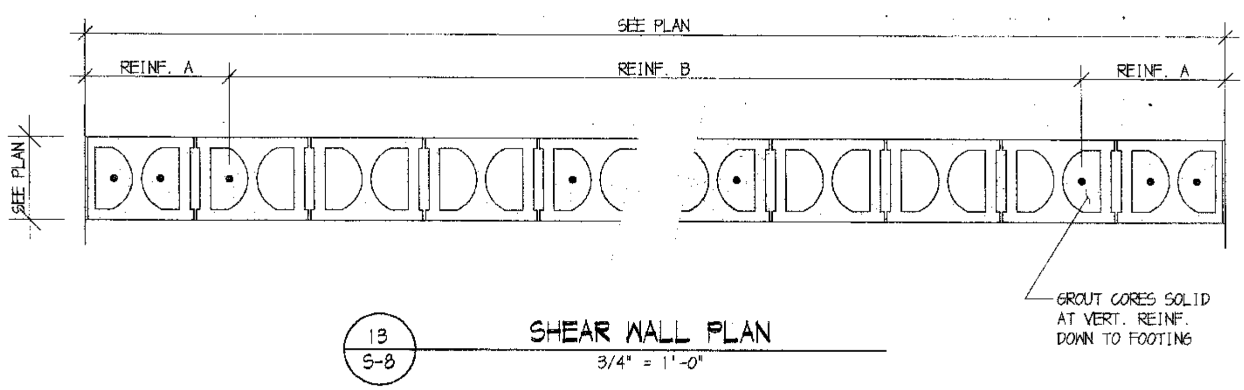


Figure 3: Typical shear wall plan.

Gravity System

Nearly every wall in Tower 'B' contributes to supporting the gravity loads. With the exception of cast in place concrete on the partially below grade ground floor, every wall is CMU. Figure 4 shows all load bearing CMU walls have regularly spaced reinforcing in grouted cells. Walls on floors 1 through 3 call for #4 reinforcing bar spaced at 32 inches on center. Walls on floors 4 through 7 call for #4 reinforcing bars spaced at 48 inches on center. Window and door opening are supported by precast concrete lintels, as can been see in plan in figure 4 and in detail in figure 5.

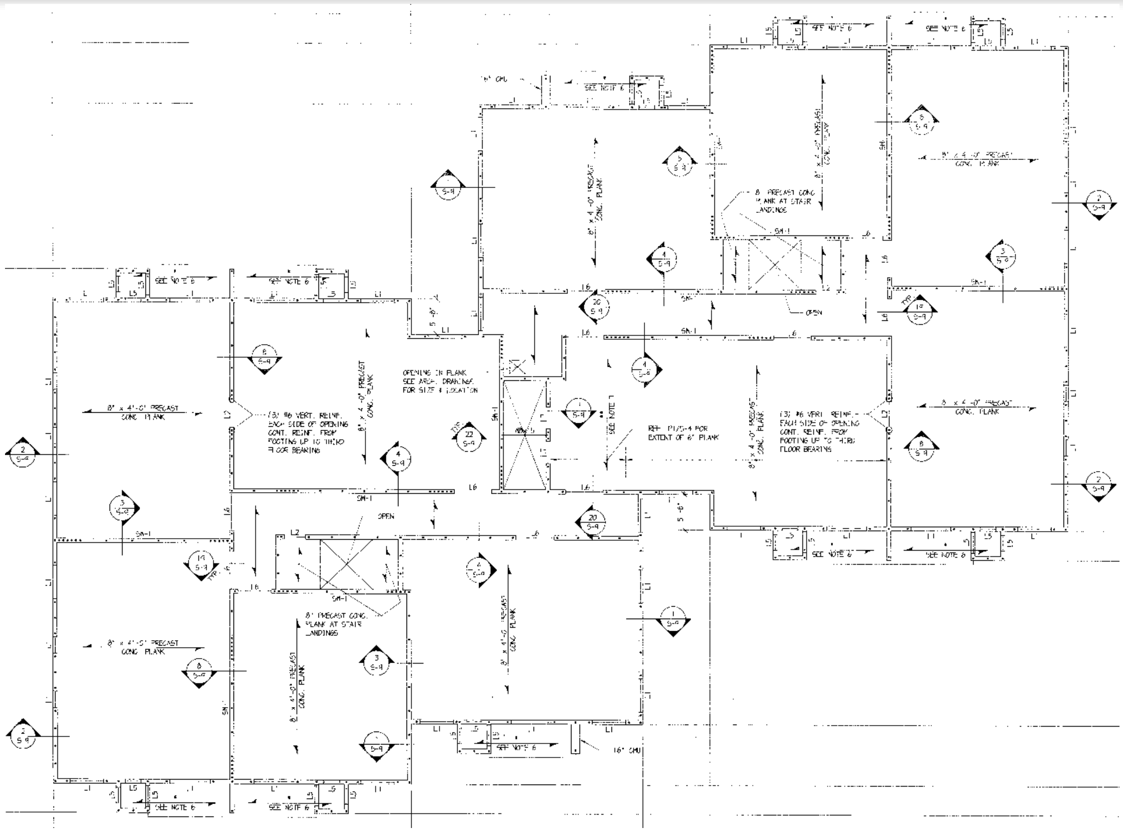


Figure 4: Typical plan layout showing reinforced CMU walls.

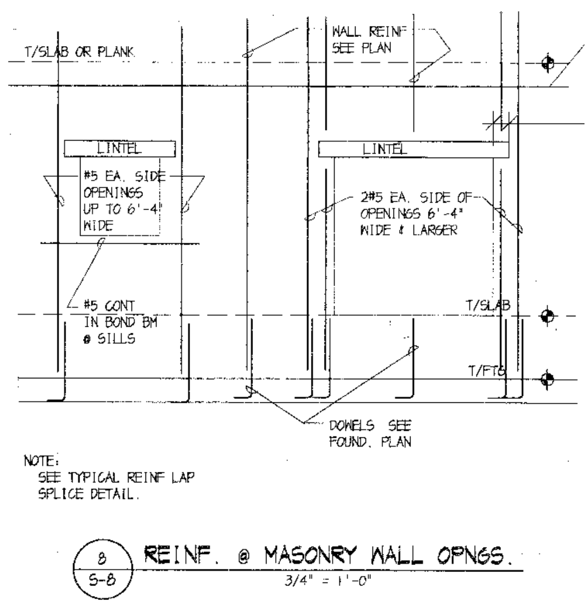


Figure 5: Typical wall openings supported by lintels.

Floor System

The floors of Tower 'B' are precast hollow core concrete plank. The corridor floors are 6 inch plank and all others are 8 inch plank. Referring back to figure 4, the planks span one direction each, but alternate per floor section. Special attention was given to certain plank joints due to the camber and direction of the planks. Said joints were off level where mid spans met perpendicularly with plank ends. Joints and levels corrections were filled solid with 300 psi flowable grout.

The support for the floor planks, as stated before, comes from the CMU walls. At the top of each level's CMU wall is a CMU bond beam with one continuous #5 reinforcing bar. The planks sit directly on a 3 inch bearing strip on the top of the wall. The floors are tied in using #4 reinforcing bars spaced at 48 inches and bent to suit each locations condition. Figures 6 through 8 display a variety of floor plank to wall connection conditions.

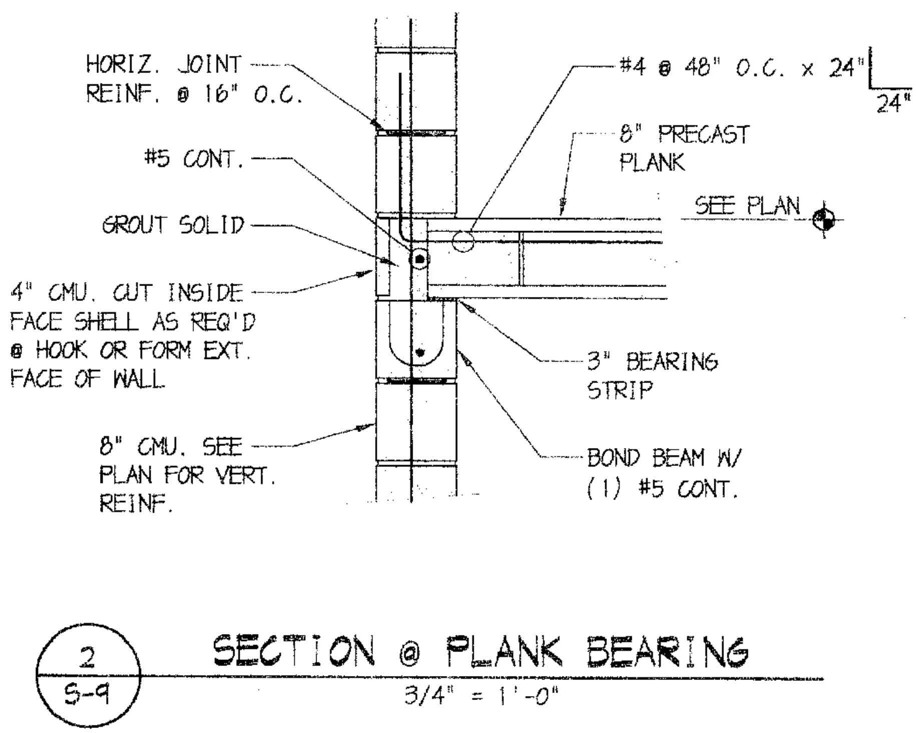


Figure 6: Detail of floor plank bearing on CMU wall.

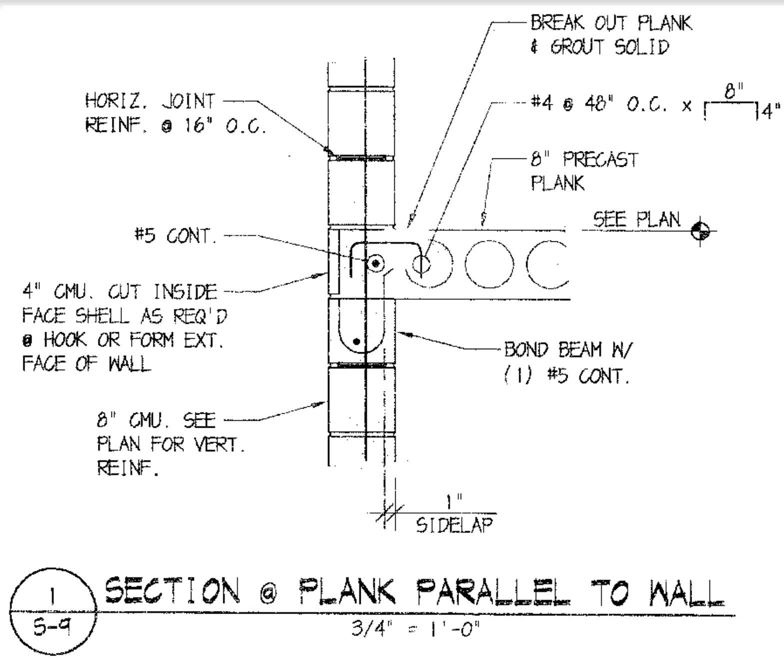


Figure 7: Detail of floor plank running parallel to wall connection.

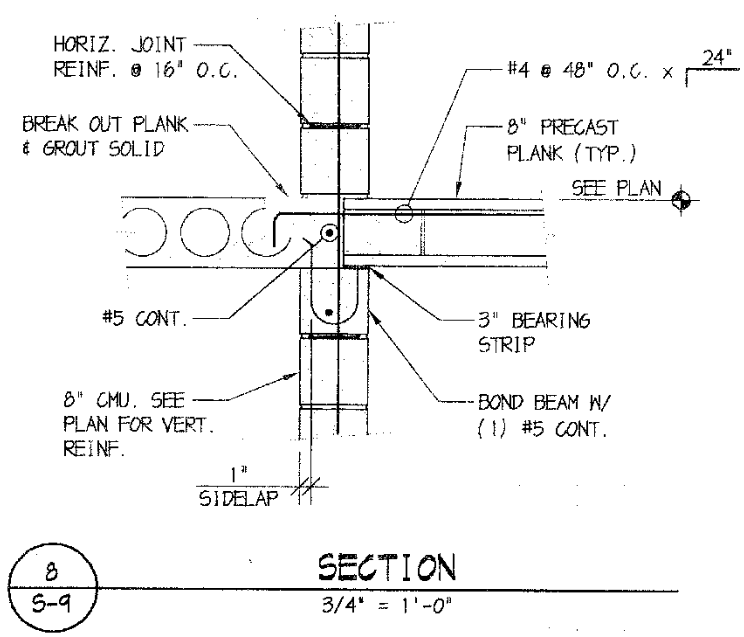


Figure 8: Detail of both bearing and parallel connection conditions.

Roof System

The roof of Tower 'B' is the same basic design as the typical floor system. It is accessible but the layout is mostly empty. Much like the other floors, the roof consists of 8 inch plank throughout except over the corridors where it is 6 inch plank and bears on the CMU wall. Joints, again, are filled solid with 3000 psi flowable grout. Figures 9 and 10 show two connection conditions.

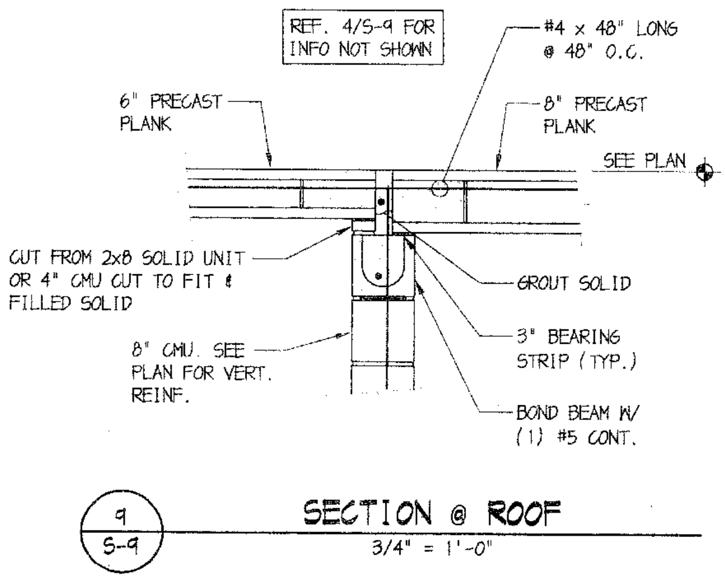


Figure 9: Detail of roof connection.

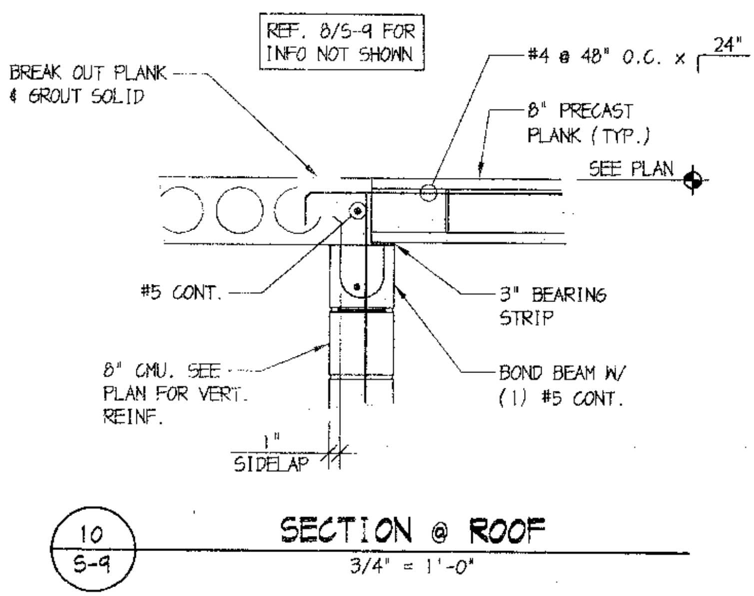


Figure 10: Detail of roof floor connection.

Material Strengths

Existing structural system

Masonry

8" CMU – ASTM C90 Grade N	1900 psi
Core Grout	3000 psi
Bond Beam Grout	2500 psi

Precast

8" x 4' Hollow Core Plank	5000 psi
Joint Grout	3000 psi

Concrete

Foundation Wall	3000 psi
Slab on Grade	3500 psi
Footings	3000 psi
Reinforcement	60 ksi (A615)

Cold Formed Steel Framing

12, 14, & 16 Gage Studs	50 ksi (A653)
18 & 20 Gage Studs	33 ksi (A653)

Design Loads

The building design loads were determined by referencing ASCE 7-05. The live loads were then compared with the loads determined by the designer. However, the designed dead loads were not specified in the documents, therefore, the values determined by this analysis could not be compared to actual design dead loads. Appendix B details more of the dead load calculations. Tables 1 and 2 show this data. Snow loads were also calculated and can be found in Appendix A.

Live Loads		
Area	Actual Design	Thesis Design
Lobbies	100 psf	100 psf
1st Floor Corridor	100 psf	100 psf
Upper Corridors	40 psf	40 psf
Apartment	40 psf	40 psf
Balconies	60 psf	60 psf
Roof	30 psf	20 psf

Table 1: Live Loads

Level	Dead Loads
Roof	821.30
7	1788.24
6	1738.89
5	1738.89
4	1738.89
3	1738.89
2	1738.89
1	1788.24
Ground	1685.56
Total Dead Load	14777.80

Table 2: Level by Level Breakdown of Dead Loads For Existing Structure (kips)

Wind

Wind loads were calculated referencing ASCE 7-05 and flowcharts describing Method 2 for the main wind-force resisting system (MWFRS). According to ASCE 7-05, the structure was found to be rigid. For this preliminary analysis, the shape of Tower 'B' was simplified into a solid rectangular shape. The overall dimensions of the building footprint were used for this basic shape. The effects of the parapets, due to their size, were negligible. The calculated values take into account the effects of internal pressure and were done on a worst case scenario basis. Refer to Appendix C for a list of values and calculations. Refer to tables 3 through 7 and figures 11 through 14 for a detailed breakdown of wind loads.

Pressure (psf) North/South			
Level	Height Above Ground (ft)	Windward	Leeward
Top	78.67	13.99	-8.46
7	68.67	13.57	-8.46
6	59.33	13.13	-8.46
5	50.00	12.64	-8.46
4	40.67	12.09	-8.46
3	31.33	11.43	-8.46
2	22.00	10.61	-8.46
1	12.00	9.82	-8.46
Ground	0.00	9.82	-8.46
L/B = 160.67/127.33 = 1.262			

Table 3: Wind Pressures Acting in the North/South Direction

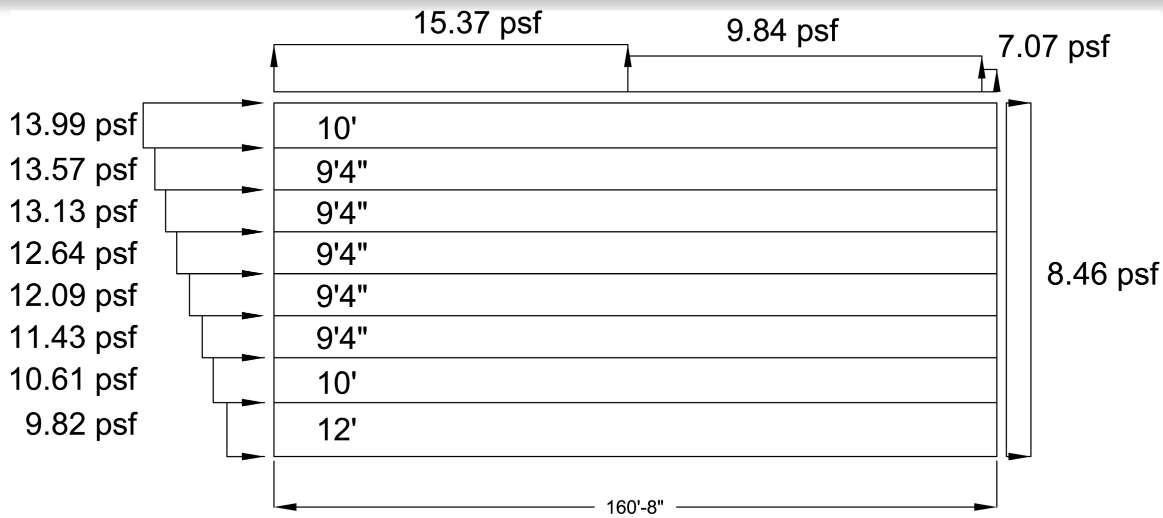


Figure 11: Diagram of Wind Pressures Acting in the North/South Direction

Pressure (psf) East/West			
Level	Height Above Ground (ft)	Windward	Leeward
Top	78.67	13.99	-9.84
7	68.67	13.57	-9.84
6	59.33	13.13	-9.84
5	50.00	12.64	-9.84
4	40.67	12.09	-9.84
3	31.33	11.43	-9.84
2	22.00	10.61	-9.84
1	12.00	9.39	-9.84
Ground	0.00	2.93	-9.84
L/B = 127.33/160.67 = .792			

Table 4: Wind Pressures Acting in the East/West Direction

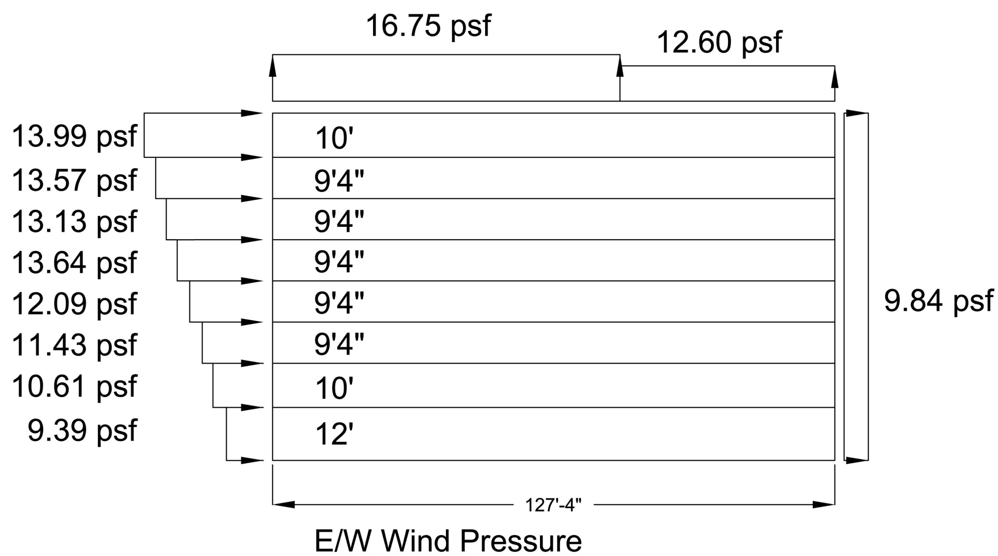


Figure 12: Diagram of Wind Pressures Acting in the East/West Direction

Roof N/S			
Horiz Dist. From WW edge (ft)	Cp Roof	Pressure (psf)	Force (kips)
0 to 39.335	-0.9	-15.37	34.26
39.335 to 78.67	-0.9	-15.37	34.26
78.67 to 157.34	-0.5	-9.84	43.87
157.34 to 160.67	-0.3	-7.07	1.33
Roof E/W			
Horiz Dist. From WW Edge	Cp Roof	Pressure (psf)	Force (kips)
0 to 39.335	-1.0	-16.75	50.96
39.335 to 127.33	-0.7	-12.60	85.77

Table 5: Wind Pressures and Force Acting on the Roof

Force (kips) North/South		
Level	Height Above Ground (ft)	Level Force
Top	78.67	28.43
7	68.67	26.07
6	59.33	25.53
5	50.00	24.94
4	40.67	24.25
3	31.33	23.42
2	22.00	23.13
1	12.00	25.59
Ground	0.00	
Total Force		201.36

Table 6: Wind Forces Acting on the North/South Direction

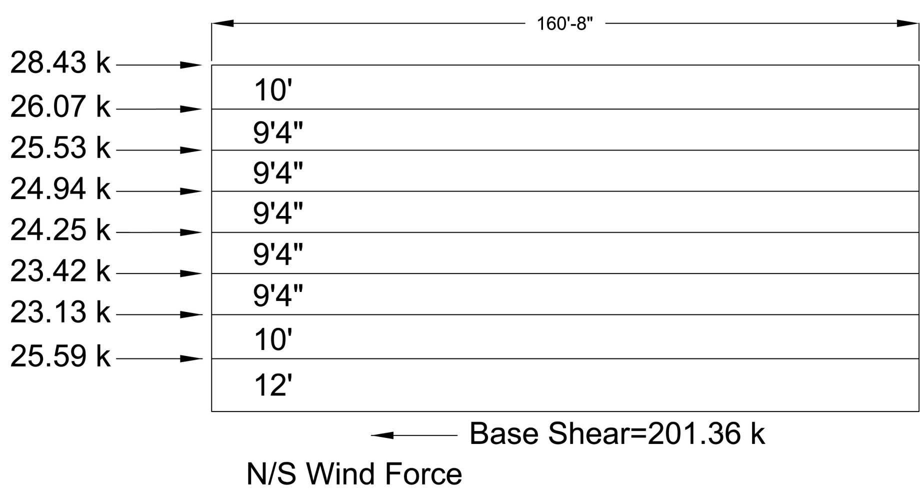


Figure 13: Diagram of Wind Forces Acting in the North/South Direction

Force (kips) East/West		
Level	Height Above Ground (ft)	Level Force
Top	78.67	38.10
7	68.67	34.97
6	59.33	34.29
5	50.00	33.54
4	40.67	32.67
3	31.33	31.63
2	22.00	31.34
1	12.00	32.87
Ground	0.00	
Total Force		269.40

Table 7: Wind Forces Acting on the East/West Direction

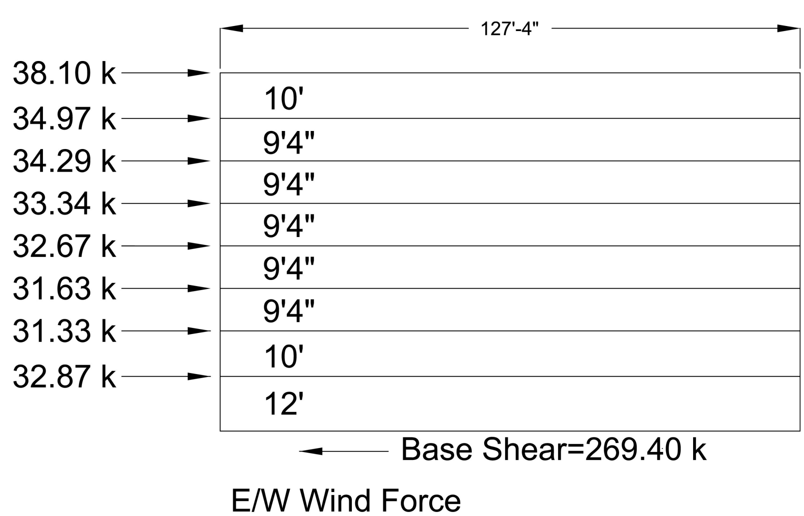


Figure 14: Diagram of Wind Forces Acting on the East/West Direction

Seismic

Seismic loads were calculated referencing ASCE 7-05 and flowchart 6.8. These values are detailed in table 8. It was assumed that the structure is rigid. The total building weight of Tower 'B' used to calculate seismic loads is detailed in table 2. Refer to Appendix D for a list of values and calculations. Table 9 shows a comparison of the lateral forces.

Level	Fx (Kips)	Vx (Kips)	Overturning Moment (ft-k)
Roof	58.11	-	-
7	125.08	58.11	3990.20
6	104.61	183.18	10868.27
5	88.16	287.80	14389.83
4	82.29	375.96	17545.99
3	55.24	458.25	14356.95
2	38.79	513.49	11296.82
1	21.86	552.28	6627.40
Ground	0.00	574.14	0.00
		Total Overturning Moment=	79075.45

Table 8: Seismic Design Story Shear Forces

Figure 15: Diagram of Seismic Design Story Shear Forces (Existing Structure)

Worst Case Lateral Loads (Base Shear)	
Wind North/South	201.36 k
Wind East/West	269.40 k
Seismic	574.14 k

Table 9: Worst Case Base Shears

Proposal

Problem Statement

The analysis performed in Technical Report 1 determined that the controlling lateral load was seismic. In Technical Report 3 it was determined that the lateral system was designed well within the required limits. While the building was designed to adequately handle these forces, the magnitude of the load is caused by the building's heavy design and self-weight. All load bearing and lateral load resisting walls are reinforced CMU. The masonry design offers many structural advantages and consistency in design, and is relatively simple to construction. However, with such weight comes more seismic concern. Tower 'B' is designed virtually identical to multiple neighboring apartment towers and is part of a residential complex.

Proposed Solution and Methods

Since the critical lateral load was created by the self-weight of the building, a lighter structural system may be more beneficial and economical. By replacing the heavy masonry construction with a light, steel based design; the lateral seismic load can be greatly reduced while maintaining required strength. This will require an overhaul of the entire structural system.

To reduce weight and maintain ease of design and construction, use of *The Infinity Structural System* (see acknowledgments page) is proposed. Infinity Structures is a type of prefabricated framing system. The walls are made of "pre-panelized" load-bearing 14 to 12 gage metal studs typically spaced at 16 inches on center. Lateral loads are resisted by "shear panels" which are essentially load bearing stud walls with Grade 55 steel rods crossing diagonally through the wall, making an "X". These panels will be stacked floor to floor and bolted together through the floor to create a continuous lateral load-resisting frame from the foundation and up. "Pre-panelized" sections can also be made to incorporate rigid insulation.

The floor system used in Infinity Structures fortunately will maintain a similar depth to the current floor system. It will essentially be a slab on deck design. Though slightly different in composition, in Technical Report 2 it was determined that a slab on deck design self weight was comparable to that of the current floor system. This will work well with the effort to reduce self-weight in subsequent seismic load considerations. Unsupported floor span lengths can be maintained, greatly due to fact that the floor system will only be sized for residential Live Loads. Free spanning floor length reductions may need to be considered if further analyses indicate as such.

Breadth Topics

Sustainability

Since the roof of Tower 'B' is flat; it would make an ideal place for a "green roof" system. This type of roofing solution can be used for several environment design considerations. It would make a great way to collect and filter rainwater. This water can then be used to irrigate the landscape, cutting back on the use of potable water resources. Cisterns will need to be sized to store the collected rainwater. The green roof may potentially have a positive impact on the cooling loads of the building. An analysis should be performed to determine the effect on the building's cooling needs. Further investigation may determine whether this roof space may also be made public for the residence to enjoy.

In addition to the green roof, the amount of waste and the management there of from construction should be considered. The proposed system is mostly prefabricated and may present for a less wasteful construction site.

Construction Management

A cost comparison of the proposed and original systems should be conducted to further investigate the economics of design. This comparison shall include how the schedule is affected, as well as the material, construction, and transportation costs. Overall efficiency and cost will then indicate whether the proposed alternative is a viable option.

Depth Study: Redesign of Structural System

Overview

One of the most important and initial steps in the design of Tower 'B' using the Infinity Structural System was to evaluate the buildings designated floor plan, and implement the new structure without drastically changing the layout of the plan. The same unsupported floor spans and direction could not be maintained due to the nature of the new system. This proved particularly difficult when considering the functions of various spaces and will be discussed in detail later on.

The new gravity system, fortunately, could be easily manipulated to find a suitable compromise between the existing layout and the new type of structural system. To accommodate the sustainability breadth topic, an extensive green roof wet load was taken into consideration to fully understand the comparison of the original and new designs.

Floor System Design

The biggest challenge to the redesign was the use of the slab on deck floor system in the existing layout. The original design made use of one of the most economical floor systems, precast hollow core plank. Referring back to figure 4, the planks spanned different directions. The floor was essentially separated in to sections according to the building's apartment units that it was located in. The typical spans distances for the precast plank were about 28 feet or more in some places. There was no logical option to have the floor system of the Infinity Structural System span the original distances.

Infinity makes use of Epicore MSR deck. It is a 20 gage composite type deck that uses dovetail shaped locking flutes to keep slab depths shallow and reinforcing bar usage to a minimum across spans. It is specifically designed for multistory residential applications. Refer to figure 16 for a section detail.

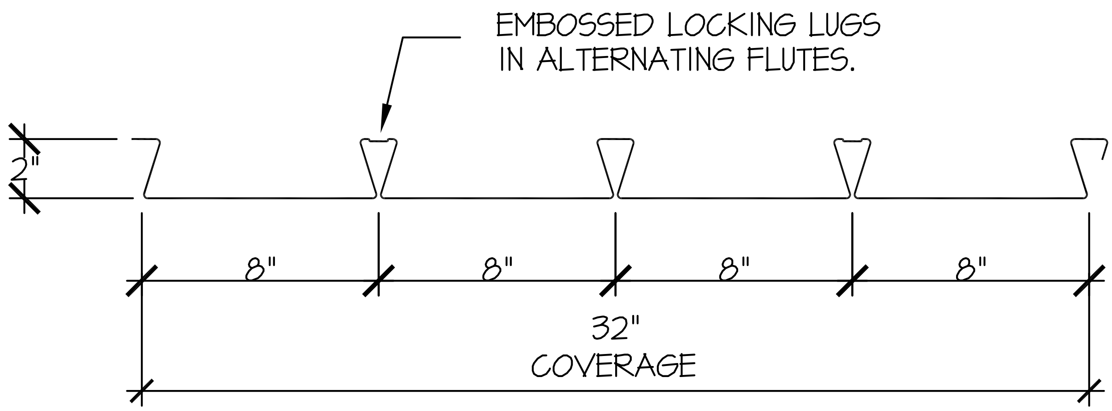


Figure 16: Epicore MSR deck profile

Keeping in mind that the entire purpose of the proposed redesign is to reduce building weight, it is important to consider the depth of the slab in the floor system. The only way to keep the floors self-weight relative or less than that of the precast, the total slab depth must stay around 5 inches. By reassigning interior partition walls from Tower 'B's original layout as load bearing, along with the use of steel beams over open spaces, the typical spans be can nearly halved. Refer to Figure 17 the typical layout of upper level stories. The same support lines are mirrored on the ground and first levels. Figures 18 to 22 show several floor support details.

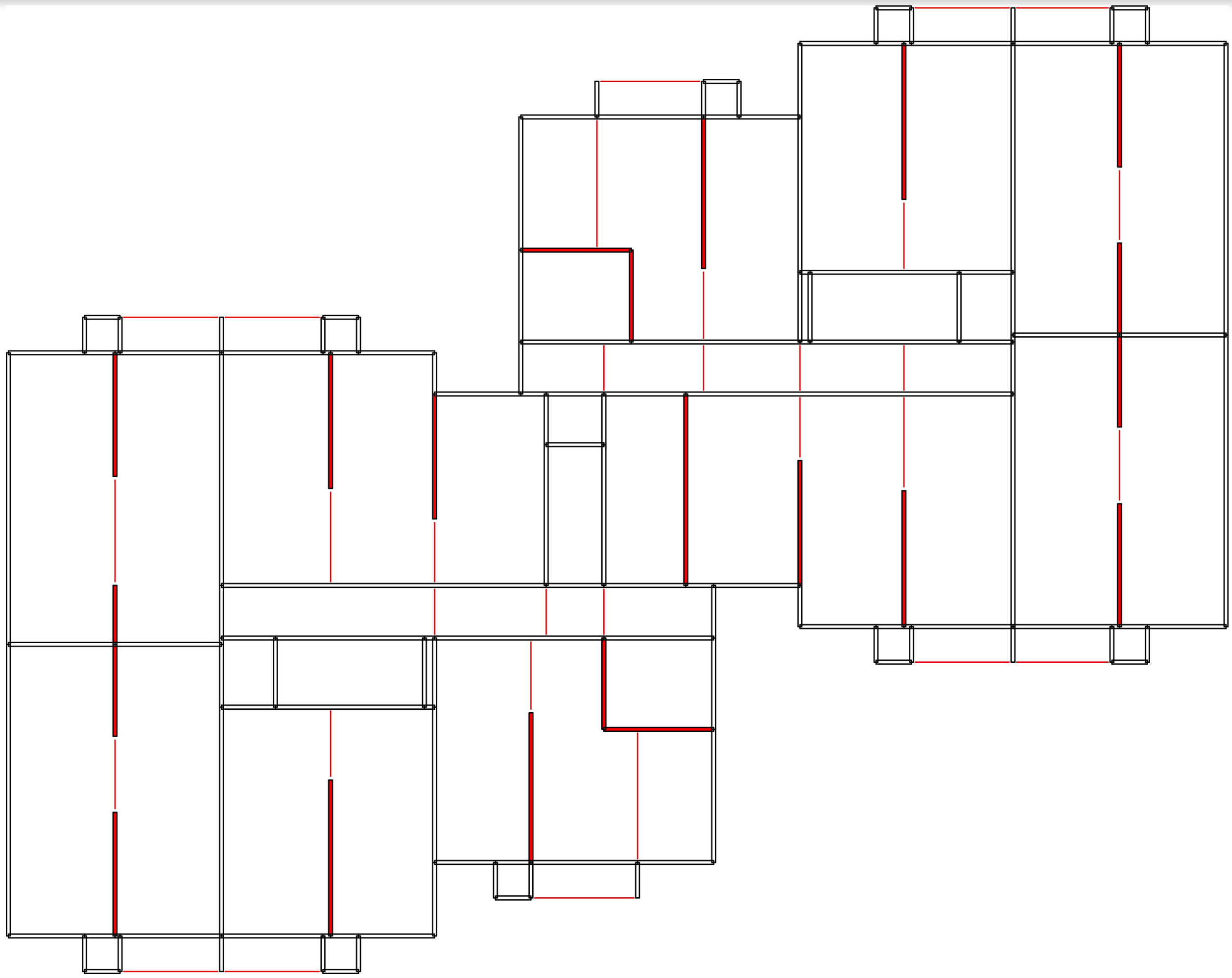


Figure 17: Typical Layout (levels 2-7) showing steel beams and reassigned interior partition walls as load bearing in red.

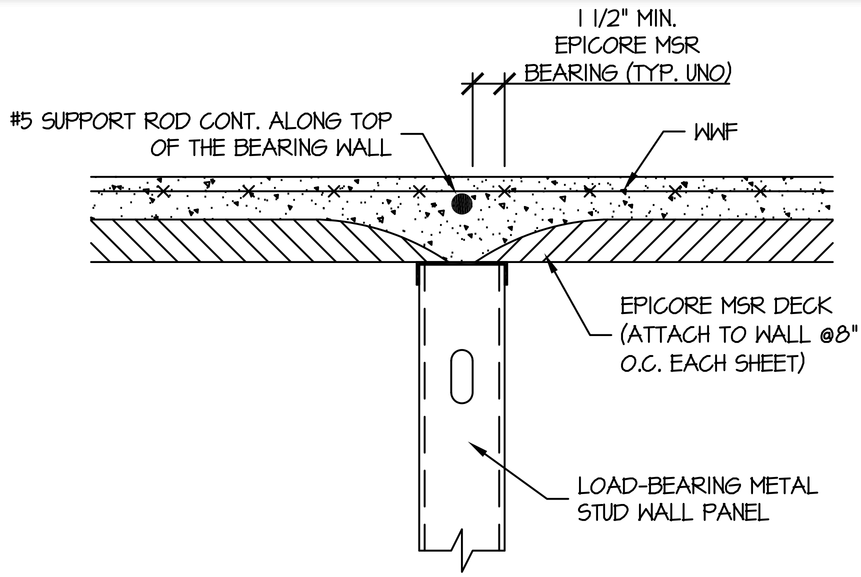


Figure 18: Typical deck on load bearing wall section detail

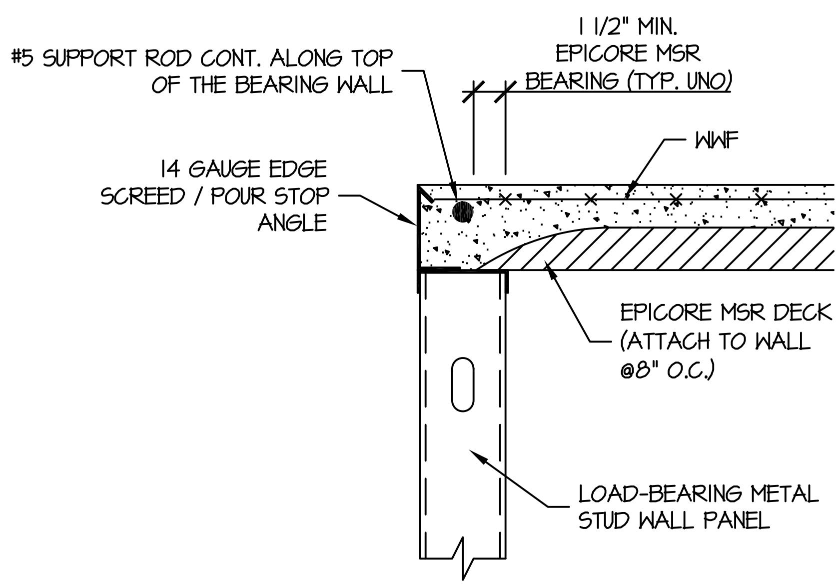


Figure 19: Typical deck at end wall section detail (perpendicular)

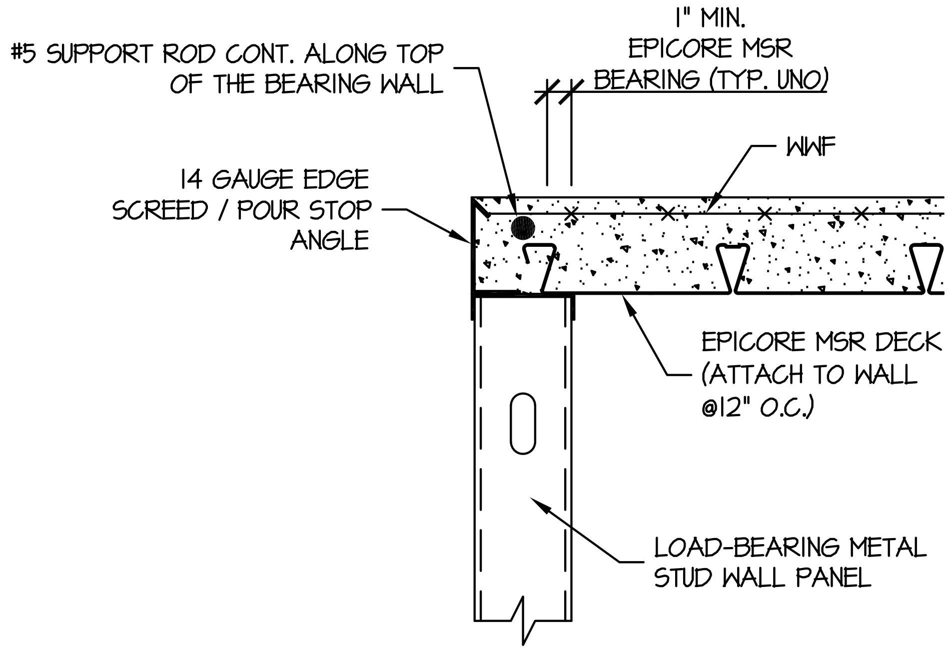


Figure 20: Typical deck at end wall section detail (parallel)

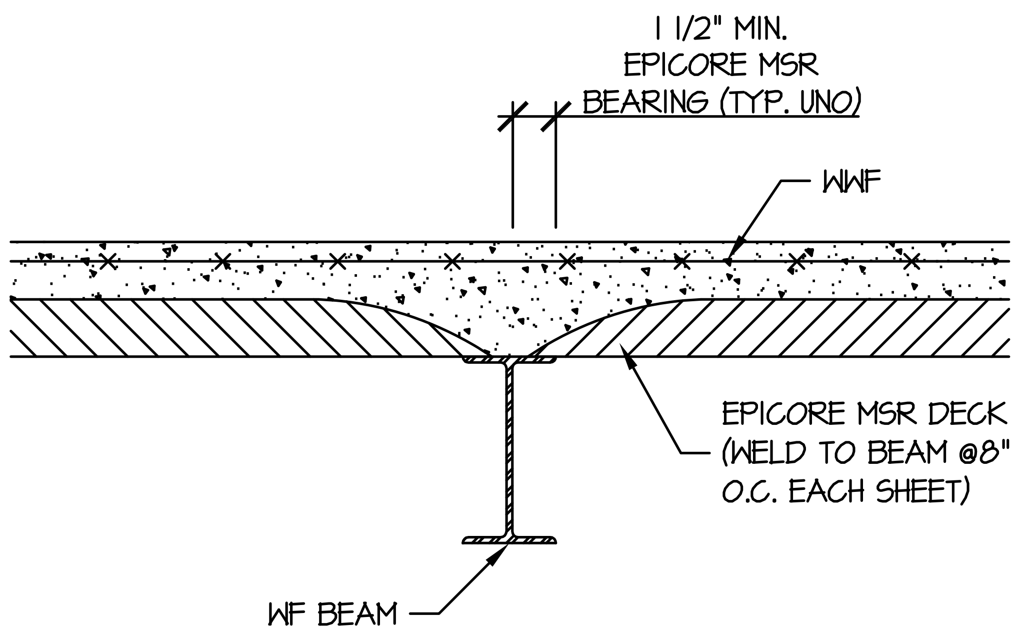


Figure 21: Deck on steel beam section detail

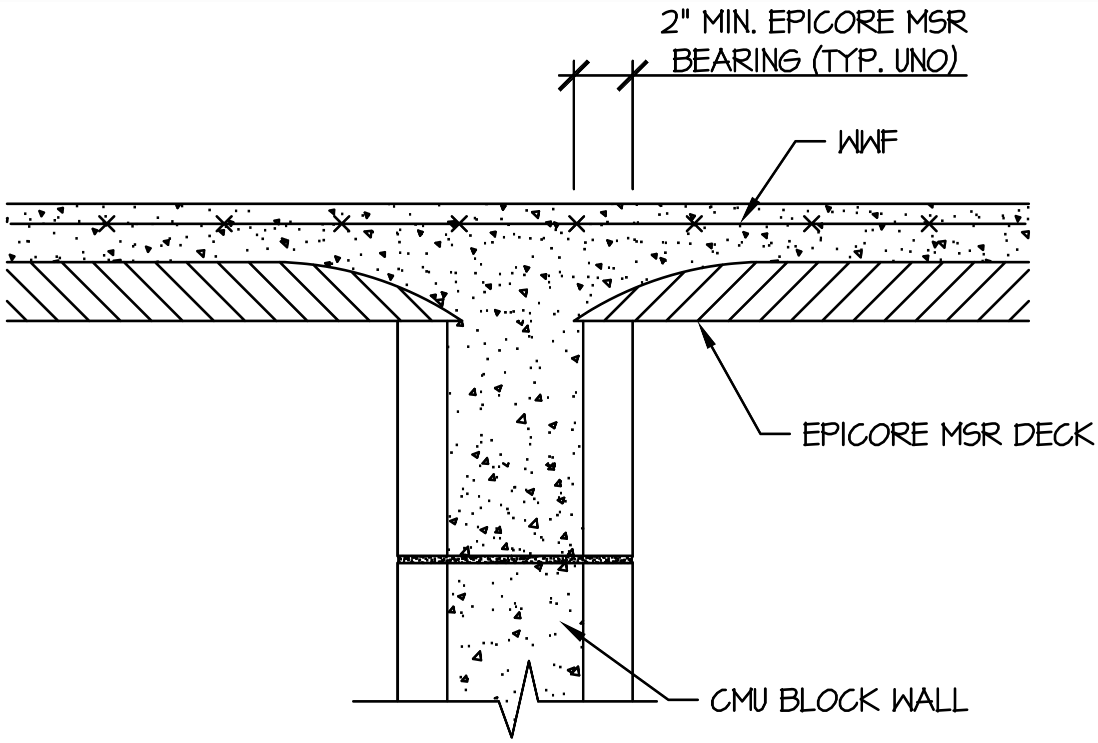


Figure 22: Deck on CMU block section detail

To meet a $WL^2/11$ deflection criteria, the slab is to be reinforced by #4's at 8 inches on center over the supports. Between the supports, the deck is capable of bearing the load itself. 6x6-W1.4xW1.4 tempered mesh is to be used throughout as aswell. Calculations and Specifications can be found in Appendix E.

Gravity System

As stated in the proposal, the gravity system for Infinity Structures is a "pre-panelized" metal stud wall system. These panels are fabricated offsite and then shipped to the construction site. Load bearing metal stud walls are a great way to reduced building self-weight. Even though it may take more linear footage of wall to support the slab on composite deck floor system, metal stud will still weigh in at less than the CMU of the existing design.

An extensive set of hand calculations done in an excel spreadsheet show in detailed breakdown, the design of the metal stud walls. Refer to Appendix F. Using the manufacturers combined axial and lateral load sizing chart the studs noted in table 10 show the necessary sizes per level.

Level	Floor Height	Total Load per Stud(s) (kips)	Stud Spacing (in)	Stud Type
Roof	-	-	-	-
7	10	1.36	16	600S162-54 33ksi
6	9.33	2.84	16	600S162-54 33ksi
5	9.33	4.32	16	600S162-68 33ksi
4	9.33	5.80	16	600S162-97 33ksi
3	9.33	7.28	16	600S162-97 33ksi
2	9.33	8.76	16	(2) 600S162-97 33ksi
1	10	10.24	16	(2) 600S162-97 33ksi
Ground	12	11.72	-	-

Table 10: Stud loads and sizes

The ground floor still maintains the same type of concrete and masonry structure, as it exists. Addition walls must be added to compensate for the alternative floor system. Metal stud construction cannot be used below grade. On levels 1 and 2, the studs must be doubled up to achieve the necessary strength. Figure 23 demonstrates the layout of one of these prefabricated panels.

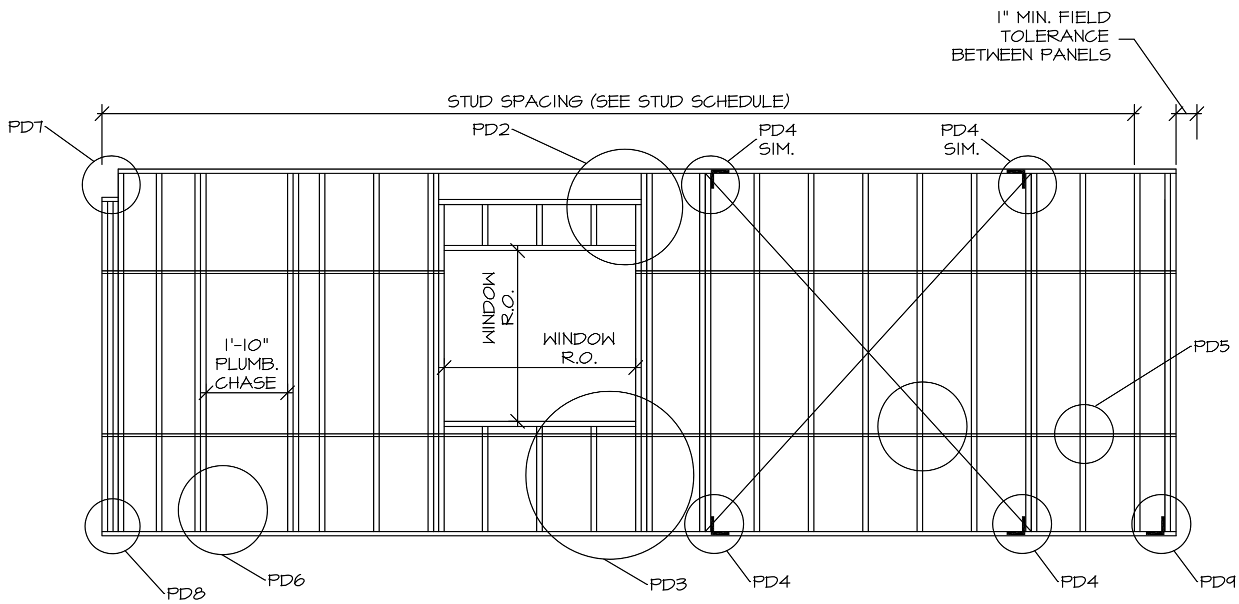


Figure 23: Example of a prefabricated panel

In areas where a load-bearing wall would create an obstacle or close off a space, steels beams and columns are used. On the ground level, it was necessary to use a series of steel beams and columns to keep spaces, such as the lobby, exercise room, and café unhindered. A computer model was built using RAM Structural System. From this model the steel sizes were generate. Spreadsheets of the beam and column sizes, as well as a 3D representation of Tower 'B' can be found in Appendix G. Figures 23 to 25 show the layouts of the ground, first, and second levels respectively with beam sizes.

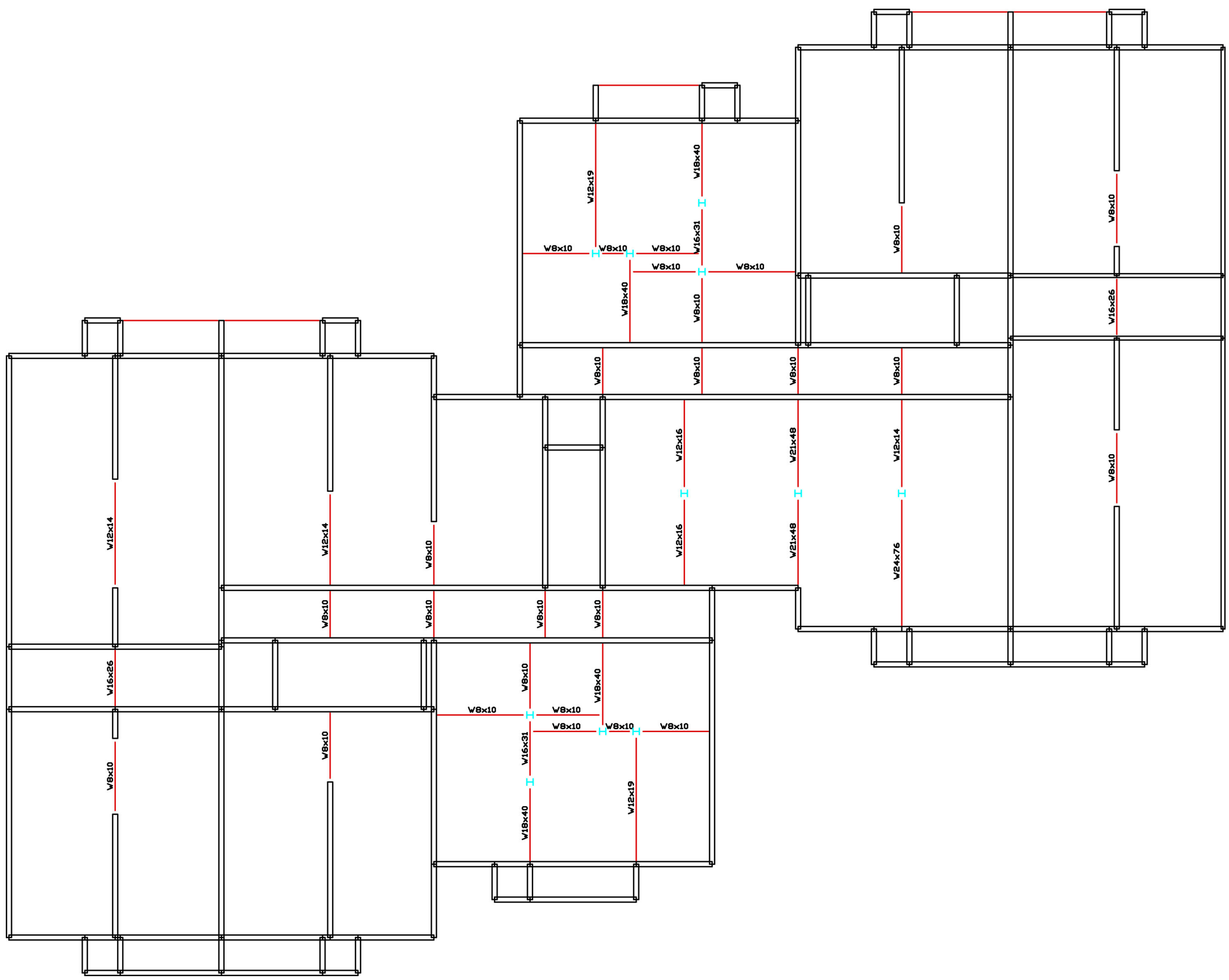


Figure 24: Layout of gravity system on ground level

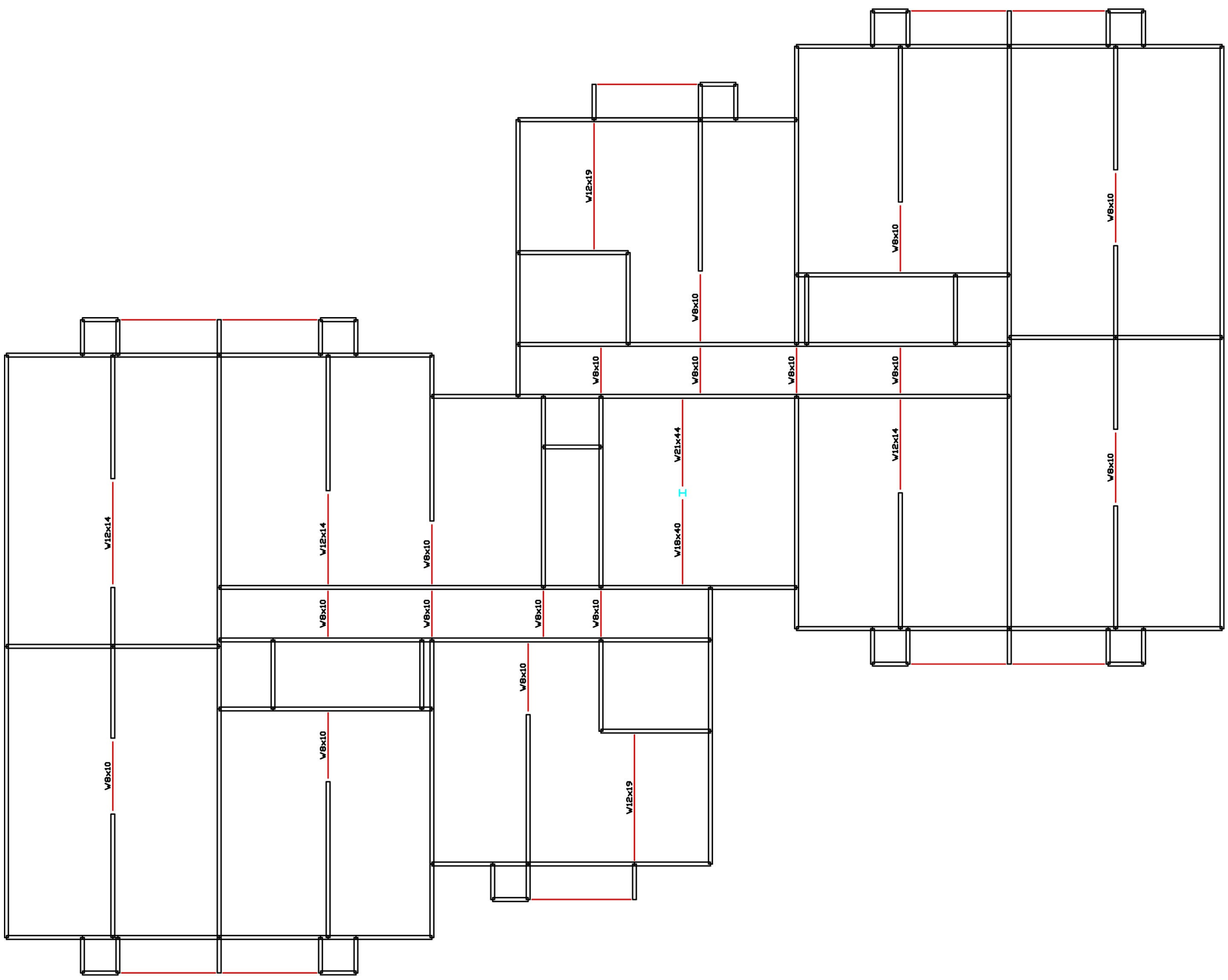


Figure 25: Layout of gravity system on first level

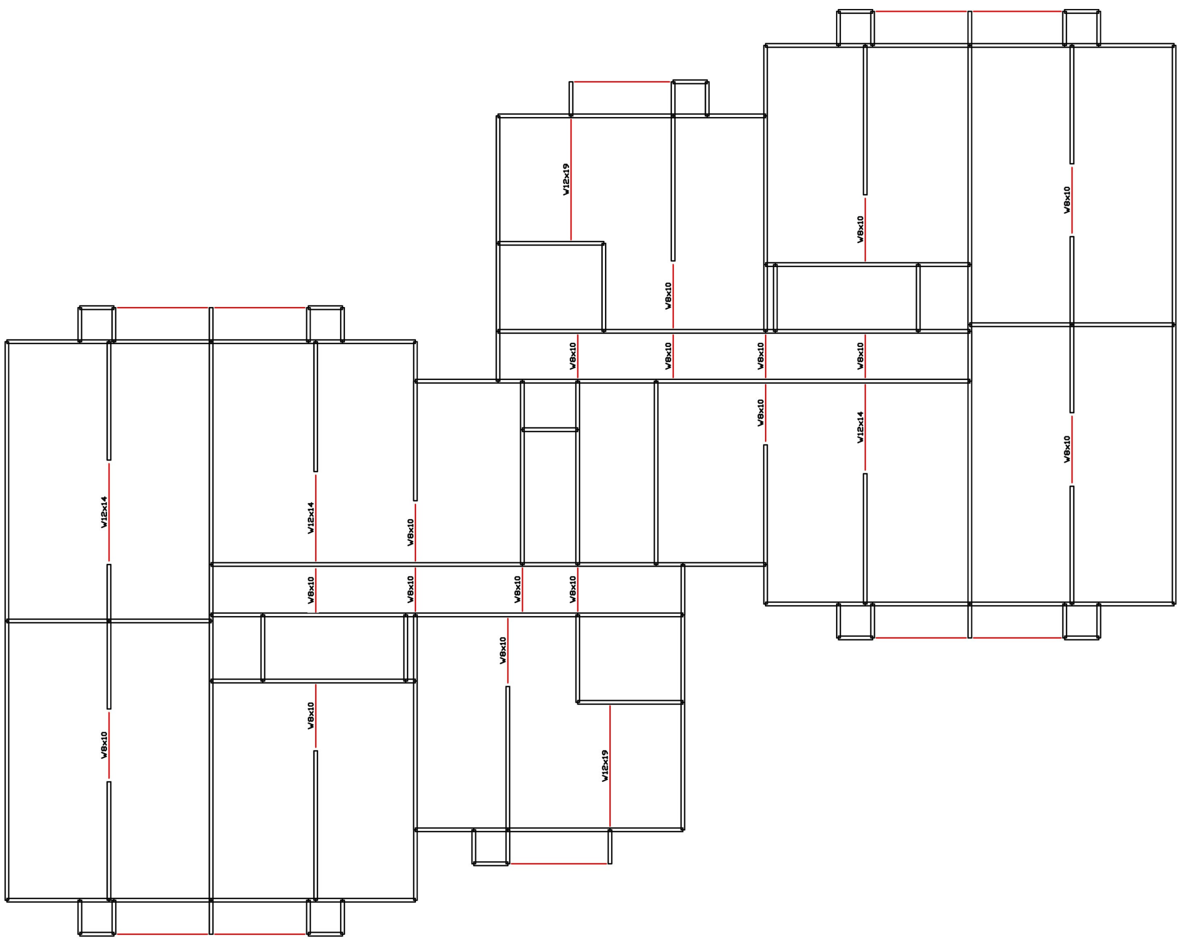


Figure 26: Layout of gravity system on second to seventh level

Lateral System

The lateral system for Tower 'B' would also be a part of the Infinity Structural System. By use of the "Infinity Shear Panel" or ISP, the lateral loads can be addressed while being seamlessly worked into the gravity system. The ISP's make use of ¾ inch round threaded grade 55 steel rods. They form an X with the ISP. This is different from the traditional type of cross bracing that is fastened to the surface of the stud walls. Refer to figure 27 for the ISP assembly.

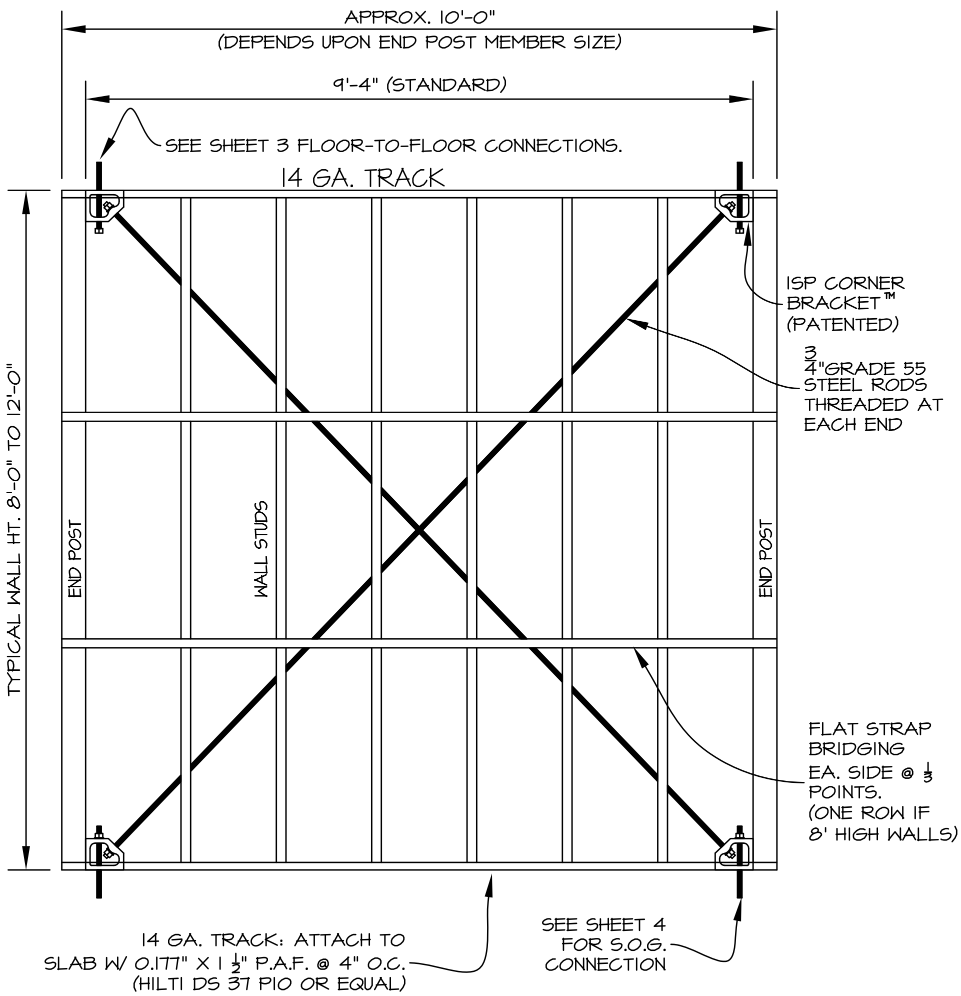


Figure 27: "Infinity Shear Panel"

The ISP would be worked into a 10-foot length of metal stud wall sized for its specific gravity load. The steel rods tie into corner brackets welded in the four corners of the ISP. These corner brackets are then bolted together through the slab to deck, from floor to floor to create a continuously braced lateral system. Refer to figure 28 to see a detail of the thru-bolt assembly. Dependant on wall height, the ISP's can resist anywhere from 7.47kips to 9.40kips of lateral force (table 11).

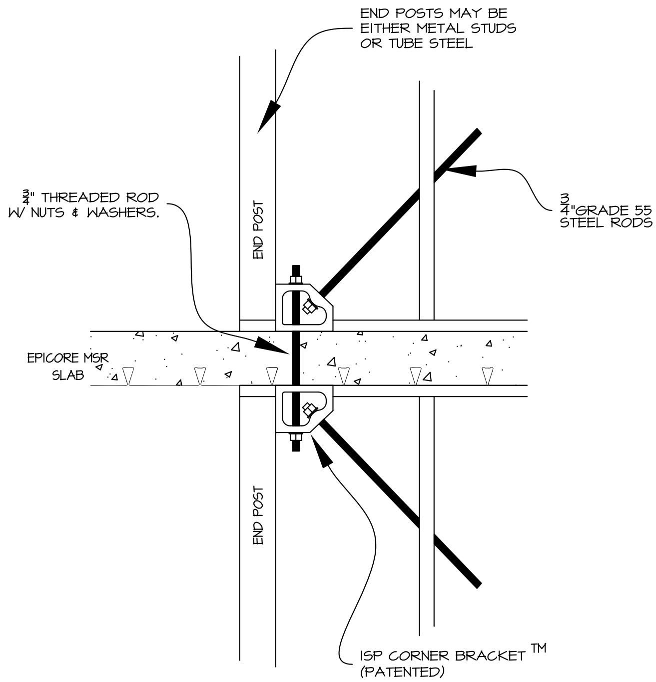


Figure 28: Thru-bolt assembly

ISP HEIGHT	ALLOWABLE
8'- 0"	9.40k
8'- 6"	9.13K
9'- 0"	8.87K
9'- 6"	8.61K
10'- 0"	8.36K
10'-6"	8.13K
11'- 0"	7.90K
11'- 6"	7.68K
12'- 0"	7.47K

Table 11: Horizontal shear values for "Infinity Shear Panels"

The redesigned structure requires and increased amount of shear walls. Even though the structure will be lighter and have lessened seismic loads, it will take more wall length than compared to the existing lateral system. The CMU shear walls of the original structure were more rigid and able to take significantly more force. Fortunately, the need for more support walls for the floor system created more walls eligible to become shear walls. Figure 29 shows the redesigned shear wall layout. A complete and detailed calculation of the lateral system was performed using an excel spreadsheet and can be found in Appendix I.

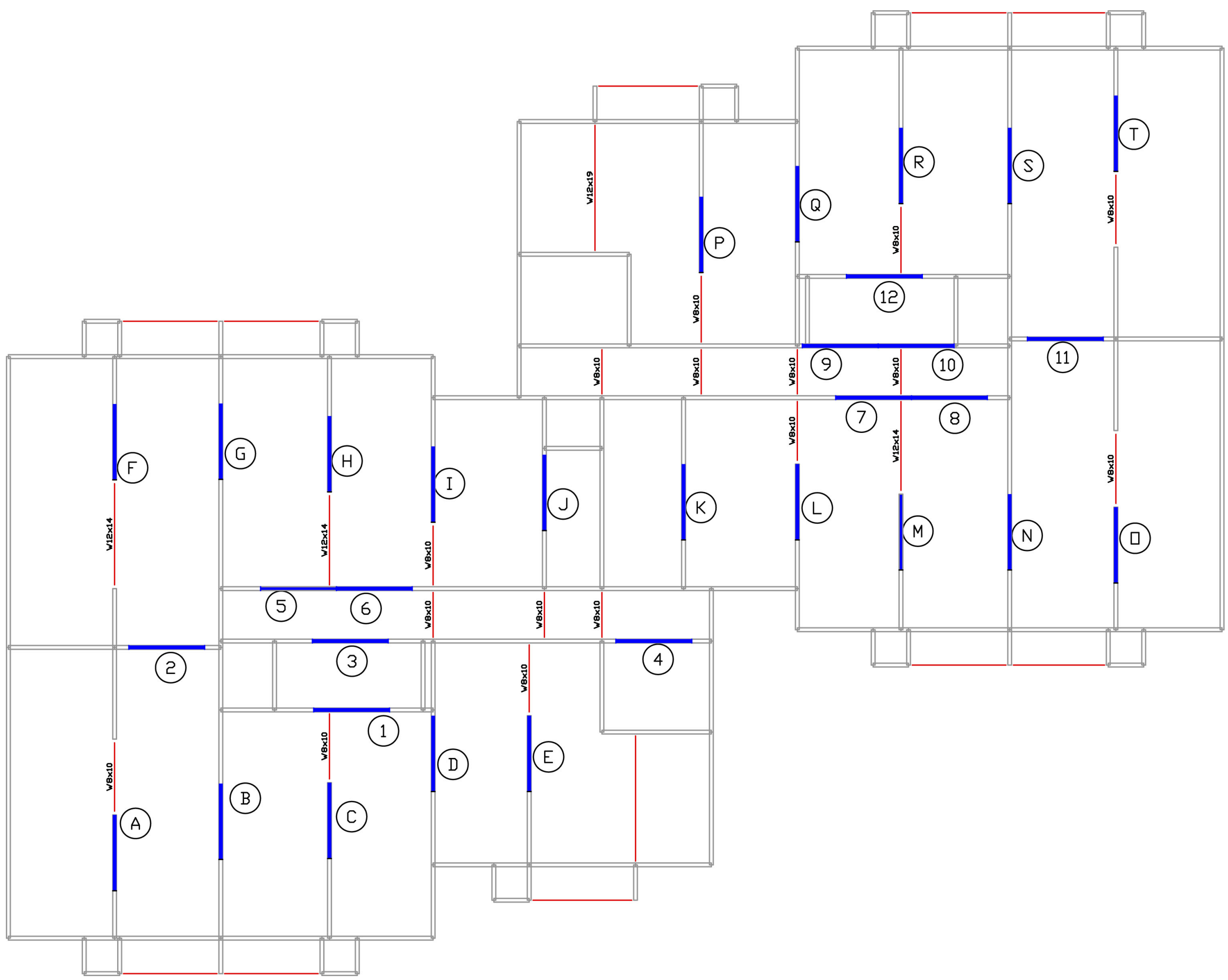


Figure 29: Shear wall layout of redesigned structural system (Numbered and Lettered blue walls indicate shear walls)

Foundations

The foundations of Tower 'B' will bear less of a load, but require additional footings. For all of the interior walls that were reassigned as load-bearing, continuous spread footings need added. In addition to that, some of the gravity loads are transferred to columns and will require their own spread footings.

The foundation merits further investigation, but is slightly beyond the scope of study for the problem statement. It is the goal of this proposed system to reduce the self-weight of Tower 'B' in effort to alleviate much of the later force that could be caused my seismic activity.

Lateral Analysis

Because Tower 'B' did not change its dimensions or location, the wind forces presented at the beginning of this report still hold true for the redesigned structure. However, since the self-weight of the building has been altered, a new seismic and lateral analysis was performed. Detailed in table 12 is a level-by-level breakdown of the self-weight of the redesigned building. A more complete set of dead load calculations can be found in Appendix F. From these deal loads, seismic loads were calculated referencing ASCE 7-05 and flowchart 6.8. These values are detailed in table 13. Figure 30 depicts theses forces acting at each level. To also view a more complete set of the seismic calculations, refer to Appendix H.

Level	Dead Loads
Roof	1025.82
7	873.75
6	872.41
5	877.05
4	886.22
3	886.22
2	918.69
1	922.36
Ground	1503.82
Total Dead Load	8766.34358

Table 12: Level by level breakdown of redesigned building dead load (kips)

Level	Fx (Kips)	Vx (Kips)	Overturning Moment (ft-k)
Roof	86.86	-	-
7	62.95	86.86	5964.94
6	54.29	149.81	8888.20
5	46.03	204.10	10204.86
4	43.49	250.13	11673.57
3	29.19	293.62	9199.08
2	21.37	322.81	7101.89
1	11.71	344.19	4130.25
Ground	0.00	355.90	
		Total Overturning Moment=	57162.78

Table 13: Seismic design story shear forces

Figure 30: Diagram of Seismic Design Story Shear Forces (Redesigned)

Sustainability Breadth

It is often difficult to make a building such as a mid-rise apartment tower sustainable. Instead of the building being conditioned by a few large air-handling units, each individual apartment possesses its own. Sustainability has to be approached in a different way. It is best to find something that the building as a whole can contribute to or take part in. Two of the best options for this type of structure are a rainwater collection system and an extensive green roof.

Tower 'B' features a vacant flat roof system. This type of empty space opens up the possibility of making the building slightly more sustainable. The existing structure itself makes for an easy way to collect rainwater. The flat roof drain thru the middle of the building by way of drainage pipes. These pipes can be rerouted to drain into a cistern and stored for irrigation purposes around the property.

Another great use for a flat roof such as this is an extensive green roof system. This type of system typically only requires 2-6 inches of growing media (soil). The redesign actually included the wet dead load of an extensive green roof. Refer to figures 31 and 32 for assembly and example. An extensive green roof is not the type to be heavily trafficked by the public. A walk-able, intensive, green roof would not be viable for this building. Tower 'B' is located in a suburban area where plenty of open green grass is easy to find. Intensive green roofs are meant for more urban areas where plant life is not naturally abundant.

A green roof can help improve the function of a flat roof in many ways. It helps to reduce the urban heat island effect, keeping the roof cool and at a more constant temp. Because of this, it also helps to increase the life expectancy of the roof membrane. To tie into the rainwater collection topic as well, green roofs help to control and retain storm water run off.

Figures 31 and 32: Green roof assembly (left), and example extensive green roof (right)

Construction Management Breadth

Using the Infinity Structural System is not even remotely close to the CMU and precast hollow core plank of the existing system. Starting at the very foundation, the redesigned project would unfold quite differently. Due to the drastic difference in the nature of the existing and redesigned structural system, It seems fitting to investigate the effects the proposed system would have on the construction time and cost of the project.

The costs of the two structural systems were broken down according to RS Means "Building Construction Cost Data." Only the structural related items were taken into consideration for comparison. Tables 14 and 15 detail the costs for the existing and redesigned systems, respectively.

Quantity	Description	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1130 SFCA	C.I.P. concrete forms	9266	5650	0	14916
3390 C.Y.	Structural concrete, 3000 psi	376290	0	0	376290
480 C.Y.	Structural concrete, 4000 PSI	55680	0	0	55680
179014 Ea.	Concrete block	270311.14	0	0	270311.14
90895 S.F.	Precast slab	731704.75	154521.5	59081.75	945308
5.2 Ton	Reinforcing steel #4 to #7, footings	8450	5720	0	14170
7.7 Lb.	Reinforcing steel, #3 to #7, floors, walls	6.85	6.01	0	12.86
129.85 C.S.F.	Welded wire fabric 6 x 6 - W1.4 x W1.4	2577.52	4349.98	0	6927.5

362 L.F.	Concrete block, lintel	1339.4	2298.7	184.62	3822.72
Total		$1455625.66	$172546.19	$59266.37	$1687438.22

Table 14: Existing Structural Costs

Quantity	Description	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
4200 C.Y.	Structural concrete, 3000 psi	466200	0	0	466200
1130 SFCA	concrete forms	9266	5650	0	14916
10770 L.F.	Metal studs	200860.5	146472	0	347332.5
1039 C.S.F.	Welded wire fabric 6 x 6 - W1.4 x W1.4	20624.15	34806.5	0	55430.65
10.1 Ton	Reinforcing steel, footings, #4 to #7	16412.5	11110	0	27522.5
103880 S.F.	Metal decking	470576.4	78948.8	4155.2	553680.4
1642 L.F.	W8x10	29802.3	11411.9	5237.98	46452.18
58 L.F.	W18x40	4205	368.3	124.7	4698
530 L.F.	W12x16	15370	2512.2	1155.4	19037.6
16.5 L.F.	W16x26	775.5	68.81	31.68	875.99
20.08	W16x31	1134.52	92.97	42.77	1270.26

20.08 L.F.	W16x31	1134.52	92.97	42.77	1270.26
25 L.F.	W18x35	1587.5	158.75	53.75	1800
3847 C.Y.	Structural concrete, 4000 PSI	446252	0	0	446252
82 L.F.	W10x45	6683	331.28	152.52	7166.8
36 L.F.	W12x87	5688	152.64	70.2	5910.84
44.3 Ton	Reinforcing steel, #7 to #11	2347.9	0	0	2347.9
Total		$1697785.27	$292084.14	$11024.20	$2000893.61

Table 15: Redesigned Structural Costs

The construction timeline of the two different systems were broken down. The actual scheduled for the existing system is shown in figure 33. A schedule was developed approximating the timeline for the proposed redesign and can be found in figure 34. Again, only the structural portions of the schedule were considered for this comparison.

ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1	Concrete Foundation	32 days	Tue 11/14/06	Wed 12/27/06		
2	Concrete Foundation Walls	14 days	Mon 12/11/06	Thu 12/28/06		
3	Concrete Slab Part 1	1 day	Sat 1/27/07	Sat 1/27/07		
4	Concrete Slab Part 2	1 day	Thu 3/1/07	Thu 3/1/07		
5	Masonry-Ground Floor	20 days	Thu 2/1/07	Wed 2/28/07		
6	Precast-First Floor	3 days	Mon 3/12/07	Wed 3/14/07		
7	Grout-First Floor	2 days	Thu 3/15/07	Fri 3/16/07		
8	Masonry-Floor1	12 days	Fri 3/16/07	Mon 4/2/07		
9	Precast-Floor2	3 days	Thu 3/29/07	Mon 4/2/07		
10	Grout Plank-Floor2	2 days	Tue 4/3/07	Wed 4/4/07		
11	Masonry-Floor2	12 days	Wed 4/4/07	Thu 4/19/07		
12	Precast-Floor3	3 days	Tue 4/17/07	Thu 4/19/07		
13	Grout Plank-Floor3	2 days	Fri 4/20/07	Mon 4/23/07		
14	Masonry-Floor3	12 days	Mon 4/23/07	Tue 5/8/07		
15	Precast-Floor4	3 days	Fri 5/4/07	Tue 5/8/07		
16	Grout Plank-Floor4	2 days	Wed 5/9/07	Thu 5/10/07		
17	Masonry-Floor4	12 days	Thu 5/10/07	Fri 5/25/07		
18	Precast-Floor5	3 days	Wed 5/23/07	Fri 5/25/07		
19	Grout Plank-Floor5	2 days	Tue 5/29/07	Wed 5/30/07		
20	Masonry-Floor5	12 days	Wed 5/30/07	Thu 6/14/07		
21	Precast-Floor6	3 days	Tue 6/12/07	Thu 6/14/07		
22	Grout Plank-Floor6	2 days	Fri 6/15/07	Mon 6/18/07		
23	Masonry-Floor6	12 days	Mon 6/18/07	Tue 7/3/07		
24	Precast-Floor7	3 days	Fri 6/29/07	Tue 7/3/07		
25	Grout Plank-Floor7	2 days	Thu 7/5/07	Fri 7/6/07		
26	Masonry-Floor7	12 days	Fri 7/6/07	Mon 7/23/07		
27	Precast-Roof	3 days	Thu 7/19/07	Mon 7/23/07		
28	Grout Plank-Roof	2 days	Tue 7/24/07	Wed 7/25/07		

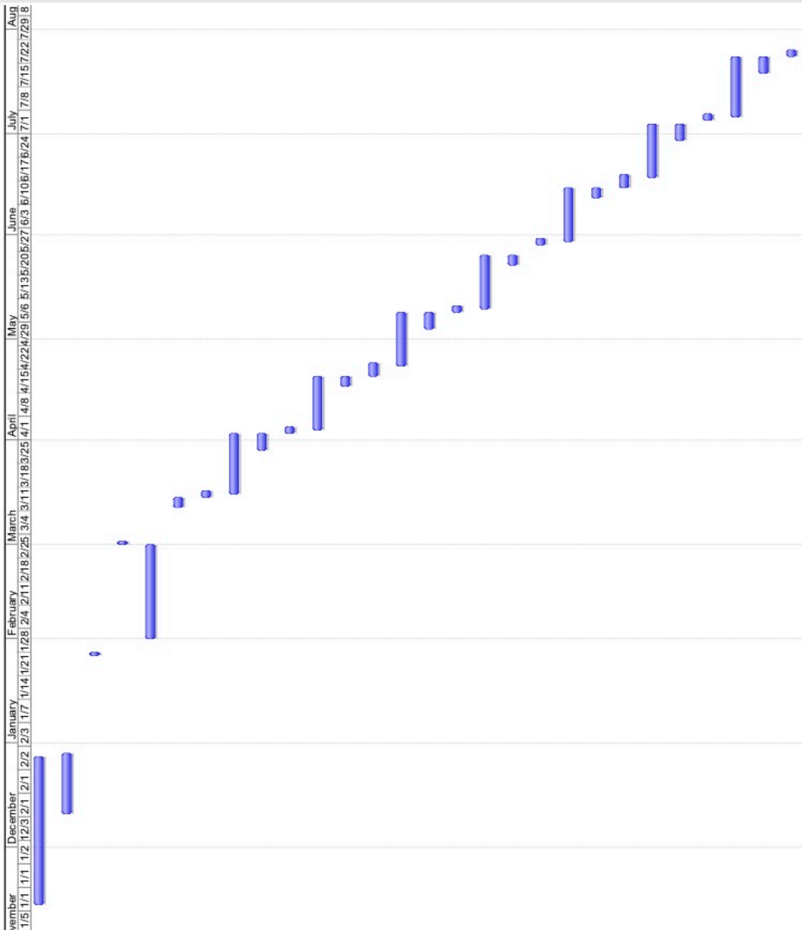
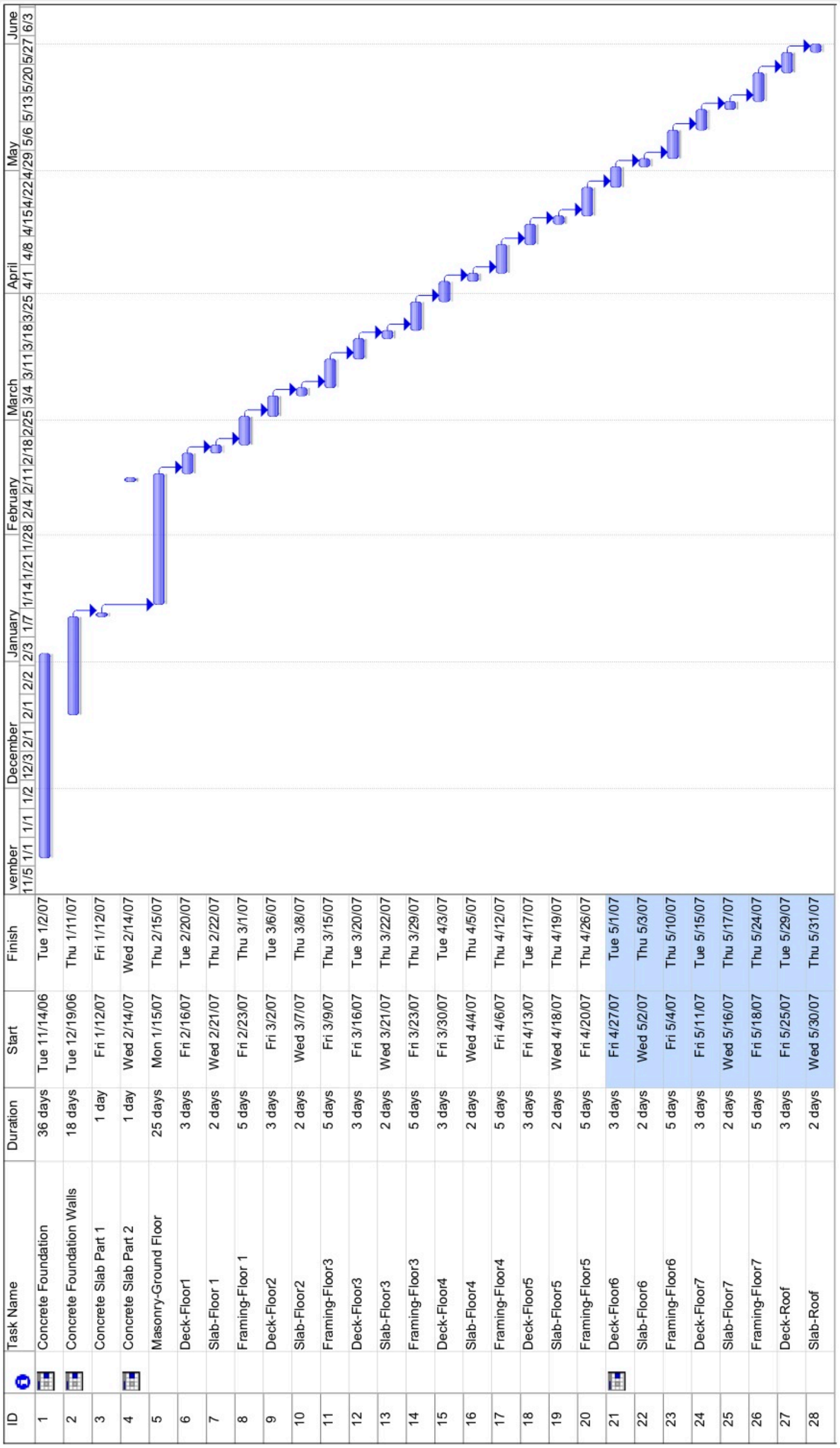


Figure 33: Existing Construction Schedule



ID	Task Name	Duration	Start	Finish
1	Concrete Foundation	36 days	Tue 11/14/06	Tue 1/2/07
2	Concrete Foundation Walls	18 days	Tue 12/19/06	Thu 1/11/07
3	Concrete Slab Part 1	1 day	Fri 1/12/07	Fri 1/12/07
4	Concrete Slab Part 2	1 day	Wed 2/14/07	Wed 2/14/07
5	Masonry-Ground Floor	25 days	Mon 1/15/07	Thu 2/15/07
6	Deck-Floor1	3 days	Fri 2/16/07	Tue 2/20/07
7	Slab-Floor 1	2 days	Wed 2/21/07	Thu 2/22/07
8	Framing-Floor 1	5 days	Fri 2/23/07	Thu 3/1/07
9	Deck-Floor2	3 days	Fri 3/2/07	Tue 3/6/07
10	Slab-Floor2	2 days	Wed 3/7/07	Thu 3/8/07
11	Framing-Floor3	5 days	Fri 3/9/07	Thu 3/15/07
12	Deck-Floor3	3 days	Fri 3/16/07	Tue 3/20/07
13	Slab-Floor3	2 days	Wed 3/21/07	Thu 3/22/07
14	Framing-Floor3	5 days	Fri 3/23/07	Thu 3/29/07
15	Deck-Floor4	3 days	Fri 3/30/07	Tue 4/3/07
16	Slab-Floor4	2 days	Wed 4/4/07	Thu 4/5/07
17	Framing-Floor4	5 days	Fri 4/6/07	Thu 4/12/07
18	Deck-Floor5	3 days	Fri 4/13/07	Tue 4/17/07
19	Slab-Floor5	2 days	Wed 4/18/07	Thu 4/19/07
20	Framing-Floor5	5 days	Fri 4/20/07	Thu 4/26/07
21	Deck-Floor6	3 days	Fri 4/27/07	Tue 5/1/07
22	Slab-Floor6	2 days	Wed 5/2/07	Thu 5/3/07
23	Framing-Floor6	5 days	Fri 5/4/07	Thu 5/10/07
24	Deck-Floor7	3 days	Fri 5/11/07	Tue 5/15/07
25	Slab-Floor7	2 days	Wed 5/16/07	Thu 5/17/07
26	Framing-Floor7	5 days	Fri 5/18/07	Thu 5/24/07
27	Deck-Roof	3 days	Fri 5/25/07	Tue 5/29/07
28	Slab-Roof	2 days	Wed 5/30/07	Thu 5/31/07

Figure 34: Redesigned Construction Schedule

Conclusions

Structural Depth

After much analysis, the redesign of Tower 'B' appears to be a success. By using the Infinity Structural System, the building self-weight was reduced by 40%. This in turn led to a seismic base shear reduction of 38%. The main goal of the proposal was achieved.

During the redesigned of Tower 'B' to become a lighter building, it was necessary to reassign interior partition walls as load bearing. This may be considered unappealing by the owner, should they wish to alter the layout of the apartment units throughout the life of the building. In addition to reassigning walls, steel columns were required in once open areas on the ground level to transfer the gravity loads to the foundation.

Should the building owner never have a need to alter the layout of apartments or find the columns troublesome on the ground level, the Infinity Structural System makes a very viable alternative to this mid-rise apartment building.

Sustainability Breadth

A breath study was performed to investigate the options for making Tower 'B' more sustainable. It is not always easy to alleviate the environmental and economical stress that a building of this nature can cause. A rainwater collection system was discussed to uncover what benefits it can have when incorporated in a setting such as this apartment building. Also, the benefits of an extensive green roof were discussed.

Construction Management Breadth

By studying the cost and construction schedule of both the existing and redesigned structures a comparison can be made as to which structure might better suit the owner. Both the cost and construction timeline were done only on the structure component of the building.

The existing structure took a total of 192 days to build. The redesigned structure took a total of 156 days to build. The proposed structural system could have provided the owner a 36-day lead. The cost comparison on the other hand, did not turn out for the benefit of the owner. According to the costs analysis, the Infinity Structural System is more expensive by $313,455.39. Viewing the project as a whole, the increased cost of the structural system may seem but a small price to pay. The redesign may costs more, but it can be completed faster than the original. This shows that the proposed redesigned can still be considered feasible.

Bibliography

Original Design Codes

- International Building Code (IBC), 2003 edition
    - With Amendments adopted by New Castle County (DE)
- American Concrete Institute (ACI)
    - Building Code Commentary 318-02
- American Institute of Steel Construction (AISC)
    - Steel Construction Manual

Additional References Used for Thesis

- American Society of Civil Engineers (ASCE)
    - ASCE 7 – 05
- Precast/Prestressed Concrete Design Handbook
    - PCI Manual for the Design of Hollow Core Slabs
- National Concrete and Masonry Association (NCMA) TEK
    - TEK 14-5A (2006)
- Epicore MSR Engineering Tables
- Infinity Structural System Design Material
- RS Means "Building Construction Cost Data" 2009 Edition
- RAM Structural System (Computer modeling program)
- Hydrotech, Green Roof Assembly, www.hyrdotechusa.com
- Clark Western Structural Steel Framing Systems, Technical Information

Appendix A - Snow Load

Snow Load

Thermal factor 1.0 C_t
Importance factor 1.0 I
Ground snow load 25 psf
Flat roof snow load 20 psf

Exposure = 0.9 = C_e

slope factor
$C_s = 1.0$

$p_g = 25 psf$

$\gamma = 0.13\ p_g + 14 \leq 30\ pcf$

$0.13(25) + 14 = 17.25 \leq 30$

$\gamma = 17.3$

Category II

$p_f = 0.7\,(C_e)(C_t)(I)(p_g) = 0.7(0.9)(1.0)(1.0)(25) = 15.75$

$p_{f_{min}} = 20\ psf > 15.75 \therefore \quad p_f = 20\ psf = p_s$

Appendix B – Existing Dead Loads

Loads

Level	Floor Height	Floor area	Deck (psf)	4" Slab / 8" Precast (psf)	Floor Finish (psf)	Partitions (psf)	Ceiling Finish (psf)	EPDM Roof Assem. (psf)	Extensive Green Roof Wet Assem. (psf)
Roof	0	12985	0	61.25	0	0	0	2	0
7	10	12985	0	61.25	1	8	0.75	0	0
6	9.33	12985	0	61.25	1	8	0.75	0	0
5	9.33	12985	0	61.25	1	8	0.75	0	0
4	9.33	12985	0	61.25	1	8	0.75	0	0
3	9.33	12985	0	61.25	1	8	0.75	0	0
2	9.33	12985	0	61.25	1	8	0.75	0	0
1	10	12985	0	61.25	1	8	0.75	0	0
Ground	12	12985	0	50	1	0	0.75	0	0

MEP (psf)	CMU (psf) (vertical)	CMU (plf)	Total Wall Length	Total Weight of walls (kips)	others DLs (kips)	Total Deal Load
0	65	0	0	0	821.30125	821.30125
10	65	650	1133	736.45	1051.785	1788.235
10	65	606.45	1133	687.10785	1051.785	1738.89285
10	65	606.45	1133	687.10785	1051.785	1738.89285
10	65	606.45	1133	687.10785	1051.785	1738.89285
10	65	606.45	1133	687.10785	1051.785	1738.89285
10	65	606.45	1133	687.10785	1051.785	1738.89285
10	65	650	1133	736.45	1051.785	1788.235
10	65	780	1133	883.74	801.82375	1685.56375
					Total:	14777.79925

Appendix C – Wind Calculations

Wind Calculations

$V = 90$ mph

$K_d = 0.85$

$I = 1.0$

exposure Category B

$K_{zt} = 1.0$

$q_z \rightarrow$ excel sheet $\qquad q_z = 0.00256\, K_z K_{zt} K_d V^2 I$

$q_h \rightarrow$ excel sheet $\qquad q_h = 0.0256\, K_z K_{zt} K_d V^2 I$

Structure is rigid

$G = 0.85$

$P_p =$ GC_{pn} windward $= 24.396$

GC_{pn} Leeward $= -16.264$

EAST / WEST

$L/B = \frac{127.73}{160.67} = .792$

WW $C_p = 0.8$

LW $C_p = -0.5$

Side $C_p = -0.7$

North / south

$L/B = \frac{160.67}{127.73} = 1.262$

WW $C_p = 0.8$

LW $C_p = -0.5$

Side $C_p = -0.7$

$GC_{pi} = \pm 0.18$

Roof: $\frac{h}{L} = \frac{78.17}{160.67} = .48$ E/W $\quad C_p \rightarrow$ refer to excel chart

$\frac{h}{L}$ $\frac{78.67}{127.37} = .67$ N/S $\quad C_p \rightarrow$ refer to excel chart

L/B=160.67/127.33=1.262

Pressure (psf) North/South

Level		Height Above Ground Z(ft)	Kz	qz (psf)	qh (psf)	Gcpi	Cp WW	Cp LW	Cp Side	G	Windward	Leeward	Sidewall	Width (ft)	Story Heigl	Area (sf)	Force (Pou	Force (Kips	Story Forc	Overturning Moment (ft-k)
Top		78.67	0.922762	16.26424	16.26423	0.18	0.8	-0.4	-0.7	0.85	13.98724	-8.4574	-12.6048	127.33	5	636.65	14289.38	14.28938	28.42988	2236.578
		73	0.90325	15.92032	16.26423	0.18	0.8	-0.4	-0.7	0.85	13.75338	-8.4574	-12.6048	127.33	5	636.65	14140.49	14.14049		
	7	68.67	0.887607	15.6446	16.26423	0.18	0.8	-0.4	-0.7	0.85	13.56589	-8.4574	-12.6048	127.33	4.67	594.6311	13095.73	13.09573	26.06545	1789.914
		64	0.869924	15.33294	16.26423	0.18	0.8	-0.4	-0.7	0.85	13.35396	-8.4574	-12.6048	127.33	4.67	594.6311	12969.71	12.96971		
	6	59.33	0.851294	15.00458	16.26423	0.18	0.8	-0.4	-0.7	0.85	13.13067	-8.4574	-12.6048	127.33	4.67	594.6311	12836.94	12.83694	25.53373	1514.916
		54.67	0.831629	14.65796	16.26423	0.18	0.8	-0.4	-0.7	0.85	12.89498	-8.4574	-12.6048	127.33	4.67	594.6311	12696.79	12.69679		
	5	50	0.810681	14.28874	16.26423	0.18	0.8	-0.4	-0.7	0.85	12.6439	-8.4574	-12.6048	127.33	4.67	594.6311	12547.49	12.54749	24.93537	1246.768
		45.33	0.788285	13.89399	16.26423	0.18	0.8	-0.4	-0.7	0.85	12.37547	-8.4574	-12.6048	127.33	4.67	594.6311	12387.88	12.38788		
	4	40.67	0.764227	13.46997	16.26423	0.18	0.8	-0.4	-0.7	0.85	12.08714	-8.4574	-12.6048	127.33	4.67	594.6311	12216.42	12.21642	24.24631	986.0973
		36	0.738054	13.00864	16.26423	0.18	0.8	-0.4	-0.7	0.85	11.77343	-8.4574	-12.6048	127.33	4.67	594.6311	12029.88	12.02988		
	3	31.33	0.709328	12.50234	16.26423	0.18	0.8	-0.4	-0.7	0.85	11.42915	-8.4574	-12.6048	127.33	4.67	594.6311	11825.16	11.82516	23.423	733.8425
		26.67	0.677431	11.94013	16.26423	0.18	0.8	-0.4	-0.7	0.85	11.04685	-8.4574	-12.6048	127.33	4.67	594.6311	11597.83	11.59783		
	2	22	0.641179	11.30117	16.26423	0.18	0.8	-0.4	-0.7	0.85	10.61235	-8.4574	-12.6048	127.33	4.67	594.6311	11339.47	11.33947	23.13278	508.9211
		17	0.595644	10.49858	16.26423	0.18	0.8	-0.4	-0.7	0.85	10.0666	-8.4574	-12.6048	127.33	5	636.65	11793.31	11.79331		
	1	12	0.57472	10.12978	16.26423	0.18	0.8	-0.4	-0.7	0.85	9.815812	-8.4574	-12.6048	127.33	5	636.65	11633.64	11.63364	25.59401	307.1281
		6	0.57472	10.12978	16.26423	0.18	0.8	-0.4	-0.7	0.85	9.815812	-8.4574	-12.6048	127.33	6	763.98	13960.37	13.96037		
Ground		0	0.57472	10.12978	16.26423	0.18	0.8	-0.4	-0.7	0.85	9.815812	-8.4574	-12.6048	127.33	0	0	0	0		
																			201.3605	9324.166

V=90
Kd=0.85
I=1.0
Exposure Category B
Kzt=1.0
alpha=7.0
Zg=1200
Kz=2.01(z/Zg)^(2/alpha)
n1=100/H=100/78.67=1.27 (rigid structure)
G=0.85
Pp: WW=24.39636 LW=-16.26424
Gcpi= +/- 0.18

L/B=127.33/160.67=.792

Pressure (psf)East/West

Level	Height Above Ground Z(ft)	Kz	qz (psf)	qh (psf)	Gcpi	Cp WW	Cp LW	Cp Side	G	Windward	Leeward	Sidewall	Width	Story Heigl	Area (sf)	Force (Pou	Force (Kips	Story Forc	Overturning Moment (ft-k)
Top	78.67	0.922762	16.26424	16.26423	0.18	0.8	-0.5	-0.7	0.85	13.98724	-9.83986	-12.6048	160.67	5	803.35	19141.5	19.1415	38.09514	2996.944
	73	0.90325	15.92032	16.26423	0.18	0.8	-0.5	-0.7	0.85	13.75338	-9.83986	-12.6048	160.67	5	803.35	18953.63	18.95363		
7	68.67	0.887607	15.6446	16.26423	0.18	0.8	-0.5	-0.7	0.85	13.56589	-9.83986	-12.6048	160.67	4.67	750.3289	17562.01	17.56201	34.96501	2401.047
	64	0.869924	15.33294	16.26423	0.18	0.8	-0.5	-0.7	0.85	13.35396	-9.83986	-12.6048	160.67	4.67	750.3289	17402.99	17.40299		
6	59.33	0.851294	15.00458	16.26423	0.18	0.8	-0.5	-0.7	0.85	13.13067	-9.83986	-12.6048	160.67	4.67	750.3289	17235.46	17.23546	34.29406	2034.667
	54.67	0.831629	14.65796	16.26423	0.18	0.8	-0.5	-0.7	0.85	12.89498	-9.83986	-12.6048	160.67	4.67	750.3289	17058.61	17.05861		
5	50	0.810681	14.28874	16.26423	0.18	0.8	-0.5	-0.7	0.85	12.6439	-9.83986	-12.6048	160.67	4.67	750.3289	16870.22	16.87022	33.53903	1676.951
	45.33	0.788285	13.89399	16.26423	0.18	0.8	-0.5	-0.7	0.85	12.37547	-9.83986	-12.6048	160.67	4.67	750.3289	16668.81	16.66881		
4	40.67	0.764227	13.46997	16.26423	0.18	0.8	-0.5	-0.7	0.85	12.08714	-9.83986	-12.6048	160.67	4.67	750.3289	16452.46	16.45246	32.66954	1328.67
	36	0.738054	13.00864	16.26423	0.18	0.8	-0.5	-0.7	0.85	11.77343	-9.83986	-12.6048	160.67	4.67	750.3289	16217.08	16.21708		
3	31.33	0.709328	12.50234	16.26423	0.18	0.8	-0.5	-0.7	0.85	11.42915	-9.83986	-12.6048	160.67	4.67	750.3289	15958.75	15.95875	31.63066	990.9885
	26.67	0.677431	11.94013	16.26423	0.18	0.8	-0.5	-0.7	0.85	11.04685	-9.83986	-12.6048	160.67	4.67	750.3289	15671.9	15.6719		
2	22	0.641179	11.30117	16.26423	0.18	0.8	-0.5	-0.7	0.85	10.61235	-9.83986	-12.6048	160.67	4.67	750.3289	15345.89	15.34589	31.33774	689.4304
	17	0.595644	10.49858	16.26423	0.18	0.8	-0.5	-0.7	0.85	10.0666	-9.83986	-12.6048	160.67	5	803.35	15991.86	15.99186		
1	12	0.539222	9.504109	16.26423	0.18	0.8	-0.5	-0.7	0.85	9.390356	-9.83986	-12.6048	160.67	5	803.35	15448.6	15.4486	32.86755	394.4106
	6	0.442343	7.796556	16.26423	0.18	0.8	-0.5	-0.7	0.85	8.22922	-9.83986	-12.6048	160.67	6	964.02	17418.96	17.41896		
Ground	0	0	0	16.26423	0.18	0.8	-0.5	-0.7	0.85	2.927562	-9.83986	-12.6048	160.67	0	0	0	0		
																		269.3987	12513.11

Roof N/S

Horiz Dist. From	Effective Width		Resultant F	Cp Roof	qh	G	Gcpi	Pressure (p	Force
0 to 39.335	56.67	39.335	19.67	-0.9	16.26423	0.85	0.18	-15.3697	34.26082
39.335 to 78.67	56.67	39.335	59.0025	-0.9	16.26423	0.85	0.18	-15.3697	34.26082
78.67 to 157.34	56.67	78.67	118.005	-0.5	16.26423	0.85	0.18	-9.83986	43.86835
157.34 to 160.6	56.67	3.32	158.97	-0.3	16.26423	0.85	0.18	-7.07494	1.331111

Roof E/W

Horiz Dist. From	Effective Width		Resultant F	Cp Roof	qh	G	Gcpi	Pressure (p	Force
0 to 39.335	77.33	39.335	19.6675	-1	16.26423	0.85	0.18	-16.7522	50.95631
39.335 to 127.3	77.33	87.998	83.334	-0.7	16.26423	0.85	0.18	-12.6048	85.77409

Appendix D – Existing Seismic Calculations

Level	hx	Wx	wxhx^k	Cvx	V	Fx (Kips)	Vx (Kips)	Overturning Moment (ft-k)
Roof	78.67	821.30125	189074.0955	0.101206875	574.14	58.10691533	-	-
7	68.67	1788.235	406986.0962	0.217849997	574.14	125.076397	58.10691533	3990.201876
6	59.33	1738.89285	340400.9955	0.182208573	574.14	104.61323	183.1833124	10868.26592
5	50	1738.89285	286870.8879	0.153555177	574.14	88.16216919	287.7965423	14389.82712
4	46.67	1738.89285	267765.2867	0.143328402	574.14	82.29056872	375.9587115	17545.99307
3	31.33	1738.89285	179753.2983	0.096217674	574.14	55.24241521	458.2492802	14356.94995
2	22	1738.89285	126223.1907	0.067564278	574.14	38.79135444	513.4916954	11296.8173
1	12	1788.235	71120.33135	0.038069025	574.14	21.85695011	552.2830499	6627.396599
Ground	0	1685.56375	0	0	574.14	0	574.14	0
			1868194.182			574.14		79075.45183

Seismic Calculations

Lat: 39.777
Long: -75.597

Seismic Importance Factor : 1.0
Seismic use group : I
Seismic design Category : B
Site Class : C
Occupancy Category : II

S_s & S_1 from USGS Ground Motion Parameters Calculator.

$S_s = 0.263$ $S_1 = 0.058$

$S_{m_s} = F_a S_s = (1.2)(.263) = (0.316)$
$S_{m_1} = F_v S_1 = (1.7)(0.058) = (0.099)$
$S_{DS} = (2/3)(S_{m_s}) = (2/3)(.316) = 0.210$
$S_{D1} = (2/3)(S_{m_1}) = (2/3)(0.099) = 0.066$

$T_a = C_t h^x{}_n$ $C^t = 0.016$ $h_n = 78.67$ $x = .9$

$T \approx T_a = 0.016(78.67)^{.4} = 0.813$ sec

$S_{D1} \leq 0.1 \therefore C_u = 1.7$ $C_u T_a = 1.7(.813) = 1.383$ $T_L = 6_{sec} > T$

$C_s = \frac{S_{D1}}{T\frac{R}{I}} \leq \frac{S_{DS}}{\frac{R}{I}}$ $T = 0.813$ $R = 2$ $I = 1.0$

$C_s = \frac{0.066}{.813\left(\frac{2}{1.0}\right)} = 0.406 \leq \frac{.210}{\left(\frac{2}{1}\right)}$ (.105)

CMU Base shear V = Total weight = 14141.5 kips

$k = 1.16$

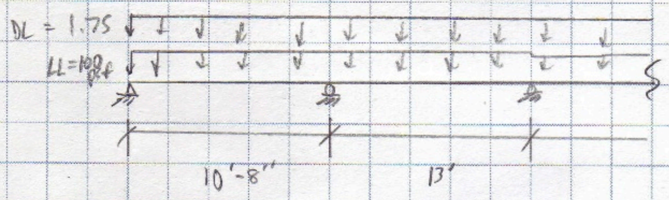
$V = C_s W = 0.0406(14141.5) =$ **574.14 kips**

Metal STUD Base shear V Total weight = 8766.3 kips

$V = C_s W = 0.0406(8766.3) =$ **355.9 kips**

Appendix E – Floor System Calculations

First Floor Corridor Deck Design LL 100 (psf)



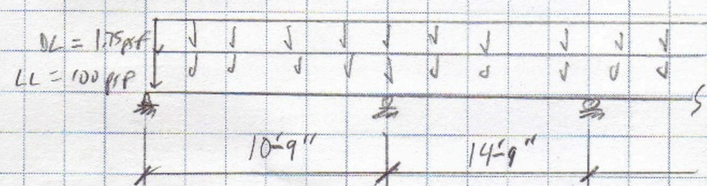
Σ DL = 1.75 ≤ 5 psf ∴ ok!
Floor Finish = 1
Ceiling = .75

10'-8" ≤ 14'-10" ∴ ok!
13' ≤ 14'-10"

★ Corridors of First floor falls within specification of Epicore MSR Catalogue for 20 gage composite deck.
This is worst case ∴ all other corridor loads ok!

First Floor lobby LL 100 (psf)

LLreq = 100 = LLdesign



10'-9" ≤ 14'-10" ∴ ok!
14'-9" ≤ 14'-10"

DL = 1.75 psf ≤ 5 psf ∴ ok!

★ This worst case too works according to deck manual!

Appendix F – Redesigned Dead Loads

Loads

Level	Floor Height	Floor area	Deck (psf)	4" Slab (psf)	Floor Finish (psf)	Partitions (psf)	Ceiling Finish (psf)	EPDM Roof Assem. (psf)
Roof	0	12985	2	50	0	0	0	2
7	10	12985	2	50	1	2	0.75	0
6	9.33	12985	2	50	1	2	0.75	0
5	9.33	12985	2	50	1	2	0.75	0
4	9.33	12985	2	50	1	2	0.75	0
3	9.33	12985	2	50	1	2	0.75	0
2	9.33	12985	2	50	1	2	0.75	0
1	10	12985	2	50	1	2	0.75	0
Ground	12	12985	0	50	1	0	0.75	0

Extensive Green Roof Wet Assem. (psf)	MEP (psf)	Total psf (w/o wall)	Live Load	Tributary Width	Load on wall w/o wall (plf)	TotalLoad On Wall According to Level	Stud Type	Stud/CMU (plf)	Stud Spacing (in)
25	0	77	20	14	1358			0	0
0	10	65.75	40	14	1480.5	1.358	600S162-54 33 ksi	1.89	16
0	10	65.75	40	14	1480.5	2.8385	600S162-54 33ksi	1.89	16
0	10	65.75	40	14	1480.5	4.319	600S162-68 33ksi	2.36	16
0	10	65.75	40	14	1480.5	5.7995	600S162-97 33ksi	3.29	16
0	10	65.75	40	14	1480.5	7.28	600S162-97 33ksi	3.29	16
0	10	65.75	40	14	1480.5	8.7605	600S162-97 33ksi	3.29	16
0	10	65.75	40	14	1480.5	10.241	600S162-97 33ksi	3.29	16
0	10	61.75	40	14	1424.5	11.7215		0	0

#of Studs	Load-bearing Wall (klf)	TOTAL LOAD ON WALL	Total Wall Length	Total Weight of walls (kips)	pre total	Total Deal Load
0	0		0	0	1025.815	1025.815
1	0.014175	1.372175	1410	19.98675	853.76375	873.7505
1	0.013225275	2.851725275	1410	18.64763775	853.76375	872.4113878
1	0.0165141	4.3355141	1410	23.284881	853.76375	877.048631
1	0.023021775	5.822521775	1410	32.46070275	853.76375	886.2244528
1	0.023021775	7.303021775	1410	32.46070275	853.76375	886.2244528
2	0.04604355	8.80654355	1410	64.9214055	853.76375	918.6851555
2	0.04935	10.29035	1390	68.5965	853.76375	922.36025
0	780	791.7215	900	702	801.82375	1503.82375
					Total:	8766.34358

Appendix G – RAM Steel Sizes and 3D Representations

Gravity Column Design Summary
RAM Steel
v14.00.03.00
DataBase: Tower B redo
Building Code: IBC
Steel Code: AISC360-05 ASD
03/31/10 16:12:03

Column Line 14-D.2

Level	Pu	Mux	Muy	LC	Interaction	Angle	Fy	Size
Ground Flo	96.3	0	16	6	0.90 Eq (H1	0	50	W10X33

Column Line 14-D.5

Level	Pu	Mux	Muy	LC	Interaction	Angle	Fy	Size
Ground Flo	94	0	31.3	6	0.25 Eq (H1	0	50	W12X96

Column Line 16-Q.1

Level	Pu	Mux	Muy	LC	Interaction	Angle	Fy	Size
Ground Flo	91.6	0	6.3	1	0.63 Eq (H1	0	50	W10X33

Column Line 17-D.4

Level	Pu	Mux	Muy	LC	Interaction	Angle	Fy	Size
Ground Flo	63.5	0	39.4	1	0.53 Eq (H1	0	50	W10X60

Column Line 18-Q.1

Level	Pu	Mux	Muy	LC	Interaction	Angle	Fy	Size
Ground Flo	63.9	0	39.7	1	0.53 Eq (H1	0	50	W10X60

Column Line 19-D.4

Level	Pu	Mux	Muy	LC	Interaction	Angle	Fy	Size
Ground Flo	91.6	0	6.3	1	0.63 Eq (H1	0	50	W10X33

Column Line 20-J.4

Level	Pu	Mux	Muy	LC	Interaction	Angle	Fy	Size
First	102.5	0	11.9	10	0.77 Eq (H1	0	50	W10X33
Ground Flo	143.4	0	2.2	10	0.79 Eq (H1	0	50	W10X33

Column Line 21-Q.0

Level	Pu	Mux	Muy	LC	Interaction	Angle	Fy	Size
Ground Flo	94	0	32.1	10	0.26 Eq (H1	0	50	W12X96

Column Line 21-Q.3

Level	Pu	Mux	Muy	LC	Interaction	Angle	Fy	Size
Ground Flo	97.2	0	15.5	10	0.89 Eq (H1	0	50	W10X33

Column Line 24-J.4

Level	Pu	Mux	Muy	LC	Interaction	Angle	Fy	Size
Ground Flo	133.3	0	16.9	10	0.92 Eq (H1	0	50	W10X39

Column Line 27-J.4

Level	Pu	Mux	Muy	LC	Interaction	Angle	Fy	Size
Ground Flo	183.7	0	73.6	6	0.64 Eq (H1	0	50	W12X96

Beam Summary
RAM Steel
v14.00.03.00
DataBase: Tower B redo
Building Code: IBC
Steel Code: AISC360-05 ASD
#########
STEEL BEAM DESIGN SUMMARY:
Floor Type: Roof

Bm #	Length	+Ma	-Ma	Mn	Fy	Beam Size	Studs
	ft	kip-ft	kip-ft	kip-ft	ksi		
32	10	16.8	0	36.5	50	W8X1	
29	14.33	34.5	0	72.5	50	W12X	
50	13.33	0.3	0	13.1	50	W8X1	
42	13.33	0.3	0	13.1	50	W8X1	
51	13.33	0.3	0	13.1	50	W8X1	
43	13.33	0.3	0	13.1	50	W8X1	
27	9.58	15.4	0	36.5	50	W8X1	
25	12.75	27.3	0	52.1	50	W10X	
17	6.92	12.2	0	36.5	50	W8X1	
26	8.75	13	0	36.5	50	W8X1	
40	14	0.3	0	12.2	50	W8X1	
31	9.83	12.9	0	36.5	50	W8X1	
16	6.92	6.4	0	36.5	50	W8X1	
7	17.5	44.3	0	83.8	50	W12X	
44	14	0.3	0	12.2	50	W8X1	
2	6.92	6.3	0	36.5	50	W8X1	
19	6.83	6.7	0	36.5	50	W8X1	
22	17.5	44.3	0	83.8	50	W12X	
20	6.83	7.2	0	36.5	50	W8X1	
10	9.67	12.4	0	36.5	50	W8X1	
11	8.75	13.1	0	36.5	50	W8X1	
5	6.83	7.4	0	36.5	50	W8X1	
13	12.71	27.1	0	52.1	50	W10X	
6	6.83	7.8	0	36.5	50	W8X1	
35	9.58	15.4	0	36.5	50	W8X1	
39	13.33	0.3	0	13.1	50	W8X1	
36	13.33	0.3	0	13.1	50	W8X1	
38	13	0.3	0	13.6	50	W8X1	
37	13	0.3	0	13.6	50	W8X1	
24	10.1	17.1	0	36.5	50	W8X1	
33	10	16.8	0	36.5	50	W8X1	

Floor Type: Typical

Bm #	Length	+Ma	-Ma	Mn	Fy	Beam Size	Studs
	ft	kip-ft	kip-ft	kip-ft	ksi		
32	10	19.4	0	36.5	50	W8X1	
29	14.33	39.9	0	72.5	50	W12X	
50	13.33	0.3	0	13.1	50	W8X1	
42	13.33	0.3	0	13.1	50	W8X1	
51	13.33	0.3	0	13.1	50	W8X1	

43	13.33	0.3	0	13.1	50	W8X1	
27	9.58	17.8	0	36.5	50	W8X1	
25	12.75	31.6	0	72.5	50	W12X	
17	6.92	14.1	0	36.5	50	W8X1	
26	8.75	15	0	36.5	50	W8X1	
40	14	0.3	0	12.2	50	W8X1	
31	9.83	14.9	0	36.5	50	W8X1	
16	6.92	7.4	0	36.5	50	W8X1	
7	17.5	51.3	0	102.9	50	W12X	
44	14	0.3	0	12.2	50	W8X1	
2	6.92	7.3	0	36.5	50	W8X1	
19	6.83	7.8	0	36.5	50	W8X1	
22	17.5	51.3	0	102.9	50	W12X	
20	6.83	8.3	0	36.5	50	W8X1	
10	9.67	14.4	0	36.5	50	W8X1	
11	8.75	15.2	0	36.5	50	W8X1	
5	6.83	8.5	0	36.5	50	W8X1	
13	12.71	31.4	0	72.5	50	W12X	
6	6.83	9	0	36.5	50	W8X1	
35	9.58	17.8	0	36.5	50	W8X1	
39	13.33	0.3	0	13.1	50	W8X1	
36	13.33	0.3	0	13.1	50	W8X1	
38	13	0.3	0	13.6	50	W8X1	
37	13	0.3	0	13.6	50	W8X1	
24	10.1	19.8	0	36.5	50	W8X1	
33	10	19.4	0	36.5	50	W8X1	

Floor Type: First

Bm #	Length	+Ma	-Ma	Mn	Fy	Beam Size	Studs
	ft	kip-ft	kip-ft	kip-ft	ksi		
32	10	19.4	0	36.5	50	W8X1	
29	14.33	39.9	0	72.5	50	W12X	
42	13.33	0.3	0	13.1	50	W8X1	
43	13.33	0.3	0	13.1	50	W8X1	
41	13.33	0.3	0	13.1	50	W8X1	
44	13.33	0.3	0	13.1	50	W8X1	
27	9.58	17.8	0	36.5	50	W8X1	
25	12.75	31.6	0	72.5	50	W12X	
17	6.92	14.1	0	36.5	50	W8X1	
26	8.75	15	0	36.5	50	W8X1	
40	14	0.3	0	12.2	50	W8X1	
31	9.83	14.9	0	36.5	50	W8X1	
16	6.92	7.4	0	36.5	50	W8X1	
7	17.5	51.3	0	102.9	50	W12X	
45	14	0.3	0	12.2	50	W8X1	
2	6.92	7.3	0	36.5	50	W8X1	
19	6.83	7.8	0	36.5	50	W8X1	
22	17.5	51.3	0	102.9	50	W12X	
51	12.46	189.6	0	326.7	50	W18X	
50	12.71	197.4	0	397.5	50	W21X	
20	6.83	8.3	0	36.5	50	W8X1	

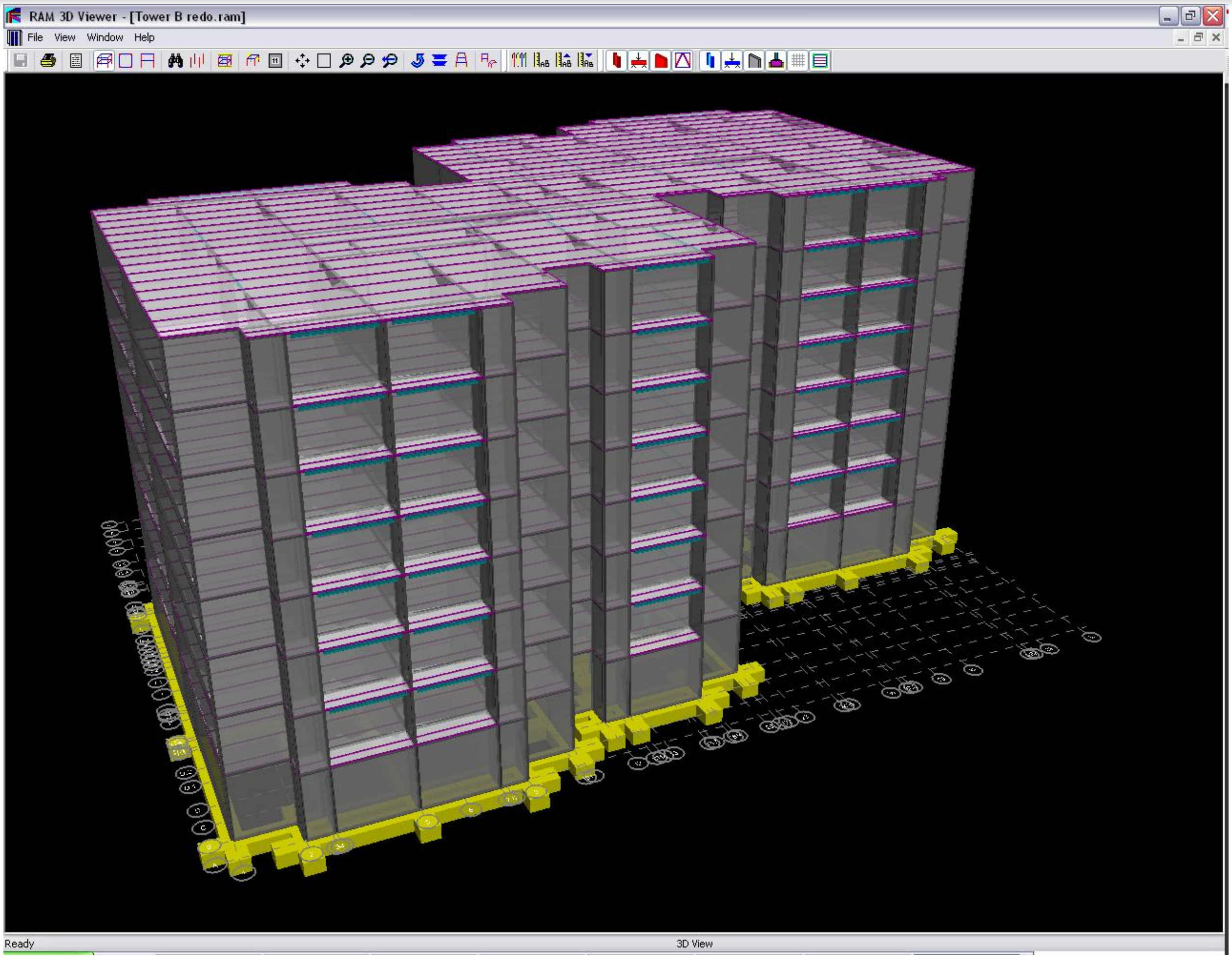
10	9.67	14.4	0	36.5	50	W8X1
5	6.83	8.5	0	36.5	50	W8X1
13	12.71	31.4	0	72.5	50	W12X
6	6.83	9	0	36.5	50	W8X1
35	9.58	17.8	0	36.5	50	W8X1
39	13.33	0.3	0	13.1	50	W8X1
36	13.33	0.3	0	13.1	50	W8X1
38	13	0.3	0	13.6	50	W8X1
37	13	0.3	0	13.6	50	W8X1
24	10.1	19.8	0	36.5	50	W8X1
33	10	19.4	0	36.5	50	W8X1

Floor Type: Ground

Bm #	Length ft	+Ma kip-ft	-Ma kip-ft	Mn kip-ft	Fy ksi	Beam Size		Studs
28	10	19.4	0	36.5	50	W8X1		
1	8.25	103.4	0	184.2	50	W16X		
29	14.33	39.9	0	72.5	50	W12X		
40	13.33	0.3	0	13.1	50	W8X1		
39	13.33	0.3	0	13.1	50	W8X1		
27	9.58	17.8	0	36.5	50	W8X1		
51	6.92	14.3	0	36.5	50	W8X1		
25	12.75	31.6	0	72.5	50	W12X		
50	12.67	0	0	14.1	50	W8X1		
17	6.92	14.5	0	36.5	50	W8X1		
26	8.75	15	0	36.5	50	W8X1		
41	10	0.3	0	20.2	50	W8X1		
56	10.83	170	0	326.7	50	W18X		
55	8.83	110.7	0	225	50	W16X		
48	9.58	0	0	21.5	50	W8X1		
32	9.83	15	0	36.5	50	W8X1		
49	9.58	0	0	21.5	50	W8X1		
16	6.92	11.4	0	36.5	50	W8X1		
7	17.5	51.3	0	102.9	50	W12X		
42	4.5	0	0	36.5	50	W8X1		
36	14	0.3	0	12.2	50	W8X1		
21	12	187.9	0	326.7	50	W18X		
46	4.42	0	0	36.5	50	W8X1		
2	6.92	11.2	0	36.5	50	W8X1		
19	6.83	12	0	36.5	50	W8X1		
8	12.08	190.5	0	326.7	50	W18X		
43	9.5	0	0	21.8	50	W8X1		
44	9.5	0	0	21.8	50	W8X1		
22	17.5	51.3	0	102.9	50	W12X		
47	10	0.3	0	20.2	50	W8X1		
60	12.46	42.8	0	83.8	50	W12X	u	
59	12.71	44.5	0	83.8	50	W12X		
20	6.83	12.8	0	36.5	50	W8X1		
10	9.67	14.4	0	36.5	50	W8X1		
57	9.08	116.6	0	225	50	W16X		
45	12.67	0	0	14.1	50	W8X1		

58	10.83	170	0	326.7	50	W18X4	
54	12.46	250.5	0	442.2	50	W21X4	
53	12.71	224.1	0	442.2	50	W21X4	u
5	6.83	13.1	0	36.5	50	W8X1	
14	17.88	487.2	0	833.3	50	W24X7	
13	12.71	31.4	0	72.5	50	W12X1	
6	6.83	14	0	36.5	50	W8X1	
31	9.58	17.8	0	36.5	50	W8X1	
34	13.33	0.3	0	13.1	50	W8X1	
35	13	0.3	0	13.6	50	W8X1	
24	10.1	19.8	0	36.5	50	W8X1	
3	8.25	103.4	0	184.2	50	W16X1	
23	10	19.4	0	36.5	50	W8X1	

* after Size denotes beam failed stress/capacity criteria.
# after Size denotes beam failed deflection criteria.
u after Size denotes this size has been assigned by the User.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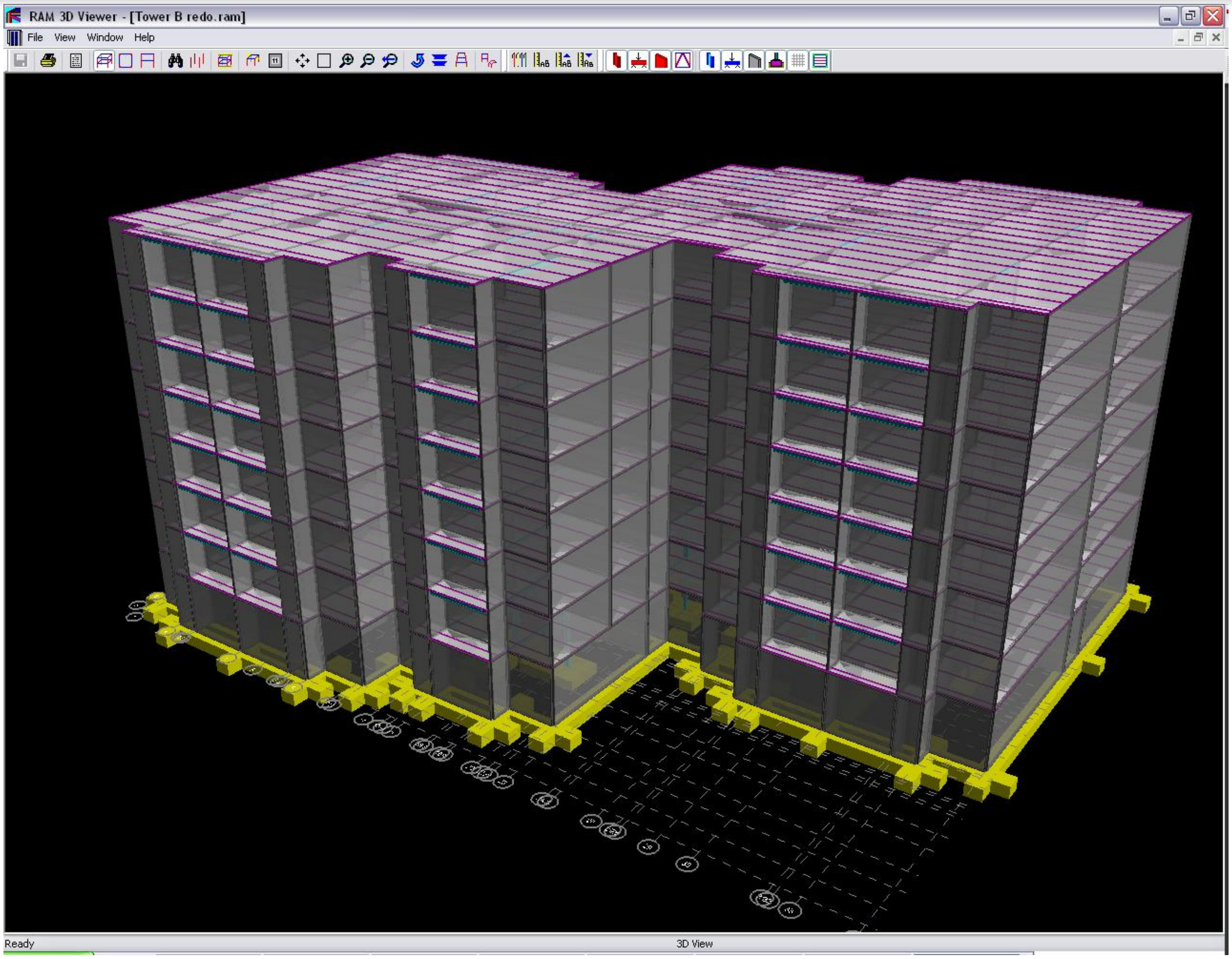
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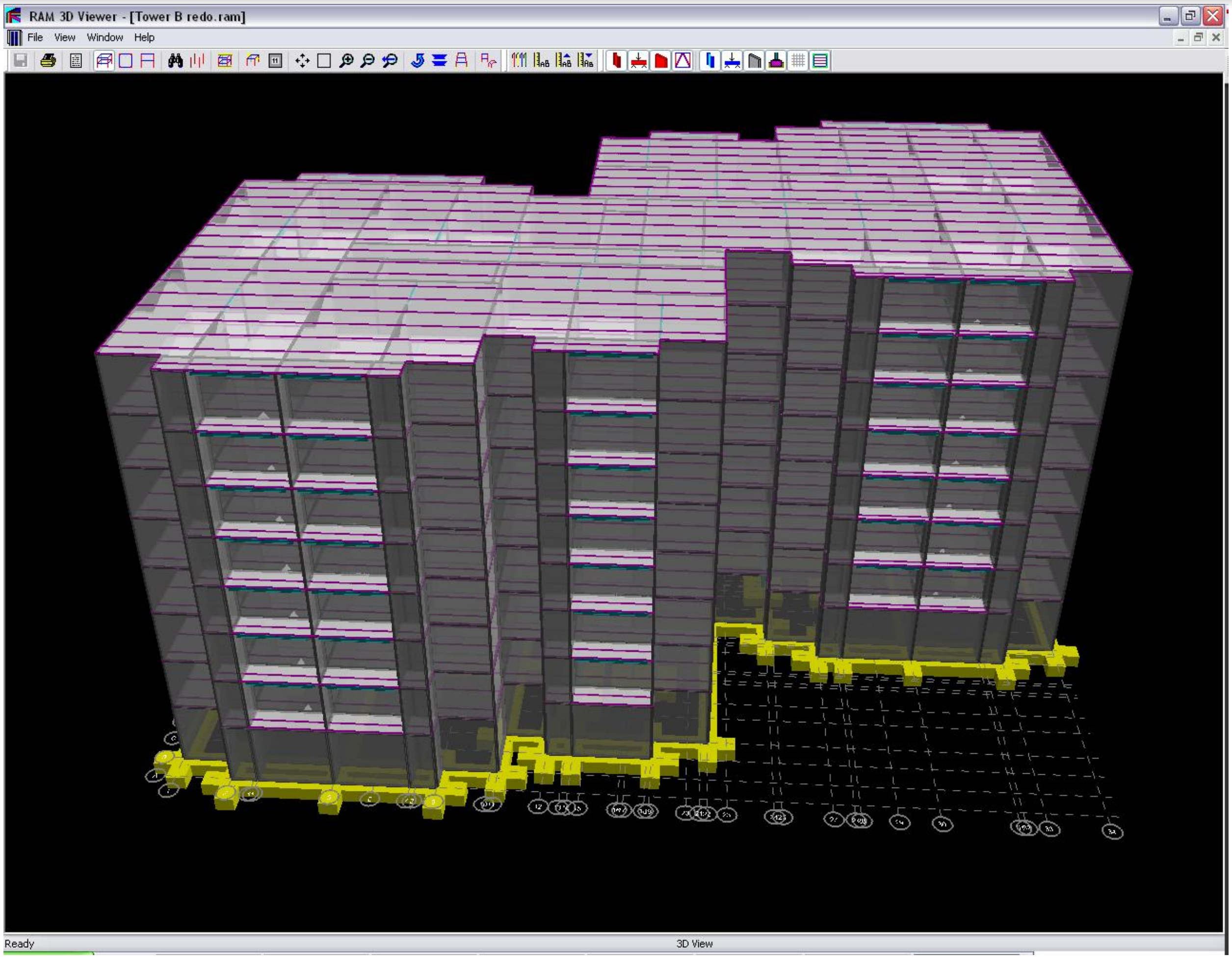
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Appendix H – Redesigned Seismic

Level	hx	Wx	wxhx^k	Cvx	V	Fx (Kips)	Vx (Kips)	Overturning Moment (ft-k)
Roof	78.67	1025.815	244708.6058	0.244068092	355.9	86.86383383	-	-
7	68.67	873.7505	177327.6565	0.176863509	355.9	62.94572289	86.86383383	5964.939469
6	59.33	872.4113878	152936.4786	0.152536174	355.9	54.28762435	149.8095567	8888.201
5	50	877.048631	129681.3334	0.129341898	355.9	46.03278156	204.0971811	10204.85905
4	46.67	886.2244528	122514.7918	0.122194115	355.9	43.48888542	250.1299626	11673.56536
3	31.33	886.2244528	82245.30594	0.082030032	355.9	29.19448854	293.618848	9199.078509
2	22	918.6851555	60213.8022	0.060056195	355.9	21.37399987	322.8133366	7101.893405
1	12	922.36025	32996.35116	0.032909985	355.9	11.71266354	344.1873365	4130.248038
Ground	0	1503.82375	0	0	355.9	0	355.9	
			1002624.325			355.9		57162.78483

Appendix I – Redesigned Lateral Analysis

N/S Seismic

Level 1 Seismic

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load	Distributed Load	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
1	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	62.9457229	5.24547691	6.7948E-05	8.3807E-05	0.00015176	2.4	335.2	4.8	2.09E+11	0.01678983	5.22868708
2	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	62.9457229	5.24547691	6.7948E-05	8.3807E-05	0.00015176	2.4	245.2	4.8	2.09E+11	0.01228182	5.23319509
3	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	62.9457229	5.24547691	6.7948E-05	8.3807E-05	0.00015176	2.4	245.2	4.8	2.09E+11	0.01228182	5.23319509
4	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	62.9457229	5.24547691	6.7948E-05	8.3807E-05	0.00015176	2.4	245.2	4.8	2.09E+11	0.01228182	5.25775873
5	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	62.9457229	5.24547691	6.7948E-05	8.3807E-05	0.00015176	2.4	154.1	4.8	2.09E+11	0.00771871	5.25319562
6	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	62.9457229	5.24547691	6.7948E-05	8.3807E-05	0.00015176	2.4	154.2	4.8	2.09E+11	0.00772372	5.25320063
7	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	62.9457229	5.24547691	6.7948E-05	8.3807E-05	0.00015176	2.4	161.8	4.8	2.09E+11	0.0081044	5.25358131
8	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	62.9457229	5.24547691	6.7948E-05	8.3807E-05	0.00015176	2.4	161.8	4.8	2.09E+11	0.0081044	5.25358131
9	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	62.9457229	5.24547691	6.7948E-05	8.3807E-05	0.00015176	2.4	237.8	4.8	2.09E+11	0.01191116	5.25738807
10	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	62.9457229	5.24547691	6.7948E-05	8.3807E-05	0.00015176	2.4	237.8	4.8	2.09E+11	0.01191116	5.25738807
11	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	62.9457229	5.24547691	6.7948E-05	8.3807E-05	0.00015176	2.4	237.8	4.8	2.09E+11	0.01191116	5.25738807
12	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	62.9457229	5.24547691	6.7948E-05	8.3807E-05	0.00015176	2.4	341.8	4.8	2.09E+11	0.01712042	5.26259732
								414784.0804	1											

Level 2 Seismic

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load	Distributed Load	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
1	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	54.2876244	4.5239687	4.2721E-05	6.5052E-05	0.00010777	2.16	335.2	4.8	2.54E+11	0.01445231	4.50951639
2	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	54.2876244	4.5239687	4.2721E-05	6.5052E-05	0.00010777	2.16	245.2	4.8	2.54E+11	0.01057191	4.51339678
3	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	54.2876244	4.5239687	4.2721E-05	6.5052E-05	0.00010777	2.16	245.2	4.8	2.54E+11	0.01057191	4.51339678
4	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	54.2876244	4.5239687	4.2721E-05	6.5052E-05	0.00010777	2.16	245.2	4.8	2.54E+11	0.01057191	4.51339678
5	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	54.2876244	4.5239687	4.2721E-05	6.5052E-05	0.00010777	2.16	154.1	4.8	2.54E+11	0.00664409	4.5173246
6	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	54.2876244	4.5239687	4.2721E-05	6.5052E-05	0.00010777	2.16	154.2	4.8	2.54E+11	0.00664841	4.51732029
7	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	54.2876244	4.5239687	4.2721E-05	6.5052E-05	0.00010777	2.16	161.8	4.8	2.54E+11	0.00697608	4.51699261
8	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	54.2876244	4.5239687	4.2721E-05	6.5052E-05	0.00010777	2.16	161.8	4.8	2.54E+11	0.00697608	4.51699261
9	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	54.2876244	4.5239687	4.2721E-05	6.5052E-05	0.00010777	2.16	237.8	4.8	2.54E+11	0.01025286	4.51371584
10	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	54.2876244	4.5239687	4.2721E-05	6.5052E-05	0.00010777	2.16	237.8	4.8	2.54E+11	0.01025286	4.51371584
11	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	54.2876244	4.5239687	4.2721E-05	6.5052E-05	0.00010777	2.16	237.8	4.8	2.54E+11	0.01025286	4.51371584
12	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	54.2876244	4.5239687	4.2721E-05	6.5052E-05	0.00010777	2.16	341.8	4.8	2.54E+11	0.01473687	4.50923183
								503724.1973	1											0

Level 3 Seismic

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load	Distributed Load	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
1	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	46.0327816	3.83606513	3.6225E-05	5.516E-05	9.1385E-05	2.16	335.2	4.8	2.54E+11	0.01225472	3.8238104
2	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	46.0327816	3.83606513	3.6225E-05	5.516E-05	9.1385E-05	2.16	245.2	4.8	2.54E+11	0.00896438	3.82710075
3	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	46.0327816	3.83606513	3.6225E-05	5.516E-05	9.1385E-05	2.16	245.2	4.8	2.54E+11	0.00896438	3.82710075
4	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	46.0327816	3.83606513	3.6225E-05	5.516E-05	9.1385E-05	2.16	245.2	4.8	2.54E+11	0.00896438	3.82710075
5	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	46.0327816	3.83606513	3.6225E-05	5.516E-05	9.1385E-05	2.16	154.1	4.8	2.54E+11	0.00563381	3.83043132
6	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	46.0327816	3.83606513	3.6225E-05	5.516E-05	9.1385E-05	2.16	154.2	4.8	2.54E+11	0.00563747	3.83042766
7	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	46.0327816	3.83606513	3.6225E-05	5.516E-05	9.1385E-05	2.16	161.8	4.8	2.54E+11	0.00591532	3.83014981
8	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	46.0327816	3.83606513	3.6225E-05	5.516E-05	9.1385E-05	2.16	161.8	4.8	2.54E+11	0.00591532	3.83014981
9	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	46.0327816	3.83606513	3.6225E-05	5.516E-05	9.1385E-05	2.16	237.8	4.8	2.54E+11	0.00869384	3.82737129
10	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	46.0327816	3.83606513	3.6225E-05	5.516E-05	9.1385E-05	2.16	237.8	4.8	2.54E+11	0.00869384	3.82737129
11	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	46.0327816	3.83606513	3.6225E-05	5.516E-05	9.1385E-05	2.16	237.8	4.8	2.54E+11	0.00869384	3.82737129
12	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	46.0327816	3.83606513	3.6225E-05	5.516E-05	9.1385E-05	2.16	341.8	4.8	2.54E+11	0.01249602	3.82356911
								503724.1973	1											

Level 4 Seismic

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load	Distributed Load	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
1	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	43.4888854	3.62407379	3.4223E-05	5.2112E-05	8.6335E-05	2.16	335.2	4.8	2.54E+11	0.0115775	3.61249629
2	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	43.4888854	3.62407379	3.4223E-05	5.2112E-05	8.6335E-05	2.16	245.2	4.8	2.54E+11	0.00846898	3.61560481
3	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	43.4888854	3.62407379	3.4223E-05	5.2112E-05	8.6335E-05	2.16	245.2	4.8	2.54E+11	0.00846898	3.61560481
4	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	43.4888854	3.62407379	3.4223E-05	5.2112E-05	8.6335E-05	2.16	245.2	4.8	2.54E+11	0.00846898	3.61560481
5	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	43.4888854	3.62407379	3.4223E-05	5.2112E-05	8.6335E-05	2.16	154.1	4.8	2.54E+11	0.00532247	3.61875131
6	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	43.4888854	3.62407379	3.4223E-05	5.2112E-05	8.6335E-05	2.16	154.2	4.8	2.54E+11	0.00532592	3.61874786

7	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	43.4888854	3.62407379	3.4223E-05	5.2112E-05	8.6335E-05	2.16	161.8	4.8	2.54E+11	0.00558842	3.61848536
8	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	43.4888854	3.62407379	3.4223E-05	5.2112E-05	8.6335E-05	2.16	161.8	4.8	2.54E+11	0.00558842	3.61848536
9	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	43.4888854	3.62407379	3.4223E-05	5.2112E-05	8.6335E-05	2.16	237.8	4.8	2.54E+11	0.00821339	3.61586039
10	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	43.4888854	3.62407379	3.4223E-05	5.2112E-05	8.6335E-05	2.16	237.8	4.8	2.54E+11	0.00821339	3.61586039
11	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	43.4888854	3.62407379	3.4223E-05	5.2112E-05	8.6335E-05	2.16	237.8	4.8	2.54E+11	0.00821339	3.61586039
12	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	43.4888854	3.62407379	3.4223E-05	5.2112E-05	8.6335E-05	2.16	341.8	4.8	2.54E+11	0.01180545	3.61226833
								503724.1973	1											

Level 5 Seismic

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load	Distributed Load	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
1	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	29.1944885	2.43287405	2.2974E-05	3.4983E-05	5.7957E-05	2.16	335.2	4.8	2.54E+11	0.00777208	2.42510197
2	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	29.1944885	2.43287405	2.2974E-05	3.4983E-05	5.7957E-05	2.16	245.2	4.8	2.54E+11	0.0056853	2.42718874
3	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	29.1944885	2.43287405	2.2974E-05	3.4983E-05	5.7957E-05	2.16	245.2	4.8	2.54E+11	0.0056853	2.42718874
4	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	29.1944885	2.43287405	2.2974E-05	3.4983E-05	5.7957E-05	2.16	245.2	4.8	2.54E+11	0.0056853	2.42718874
5	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	29.1944885	2.43287405	2.2974E-05	3.4983E-05	5.7957E-05	2.16	154.1	4.8	2.54E+11	0.00357302	2.42930102
6	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	29.1944885	2.43287405	2.2974E-05	3.4983E-05	5.7957E-05	2.16	154.2	4.8	2.54E+11	0.00357534	2.4292987
7	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	29.1944885	2.43287405	2.2974E-05	3.4983E-05	5.7957E-05	2.16	161.8	4.8	2.54E+11	0.00375156	2.42912249
8	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	29.1944885	2.43287405	2.2974E-05	3.4983E-05	5.7957E-05	2.16	161.8	4.8	2.54E+11	0.00375156	2.42912249
9	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	29.1944885	2.43287405	2.2974E-05	3.4983E-05	5.7957E-05	2.16	237.8	4.8	2.54E+11	0.00551372	2.42736032
10	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	29.1944885	2.43287405	2.2974E-05	3.4983E-05	5.7957E-05	2.16	237.8	4.8	2.54E+11	0.00551372	2.42736032
11	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	29.1944885	2.43287405	2.2974E-05	3.4983E-05	5.7957E-05	2.16	237.8	4.8	2.54E+11	0.00551372	2.42736032
12	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	29.1944885	2.43287405	2.2974E-05	3.4983E-05	5.7957E-05	2.16	341.8	4.8	2.54E+11	0.00792511	2.42494894
								503724.1973	1											

Level 6 Seismic

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load	Distributed Load	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
1	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	21.3739999	1.78116666	1.682E-05	2.5612E-05	4.2432E-05	2.16	335.2	4.8	2.54E+11	0.00569013	1.77547653
2	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	21.3739999	1.78116666	1.682E-05	2.5612E-05	4.2432E-05	2.16	245.2	4.8	2.54E+11	0.00416235	1.77700431
3	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	21.3739999	1.78116666	1.682E-05	2.5612E-05	4.2432E-05	2.16	245.2	4.8	2.54E+11	0.00416235	1.77700431
4	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	21.3739999	1.78116666	1.682E-05	2.5612E-05	4.2432E-05	2.16	245.2	4.8	2.54E+11	0.00416235	1.77700431
5	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	21.3739999	1.78116666	1.682E-05	2.5612E-05	4.2432E-05	2.16	154.1	4.8	2.54E+11	0.0026159	1.77855076
6	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	21.3739999	1.78116666	1.682E-05	2.5612E-05	4.2432E-05	2.16	154.2	4.8	2.54E+11	0.0026176	1.77854906
7	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	21.3739999	1.78116666	1.682E-05	2.5612E-05	4.2432E-05	2.16	161.8	4.8	2.54E+11	0.00274661	1.77842005
8	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	21.3739999	1.78116666	1.682E-05	2.5612E-05	4.2432E-05	2.16	161.8	4.8	2.54E+11	0.00274661	1.77842005
9	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	21.3739999	1.78116666	1.682E-05	2.5612E-05	4.2432E-05	2.16	237.8	4.8	2.54E+11	0.00403673	1.77712992
10	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	21.3739999	1.78116666	1.682E-05	2.5612E-05	4.2432E-05	2.16	237.8	4.8	2.54E+11	0.00403673	1.77712992
11	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	21.3739999	1.78116666	1.682E-05	2.5612E-05	4.2432E-05	2.16	237.8	4.8	2.54E+11	0.00403673	1.77712992
12	120	108	1533312	29000	720	1	2.3823E-05	41977.01644	0.08333333	21.3739999	1.78116666	1.682E-05	2.5612E-05	4.2432E-05	2.16	341.8	4.8	2.54E+11	0.00580217	1.77536449
								503724.1973	1											

Level 7 Seismic

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load	Distributed Load	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
1	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	11.7126635	0.97605529	1.2644E-05	1.5594E-05	2.8238E-05	2.4	335.2	4.8	2.09E+11	0.0031182	0.9729371
2	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	11.7126635	0.97605529	1.2644E-05	1.5594E-05	2.8238E-05	2.4	245.2	4.8	2.09E+11	0.00228097	0.97377432
3	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	11.7126635	0.97605529	1.2644E-05	1.5594E-05	2.8238E-05	2.4	245.2	4.8	2.09E+11	0.00228097	0.97377432
4	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	11.7126635	0.97605529	1.2644E-05	1.5594E-05	2.8238E-05	2.4	245.2	4.8	2.09E+11	0.00228097	0.97377432
5	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	11.7126635	0.97605529	1.2644E-05	1.5594E-05	2.8238E-05	2.4	154.1	4.8	2.09E+11	0.00143351	0.97462178
6	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	11.7126635	0.97605529	1.2644E-05	1.5594E-05	2.8238E-05	2.4	154.2	4.8	2.09E+11	0.00143444	0.97462085
7	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	11.7126635	0.97605529	1.2644E-05	1.5594E-05	2.8238E-05	2.4	161.8	4.8	2.09E+11	0.00150514	0.97455015
8	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	11.7126635	0.97605529	1.2644E-05	1.5594E-05	2.8238E-05	2.4	161.8	4.8	2.09E+11	0.00150514	0.97455015
9	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	11.7126635	0.97605529	1.2644E-05	1.5594E-05	2.8238E-05	2.4	237.8	4.8	2.09E+11	0.00221213	0.97384316
10	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	11.7126635	0.97605529	1.2644E-05	1.5594E-05	2.8238E-05	2.4	237.8	4.8	2.09E+11	0.00221213	0.97384316
11	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	11.7126635	0.97605529	1.2644E-05	1.5594E-05	2.8238E-05	2.4	237.8	4.8	2.09E+11	0.00221213	0.97384316
12	120	120	1533312	29000	720	1	2.8931E-05	34565.34004	0.08333333	11.7126635	0.97605529	1.2644E-05	1.5594E-05	2.8238E-05	2.4	341.8	4.8	2.09E+11	0.00317959	0.9728757
								414784.0804	1											

E/W Seismic

Level 1 E/W Direction

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area	P	Delta P	K	K/Sum of K	Load	Direct Shear	Delta Flexure	Delta Shear	Delta total	Drift	Distance	ex (in)	J	Fit (k)	Total Forces
A	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	784.3	7.7	2.09E+11	0.350531152	17.76459182
B	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	616.3	7.7	2.09E+11	0.275446065	17.83967691
C	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	450.3	7.7	2.09E+11	0.201254849	17.91386812
D	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	280.3	7.7	2.09E+11	0.125275892	17.98984708
E	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	128.3	7.7	2.09E+11	0.057341766	18.05778121
F	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	784.3	7.7	2.09E+11	0.350531152	17.76459182
G	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	616.3	7.7	2.09E+11	0.275446065	17.83967691
H	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	450.3	7.7	2.09E+11	0.201254849	17.91386812
I	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	280.3	7.7	2.09E+11	0.125275892	17.98984708
J	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	112.8	7.7	2.09E+11	0.050414273	18.0647087
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	295.7	7.7	2.09E+11	0.132158691	18.24728166
M	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	459.7	7.7	2.09E+11	0.205456038	18.32057901
N	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	625.7	7.7	2.09E+11	0.279647255	18.39477023
O	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	799.7	7.7	2.09E+11	0.357413952	18.47253692
P	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	140.7	7.7	2.09E+11	0.06288376	18.17800673
Q	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	295.7	7.7	2.09E+11	0.132158691	18.24728166
R	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	459.7	7.7	2.09E+11	0.205456038	18.32057901
S	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	625.7	7.7	2.09E+11	0.279647255	18.39477023
T	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	344.187	18.11512297	0.000230681	0.00028452	0.000515201	0.3	799.7	7.7	2.09E+11	0.357413952	18.47253692
								668064.5893	1											

Level 2 E/W Direction

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area	P	Delta P	K	K/Sum of K	Load	Direct Shear	Delta Flexure	Delta Shear	Delta total	Drift	Distance	ex (in)	J	Fit (k)	Total Forces
A	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	790.1	1.9	2.54E+11	0.081564701	16.05910213
B	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	622.1	1.9	2.54E+11	0.064221492	16.07644534
C	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	456.1	1.9	2.54E+11	0.047084749	16.09358208
D	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	286.1	1.9	2.54E+11	0.029535073	16.11113176
E	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	134.1	1.9	2.54E+11	0.013843598	16.12682323
F	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	790.1	1.9	2.54E+11	0.081564701	16.05910213
G	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	622.1	1.9	2.54E+11	0.064221492	16.07644534
H	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	456.1	1.9	2.54E+11	0.047084749	16.09358208
I	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	286.1	1.9	2.54E+11	0.029535073	16.11113176
J	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	118.1	1.9	2.54E+11	0.012191863	16.12847497
K	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	109.9	1.9	2.54E+11	0.01134535	16.12932148
L	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	289.9	1.9	2.54E+11	0.02992736	16.11073947
M	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	453.9	1.9	2.54E+11	0.046857636	16.09380919
N	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	619.9	1.9	2.54E+11	0.063994378	16.07667245
O	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	793.9	1.9	2.54E+11	0.081956988	16.05870984
P	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	134.9	1.9	2.54E+11	0.013926184	16.12674065
Q	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	289.9	1.9	2.54E+11	0.02992736	16.11073947
R	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	453.9	1.9	2.54E+11	0.046857636	16.09380919
S	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	619.9	1.9	2.54E+11	0.063994378	16.07667245
T	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	322.813	16.14066683	0.000149837	0.000228158	0.000377995	0.3	793.9	1.9	2.54E+11	0.081956988	16.05870984
								854015.1621	1											

Level 3 E/W Direction

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area	P	Delta P	K	K/Sum of K	Load	Direct Shear	Delta Flexure	Delta Shear	Delta total	Drift	Distance	ex (in)	J	Fit (k)	Total Forces
A	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	790.1	1.9	2.54E+11	0.074188179	14.75513058
B	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	622.1	1.9	2.54E+11	0.058413449	14.73935585
C	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	456.1	1.9	2.54E+11	0.042826514	14.72376892
D	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	286.1	1.9	2.54E+11	0.026863989	14.70780639
E	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	134.1	1.9	2.54E+11	0.012591615	14.69353402
F	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	790.1	1.9	2.54E+11	0.074188179	14.75513058
G	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	622.1	1.9	2.54E+11	0.058413449	14.73935585
H	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	456.1	1.9	2.54E+11	0.042826514	14.72376892
I	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	286.1	1.9	2.54E+11	0.026863989	14.70780639
J	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	118.1	1.9	2.54E+11	0.01108926	14.69203166
K	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	109.9	1.9	2.54E+11	0.010319302	14.6912617
L	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	289.9	1.9	2.54E+11	0.027220799	14.7081632
M	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	453.9	1.9	2.54E+11	0.04261994	14.72356234

N	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	619.9	1.9	2.54E+11	0.058206875	14.73914928
O	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	793.9	1.9	2.54E+11	0.074544988	14.75548739
P	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	134.9	1.9	2.54E+11	0.012666733	14.69360913
Q	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	289.9	1.9	2.54E+11	0.027220799	14.7081632
R	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	453.9	1.9	2.54E+11	0.04261994	14.72356234
S	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	619.9	1.9	2.54E+11	0.058206875	14.73914928
T	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	293.619	14.6809424	0.000136286	0.000207524	0.00034381	0.3	793.9	1.9	2.54E+11	0.074544988	14.75548739
								854015.1621	1											
Level 4 E/W Direction																				
Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area	P	Delta P	K	K/Sum of K	Load	Direct Shear	Delta Flexure	Delta Shear	Delta total	Drift	Distance	ex (in)	J	Fit (k)	Total Forces
A	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	790.1	1.9	2.54E+11	0.063199916	12.56969805
B	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	622.1	1.9	2.54E+11	0.049761635	12.55625977
C	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	456.1	1.9	2.54E+11	0.036483333	12.54298146
D	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	286.1	1.9	2.54E+11	0.022885073	12.5293832
E	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	134.1	1.9	2.54E+11	0.010726628	12.51722476
F	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	790.1	1.9	2.54E+11	0.063199916	12.56969805
G	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	622.1	1.9	2.54E+11	0.049761635	12.55625977
H	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	456.1	1.9	2.54E+11	0.036483333	12.54298146
I	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	286.1	1.9	2.54E+11	0.022885073	12.5293832
J	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	118.1	1.9	2.54E+11	0.009446792	12.51594492
K	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	109.9	1.9	2.54E+11	0.008790876	12.51528901
L	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	289.9	1.9	2.54E+11	0.023189034	12.52968716
M	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	453.9	1.9	2.54E+11	0.036307356	12.54280549
N	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	619.9	1.9	2.54E+11	0.049585657	12.55608379
O	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	793.9	1.9	2.54E+11	0.063503877	12.57000201
P	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	134.9	1.9	2.54E+11	0.01079062	12.51728875
Q	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	289.9	1.9	2.54E+11	0.023189034	12.52968716
R	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	453.9	1.9	2.54E+11	0.036307356	12.54280549
S	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	619.9	1.9	2.54E+11	0.049585657	12.55608379
T	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	250.13	12.50649813	0.0001161	0.000176787	0.000292887	0.3	793.9	1.9	2.54E+11	0.063503877	12.57000201
								854015.1621	1											
Level 5 E/W Direction																				
Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area	P	Delta P	K	K/Sum of K	Load	Direct Shear	Delta Flexure	Delta Shear	Delta total	Drift	Distance	ex (in)	J	Fit (k)	Total Forces
A	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	790.1	1.9	2.54E+11	0.05156889	10.25642794
B	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	622.1	1.9	2.54E+11	0.04060373	10.24546278
C	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	456.1	1.9	2.54E+11	0.029769106	10.23462816
D	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	286.1	1.9	2.54E+11	0.018673408	10.22353246
E	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	134.1	1.9	2.54E+11	0.008752548	10.2136116
F	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	790.1	1.9	2.54E+11	0.05156889	10.25642794
G	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	622.1	1.9	2.54E+11	0.04060373	10.24546278
H	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	456.1	1.9	2.54E+11	0.029769106	10.23462816
I	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	286.1	1.9	2.54E+11	0.018673408	10.22353246
J	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	118.1	1.9	2.54E+11	0.007708247	10.2125673
K	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	109.9	1.9	2.54E+11	0.007173043	10.2120321
L	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	289.9	1.9	2.54E+11	0.018921429	10.22378048
M	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	453.9	1.9	2.54E+11	0.029625515	10.23448457
N	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	619.9	1.9	2.54E+11	0.040460138	10.24531919
O	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	793.9	1.9	2.54E+11	0.051816912	10.25667597
P	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	134.9	1.9	2.54E+11	0.008804763	10.21366382
Q	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	289.9	1.9	2.54E+11	0.018921429	10.22378048
R	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	453.9	1.9	2.54E+11	0.029625515	10.23448457
S	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	619.9	1.9	2.54E+11	0.040460138	10.24531919
T	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	204.097	10.20485905	9.47337E-05	0.000144252	0.000238985	0.3	793.9	1.9	2.54E+11	0.051816912	10.25667597
								854015.1621	1											
Level 6 E/W Direction																				
Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area	P	Delta P	K	K/Sum of K	Load	Direct Shear	Delta Flexure	Delta Shear	Delta total	Drift	Distance	ex (in)	J	Fit (k)	Total Forces
A	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	790.1	1.9	2.54E+11	0.037852128	7.528329964
B	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	622.1	1.9	2.54E+11	0.02980358	7.520281416
C	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	456.1	1.9	2.54E+11	0.021850849	7.512328684

D	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	286.1	1.9	2.54E+11	0.013706485	7.504184321
E	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	134.1	1.9	2.54E+11	0.006424466	7.496902301
F	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	790.1	1.9	2.54E+11	0.037852128	7.528329964
G	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	622.1	1.9	2.54E+11	0.02980358	7.520281416
H	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	456.1	1.9	2.54E+11	0.021850849	7.512328684
I	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	286.1	1.9	2.54E+11	0.013706485	7.504184321
J	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	118.1	1.9	2.54E+11	0.005657937	7.496135773
K	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	109.9	1.9	2.54E+11	0.005265092	7.495742927
L	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	289.9	1.9	2.54E+11	0.013888536	7.504366371
M	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	453.9	1.9	2.54E+11	0.021745451	7.512223287
N	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	619.9	1.9	2.54E+11	0.029698183	7.520176018
O	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	793.9	1.9	2.54E+11	0.038034178	7.528512014
P	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	134.9	1.9	2.54E+11	0.006462792	7.496940628
Q	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	289.9	1.9	2.54E+11	0.013888536	7.504366371
R	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	453.9	1.9	2.54E+11	0.021745451	7.512223287
S	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	619.9	1.9	2.54E+11	0.029698183	7.520176018
T	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	149.81	7.490477836	6.95356E-05	0.000105882	0.000175418	0.3	793.9	1.9	2.54E+11	0.038034178	7.528512014
								854015.1621	1											

Level 7 E/W Direction

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area	P	Delta P	K	K/Sum of K	Load	Direct Shear	Delta Flexure	Delta Shear	Delta total	Drift	Distance	ex (in)	J	Fit (k)	Total Forces
A	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	790.1	1.9	2.09E+11	0.021948309	4.365140001
B	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	622.1	1.9	2.09E+11	0.017281411	4.360473103
C	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	456.1	1.9	2.09E+11	0.012670072	4.355861763
D	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	286.1	1.9	2.09E+11	0.007947616	4.351139307
E	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	134.1	1.9	2.09E+11	0.003725184	4.346916876
F	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	790.1	1.9	2.09E+11	0.021948309	4.365140001
G	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	622.1	1.9	2.09E+11	0.017281411	4.360473103
H	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	456.1	1.9	2.09E+11	0.012670072	4.355861763
I	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	286.1	1.9	2.09E+11	0.007947616	4.351139307
J	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	118.1	1.9	2.09E+11	0.003280718	4.346472409
K	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	109.9	1.9	2.09E+11	0.003052929	4.34624462
L	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	289.9	1.9	2.09E+11	0.008053177	4.351244868
M	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	453.9	1.9	2.09E+11	0.012608958	4.355800649
N	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	619.9	1.9	2.09E+11	0.017220297	4.360411989
O	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	793.9	1.9	2.09E+11	0.02205387	4.365245561
P	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	134.9	1.9	2.09E+11	0.003747408	4.346939099
Q	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	289.9	1.9	2.09E+11	0.008053177	4.351244868
R	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	453.9	1.9	2.09E+11	0.012608958	4.355800649
S	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	619.9	1.9	2.09E+11	0.017220297	4.360411989
T	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	86.8638	4.343191691	5.53069E-05	6.82151E-05	0.000123522	0.3	793.9	1.9	2.09E+11	0.02205387	4.365245561
								703225.8835	1											

E/W Wind

Level 1 E/W Direction

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load(1.6W)	Direct Shear Force (k)	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
A	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	784.3	7.7	2.09E+11	0.053561338	2.714438662
B	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	616.3	7.7	2.09E+11	0.042088299	2.725911701
C	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	450.3	7.7	2.09E+11	0.030751843	2.737248157
D	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	280.3	7.7	2.09E+11	0.01914222	2.74885778
E	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	128.3	7.7	2.09E+11	0.008761851	2.759238149
F	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	784.3	7.7	2.09E+11	0.053561338	2.714438662
G	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	616.3	7.7	2.09E+11	0.042088299	2.725911701
H	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	450.3	7.7	2.09E+11	0.030751843	2.737248157
I	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	280.3	7.7	2.09E+11	0.01914222	2.74885778
J	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	112.8	7.7	2.09E+11	0.007703326	2.760296674
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	295.7	7.7	2.09E+11	0.020193915	2.747806085
M	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	459.7	7.7	2.09E+11	0.031393787	2.736606213
N	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	625.7	7.7	2.09E+11	0.042730243	2.725269757
O	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	799.7	7.7	2.09E+11	0.054613034	2.713386966
P	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	140.7	7.7	2.09E+11	0.009608671	2.758391329
Q	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	295.7	7.7	2.09E+11	0.020193915	2.747806085
R	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	459.7	7.7	2.09E+11	0.031393787	2.736606213
S	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	625.7	7.7	2.09E+11	0.042730243	2.725269757
T	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.052631579	52.59	2.768	3.52481E-05	4.34748E-05	7.87229E-05	0.3	799.7	7.7	2.09E+11	0.054613034	2.713386966
								668064.5893	1											

Level 2 E/W Direction

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load(1.6W)	Direct Shear Force (k)	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
A	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	790.1	1.9	2.54E+11	0.012665757	2.493734243
B	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	622.1	1.9	2.54E+11	0.009972621	2.496427379
C	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	456.1	1.9	2.54E+11	0.007311545	2.499088455
D	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	286.1	1.9	2.54E+11	0.004586347	2.501813653
E	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	134.1	1.9	2.54E+11	0.0021497	2.5042503
F	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	790.1	1.9	2.54E+11	0.012665757	2.493734243
G	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	622.1	1.9	2.54E+11	0.009972621	2.496427379
H	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	456.1	1.9	2.54E+11	0.007311545	2.499088455
I	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	286.1	1.9	2.54E+11	0.004586347	2.501813653
J	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	118.1	1.9	2.54E+11	0.001893211	2.504506789
K	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	109.9	1.9	2.54E+11	0.00176176	2.50463824
L	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	289.9	1.9	2.54E+11	0.004647264	2.501752736
M	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	453.9	1.9	2.54E+11	0.007276278	2.499123722
N	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	619.9	1.9	2.54E+11	0.009937353	2.496462647
O	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	793.9	1.9	2.54E+11	0.012726673	2.493673327
P	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	134.9	1.9	2.54E+11	0.002162525	2.504237475
Q	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	289.9	1.9	2.54E+11	0.004647264	2.501752736
R	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	453.9	1.9	2.54E+11	0.007276278	2.499123722
S	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	619.9	1.9	2.54E+11	0.009937353	2.496462647
T	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.13	2.5064	2.32674E-05	3.54295E-05	5.86969E-05	0.3	793.9	1.9	2.54E+11	0.012726673	2.493673327
								854015.1621	1											

Level 3 E/W Direction

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load(1.6W)	Direct Shear Force (k)	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
A	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	790.1	1.9	2.54E+11	0.012787038	2.543187038
B	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	622.1	1.9	2.54E+11	0.010068113	2.540468113
C	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	456.1	1.9	2.54E+11	0.007381557	2.537781557
D	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	286.1	1.9	2.54E+11	0.004630264	2.535030264
E	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	134.1	1.9	2.54E+11	0.002170285	2.532570285

F	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	790.1	1.9	2.54E+11	0.012787038	2.543187038
G	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	622.1	1.9	2.54E+11	0.010068113	2.540468113
H	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	456.1	1.9	2.54E+11	0.007381557	2.537781557
I	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	286.1	1.9	2.54E+11	0.004630264	2.535030264
J	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	118.1	1.9	2.54E+11	0.001911339	2.532311339
K	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	109.9	1.9	2.54E+11	0.00177863	2.53217863
L	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	289.9	1.9	2.54E+11	0.004691763	2.535091763
M	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	453.9	1.9	2.54E+11	0.007345952	2.537745952
N	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	619.9	1.9	2.54E+11	0.010032508	2.540432508
O	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	793.9	1.9	2.54E+11	0.012848537	2.543248537
P	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	134.9	1.9	2.54E+11	0.002183232	2.532583232
Q	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	289.9	1.9	2.54E+11	0.004691763	2.535091763
R	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	453.9	1.9	2.54E+11	0.007345952	2.537745952
S	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	619.9	1.9	2.54E+11	0.010032508	2.540432508
T	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	50.61	2.5304	2.34902E-05	3.57687E-05	5.92589E-05	0.3	793.9	1.9	2.54E+11	0.012848537	2.543248537
								854015.1621	1											

Level 4 E/W Direction

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load(1.6W)	Direct Shear Force (k)	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
A	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	790.1	1.9	2.54E+11	0.013207478	2.626807478
B	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	622.1	1.9	2.54E+11	0.010399155	2.623999155
C	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	456.1	1.9	2.54E+11	0.007624264	2.621224264
D	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	286.1	1.9	2.54E+11	0.004782508	2.608817492
E	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	134.1	1.9	2.54E+11	0.002241644	2.611358356
F	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	790.1	1.9	2.54E+11	0.013207478	2.600392522
G	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	622.1	1.9	2.54E+11	0.010399155	2.603200845
H	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	456.1	1.9	2.54E+11	0.007624264	2.605975736
I	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	286.1	1.9	2.54E+11	0.004782508	2.608817492
J	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	118.1	1.9	2.54E+11	0.001974184	2.611625816
K	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	109.9	1.9	2.54E+11	0.001837112	2.611762888
L	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	289.9	1.9	2.54E+11	0.004846029	2.608753971
M	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	453.9	1.9	2.54E+11	0.007587488	2.606012512
N	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	619.9	1.9	2.54E+11	0.010362379	2.603237621
O	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	793.9	1.9	2.54E+11	0.013271	2.600329
P	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	134.9	1.9	2.54E+11	0.002255017	2.611344983
Q	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	289.9	1.9	2.54E+11	0.004846029	2.608753971
R	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	453.9	1.9	2.54E+11	0.007587488	2.606012512
S	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	619.9	1.9	2.54E+11	0.010362379	2.603237621
T	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	52.27	2.6136	2.42626E-05	3.69448E-05	6.12073E-05	0.3	793.9	1.9	2.54E+11	0.013271	2.600329
								854015.1621	1											

Level 5 E/W Direction

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load(1.6W)	Direct Shear Force (k)	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
A	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	790.1	1.9	2.54E+11	0.013478339	2.680678339
B	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	622.1	1.9	2.54E+11	0.010612422	2.677812422
C	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	456.1	1.9	2.54E+11	0.007780623	2.674980623
D	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	286.1	1.9	2.54E+11	0.004880588	2.662319412
E	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	134.1	1.9	2.54E+11	0.002287616	2.664912384
F	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	790.1	1.9	2.54E+11	0.013478339	2.653721661
G	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	622.1	1.9	2.54E+11	0.010612422	2.656587578
H	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	456.1	1.9	2.54E+11	0.007780623	2.659419377
I	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	286.1	1.9	2.54E+11	0.004880588	2.662319412
J	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	118.1	1.9	2.54E+11	0.002014671	2.665185329
K	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	109.9	1.9	2.54E+11	0.001874787	2.665325213
L	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	289.9	1.9	2.54E+11	0.004945412	2.662254588
M	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	453.9	1.9	2.54E+11	0.007743093	2.659456907
N	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	619.9	1.9	2.54E+11	0.010574892	2.656625108

O	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	793.9	1.9	2.54E+11	0.013543163	2.653656837
P	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	134.9	1.9	2.54E+11	0.002301263	2.664898737
Q	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	289.9	1.9	2.54E+11	0.004945412	2.662254588
R	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	453.9	1.9	2.54E+11	0.007743093	2.659456907
S	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	619.9	1.9	2.54E+11	0.010574892	2.656625108
T	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	53.34	2.6672	2.47601E-05	3.77025E-05	6.24626E-05	0.3	793.9	1.9	2.54E+11	0.013543163	2.653656837
								854015.1621	1											

Level 6 E/W Direction

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load(1.6W)	Direct Shear Force (k)	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
A	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	790.1	1.9	2.54E+11	0.013862394	2.757062394
B	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	622.1	1.9	2.54E+11	0.010914815	2.754114815
C	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	456.1	1.9	2.54E+11	0.008002326	2.751202326
D	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	286.1	1.9	2.54E+11	0.005019657	2.748219657
E	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	134.1	1.9	2.54E+11	0.0023528	2.7455528
F	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	790.1	1.9	2.54E+11	0.013862394	2.757062394
G	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	622.1	1.9	2.54E+11	0.010914815	2.754114815
H	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	456.1	1.9	2.54E+11	0.008002326	2.751202326
I	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	286.1	1.9	2.54E+11	0.005019657	2.748219657
J	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	118.1	1.9	2.54E+11	0.002072078	2.745272078
K	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	109.9	1.9	2.54E+11	0.001928208	2.745128208
L	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	289.9	1.9	2.54E+11	0.005086328	2.748286328
M	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	453.9	1.9	2.54E+11	0.007963727	2.751163727
N	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	619.9	1.9	2.54E+11	0.010876216	2.754076216
O	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	793.9	1.9	2.54E+11	0.013929066	2.757129066
P	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	134.9	1.9	2.54E+11	0.002366836	2.745566836
Q	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	289.9	1.9	2.54E+11	0.005086328	2.748286328
R	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	453.9	1.9	2.54E+11	0.007963727	2.751163727
S	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	619.9	1.9	2.54E+11	0.010876216	2.754076216
T	120	108	1533312	29500	720	1	2.34188E-05	42700.75811	0.05	54.86	2.7432	2.54657E-05	3.87768E-05	6.42424E-05	0.3	793.9	1.9	2.54E+11	0.013929066	2.757129066
								854015.1621	1											

Level 7 E/W Direction

Wall	L (in)	H (in)	I (in^4)	E (ksi)	Area (in^2)	P	Delta P	K	K/Sum of K	Load(1.6W)	Direct Shear Force (k)	Delta Flexure	Delta Shear	Delta total	Allowable Drift 0.02h (in)	Distance from COR	ex (in)	J	Fit (k)	Total Forces (k)
A	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	790.1	1.9	2.09E+11	0.014137665	2.811737665
B	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	622.1	1.9	2.09E+11	0.011131555	2.808731555
C	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	456.1	1.9	2.09E+11	0.008161232	2.805761232
D	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	286.1	1.9	2.09E+11	0.005119334	2.802719334
E	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	134.1	1.9	2.09E+11	0.00239952	2.79999952
F	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	790.1	1.9	2.09E+11	0.014137665	2.811737665
G	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	622.1	1.9	2.09E+11	0.011131555	2.808731555
H	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	456.1	1.9	2.09E+11	0.008161232	2.805761232
I	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	286.1	1.9	2.09E+11	0.005119334	2.802719334
J	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	118.1	1.9	2.09E+11	0.002113224	2.799713224
K	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	109.9	1.9	2.09E+11	0.001966497	2.799566497
L	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	289.9	1.9	2.09E+11	0.00518733	2.80278733
M	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	453.9	1.9	2.09E+11	0.008121866	2.805721866
N	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	619.9	1.9	2.09E+11	0.011092189	2.808692189
O	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	793.9	1.9	2.09E+11	0.01420566	2.81180566
P	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	134.9	1.9	2.09E+11	0.002413835	2.800013835
Q	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	289.9	1.9	2.09E+11	0.00518733	2.80278733
R	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	453.9	1.9	2.09E+11	0.008121866	2.805721866
S	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	619.9	1.9	2.09E+11	0.011092189	2.808692189
T	120	120	1533312	29500	720	1	2.84404E-05	35161.29417	0.05	55.95	2.7976	3.56251E-05	4.39397E-05	7.95648E-05	0.3	793.9	1.9	2.09E+11	0.01420566	2.81180566
								703225.8835	1											