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1000 CONNECTICUT AVENUE

Washington DC



FINAL THESIS REPORT: STEEL DESIGN AND ANALYSIS



UT AVENUE, NW OFFICE BUILDING WASHINGTON DC





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Executive Summary

1000 Connecticut Avenue is a 12 story, 565, 000 GSF commercial office building located at the corner of K Street and Connecticut Avenue in Washington D.C. The building is used primarily for office space, but also contains retail space on the first level, commercial office space on levels 3-12, a roof-top terrace with a green roof, and four levels of underground parking.

For this thesis report, 1000 Connecticut Avenue was re-located to Arlington, Virginia and the existing two-way flat slab floor system with lateral resisting concrete moment frames was re-designed as a composite steel floor gravity floor system with lateral resisting moment and braced frames. Before relocating the building to Arlington, VA it was found that Washington D.C. has a zoning height limit of 130 ft. With the existing structure having a height of 130 ft., it was found that to use the new steel system the building would either need to be designed for a reduced number of stories or relocated to a region that does not have a height limit since the new steel system will increase the floor structural depth. To use the new steel structural system in Washington D.C., the structure would need to be re-designed for a reduced number of stories to maintain a minimum floor-to-ceiling height of 8'-6" and to remain within the restricted 130 ft. height limit. Reducing the number of stories from 12 to 11 was undesirable, therefore to create a fair comparison between the two systems the building was relocated to Arlington, VA, which does not have a height limit. The goal of the re-design was to

- increase the bay sizes to open the floor plan layout;
- increase floor-to-floor height to increase the openness of the space;
- Reduce the construction schedule;
- Reduce the structural system cost;
- Increase the annual revenue by increasing the rental value of the space and increasing the amount of rentable space

When designing the steel framing layout, a uniform layout was created to reduce the number of required skewed members and wider bays were created by removing certain existing column lines and relocating columns. Wider bays were created to open the floor plan and to increase the rental value of the space with reduced column obstructions and more rentable space. Maintaining an open floor layout was an important aspect of the re-design, therefore for the lateral system moment frames were used to avoid obstructions in the in the floor plan layout and braced frames were located around the elevator shafts and stairwell cores. The gravity system was designed as a composite steel system to achieve long spans while maintaining minimal structural depth. AISC 14th edition was used to design the gravity frame members. ETABS was used to analyze and design the lateral system. The lateral system design and analysis was based on the wind and seismic lateral loads calculated according to ASCE 7-10. The wind loads were determined by using Analytical Procedure (method 2) outlined in ASCE 7-10 and the seismic loads were determined by using the Equivalent Lateral Force Procedure outlined in ASCE 7-10. After designing the gravity and lateral systems, typical member connections were designed. The typical connections designed were orthogonal and skewed shear connections and a moment frame connection.

After designing the gravity and lateral systems, two breadth studies were conducted to determine how the new structural system will affect other aspects of the building. The first breath study was construction management impact. This breadth analyzed the impact of the structural system redesign on the superstructure cost; construction sequence of the existing system to the proposed construction sequence of the new structural system; site logistics of steel versus concrete; building LEED certification; and the anticipated revenue increase from the use of the new structural system. First the cost of the current structural system was compared to the cost estimate of the new structural system. In this portion of the analysis it was found that the new structural system will cost \$5,994,630 more than the existing structural system. Second, the new structural system construction schedule was compared to the existing system construction schedule. It was found that the new structural system was erected 18 days earlier than the existing structural system, thus representing the use of the new system reduced the construction schedule. Third, how the construction site will have to be managed differently for steel compared to concrete was be evaluated. Using the existing 1000 Connecticut Avenue existing site for analysis, it was found that the site will be managed similarly for both materials. Fourth, the building LEED certification with the use of the new structural system was be compared to the existing building LEED certification and it after the analysis it was found that the building will maintain LEED Gold Certification. Last, the revenue obtained from the new structural system with wider bays and higher floor-to-ceiling heights was compared to the existing structural system's revenue. Wider bays and higher floor-to-ceiling heights increased the rental value of the floor space and therefore the building owner will be able charge higher rent which increased the revenue. The additional revenue obtained from using the new structural system is \$3,705,450. This shows that even though the structural system costs more than the existing system, the amount of additional revenue obtained from using the new system is far more beneficial than using the existing system. Therefore the re-designed structural system with wider bays and floor-to-ceiling heights results in an overall very successful design with a reduced construction schedule and increased rental value. The proposed steel structural system is a viable alternative system to use in Arlington, VA since the new system has many additional benefits compared to the existing concrete structural system.

The second breadth studied was acoustics and lighting impact. This breadth involved determining the sound treatments required for a typical office space located in the new structural system. The analysis began by determining the level of speech privacy the common wall barrier between offices provided. It was shown that a 54 STC rated 8" partition wall with 2-layers of ½" thick gypsum wall board on both sides, staggered electrical boxes isolated with insulation, and 2 ½" metal studs spaced 24" o.c. and is very adequate for providing speech privacy for the offices housed in the new steel structural system. In addition, since the new structural system was designed for higher floor-to-ceiling heights, lighting illuminance applied to the work plane surfaces were affected. As a result, a lighting breadth was conducted by designing the lighting system for a typical office space using the existing floor-to-ceiling height of 8'-6" and checking to determine if the same lighting system can be used for the new floor-to-ceiling height of 10'-6". AGI was be used to design the lighting system for the space and the average illuminance in the space was compared to the target illuminance of the space. The IESNA Handbook 10th edition was used to determine the target illuminance and maximum power density for a private office

space. It was found that the lighting system designed for the space with a floor-to-ceiling height of 8'-6" also achieved the target lighting illuminance for the space with a floor-to-ceiling height of 10'-6".

The appendices in this report include hand calculations for wind, seismic, snow and gravity loads; gravity system design; construction management breadth calculations; floor plans and a building section.

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Building Introduction

1000 Connecticut Avenue, NW Office Building is a new 12 story office building located at the northwest intersection of K Street and Connecticut Avenue in Washington DC, as can be seen in Figure 1. The 1000 Connecticut Avenue Office building is designed to achieve LEED Gold certification upon completion. Despite being used primarily for office space, the building is comprised of mix occupancies, which include: office space, a gymnasium, retail, and parking garages. The structure has 4 levels of underground parking. The building's total square footage is 555,000 SF with 370,000 SF above grade and 185,000 SF below grade.



Figure 1 Building Site

To create a new Washington landmark, the building is designed to complement surrounding institutions by blending both traditional and modern materials. The facade consists of a glass, stainless steel and stone panel curtain wall system. Exterior and interior aluminum and glass storefront windows and doors are on the ground level. The lobby and retail space are located on the 1st level, which has a 12'-6 1/2" floor-to-floor story height. A canopy facing K Street brings attention to the main lobby entrance, as can be seen in Figure 2.





Figure 2 Main Lobby Entrance facing K Street (left) and perspective of curtain wall system (right)

Beyond the main entrance is a two story intricate lobby space with carrera marble and Chelmsford granite flooring, aluminum spline panels integrated with glass fiber reinforced gypsum (GFRG) ceiling tiles and European white oak wood screens, as can be seen in Figure 3.





Figure 3 Perspective of lobby

The retail space is broken down into several retail stores facing K Street and Connecticut Avenue. These retail stores are housed behind storefront glass to enable display of merchandise to potential customers. The 2nd-12th levels have 10'-7 ½" floor-to-floor story heights. Housed on the typical levels (3rd-12th) is the office space. A combination of tall story heights and a continuous floor to ceiling glass façade enables natural daylight to enter the building space as well as provides scenery to the Washington monuments, Farragut Park , and the White House, as can be seen in Figure 4.



Figure 4 Perspective of typical office with floor-to-ceiling windows that supply views to the city

In addition, located on the penthouse level is a roof-top terrace with a green roof and a mechanical penthouse, as can be seen in Figure 5.



Figure 5 Perspective of green roof on roof-top terrace and mechanical penthouse

Housed on the basement levels (B1-B4) are underground parking and a fitness center. A total of 253 parking spaces are provided; level B1 has 19 parking spaces; level B2 has 74 parking spaces; level B3 has 78 parking spaces; level B4 has 82 parking spaces. In addition, the fitness center is located on level B1.

Existing Structural Overview

1000 Connecticut Avenue Office Building's structural system is comprised of a reinforced concrete flat slab floor system with drop panels and a bay spacing of approximately 30 feet by 30 feet. The slab and columns combined perform as a reinforced concrete moment frame. The substructure and superstructure floor systems are both comprised of an 8" thick two-way system with #5 reinforcing bars spaced 12" on center in both the column and middle strips and 8" thick drop panels. The below grade parking garage ramp is comprised of a 14" thick slab with #5 reinforcing bars provided both top and bottom with a spacing of 12" on center.

Foundation

ECS Mid-Atlantic, LLC performed a geotechnical analysis of the building's site soil conditions as well as provided recommendations for the foundation. A total of five borings were observed in the geotechnical analysis. It was determined that a majority of the site's existing fill consists of a mixture of silt, sand, gravel, and wood. The natural soils consisted of sandy silt, sand with silt, clayey gravel, silty gravel, and silty sand. The soil varies from loose to extremely dense in relative density. Based on the samples recovered from the rock coring operations, the rock is classified as completely to moderately weathered, thinly bedded, and hard to very hard gneiss.

At the time of the study, the groundwater was recorded at a boring depth of 7.5 feet below the existing ground surface. The shallow water table is located at an elevation of 35 to 38 feet in the vicinity of the site.

1000 Connecticut Avenue, NW Office Building is supported by a shallow foundation consisting of column footings and strap beams, as can be seen in Figure 6. The typical column footing sizes are $4'-0'' \times 4'-0'' \times 5'-0'' \times 5'-0''$, and $4'-0'' \times 8'-0''$.

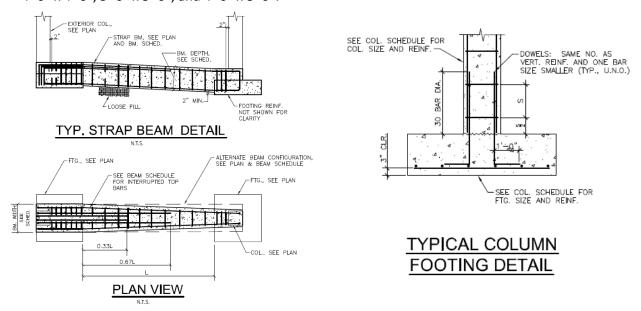


Figure 6 Details of typical strap beam and column footing

The footings bear on 50 KSF competent rock. The Strap beams (cantilever footings) are used to prevent the exterior footings from overturning by connecting the strap beam to both the exterior footing and to an adjacent interior footing. A simplified foundation plan can be seen in Figure 7.

The slab on grade is 5" thick, 5000 psi concrete with 6x6-W2.9xW2.9 wire welded fabric on a minimum 15 mil Polyethylene sheet over 6" washed crushed stone. The foundation walls consists of concrete masonry units vertically reinforced with #5 bars at 16" on center and horizontally reinforced with #4 bars at 12" on center and are subjected to a lateral load (earth pressure) of 45 PSF per foot of wall depth.

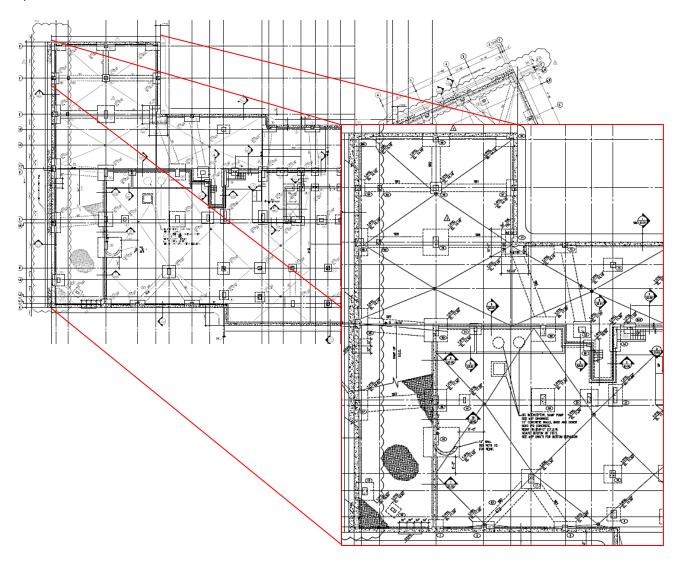


Figure 7 Foundation plan

Framing and Floor System

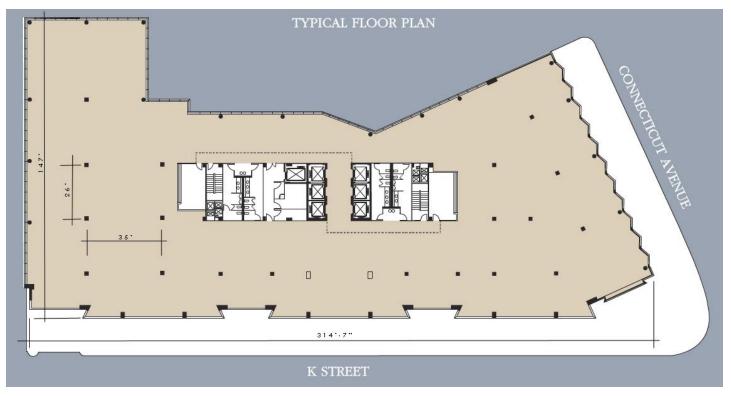


Figure 8 Floor plan displaying column locations and bays

The framing system is composed of reinforced concrete columns with an average column-to-column spacing of 30'x30', as can be seen in Figure 8. The columns have a specified concrete strength of f'c=8000 psi for columns on levels B4 to level 3, f'c=6000 psi for columns on levels 4-7, and f'c=5000 psi for columns on levels 8-mechanical penthouse. The columns are framed at the concrete floor, as can be seen in Figure 9, and the columns vary in size. The most common column sizes are 24"x24", 16"x48", and 24"x30". The column capitals are 6" thick, measured from the bottom of the drop panel, extending 6" all around the face of the column, as can be seen in Figure 10.

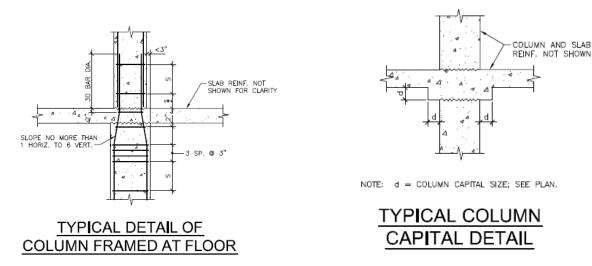


Figure 9 Typical Detail of column framed at the floor

Figure 10 Typical column capital detail

The typical floor system is comprised of an 8" thick two-way flat slab with drop panels reinforced with #5 bottom bars spaced 12" on center in both the column and middle strips, as can be seen in Figure 11.

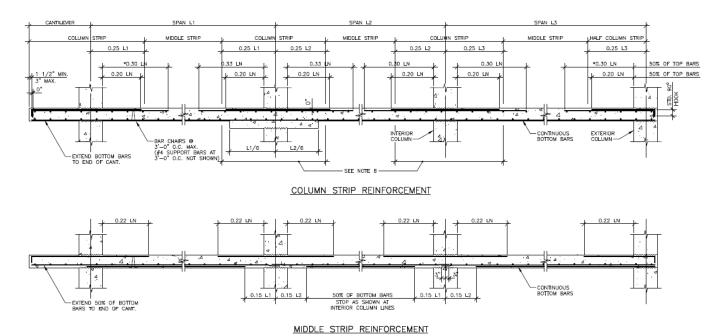
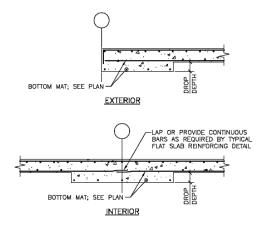


Figure 11 Typical two-way slab reinforcing detail

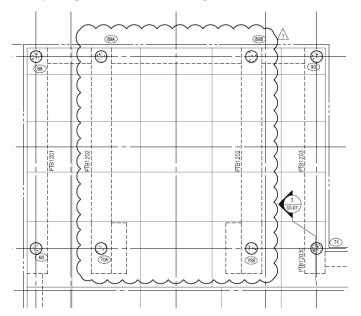
The individual drop panels are 8" thick, extending a distance d/6 from the centerline of the column, as can be seen in Figure 12.

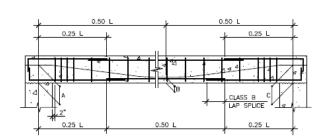


TYPICAL CONTINUOUS DROP REINFORCING DETAILS

Figure 12 Typical Continuous drop panel

A 36" wide by 3 ½" deep continuous drop panel is located around the perimeter on all floor levels. Levels 3-12 are supported by four post-tension beams above the lobby area. Due to the two story lobby, there's a large column-to-column spacing. As a result, post tension beams are used to support the slab on levels 3-12 located above the lobby. In addition, four post-tension beams support the slab on levels 3-12 that are located above the two-story parking deck, which also has a large column-to-column spacing, as can be seen in Figure 13.





TYPICAL SINGLE SPAN
POST TENSIONED BEAM
REINFORCING DETAIL
(LONG SPANS)

Figure 13 Plan view and typical detail of Post-tension beams supporting slab on levels above two-story loading dock

Lateral System

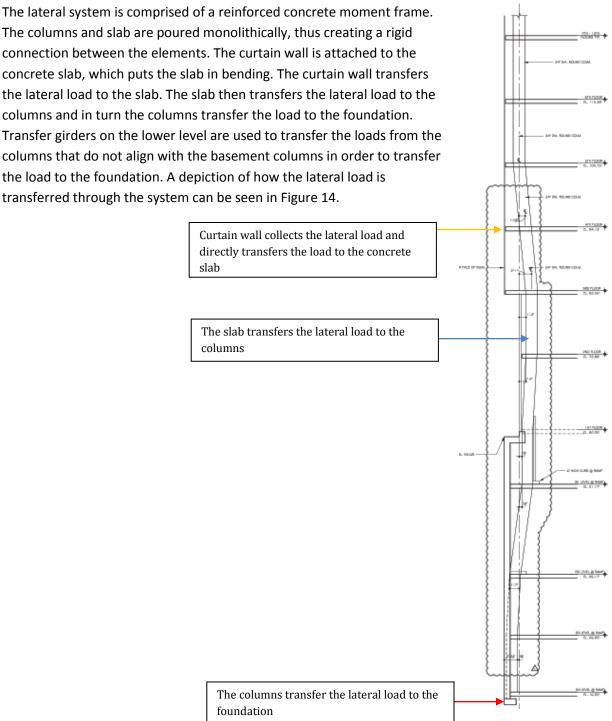


Figure 14 Lateral load path depiction

Roof System

The main roof framing system is supported by an 8"thick concrete slab with #5 bars spaced 12" on center at the bottom in the east-west direction. The slab also has 8" thick drop panels. The penthouse framing system is separated into two roofs: Elevator Machine Room roof and the high roof. The elevator machine room roof framing system is supported by 14" and 8" thick slab with #7 bars with 6" spacing on center top and bottom in the east-west direction.

Design Codes

According to sheet S601, the original building was designed to comply with the following:

- 2000 International Building Code (IBC 2000)
- Building Code Requirements for Structural Concrete (ACI 318)
- Specifications for Structural Concrete (ACI 301)
- Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315)
- Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (AISC manual), Allowable Strength Design (ASD) method

The codes that were used to complete the analyses within this report are the following:

- Minimum Design Loads for Building and Other Structures (ASCE 7-10)
- AISC Steel Construction Manual, 14th Edition, Load and Resistance Factor Design (LRFD) method
- Vulcraft Steel Roof and Floor Deck Manual, 2008

Structural Materials

Table 1 below shows the several types of materials that were used for this project according to the general notes page of the structural drawings on sheet S601.

Concrete (Cast-in-Place)				
Usage	Weight	Strength (psi)		
Spread Footings	Normal	4000		
Strap Beams	Normal	4000		
Foundation Walls	Normal	4000		
Formed Slabs and Beams	Normal	5000		
Columns	Normal	Varies (based on column		
		schedule)		
Concrete Toppings	Normal	5000		
Slabs on Grade	Normal	5000		
Pea-gravel concrete (or grout)	Normal	2500 (for filling CMU units)		
All other concrete	Normal	3000		
	Reinforcing Steel			
Туре	Standard	Grade		
Deformed Reinforcing Bars	ASTM A615	60		
	ASTM A775	N/A		
Welded Wire Fabric	ASTM A185	N/A		
Reinforcing Bar Mats	ASTM A184	N/A		
	Post-Tensioning (Unbonded)			
Туре	Standard	Strength (ksi)		
Prestressed Steel (seven wire low-	ASTM A416	270		
relaxation or stressed relieved				
strand)				
	Miscellaneous Steel			
Туре	Standard	Grade		
Structural Steel	ASTM A36	N/A		
Bolts	ASTM A325	N/A		
Welds	AWS	N/A		

Table 1 Design materials

Gravity Loads

For this technical report, live loads and snow loads were compared to the loads listed on the structural drawings. In addition, dead loads were calculated and assumed in order to spot check gravity members and typical columns. The system evaluations were then compared to the original design. The hand calculations for the gravity member checks can be found in Appendix A.

Dead and Live Loads

Table 2 below is a list of the live loads in which the project was designed for compared to the minimum design live loads outlined in ASCE 7-10.

Floor Live Loads				
Occupancy	Design Load (psf)	ASCE 7-10		
Parking Levels	50	40		
Retail	100	100		
Vestibules &	100	100		
Lobbies				
Office Floors	100=(80 psf+ 20 psf	70= (50 psf + 20 psf		
	partitions)	partitions)		
Corridors	100	100 on ground level		
		80 above 1 st level		
Stairs	100	100		
Balconies &	100	100		
Terraces				
Mechanical Room	150	-		
Pump Room,	150	-		
Generator Room				
Light Storage	125	125		
Loading Dock,	350	250		
Truck Bays				
Slab On Grade	100	-		
Green Roof Areas	30	-		
Terrace	100	100		

Table 2 Summary of design live loads compared to minimum design live loads on ASCE 7-10 Note: - Means the load for the specified occupancy was not provided

Based on the above design live loads, certain spaces were designed for higher loads to create a more conservative design and to allow for design flexibility. For this technical report, the design live loads were used for the gravity member analyses.

Snow Load

The snow load was determined in conformance to chapter 7 in ASCE 7-10. A summary of the snow drift parameters are shown in table 3.

Flat Roof Snow load Calculations		
Variable	Value	
Ground Snow, pg (psf)	25	
Temperature, Factor C _t	1.0	
Exposure Factor, C _e	0.9	
Importance Factor, I _s	1.0	
Flat Roof Snow Load, p _f	15.75	

Table 3 Summary of roof snow calculations

According to structural drawing sheet S601, the flat roof snow load was 22.5 psf whereas 15.75 psf was calculated in this technical report. The 15.75 psf value was used to determine the snow load and snow drifts. These subsequent calculations can be found in Appendix A.

Table 4 below is a list of the dead loads that were used for the gravity spot checks. The superimposed dead loads for the floor levels and roofs were assumed.

Dead Loads		
Normal Weight Concrete	150 pcf	
Curtain Wall	250 plf	
Precast Panels	450 plf	
Floor Superimposed Dead Load (ceiling, lights,	10 psf	
MEP, miscellaneous)		
Main Roof Superimposed Dead Load (ceiling,	10 psf	
lights, MEP, miscellaneous)		
Penthouse Roof Superimposed Dead Loads	5 psf	

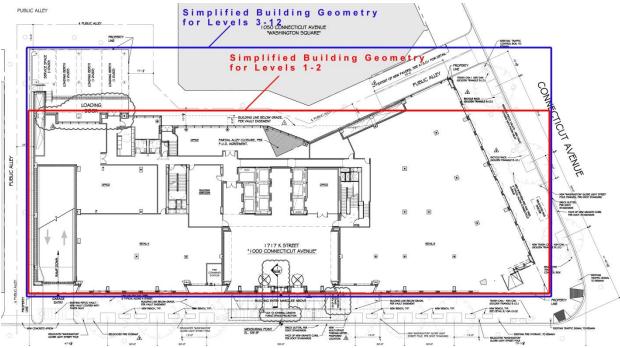
Table 4 Summary of dead loads

Lateral Loads

In this report, wind and seismic lateral loads were calculated to determine the loads acting on the structure's lateral system. To perform manual calculations for determining the lateral loads, simplifying assumptions were made. In addition, it was determined how much of the story force was distributed to each moment frame, which will be discussed later in this report. The hand calculations associated with the wind and seismic loads determination can be found in Appendices B and C.

Wind Loads

Wind loads were determined using the Main Wind Force Resisting System (MWFRS) procedure (method 2) in conformance to Chapters 26 and 27 outlined in ASCE 7-10. Due to the building's complex geometry,



a rectangular building shape was assumed to simplify the wind load analysis, as can be seen in Figure 17.

Figure 17 Simplified building shape for wind load analysis

Most of the calculations for determining the wind pressures and story forces were performed in Microsoft Excel. In the analysis, windward, leeward, sidewall, and roof suction pressures were determined. Internal pressures were neglected in calculating the design wind pressure because internal pressures do not contribute towards the external wind pressures acting on the building.

The general wind load design criteria and guest effect factors can be found in Tables 5 and 6. The calculated approximate lower- bound natural frequency for the building was 0.544 Hz, which is less than 1 Hz, therefore the gust factors were calculated in the event the building is flexible.

Further, wind pressures in the N-S and E-W directions can be seen in Tables 7 and 8 with the corresponding vertical profile sketch of the wind pressures shown in Figures 18 and 19. The story forces were then determined based on the wind pressures. The resulting base shears were 1401 k for the N-S direction and 553 k in the E-W direction. The story forces and overturning moments for both the N-S and E-W directions can be found in Tables 9 and 10 along with the vertical profile of the story forces in Figures 20 and 21.

General Wind Load Design Criteria				
Design Wind Speed, V	115 mph	ASCE 7-10, Fig. 26.5-1A		
Directionality Factor, K _d - MWFRS	0.85	ASCE 7-10, Tbl. 26.6-1		
Directionality Factor, K _d - Mechanical PH	0.9	ASCE 7-10, Tbl. 26.6-1		
Exposure Category	В	ASCE 7-10, Sect. 26.7.3		
Topographic Factor, K _{zt}	1.0	ASCE 7-10, Sect. 26.8.2		
Internal Pressure Coeficient, GC _{pi}	0.18	ASCE 7-10, Tbl. 26.11-1		

Table 5 General wind design criteria

Gust Factor-MWFRS				
N-S Wind		E-W V	Vind	
Levels 1-2	Levels 3-12	Levels 1-2	Levels 3-12	
0.861	0.861	0.945	0.926	
Gust Factor-Mechnical Penthouse				
N-S Wind		E-W Wind		
0.85		0.8	5	

Table 6 Guest Factors

Wind Pressures - N-S Direction				
		Distances	Wind Pressure	
Type	Floor	(ft)	(psf)	
	1	0	11.30	
	2	12.54	11.30	
	3	23.17	13.08	
	4	33.79	15.06	
	5	44.42	16.06	
	6	55.04	16.85	
	7	65.67	17.64	
	8	76.29	18.43	
	9	86.92	19.03	
	10	97.54	19.62	
	11	108.17	20.61	
	12	118.79	20.61	
Windward Walls	Main Roof	130	21.61	
Leedward Walls	Levels 1-2	0 to 23.17	-13.50	
	Level 3 -12	23.17 to 130	-13.50	
Side Walls	All	All	-18.91	
	N/A	0 to 65	-32.52	
Roof	N/A	65 to 130	-20.20	
	N/A	130-260	-17.61	
	N/A	>260	N/A	

Table 7 N-S Wind Pressures

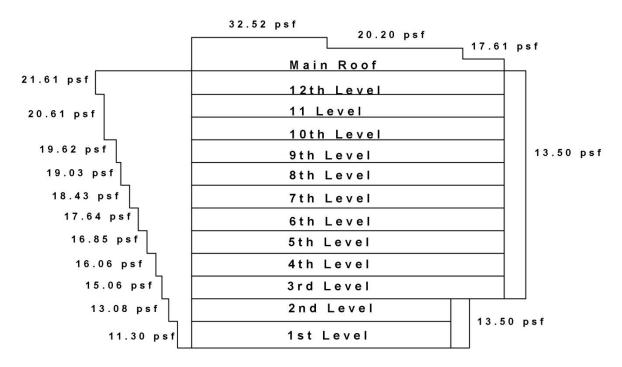


Figure 18 N-S wind pressure vertical pressure sketch

Wind Pressures - E-W Direction				
		Distances	Wind Pressure	
Type	Floor	(ft)	(psf)	
	1	0	12.40	
	2	12.54	12.40	
	3	23.17	14.07	
	4	33.79	16.20	
	5	44.42	17.27	
	6	55.04	18.12	
	7	65.67	18.97	
	8	76.29	19.83	
	9	86.92	20.47	
	10	97.54	21.11	
	11	108.17	22.17	
	12	118.79	22.17	
Windward Walls	Main Roof	130	23.24	
Leedward Walls	Levels 1-2	0 to 23.17	-8.03	
	Level 3 -12	23.17 to 130	-8.51	
Side Walls	Levels 1-2	0 to 23.17	-20.75	
	Levels 3-12	23.17 to 130	-20.33	
	N/A	0 to 65	-26.14	
Roof	N/A	65 to 130	-26.14	
	N/A	130-260	-14.52	
	N/A	>260	-8.71	

Table 8 E-W wind pressures

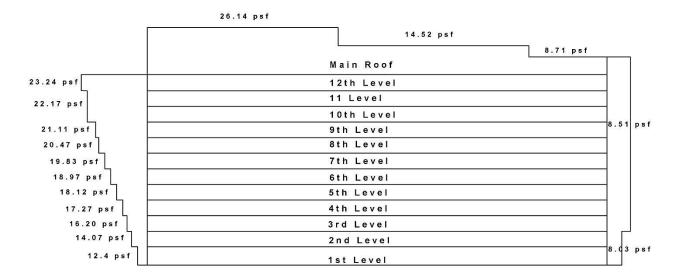


Figure 19 E-W vertical wind pressure profile

Wind Forces - N-S Direction										
		Tributary Below			Tributary Above			Story Force	Story Shear	Overturning
Floor	Elevation (ft)	Height (ft)	Length (ft)	Area (ft²)	Height (ft)	Length (ft)	Area (ft²)	(Kips)	(Kips)	Moment (K-ft)
PH Roof	148.5	18.5	199.83	3696.86	0	199.83	0	142.82	142.82	21208.42
Main Roof	130	5.31	314.58	1671.21	0	314.58	0	58.68	201.49	7627.83
12	118.79	5.31	314.58	1671.21	5.31	314.58	1671.21	115.69	317.19	13743.40
11	108.17	5.31	314.58	1671.21	5.31	314.58	1671.21	114.04	431.23	12335.55
10	97.54	5.31	314.58	1671.21	5.31	314.58	1671.21	112.38	543.61	10961.76
9	86.92	5.31	314.58	1671.21	5.31	314.58	1671.21	109.73	653.34	9537.91
8	76.29	5.31	314.58	1671.21	5.31	314.58	1671.21	107.74	761.09	8219.83
7	65.67	5.31	314.58	1671.21	5.31	314.58	1671.21	105.43	866.51	6923.30
6	55.04	5.31	314.58	1671.21	5.31	314.58	1671.21	102.78	969.29	5656.76
5	44.42	5.31	314.58	1671.21	5.31	314.58	1671.21	100.13	1069.41	4447.57
4	33.79	5.31	314.58	1671.21	5.31	314.58	1671.21	97.14	1166.56	3282.49
3	23.17	5.31	314.58	1671.21	5.31	314.58	1671.21	92.17	1258.73	2135.69
2	12.54	6.27	314.58	1972.42	5.31	314.58	1671.21	93.35	1352.08	1170.63
1	0	0	314.58	0.00	6.27	314.58	1972.42	48.92	1401.00	0.00
Total Base Shear =										1401 K
	Total Overturning Moment =									107,251 K-ft

 Table 9 N-S Story forces, base shear, and overturning moment

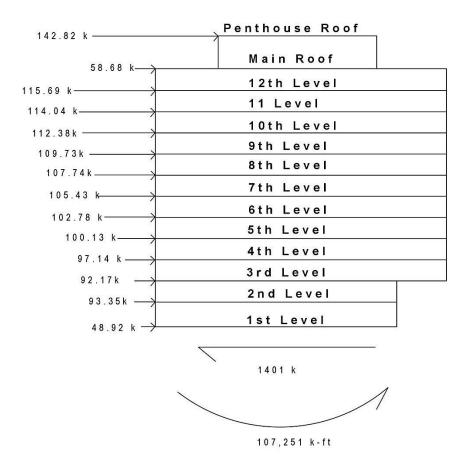


Figure 20 Vertical profile of story forces in N-S direction

Wind Forces - E-W Direction										
		Tributary Below			Tributary Above			Story Force	Story Shear	Overturning
Floor	Elevation (ft)	Height (ft)	Length (ft)	Area (ft²)	Height (ft)	Length (ft)	Area (ft²)	(Kips)	(Kips)	Moment (K-ft)
PH Roof	148.5	18.5	59.83	1106.86	0	59.83	0	42.76	42.76	6349.90
Main Roof	130	5.31	147	780.94	0	147	0	27.57	70.33	3583.67
12	118.79	5.31	147	780.94	5.31	147	780.94	48.75	119.08	5791.43
11	108.17	5.31	147	780.94	5.31	147	780.94	47.92	167.00	5183.62
10	97.54	5.31	147	780.94	5.31	147	780.94	47.09	214.09	4593.03
9	86.92	5.31	147	780.94	5.31	147	780.94	45.76	259.85	3977.18
8	76.29	5.31	147	780.94	5.31	147	780.94	44.76	304.60	3414.58
7	65.67	5.31	147	780.94	5.31	147	780.94	43.59	348.20	2862.72
6	55.04	5.31	147	780.94	5.31	147	780.94	42.26	390.46	2326.03
5	44.42	5.31	147	780.94	5.31	147	780.94	40.93	431.39	1818.06
4	33.79	5.31	147	780.94	5.31	147	780.94	39.43	470.82	1332.35
3	23.17	5.31	147	780.94	5.31	147	780.94	36.56	507.38	847.10
2	12.54	6.27	121.75	763.37	5.31	121.75	646.80	29.90	537.27	374.88
1	0	0	121.75	0.00	6.27	121.75	763.37	15.60	552.87	0.00
	Total Base Shear =									
	Total Overturning Moment =									42,455 K-ft

Table 10 E-W Story forces, base shear, and overturning moment

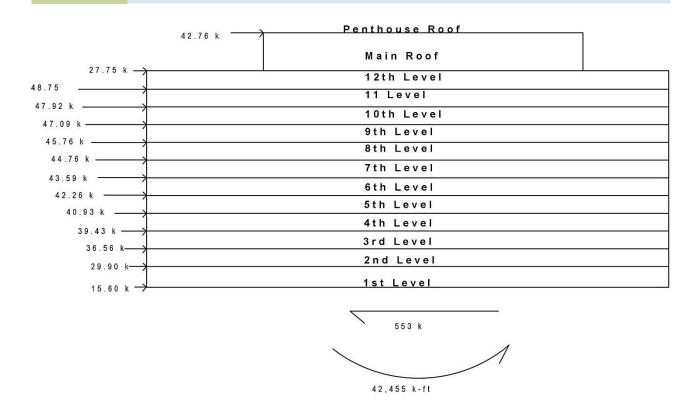


Figure 21 Vertical profile of story forces in E-W direction

Seismic Loads

Seismic loads were determined using the Equivalent Lateral Force Procedure outlined in Chapters 11 and 12 in ASCE 7-10. For analysis, the 1st level weight was neglected and thus the 2nd-12th levels, main roof, and penthouse were considered for building weight calculations. The typical floor level slab thickness is 8" with small areas consisting of 12" slabs. For calculation simplification, a uniform slab thickness of 8" was used.

Since the lateral resisting system consists of a reinforced concrete moment frame in both the N-S and E-W directions, one analysis was performed to determine the seismic story forces and base shear for both directions.

Since this building has several stories above grade, building weight was determined by calculating the dead weight for the typical floor level and applying that story weight to the other floor levels (levels 2-12). The weight on the main roof and penthouse roof were calculated separately. The weight included for summing the total building weight were the weight of the slabs, columns, drop panels, and superimposed dead loads.

After the analysis, the determined base shear was 1001 kips and an overturning moment of 95,973 K-ft. Refer to Table 11 for seismic force analysis results.

				0						
Seismic Forces										
	Height to level i	Story Height	Story Weight			Story Force	Story Shear	Overturning Moment		
	h _i	h _x	W _x			fi	Vi	Mz		
level i	(ft)	(ft)	(kips)	w _x *h _x *	C _{VX}	(kips)	(kips)	(k-ft)		
PH Roof	0	148.0	754	779331	0.034	34	34	5036		
Main Roof	0	129.5	4000	3434311	0.150	150	184	19417		
12	10.63	118.8	4737	3610992	0.157	158	342	18741		
11	10.63	108.2	4737	3170303	0.138	138	480	14982		
10	10.63	97.6	4737	2746158	0.120	120	600	11703		
9	10.63	87.0	4737	2339639	0.102	102	702	8884		
8	10.63	76.3	4737	1952037	0.085	85	788	6506		
7	10.63	65.7	4737	1584929	0.069	69	857	4547		
6	10.63	55.1	4737	1240295	0.054	54	911	2982		
5	10.63	44.4	4737	920716	0.040	40	951	1786		
4	10.63	33.8	4737	629751	0.027	28	979	930		
3	10.63	23.2	4737	372723	0.016	16	995	377		
2	12.54	12.5	4453	149344	0.007	7	1001	82		
		Σ=	56577	22930529		1001		95973		

Table 11 Story forces, base shear, and overturning moment due to seismic loads

Problem Statement

1000 Connecticut Avenue's structural system currently consists of a two-way flat slab floor system supported by concrete columns with an average spacing of 30ft x 30 ft. The current lateral system consists of concrete moment frames comprised of the concrete columns and the two-way flat slab system. The in-depth analyses performed in technical reports 1-3 showed that the existing structural system is adequate to support the combined lateral and gravity loads and meets serviceability requirements.

The author of this report was extremely interested in steel design. Therefore a scenario was created in which 1000 Connecticut Avenue NW Office Building was re-located to Arlington, VA and re-designed as a steel frame system consisting of two lateral systems: moment frames and braced frames. The new structural system will be analyzed to determine whether:

- the overall building cost can be reduced;
- the construction schedule can be reduced;
- LEED certification will remain unchanged;
- the bay sizes and floor-to-ceiling heights can be increased;
- the annual revenue can be increased

Since the existing 12 story structure is located in Washington DC, which has a zoning building height restriction of 130 ft., in order to use the new steel system the structural system will have to be designed as 11 stories to stay within the height limit or re-located to an area that does not have a height restriction. To make a fair comparison between the two systems, the building will be re-located to Arlington, VA so that the new structural system can be designed as 12 stories.

The major design differences between the existing structural system and the proposed structural system can be seen below.

- The steel structural system will increase the structural depth and therefore to maintain a minimum floor-to-ceiling height of 8'-6" the overall building height will need to be increased. Since the building height is currently 130 ft., the building height cannot be increased with the existing 12 stories. As a result, the number of stories will have to reduce to 11 to stay within the height limitation or the building will have to be re-located.
- The current column layout is non-uniform and therefore to reduce the number of skewed connections with using the new steel structural system, a uniform framing layout will need to be created by removing and re-locating columns to create a uniform layout.
- The alternative lateral systems will be subjected to different seismic loads; therefore the seismic loads will need to be re-calculated for the new system.
- To maintain a minimum floor-to-ceiling height of 8'-6" with the use of the new structural system, the floor-to-floor height will need to increase. As a result of increasing the floor-to-floor height, the wind loads for the new system will need to be recalculated.
- The steel system will be subjected to more vibration.

• The structural steel system is more flexible and therefore braced frames will be needed to resist lateral loads.

Proposed Solution

1000 Connecticut Avenue's structural system will be re-designed as a steel framing system. The lateral force resisting system will consist of moment frames around the perimeter and in the core of the building and concentric braced frames will be located around the elevator shafts and stairwell cores. The lateral force resisting beams that connect the columns in the moment frame will be designed as non-composite beams. After calculating the wind and seismic loads for the new structural system, the new lateral system will be modeled and analyzed in ETABS for both seismic and wind loads.

A composite beam/girder system with composite deck will be used for the gravity system. To use this gravity floor system, the building height will need to increase since the structural depth for each level will increase. 1000 Connecticut Avenue is currently 130 feet and the zoning height restriction in Washington DC is 130 ft. Therefore to use the composite steel beam/girder floor system the number of stories will need to be reduced from 12 to 11 to maintain high floor-to-ceiling heights and to remain within the restricted height limit or the building will have to be re-located. Therefore, the structural system will be designed as 12 stories by re-locating the building to Arlington, VA, which does not have a zoning height restriction. In addition, to decrease the number of skewed connections, columns will be re-located to create a more uniform framing layout, certain column lines will be removed to create wider bays, and the new structural system will be designed for higher floor-to-floor heights.

MAE Material Incorporation

For re-designing 1000 Connecticut Avenue's new structural system, material learned in two MAE courses were used. The lateral system was modeled, analyzed, and designed in ETABS using material learned in AE 597A (Computer Modeling). In addition, material learned in AE 534 (Steel Connections Design) was used to design the typical orthogonal and skewed shear connections and a typical moment connection. Each connection was designed and checked based on each connection's limit states. Both the lateral system and connection designs can be seen in the "Structural Depth: Steel Re-designs" section.

Breadth Studies

The integrated studies taught in the Architectural Engineering Program were incorporated in the report by conducting two breadth studies. The first breath studied was construction management Impact. This breadth will analyze the impact of the structural system redesign on the total building cost; construction schedule; site logistics of steel versus concrete; building LEED certification; and the anticipated revenue increase from the use of the new structural system. First, the current cost estimate will be compared to the cost estimate of the new structural system. Second, the new structural system construction schedule will be compared to the existing system construction schedule. Third, how the construction site will have to be managed differently for steel compared to concrete will be evaluated. Fourth, the building LEED certification with the use of the new structural system will be compared to the existing building LEED certification. Last, the revenue obtained from the new structural system with wider bays and higher floor-to-ceiling heights will be compared to the existing structural system's revenue. Wider bays and higher floor-to-ceiling heights will increase the rental value of the floor space and therefore the building owner will be able charge higher rent, which will potentially increase revenue.

The second breadth studied was acoustics and lighting impact. This breadth will involve determining the sound treatments required for a typical office space housed in the new structural system. Based on the sound treatments in the space, the sound transmission class (STC) and noise reduction (NR) values will be determined for the typical office space. In addition, since the new structural system will be designed for higher floor-to-ceiling heights, lighting illuminance applied to the work plane surfaces will be affected. As a result, a lighting breadth will be conducted by designing the lighting system for a typical office space using the existing floor-to-ceiling height of 8'-6" and checking to determine if the same lighting system can be used for the space with a new floor-to-ceiling height of 10'-6". AGI will be used to design the lighting system for the space and the average illuminance in the space will be compared to the target illuminance. The IESNA Handbook 10th edition was used to determine the target illuminance and maximum power density for a private office space. Both spaces with the lighting system layout will be represented through renderings.

Structural Depth: Steel Re-Designs

Gravity System Design

To begin the structural system re-design, the framing layout and lateral system locations were determined. The goal of the re-design was to increase the rental value of the building space by creating wider bays and higher floor-to-ceiling heights. As a result, certain column lines that were in the existing structural layout were removed to increase the bay sizes and columns were re-located to create a uniform framing layout to reduce the number of required skewed connections. After designing the framing layout, a 3VLI20 composite deck was chosen for the design. The new framing system layout can be seen in Figure 22.

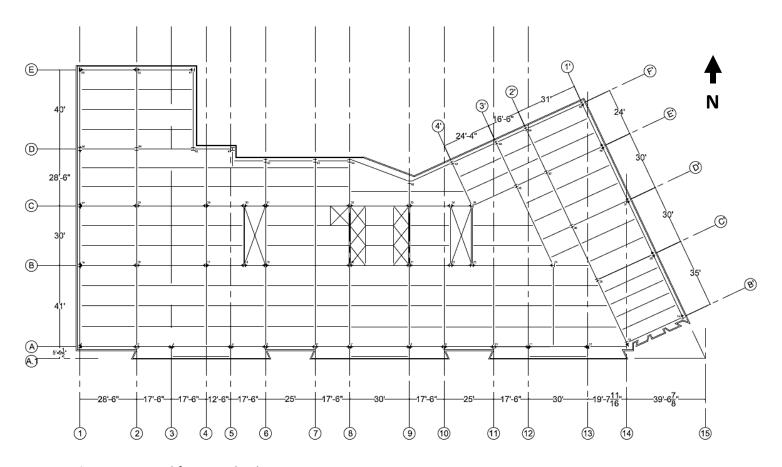


Figure 22 Typical framing plan layout

When designing the framing layout, it was found that skewed members will be needed to transition the framing layout to the portion of the building that is tilted 25 degrees counterclockwise from North axis. When initially designing the framing layout, the section located between column lines 2' and 4' was designed as can be seen in Figure 23. This design was then changed to the final design to avoid spanning the members at sharp, acute angles. As a result, column line 3 was added to increase the skewed angle and to decrease the span length of the beam members spanning into the girders at skewed angles. As a result of adding the additional column line, the beams were designed using smaller beam sections to

support the loads. In addition, according to "Orthogonal and Skewed Shear Connections Design and Detailing Requirements" article most skewed members carry less tributary area, therefore when creating the framing layout the system was designed so that only beam members will be connected at skewed angles where necessary. The girders throughout the framing layout are all connected at orthogonal angles with the exception of two girders.

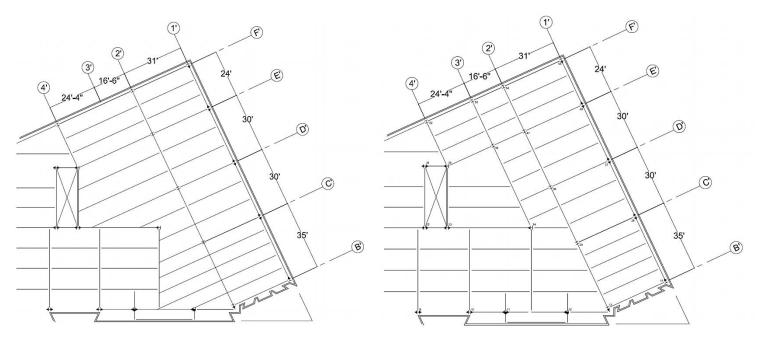


Figure 23 Original (left) and final (right) design of framing layout in tilted building region

After creating the framing layout, the moment frame and brace frame locations were determined. Five moment frames were chosen to resist the lateral loads in the East-West direction. Three of the moment frames are located around the perimeter of the building and two of the moment frames are located in the core of the building. To resist the lateral loads in the North-South direction, two moment frames located around the perimeter of the building and four braced frames located around the elevator shafts and stairwell cores were used. Moment frames were used to maintain an open floor plan without any obstructions. To avoid obstructions in the floor plan, the braced frames were located around the elevator shafts and elevator cores, where there are no openings and to keep the floor layout open. The moment frame and brace frame locations can be seen in Figure 24.

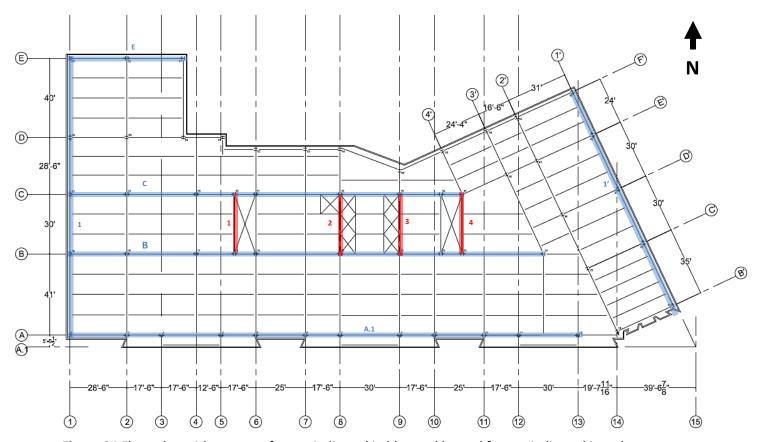


Figure 24 Floor plan with moment frames indicated in blue and braced frames indicated in red

After creating the framing layout, the composite beam and girder gravity system was designed manually using AISC 14th edition. Since the framing layout consists of varying bay sizes, the members were designed for each bay. The framing layout with member sizes can be seen in Figures 25 and 26. The calculations for the gravity system design can be found in Appendix A.

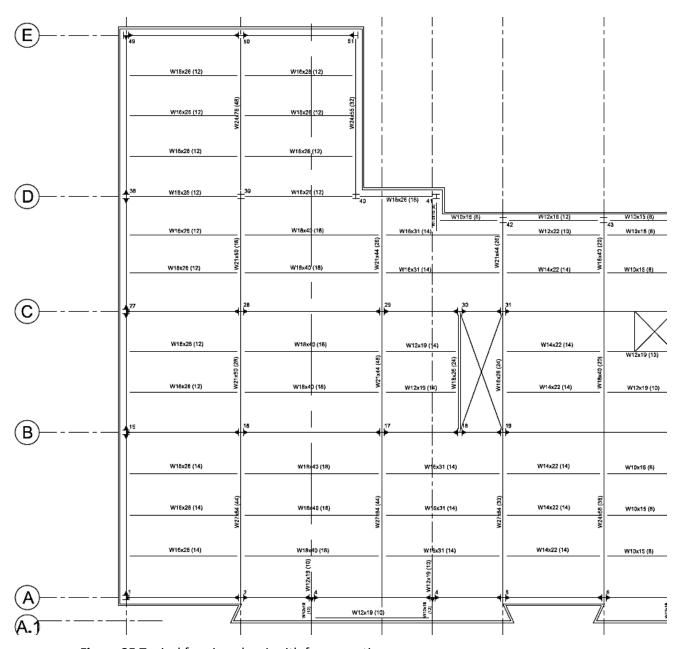


Figure 25 Typical framing plan A with frame sections

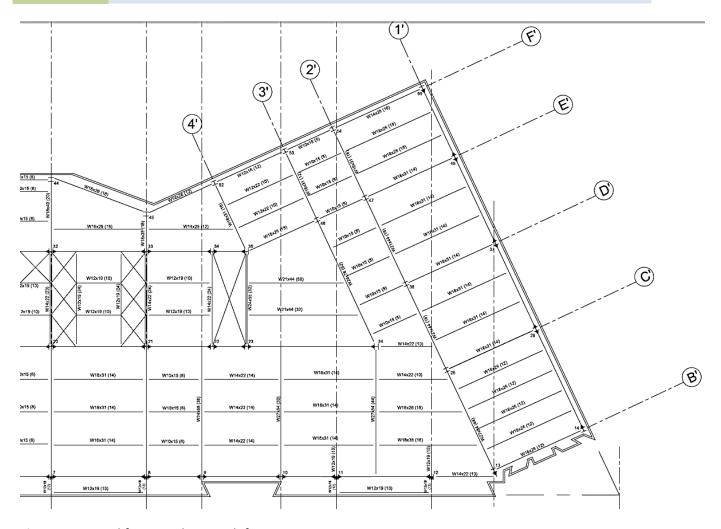


Figure 26 Typical framing plan B with frame sections

After designing the gravity system, the floor-to-floor height was chosen to be increased from the existing 10'-7" to 15'-0". The increased floor-to-floor height will increase the building height from 130ft to 180 ft. The purpose of this height increase was to maintain high floor-to-ceiling heights while taking into account the increase in structural depth due to the gravity members. The existing system has a floor-to-ceiling height of 8'-6", but after increasing the floor-to-floor height to 15'-0" in the new structural system a floor-to-ceiling height of 10'-6" will be achieved. The higher ceiling height will increase both the openness and rentable value of the space.

After increasing the floor-to-floor height, the columns were designed as two tiers. This represents the columns will be spliced every two stories. Designing the columns as 4 tiers would result in a shipment on site of 60ft long columns, which is undesirable. Therefore, the columns were designed as 2 tiers to decrease the length of the columns shipped to the construction site and to decrease cost by using smaller columns sections throughout the height of the building. The gravity columns were designed using AISC 14th edition and using the assistance of Microsoft Excel. The gravity column calculations can be seen in Appendix A. The gravity column schedule can be seen in Table 12.

	GRAVITY COLUMN SCHEDULE														
COLUMN MARK	13	25	36	39	40	41	42	43	44	45	46	47	52	53	54
COLUMN SIZE	AS NOTED	AS NOTED	AS NOTED	AS NOTED	AS NOTED	AS NOTED	AS NOTED	AS NOTED	AS NOTED	AS NOTED	AS NOTED	AS NOTED	AS NOTED	AS NOTED	AS NOTED
PENTHOUSE ROOF															
ELEV. MACH. ROOM															
MAIN ROOF															
12TH FLOOR	W14x43	W14x61	W14x48	W14x53	W14x43	W14x43	W14x43	W14x43	W14x48	W14x43	W14x43	W14x43	W14x43	W14x43	W14x43
11TH FLOOR										WE IN 15			WIND		
10 FLOOR	14/9 461	N/4 474	14/14/200	N/4 402	14/4 454	14/4 4 42	M/4 4 - 42	34/44-42	W/4 4C0	N/4 4:- 42	NAM 4C1	14/14/1-054	14/1/442	14/4 4:- 42	NAM 4:-40
9TH FLOOR	W14x61	W14x74	W14x68	W14x82	W14x61	W14x43	W14x43	W14x43	W14x68	W14x43	W14x61	W14x61	W14x43	W14x43	W14x43
8TH FLOOR															
7TH FLOOR	W14x61	W14x90	W14x90	W14x99	W14x90	W14x43	W14x43	W14x43	W14x90	W14x48	W14x68	W14x82	W14x53	W14x48	W14x53
6TH FLOOR	W14x82	W14x109	W14x99	W14x132	W14x99	W14x43	W14x43	W14x61	W14x109	W14x61	W14x90	W14x90	W14x61	W14x61	W14x61
5TH FLOOR	VVIANUE	VV14x103	VVIAXSS	VVIANISE	WIAXSS	*******	*******	VVIAXOI	WIAXIOS	VVIAXOI	***************************************	VV14X30	***************************************	VVIAXOI	***************************************
4TH FLOOR	W14x90	W14v122	W14x120	W14×150	W14v120	W14x53	W14x53	W14x61	W14x132	W14x61	W14x90	W14×109	W14x68	W14x61	W14x68
3RD FLOOR	VV14X50	VV14X13Z	VV14X120	VV14X133	VV14X120	AAT+X22	AAT4X32	AAT+X0T	VV14X13Z	VV14X01	AAT4X20	VV14X103	VV 14X00	AA14X01	AAT4X09
2ND FLOOR															
1ST FLOOR	W14x99	W14x159	W14x145	W14x193	W14x145	W14x61	W14x61	W14x68	W14x145	W14x74	W14x109	W14x132	W14x82	W14x68	W14x82

Table 12 Gravity column schedule

After designing the gravity floor system and gravity columns, a typical orthogonal connection and a typical skewed shear connection was designed. A double angel was used for the orthogonal shear connection. According to the "Orthogonal and Skewed Shear Connections Design and Detailing Requirements" article, the preferred skewed connections for economy and safety are single plates and end plates. As a result, an end plate skewed shear connection was designed in accordance to AISC 14th edition and the "Orthogonal and Skewed Shear Connections Design and Detailing Requirements" article. The typical shear connections can be seen in Figure 27. The design of the typical shear connections can be seen in Appendix D.

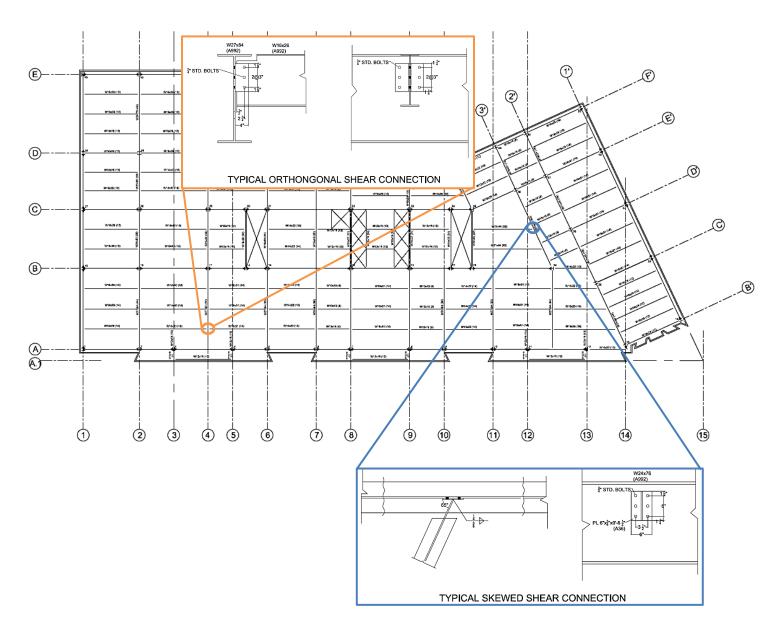


Figure 27 Typical shear connections

Lateral System Design

The lateral- force resisting beams that connect the columns were designed as non-composite. To begin the design of the lateral system, the member sizes were estimated by designing the beams, girders, and columns for gravity loads only and using AISC 14th edition. The estimated moment frame member sizes can be seen in Appendix A. After estimating the member sizes, the wind loads and seismic loads were calculated for the new structural system. The wind and seismic load calculations can be found in Appendices B and C.

Wind loads were determined using the Main Wind Force Resisting System (MWFRS) procedure (method 2) in conformance to Chapters 26 and 27 outlined in ASCE 7-10. Due to the building's complex geometry, a rectangular building shape was assumed to simplify the wind load analysis, as can be seen in Figure 17.

Most of the calculations for determining the wind pressures and story forces were performed in Microsoft Excel. In the analysis, windward, leeward, sidewall, and roof suction pressures were determined. Internal pressures were neglected in calculating the design wind pressure because internal pressures do not contribute towards the external wind pressures acting on the building.

The general wind load design criteria and guest effect factors can be found in Tables 13 and 14. The calculated approximate lower- bound natural frequency for the building was 0.417 Hz, which is less than 1 Hz, therefore the gust factors were calculated in the event the building is flexible.

General Wind Load Design Criteria								
Design Wind Speed, V	115 mph	ASCE 7-10, Fig. 26.5-1A						
Directionality Factor, K _d - MWFRS	0.85	ASCE 7-10, Tbl. 26.6-1						
Directionality Factor, K _d - Mechanical PH	0.9	ASCE 7-10, Tbl. 26.6-1						
Exposure Category	В	ASCE 7-10, Sect. 26.7.3						
Topographic Factor, K _{zt}	1.0	ASCE 7-10, Sect. 26.8.2						
Internal Pressure Coeficient, GC _{pi}	0.18	ASCE 7-10, Tbl. 26.11-1						

Table 13 General wind design criteria

1	Gust Factor-MWFRS								
	N-S Wi		E-W Wind						
	Levels 1-2 Levels 3-12		Levels 1-2	Levels 3-12					
	0.895	0.894	0.994	0.972					
	Gust F	actor-Mechn	ical Penthous	e					
	N-S Wi	nd	E-W Wind						
	0.85		0.85						

Table 14 Gust factors for the Main Wind Force Resisting System

Further, wind pressures in the N-S and E-W directions can be seen in Tables 15 and 16 with the corresponding vertical profile sketch of the wind pressures shown in Figures 28 and 29. The story forces were then determined based on the wind pressures. The resulting base shears were 2119 kips in the N-S direction with an overturning moment of 218,031 kip-ft and 850 kips in the E-W direction with an overturning moment of 88,086 kip-ft. The story forces and overturning moments for both the N-S and E-W directions can be found in Tables 17 and 18 along with the vertical profile of the story forces shown Figures 30 and 31.

Wi	nd Pressures -	- N-S Directio	n
		Distances	Wind Pressure
Type	Floor	(ft)	(psf)
	1	0	11.74
	2	15	11.74
	3	30	14.42
	4	45	16.69
	5	60	17.51
	6	75	19.16
	7	90	19.78
	8	105	21.43
	9	120	21.43
	10	135	22.46
	11	150	23.28
	12	165	24.11
Windward Walls	Main Roof	180	24.11
Leedward Walls	Levels 1-2	0 to 30	-15.07
	Level 3 -12	30 to 180	-15.05
Side Walls	All	All	-21.07
	N/A	0 to 90	-39.13
Roof	N/A	90 to 180	-21.07
	N/A	180-360	N/A
	N/A	>360	N/A

Table 15 Wind pressures in North-South direction

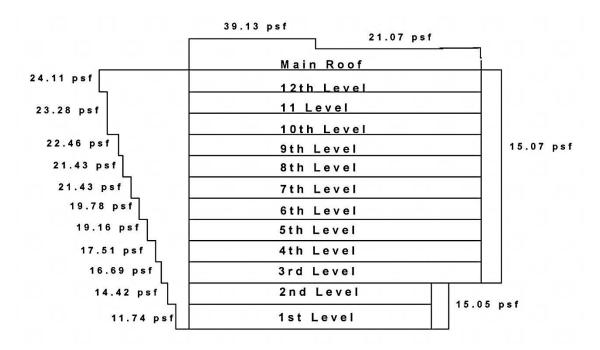


Figure 28 Vertical profile of wind pressure distribution in North-South direction

Wir	nd Pressures -	- E-W Directio	n
		Distances	Wind Pressure
Туре	Floor	(ft)	(psf)
	1	0	13.04
	2	15	13.04
	3	30	15.66
	4	45	18.13
	5	60	19.02
	6	75	20.81
	7	90	21.48
	8	105	23.27
	9	120	23.27
	10	135	24.39
	11	150	25.29
	12	165	26.18
Windward Walls	Main Roof	180	26.18
Leedward Walls	Levels 1-2	0 to 30	-9.07
	Level 3 -12	30 to 180	-9.59
Side Walls	Levels 1-2	0 to 30	-23.43
	Levels 3-12	30 to 180	-22.91
	N/A	0 to 90	-31.29
Roof	N/A	90 to 180	-28.54
	N/A	180-360	-17.28
	N/A	>360	N/A

Table 16 Wind pressures in East-West direction

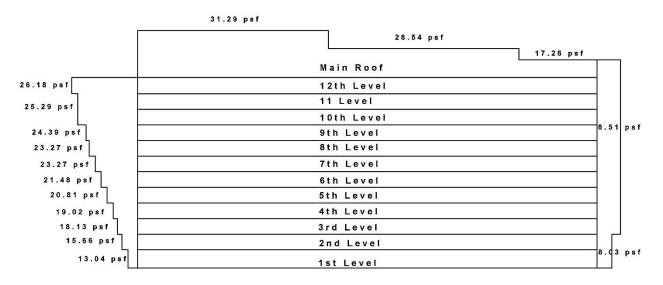


Figure 29 Vertical profile wind pressure distribution in East-West direction

				Wind F	orces - N-S I	Direction				
			Tributary Below			Tributary Abo	ve	Story Force	Story Shear	Overturning
Floor	Elevation (ft)	Height (ft)	Length (ft)	Area (ft²)	Height (ft)	Length (ft)	Area (ft²)	(Kips)	(Kips)	Moment (K-ft)
PH Roof	198.5	18.5	199.83	3696.86	0	199.83	0	152.81	152.81	30333.53
Main Roof	180	7.50	314.58	2359.35	0	314.58	0	92.39	245.20	16629.72
12	165	7.50	314.58	2359.35	7.50	314.58	2359.35	184.77	429.98	30487.83
11	150	7.50	314.58	2359.35	7.50	314.58	2359.35	182.83	612.81	27424.52
10	135	7.50	314.58	2359.35	7.50	314.58	2359.35	179.02	791.83	24167.77
9	120	7.50	314.58	2359.35	7.50	314.58	2359.35	174.57	966.39	20947.90
8	105	7.50	314.58	2359.35	7.50	314.58	2359.35	172.14	1138.53	18074.19
7	90	7.50	314.58	2359.35	7.50	314.58	2359.35	168.25	1306.77	15142.14
6	75	7.50	314.58	2359.35	7.50	314.58	2359.35	162.90	1469.67	12217.39
5	60	7.50	314.58	2359.35	7.50	314.58	2359.35	157.55	1627.22	9453.06
4	45	7.50	314.58	2359.35	7.50	314.58	2359.35	151.72	1778.94	6827.28
3	30	7.50	314.58	2359.35	7.50	314.58	2359.35	144.43	1923.37	4332.76
2	15	7.50	314.58	2359.35	7.50	314.58	2359.35	132.84	2056.20	1992.56
1	0	0	314.58	0.00	7.50	314.58	2359.35	63.26	2119.46	0.00
•		•		•			•	Tot	tal Base Shear =	2119 K
								Total Overtu	rning Moment =	218,031 K-ft

Table 17 N-S Story forces, base shear, and overturning moment

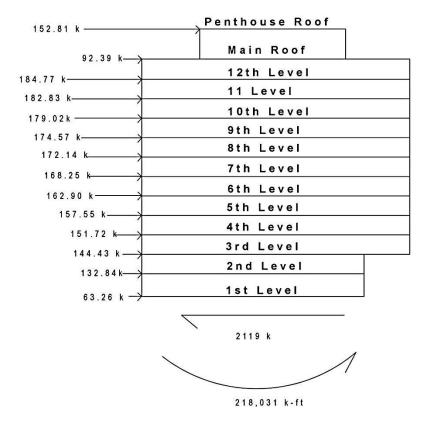


Figure 30 Vertical profile of story forces in N-S direction

	Wind Forces - E-W Direction												
			Tributary Belov	v	Tri	butary Abov	/e	Story Force	Story Shear	Overturning			
Floor	Elevation (ft)	Height (ft)	Length (ft)	Area (ft²)	Height (ft)	Length (ft)	Area (ft²)	(Kips)	(Kips)	Moment (K-ft)			
PH Roof	198.5	18.5	59.83	1106.86	0	59.83	0	45.75	45.75	9081.99			
Main Roof	180	7.50	147	1102.50	0	147	0	39.48	85.23	7106.20			
12	165	7.50	147	1102.50	7.50	147	1102.50	78.87	164.11	13014.26			
11	150	7.50	147	1102.50	7.50	147	1102.50	77.89	241.99	11683.12			
10	135	7.50	147	1102.50	7.50	147	1102.50	75.91	317.91	10248.36			
9	120	7.50	147	1102.50	7.50	147	1102.50	73.69	391.60	8843.20			
8	105	7.50	147	1102.50	7.50	147	1102.50	72.46	464.06	7608.28			
7	90	7.50	147	1102.50	7.50	147	1102.50	70.49	534.55	6343.75			
6	75	7.50	147	1102.50	7.50	147	1102.50	67.77	602.32	5082.92			
5	60	7.50	147	1102.50	7.50	147	1102.50	65.06	667.38	3903.51			
4	45	7.50	147	1102.50	7.50	147	1102.50	62.10	729.48	2794.41			
3	30	7.50	147	1102.50	7.50	147	1102.50	57.82	787.30	1734.74			
2	15	7.50	121.75	913.13	7.50	121.75	913.13	42.78	830.08	641.67			
1	0	0	121.75	0.00	7.50	121.75	913.13	20.19	850.27	0.00			
								Total	Base Shear =	850 K			
							Tot	al Overturnii	ng Moment =	88,086 K-ft			

Table 18 E-W Story forces, base shear, and overturning moment

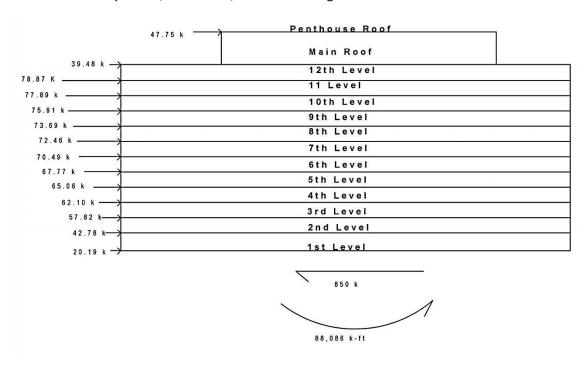


Figure 31 Vertical profile of story forces in E-W direction

Seismic loads were determined using the Equivalent Lateral Force Procedure outlined in Chapters 11 and 12 in ASCE 7-10. For analysis, the 1st level weight was neglected and only the 2nd-12th levels, main roof, and penthouse were considered for building weight calculations. For determining the seismic loads, the member self-weights (including the beams, girders and columns) were assumed to be 15 psf. Since the lateral system consists of a dual system with the combined use of moment frames and braced frames, seismic loads were calculated separately for the North-South and East-West directions. The seismic story forces and overturning moments for the N-S and E-W directions can be seen in Tables 19 and 20 and the story force distributions can be seen in Figures 32 for the N-S direction and Figure 33 for the E-W direction.

Since this building has several stories above grade, building weight was determined by calculating the dead weight for the typical floor level and applying that story weight to the other floor levels (levels 2-12). The weight on the main roof and penthouse roof were calculated separately. The weight included for summing the total building weight were the weight of the slab on deck, member self-weight allowance, super-imposed dead loads, and curtain wall self-weight.

After the analysis, the determined base shear in the North-South direction was 939 kips with an overturning moment of 123,733 K-ft. The baser shear in East-West direction was 518 kips with an overturning moment of 71,659 k-ft.

					T=	0.983	S	
					k=	1.242		
					V _b =	939	kips	
			Sei	smic Forces -	N-S Direction			
	Height to level i	Story Height	Story Weight			Story Force	Story Shear	Overturning Mome
	hi	h _x	W _x			fi	Vi	Mz
level i	(ft)	(ft)	(kips)	w _x *h _x ^k	C _{VX}	(kips)	(kips)	(k-ft)
	` /	` '	11/			· · · · · · · · · · · · · · · · · · ·	\	, ,
PH Roof	0	198.5	574	408867	0.032	30	30	59
/lain Roof	0	180.0	3375	2129093	0.165	155	185	279
12	15	165.0	3375	1911085	0.148	139	324	229
11	15	150.0	3375	1697818	0.132	124	448	185
10	15	135.0	3375	1489646	0.116	109	557	146
9	15	120.0	3375	1286996	0.100	94	650	112
8	15	105.0	3375	1090386	0.085	79	730	8:
7	15	90.0	3375	900463	0.070	66	796	59
6	15	75.0	3375	718063	0.056	52	848	39
5	15	60.0	3375	544313		40	888	2:
3	15 15	45.0 30.0	3375 3375	380835 230208	0.030 0.018	28 17	915 932	1
2		15.0	3115.5	89876	0.018	7	932	
	15	15.0	3115.5	03076	0.007		939	
		Σ=	40814.5	12877649		939		123733

Table 19 N-S Story forces, base shear, and overturning moment

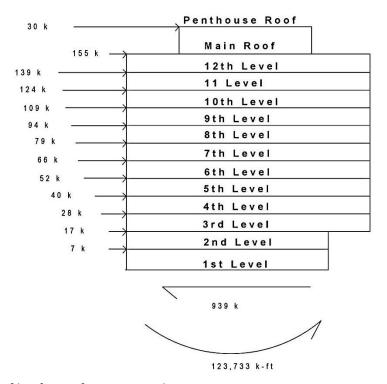


Figure 32 Vertical profile of story forces in N-S direction

					T=	1.784	s	
					k=	1.642		
					V _b =		kips	
					• 6	510	шро	
			0		D: .:			
			Seismic F	orces - E-W	Direction			
	Height to level i	Story Height	Story Weight			Story Force	Story Shear	Overturning Moment
	hi	h _x	W _x			fi	Vi	Mz
level i	(ft)	(ft)	(kips)	w _x *h _x *	C _{VX}	(kips)	(kips)	(k-ft)
PH Roof	0	198.5	574	3402786	0.038	20	20	3913
Main Roof	0	180.0	3375	17038495	0.190	99	118	
12	15	165.0	3375	14770065	0.165	86	204	14118
11	15	150.0	3375	12630357	0.141	73	277	1097
10	15	135.0	3375	10623847	0.119	62	339	
9	15	120.0	3375	8755670	0.098	51	389	
8	15	105.0	3375	7031802	0.079	41	430	427
7	15	90.0	3375	5459338	0.061	32	462	2846
6	15	75.0	3375	4046918	0.045	23	485	
5	15	60.0	3375	2805422	0.031	16	501	975
4	15	45.0	3375	1749237	0.020	10	512	450
3 2	15	30.0	3375	898891	0.010	5	517	
2	15	15.0	3115.5	265870	0.003	2	518	23
		Σ=	40814.5	89478698		518		71659

Table 20 E-W Story forces, base shear, and overturning moment

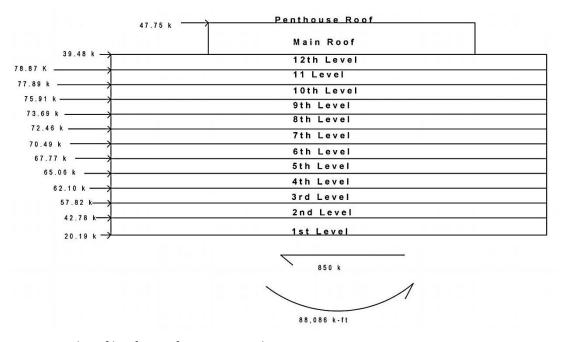


Figure 33 Vertical profile of story forces in E-W direction

Computer Model

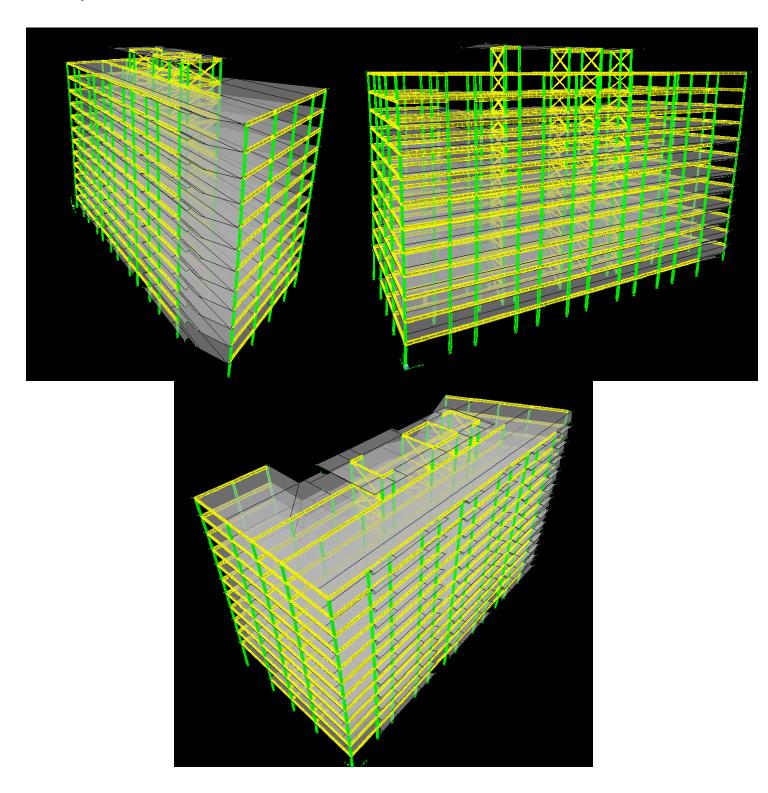


Figure 34 3D perspectives of the new lateral system modeled in ETABS

After estimating the moment frame members and determining the lateral loads, the new structural system was modeled in ETABS. Several assumptions were made when creating the lateral model. The columns were modeled as line elements and were then assigned section properties based on the gravity analysis performed to estimate the member sizes. The base supports were modeled as pin supports since the foundation consists of spread footings, which are not very rigid and thus do not carry much moment. Each floor level was modeled as an area element and assigned a rigid diaphragm since the floor system consists of a 3VLI20 composite deck with 7 ½" slab thickness. In addition, material properties were modified by eliminating the self-mass from the material definitions and applying the floor mass calculated in the seismic analysis to the diaphragm by using the Additional Area Mass function.

The ETABS model was then used to determine the controlling wind load case. The four possible wind load cases from ASCE 7-10, as can be seen in Figure 35, were considered to determine which wind case controlled the design.

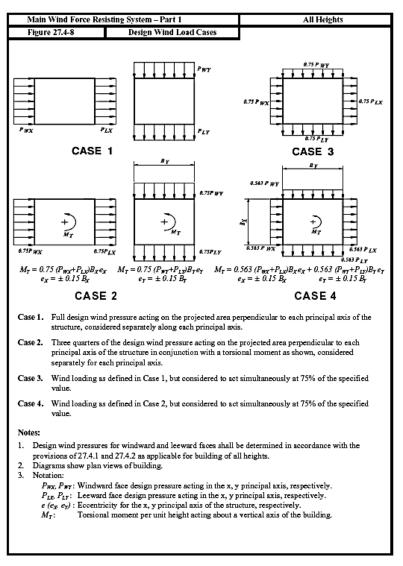


Figure 35 Design wind load cases from ASCE 7-10

The wind loads were calculated for wind load cases 2 through 4, as can be seen in Tables 21 through 23.

	CASE 2 WIND LOAD									
Wind	Forces - N-S D	irection	Wind Forces	- E-W Direction						
	Story Force	M _T	Story Force	M _T						
Floor	(Kips)	(k-ft)	(Kips)	(k-ft)						
PH Roof	114.61	3435.4	34.31	308.0						
Main Roof	69.29	3269.6	29.61	652.9						
12	138.58	6539.2	59.16	1304.4						
11	137.12	6470.4	58.42	1288.1						
10	134.27	6335.6	56.94	1255.4						
9	130.92	6177.9	55.27	1218.7						
8	129.10	6091.9	54.34	1198.3						
7	126.18	5954.3	52.86	1165.7						
6	122.17	5765.0	50.83	1120.8						
5	118.16	5575.8	48.79	1075.9						
4	113.79	5369.3	46.57	1026.9						
3	108.32	5111.2	43.37	956.3						
2	99.63	4701.1	32.08	585.9						
1	47.44	2238.7	15.14	276.6						

	CASE 3 WIND LOAD								
Wind Forces	- N-S Direction	Wind Forces	- E-W Direction						
	Story Force		Story Force						
Floor	(Kips)	Floor	(Kips)						
PH Roof	114.61	PH Roof	34.31						
Main Roof	69.29	Main Roof	29.61						
12	138.58	12	59.16						
11	137.12	11	58.42						
10	134.27	10	56.94						
9	130.92	9	55.27						
8	129.10	8	54.34						
7	126.18	7	52.86						
6	122.17	6	50.83						
5	118.16	5	48.79						
4	113.79	4	46.57						
3	108.32	3	43.37						
2	99.63	2	32.08						
1	47.44	1	15.14						

	(CASE 4 WIND LO	DAD		
Wind	Forces - N-S I	Direction	Wind Forces	- E-W Direction	
	Story Force	M _T	Story Force	M _T	M _{T N-S} + M _{T E-W}
Floor	(Kips)	(k-ft)	(Kips)	(k-ft)	(k-ft)
PH Roof	86.03	2578.8	25.76	231.2	2810.0
Main Roof	52.01	2454.4	22.23	490.1	2944.5
12	104.03	4908.8	44.41	979.2	5887.9
11	102.93	4857.1	43.85	966.9	5824.0
10	100.79	4755.9	42.74	942.4	5698.3
9	98.28	4637.6	41.49	914.8	5552.4
8	96.91	4573.0	40.79	899.5	5472.5
7	94.72	4469.7	39.68	875.0	5344.7
6	91.71	4327.6	38.16	841.3	5168.9
5	88.70	4185.5	36.63	807.6	4993.2
4	85.42	4030.6	34.96	770.9	4801.5
3	81.31	3836.8	32.56	717.8	4554.7
2	74.79	3529.0	24.08	439.8	3968.8
1	35.61	1680.6	11.37	207.6	1888.2

Tables 21-23 Calculated wind load cases 2-4 from ASCE 7-10

It was found that wind load case 1 controlled in both the North-South and East-West directions. To determine the controlling wind load case, shear forces acting in each frame on story 6 were used. The wind load case that resulted in the highest shear forces in the frames was concluded to control the design. Tables 24 through 27 show the analysis results of the shear forces acting in each frame due to each wind load case.

							-	
1	Wind Load Case 1- Sto	ory 6			Wind Load Case 2- level 6			
Frame	X-Direction	Y-Direction		Frame	X-Direction	Y-Direction		
	Shear Force (kips)	Shear Force (kips)			Shear Force (kips)	Shear Force (kips)		
MF-A.1	205.8	-		MF-A.1	172.8	-		
MF-B	152.7	-		MF-B	117.4	-		
MF-C	162.3	-		MF-C	111.6	-		
MF-E	48.7	-		MF-E	29.8	-		
MF-1	-	38.6		MF-1	-	25.0		
MF-1'	35.8	63.6		MF-1'	14.8	106.3	Γ	
BF-1	-	327.1		BF-1	-	59.6	Г	
BF-2	-	260.4		BF-2	-	172.8	Γ	
BF-3	-	289.2		BF-3	-	267.3		
BF-4	-	369.1		BF-4	-	427.6	Г	
Average Shear=	121.1	224.7	kips	Average Shear=	89.3	176.4	ki	
							Т	

MF-A.1 167.5 MF-A.1 MF-B 125.0 MF-B MF-C 117.5 MF-C MF-E 36.5 MF-E MF-1 46.3 MF-1 MF-1' 15.3 MF-1' 15.3 BF-1 312.8 BF-1 BF-2 205.2 BF-3 206.0 BF-3 BF-4 226.6 BF-4				
MF-A.1 167.5 MF-A.1 MF-B 125.0 MF-B MF-C 117.5 MF-C MF-E 36.5 MF-E MF-1 46.3 MF-1 MF-1' 15.3 MF-1' 15.3 MF-1' BF-1 312.8 BF-1 BF-2 205.2 BF-3 206.0 BF-3 BF-4 226.6 BF-4	Wind Load	Case 3- level 6	Wind Load	Case 4
MF-B 125.0 MF-B MF-C MF-C 117.5 MF-C MF-E 36.5 MF-E MF-1 46.3 MF-1 MF-1' 15.3 MF-1' 15.3 MF-1' BF-1 312.8 BF-1 BF-2 205.2 BF-2 BF-3 206.0 BF-3 BF-4 226.6 BF-4	Frame	Shear Force (kips	Frame	Shear
MF-B 125.0 MF-B MF-C MF-C 117.5 MF-C MF-E 36.5 MF-E MF-1 46.3 MF-1 MF-1' 15.3 MF-1' 15.3 MF-1' BF-1 312.8 BF-1 BF-2 205.2 BF-2 BF-3 206.0 BF-3 BF-4 226.6 BF-4				
MF-C 117.5 MF-C MF-E 36.5 MF-E MF-1 46.3 MF-1 MF-1' 15.3 MF-1' 15.3 BF-1 BF-2 205.2 BF-2 BF-3 206.0 BF-3 BF-4 226.6 BF-4	MF-A.1	167.5	MF-A.1	
MF-E 36.5 MF-E MF-1 46.3 MF-1 MF-1' 15.3 MF-1' BF-1 312.8 BF-2 205.2 BF-2 BF-3 206.0 BF-3 BF-4 226.6 BF-4	MF-B	125.0	MF-B	
MF-1 46.3 MF-1 MF-1' 15.3 MF-1' BF-1 312.8 BF-1 BF-2 205.2 BF-2 BF-3 206.0 BF-3 BF-4 226.6 BF-4	MF-C	117.5	MF-C	
MF-1' 15.3 MF-1' BF-1 BF-2 205.2 BF-3 206.0 BF-3 BF-4 226.6 BF-4	MF-E	36.5	MF-E	
BF-1 312.8 BF-1 BF-2 205.2 BF-2 BF-3 206.0 BF-3 BF-4 226.6 BF-4	MF-1	46.3	MF-1	
BF-2 205.2 BF-2 BF-3 206.0 BF-3 BF-4 226.6 BF-4	MF-1'	15.3	MF-1'	
BF-3 206.0 BF-3 BF-4 226.6 BF-4	BF-1	312.8	BF-1	
BF-4 226.6 BF-4	BF-2	205.2	BF-2	
	BF-3	206.0	BF-3	
ge Shear= 145.9 kips Average Shear=	BF-4	226.6	BF-4	
	Average Shear=	145.9 kips	Average Shear=	19

Tables 24-27 Shears acting in each frame due to the four wind load cases

As can be seen in Tables 24-27, the shear forces are greatest in the frames subjected to lateral wind load case 1, except in the case for brace frame B-4 which is subjected to a larger shear in load case 2. Overall, wind load case 1 is the controlling wind load case.

After determining the controlling wind load case, the load combination that would control the strength of the design was checked. Figure 36 shows a list of possible load combinations in ASCE 7-10.

2.3.2 Basic Combinations

Structures, components, and foundations shall be designed so that their design strength equals or exceeds the effects of the factored loads in the following combinations:

```
1. 1.4D

2. 1.2D + 1.6L + 0.5(L_r \text{ or } S \text{ or } R)

3. 1.2D + 1.6(L_r \text{ or } S \text{ or } R) + (L \text{ or } 0.5W)

4. 1.2D + 1.0W + L + 0.5(L_r \text{ or } S \text{ or } R)

5. 1.2D + 1.0E + L + 0.2S

6. 0.9D + 1.0W

7. 0.9D + 1.0E
```

Figure 36 Load and Resistance Factor Design (LRFD) load combinations from Chapter 2 of ASCE 7-10

The controlling load combination for strength was found to be combinations 4 and 5. The two combinations were then checked in both the N-S and E-W directions to determine which one controlled the strength of the design. After analysis, it was found that load combination 4 controlled the strength of the design for both the N-S and E-W directions. According to section 12.8.4.2 of ASCE 7-10 for seismic design, for a rigid diaphragm the design must include the accidental torsional moments caused by assumed displacement of the center of mass each away from its actual location by a distance equal to 5% of the dimension of the structure perpendicular to the direction of the applied forces. As a result, this accidental torsional moment was taken into account by applying seismic loads in ETABS at a 5% eccentricity from the center of mass. For analysis, story 6 was used as a sample story to determine which load combination controlled the strength of the design. The analysis results can be seen in Tables 28 through 31.

Seismic- No	orth-South - story 6	Wind Load Case	1- North-South - sto
Load Combin	nation- 1.2 D+L+1.0E	Load Combin	nation- 1.2 D+L+1.0V
Frame	Shear Force (kips)	Frame	Shear Force (kip
MF-A.1	-	MF-A.1	-
MF-B	-	MF-B	-
MF-C	-	MF-C	-
MF-E	-	MF-E	-
MF-1	22.0	MF-1	38.6
MF-1'	40.5	MF-1'	63.4
BF-1	195.6	BF-1	327.1
BF-2	157.9	BF-2	260.4
BF-3	177.5	BF-3	289.2
	227.4	n= .	369.1
BF-4	227.1	BF-4	303.1
	136.8 kips	Average Shear=	224.6 kips
werage Shear=	136.8 kips		
Average Shear= Seismic- E	136.8 kips ast-West - Story 6	Average Shear=	
Average Shear= Seismic- Ea Load Combin	136.8 kips ast-West - Story 6 nation- 1.2 D+L+1.0E	Average Shear=	224.6 kips se 1- East-West - stor
Seismic- Ed Load Combir Frame	136.8 kips ast-West - Story 6 nation- 1.2 D+L+1.0E Shear Force (kips)	Average Shear=	224.6 kips se 1- East-West - stor nation- 1.2 D+L+1.0V
Seismic- Ed Load Combin Frame MF-A.1	136.8 kips ast-West - Story 6 nation- 1.2 D+L+1.0E Shear Force (kips) 184.3	Average Shear= Wind Load Cas Load Combi	224.6 kips se 1- East-West - stor nation- 1.2 D+L+1.0V
Seismic- Education Seismic- Education Combiner Frame MF-A.1 MF-B	ast-West - Story 6 nation- 1.2 D+L+1.0E Shear Force (kips) 184.3 132.7	Average Shear= Wind Load Cas Load Combi Frame	224.6 kips se 1- East-West - stor nation- 1.2 D+L+1.0W Shear Force (kip
Seismic- Education Seismic- Education Combiner Frame MF-A.1 MF-B MF-C	136.8 kips ast-West - Story 6 nation- 1.2 D+L+1.0E Shear Force (kips) 184.3 132.7 135.9	Average Shear= Wind Load Cas Load Combi Frame MF-A.1	224.6 kips se 1- East-West - stor nation- 1.2 D+L+1.0V Shear Force (kip 205.8
Seismic- Education Seismic- Education Combiners Frame MF-A.1 MF-B MF-C MF-E	ast-West - Story 6 nation- 1.2 D+L+1.0E Shear Force (kips) 184.3 132.7	Wind Load Cas Load Combi Frame MF-A.1 MF-B	224.6 kips se 1- East-West - stor nation- 1.2 D+L+1.0V Shear Force (kip 205.8 152.7
Seismic- Education Seismic- Education Combiners Frame MF-A.1 MF-B MF-C MF-E MF-1	136.8 kips ast-West - Story 6 nation- 1.2 D+L+1.0E Shear Force (kips) 184.3 132.7 135.9 39.3	Wind Load Cas Load Combi Frame MF-A.1 MF-B MF-C	224.6 kips se 1- East-West - stornation- 1.2 D+L+1.0V Shear Force (kip 205.8 152.7 162.3
Seismic- Education Seismic- Education Combiners Frame MF-A.1 MF-B MF-C MF-E	136.8 kips ast-West - Story 6 nation- 1.2 D+L+1.0E Shear Force (kips) 184.3 132.7 135.9	Wind Load Case Load Combi Frame MF-A.1 MF-B MF-C MF-E	224.6 kips se 1- East-West - stornation- 1.2 D+L+1.0V Shear Force (kip 205.8 152.7 162.3
Seismic- Education Seismic- Education Combiners Frame MF-A.1 MF-B MF-C MF-E MF-1	136.8 kips ast-West - Story 6 nation- 1.2 D+L+1.0E Shear Force (kips) 184.3 132.7 135.9 39.3	Average Shear= Wind Load Cas Load Combi Frame MF-A.1 MF-B MF-C MF-E MF-1	224.6 kips se 1- East-West - stornation- 1.2 D+L+1.0W Shear Force (kip 205.8 152.7 162.3 48.7
Seismic- Ed Load Combin Frame MF-A.1 MF-B MF-C MF-E MF-1 MF-1	136.8 kips ast-West - Story 6 nation- 1.2 D+L+1.0E Shear Force (kips) 184.3 132.7 135.9 39.3	Average Shear= Wind Load Cas Load Combi Frame MF-A.1 MF-B MF-C MF-E MF-1 MF-1'	224.6 kips se 1- East-West - stornation- 1.2 D+L+1.0W Shear Force (kip 205.8 152.7 162.3 48.7
Seismic- Ed Load Combin Frame MF-A.1 MF-B MF-C MF-E MF-1 MF-1 MF-1' BF-1	136.8 kips ast-West - Story 6 nation- 1.2 D+L+1.0E Shear Force (kips) 184.3 132.7 135.9 39.3	Average Shear= Wind Load Cas Load Combi Frame MF-A.1 MF-B MF-C MF-E MF-1 MF-1' BF-1	224.6 kips se 1- East-West - stornation- 1.2 D+L+1.0W Shear Force (kip 205.8 152.7 162.3 48.7
Seismic- Ed Load Combin Frame MF-A.1 MF-B MF-C MF-E MF-1 MF-1' BF-1 BF-2	136.8 kips ast-West - Story 6 nation- 1.2 D+L+1.0E Shear Force (kips) 184.3 132.7 135.9 39.3	Average Shear= Wind Load Cas Load Combi Frame MF-A.1 MF-B MF-C MF-E MF-1 MF-1' BF-1 BF-2	224.6 kips se 1- East-West - stornation- 1.2 D+L+1.0W Shear Force (kip: 205.8 152.7 162.3 48.7 -

Tables 28-31 Controlling load combinations that control strength of design

As can be seen in Tables 28-31 load combination 4 controls the strength of the design in both the N-S and E-W directions. The controlling load combination in both directions was used to check if the estimated designed members determined from the gravity only analysis was adequate to support the combined lateral and gravity loads and if the structural system was within the allowable drift limits. After using the steel frame design check in ETABS, it was shown that the estimated member sizes were not adequate to support the combined gravity and lateral loads and the structure displaced as much as 10 inches in the E-W direction and 12" in the N-S direction under the unfactored wind loads. With the building having a total height of 180 ft., using a drift limit of L/400 due to unfactored wind loads the structure can displace up to 5.4 inches to remain within the allowable drift limit. Using a drift limit of 0.02H due to unfactored seismic loads, the structure can displace up to 43.2 inches to remain within the allowable drift limit. To design the lateral system to meet both strength and drift requirements, the members were then assigned AUTO sections, which is an automatic select list of members chosen as prospective design members. The lateral displacement target for the system was also set to 4 inches to keep lateral drift to a minimum.

Initially it was assumed that diagonal bracing would be used as the brace frame configuration to resist the lateral loads in the N-S direction, but after running the steel design it was shown that the displacement in the N-S direction was beyond the allowable limit. Therefore the brace frame configuration was changed to X-bracing. After running the design with the braced frames with X bracing, the lateral drift in the N-S direction was within the allowable limits. Figure 37 shows the strength adequacy of the members chosen for the design.

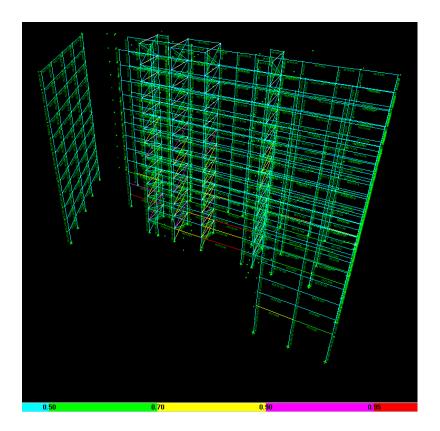


Figure 37 Strength of the design members with the use of the interaction diagram

The color at the bottom represent the interaction diagram in which red means the member is inadequate in strength to support the load and blue means the member is very adequate to support the load. The members in Figure 37 are all adequate to support the load except 3 members highlighted in red. This represents the members highlighted in red need to be increased in size to support the load. After re-rerunning the design, ETABS selected all members that were adequate to support the combined gravity and lateral loads and an overall system that was within the allowable drift limits. The final member selection can be seen in Figure 38.

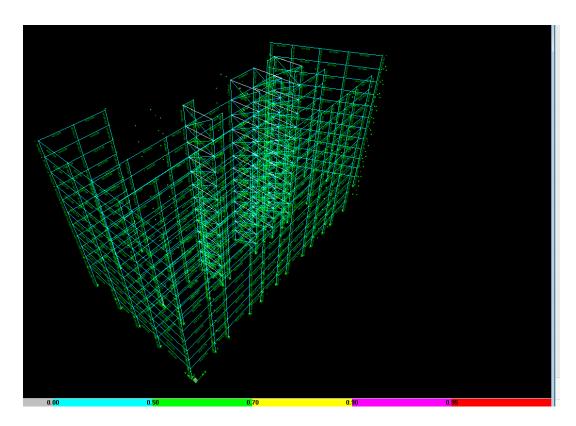
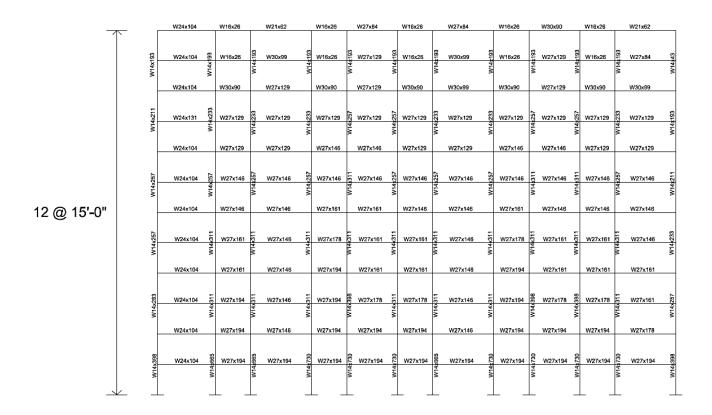


Figure 38 Final lateral system member selection

The final moment frame and braced frame design sections can be seen In Figures 39 through 46.

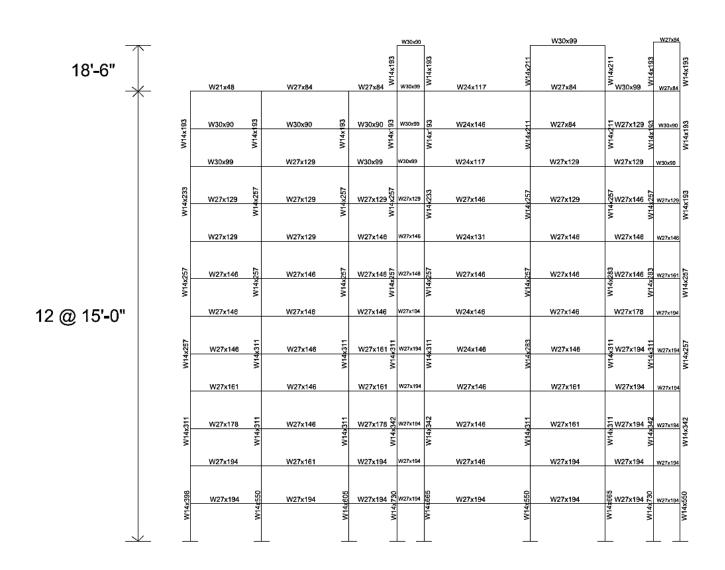


MOMENT FRAME A.1

Figure 39 Moment Frame A.1

						W27X84			W30X90	•	w27x84		
	W21X48		W27X84		M30X39 W14X193	66X08A 6 W14X193	W24X104	W14X193	W27X84	M30X80 W14X193	06X0EA W14X193	W27X129	
W14X193	W27X84	W14X193	W30X9D	W14X211	мзохаа W14X193	6W14X193	W27X146	W14X211	W27X84	M30X30 W14X193	4X193	W27X146	W14X193
W14X193	W30X90	W14X193	w30X99	W14X211		65X0EM	W24X117	W14X211	w30X99	W27X129	65X0EM	W27X146	W14X193
W14X211	W27X129	W14X233	W27X129	W14X257	14X233	фховм ф14X211	W24X117	W14X233	W27X129	W27X129 ¥	₩30x₩ ₩14X211	W27X146	W14X193
W14X211	W27X129	W14X233	W27X129	W14X257	W27X146	мзохад W14X21	W27X146	W14X233	W27X129	W27X146	6W14X211	W27X146	W14X193
W14X257	W27X146	W14X257	W27X146	W14X2B3	M21X181 W14X257	4X257	W24X146	W14X257	W27X146	W27X146 ×	14X257	W27X146	W14X211
W14X257	W27X146	W14X257	W27X146	W14X283	W27X194 X	M21X128 W14X257	W24X146	W14X257	W27X146	W27X181 X	w27X14X	W27X146	W14X211
W14X257	W27X146	W14X283	W27X146	W14X311	W27X194 4X31	M27X14X	W27X146	W14X283	W27X146	W27X178	M21X146	W27X146	W14X233
W14X257	W27X181	W14X283	W27X146	W14X311	W27X194 W	M21X126	W27X146	W14X283	W27X146	W27X194	M27X161	W27X161	W14X233
W14X311	W27X181	W14X311	W27X146	W14X311	W27X194 5	M27X161 W14X311	W27X146	W14X342	W27X181	W27X194	W27X194	W27X161	W14X257
W14X311	W27X194	W14X311	W27X146	W14X311	W27X194 A	W27X194	W27X181	W14X342	W27X178	W27X194	W27X144 W27X144	W27X161	W14X257
W14X398	W27X194	W14X550	W27X194	W14X665	W27X194 W	W27X194	W27X178	W14X500	W27X194	W27X194	W27X194	W27X194	W14X370
W14338	. → x	W14X550		W14X665	W14X730	W14X605		W14X500		W14X730	W14X665		W14X370

Figure 40 Moment Frame B



MOMENT FRAME C

Figure 41 Moment Frame C

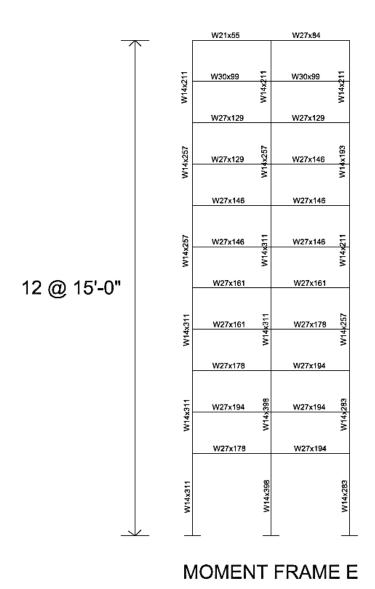


Figure 42 Moment Frame E

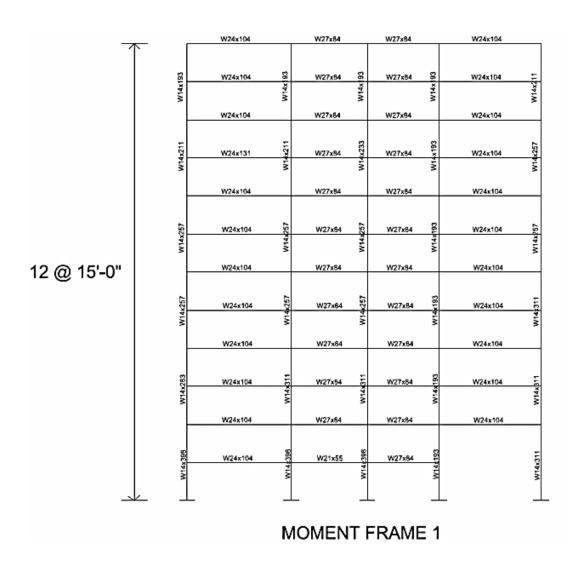


Figure 43 Moment Frame 1

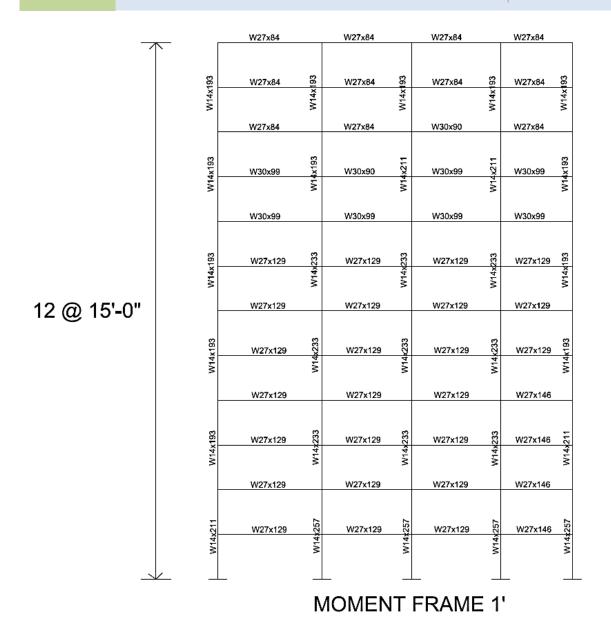
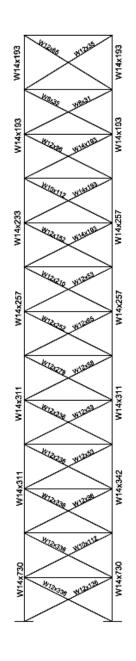
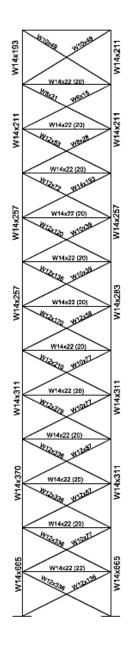


Figure 44 Moment Frame 1'





BRACE FRAME 1

BRACE FRAME 2

Figure 45 Braced frames 1 and 2

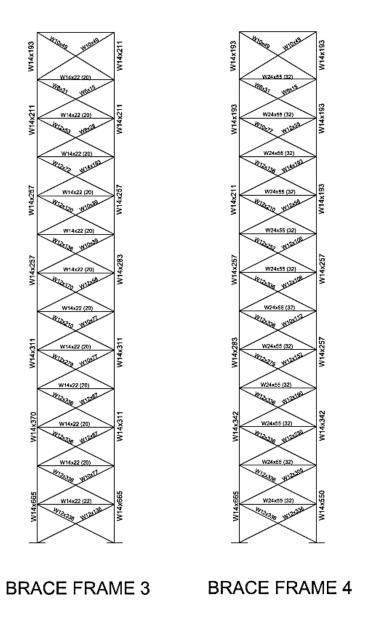
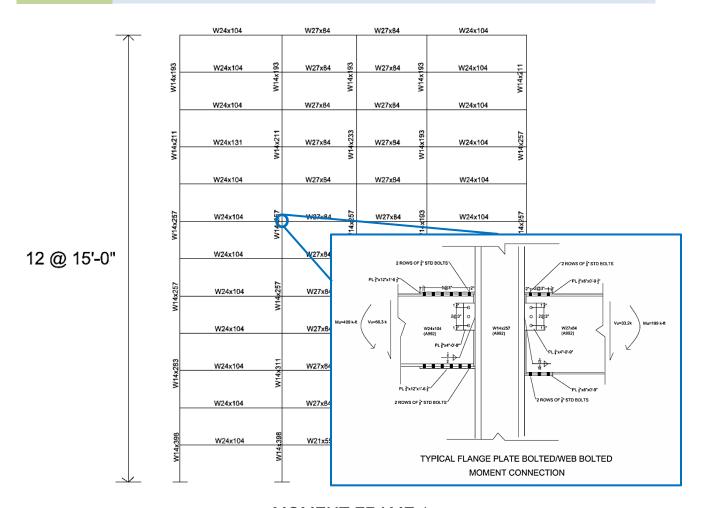


Figure 46 Braced frames 3 and 4

After designing the lateral system members, a typical moment frame connection was designed. The connection can be seen in Figure 47. The calculations for the typical moment connection design can be seen in Appendix D.



MOMENT FRAME 1

Figure 47 Typical moment frame connection

After designing the lateral system, the system was checked for relative stiffness, building torsion, lateral drift and displacement, and overturning moment.

Building Torsion

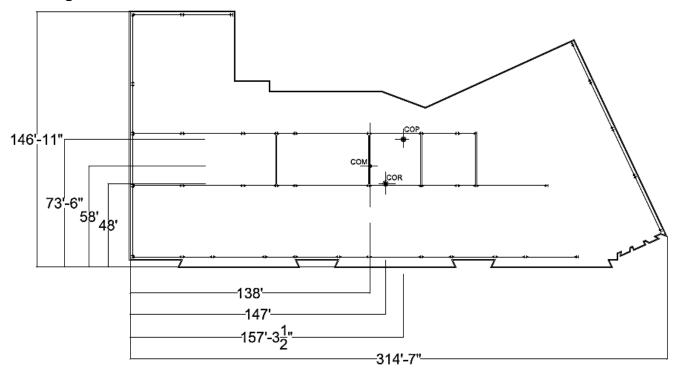


Figure 48 Plan view showing the location of the Center of Mass (COM), Center of Rigidity (COR), and Center of Pressure (COP)

When the Center of Mass (COM) and Center of Rigidity (COR) do not coincide, the building will be subjected to torsional effects caused by the seismic loads. In addition, wind loads act at the Center of Pressure (COP) and are resisted at the COR and if the COM and COP do not coincide, the building will be subjected to torsional effects caused by the wind loads. These torsional effects must be accounted for in design. To determine the total building torsion, one must consider the torsion due to the location difference between the COR and COM (or COR and COP). Torsional moments were calculated for the controlling wind load case 1, as can be seen in Table 32.

	Torsional M	oments due to W	ind Load Case 1	- X direction		
Level	N-S Story Force	COR Location	COP Location		Torsional Moment, M	
	(kips)	(ft)	(ft)	(ft)	(k-ft)	
Main roof	92.40	147	157.3	10.3	952	
12	184.80	147	157.3	10.3	1903	
11	181.80	147	157.3	10.3	1873	
10	129.00	147	157.3	10.3	1329	
9	174.60	147	157.3	10.3	1798	
8	172.10	147	157.3	10.3	1773	
7	168.30	147	157.3	10.3	1733	
6	162.90	147	157.3	10.3	1678	
5	5 157.60		157.3	10.3	1623	
4	151.70	147	157.3	10.3	1563	
3	144.40	147	157.3	10.3	1487	
2	132.80	147	157.3	10.3	1368	
	Torsional M	oments due to W	ind Load Case 1	- Y direction		
Level	E-W Story Force	COR Location	COP Location	Eccentricity, e _y	Torsional Moment, M _T	
	(kips)	(ft)	(ft)	(ft)	(k-ft)	
Main roof	39.50	48	73.5	25.5	1007	
12	78.90	48	73.5	25.5	2012	
11	77.90	48	73.5	25.5	1986	
10	75.90	48	73.5	25.5	1935	
9	73.70	48	73.5	25.5	1879	
8	72.50	48	73.5	25.5	1849	
7	70.50	48	73.5	25.5	1798	
6	67.80	48	73.5	25.5	1729	
5	65.10	48	73.5	25.5	1660	
4	62.10	48	73.5	25.5	1584	
3	57.80	48	73.5	25.5	1474	
2	42.80	41	53.6	12.8	548	

Table 32 Torsional moments due to eccentric wind load case 1 in both the N-S and E-W directions

Relative Stiffness

The distribution of lateral story forces at a given story level to the lateral force resisting systems at that story is done according to the relative stiffness of each lateral system. The stiffness of each system is determined by applying a unit load at the top story of each lateral force resisting system element. The stiffer the system, the more lateral load it will resist. The location and orientation of each moment frame and braced frame can be seen in Figure 24. The stiffness of each frame was found in order to complete an analysis of both the direct and torsional shears, which will be discussed later in this report.

Each frame's stiffness was determined by applying a 1000 kip story load in the X –direction at the main roof level, which is the top level of the lateral force resisting system, and using ETABS to find the shear and displacement of each frame at the main roof level due to the 1000 kip story load. This same procedure was also applied to the Y-direction. The shear force and displacement in each frame at the main roof level were used to determine each frame's stiffness, K, where:

 $K_i = P/\delta$, where P is the shear force in the frame at the main roof level and δ is the frame's displacement due to the 1000 k story load.

After determining each frame's stiffness, the relative stiffness was calculated by comparing the stiffness of each frame to the frame with the greatest stiffness. Firstly, the frame with the largest stiffness was

set to have a relative stiffness of 1 (or 100 percent). The remaining frames' relative rigidity was determined by dividing each frame's stiffness, K, by the highest stiffness. This procedure was also applied to the Y-direction. Each frame's relative stiffness can be seen in Table 33.

	1			
	Relative	Stiffness of LFRS in E-W I	Direction	
Frame	Displacement (12th story)	shear force (12th story)	Stiffness, K	Relative Stiffness (%
	X dir (in)	X dir (Kips)	X dir (kip/in)	X dir
MF-A.1	7.570	293.40	38.76	90.05
MF-B	7.790	335.30	43.04	100.00
MF-C	7.950	294.90	37.09	86.19
MF-E	8.320	73.30	8.81	20.47
MF-1	7.640	47.80	6.26	14.54
	Relative	Stiffness of LFRS in N-S D	Direction	
Frame	Displacement (12th story)	shear force (12th story)	Stiffness, K	Relative Stiffness (%
	Y dir (in)	Y dir (Kips)	Y dir (kip/in)	Y dir
MF-1'	3.720	101.30	27.23	51.80
BF-1	4.400	231.30	52.57	100.00
BF-2	4.198	166.60	39.69	75.49
BF-3	4.081	178.60	43.76	83.25
BF-4	3.964	179.20	45.21	85.99

Table 33 Relative stiffness of the Lateral Force Resisting Systems (LFRS)

As can be seen in Table 33, Moment Frame B (MF-B) resists the largest portion of the 1000 kip lateral load applied in the in the E-W direction because it's the stiffest frame in the E-W direction and thus resists a larger portion of the lateral loads acting in the E-W direction. Its location and span length relative to the other moment frame can be seen in Figure 24. Also Table33 shows that Brace Frame 1(BF-1) resists the largest portion of the 1000 kip lateral load applied in the N-S direction. This represents that brace frame 1 is the stiffest lateral force resisting frame in the N-S direction. Load follows stiffness and therefore the stiffer frames resist the largest portion of the lateral loads.

Lateral Load Distribution

Lateral force resisting systems resist lateral loads through direct shear and torsional shear. For 1000 Connecticut Avenue, to determine the portion of the story lateral force resisted by each frame, sample calculations were completed by solving for both the direct and torsional shears in each frame. The total shear in each frame was determined by adding the direct shear to the torsional shear. A plan view of the direction of the direct shear (DS) and torsional shear (TS) forces acting on the frames subjected to a 155 kip seismic lateral load acting on the main roof level in the N-S direction can be seen in Figure 49. The sample calculations for the direct shear and torsional shear acting on the North-South resisting frames due to the 155 kip seismic load can be seen in Tables 34 through 36.

Direct Shear

The frames that are parallel to the direct shear will participate in resistance. For example, the lateral loads acting in the North-South direction will be resisted directly by braced frames 1-4 and moment frames 1 and 1'. The lateral loads acting in the East-West direction will be resisted directly by moment

frames A.1, B, C, E, and 1'. Since moment frame 1' is oriented at an angle, it will participate in resisting the lateral loads in both the N-S and E-W directions.

The direct shear of each frame was calculated by multiplying the relative stiffness of each frame by the lateral load. The relative stiffness represents the portion of the story lateral load resisted by the frame.

Relative stiffness=
$$=\frac{\mathrm{Ki}}{\Sigma^{\mathrm{ki}}}$$

Where,

K_i is the stiffness of the frame parallel to the lateral load

A sample distribution of the 155 kip seismic lateral load acting on the main roof level can be found in Table 34.

Torsional Shear

If the Center of Mass (COM) and Center of Rigidity (COR) do not coincide, then the seismic loads will cause torsional effects; seismic loads act through the COM, but are resisted through the COR. In addition, the wind loads act at the Center of Pressure (COP) and are resisted at the COR. Contrast to direct shear, all of the frames will participate in resisting these torsional effects. The torsional shear in each frame was first determined by finding the eccentricity between the COM and COR. Next, the distance between the frame and COR was determined where the distance is the moment arm between the COR and the frame. The torsional Shear equation with corresponding variable definitions can be seen below.

Torsional Shear,
$$V_i = \frac{Ved_iK_i}{\sum K_i{d_i}^2}$$

Where,

V- story lateral load

e- eccentricity (distance between the COM and COR or COM and COP)

Ki- stiffness of the lateral force resisting system element

di- moment arm between COR to the lateral force resisting system element

The sample calculations for torsional shears and total shears acting on the North-South resisting frames due to the 155 kip seismic load can be seen in Tables 35 and 36.

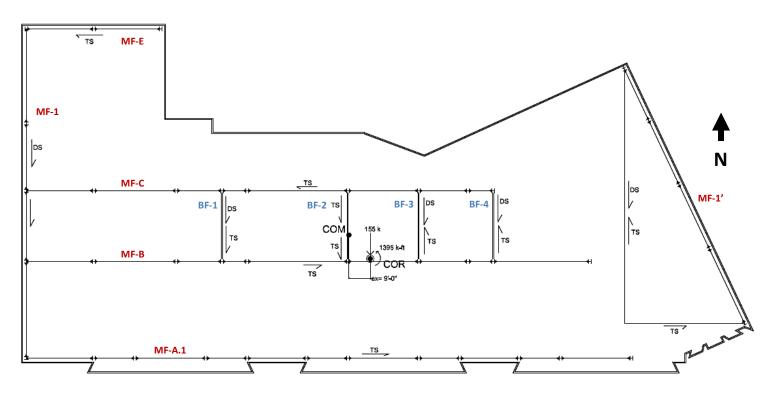


Figure 49 Plan view of the direction of the direct shear (DS) and torsional shear (TS) forces acting on the frames subjected to a 155 kip seismic lateral load acting on the main roof level in the N-S direction

				I
	Direct S	hear in Frames	Resisitng N-S	Seismic Lateral Load
	Frame	Lateral Force	Stiffness, K	Direct shear
	riallie	(kips)	(k/in)	(kips)
	MF-1	155	128.6	20.2
	MF-1'	155	101.3	15.9
	BF-1	155	231.30	36.4
	BF-2	155	166.60	26.2
	BF-3	155	178.60	28.1
	BF-4	155	179.20	28.2
Ī				

Table 34 Direct shear calculation for frames resisting 155 kip seismic load

As can be seen in Table 34, brace frame 1 resists the largest portion of the seismic load applied in the N-S direction. This was also shown in table 33 under the "relative stiffness" section in which it was shown that brace frame 1 would resist most of the lateral load because its stiffer than the other frames participating in resisting the direct shear. The stiffer the frame the more load it will resist because load follows stiffness. In addition, the torsional shears acting on the N-S frames can be seen in table 35 and the total shear acting on the N-S frames can be seen in Table 36.

	Tor	sional Shear in Frame	es Resisting N-S Seismi	Lateral Lo		
Frame	Lateral Force	Stiffness, K	e _x	d	K*d²	Torsional Shear
Trume	(kips)	(k/in)	(ft)	(ft)		(kips)
MF-1	155	128.6	9.0	145.5	2722494	4.771
MF-1'	155	101.3	9.0	-107.56	1171955	-2.778
BF-1	155	231.30	9.0	65.77	1000533	3.879
BF-2	155	166.60	9.0	9.50	15035.65	0.404
BF-3	155	178.60	9.0	-20.50	75056.65	-0.933
BF-4	155	179.20	9.0	-52.10	486422.3	-2.380
				$J=\Sigma K*d^2=$	5471497	
	Total Shear in Fra	mes Resisting N-S Se	eismic Load			
Frame	Direct Shear (DS)	Torsional Shear (TS)	Total Shear (kips)			
riaine	(kips)	(kips)	(DS+TS)			
MF-1	20.2	4.771	25.0			
MF-1'	15.9	-2.778	13.1			
BF-1	36.4	3.879	40.3			
BF-2	26.2	0.404	26.6			
BF-3	28.1	-0.933	27.2			
BF-4	28.2	-2.380	25.8			

Tables 35 and 36 Torsional shear and total shear acting on the N-S resisting frames

Story Drift and Lateral Displacement

The lateral displacements and story drifts were obtained from ETABS. This was done by using only unfactored wind and seismic loads. The inter-story drifts due to the un-factored wind load case 1 were compared to the H/400 allowable displacement, from ASCE 7-10, where H is the story-to-story- height. For the un-factored seismic loads, the inter-story drifts were compared to 0.020H from table 12.12-1 of ASCE 7-10, as can be seen in Figure 50. 1000 Connecticut Avenue has a risk category of II and has a combined moment frame and brace frame dual lateral system; therefore the allowable drift will be 0.02H, where H is the story-to-story height.

Table 12.12-1 Allowable Story Drift, $\Delta_a^{a,b}$

	I	Risk Category	
Structure	I or II	III	IV
Structures, other than masonry shear wall structures, 4 stories or less above the base as defined in Section 11.2, with interior walls, partitions, ceilings, and exterior wall systems that have been designed to accommodate the story drifts.	$0.025h_{ss}^{c}$	0.020h _{sx}	0.015h _{sx}
Masonry cantilever shear wall structures ^d	$0.010h_{sx}$	$0.010h_{sx}$	$0.010h_{sx}$
Other masonry shear wall structures	$0.007h_{sx}$	$0.007h_{sx}$	$0.007h_{sx}$
All other structures	$0.020h_{sx}$	$0.015h_{sx}$	$0.010h_{sx}$

 $^{{}^{}a}h_{sx}$ is the story height below Level x.

Figure 50 Table of allowable story drift for seismic loads

The serviceability for both the wind and seismic loads were found to be within the allowable limits. The story displacements and story drifts in the N-S and E-W directions can be found in Tables 37 and 38.

^bFor seismic force-resisting systems comprised solely of moment frames in Seismic Design Categories D, E, and F, the allowable story drift shall comply with the requirements of Section 12.12.1.1.

^cThere shall be no drift limit for single-story structures with interior walls, partitions, ceilings, and exterior wall systems that have been designed to accommodate the story drifts. The structure separation requirement of Section 12.12.3 is not waived.

^dStructures in which the basic structural system consists of masonry shear walls designed as vertical elements cantilevered from their base or foundation support which are so constructed that moment transfer between shear walls (coupling) is negligible.

St	ory Displacement/ D	rift Due to Un	factored Wir	nd Loads (Wind	l Load Case 1	1
Story	Height Above Grade			H/400	Inter-Sto	
	(ft)	X (in)	Y (in)	(in)	X (in)	Y (in)
Main Roof	180	2.0567	1.8145	0.45	0.0705	0.2160
11	165	1.9862	1.5985	0.45	0.0967	0.1921
10	150	1.8895	1.4064	0.45	0.1154	0.1936
9	135	1.7741	1.2128	0.45	0.1412	0.1890
8	120	1.6329	1.0238	0.45	0.1588	0.1922
7	105	1.4741	0.8316	0.45	0.1784	0.1831
6	90	1.2957	0.6485	0.45	0.1866	0.1657
5	75	1.1091	0.4828	0.45	0.2018	0.1456
4	60	0.9073	0.3372	0.45	0.2062	0.1243
3	45	0.7011	0.2129	0.45	0.2098	0.0921
2	30	0.4913	0.1208	0.45	0.1852	0.0622
1	15	0.3061	0.0586	0.45	0.3061	0.0586
	Story Displace	ment/ Drift D	ue to Unfact	ored Seismic L	.oads	
Story	Height Above Grade	Actual Disp	lacement	0.02H	Inter-Sto	ry Drift
	(ft)	X (in)	Y (in)	(in)	X (in)	Y (in)
Main Roof	180	2.0308	1.192	3.6	0.0969	0.144
11	165	1.9339	1.048	3.6	0.1323	0.1263
10	150	1.8016	0.9217	3.6	0.1482	0.13
9	135	1.6534	0.7917	3.6	0.1709	0.1275
8	120	1.4825	0.6642	3.6	0.1809	0.1304
7	105	1.3016	0.5338	3.6	0.20	0.1237
6	90	1.1	0.4101	3.6	0.18	0.1104
5	75	0.9225	0.2997	3.6	0.191	0.0955
4	60	0.732	0.2042	3.6	0.1828	0.0796
3	45	0.5492	0.1246	3.6	0.1741	0.0568
2	30	0.3751	0.0678	3.6	0.1442	0.0358
1	15	0.2309	0.032	3.6	0.2309	0.032

_										
	Total Rigid Diaphragm Displacement Due to									
	Unfactored Wind Loads (case 1)									
	Displace	ment (Main Roof)	Total Height	H/400						
	X (in)	Y (in)	(ft)	(in)						
	2.11	2.26	180	5.4						
	Tota	l Rigid Diaphragm Di	splacement D	ue to						
	Unfactored Seismic Loads									
	Displace	ment (Main Roof)	Total Height	0.02H						
	X (in)	Y (in)	(ft)	(in)						
	2.07	1.62	180	43.2						

Tables 37 and 38 Story displacements/drifts due to un-factored wind and seismic loads

As can be seen in Tables 37 and 38, the inter-story drift of the lateral system is within the permissible limits for both the wind and seismic cases.

Overturning and Stability Analysis

A building's foundation must be designed to support both axial loads and bending moments caused by the lateral loads. The support base of lateral force resisting columns is subjected to uplift forces caused by the lateral loads. As a result, these uplift forces subject the building to overturning moments.

1000 Connecticut Avenue's foundation is comprised of spread footings, which behave as pinned connections due to their low rigidity. As a result, the foundation does not participate in resisting moments caused by the lateral loads. Through the analysis of the lateral system, the foundation was checked to determine if it is adequate to carry the moment due to the lateral forces on the slab, which transfers the load to the columns. The overturning moments were found by using the controlling lateral loads in each direction. It was determined in preceding sections of this thesis report that wind load case 1 was the controlling lateral load for both the North-South and East-West directions. Wind load case 1 was used to calculate the overturning moments by multiplying the lateral loads by the story height. The resisting moments were calculated by multiplying the total building weight by half of the building length, where the building length is in the direction in which the resisting moment is acting. Load combination 0.9D + 1.0W was found to control for checking the overturning moments. As can be seen in Table 39, the resisting moment is much greater than the overturning moment in both the N-S and E-W directions. Therefore, it was found that the slab-to-column moment frame systems below grade are adequate to carry the moments due to the lateral loads. Since the spread footings will behave as pinned connections, the columns will not transfer any moment to the foundation. Therefore the rigid connection between the slab and columns will carry the overturning moment.

		Overture	ning Moment			
		N-S Win		E-W Win	d	
Floor	Height (ft)	Lateral Force (kips)	Moment (k-ft)	Lateral Force (kips)	Moment (k-ft)	
PH Roof	198.5	152.81	30332.8	47.75	9478.4	
Main Roof	180	92.39	16630.2	39.48	7106.4	
12	165	184.77	30487.1	78.87	13013.6	
11	150	182.83	27424.5	77.89	11683.5	
10	135	179.02	24167.7	75.91	10247.9	
9	120	174.57	20948.4	73.69	8842.8	
8	105	172.14	18074.7	72.46	7608.3	
7	90	168.25	15142.5	70.49	6344.1	
6	75	162.9	12217.5	67.77	5082.8	
5	60	157.55	9453.0	65.06	3903.6	
4	45	151.72	6827.4	62.1	2794.5	
3	30	144.43	4332.9	57.82	1734.6	
2	15	132.84	1992.6	42.78	641.7	
Overturning N	/loment=	Σ=	218031		88482	
		Resisti	ng Moment			
Bulding Weig	ght kips)	N-S Wind		E-W Win	d	
		Length- Y direction (ft)	Moment (k-ft)	Length- X direction (ft)	Moment (k-ft)	
38099)	147	2520272	314.6	5393724	
0.9* DL (l	kips)					
34289	9					
		Summary	of Moments			
Direction	on	Overturning Moment		Resisting Moment		
N-S		(k-ft) 218031		(k-ft)		
		218031 88482		2520272		
E-W		00402		5393724		

Table 39 Overturning and resisting moments in the N-S and E-W directions

In addition, with the lateral system consisting of braced frames, the braced frames will subject the foundation to uplift. As a result the foundation must be checked to determine if it is stable enough to resist the uplift forces. To check for uplift forces, brace frame 3 was used. The controlling load combination for checking uplift is 0.9D+1.0W. As can be seen in Figure 51, the braced frame is subjected to a factored tensile uplift force of 6123 kips.

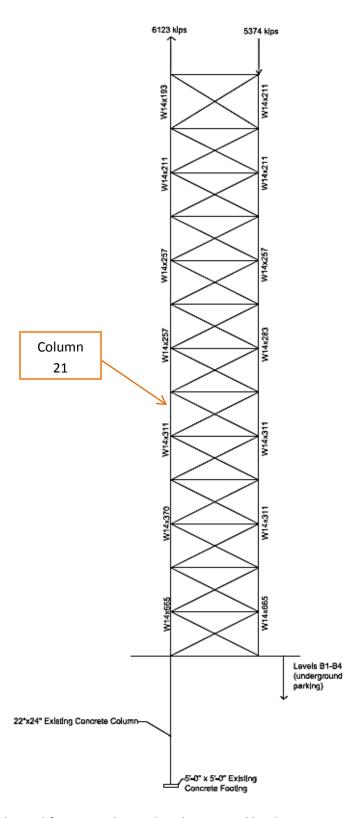


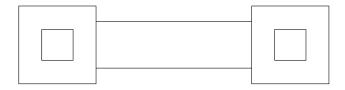
Figure 51 Uplift force braced frame is subjected to due to wind load case 1 acting in the N-S direction

The concrete footing subjected to the uplift force carries a resistive dead load of 1559 kips, which is smaller than the uplift force of 6123 kips acting on the footing. As a result, the foundation will need to be designed to resist this uplift force. A summary of the loads acting on the footing supporting column 21 can be seen in Table 40.

Total Load Acting on Footing support	ing Column	-21
Tributary Area of C-21		
per floor or roof=	1027	ft ²
Influence Area=	3022	ft ²
Floor Dead Load= (slab+SDL+bm/gird. self-wt)	90	psf
Roof Dead Load= (slab+SDL+bm/gird. Self-wt)	90	psf
PH roof DL	32.0	kips
Parking Level DL (slab+SDL)	110	psf
steel column self-wt	65.7	kips
concrete column self wt	24.6	kips
Load Above Footing	Roof +	
	16	Floors
P _D	1610.0	kips
Total DL	1732.3	kips
0.9DL	1559.0	kips
Total Uplift Force due to controlling N-S	6123	kips
Lateral Load		

Table 40 Total load acting on footing supporting column 21

The existing foundation consists of spread footings, but in order to resist the uplift on the foundation caused by the braced frames there are three options that can be used to resist the uplift forces. One option is to use a grade beam that connects two spread footings to resist the uplift forces. The additional rigidity provided by the beam enables the foundation to resist the lateral loads. The grade beam configuration can be seen in Figure 52.



SPREAD FOOTINGS CONNECTED WITH GRADE BEAM

Figure 52 Spread footings connected with a grade beam

Another alternative foundation is to use a combined spread footing. The combined footings will have additional rigidity needed to resist the uplift forces subjected on it by the braced frames. Figure 53 displays a typical layout of a combined spread footing.



COMBINED FOOTING

Figure 53 Combined spread footing

The last alternative is to use a mat foundation, which acts as a fixed base connection and thus will resist uplift forces.

Construction Management Breadth

The construction management breadth was analyzed to determine the impact the structural system redesign would have on the total building cost; construction schedule; site logistics of steel versus concrete construction; building LEED certification; and the anticipated revenue increase from the use of the new structural system. First, the current concrete construction cost estimate was compared to the cost estimate of the new structural system. Second, the new structural system construction schedule was compared to the existing system construction schedule. Third, how the existing construction site had to be managed differently for steel construction compared to concrete construction was evaluated. Fourth, the building LEED certification with the use of the new structural system was compared to the building LEED certification with the use of the existing concrete structural system. Last, the revenue obtained from the new structural system with wider bays and higher floor-to-ceiling heights was compared to the existing structural system's revenue. Wider bays and higher floor-to-ceiling heights increases the rental value of the floor space and therefore the building owner will be able to charge higher rent, which will potentially increase revenue.

New System Cost

After changing the structural system to steel, a cost analysis was completed to determine if the new system would cost less than the existing structural system. The cost was determined for the superstructure and the cost of the new superstructure was compared to the existing superstructure cost. A summary of each system's cost can be seen in Table 41. The analysis showed that the new structural system will cost \$5,994,630 more than the cost of the existing superstructure. RS Means 2012 was used to determine the cost of the new structural system. The detailed superstructure cost calculations can be found in Appendix E.

Structural Steel System Super Structu	re Cost Summary	Existing Concrete Super Structu	ire Cost Summar	
	Total Cost	B-4 SOG	\$400,000	
Gravity Beams	\$1,109,598	Building Foundations		
Gravity Girders	\$907,770	(footings & strap	\$725,000	
Moment Frame Beam/	40.000.004	beams)		
Girder Members	\$2,229,921	Lower level (B-4 to	44 000 000 0	
Gravity Columns	\$287,164	1st flr) foundation walls	\$1,200,000.0	
Moment Frame Columns	\$2,350,577	Columns and elevated	ć2 140 000 0	
Braces	\$764,853	decks (B-4 to 1st flr)	\$3,140,000.0	
Column Base Plates	Ć4 052	Misc. subcontractor		
Connections	\$4,952	costs (submittals, gen.	¢250,000,00	
Colum Splice Connections	\$138,207	conditions, tower crane,	\$250,000.00	
Orthogonal Shear Coonnections	\$255,409	etc.)		
Skewed Shear Connections	\$8,101	Columns from 1st floor &	\$6,035,000.0	
Moment Frame Connections	\$235,523	elevated decks up through		
Brace Frame Connections	\$147,783	penthouse roof		
Steel Floor Deck	\$985,470	Grand Total	\$11,750,	
Shear Studs	\$52,869			
Sprayed Cementious Fireproofing	\$580,587			
	\$580,587 \$1,760,434			
Elevated Slabs				
Elevated Slabs	\$1,760,434			
Elevated Slabs Total Steel Structure Bare Cost	\$1,760,434 \$11,819,218			
Elevated Slabs Total Steel Structure Bare Cost SYSTEM	\$1,760,434 \$11,819,218 COST			
Elevated Slabs Total Steel Structure Bare Cost SYSTEM B-4 SOG	\$1,760,434 \$11,819,218 COST			
Elevated Slabs Total Steel Structure Bare Cost SYSTEM B-4 SOG Building Foundations	\$1,760,434 \$11,819,218 COST \$400,000			
Elevated Slabs Total Steel Structure Bare Cost SYSTEM B-4 SOG Building Foundations (footings & strap beams)	\$1,760,434 \$11,819,218 COST \$400,000 \$725,000			
Elevated Slabs Total Steel Structure Bare Cost SYSTEM B-4 SOG Building Foundations (footings & strap	\$1,760,434 \$11,819,218 COST \$400,000			
Elevated Slabs Total Steel Structure Bare Cost SYSTEM B-4 SOG Building Foundations (footings & strap beams) Lower level (B-4 to	\$1,760,434 \$11,819,218 COST \$400,000 \$725,000			
Elevated Slabs Total Steel Structure Bare Cost SYSTEM B-4 SOG Building Foundations (footings & strap beams) Lower level (B-4 to 1st flr) foundation walls Columns and elevated	\$1,760,434 \$11,819,218 COST \$400,000 \$725,000			
Elevated Slabs Total Steel Structure Bare Cost SYSTEM B-4 SOG Building Foundations (footings & strap beams) Lower level (B-4 to 1st flr) foundation walls	\$1,760,434 \$11,819,218 COST \$400,000 \$725,000			
Elevated Slabs Total Steel Structure Bare Cost SYSTEM B-4 SOG Building Foundations (footings & strap beams) Lower level (B-4 to 1st flr) foundation walls Columns and elevated decks (B-4 to 1st flr)	\$1,760,434 \$11,819,218 COST \$400,000 \$725,000 \$1,200,000.00 \$3,140,000.00			
Elevated Slabs Total Steel Structure Bare Cost SYSTEM B-4 SOG Building Foundations (footings & strap beams) Lower level (B-4 to 1st flr) foundation walls Columns and elevated decks (B-4 to 1st flr) Misc. subcontractor	\$1,760,434 \$11,819,218 COST \$400,000 \$725,000			
Elevated Slabs Total Steel Structure Bare Cost SYSTEM B-4 SOG Building Foundations (footings & strap beams) Lower level (B-4 to 1st flr) foundation walls Columns and elevated decks (B-4 to 1st flr) Misc. subcontractor costs (submittals, gen.	\$1,760,434 \$11,819,218 COST \$400,000 \$725,000 \$1,200,000.00 \$3,140,000.00			
Elevated Slabs Total Steel Structure Bare Cost SYSTEM B-4 SOG Building Foundations (footings & strap beams) Lower level (B-4 to 1st flr) foundation walls Columns and elevated decks (B-4 to 1st flr) Misc. subcontractor costs (submittals, gen. conditions, tower crane,	\$1,760,434 \$11,819,218 COST \$400,000 \$725,000 \$1,200,000.00 \$3,140,000.00			
B-4 SOG Building Foundations (footings & strap beams) Lower level (B-4 to 1st flr) foundation walls Columns and elevated decks (B-4 to 1st flr) Misc. subcontractor costs (submittals, gen. conditions, tower crane, etc.)	\$1,760,434 \$11,819,218 COST \$400,000 \$725,000 \$1,200,000.00 \$3,140,000.00			

Table 41 New system cost versus existing system cost

Construction Schedule

After changing the structural system from steel to concrete, a construction schedule study was conducted to determine if the schedule of the new structural system can be shorten. The schedule path chosen to decrease the construction of the steel framing system can be seen listed below.

- 1. erect the first set 2 tier columns
- 2. erect the steel beams and girders at stories one and two
- 3. Erect the metal decks at stories 1 and 2
- 4. Pour the slab on deck at story 1 while the second set of 2 tier columns are being erected
- 5. Pour the slab on deck at story 2 while the beams and girders at stories 3 and 4 are being erected

The steel construction schedule will follow the above sequence until its completion. The steel system's proposed construction schedule can be seen in Figure 54. The schedule date starts on November 19, 2010 because that is the same day in which the existing concrete system reached grade level.

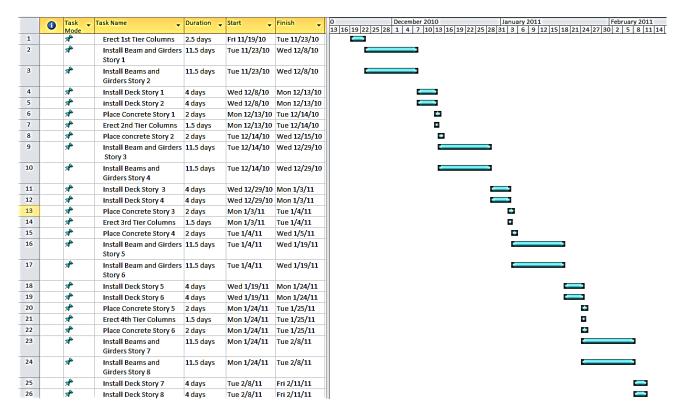




Figure 54 Proposed construction sequence for the steel framing system

The existing system's first level through main roof concrete construction schedule sequence can be seen in Figure 55.

First Flo	oor				Fifth Floor
Comment	Operations				Concrete Operations
Concrete	Operations				Typical Activities
Typical A	ctivities				AGS100320 FRP Elevated Deck - 05 9 0 03JAN11A 14JAN11A
AGS100000	FRP Elevated Deck - 01	20	0 13OCT10A	19NOV10A	AGS100340 FRP Columns - 05 5 0 10JAN11A 17JAN11A
AGS100020	FRP Columns - 01	16	0 01NOV10A	02DEC10A	AGS100440 Strip/Reshore - 05 to 06 10 0 12JAN11A 28JAN11A
					AGS100300 Remove Reshores - 04 to 05 10 0 15FEB11A 18FEB11A
AGS100120	Strip/Reshore - 01 to 02	10	0 02DEC10A	15DEC10A	CN121780 FRP Concrete Pads/Curbs - 05 5 0 15MAR11A 25APR11A
BGS100220	Remove Reshores - B1 to 01	10	0 29DEC10A	03JAN11A	Sixth Floor
CN121700	FRP Concrete Pads/Curbs - 01	5	0 07MAR11A	10MAY11A	Concrete Operations
Second 1	Floor				Typical Activities
					AGS100400 FRP Elevated Deck - 08 9 0 12JAN11A 25JAN11A AGS100420 FRP Columns - 06 5 0 17JAN11A 26JAN11A
Concrete	Operations				AGS100520 Strip/Reshore - 06 to 07 10 0 04FEB11A 14FEB11A
Typical A	ctivities				AGS100380 Remove Reshores - 05 to 08 10 0 16FEB11A 22FEB11A
AGS100080			5 55101404	45050404	CN121800 FRP Concrete Pads/Curbs - 08 5 0 15MAR11A 25APR11A
	FRP Elevated Deck - 02	14	0 05NOV10A	15DEC10A	Seventh Floor
AGS100100	FRP Columns - 02	11	0 29NOV10A	16DEC10A	
AGS100200	Strip/Reshore - 02 to 03	10	0 29NOV10A	13DEC10A	Concrete Operations
AGS100060	Remove Reshores - 01 to 02	10	0 03JAN11A	26JAN11A	Typical Activities
CN121720	FRP Concrete Pads/Curbs - 02	5	0 23FEB11A	25FEB11A	AGS100480 FRP Elevated Deck - 07 9 0 20JAN11A 07FEB11A AGS100500 FRP Columns - 07 6 0 01FEB11A 08FEB11A
			5 20. 22		AGS100600 Strip/Reshore - 07 to 08 10 0 17FEB11A 08FEB11A 22FEB11A
Third F	loor				AGS100460 Remove Reshores - 08 to 07 10 0 28FEB11A 09MAR11A
Concrete	Operations				CN121820 FRP Concrete Pads/Curbs - 07 5 0 27APR11A 02MAY11A
					Eighth Floor
Typical A					Concrete Operations
AGS100160	FRP Elevated Deck - 03	10	0 08DEC10A	28DEC10A	Typical Activities
AGS100180	FRP Columns - 03	6	0 10DEC10A	29DEC10A	AGS100560 FRP Elevated Deck - 08 9 0 03FEB11A 16FEB11A
AGS100280	Strip/Reshore - 03 to 04	10	0 31DEC10A	14JAN11A	AGS100580 FRP Columns - 08 5 0 09FEB11A 17FEB11A
AGS100140	Remove Reshores - 02 to 03	10	0 17JAN11A	25JAN11A	AGS100680 Strip/Reshore - 08 to 09 10 0 23FEB11A 03MAR11A
CN121740	FRP Concrete Pads/Curbs - 03	5	0 23FEB11A	25FEB11A	AGS100540 Remove Reshores - 07 to 08 10 0 16MAR11A 21MAR11A
		3	0 ZSI EBITA	201 EDTIA	CN121840 FRP Concrete Pads/Curbs - 08 5 0 27APR11A 02MAY11A
Fourth 1	Floor				Ninth Floor
Concrete	Operations				Concrete Operations
Typical A	ctivities				Typical Activities
AGS100240	FRP Elevated Deck - 04	9	0 22DEC10A	06JAN11A	AGS100860 FRP Columns - 09 5 0 18FEB11A 02MAR11A
		_			AGS100760 Strip/Reshore - 09 to 10 10 0 08MAR11A 17MAR11A
AGS100260	FRP Columns - 04	5	0 27DEC10A	07JAN11A	AGS100020 Remove Reshores - 08 to 09 10 0 18MAR11A 29MAR11A
AGS100360	Strip/Reshore - 04 to 05	10	0 14JAN11A	28JAN11A	CN121860 FRP Concrete Pads/Curbs - 09 5 0 27APR11A 02MAY11A

Tenth F	loor				
Concrete	Operations				
Typical A	ctivities				
AGS100720	FRP Elevated Deck - 10	9	0	21FEB11A	11MAR11A
AGS100740	FRP Columns - 10	0	0	03MAR11A	15MAR11A
AGS100840	Strip/Reshore - 10 to 11	10	_	18MAR11A	29MAR11A
AGS100700	Remove Reshores - 09 to 10	10	_	30MAR11A	20APR11A
CN121880	FRP Concrete Pads/Curbs - 10	5	0	27APR11A	02MAY11A
Eleventh	ı Floor				
Concrete	Operations				
Typical A	ctivities				
AGS100800	FRP Elevated Deck - 11	9	0	08MAR11A	24MAR11A
AGS100820	FRP Columns - 11	5	0	16MAR11A	25MAR11A
AGS100920	Strip/Reshore - 11 to 12	10	0	30MAR11A	15APR11A
AGS100780	Remove Reshores - 10 to 11	5	0	20APR11A	26APR11A
CN121920	FRP Concrete Pads/Curbs - 11	5	0	27APR11A	02MAY11A
Twelfth	Floor				
Concrete	Operations				
Typical A	ctivities				
AGS100880	FRP Elevated Deck - 12	9	0	17MAR11A	08APR11A
AGS100900	FRP Columns - 12	5	0	28MAR11A	09APR11A
AGS101000	Strip/Reshore - 12 to R	10	0	15APR11A	25APR11A
AGS100860	Remove Reshores - 11 to 12	5	0	20APR11A	26MAY11A
CN121940	FRP Concrete Pads/Curbs - 12	5	0	27APR11A	02MAY11A
Roof					
Concrete	Operations				
Typical A	ctivities				
AGS100960	FRP Elevated Deck - R	12	0	29MAR11A	15APR11A
AGS100980	FRP Columns - R	8	0	13APR11A	14APR11A
AGS101020	FRP Elevated Deck - EMR	5	0	22APR11A	28APR11A
AGS101080	Strip/Reshore - R to PHR	10	0	26APR11A	03MAY11A
	FRP Concrete Pads/Curbs - PH	- 5		30APR11A	04MAY11A

Figure 55 Existing construction sequence for levels 1 through Main roof

As can be seen in Figure 55, the elevated slab for the roof was completed by April 15, 2011 where as for the steel system the slab on deck on the main roof level would be completed by March 28, 2011. As a result, the use of the steel system shortens the construction schedule by 18 days. RS Means 2012 was used to determine the duration for each activity required to complete the steel system construction. The detailed calculations for durations of the steel system schedule can be seen in Appendix E.

Site Logistics

The site logistics of concrete versus steel construction will vary, therefore a site logistics study was conducted to determine how the two materials will have to be managed differently on the same site. The 1000 Connecticut Avenue project incorporated the use of Ox Blue to track the progress of the project. Ox Blue is a web camera used to keep track and view the progress of the project on site. The use of the web camera was executed on the first day construction began, which was on October 19, 2009. For the site logistics study, images taken by the camera system were used to determine the site logistics of the existing system. Select images taken during the course of construction were used to help with the site logistics study. Select images used for the study can be seen in Figures 56 through 61.



Figure 56 construction site before excavation (October 2009)



Figure 57 Beginning stages of excavation (December 2009)

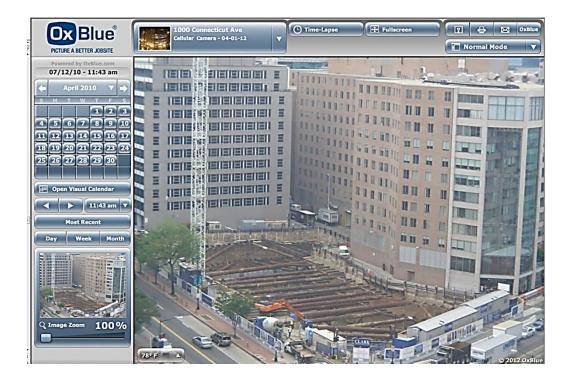


Figure 58 Construction site after excavation (April 2010)



Figure 59 erection of the subgrade four - level underground parking garage (October 2010)



Figure 60 Erection of the twelfth story (main roof) (March 2011)

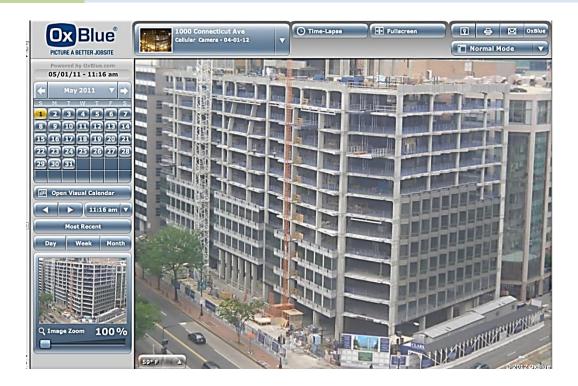


Figure 61 Concrete tops out in May 2011 and the early stages of glass curtain wall installation

Based on Figures 56 through 61, the site appears to have been managed the same throughout the structural system's construction. An animated depiction of the site logistics can be seen in Figure 62.



Figure 62 Existing concrete system's site logistics

As can be seen in Figures 56 through 61, the management of the site appeared to stay the same throughout the different phases of the project in terms of equipment location and vehicular egress. The crane shown in Figures 56 through 61 is used to lift the form work and is used to place the concrete. The existing site appears to have used the crane and bucket placement method to pour and place the concrete. The private alleys are shut down during construction and are used as egress for the trucks. As can be seen in Figure 58 the trucks enter the site by traveling South on Connecticut Avenue and using the service road along K Street and the alleys as egress to gain access to the sight. The trailers are located along Connecticut Avenue which is a good viewing location for the project managers and engineers to track the progress of the project.

After analyzing the site logistics for the existing concrete structure, a study was completed to determine how the site will have to be managed if steel were used. The proposed site logistics for the steel construction can be seen in Figure 63.



Figure 63 proposed site logistics plan for steel construction

It's assumed the steel members will be labeled before arriving to the construction site. As a result, the members can be placed directly in the steel lay down areas upon arrival to the site. The same tall crane used for the concrete construction will also be used for erecting the steel members. Concrete will be placed by using the crane and bucket method, the same method used in the concrete construction. The crane and bucket method takes longer to execute than using a concrete pump, but it's still effective and less expensive. In addition, with the use of the same crane and concrete placement method there will be no additional cost accumulated when erecting the steel system. The lay down areas for the steel will be located adjacent to the crane and near the south facing wall for easy access. The same egress paths used for the concrete construction will also be used for the steel system construction.

After the analysis, it was shown that the site will be management very similarly to that of the concrete construction site, with the difference being the requirement of lay down areas for the steel members. The same equipment will be used which will avoid any additional cost. The Crane and bucket method will be used to pour the concrete. The same crane used for the construction of the existing system can be used for the erection of the steel system.

LEED Certification

After changing the structural system to steel, it was shown that the certification for the shell and core will remain platinum certified. The LEED analysis of the new and existing systems was based on LEED 2.0 for New Construction and Major Renovations. The use of the new system will increase the rating from 51 points to 52 points. Under the Material and Resources category, with the use of steel the building will be able to use at least 1% of reused steel for the structural members and metal decks, in which the new system will be able to obtain 1 point for credit 3 (Materials and Reuse, 1%). In addition it is assumed that the building re-located to Arlington, VA will be located in a previously developed site (Credit 1 under "Sustainable Sites") and the building will be located in a developed community. Since the building will be re-located to downtown Arlington, the point for credit 2 under "Sustainable Sites" will be achieved. The analysis of the existing system's LEED certification can be seen in Table 42.

Categories	Credit	Status	Possible Points	Points Achieve
	Prereg 1-Construction Activity Pollution Prevention	Sediment and erosion control plans		
	· · · · · · · · · · · · · · · · · · ·	included in submission	У	Y
	Credit 1- Site Selection	project is located on previously developed site		
		above floodplain, etc	1	1
	Credit 2- Developed Density & Community Connectivity	Project is located within downtown DC area	1	1
	Credit 3 - Brownfield Revelopment	Project does not appear to be a Brownfield. Project	_	
	· ·	will be doing asbestos abatement	1	1
	Credit 4.1 - Alternative Transportation,	Project site is located within 0.5 miles of 2 metro		
	Plublic Transportation Access	stations, Farragut west and north	1	1
	credit 4.2 - Alternative Transportation,	Assumed FTE occupants: 1445		
	Bicycle Storage & Changing Rooms	Bike parking required: ≥ 40 spots		
	bicycle storage & changing noonis	Showers required: 8		
		Bike parking provided: 41	1	1
		Showers provided: 8		
		·	-	
		Bike racks added on street level		
	Credit 4.3 - Atlernative Transportation, Low Emitting	Total Parking: 256		
	& Fuel Efficient Vehicles	Parking for low emit/fe veheicles req'd: 13 spots	1	1
AINABLE		Parking dedicated: 13 spots	152	
SITES	Credit 4.4 - Alternative Transporation, Parking	1	1	
	Capacity	Parking provided: 256		_
		Green roof area meets requirements, but it must be		
	Habitat	determined if plants for green roof qualify as native	1	1
		or adapted		
	Credit 5.2 - Site Development, Maximize Open Space	No opent space require		
		Provide open space= 20% of site area		
		Site area=33,231 SF	1	1
		Open space req'd: 8310 SF (2080 SF green)		
		Open space provided: ≥ 18600 SF (green roof)		
	Credit 6.1 - Storm Design, Quality Control	Previously developed site required 25% reduction		
		in stormwater rate and quantity.	1	1
		Green roof increased pro-development imperviousness	1	1
		by approx. 40%.		
	Credit 6.2 - Stormwater Design, Quality Control	≤5% uncontrolled run-off. Green roof satisfies		
		treatment for city. No other additional treatment	1	0
		planned for building		
	Credit 7.1 - Heat Island Effect, Non-Roof	All parking is underground	1	1
	Credit 7.2 - Heat Island Effect, Roof	Roof area= 31,664 SF		
		50% = 15,610; 75% = 23,514 SF	1	1
		Green roof provided= 16,687 SF (51%)		
	Credit 8 - Light Pollution Reduction	Meeting on 10/24/2011 indicaed they may try and pursue		
		this credit. E-6.01 has Ltg Control system well defined.		
		PCF sendexterior lighting product cut sheets. Project meet	1	1
		requirements		
	Credit 9 - Tenant Design & Construction Guidelines	SDK sent draft copy of tenant guidelines to owner		
	Credit 5 - Teriant Design & Construction Guidennes	on 7/17/07. Owner provided delivery receipt of tenant	1	
		guidelines.	1	1
		TOTAL SUSTAINBLE SITE POINTS	15	14

	Credit 1.1 - Water Efficient Landscaping, Reduce 50%	-	1	1
	Credit 1.2 - Water Efficent Landscaping, No Potable	6/21/07 Team confirmed no permanent irrigation will be	_	
	Water Use or No Irrigation	included in the project	1	1
NATES.	Credit 2 - Innovation Wastewater Technologies	No fixture performance in DD Set. MEP spec refers to the use		
WATER	Credit 2 - Innovation wastewater rechnologies		1	1
FEELCIENCY		of water saver type fixtures		
EFFICIENCY	Credit 3.1 - Water Use Reduction, 20% Reduction	Toilets 1.6/1.1 gpm: Urinals 0.50 gpf; sinks 0.50 gpm;	1	1
		showers 1.25 gpm. Current % reduction at 41.5 %	-	-
	Credit 3.2 - Water Use Reduction, 30% Reduction	Toilets 1.6/1.1 gpm: Urinals 0.50 gpf; sinks 0.50 gpm;		
	oreare 3.2 - Water ose neaderion, 30% neaderion		1	1
		showers 1.25 gpm. Current % reduction at 41.5 %		
		TOTAL WATER EFFICIENCY POINTS	5	5
	P 5	0DV 1 0 1 1 1 220000		
	Prereq - Fundamental Commissioning of the Building	SDK engaged as Cx agent. Addendum 1 has 230800		
	Energy Systems	with full checklists; OK. No reference in 239000 or 239250		
		(BAS Sections) or 260100n to 230800 or 019100 in Add 1,	Υ	Y
		Add 2, or Amd 1. (WDG indicated that references are not		
		allowed and all DIV 1 spcs will be applicable).		
	Prereg 2 - Minumun Energy Performance	EMO report confirms compliance.	Υ	Y
	Prereq 3 - Fundamental Refrigerant Management	Drawings show use chillers to use R-134a	Υ	Y
ENERGY	Credit 1 - Optimize Energy Performance	CDC report shows 21.1% or 4 points. 6/3/10 - EMO indicates	8	8
		project will earn maxmimum 8 points.	٥	•
&	Credit 2 - On-Site Renewable Energy, 1%	No use of renewable energy shown in drawings	1	0
			1	J
ATMOSPHERE	Credit 3 - Enhanced Commissioning	Enhanced Cx not selected for implementation by owner. SDK		_
		Engineers downgraded point, no acceptance of enhanced cx	1	0
		and project is to late to include.		
	Credit 4 - Enhanced Refrigerant Management	Calc made 10/9/07 with Chillers and Packaged ACUs.	1	1
	Credit 5.1 - Measurement & Verificsation, Base	Amd 1 provided additional requirements needed to meet M&V		
	· · · · · · · · · · · · · · · · · · ·	, and a provided additional requirements needed to meet M&V	1	1
	Building			
	Credit 5.2 - Measurement & Verification, Tenant	Amd 1 provided additional requirements needed to meet	1	1
	Sub-metering	tenant M&V	-	-
	Credit 6 - Green Power, 35%	SDK sent green power options/cost estimate to ownership	1	1
		10/25/07		
		TOTAL ENERGY & ATMOSPHERE POINTS	14	12
1	I.	1	1	
	Prereq 1 - Storage & Collection of Recyclables	90 sf of recycling shown in loading dock area. Distributed		
		recycling space is shown throughout the building and enforced	Y	Υ
		in tenant guidelines.	•	·
		_		
	Credit 1.1 - Building Reuse, Maintain 25%, 50%, 75%	Building will not be re-using existing shell	3	
	of Existing Walls, Floors & Roof			0
MATERIALS	Credit 2.1 - Construction Waste Management, Divert	CWM spefication included in permit set. SDK received demo	2	
0	50%, 75% From Disposal	waste management plan 12/31/07	2	2
&	Credit 3 - Materials Reuse, 1%	<u> </u>	1	0
RESOURCES	·			
RESOURCES	Credit 4.1 - Recycled Content, Speify 10%, 20% (post-	Construction document specification sections support credit	2	2
	consumer + pre-consumer)			
	Credit 5.1 - Regional Materials, 10%, 20% Extracted	Construction document specification sections support credit	2	2
	and Manufactured Regionally			
	Cresdit 6 - Certified Wood	Wood is to be used for finishes and wood doors	1	1
	Cresuit o-Certified Wood			
		TOTAL MATERIALS & RESOURCES POINTS	11	7
	Prereg 1 - Minumum IAQ Performance			
	Freied 1-Millumum IAQ Ferrormance	Ventilation calcs indicate all araea exceed 62.1-04. Addendum	V	
	Freied 1-Milliam MQ Feriormance		Y	Υ
	·	1 brough Fitness OA cfm up to 30% above 62.1-04		
	Prereq 2 - Environ. Tobacco Smoke Control	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code	Y Y	Y
	·	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring Al points for OA Valves for		
	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code	Υ	Υ
	Prereq 2 - Environ. Tobacco Smoke Control	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring Al points for OA Valves for	Y 1	Υ
	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring Al points for OA Valves for all AHUs and all ACUs serving occupied spaces.	Υ	Υ
	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher	Y 1	Y 1
	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04	Y 1	Y 1
	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher	Y 1	Y 1
	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OAValves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan.	Y 1	1 1
	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04	Y 1	1 1
INDOOR	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OAValves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan.	Y 1	1 1
	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring Al points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec	Y 1	1 1
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Construction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set	1 1	1 1
	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OAValves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced	Y 1	1 1
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1	1 1	1 1
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Construction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OAValves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced	1 1	1 1
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1	1 1	1 1
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1	Y 1 1 1 3	1 1 1
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products Credit 5 - Indoor Chemical & Pollutant Source	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring Al points for OAValves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1 Composite wood requirements included in specifications 10/24/11 meeting w/ Owner indicated credit is not being	1 1	1 1
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products Credit 5 - Indoor Chemical & Pollutant Source Control	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring Al points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1 Composite wood requirements included in specifications 10/24/11 meeting w/ Owner indicated credit is not being pursued. Addendum 1 shows final filters revied to MERV-11	Y 1 1 1 3	1 1 1
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products Credit 5 - Indoor Chemical & Pollutant Source	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1 composite wood requirements included in specifications 10/24/11 meeting w/ Owner indicated credit is not being pursued. Addendum 1 shows final filters revied to MERV-11 Based on HVAC design, thermostats controlling VAV boxes will	Y 1 1 1 1 1	1 1 1 2 0
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products Credit 5 - Indoor Chemical & Pollutant Source Control	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring Al points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1 Composite wood requirements included in specifications 10/24/11 meeting w/ Owner indicated credit is not being pursued. Addendum 1 shows final filters revied to MERV-11	Y 1 1 1 3	1 1 1
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products Credit 5 - Indoor Chemical & Pollutant Source Control	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1 composite wood requirements included in specifications 10/24/11 meeting w/ Owner indicated credit is not being pursued. Addendum 1 shows final filters revied to MERV-11 Based on HVAC design, thermostats controlling VAV boxes will	Y 1 1 1 1 1	1 1 1 2 0
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products Credit 5 - Indoor Chemical & Pollutant Source Control Credit 6 - Controllability of Systems, Thermal Comfort	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring Al points for OAValves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1 Composite wood requirements included in specifications 10/24/11 meeting w/ Owner indicated credit is not being pursued. Addendum 1 shows final filters revied to MERV-11 Based on HVAC design, thermostats controlling VAV boxes will be included 1 per 1.8 people on perimeter and 1 per 4 FTE on interior	Y 1 1 1 1 1 1 1 1 1	1 1 1 2
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Construction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products Credit 5 - Indoor Chemical & Pollutant Source Control Credit 6 - Controllability of Systems, Thermal Comfort Credit 7 - Thermal Comfort, Design	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1 Composite wood requirements included in specifications 10/24/11 meeting w/ Owner indicated credit is not being pursued. Addendum 1 shows final filters revied to MERV-11 Based on HVAC design, thermostats controlling VAV boxes will be included 1 per 1.8 people on perimeter and 1 per 4 FTE on interior MEP outline spec gives design conditions for HVAC system	Y 1 1 1 1 1 1 1 1 1 1 1	Y 1 1 1 2 0 1 1
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products Credit 5 - Indoor Chemical & Pollutant Source Control Credit 6 - Controllability of Systems, Thermal Comfort	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1 Composite wood requirements included in specifications 10/24/11 meeting w/ Owner indicated credit is not being pursued. Addendum 1 shows final flits revied to MERV-11 Based on HVAC design, thermostatis controlling VAV boxes will be included 1 per 1.8 people on perimeter and 1 per 4 FTE on interior MEP outline spec gives design conditions for HVAC system Tvis for glass is 0.61. Intials daylight calculation does not meet	Y 1 1 1 1 1 1 1 1 1	1 1 1 2
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products Credit 5 - Indoor Chemical & Pollutant Source Control Credit 6 - Controllability of Systems, Thermal Comfort Credit 7 - Thermal Comfort, Design Credit 8.1 - Daylight & Views, Daylight 75%	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring Al points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1 Composite wood requirements included in specifications 10/24/11 meeting w/ Owner indicated credit is not being pursued. Addendum 1 shows final filters revied to MERV-11 Based on HVAC design, thermostats controlling VAV boxes will be included 1 per 1.8 people on perimeter and 1 per 4 FTE on interior MEP outline spec gives design conditions for HVAC system Tvis for glass is 0.61. Intials daylight calculation does not meet 75% area for 2% day lighting	Y 1 1 1 1 1 1 1 1 1 1 1	Y 1 1 1 2 0 1 1
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Construction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products Credit 5 - Indoor Chemical & Pollutant Source Control Credit 6 - Controllability of Systems, Thermal Comfort Credit 7 - Thermal Comfort, Design	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring AI points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1 Composite wood requirements included in specifications 10/24/11 meeting w/ Owner indicated credit is not being pursued. Addendum 1 shows final flits revied to MERV-11 Based on HVAC design, thermostatis controlling VAV boxes will be included 1 per 1.8 people on perimeter and 1 per 4 FTE on interior MEP outline spec gives design conditions for HVAC system Tvis for glass is 0.61. Intials daylight calculation does not meet	Y 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Y 1 1 1 2 0 1 1 0
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products Credit 5 - Indoor Chemical & Pollutant Source Control Credit 6 - Controllability of Systems, Thermal Comfort Credit 7 - Thermal Comfort, Design Credit 8.1 - Daylight & Views, Daylight 75%	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring Al points for OA Valves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1 Composite wood requirements included in specifications 10/24/11 meeting w/ Owner indicated credit is not being pursued. Addendum 1 shows final filters revied to MERV-11 Based on HVAC design, thermostats controlling VAV boxes will be included 1 per 1.8 people on perimeter and 1 per 4 FTE on interior MEP outline spec gives design conditions for HVAC system Tvis for glass is 0.61. Intials daylight calculation does not meet 75% area for 2% day lighting	Y 1 1 1 1 1 1 1 1 1 1 1	Y 1 1 1 2 0 1 1
ENVORONMENTAL	Prereq 2 - Environ. Tobacco Smoke Control Credit 1 - Outdoor Air Delivery Monitoring Credit 2 - Increased Ventilation Credit 3 - Constuction IAQ Management, During Construction Credit 4.1 - Low-Emitting Materials, Adhesives & Sealants Credit 4.2 - Low-Emitting Materials, Paints Credit 4.3 - Low-Emitting Materials, Carpet Credit 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products Credit 5 - Indoor Chemical & Pollutant Source Control Credit 6 - Controllability of Systems, Thermal Comfort Credit 7 - Thermal Comfort, Design Credit 8.1 - Daylight & Views, Daylight 75%	1 brough Fitness OA cfm up to 30% above 62.1-04 No smoking allowed within the building according to DC code Add. 1 now has OA Flow monitoring Al points for OAValves for all AHUs and all ACUs serving occupied spaces. Ventilation calcs and Addendum 1 for Fitness OA now show all mechanically ventilated paces are at least 30% higher than 62.1-04 Clark submitted Construction IAQ Management Plan. No mention of Low VOC adhesive and sealants in permit spec Low VOC paints enforced in bid and addendum set Carpet specification included. CRI green label plus enforced in Addendum 1 Composite wood requirements included in specifications 10/24/11 meeting w/ Owner indicated credit is not being pursued. Addendum 1 shows final filters revied to MERV-11 Based on HVAC design, thermostats controlling VAV boxes will be included 1 per 1.8 people on perimeter and 1 per 4 FTE on interior MEP outline spec gives design conditions for HVAC system Tvis for glass is 0.61. Intials daylighting Documentation is complete and ready for submission in	Y 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Y 1 1 1 2 0 1 1 0

	I .	I I			
	Credit 1 - Innovation in Design: Reduced Heat Islands	100% of parking is underground	1	1	
INNOVATION	Credit 1.2 - Innovation in Design: Education Credit	Sent education program details to owner on 10/25/07	1	1	
and	Credit 1.3 - Innovation in Design: Water Use Reduction	Toilets 1.6/1.1 gpm; Urinals 0.50 gpf; sinks 0.50 gpm; showers	1		
	40%	1.25 gpm. Current % reduction of 41.5%	1	1	
DESIGN	Credit 1.4 - Innovation in Design: Exemplary Performance	Project is located close to multiple transport options			
	in Transporation		1	1	
	Credit 2 - LEED Accredited Professional	SDK qualities as a LEED AP	1	1	
		TOTAL INDOOR ENVIRONMENTAL QUALITY POINTS	5	5	
		TOTAL CORE and SHELL Points	61	51	
				1	
			LEED CERTIFIED PLATINUM for CORE and S		

23-27	LEED Certified for Core and Shell
28-33	LEED Certified Silver for Core and Shell
34-44	LEED Certified Gold for Core and Shell
45-61	LEED Certified Platinumfor Core and Shell

Table 42 Existing LEED certification check

Annual Revenue

After increasing the floor-to-floor height to 15′-0″ and creating wider bays increased the rental value of the space. The floor layout is more open and due to fewer obstructions due to columns and with an increase floor-to-ceiling height of 10′-6″ increases the openness of the space. A combination of wider bays and higher-floor-to-ceiling heights increases the rental value of the space, therefore a revenue study was performed to determine the amount of annual revenue that can be obtained with the use of the new structural system. The analysis was conducted by contacting a realtor representative in Washington D.C. to obtain information on the current asking rental price per square footage for the space. A realtor representative at Summit Commercial Real Estate Agency located in Washington, D.C. disclosed that the asking price for 1000 Connecticut Avenue is \$55.00 per square foot. After asking the representative how much more rent can be charged with the additional amenities of wider bays and higher floor-to-ceiling heights, the representative disclosed that an additional \$10-\$20 can be charged per square foot. Therefore the asking price can increase up to \$65-\$75 per square foot.

For the analysis, it was assumed that the new building system will be located in a business district in Arlington, VA and that the asking price for the existing building re-located to Arlington, VA will be \$55 per square foot. It was also assumed that the rent would increase to \$65 per square foot if the new steel system were used in place of the concrete structure. The results of the annual revenue obtained with the use of the new structural system versus the revenue obtained from the use of the existing system can be found in Table 43.

Annual Revenue						
Ammenities	Existing Structura	l System Layout	NewStructural Sy	stem Layout		
Avg. column spacing	30'-0"		35'-0"			
Floor-to-ceiling Ht	8'-6"		10'-6"			
# of columns	89		55			
above grade	09		33			
Total rentable office area	370545	sf. ft.	370545	sf. ft		
Total rentable retail area	15246	sf. ft.	15246	sf. ft.		
cost per sq. ft.	\$55.00		\$65.00			
Annual Revenue	\$20,379,975.00		\$24,085,425.00			
Additional Annual Revenue						
Obtained from New	\$3,705,450.00					
Structural System Layout						

 Table 43 Annual revenue comparison between new steel system and existing concrete system

As can be seen in Table 43, the annual revenue obtained with the use of the steel structural system layout will increase the annual revenue an additional \$3,705,450 per year.

Acoustics and Lighting Breadths

After designing the new steel structural system, acoustics and lighting breadths were conducted for the office spaces supported by the new system. The acoustics breadth involved determining the sound treatments required for a typical office space housed in the new structural system. Based on the sound treatments in the space, the sound transmission class (STC) and noise reduction (NR) values were determined for a typical office space. In addition, since the new structural system was designed for higher floor-to-ceiling heights, lighting illuminance applied to the work plane surfaces were affected. As a result, a lighting breadth will be conducted by designing the lighting system for a typical office space using the existing floor-to-ceiling height of 8'-6" and checking to determine if the same lighting system can be used for the space with a new floor-to-ceiling height of 10'-6".

Acoustics Breadth

After changing the structural system from concrete to steel, the amount of sound transmitted between the space increases. As a result, an acoustical study was performed to determine the type of wall partitions, finish floor materials, and ceiling materials will be needed to attenuate the sound transmitted between the office spaces. As a can be seen in Figure 64 1000 Connecticut Avenue will be comprised of a series of office spaces located around the perimeter of the building. The private offices will be occupied by attorneys.

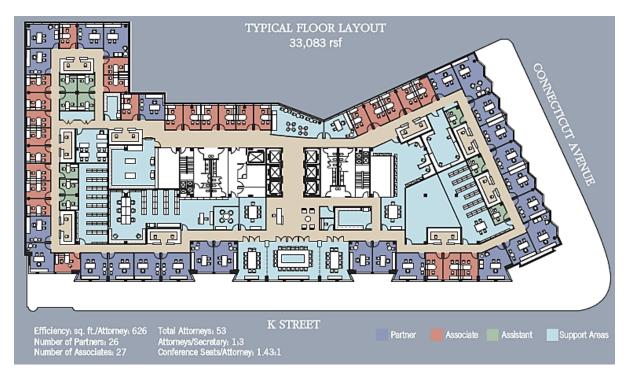


Figure 64 Typical floor plan layout

With the private office spaces being occupied by attorneys, speech privacy will be very important and must be considered when designing the office spaces. For analyzing the office space, the speech privacy analysis method outlined in Chapter 6 of "Architectural Acoustics" by David M. Egan will be used. The

speech analysis method is a step-by-step procedure broken down into 6 steps that are used to determine the minimum STC rating for common barriers between adjacent spaces in order to achieve satisfactory privacy. The speech privacy analysis procedure can be seen listed and described in Figure 65.

 Speech Effort (dBA): Describes how people will talk in the source room. It is assumed that both talker and listener are located at least 2 to 3 ft away from the common barrier.

Conversational: Most private offices, hotel rooms, hospital patient rooms, and so on, where face-to-face conversations between persons are within 6 ft, or words are spoken into a telephone.

Raised: Boardrooms and conference rooms where people usually increase their speech effort to a raised voice level. (Seating layouts for conference rooms should be circular, oval, or lozenge-shaped so talkers and listeners will be close together.)

Loud: Noisy computer equipment rooms, where operators must speak in a loud voice to communicate; psychiatrists' offices; and classrooms.

Shout: Psychiatrists' treatment rooms, where patients may become excited. Under conditions of determined screaming, sound levels can be much greater than 78 dBA.

Source Room Floor Area A₁ (ft²): Approximates the effect of sound absorption in the source room.

In a small room, sound reflects more frequently from the room surfaces which results in a buildup of sound energy. Conversely, in a large room sound will tend to spread out so the level of speech signals will be lower. It is assumed by the speech privacy method that at least one major surface is sound-absorbing. However, for sparsely furnished reverberant rooms, use $A_1 < 1/2$ of the actual source room floor area.

3. Privacy Allowance: Represents the kind of privacy that is desired.

Normal: The occupant wants reasonable freedom from disturbing intruding speech. Intruding speech may be loud enough to be generally understood with careful listening but not sufficiently loud to distract occupants from work activities. For example, although engineers, accountants, and other professionals may work closely together, they routinely desire privacy from their neighbor's distracting conversations.

Confidential: The occupant does not want private conversations overheard in the next room. Intruding speech is reduced so that an occasional word may be recognized but comprehension of phrases and sentences is not possible. Doctors and lawyers usually require confidential privacy; likewise, such privacy is essential in courthouses between courtroom and jury room, and between courtroom and witness waiting room. Executives and supervisors also usually require this degree of privacy to be free to discuss sensitive issues with employees.

Sound Transmission Class STC: Accounts for sound transmission loss of common barrier.

The STC is a single-number rating of airborne sound transmission loss performance for a barrier, measured over a standard frequency range. STC ratings are given in Chap. 4 for various building constructions. If all other speech privacy factors are known, the required STC can be determined by setting the speech privacy rating number equal to 0. A speech privacy rating number of 0 represents a condition where excessive intruding speech does not occur.

 Noise Reduction Factor A₂/S: Approximates the effect of sound absorption in the receiving room and the size of the common barrier.

The receiving room size A_2 (floor area, ft²) is important because noise buildup is greater in small rooms than in large rooms. The common barrier size S (surface area, ft²) is also an important factor because it will be the primary transmitter of sound energy to the receiving room. The larger the common barrier, the more sound transmitted.

Adjacent Room Background Noise Level (dBA): Represents masking sound available.

The background noise levels in the adjacent room should be designed to cover up, or mask, the intruding speech signals. Background noise should be bland, continuous, and virtually unnoticeable to the occupants. Recommended background NC levels and corresponding RC levels are presented in Chap. 4. (Remember dBA values are about 6 to 10 greater than corresponding NC criteria.) It also is important that the source of the background noise be reliable. For example, in offices where work activity fluctuates, the noise produced by the activity also will fluctuate. Consequently, designers should always specify reliable sources of background sound such as airflow noise at air diffusers of constant-volume HVAC systems or, in special situations, neutral noise from electronic masking systems (not music, which contains information).

Figure 65 Speech privacy analysis step-by-step procedure from "Architectural Acoustics" by M. David Egan

For the acoustical study, the common wall barrier between a conference room and private office was evaluated.

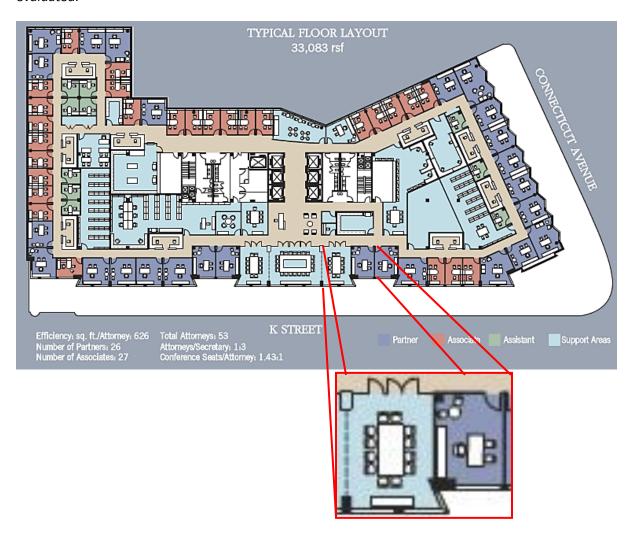


Figure 66 Plan of an attorney's private office (right) and adjacent conference room (left)

The dimensions for the two spaces used for analysis can be seen in Figure 67.

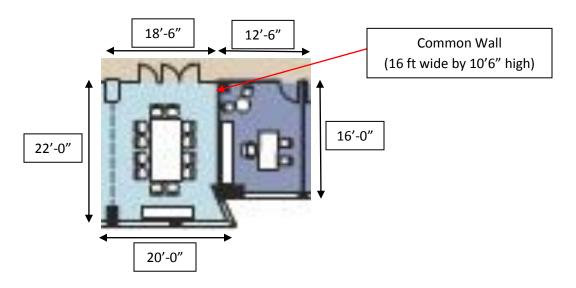


Figure 67 Private office room and conference room dimensions

According to the existing partition schedule, one of the partitions used as a common barrier between the enclosed spaces can been seen in Figure 68. For analysis, this partition type will be used as a common wall barrier between the office spaces housed in the new structural system.

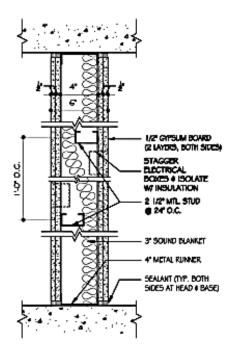


Figure 68 Common partition wall barrier between the private offices and conference rooms with an STC rating of 54

Image obtained from the existing partition wall schedule sheet A1.50

The above partition wall barrier was used to determine if it provides satisfactory privacy between the two spaces chosen for analysis.

To begin the analysis, it was decided that both enclosed spaces will have carpeted floors and soundabsorbing acoustical ceilings. With the spaces being occupied by attorneys, it was assumed that both spaces will be used for confidential work. The step-by-step speech privacy analysis can be seen in Table 44 and Figure 70.

Speech Privacy Analysis							
	•	•					
Step 1: Speech Effort	Source Ro	om: Confe	rence Roo	m			
	the speed	the speech effort will be raised					
Step 2: Source Room Floor Area A ₁	△ ₁ =	411.5	ft ²				
Step 3: Privacy Allowance	Confident	ial privacy					
Step 4: Sound Transmission Class	The STC value for the common						
	partition v	vall barriei	r is 54				
Step 5: Noise Reduction Factor (A ₂ /S)	Receiving Room (private office) Floor Area, $A_{\mathcal{I}}$				200	ft ²	
	Common Wall Barrier Surface Area, S=			168	ft²		
	NRF=	1.19					
Step 6: Adjacent Room Background Noise	e According to chapter 4 of "Architectural Acoustics" The minumum					um	
	recommended background noise due to the HVAC is:						
	Noise Criteria (NC) - 30 for the private office						
	NC - 25 for	the confe	rence rooi	m			

Table 44 Summary of speech privacy analysis results

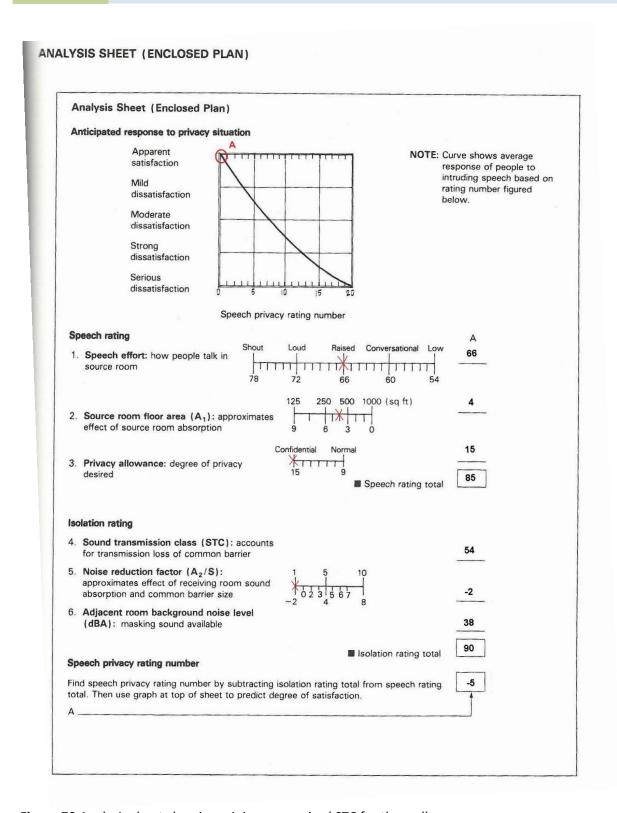


Figure 70 Analysis sheet showing minimum required STC for the wall

As shown in Figure 70, the speech privacy analysis resulted in a speech privacy rating of -5. This shows that the STC-54 rated 8" partition wall with 2-layers of ½" thick gypsum wall board on both sides, staggered electrical boxes isolated with insulation, and 2 ½" metal studs spaced 24" o.c. and is very adequate for providing speech privacy for the offices housed in the new steel structural system.

Lighting Breadth

Increasing the floor-to-ceiling height from 8'-6" in the existing structure to 10'-6" in the new structural system caused the distance to the work plane to increase. Assuming the light fixtures are suspended 1.5 ft. from the ceiling and the work plane is 2.5 ft from the floor, the work plane distance will increase from 4.5 ft. to 6.5 ft in the new system. As a result, the lighting system used in the existing system may not work in the new system with higher floor-to-ceiling heights. For the lighting breadth, the lighting system was designed for a typical office space using the original floor to ceiling height of 8'-6". After changing the floor-to-ceiling height to 10'-6", the same lighting system was checked to determine if it could be used with the new work plane distance. The space chosen for analysis can be seen in Figure 71.



Figure 71 Typical office with existing lighting system

To begin the design, the important tasks that occur in the space had to be determined. It was found that the tasks that will occur in the private office space consist of reading, writing, and computer work. Next, based on the tasks that occur in the space, the target illuminance for the office was found to be 30 footcandles, which was obtained from the IESNA Handbook. The light distribution must be within \pm 10 percent of the target illuminance. Therefore, the illuminance of the light distribution must range between 27-33 foot-candles to be acceptable.

The lighting fixture was selected using Delta Light and a (2) 28 W T5 lamp was chosen using Sylvania's lamp and ballast catalog, which can be found in Appendix F. The light fixture chosen has 87.3% efficiency, which consists of 27.4% of up light and 60% of down light. The light fixture can be seen in Figure 72.



Figure 72 Lighting fixture chosen for the typical office space

After assuming the surface reflectances and determining the total light loss factors, AGI was used to determine both the layout and number of luminaires needed to meet the 30 foot-candle target illuminance for the given space, which can be seen in Figures 73. For design simplicity, the triangular shape of the curtain wall was neglected and was assumed to be straight.

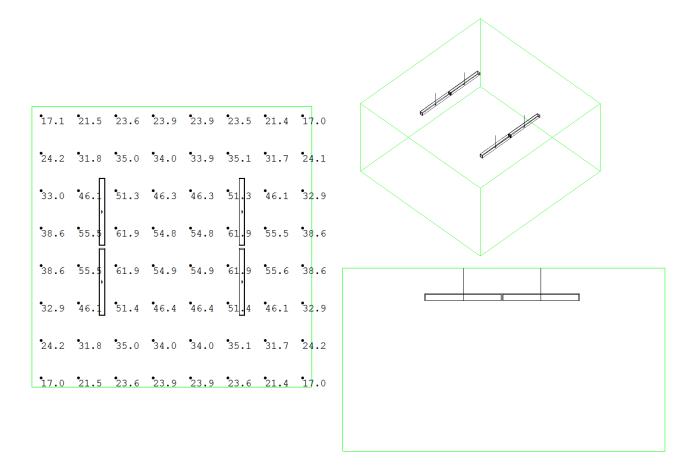


Figure 73 office plan with luminaire layout and illuminance values

The above layout results in a 37.4 foot-candle illuminance which meets the space's target illuminance. A rendering of the space with the new layout can be seen in Figure 74 and the office space's thermograph with the new lighting system can be seen in Figure 75.

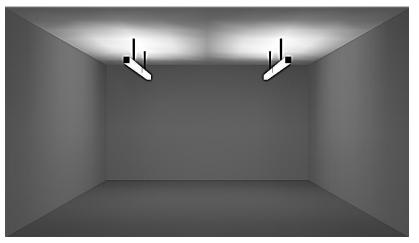


Figure 74 Rendering of the office space with 8'-6" floor-to-ceiling height

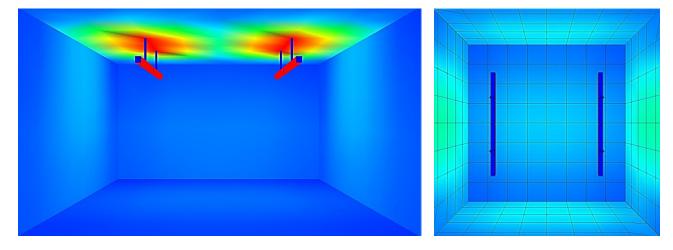


Figure 75 A thermograph of the of the office space with 8'-6" floor-to-ceiling height

The consistent blue color on the floor and walls in Figure 75 represents the designed lighting layout uniformly distributes the light through the space, thus preventing any hot spots from forming on the vertical and horizontal work planes.

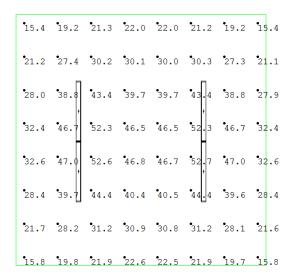
In addition, after determining the number of luminaires needed to meet the target illuminance, the power density was calculated to determine the amount of energy the new lighting system uses. A summary of the power density calculations can be seen in Table 45.

	Exist	ing System with an	8'-6" Floo	r-To-Ceiling	Height				
Design Cr									
	Tasks include:	office work (reading	g, writing,	meetings,	etc), and	PCwork			
	Target illuminance level:	30 fc							
	Additional Considerations:	Avoid reflected an	d direct el	are					
		Create uniform lay			t distriub	ution withi	n ± 10 % of	target illi	uminance
		,							
Summary	of Lighting System:								
	nformation								
	Luminaire Type:	Nobody 200 P1254	1						
	Catalog Number:	6 331 02 88							
	Description:	Direct/Indirect ligh	nt distribu	tion					
Room Det	ails:								
	Length=	15	ft						
	Width=	15							
	Ceiling Height=	8.5							
	Room Floor Area=	225							
	Work Plane Height=	2.5							-
	Room Reflectances:	2.3	IL.						
	Ceiling (acoustical ceiling tile)	70	94						
	Wall (gypsum wall board painted white)								-
	Doors (wood)	30							
	Windows		96						_
		20							
	Floor (light gray carpet)	20	70						
						-			
	Average Wall Reflectance, ρ wall avg=	0.30 (21ft ²)			0 (361.5ft	<u>^)=</u>	45.7	%	
			51	lOft ²					
Light Loss	Factors (LLFs)								
	Luminaire Dirt Depreciation(LLD)	0.93	(The lumi	naire is ler	sed and it	t's assume	the lumir	naires are	on a twel
			month cle	eaning sch	edule and	are locate	d in a clear	n environi	ment)
	Lamp Burnout Factor (LBO)	1.0	(It's assur	ned the la	mps are go	oing to be c	hanged as	they burn	out)
	Lamp Lumen Depreciation (LLD)	Mean Luments	2418=	0.93					
		Initial Lumens	2600						
	Ballast Factor (BF)	1.0							
	Total LLF	LDD*LBO*LLD*BF=	0.865						
Calculatio	ons:								
he lume	n method								
E _{eve} =	lamps per luminaire x # of luminaire	s x CU x LLFs =	37.4	(obtained	from AGI	analysis)			
	Floor area								
	1100. 0160								
Power D-	nsity used=1 ballast/lum(4 lum)(65 W)=	0.510	W/ 5 -2						
rowerbe		0.510	w/π						-
	510 ft²								

Table 45 Power density calculations

It was found that the power density of the lighting system was 0.510 W/ft². According to IESNA 2010, the maximum power density for a closed office space is 1.11 W/ft². This represents that the new lighting system conserves energy and thus results in energy savings.

After designing the lighting system for the office space in the existing structural system, the same lighting system was checked to determine if it will meet the office space target illuminance in the new structural system with higher floor-to-floor heights. Using AGI to check the design, the floor-to-ceiling height was increased to 10-6". Keeping the work plane height at 2'-6" and the suspended lighting fixture distance at 1'-6", the distance to the work plane increased to 6'-6" in the new system. The illuminance values of the new space can be seen in Figure 76.



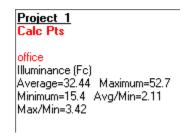


Figure 76 Illuminance values of the office space with a 10'-6" floor-to-ceiling height

After the analysis, it was found that the lighting layout used in the existing office space can also be used in the new space with an increased work plane distance of 2'-0''. As can be seen in Figure 76, the design resulted in an average illuminance of 32.44 foot-candles, which meets the target illuminance within $\pm 10\%$. A rendering of the space with the new layout can be seen in Figure 77 and the office space's thermograph with the lighting system can be seen in Figure 78.

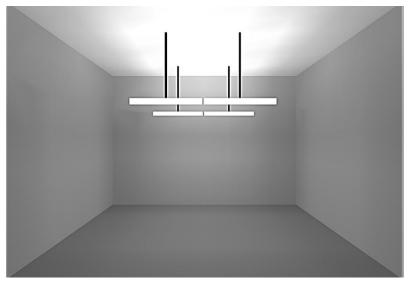




Figure 77 Rendering of the office space with 10'-6" floor-to-ceiling height

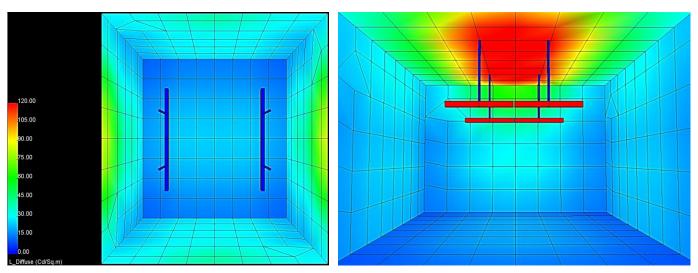


Figure 78 A thermograph of the office space with 10'-6" floor-to-ceiling height

The consistent blue color on the floor and walls represents that the designed lighting layout uniformly distributes the light through the space therefore preventing any hot spot from forming on the vertical and horizontal work planes.

In addition, after determining the number of luminaires needed to meet the target illuminance, the power density was calculated to determine the amount of energy the new lighting system uses. A summary of the power density calculations can be seen in Table 46.

	Ne	w System with a 10	'-6" Floor-	To-Ceiling H	leight				
Design Cri									
	Tasks include:	office work (readin	g, writing.	meetings.	etc), and I	PCwork			
	Target illuminance level:	30 fc (obtained fro							
	Additional Considerations:	Avoid reflected an		are					
		Create uniform lay			ıt distriub	ution withi	n ± 10 % of	target ill	uminance
Summary	of Lighting System:								
	nformation								
	Luminaire Type:	Nobody 200 P1254	1						
	Catalog Number:	6 331 02 88							
	Description:	Direct/Indirect ligh	nt distribu	tion					
Room Det	ails:								
	Length=	15							
	Width=	15	ft						
	Ceiling Height=	10.5	ft						
	Room Floor Area=	225	ft ²						
	Work Plane Height=	2.5	ft						
	Room Reflectances:								
	Ceiling (acoustical ceiling tile)	70	%						
	Wall (gypsum wall board painted white)	60	%						
	Doors (wood)	30	%						
	Windows	8	96						
	Floor (light gray carpet)	20	%						
	Average Wall Reflectance, p well ave=	0.30 (21ft²)	+0.08(15)	7.5ft²)+0.6	0 (451.5ft	²)=	46	96	
	71 112 213			30 ft ²	•				
Light Loss	Factors (LLFs)								
	Luminaire Dirt Depreciation(LLD)	0.93	(The lumi	naire is len	sed and it	's assumed	the lumir	naires ar	e on a twel
			month cle	eaning sche	edule and	are located	d in a clear	n environ	ment)
	Lamp Burnout Factor (LBO)	1.0	(It's assur	ned the lar	nps are go	ing to be c	hanged as	they bur	n out)
	Lamp Lumen Depreciation (LLD)	Mean Luments	2418=	0.93					
		Initial Lumens	2600						
	Ballast Factor (BF)	1.0							
	Total LLF	LDD*LBO*LLD*BF=	0.865						
Calculatio									
The lumer									
E _{avg} =	lamps per luminaire x # of luminaire	s x CU x LLFs =	32.4	(obtained	from AGI	analysis)			
	Floor area								
	nsity used=1 ballast/lum(4 lum)(65 W)=	0.413	111/52						
Power De	nsity used= 1 hallast/lum(4 lum)(65 W) =								

Table 46 Power density calculations

It was found that the power density of the lighting system was 0.413 W/ft². According to IESNA 2010, the maximum power density for a closed office space is 1.11 W/ft², which represents that the new lighting system conserves energy and thus results in energy savings for the new space.

In addition to designing the lighting system for the typical office space supported by the existing and new structural systems, the control of reflected glare was investigated. According to "Mechanical and Electrical Equipment for Buildings," there are a number of techniques that can be used to minimize contrast loss due to veiling reflections while maintaining adequate illumination. One of the techniques investigated was physical arrangement of system elements. In a space that uses multiple sources, particularly continuous rows as the design layout chosen for the office space, placing the work between

rows with the line of sight parallel to the long axis of the units is an effective technique. Figure 79 shows both the preferred and non-preferred arrangement of work.

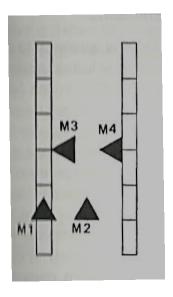


Figure79 Preferred and non-preferred arrangements of four possible work planes *Image obtained from "Mechanical and Electrical Equipment for Buildings"*

According to "Mechanical and Electrical Equipment for Buildings," M2 is the best location in that the work plane receives light from both rows of luminaires. Positions M1 and M3 are undesirable because they have bright sources in the offending zone, which can be seen depicted in Figure 80. Position M4 is also an ideal location because there are no glare sources in the offending zone.

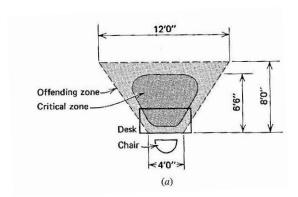


Figure 80 Offending and critical zones for the work plane Image obtained from "Mechanical and Electrical Equipment for Buildings"

Based on the above information, if the work plane (desk) in the office space were located between the two rows of luminaires, where the occupants line of sight were parallel to the long axis of the luminaire units (similar to location M2 in Figure 79), direct and reflective glare would be avoided because the light

contributed by the two rows of luminaires would bounce off of the desk away from the occupant. This desk configuration would also prevent shadows. If the desk were placed in front or directly beneath the row of luminaires (similar to locations M3 and M1 in Figure 79) the occupant would be subjected to direct and reflected glare and shadows, which are undesirable.

Conclusion

Before re-locating 1000 Connecticut Avenue to Arlington, VA it was found that to stay within Washington D.C.'s zoning height limit of 130 ft. when using the new steel structural system the system would have to be designed for a reduced number of stories. Reducing the number of stories from 12 to 11 was undesirable, therefore to create a fair comparison between the existing concrete system and new steel system the building was relocated to Arlington, VA, which does not have a height limit. The goal of the re-design was to

- increase the bay sizes to open the floor plan layout;
- increase floor-to-floor height to increase the openness of the space;
- Reduce the construction schedule;
- Reduce the structural system cost;
- Increase the annual revenue by increasing the rental value of the space and increasing the amount of rentable space

When designing the steel framing layout, a uniform layout was created to reduce number of required skewed members and wider bays were created by removing certain existing column lines and relocating columns. Wider bays were created to open the floor plan and to increase the rental value of the space with reduced column obstructions and more rentable space. Maintaining an open floor layout was an importance aspect of the re-design, therefore for the lateral system moment frames were used to avoid obstructions in the in the floor plan layout and braced frames were located around the elevator shafts and stairwell cores. The gravity system was designed as a composite steel system to achieve long spans while maintaining minimal structural depth. AISC 14th edition was used to design the gravity frame members. ETABS was used to analyze and design the lateral system. The lateral system design and analysis was based on the wind and seismic lateral loads calculated according to ASCE 7-10. The wind loads were determined by using Analytical Procedure (method 2) outlined in ASCE 7-10 and the seismic loads were determined by using the Equivalent Lateral Force Procedure outlined in ASCE 7-10. After designing the gravity and lateral systems, typical member connections were designed. The typical connections designed were orthogonal and skewed shear connections and a moment frame connection.

After designing the gravity and lateral systems, two breadth studies were conducted to determine how the new structural system affected other aspects of the building. The first breath study was construction management impact. In this breadth, it was found that the new structural system will cost \$5,994,630 more than the existing structural system. Second, the proposed construction sequence for the new structural was erected 18 days sooner than the existing structural system, thus representing the use of the new system reduced the construction schedule. Third, using the existing 1000 Connecticut Avenue site for the site logistics analysis, it was found that the site will be managed similarly for both concrete and steel construction. Fourth, the building will maintain LEED Gold Certification with the use of the new steel structural system. Last, the revenue obtained from the new structural system with wider bays and higher floor-to-ceiling heights resulted in additional revenue of \$3,705,450 annually since the rental value of the space increased with the new framing layout. Therefore based on the construction management breadth, it is concluded that the new structural system with wider bays and higher floor-

to-ceiling heights results in an overall very successful design with a reduced construction schedule and increased rental value. It is concluded that the proposed steel structural system is a viable alternative system to use in Arlington, VA since the new system has many additional benefits compared to the existing concrete structural system.

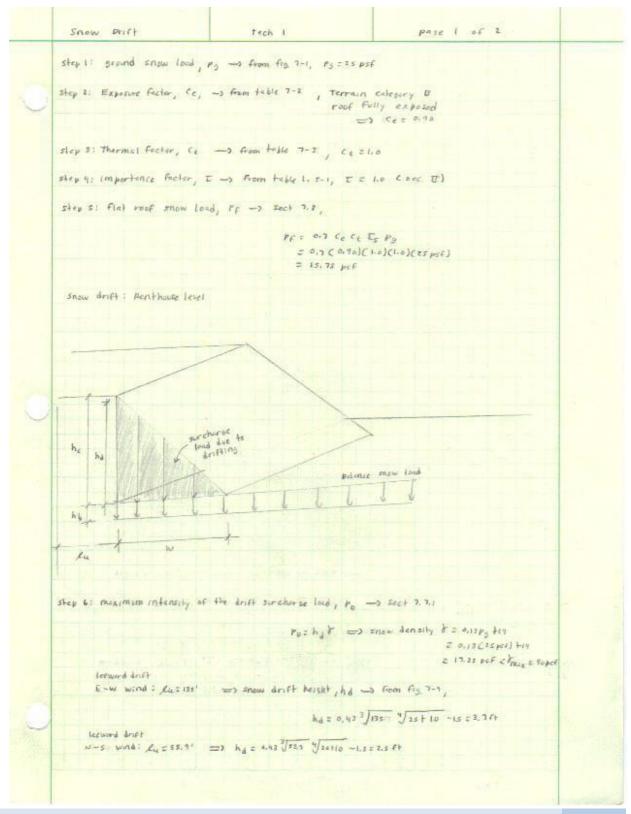
The second breadth studied was acoustics and lighting impact. This breadth involved determining the sound treatments required for a typical office space located in the new structural system. The analysis began by determining the level of speech privacy the common wall barrier between offices provided. It was shown that a 54 STC rated 8" partition wall with 2-layers of ½" thick gypsum wall board on both sides, staggered electrical boxes isolated with insulation, and 2 ½" metal studs spaced 24" o.c. and is very adequate for providing speech privacy for the offices housed in the new steel structural system. In addition, since the new structural system was designed for higher floor-to-ceiling heights, lighting illuminance applied to the work plane surfaces were affected. As a result, a lighting breadth was conducted by designing the lighting system for a typical office space using the existing floor-to-ceiling height of 8'-6" and checking to determine if the same lighting system can be used for the new floor-to-ceiling height of 10'-6". AGI was used to design the lighting system for the space and the average illuminance in the space was compared to the target illuminance of the space. The IESNA Handbook 10th edition was used to determine the target illuminance and maximum power density for a private office space. It was found that the lighting system designed for the space with a floor-to-ceiling height of 8'-6" also achieved the target lighting illuminance for the space with a floor-to-ceiling height of 10'-6".

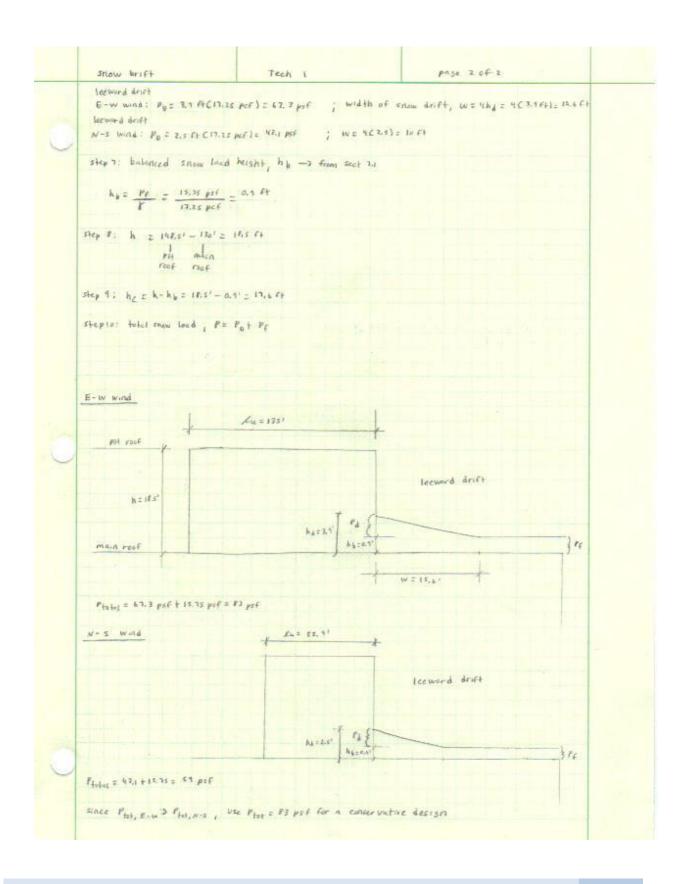
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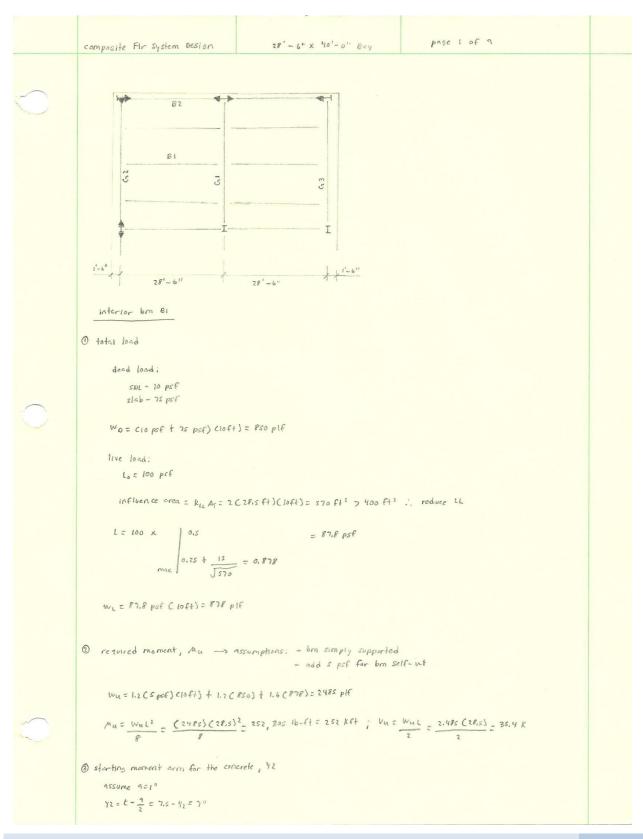
Appendix A: Gravity System Design

Snow Load Calculation





Gravity Floor System Design

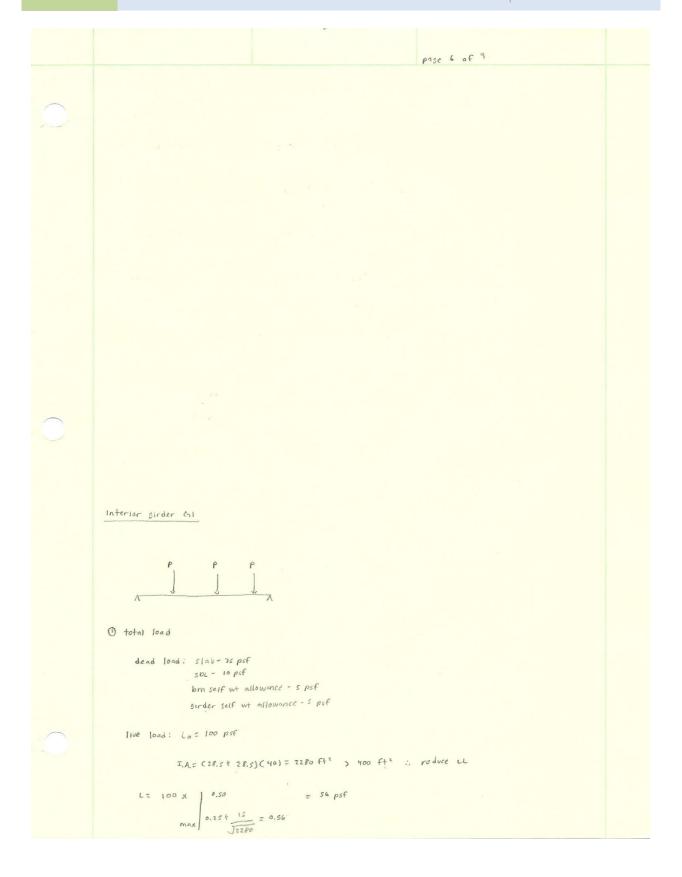


	page 2 of 9
\mathfrak{G} determine \mathbf{I}_{LB}	
all & all max = 1/360	
360 3878) (28.5)4 (1728) & 28.5 (12)	
ILB 2 S(0.878)(285)4(1728) = 473 in4	
$\Delta_{TL} \leq \Delta_{TL_f reax} = {}^{L}/_{240}$	
I(B 2 500.878+0.850)(28.5)4 (1728) = 621 In 4	
(Select potential W-shapes from table 2-19 and 3-20 in Manual (SAn 2 252 Kft, ILB 2 621 1174)	af
WIOX26 , ILB=655 in4 , 8,4n= 313 KFt , & Pn= 317 K	(41=5)
WIZXZZ , ILB = 631 in" , BMn = 274 Kft , Eqn = 238 K	cy1=3)
W14x22, ILB = 672 In4 , AMR = 270 KFt , & Qn = 199K	(41=4)
W14 X26, ILB = 634 109 , BMn = 265 Kft , & Qn = 135K	(11:6)
6 # of studs/bm	
wlox26: $\frac{29a}{9h}$ x2 = $\frac{317}{17.2}$ x2 = $\frac{38}{28.5}$ \times use 2 studs/rib 17.2 1 stud/rib	W19xx6: 135 x 2 = 16 studs < 28.5
317 X2 2 44 Steds < 28.51(2) = 57 1.0 K	
W12X22: 238 x 2 = 28 studs < 28.5'	
W14x22; 199 x2 = 24 studs < 28,51	
1) check economy	
W10x26 W44 Studs : 26 # x 28.5' + 44 Studs x 10#/stud= 1181#	
W 12x22 W/ 28 studs : 72 # x 28.5' + 28 x 10#/stud = 907 #	
w14x22 w/ 24 studs ; 22 #x 28.51 + 24 x 10#/stud = 867 #	
W14x26 W1 16 Steds: 26 # x28,5" + 16x 10 # 1sted = 901 #	

	28'-6" x 40'-0" Bay page 3 of 9	
	1 check a	
-0	$\frac{2 = \xi Q_{0}}{0.88 f'c beff}$ $\frac{1}{2} C(0) C(12) X 2 = 85.5 '' \leftarrow \frac{1}{2} C(0) C(12) X 2 = 120'' $ $\frac{28.5 C(12)}{8} + \frac{10 C(12)}{2} = 102.75''$	
	$\min \left \frac{28.5 \text{ (12)}}{8} + \frac{10 \text{ (12)}}{2} \right = 102.75\%$	
	W14 x22: a = 199 = 0.68" < assumed 1" : 0k	
	1 check unshored strensth	
	W14 X22 , \$\phi_6 Mp = 125 KF+	
	Wu = 1.2(75 psf) (10ft) + 1.2 (22 p1f) + 1.6(20 psf) (10ft) = 1246 plf	
	Auz 1.246 KIF (28.5) = 126.5 KFt 3 \$ pmp : Increase section	
	try W14x26	
	Wu = 900+ 1.2 (26) + 320 = 1251 plf	
	Mu= 127 Kft < \$6 Mp= 151 Kft : ak for no shoring	
	1 check Awc	
	Wwe = 75 psf cloft) + 26 plf = 776 plf	
	$\Delta_{WC} = \frac{5(0.776 \text{ kif})(285)^{9}(1728)}{384(29000)(245)} = 1.62^{9}$	
	Awc, max = 28.5 (12) = 1.43" 2 Dwc not ok	
	try W16x26: Awc = s(0.776)(28.5) 4 (1728) 1.32" < Dwc, max ok 384(24000)(201)	
	1) check LL and TL deflection W16x26;	
	42=7, point 41=7 (29a= 26 K), ILB= 640 in4	
	ALL = S(0.878) (28.5) 4 (1728) = 0,70" < ALL, MOX = 0.95"	
	ATL = SCI.728)(28.5)4 (1728) = 1.384 2 ATL, max = 1.43"	

	28'-6" x 40'-0" Bay page 4 of 9	
	(1) check Au, Vu and bm self- ut assumption	
2	My = 252 kft < DMn = 296 Kft : OK	
	Vu = 35,4 K < Ø Vn = 106 K 2. 0 K	
	self wt = 26 plf = 2.6 pcf < s psf : 6k	
	↑ Wtelb,	
	(3) check economy: W16x26: \$0, x2 = 96K x2 => 12 studs < 28,5' ok	
	use w16x26 w1 12 studs	
0		

	28'-6" X 40'-0" Bay	pase s of 9	
	26 - 0 X 10 - 0 Bay	h-12c 2 27 ,	
exterior bm B2			
Managed Copy and an annual company of the Annual Copy and an annual Co			
at the terminal of the second			
281-611			
1 total local			
And Ind.			
deed locd: sleb - 75 psf			
SDL - to psf			
self-ut cllow - s psf			
certain wall- 250 pif			
Wo = (7st lots) psf (6.s ft) f :	iso pif = 83s pif		
live loca:			
Lo = 100 psf			
influence area = 21.5 ft Cli	1.5 F4] = 327.75 Ft2 < 400 Ft2, 11 red	action not applicable	
W_ = 100 psf C6.sft) = 650 p11	e		
The part of the pa			
Wu = 1,2 (835) + 1,6 (650) = 2042	p IF		
@ Mu = 2.042 KIF (28.5 Ft) = 131	8,2 Kft < ØMn = ØMp => 2x > 13	36.9 in 3	
12		0.9 (so kc;)	
W 2 W W C C 2 C C C 1			
Vu = 2.042 KIF (28.5ft) = 29 K	2 900		
3 ATL & ATL, max = 1/290 = 1.925	,		
ATT = WEY => IX = 2.045 (2	8.5) 4 (1728) = 146.7 in4		
384 EI 384 C	29000)(1.425)		
@ select non-composite w-shope			
try wizx26 beam 2x=3	7.2 103 5 36,9 103 OK		
	4 14 2 148 5 14 0 K		
1× = <0	9		
ØMO =	140 Kft > 138.2 Kft OK		
	84.2 K > 29 K OK		
1 1 5 1 1	and the land		
note: required by size to support For by size due to combined			
refer to moment frame E ele	evation in report		
in money:			



	28'-6" × "10"-0" Bay page 7 of 9	
-	$W_{4} = 1.2 (7s + 10 + s + s) + 1.6(s6) = 204 psf$ $P_{4} = 204 psf \left(\frac{28.s + 28.s}{2} \right) (10) = 58.1 K$	
	(1) Mu = 0.50 PL = 0.50 C 58.1 K) C 40ft) = 1162 Kft Vu = 1.5 P = 1.5 (58.1 K) = 87.2 K	
	3 ALL & ALL, PICX	
	$\frac{1}{EL} = \frac{1.33\%}{360} = \frac{40C(2)}{360} = \frac{1.33\%}{360}$ $\frac{1}{29000} = \frac{2394}{360} = \frac{1.33\%}{29000} = \frac{1.33\%}{2900} = \frac$	
	$A_{TL} \leq A_{TL, max} = \frac{L}{240} = \frac{40c_{12}}{240} = 2^{n}$ $I_{LB} \geq \frac{0.05(43k)(40f+)^{3}(172f)}{24000(2)} = 4100 in^{4}$	
	\mathfrak{D} required unshared strength Sirver self-ut allowance $P_{u} = 1.2 \left[(75+5) \text{ psf } (10f+) \right] (28.5 \text{ f+}) + 1.6(20 \text{ psf }) (10f+) (28.5 \text{ f+}) = 36.5 \text{ k}$	
	$A_{u} = 0.50 PL = 0.50 (36.5 k)(40ft) = 730 kft \le 96 Mp$	
	(3) assume $a = 2^n$, $42 = 7.5 - \frac{2}{2} = 6.5^n$	
	© select potential w-shapes (\$\phi_{Mn} \ge 1162 kft, \ I_{18} \ge 4100 m4, \ \phi_{b} mp \ge 730 kft)	
	W24×76: YI=BFL, TLE = 4480 in4, ØMn = 1240 KFt, ØbMp = 750 KFt, €9n = 509 K W24×84; YI= 6, TLE = 4550 in4, ØMn = 1290 KFt, ØbMp = 840 KFt, ≤9n = 425 K	
	1 # of study sirder and economy from table 3-21 in manual, Pn = 21.5 K	
	1024 x76: 29n x2 = 509 x2 = 48 stude; 76 # x 40 + 48 stude x 10 #/stude = 3520 #	
	W24x84: 425 x2 = 40 studs . 84# x 40' + 40 studs x 10#/stud = 3760#	
	try W24x76 since it's more economical	

28'-6" x40'-0" Bay page 8 of 9

Check a

for interior sinder, befor =
$$\frac{2 \times spon}{\rho} = \frac{2 \times 40c(2)}{\rho} = 120^{\circ} = \frac{1}{2}$$

min $\frac{2 \times \frac{1}{2} + rib_{Wid} + h}{2} = 2 \times \frac{28.5 \cdot C(2)}{2} = 342^{\circ}$

1 check all, azi, inshored strensth, Mu, vu, sinder self- wt assumpt.

unshored strength: Pu = 1.2 [crspsf) Cloff) + 76 plf] Cz8.5 ft) + 1.6 Czo]C (off) cz8.5 ft) = 32.4 K

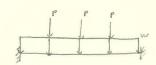
My = 0.50 (37.4 k) (40ft) = 748 Kft < \$6 Mp = 750 K OK

Mu = 1162 Kft < BMn = 1240 Kft OK

V4 = 87.2 K < PVn = 315 K OK

use w24x 26 sirder with 48 studs

Exterior Chirden Car

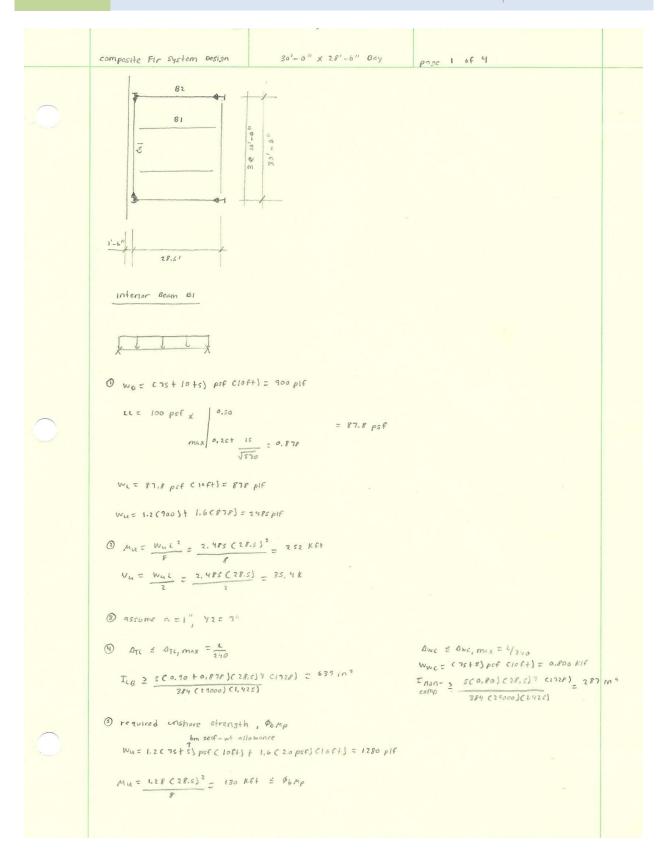


1 load :

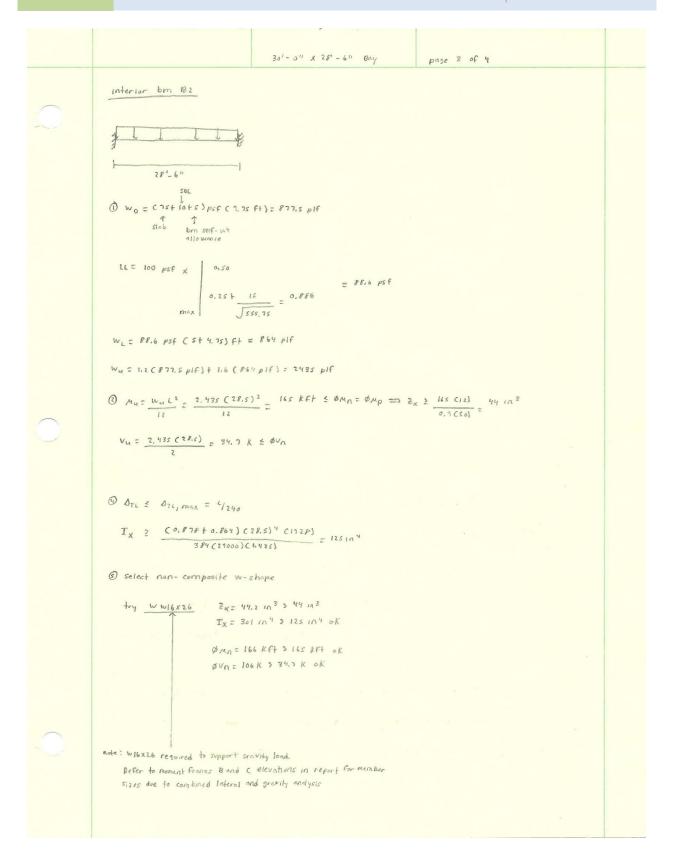
live : 100 psf x
$$0.25 + \frac{15}{J_{1200}} = 0.68$$

pase 9 of 9 28'-6" X 40'-0" Boy bra-not allow. Pu = [1.2 (75+ 10+5) psc + 1.6 (68 psc)] (15,75 f+)(10f+) = 34,2 K Wuz 1.2 (s psf) (1s, 7s ft) + 1.2 (250 p) f) = 39s p)f sinder seif-ut allow. @ My = 0.313 PL + WL2 = 0.313 (34.2 K) (40 Ft) + 0.395 KIF (40 Ft)2 = 481 KFt & DMn = DMP Vus 1.5p + wl = 1.5(34,2 k) + 0.345 kif (40ft) = 59.2 k = 000 $\phi_{Mp} = \frac{\phi F_Y^2 x}{0.9(50 \text{ Ke}_i)} \implies Z_X = \frac{4F_1 \text{ K} F_1^2 \text{ Clab}}{0.9(50 \text{ Ke}_i)} = 12\%. 3 \text{ in}^3$ 1 ATL & ATL, max = 4240 = 2.0" $\frac{\Delta_{TL} = \frac{0.010 \ PL^{2}}{ET} + \frac{WL^{4}}{384 \ ET} = \frac{0.010 \ (34,2) \ (40)^{3} \ ci728)}{21000 \ T_{X}} + \frac{d.355 \ (40)^{4} \ (21728)}{384 \ (25000) \ T_{X}} = \frac{1304}{T_{X}} + \frac{157}{T_{X}}$ Z,0" = 1441 => Tx 2 731 104 1 select non-composite w-section wayxes girder required w1 2x = 139 in 3 > 12 F. 3 in 3 ok to support gravity land Ix = 1350 in 4 3 731 in 4 ok PMA = 503 KFt > 4FI KFt OK OUN = 252 K > 59.2 K 6K note; Etabs used for lateral analysis self wt = 55 plf = 3.5 psf < 5 psf ok 15.75 FF - refer to moment frame 1 elevation in report for member sizes due to combined lateral and gravity analysis Extense Chieder Ch3 use wayers w/ 32 studs - refer to excel spread sheet for design

Live Trib Spa	Exterior Gir id Load:	der G3- simply supporte slab SDL	ed with		psf	and a distribu	ted dead lo	ad	
Live Trib Spa	d Load:	SDL							
Trib Spa				10	nsf				
Trib Spa									
Trib Spa		bm self-wt allow.			psf				
Trib Spa		girder self-wt allow. wall			psf				
Trib Spa		wali		250	pir				
Trib Spa	Load:	office space		100	nsf				
Spa	tueu.	office space		100	μοι				
	. Width:	15.75	ft						
	n, L:	40							
i Infl	uence Area:	1200	ft ²						
Ll _{re}		0.68							
	-								
	P _u =	34.2	kips						
	W _u =	0.395	klf						
	•								
step 2	M ₄ =	763	k-ft		≤¢Mn				
	V _u =		kips		≤ØVn				
		-	- Topis						
step 3	assume a=2"	Y2=7-a/2=6.5"							
step 4	$\Delta_{TL} \le \Delta_{TL, rest}$	L/240=		2	in				
	Punfactored**	24.9	kips						
	W _{unfactored} =								
	"unfactored" Lo≥								
	1,02	2/03							
step 5 u	nshored strength	ø.m.							
	an an engel	- 5 p							
De a	d Load:	slab		75	psf				
		girder self-wt allow.			psf				
Live	Load:	Constr. LL		20	psf				
	. Width:	15.75							
Spa	n, L:	40	ft						
			10-						
	P.=		kips						
	M,=	403.2	kift		≤ Ø _b M _p				
etc- e	e.t.	notostalk							
step 6		potential w-shapes							
	(ØM _n ≥763 kft, l	_{ta} ≥ 2703 in 4, ØbMp≥ 4	us kit						
W21x57	Y1=	BFL				W24x55	Y1=		6
W41X3/	Y1= ∑Qn		kips			WZ4835	Y1= ΣQn		6 329 kips
1	ØMn=	850					ØMn=		329 kips 853 kft
	ØbMp=	484					ØbMp=		503 kft
	La=	2770					l _a =		920
							_		
step 7	# of studs	per girder and economy	,						
	stud strength	21.5	kig	25					
W21x57	∑Qn/Qx2	38.05		+		40 studs			
	economy:	2680	#						
W24x55	50a 40 2	30.6				32 studs			
W24X35	∑Qn/Q x2 economy:	30.6 2520		7		oz studs			
	Somothy.	220	-						
-	try W24x55 w/ 32	studs since it's more ec	onomic	al					
step 8 che	ck a								
1		ı							
	b _{e#} =								
		231							
		78							
	min	360	in						
	ΣQn=		kips						
	f'c= beff=		ksi in						
	Dell*	/0							
	a*	∑Qn/(0.85x f'c xbeff)		1.24	≤ 2.0 in	ok			
step 9	check ∆LL, ∆	TL, unshored strengh, N	Лu, Vu,	and g	irder se	lf-wt assumpt	bn		
	PL, unfactored"		kips						
	l _{te} =	2920.0	in*						
	∆ _{u,} =	0.70	in≤Δ _t	Lme ⁼	L/360:	1.33 in	ok		
	∆ _{TL} =	1.85	in≤Δ ₁	[Lyrex ²	L/240:	2.0 in	ok		
		alan c							
Uns	hored strength	ØbМр=	503 kf	rt≥ 40	is kft		ok		
1	Mu-	763	16-0	ina-	853 kf		ok		
1	IVI U	/03	KK 2 K	envill s	0.33 KI		J.K		
	Vu-	59.2	kips <	ØVn•	252 kip	s	ok		
		332		2000					
gird	er-self wt assump	t=girderwt/trib.Width	= 55 pit	/15.7	5 ft= 3.5	5 pst	≤ 5 psf	ok	
gird	er-self wt assump	t= girderwt/trib. Width	= 55 plf	/15.7	5 ft= 3.5	5 pst	≤ 5 pst	ok	
_	er-self wt assump Girder Design:				5 ft= 3.9		≤ 5 pst	ok T	

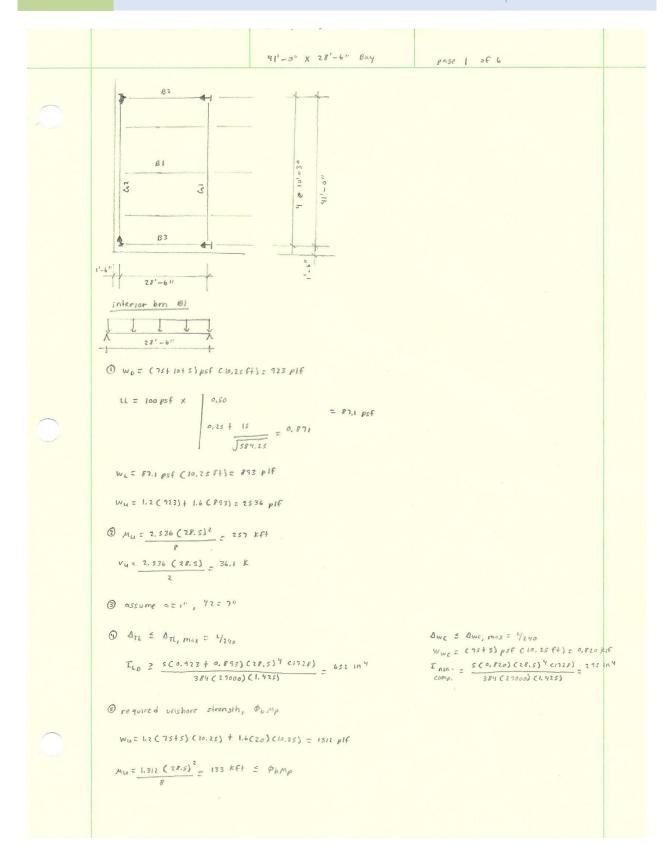


30'-0" x 28'-6" Bay page 2 of 4
6) select potential W- shopes CAMP 2 252 Kft, ILB 2 639 IN 4, Ob MP 2 130 Kft, I 2 287 IN 4)
W(4 22 VI = 1 50 - 14 2 F - 712 - 4 T - 74 (2 4 day 2 - 4 5 day 2 - 4 6 day 2
W14x30: 41= 6, Eqn= 147k, ILB= 717 in4, I= 291 in4, PMn= 300 Kft, PBMp= 177 Kft
W 16x26: 41= 7, 29n= 96k, Thes 640 in", Is 301 in4, \$MAS 259 Kft, \$6 Mp= 166 Kft
1) # of study on and economy
W14x30: 147k x2 => 18 studs ; 30 #x 28.5' + 18 studs x 10#/stud = 1035#
W 16x26: 96K x2 => 12 studs; 26 # x 28.51 + 12 studs x 16# 1stud = 861 #
try W16x26 w 12 studs
6 check a
beff = 8s, si
a = 16 0,32" < 1" of
1 check all, ATL, Awc, unshared strongth, Mu, Vu, bon self-ut assumption
ALL = 5(0.878 KIF)(28.5 FH)4(1728) = 0,70" < 4260 = 0.75" OF
DTL = 5(0.900 + 0.878) (28.5)4 (1728) = 1,42" < 4240 = 1.43" OK 384 (29000) (640)
OWC = SE 0,800) C28,534 C1728) = 1.36" < 4240 OK
Muz 252 Kft < PMn = 259 Kft
Vu = 35.4 k < ØUn =
bm self-wt = $\frac{26 plf}{10ft}$ = $\frac{2.6 psf}{10ft}$ = $\frac{2.6 psf}{10ft}$ = $\frac{2.6 psf}{10ft}$
use w16x26 bm w1 12 stods





		ior Girder G1 - fixed with			ds and a	distribute	d des	d load		
Step 1	De ad Load:	slab SDL			psf psf					
		bm self-wt allow.		5	psf					
		girder self-wt allow. wall		5 250	psf olf					
	Live Load:	office space		100	psf					
	Trib. Width:	15.75								
	Span, L: Influence Area:	90 900	ft ft ²							
	Ll _{red}	0.75								
	P _u =	359	kips							
	W _v =	0.395								
step 2	M _u =	200	k-ft		≤ØMn					
step 2	₩G- Vu=		kips		≤ØVn					
step 3	assume a=2"	Y2=7-a/2=6.5*								
step 4	$\Delta_{TL} \le \Delta_{TL, wex}$	L/240=		1.5	in					
	P _{unfactored} = W _{unfactored} =	26.0 0.329	kips							
	lu≥	251								
		4								
step 5	unshored strength	Σ-βro1 _β								
	Dead Load:	slab girder self-wt allow.			psf out					
		-			psf					
	Live Load:	Constr. LL		20	psf					
	Trib. Width:	15.75								
	Span, L:	30	ft							
	P _u =	20.2	kips							
	М,=	134	k-ft		≤Ø _b M _p					
step 6	Select	potential w-shapes								
	(ØM _n ≥269 kft,	l _{ta} ≥251 in4, ØbMp≥1	34 kft	t						
6x26	Y1=	6	,			W16x	31	Y1=		7
	∑Qn ØMn=		kips kft					ΣQn ØMn≃		114 kips 309 kft
	ØbMp=	166	kft					ØbMp=		203 kft
	l _{te} =	734	in"					l _{us} =		756 in ⁴
step 7	# of studs	per girder and econom	v							
	stud strength	21.5		dps						
/16x26	∑Qn/Qx2	13.49		→		14 studs				
	economy:	920	#							
V16x31	∑Qn/Q x2 economy:	10.6 1050		→		12 studs				
	try W16x26 w/ 14	studs since it's more eo	onon	nical						
step 8	check a									
	b _{etf} =	90	in							
		216	in							
	min	63 189	in in							
		•								
	ΣQn= f'c=		kips ksi							
	beff=		in							
	a•	∑Qn/(0.85x f'c xbeff)		0.68	≤ 2.0 in	ak				
step 9	check ALL /	ITL, unshored strengh, F	Mu. V	u, and «	girderse	df-wt assu	mptio	n		
	arriver tellip t									
	Pi., unfectored**	11.8 734.0	kips in ⁴							
	l _{is} =	734.0	an.							
	Δ _{U,} =	0.21	in≤	Δ _{Llome} =	L/360 :		1.0	inok		
	∆ _n =	0.51	in≤	Δπσ=	L/240 :		1.5	inok		
	Unshored strength	ØbМр=	166	kft ≥ 13	4 kft			ak		
	Mu=	269	kfts	ØMn=	290 kf	t		ak		
	Vu=	41.8	kips	≤¢Nn∗	106 kip	s		ak		
	airder self ut server	t= girder wt/trib. Width						≤5 psf	ak	
	Rinder-sell Mt assump	n – girder wij trib. Width	- 26	p#/15.7	σπ= 1.	oo pat		a o psi	GK	
	Girder Design:	Use W16x26 wi	th 14	studst	o suppo	rt gravity	load c	nly	T	

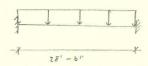


page 2 of 6 41'-0" x 28'-6" Bay 6 select potential w- shapes (\$ Mn = 257, ILB = 652 IN4, \$6 Mp = 133 Kft, I = 245 In4) WIYX34: 41=7 , EQ= 125K, ILB= 732 IN4, I= 340 IN4, PANE 316 KFT, \$6 Mp= 205 KFT WI6x26: 41=6 , Eqn= 145K , ELB= 765 In4 , E= 301 In4 , BMn= 296 Kft, \$6 Mp = 166 Kft WIGK 31: 41=7, Eqn = 114 K, ILB = 783 IN4, It = 875 IN4, DMA = 313 Kft, Db Mp = 203 Kft @ # of studs/bm and economy W14x34: 175 x2 => 16 studs < 28.51 OK ; 34 # x 28.51 + 16 studs x 10#/stud= 1129 # WIGK 26; 145 X2 => 18 studs < 28.5' OK ; 26 # x28.5' + 18 studs x 10# 15tud = 921 # WIGX 31: 114 X2 => 14 stods < 28.5' OK ; 31 # X 28.5' + 14 stods X 10#/stod = 1024# try W16 X26 W1 14 studs (8) check a 0.85(4)(85.5) = 0.5" < 1" 0K beff = 2x 28.5 (12) = 85.5" (-2) = 123" 1 check Qu, ATL, Duc, unshared strength, Mu, Vu, br self-ut assumpt. all = 5(0,893)(28.5)4 (1728) = 0.60" < 4/360 = 0.95" ok 384 (29000) (765) ATL = 5(0,893+0,923)(28.5)4 C/728) = 1.22" < 4/240 = 1.43" OK 384 (29000)(765) Auc = s(0,820) (28,5)4 (1728) = 1.39" 2 4240 0K unshored strength: Mu = 183 Eft & PEMp = 166 Eft OK Mu = 257 Kft & PMn = 296 Kft OK Vu= 36.1 K & OVA= 106 K OK bm self-wt = 26 plf = 2.54 psf < 5 psf ok use wi6x26 w/ 14 studs

41'-0" X 28'-6" Bay page 3 of 6 interior bm Bz 28'-6" 1 Wo = (7st 10+ 5) psf (10.125 ft) = 911 pif LL = 100 psf x | 0.50 max | 0.25 + 15 = 0.874 = 87.4 psf WL = 87.4 psf (10. 125 ft) = 885 pif Wu = 1.2 (911) + 1.6 (885) = 2509 pif @ Mu = wul2 = 2.509 KIF (28.5 ft) = 170 Kft & PMn = PMp => 2x = 170 CIZ) 45.3 in 3 Vu = 2.504 KIF (28.5) = 35.8 K & DVn 3 ATL & ATL, max = 4240 Tx 2 (0,911 + 0,885) (28,5) 4 (1728) = 129 104 384 (25000)(1.425) 1 Select non-composite W- shape W14x30 bm required to support w1 2x = 47,3 110° > 45,2 in 3 ox Ix= 29/ 107 > 129 10 9 0K gravity load \$6MPx = 177 KFt > 170 KFt ok BVA = 112 K > 35,8 K OK - refer to moment frame B elevation In report for member sizes are to combined lateral and gravity analysis

41'-0" x 28'-6" Bay pase 4 of 6

exterior bm B3



1 Wp = (75+10+5) psf (6,625 ft) + 250 pif = 846,25 pif

WL = 100 pst (6.625 ft) = 662.5 plf

Wu = 1.2 (846.25) + 1.6 (662.5) = 2076 plf

(3)
$$M_{U} = \frac{2.076(28.5)^{2}}{12} = 141 \text{ Ref} \pm \phi M_{0} = \phi M_{p} = 32 \times 2 \frac{141 \text{ Civil}}{0.5(50)} = 32.6 \text{ in}^{3}$$

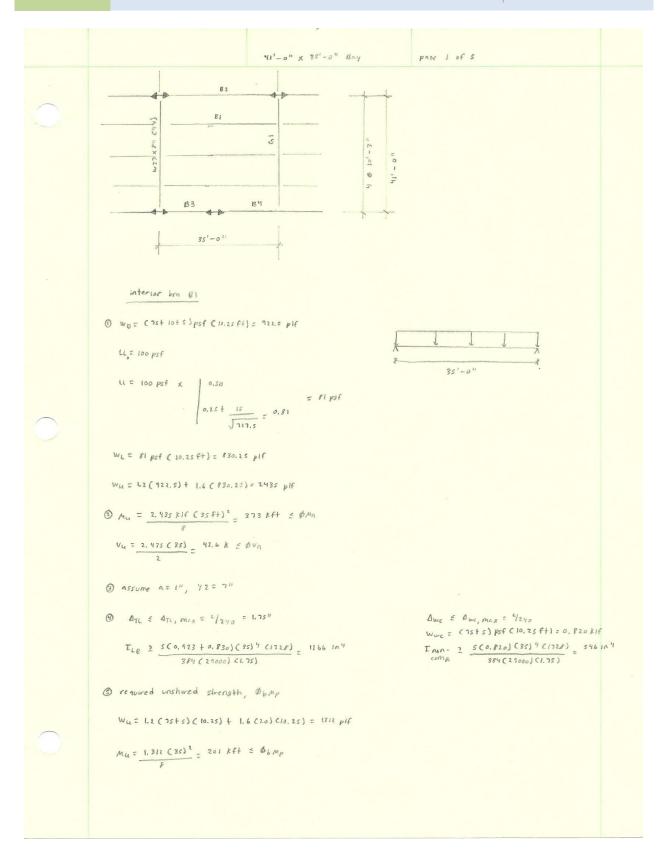
1 select non-composite w-shape

- refer to moment frame A.I elevation in report for member sizes are to combined lat. and sravity analysis

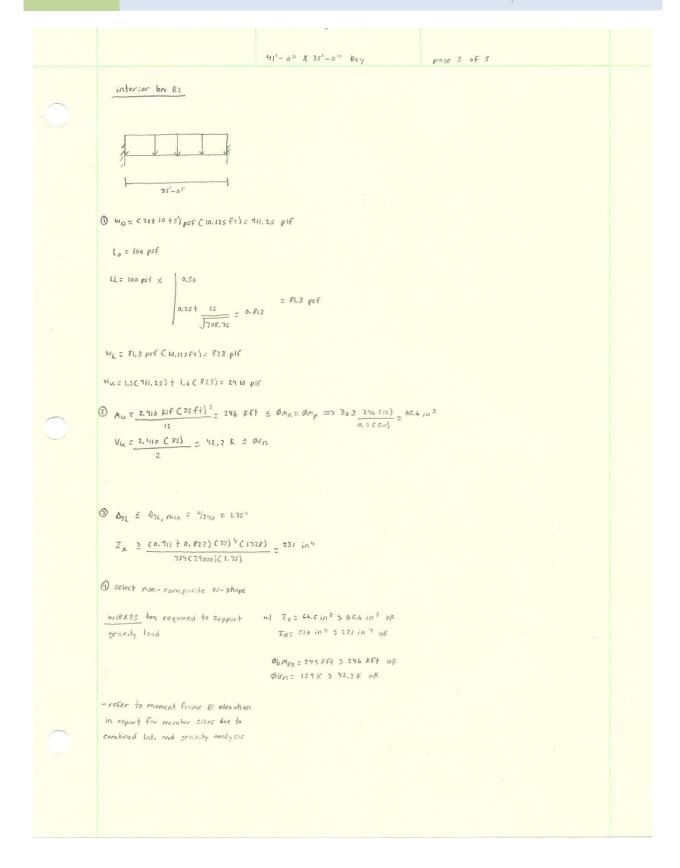
41'-0" x 28'-6" Bay page s of 6 interior sirder al ourder solf-wt allow. 1 Wp = (75+10+5+5) psf = 95 psf LL = 100 psf x 0.50 0.25+ 15 = 0,544 = 54,4 psf Wy = 1.2 (95 psf) + 1.6 (54.4 psf) = 201 psf $P_{4} = 201 \text{ psf} \left(\frac{28.5 + 35}{2}\right) \text{ ft } (10.25 \text{ ft}) = 65.4 \text{ K}$ @ Mu = 0.50 PL = 0.50 (65.4 K) (41ft) = 1341 Kft @ assume a= 2", 42 = 6.5" Vu= 1.5P= 1.5(65.4) = 98.1 K 9 ATL = ATL, max = 4/240 = 41 (12)/240 = 2.05" TLB = 0.050 (48.6 K)(41f+) 2(172f) = 4868 in 4 3 required unshared strength, &bup Pu= 1,2 [(75+5) psf (10.25 ft)] (31.75 ft) + 1.6 (20) (10.25) (31.75) = 41,7K My = 0.50 (41.7k) (41ft) = 855 Kft = \$phmp 6 select potential w- shapes C \$ Mn ≥ 1341 Kft, ILB ≥ 4868 in 7, \$ ph Mp ≥ 855 Kft) . W24x94: 41=6 EPn=469, PMn=1450 Kft, PbMp= 953 Kft, ILB= \$140 in4 W27 X84: 4156 EPn= 452 K, PMn= 1420 Kft, Pb Mp= 915 Kft, ILB= 5460 104 1 # of study | ourder and economy W29x94: 469 x2 = 44 stods ; 94 #x 411 + 44 stods x lo#/stod = 4294# W 27x89: 452 x2 = 44 stods; 84 # x 41 + 44 stods x lo# /stod = 3884 # try w 27 x 84 w/ 44 steds since it's more economical

41'-0" x 28'-6" Boy page 6 of 6 1 check a a = 452 1.08" < 2" oK beff = | 2x 41(12) = 123" 4 controls min 1 (28,5)(12) + 1 (35)(12) = 381" 41 (12) + 1 (28,5)(12) = 61.5 + 171 = 232,5" 41 (12) + 1 (35) (12) = 41.5 + 210 = 271.5" 1 check ALL, OTL, unshared strength, Mu, Vu, sinder self-ut assumption Δ_{L(=} 0,050 (17.7K) (41 ft) 2 (1728) = 0.67" < 4360 = 1.37" οΚ OTC = 0.050 (48.6 K) (41 ft) 2 (1728) = 1.83" < 4240 = 2.05" OK unshaced strength: Pu= 1,2 [(75psf)(10,25ff) + 84pif] (31,75ff) + 1,6 (20psf) (10,25) (31,75) = 42.9 K Mu= 0,50 (42,9 K) (41ft) = 879 Kft & \$6Mp = 915 Kft ok My = 1341 KFF ≤ \$Mn = 1420 KFF OK Vu = 98.1 K & dVn = 368 K OK sinder self- wt = 84 plf = 7.65 psf 2 spsf assumed of use W27 X84 W 44 studs Exterior Chirder G2 - refer to excel spread sheet for design

	Eutori	41' or Girder G2-fixed with		28'-6" Bay	distributed d	and land	
Step 1	Dead Load:	slab	o poi	75 psf	unstributed d	ead road	
		SDL		10 psf 5 psf			
		bm self-wt allow. girder self-wt allow.		5 psf			
		wall		250 plf			
	Live Load:	office space		100 psf			
	Trib. Width:	15.75	_				
	Span, L:	41.0					
	Influence Area:	1230					
	Ll _{red}	0.68					
	P _u =	34.9	kips				
	W _u =	0.395	kF				
step 2	M _o =	504	k-ft	≤ ØMr			
	V _u =		kips	≤ØVn			
eton 3	assume a=2"	Y2=7-a/2=6.5"					
step 3	assume a=2	12=7-a/2=0.5					
step 4	Δ _{Π,} ≤ Δ _{Π, max} =	L/240=		2.05 in			
	Punkdored*	25.5 0.329	kips ur				
	W _{umbstored} = l <u>u</u> ≥	0.329 581					
step 5	unshored strength	$\wp_b M_p$					
	Dead Load:	slab		75 psf			
		girder self-wt allow.		5 psf			
	Live Load:	Constr. LL		20 psf			
	Trib. Width:	15.75					
	Span, L:	41	ft				
	P.=	20.7	kips				
	M,=		k-ft	≤ Ø _b M	p		
step 6	Falant	potential w-shapes					
SIED 6		potentiaiw-snapes _{la} ≥581 in 4,¢bMp≥26	55 kft				
W16×40	Y1= ∑Qn	4 325	kips		W18×40	Y1= ∑On	BFL 274 kips
	ØMn=		kft			ØMn=	523 kft
	ØbMp= l _{us} =	1400	kft h ⁴			ØbMp= l _{us} =	294 kft 1510 in ⁴
	w						
step 7	# of studs p stud strength	er girder and economy 21.5		ips			
	_						
W16x40	∑Qn/Q x2 economy:	30.23 1960		→	32 studs		
W18×40	∑Qn/Q x2 economy:	25.5 1900		→	26 studs		
		tuds since t's more eco		1			
		ruas since it s inbre ecc	nonn	iai			
step 8	check a						
	b _{ef} =	123	in				
		232.5					
	nte	79.5 189					
		•					
	∑Qn= fc=		kips ksi				
	beff=	79.5					
	~-	ΣQn/(0.85xf°c xbeff)		1.01 ≤ 2.0 ir	n ok		
step 9	check ΔLL, Δ	L, unshored strengh, N	Λu, Vu	, and girderse	elf-wt assumpt	tion	
	Pi, unkdored"		kips				
	l ₁₈ =	1510.0	in ⁴				
	Δ,,=	0.30	in≤	S _{Urmax} = L/360	_ 1	A in ok	
	Δ _π =	0.79	in≤	1 _{Turne} = L/240	= 2.0)5 in ak	
	Unshored strength	ØbMp=	294	kft≥265 kft		ak far nosh	oring
	Mu=	En.A	16-	ØMn = 523 ki	11	ok	
	Vu=	60.5	kips	≤ØVn=106 kij	ps	ok	
	girder-self wt assumpt	girderwt/trib. Width=	40 pl	/15.75 ft= 2.5	4 psf	≤5 psf	ok
	Girder Design:	Use W18x40 w					
	r/ 26 studs required to su to combined lateral and p		er to r	noment fram	e 1 elevation i	n report for me	ember
lote: The	beams and girders in the	moment frames were					
arged t	o non-composite. The m	oneni mame elevation:	a cons	os of ndn-co	проже веап	v8=sermemb	



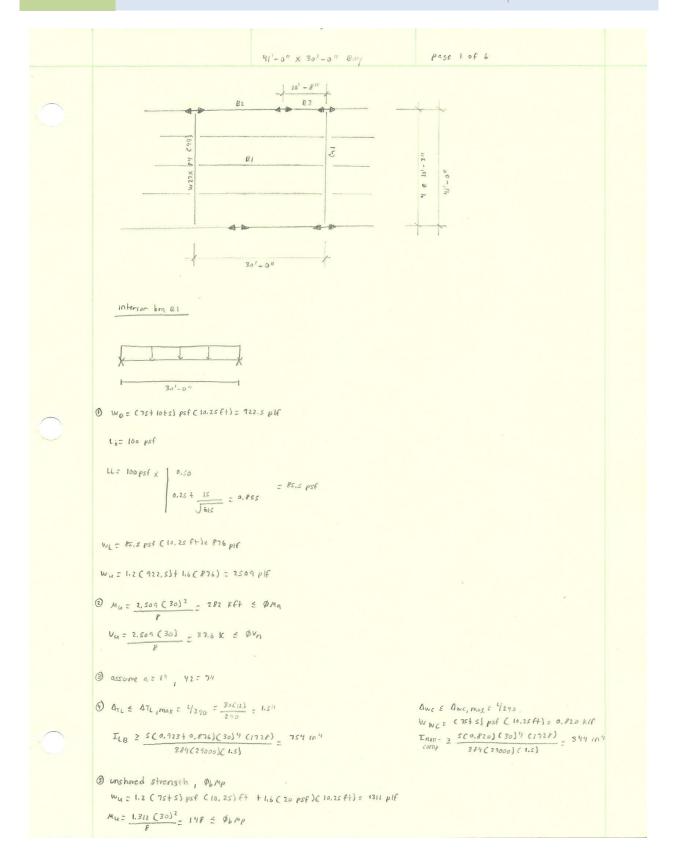
41'-0" x 35'-0" Bay pase 2 of s @ select potential wo shopes (\$MA 2 373, ILB 2 1166 in 4, \$P6 Mp 2 201 Kft, I 2 546 in 4) W 16x45: YET, EPn = 166 k, ILB = 1190 in4, I = 586 in4, PMn = 467 Kft, \$6 Mp = 309 Kft WIFX 40: 41= 7, Eq. = 148K, ILB = 1210 IN", I = 612 IN", OMN = 446 Eft, ObMp = 294 Kft 1 # of stids | bm and economy W16x45: 186K x2 => 20 studs < 35' ak ; 45# x 35' + 20 studs x 10#/stud = 1775 # WIRX 40: 148K x2 => 18 studs < 35' OK 40# x35' + 18 studs x 10 #/stud = 1580 # try W18x40 w/ 18 steds since it's more economical 1 check a 0,85 (4)(105) = 0,41" (1" beff = 2X 35(11) = 105" (min 2 x 1 (10.25) CIZ) = 123" 35 C(2) + 1 C10.25 (C12) = 114 " 1 check 44, ATL, Awc, unshored strength, Mu, Vu, bom seef-ut assumption ALL = 5(0.830)(35)4 (1728) = 0.80" < 4/360 = 1.17" OK att = s(1.753) (35) 4 (1728) = 1.64" < 4/240 = 1.75" ok Awc = 5(0,820)(35)4(1728) = 1.56" < 4240=1.75" OK 384 (21000) (612) unshared strength: My = 201 KFt & dbmp = 294 KFt OK Mu = 373 Kft & PMn = 446 Kft OK V4 = 42.6 K = DVn = 169 K OK bin self-wt = 40 plf = 3.9 psf < 5 psf assumed ok use wi8x40 w/ 18 studs)



41'-0" x 35'-0" Bay pase 4 of s interior sirder Cal 41'-6" sirver self-ut allow. 1 Wa = (75+ 10+5+5) = 95 psf LL = 100 psf x | 0.50 0.25 + 15 = 0.54 = 54,1 psf Wu = 1.2 (95)+ 1.6 (54.1) = 200.6 psf Pu = 200.6 psf (30+35) ft (10, 25 ft) = 66.8 K @ MU = 0,5 PL = 0,5 (66. FK) (41 ft) = 1369 KFt V4 = 1.5p = 1.5 (66,8 k) = 100 K 3 assume 9=2, 4226.5" 1 ATL & ATL, Max = 4240 = 2.05" ILB > 0.050 (41.7K)(41A)3 (1728) 4978 114 1 unshored strensth, \$6 Mp Pu= 1.2 [(75+5) psf (10,25f+)] (32.5f+) + 1.6 (20)(10.25)(32.5) = 42.6 K Mu = 0.56(42.6K)(41F+) = 873 Kft & \$6Mp 6 select potential w-shapes (DAn 2 1369 Kft, ILB 2 4978 M4, \$6Mp 2 873 Kft) W24x94: 41=6, ILB = \$140 in 4, Amn = 1450 Kft, \$6mp = 953 Kft, \$Q = 469 K W27x84; 41= 6, Eq= 452 K, TLB= 5460 in4, ØMn= 1420 Kft, ØbMp= 915 Kft 1 # of study | pirder and economy W24x94; 469K x2 => 44 stods ; 94# x 41' + 44 stods x 10 #/ stod = 4294 # w27x84; 452 k x2 => 44 steds; 84 ± x41' + 44 steds x 10 # 1 sted = 3884 # try wzzxey wy 44 stids

	411-0" x 35'-0" Boy	pase sofs	1
(3) Check a	beff = 2 x 41(11) = 123" E		
9= 452 0.85(4)(123) = 1,08" < 2" 0K	$m_{\rm in} \left\{ \frac{1}{2} (3s)c(z) + \frac{1}{2} (3o) \right\}$	C(L) = 3704	
1 check Bil, ATL, unshored strength			
Q _{LL} = 0.050 (18K)(41 ft) ² (1728) 29000 (5460)			
4TL = 0.050 (47.7 K) (418+13 (1728) 29000 (5460)	z 1.87" 2 (1240= 2.054		
unshored strength: Pu = 1.2 [75 psf Mu = 0.50 c43,9 k	(10,258+) + 84 p16] (32,58+) + 1.6) (418+) = 900 K8+ < \$6Mp = 915 K8	, (20 psf) (10,25) (32,5) = 43.9 K	
Mu= 1369 Kft & ØMn= 1420 Kft of			
sirder seif- ut = 89plf = 2.58 psf	c & spst assumed of		
Use WZ7x84 W/ 44 studs			
Exterior lon 133			
- refer to excel spreadsheet for de	รมูด		

		41'-	0"x 35'-0" E	Зау				
		Exterior Beam B3-	fixed with	a distribu	ted load			
Step 1	Dead Load:	slab	75	psf				
		SDL	10	psf				
		bm self-wt allow.	5	psf				
		girder self-wt allow.	not app	olicable				
		wall	250	plf				
	Live Load:	office space	100	psf				
	Trib. Width:	8	ft					
	Span, L:	17.5	ft					
	Influence Area:	280	ft ²					
	LL _{red}	1.00						
	P _u =	0.0	kips					
	W _u =		klf					
step 2	M _u =	62	k-ft	≤ØMn=Ø	Mp	Zx≥	16.6	in ³
	V _u =	21.4	kips	≤ØVn				
step 3	$\Delta_{TL} \leq \Delta_{TL,max} =$	L/240=	0.875	in				
	P _{unfactored} =	0.0	kips					
	W _{unfactored} =	0.970	klf					
	l _x ≥		in ⁴					
step 4	Select non-com	posite W-shape						
	W 12x14 required to	support gravity load						
		nt frame A.1 elevation	in report fo	or membe	r sizes due	to combin	ed lateral	and grav
	analysis							



		41'-0" x 30'-0" Bay	page 2 of 6	
		ELB 2 754 in4, \$6 mp 2 148 ket, 1		
	\mathfrak{D} # of study by and economy with x31; $\frac{114 \text{K}}{17.2 \text{K}}$ x2 => 14 study < 3	10' 0K ; 31#X 30' + 14 studs X 101	# 1stud = 1070 #	
	@ check a	becf = 2 x 30(12) = 70	5 ft	
	0.85(4)(10)	becf z		
0	3 check Bis DTI Ame unshored	strength, Mu, Vu, bm seif-ut assimpt	กุลก	
	ALL = 5(0.876) (30) 4 (1728) = 0.			
	QT = 5C1.80}(30) 4 (1728) 389 (21000) (783) = 1.44	" 4 61240= 1.5" oK		
	AWC = S(0.820) (30) 4 (1728) 384 (29000)(375) = 1.37	" < 4240 = 6.54 OK		
	unshared strensth: Mu = 148 Kft & Mu = 282 Kft & BMn = 313 Kft &			a.
	Vuz 37.6 Kft = ØVn= 131 K OK bm self-ut = 31plf 302 006	/ SpcE assumed as		
	Use W16x31 W1 14 studs	The second of		

411-011 X 301-011 Bey page 3 of 6 interior bm Bz 1 Wp = (75+ 10+5) psf (10.125 ft) = 911.25 plf Lo = 100 psf , I.A. = (10,25+10) f+ (19,33 f+) = 34,4 f+2 < 406ft2 : LL reduction not required WI = 100 (10.125) = 10 12.5 PIF Wu= 1.2 (911, 25) + 1.6 (1012.5) = 2714 pk ② My = 2.714 kIf (19, 33)2 = 84.5 kft ≤ ΦMη = ΦΜρ => 2x ≥ 84.5 (12) = 22.5 in2 Vu = 2.719 kif (19, 83 ff) = 26,2 K = DUn 3 ATL & ATL, max = 1/240 = 0,97" Tx 2 (0.911+ 1.013)(19.33) 4 (1728) 43 in4 @ select non-composite w-shape WIZXIS bm required to support w/ Zx= 24.7 in 3 > 22.5 in 3 of Tx= 130 in 4 3 43 in 4 ok stravity load \$ 6 Mpx = 92.6 Kft > 84.5 Kft OK dun = 86 K 3 26.2 K 0 K - refer to moment frame B elevation in report for number sizes due to combined lat, and gravity load enalysis

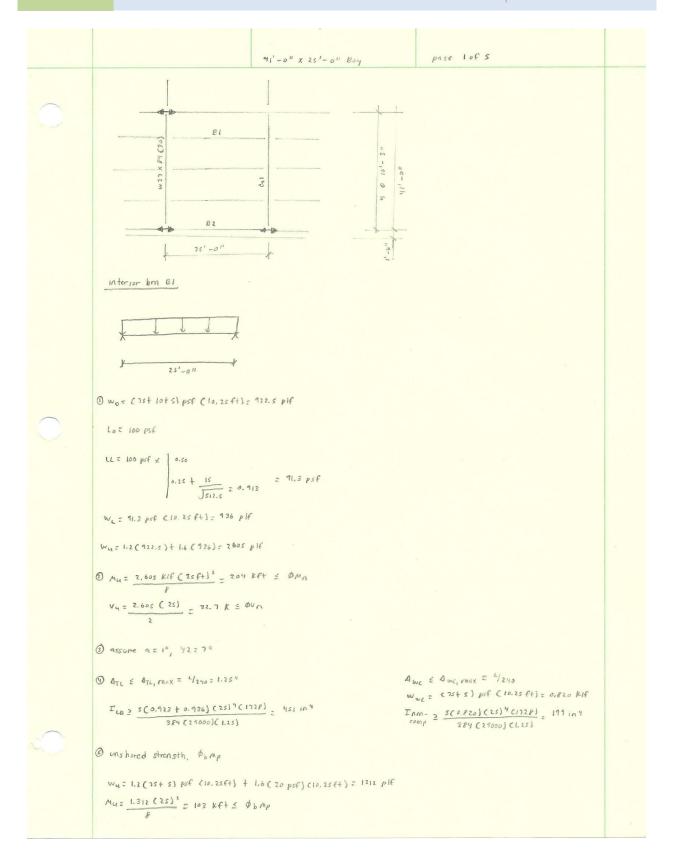
411-0" x 30'x 0" Bay page 4 of 6 interior brn 83 1 Wp = (75+ 10+5) psf (10.125 ft) = 911,25 pif Lo = 100 psf , T.A. = (10.25+10) ff (10.67 ft) = 216 ft2 < 400 ft2 :. Le reduction not required WL = 100 psf C 10.125 ft)= 1012,5 plf Wu = 1.2 (911,25) + 1.6 (1012,5) = 27 14 plf ⊕ M_H = 2.714 KIF C 10.67 ft)² = 25.7 Kft ≤ ØM_R = ØM_P => 2x ≥ 25.7 C12) = 6.7 in²

12

0.9 (50) Vu= 2.714 (10.67) = 14.5 K & DVA 1 ATL & ATL, Max = 4240 = 0.53" ILB 2 (0.912+ 1.013) (10.67) 4 (1728) = 7.3 104 384 (29000) (0,53) @ select non-composite W- shape W8x10 bm required to support al Zx = 8.87 m2 > 6.9 in 3 ok Ix= 30, 8 in 4 > 7,3 in 4 of sravity load \$ 6 MPX = 32.9 KFt 3 25.7 KFt OK dun = 40,2 K > 14,5K OK - refer to moment frame B elevation in report for member sizes due to combined lat, and pravity load analysis

411-011 X 301-011 Boy page s of 6 interior girder Cal 41'-0" pirder seif- ut allow. O Was (1st lot st s) = 1s psf bm wt. a liow. LL = 100 psf x 0.50 max | 0.25 + 15 = 0.566 = 56,6 psf Wu= 1.7 (45)+ 1.6(56.6) = 204.6 psf Pu= 204.6 psf (30+25) f+ (10.25f+) = 57.7 k @ Muz o.s (57.7 k)(41ft)= 1183 Kft & ØMn Vu = 45 (57.7 K) = 86.6 K = ØVn 3 assume a= 2" 42 2 6.5" 1 ATL & ATL, Max = 1/240 = 2.05" ILB 3 0.000 (45.7 K)(41+1) 2 (1728) = 4277 in4 3 unshared strength, do mp Pu= 1.2 [(25+5) psf (10.25 ft)] (27.5 ft) + 1.6 (20 psf) (10.25ft) (27.5 ft) = 36.1 K Mu = 0.50(36,1 k)(41f+) = 740 \$ \$6 Mp 3 select potential w- shopes (\$ Mn = 1183 KF+ ILD 2 4277 104, \$ Mp = 740 KF+) W 24 X 84: 41 = 6 & PA = 425 K, ILB = 4550 in4, OMA = 1290 Kft, Obmp = 840 Kft w 27x84; 41=7, € 9n= 309 K, ILE = 4000 in4, 6 Mn= 1300 Kft, 66 Mp= 915 Kft O # of stids | ourder and economy W24x84: 425K X2 => 40 strds ; 84 # X41' + 40 strds x 10#/strd = 3844 # w 27x 84: 309 x2 => 30 studs; 84 # x 41 + 30 studs x 10 #/ stud = 37 44 # try warx 84 ul 30 stras

4	11'-0" x 30'-0" Boy	page 6 of 6	
A			
® check a			
a- 305 A 208 C 20	occ - 12 x 41(1) 1224 -		
9 = 309 = 0,744 624 b	P P		
	min 2 (30)(12) + 1 (25)(12)	- 330 h	
	min 2		
1 check ALL, ATL, unshored strength, Mu	, va, pirder self-ut assumpts	ion	
29000 4800 in 4)	≥ 4360 = 1.37" OF		
5 1909 (1800 W)			
A 0.050 (42.2 K)(4164)2(1228) 1.83	" & 42 - 2.05" OK		
4TL = 0.050 (42.7 K)(41ft) 2(1728) 2 1.83	. 46 *		
unshored strength: Pu = 12 ((75 psf)(10.2			
Muz 0.50(37.2 K)(41 ft)= 763 Kft < \$bmp = 715 Kft	ok	
Muz 1183 < \$Mn = 1300 KFt OK Vuz 86.6 K < \$Vnz 268 K OK			
17 2 0.0 k 5 0 N 2 2 2 4 24			
pirder self-ut = 84 pif 3.05 pcf <	sort assumed ak		
Birder self-ut = 84plf = 3.05 psf <	for seven by		
use weax 84 w/ 30 studs			

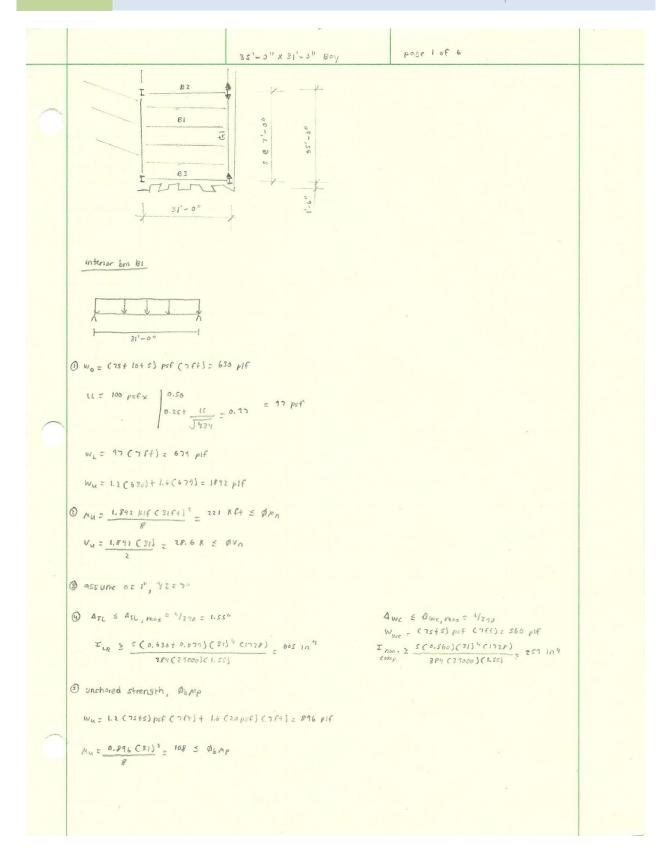


411 -0" x 25'-0" Bay pase 2 of s 6 select potential w-shape (\$ Mn = 204 Kft, ILB = 451 in 4, \$6 Mp = 103 Kft, Inc = 199 in 4) WIZX26: 41=7, EPn= 95.6 K, ILR = 467 104, E= 204 104, PAn= 218 KFt, \$6MP= 140 KFt W14x22: 41=6, 2 9n= 119K, ILR= \$33 IN", I= 199 IN9, PMn= 225 KFt, \$6 Mp= 125 KFt 1) # of studs/bm and economy WIZX26: 15,6 K => 12 studs < 25' ok ; 26 # x 25' + 12 studs x 10 #/stud = 770 # W19x22: 111k x2 => 14 studs &25' ok ; 22#x25' + 14 studs x 10# 1stud = 690# 17.2K try w14x22 w/ 14 studs since it's more economical 1 check a 9 = 119 0,85 (4)(75) = 0,47" < 1" ok min 2x1 (10.25)(12) = 1234 O check all, ATL, Awa, unshored strength, Mu, Va, bm-self-ut Acc = S(0.936)(25)4 (1728) = 0.53" < 4360 = 0.83" ok ATT = SC1.86)(25) 4 C1728) = 1.06" < 4/240 = 1.25" OK Awc = \$(0.820)(25) 4 (1728) = 1.254 5 4240 = 1.25" OF 384(29000) (199) unshared strength: Mu: 103Kft & Phomp = 125 Kft OK Mu: 204 Kft & DAM = 225 Kft OK V4 = 32.7 K & DVn = 74.5 K OK bm self-ut = 22 plf = 2.15 psf 2 5 psf assumed ok Tuse WIYXZZ W/ 14 studs

		41'-0" x 25'-0" Bay	page 3 of s	
	exterior bm Bz			
	CATCHON WILL GE			
	The state of the s			
	A P			
	25'-0"			
		curten well ut		
	1 wo = clot 7st s) psf (6.62s ft)	+ 250 pif = 846,25 pif		
	LL= 100 psf I.A = C10.25 + 1.5	s) ft (25ft) = 293, 75 ft 2 < 400 ft 2	in II made the net required	
	, , , , , ,		The season of the control	
	663 - 10			
	W_ = 100 (6.625) = 662.5 plf			
	12 (84620) 1 1 0112	20. 216		
	W4 = 1.2 (846,25) + 1.6 (662.5) = 2	0 15 plt		
	@ Mu = 2.076 KIF (25 F+) 2 = 108	kft = \$Mn = \$Mp => 2x = 108 (12)	28.8 in 3	
	12	0,7 (50)		
	V4 = 2,076 (25) = 26 K 5 \$V	q		
	2			
			*	
	3 ATL 5 ATL, MACX 2 1/240 : 1.25"			
	1 (0)	,		
	ILB 2 (0.846 + 0.663) (25)4 (1 384 (24000)(1.25)	2 73 10 4		
	384 (24000)(1.28)			
	9 select non-composite w-shape			
	W12x22 required to support	1 2x = 29.3 in 3 > 28.8 in 3 ok		
	gravity load	IX = 156 in 4 > 73 in 4 of		
		\$bAP = 110 KA > 108 KA OK		
		\$VA = 95.9 K > 26 K OK		
		AND TOTAL		
	-0.0	To the second se		
	-refer to moment frame Ail elev			
	in report for member sizes due to	combined		
	lati and gravity load analysis			
1				

		41'-0" x 25'-0" Bay	page 4 of S	
,		11 0 % 6- 0 829	Page 1 of 5	
	interior sirder Cal			
	PPP			
		*		
	/			
	41'-0"	-1		
	earder self- wt allow.			
	0 Wo = (75+10+5+5) = 75 psf			
	1			
	bm wt allow			
	1(= 100 psf x 0.50			
		= 61 psf		
	max 0.25+ 15 = 0.6			
	Wuz 1.2 (95) + 1.6 (61) = 211.6 psf	P() W W		
	Pu = 211.6 psf (25+ 17.5) ft (10.25	77) 2 10.1 K		
	1 Mu= 0.5 (46,1) (41) = 945 Kft = 5	\$/* n		
	Vuz 1.5 (46.1 K) = 69.2 K			
	3 assume az 1", 42 2 6.5"			
	1 ATL & ATL, MAX = 4240 = 2.05"			
	TLB 2 0.050 (34K) (41ft)3 (1728)	3406 in 9		
	£ 1000 £ 2,05 }			
	1 unshored strength, Obmp			
		(21,25ft) + 1.6 (20 psf)(10.25ft	-) (21,25 ft) = 27.9 K	
	Muz 0.50 (27.9 K) (41ft)= 572 K	ft & \$b mp		
	Select potential w-shopes			
	(\$ Mn 2 945 KFt, ILB 2 3	406 in4, ObAp 2 572 Kft)		
	wz4 x 68: 41 = 6, & 9n = 366 K, ILB:	3640 in4, \$MA = 1050 kft, \$6 M	p = 664 Kft	
	WZ4X76; 41=7, Eqn= 280 K, ILB:	: 3630 in 7, \$Mn = 1070 Kft , \$61	mp = 750 Kft	
	in in			

pase s of s 41'-0" x 25'-0" Bay 1) # of study sirder and economy W 24x 68: 366 K x 2 => 36 studs; 68 # x 41' + 36 studs x 10 # 1 stude = 3148 # W24x76: 280 K x2 => 28 studs; 76 # x 41' x 28 studs x 10 # / stud = 3396 # 21.5 K try w24x68 w/ 36 stids since it's more economical 1 check a before $\frac{2 \times \frac{41(2i2)}{8} = 123'' \leftarrow}{\frac{1}{2}(25)(2i2)} + \frac{1}{2}(27.5)(2i2) = 255''$ 0,85 C4) C123) = 0,88" 2 2" OK O check ALL, ATL, unshored strength, Mu, vu, sirder self- wt assumpt. BLL = 0.050 (13.3K) (41 ft) 3 (1728) = 0.754 4 1/360 = 1.374 6K 29000(3640 104) QTL = 0.050 (34K) (41ft) 2 (1728) = 1.72" & 4240 = 2.05" OK unshored strength: Puz 1.2 [C75 psfl(10.25. Ft) + 68 pif] (21.25 ft) + 1.6 (20 psfl(10.25 ft) (21.25 ft) = 28.2 K Mu= 0.50(28,3K)(41ft)= 580.2 kft = \$6Mp= 664 kft ok MU = 945 Kft & MAN = 1050 Kft OK V4 = 69.2 K & ØVA = 295 K OK Self-ut 2 68 plf = 3,2 psf & s psf assumed ox use w24 x 68 w/ 36 studs /



page 2 of 6 35'-0" x 31'-0" Boy @ select potential w-shapes (PM = 221 Kft, ILD = 605 IN , P6Mp = 108 Kft, INC = 259 IN) W14x30; 41=7, Eqn = 111K, ILB = 634 in4, I = 291 in4, An= 275 Kft, Obme= 177 Kft W16226: 41:7, EPA= 76 K, ILE = 640 IN4, I = 301 IN4, BMA = 259 KFt, Obmp = 166 KFt 6) # of studs/bm and economy W14x30: 111K x2 => 14 stude < 31' ok ; 30# x31' + 14 stude x 10*/stud = 1070# w16x26: 96 K x2 => 12 studs < 31' ok; 26# x31' + 12 studs x 10#/stud = 926# try WIEKZE W/ 12 stude since it's more economical 1 check a 9= 96 0.84 C4)(84) = 0.34" < 1" OK befc = 2 x 316121 = 93" 2 x 1 (7)(12) = 84" = 31(11) + 1 (7)(12) = 88.5" O check are, are, and, unshared strength, Mu, Vu, bm seif-ut DLL = 5(0.675)(31) 4 (1728) = 0.76" 4 4/360 = 1.03" OK 384 (22000) (640) ATL = 5(1.31)(31)4(1728) 1.47" = 4240 = 1.55" OK DWC= SC0,560) (31) 4 (1728) = 1.330 E -/240 = 1.55" OK 384(22000) (301) unshared strength: Muz lop Kft & 96mpz 166 Kft OK Mu = 221 Kft & dAn = 259 Kft OF Vu= 28,6 K ≤ Ø Vn= 106 K of self- ut = 26 plf = 3.7 psf & spsf assumed ok use WIEX26 w/ 12 studs

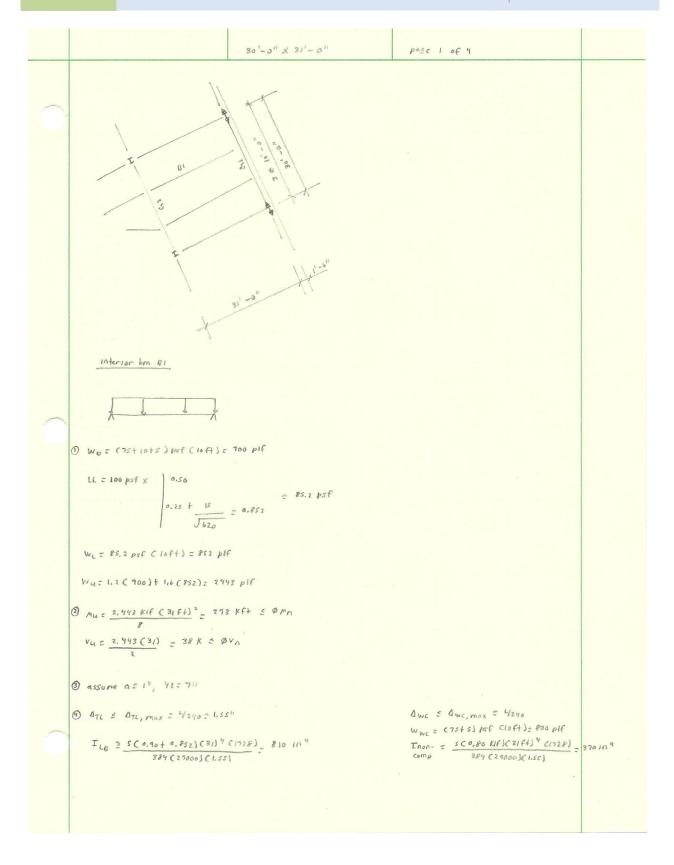
		35'-0" x 31'-0" Boy	page 3 of 6
77			
	interior bra 02		
1			
	partir married and an analysis of the second and an analysis of the second		
	* * * *		
	31'-0"		
	1 wo = (75+10+5) psf (8.5 f+)= 7	765 plf	
	LL = 100 psf x 0.50		
	0.254 15	= 90.3 ple	
	Jszn	0,103	
	WL = 90.3 (8.5) = 768 plf		
	W		
	Wu= 1.2 (765) + 1.6 (768) = 2147	plf	
	1 Mu = 2,147 KIF (31f+)2 = 258	kft & DMA	
	0		
	Vu = 2,147 (31) = 33,3 K =	€ ØVn	
	(9) assume a=1" 42=7"		
	1 ATL & ATL, MAX = 4/240 = 455	в	Awa & Awa, max = 4/240
			Wwc = (75+8) psf (8.5 ft) = 680 p f
	ILB > SC0.765 + 0.768)(31)	(C1728) = 709 114	Inon- 2 5(0.680)(31)4 (1728) = 314 104 comp 384 (27000) (1.55)
	384 (27000)(1.55)		comp 384 (21000) (1.55)
-	3 unshored strength, \$6 mp		
	Wu = 1.2 (75+5) psf (8.5f+) +	1.6 (20 psf) (8.5 ft) = 1088 plf	
	Mu = 1.088 kit (3184) = 131 kt	+ & BAP	
	0		
	6 select potential W-shapes		
	(PMn 2 258 Kft,	ILB = 709 in 7, \$6 Mp = 131 kft, In	2 317 [1 7]
	W14x34: 41=7, Eqn = 125 K	ILB = 732 In 4, I = 340 In 4, PAN	= 316 KFT , PhMp = 205 KFT
	W16x31: 41= 7, Eqn: 114 K	ELB = 783 in 4, E= 375 in 4, PMA	= 313 Kft, \$\Phi_b Mp = 203 Kft
	1 # of study by and economy		
	10000		to the
	17.2 k x2 => 16 studs	< 31' ; 34 # x 31' + 16 steds x	12 m/strd = 1219
		(3) ; 31 # X31 + 14 style X	
	17.2 K	try wibx 31 willy stads si	nce His more economical

		-		
	35'-0" X 21'	-0" Bay	pase 4 of 6	
	(P) check a			
- James	4 114 A 25" 4 1" OK	hace of 2 x 3	((0) 92"	
	6.2 114 = 0.38" & 1" OK	pecc = 5 x 3	8	
		1 (2)(11) + 1 01-1011 - 107"	
		2	12) + 1 (10)(12) = 1024	
		1		
		3/(12)	+ 1 (7)(11)= 88.5" =	
		31(12)	1 (10) (12) = 106.5"	
		min P		
	1 Summary			
	ALL = S(0.768)(31)4 (1728) = 0.73" 2 1/360 = 1.0	3" ok		
	384 (21000)(783)			
	ATL = 5(1.53)(31)4(1728) = 1.404 = 4240= 1.5	s" ok		
	384 (21000) (783)			
	DWC = SCO. 680] (31) 4 61728 = 1.30" 4 1/240 = 1.5	s" uk		
	384(27000)(375)			
	The state of the s			
	unshored strength: Mu= 131 Kft = \$6 Mp = 203 K	Ft ok		
	MU = 28F KFT = DMA = 313 KFT OK			
	Vu= 33.3 K = &Vn=131 K OK			
	self-ut = 31 plf 3,64 psf & 5 psf assume	d ok		
	self-ut = 31 plf = 3,64 psf < 5 psf assume			
	use w 16x31 w/ 14 studs			
	Annual control of the second control of the			
	*			
	*			
				*

35'-0" x 31'-0" Bay page s of 6 exterior sirder Cal 35'-0" 10 load: Dead : slab - 75 psf sol - lo post bm wt allow - 5 psf order self ut allow-5 psf well - 250 plf Live: 100 psf x 0.50 0.25 + 15 \[\int \] 1085 = 0.705 Pu = [1,2 (75+10+5) psf +1,6 (70,5 psf)] (1) ft)(76+) = 26.3 K Wu= 1,2(5 psf)(17 f+) + 1.2 (250 pif) = 402 pif (3) Mu = 0.40PL + WL2 = 0.40 (26.3 K)(35++) + 0.402 KIF (35++)2 = 409 KFT = PMn = DMp =) 2x 2 409 (12) = 109 m2

12

0.9(50) Vu = 2.0 Pt wl = 2.0 (26.3 K) + 0.402 KIF (35ft) = 57.6 K 5 PVA 3 ATL = ATL, max = 1/240 = 1.75" $\Delta_{\text{TL}} = \frac{0.013 \, \text{PL}^3}{\text{ET}_{\chi}} + \frac{\text{wL}^4}{384 \, \text{ET}_{\chi}} = \frac{0.013 \, (19.1 \, \text{K}) \left(\, ^3 \text{SF} \right)^3 \, c \, (1728)}{27000 \, \text{T}_{\chi}} + \frac{0.338 \, \text{KiF} \, \left(\, ^3 \text{S} \, \text{F} \right)^9 \, \left(1728 \right)}{384 \, \left(\, ^2 \, ^3 \, ^3 \, \text{O} \, \right) \, T_{\chi}} = \frac{634.3}{T_{\chi}} + \frac{78}{T_{\chi}}$ 1,75" = 712.3 => Ex 2 407 In4 @ select non- composite w-shape WIEXES required to support w/ Zx=112 in3 > 101 in3 ok Ix: 870 in 4 > 407 in 4 ok stavity load Phopx = 420 Kft > 409 Kft OK OVA = 212 K > 39.6 K OK - refer to moment frame 1' elevation in report for member sizes are to combined late and sravity load analysis



	30'-0" X 31'-6" Boy page 2 of 4
	3 unshared strensth, DEMP
1	W42 1.2 (75+5) psf (10f+) + 1.6 (20 psf) (10f+) = 1280 plf
	Mu: 1.28 KIF (31 ft) = 154 Kft & 06 Mp
	(a) select potential W-shapes C Amn ≥ 293 Kft, TLB ≥ 810 in4, Phmp ≥ 154 Kft, TNC 2 270 in4)
	W 16x31: 41=6, Eqn=114k, ILE= 114 in4, I= 375 in4, PMn= 350 kft, \$6Mp= 203 kft
	1) # of stude/by and economy
	WIGKSI: 114 K x2 => 14 studs < 31' of ; 31 # x 31' + 14 studs x 16#/stud = 1101#
	⊕ check c.
	0.85(4 K51)(231n) = 0.36" = 111 0 K Beff = 2 x 31(12) = 93" €
	2 x 1 (10)(12) = 120"
	$min = \frac{31 C(2)}{8} + \frac{1}{2} C(10) C(2) = 106.5$
	3 summary
	QLL = SCO.852)(21) 4 C1728 0.67 4 4 1/360 = 1.03" OF
	471 = 5(1.75)(31) "(1728) = 1.37" < 4240 = 455" OF
	AWC = SCO. FOS (31) 4 (1728) = 1.53" & 4240 OK
	unshored strength: Muz 159 KFt & \$6Mp. = 203 KFt OK
	MUE 273 KFT & MMN= 250 KFT OF Vu = 3F K & DVN= 131 K OK
	Self-ut = 31 plf = 3.1 psf < 5 psf assumed of
	use wiex31 w/ 14 studs]

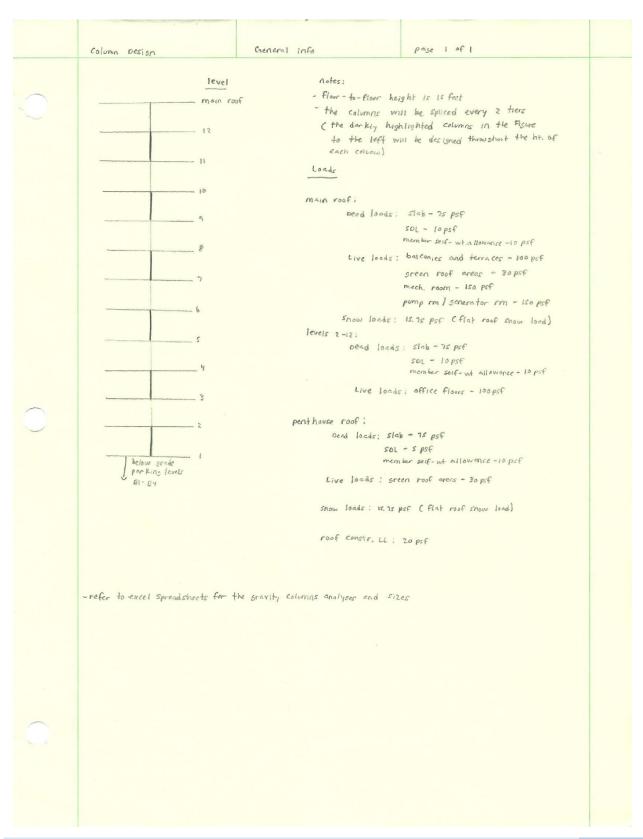
page 3 of 4 30'-0" K 31'- 0" Boy exterior sirder al 30' -0" 1 bead loads: slab - 75 psf sol - to psf bm wt allow - s psf sirder self-wt allow - 5 psf curtain wall - 250 plf Live load: 100 psf x | 0.50 0.25+ 15 = 0.73 = 73 psf bra ut allow. Pu= [1.2 (75+10+5) psf + 1.6 (73 psf)] (17 f+) (10f+) = 38.2 K Wu = 1.2 (\$ psf) (17f+) + 1.2 (250 p) f) = 402 p) f @ Mu = 0.222 PL + wi = 0.222 (38.2 K) (30ff) + 0.402 KIF (30ff) = 2PS KFF = DMn V4 = 1.0 P = 38,2 K & PVA 3 assume a=2" 42: 6.5" @ ATL & ATL, Max = 4/240= 1.5" $A_{TL} : \frac{0.008 \ PL^{3}}{EI} + \frac{WL^{4}}{384 EI} = \frac{0.008 (27.7 \ K) (3064)^{3} (1728)}{24000 \ T_{LB}} + \frac{0.335 \ KIF (3064)^{4} \ C1728)}{384 (24000) \ T_{LB}} = \frac{356.5}{I_{LB}} + \frac{42.1}{I_{LB}}$ 1.5" = 398.6 => TLB > 766 in 4 3 unshared strength, Obmp sirder seif- wt cllow. Pu= 1.2 [(75+5) psf (10f+)] (17f+) + 1.6 (20 psf) (10f+) (17f+) = 21.8 K Muz 0.222 (21.8 K) (36 ft) = 145 Kft & Ph Mp

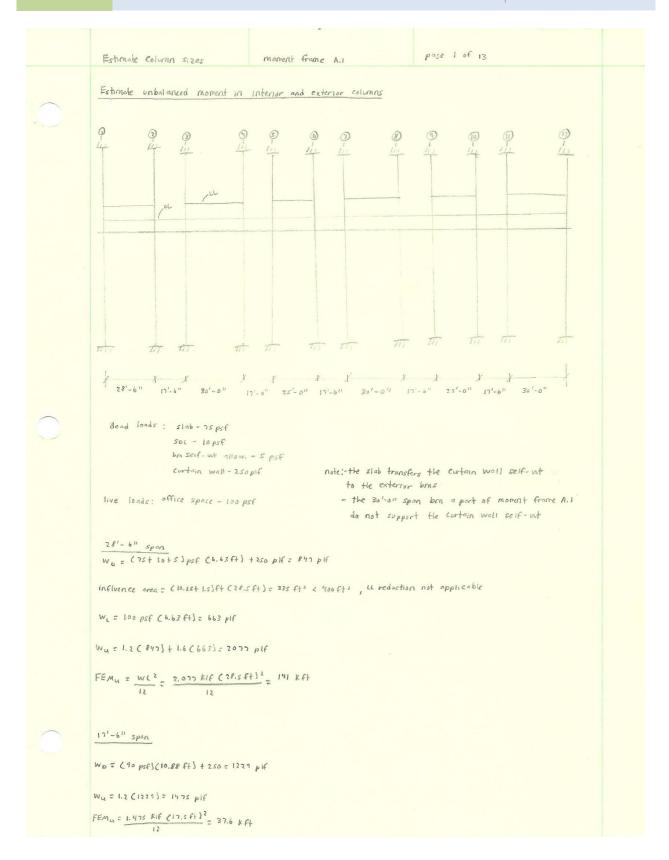
30'-0" x 31'- 0" Bay page 4 of 4 6 select potential W-shapes (0 Mn 2 285 Kft, Ich 2 266 114, \$6 Mp 2 145 Kft) WIGK31: 41=7 EQN = 114 K, ILB = 783 in4, OMA = 313 Kft, Ob Mp = 203 Kft 1 # of studs/ sirver and economy W16x31: 114 x2 => 12 stude ; 31 # x30" + 12 stude x 10 # / stude = 1050 # note: beans and sirders in moment frames were initially designed as composite, but the design of the lateral beam and pirder members were chansed to non-composite - refer to moment frame I' elevation in report for member sizes eve to combined lateral and gravity load analysis

20 **@** 0 0 @ <u>6</u>

TYPICAL FLOOR FRAMING PLAN

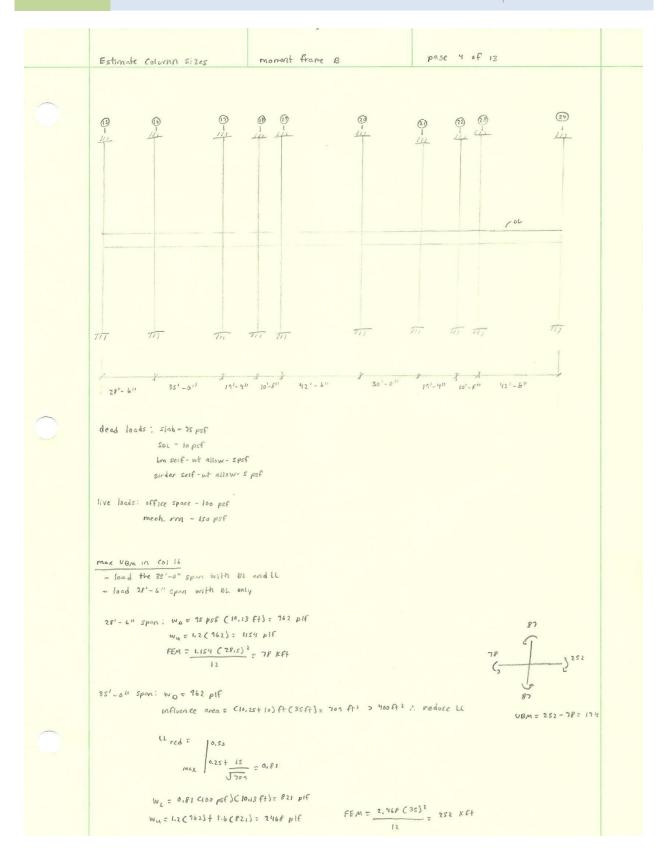
Column Design





		page Z of 13	
 Estimale Column Sizes	moment frame A.I	P-50 1 15	
30'- all spon			
Wo = 90 psf (7.38 ft) = 664 plf			
MOS 10 bet C vettle as bit			
influence area = (4.5+10.25)ft (30	ft) = 442,5 ft 2 3 400 ft 2 , LL redu	etron required	
1			
clred = 0.50			
$m_{4\chi}$ $0.22 + 15 = 0.96$			
max) 3442.5			
W_ = 0.96 (100 psf)(7.38 ft) = 708	25016		2
Wu = 1.2 (664) + 1.6 (708,5) = 1930	plf		
FEM. = 1.930 (20)2 KCI			
FEMu = 1.930 (30)2 145 Kft			
25'-0" Spon			
Wo = 10 psf (6.63 ft) + 250 = 847	plf		
inflyence area = (10.25 + 1.5) f+ (25	ft) = 294 ft 2 & 400 ft 2, LL redu	chen not applicable	
		, pp. 1	
WL = 100 psf C 6.63 ft) = 663 plf			
Wu = 1.2 (847) + 1.6 (663) = 2077	plf :		
FEMU: 2.077 (255) = 108 Kft			
12			

Estimate column sizes	moment frame A.I	pase 3 of 13
51.7 Kft 51.7 Kft 37.6 Kft 51.7 Kft	uem = 141-27.6 = 102,4 ket assume: heaf of cem is distributed fo collabore and half to collabora	Col 8 Col 8 S3.7 Col 8 S3.7
201 4 52.7 145 (3) 37.6	145-37.6 ± 107.4	Col 7 25.2 27.6 (5) 25.2 26.2 27.6 28.2
25,2 37.6 (5) 35.2 Col 6 25.2 27.6 27.6 27.6 27.6 27.6 27.6 27.6 27.6 27.6 27.6 27.6 27.6 27.6 27.6	27.6 276.4 COLUMN SS.7 SS.7 145 (145)	Col 10 25,2 27.6 72.5
note: K=1.0, L=15'-0", d=1 Peq = Pu + 24 Mu = unbal col axial local d depth of		Per and estimated col. size

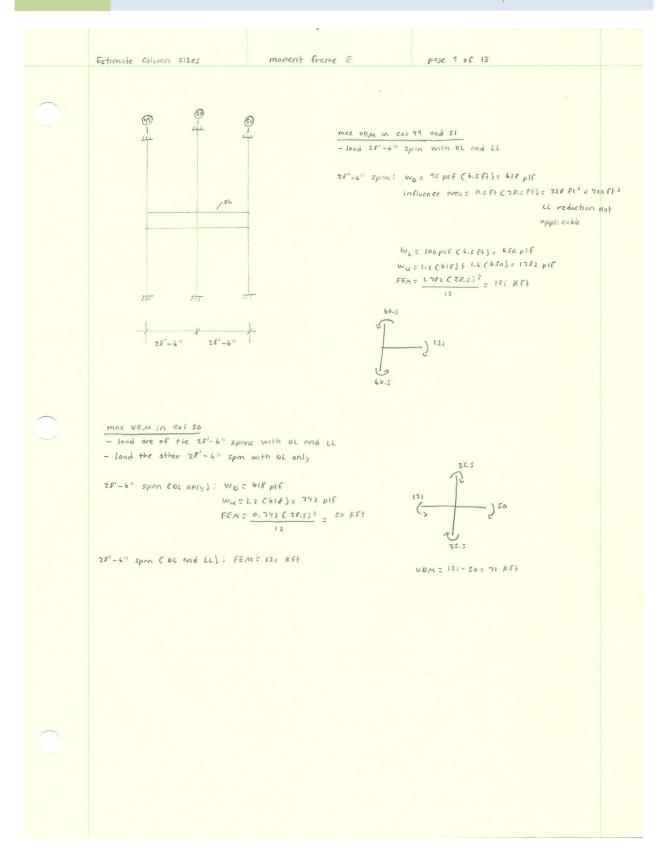


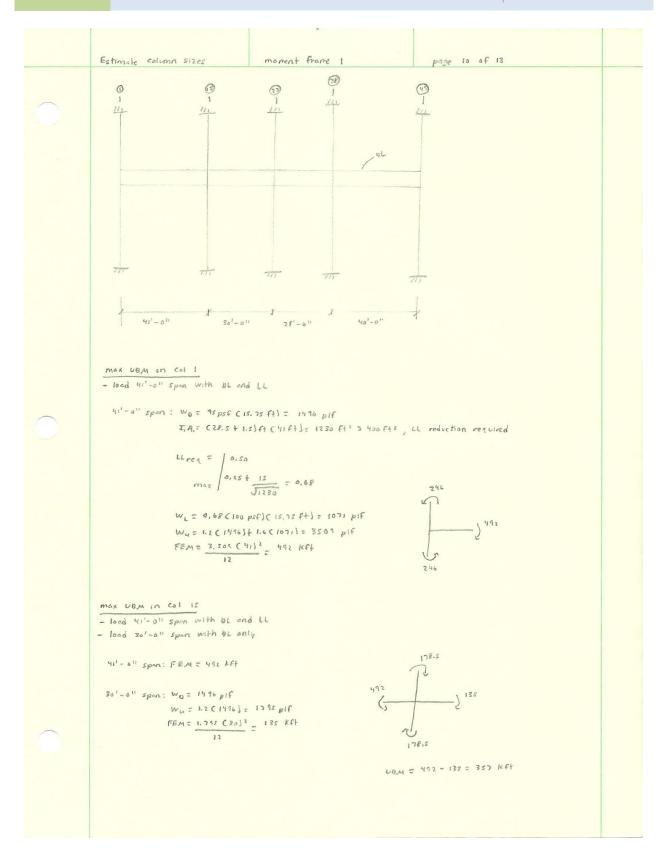
Estimate column size	moment frame B	pase 5 of 13
1200000		
max UBM in Col 17		
- load 35'-0" spon with be on		
- load 19'-4" Spon with OL and	7	108
77	251	/ /*
35'-0" spen: FEM= 252 Kft		36
191 - 4" spen; Wo = 95 psf (10.13	ft) = 962 plf	
Wy = 1.2 (962) = 115		108
FEM = 1,154 (19.33)		1BM = 252 - 36 = 216
12		
max UBM in col 18		
- load 19'-4" spon with or on		
- load 101-80 spon with of onl	y	
19'-4" spon: Wo = 962 plf		\$3, 3
	10,13 ft) = 15 20 plf	
W4 = 1.2 (962)+	1.6 (1520) = 3586	10
FEM: 3, 586 C19.	33)2 = 112 Kft	5,5
ιΣ	()	
10'-6" Spon: Wa = 95 psf Cs.1.	3 ft 1 = 487 mic	
Wy = 112 (487) =		\$3,3
		NBM = 412 - 5,5 = 106,5
FEM = 0.584 (10.6.		
MEX UEM IN COLIS		
-load 42'-6" span with DL and		
- 1000 to -6" Span with bl anty		
42'-6" spen: Wo = 162 plf		
influence area:	20.25 ft (42.5 ft) = 861 ft2 3 4	ooft ² , LL reduction required
llred z 0.50		
e a c t	21	ורי
max J	= 0.76	GT .
	(**)	
W = 0.76 C100 ps	f) (10,13 ft) = 770 plf	5.5 (3)
Weg = 1.2 (962) + 1.		->
FEM = 2.386 (42.5)	2 = 359 Kft	1/2
12		177
10 01 0 0 554 0 0 10		
101-811 spen: FEM = S.S Kft		

Estimate column sizes moment frame 18 page 6 of 13	
 Estimate services wobsert grown is Local	
max usm for cal 20	
-load 42'-6" span with be and le	
~ load 30'-0" span with us only	
136,2	
42'-6" span; FEM= 359 Kft	
357 86,6	
30'-0" span: wo = 962 pif	
W = 1.2 (962) = 1154 p1f	
FEM = 1.154 (30) 2 86.6 kft UBM = 359-86.6 = 272.4 kft	
15 ORW = 221 = 0.00	
max UBM for COI 21	
- load 30'-0" span with be and the	
- load 19'-4" Spon with bl anly	
$30'-8''$ spon; $W_D = 962$ pif	
influence area = 20.25 ft (30ft) = 608 ft > 2 400 ft > LL reduction required	
LL red = 0.50	
$m_{ax} = \frac{0.50}{\sqrt{508}} = 0.86$	
\bigcap	
WL = 0.86 (100 psf)(10,13 ft) = 871 plf	
W4 = 1.2 (962) + 1.6 (871) = 2548 pif	
FEM = 2.548 (2012 = 191 KFt	
77.5	
UBM = 171-36 = 155 kft	
19'-4" spon: FEM = 36 Kft	
max 46m col 22	
- load 191-411 Span with be and be	
- load 10'- 8" span with be only	
191-411 spen; Wb = 962 pif	
influence area = 20,25 ft (19,33 ft) = 391 < 400 ft 2, LL reduction not applicable	
W_ = 100 psf (10.13 ft) = 1013 p1f	
Wu = 1.2(762)+ 1.6(1013) = 2775 pff	
FEM: 2.775(19.33)2 86.4 KFT	
86.4 7	
(, -2	
10'-8" Span: FEM: SIS KFt	
Yo.s	
UBM = 86,4 = 5,5 = 81 Kft	
· ·	

Estimate column sizes moment frame B page 7 of 13					
mex UBM on cal 23					
- load 42'- 6" spon with of and ll - load lat-E" spon with of only					
T sood is the sport with of only					
421-611 spon: FEA= 359 KFt 5.5 (-) 359					
42'-6" spon: FEM= 359 KFt s.s (,) 359					
10'-8" spon: FEM = 5.5 Kft					
176.8					
UBM = 359 = S15 = 353,5 KFF					
mex uem on col 24					
- load 42'-6" spon with or and LL					
2,91					
42'-6" spon: FEM= 359 Kft					
35 9					
179.5					

Estimate column sizes	monent frame C	page 8 of 13				
of trivials	12					
max uem in col 28 - refer to col 16						
max upm in col 29 - refer to col 17						
Max VBM IN cal 30 - refer to cal 18						
max VBM in col 31 - refer to col 15						
max vBM in col 32 - refer to c						
max vBM in col 33 - refer to						
max UBM in col 34 - refer to	COLSS					
- load 10'-f" span with be and	ιι					
WL = 100 psf (4.75	1.5ft (10.67ft) = 101 ft 2 < 400 ft ft) = 475 p1f	ti, cl reduction not applicable 6.2				
W4 = 1.2 (451) + 1.6 FEM = 1.301 C 10.67) = 15'3 KET	P				
12	(;-					
		6,2				





Estimate column sizes moment frame page 11 of 13	
pase ii ot is	
max VBM in col 27	
- loed 30'-011 span with at and LL	
- load 28'-6" spon with be only	
spon with at only	
30 -0" span: Wo = 1496 pif	
T 4 = 2.01 (2.01) = 0.1 (12.01)	
I.A. = 30ft (30ft) = 900 ft2 > 400 ft2, LL reduction required	
$\frac{11 \text{ red}}{\text{mex}} = \frac{0.50}{1200}$	
land of	
10.25 \$ 0.75	
mex / 1200	
10 10 00 00 00 10 110 110 0	
WL = 0.75 C108)(15,75) = 1181 pif	
Wa = 1.2 (1496) + 1.6 (1181) = 36 PS p1f	
FEM = 3.6 85 (30) = 276 Kft	
12	
276	
28'-6" saca: Wa = 1496 MF	
28'-6" spen: WD = 1496 plf	
Wu = 1.2 (1496) = 1795 pif	
FEM = 1.795 (28,5) 2 = 121 Ket	
77.5	
UBM = 276-121 = 155 KFF	
mex 43M in cal 38	
to a short (I) get 1 Se	
- locd "o" - o" spon with or and th	
- load to -o" spon with ou and it	
- load 28'-6" spon with be only	
- load 28'-6" spon with be only 40'-6" spon: Wp = 1416 pef	
- load 28'-6" spon with be only	
- load 28'-6" spon with of only 40'-6" spon: Wa = 1416 plf T.A. = 30ft (40ft) = 1200 ft 2 > 400 ft 2, LL reduct, regid	
- load 28'-6" spon with of only 40'-6" spon: Wa = 1416 plf T.A. = 30ft (40ft) = 1200 ft 2 > 400 ft 2, LL reduct, regid	
- load 28'-6" spon with of only 40'-6" spon: Wa = 1416 plf T.A. = 30ft (40ft) = 1200 ft 2 > 400 ft 2, LL reduct, regid	
- load 28'-6" spon with of only 40'-6" spon: Wa = 1416 plf T.A. = 30ft (40ft) = 1200 ft 2 > 400 ft 2, LL reduct, regid	
- load 28'-6" spon with of only 40'-6" spon: Wa = 1416 plf T.A. = 30ft (40ft) = 1200 ft 2 > 400 ft 2, LL reduct, regid	
- load 28'-6" spon with of only 40'-6" spon: Wa = 1416 plf T.A. = 30ft (40ft) = 1200 ft 2 > 400 ft 2, LL reduct, regid	
- load 28'-6" spon with of only 40'-6" spon: Wa = 1416 plf T.A. = 30ft (40ft) = 1200 ft 2 > 400 ft 2, it reduct, regid	
- load 28'-6" spon with DL only 40'-0" spon: Wp = 1416 plf F.A. = 30ft C40ft] = 1200 ft 2 > 400 ft 2, LL reduct, regid Lived = 0.50	
- load 28'-6" spon with of only 40'-6" spon: Wa = 1416 plf T.A. = 30ft (40ft) = 1200 ft 2 > 400 ft 2, it reduct, regid	
- load 2f'-611 spon with DL only 401-0" spon: $W_D = 1416$ plf $I.A. = 30 \text{ ft } C \text{ 40 ft} = 1200 \text{ ft }^2 200 \text{ ft }^2, LL \text{ reduct. resid}$ $U_{\text{red}} = \begin{bmatrix} 0.50 \\ 0.25 + \frac{15}{1200} \end{bmatrix} = 0.68$ 173.5	
- load $2f'-6l'$ spon with $0L$ only $40^{1}-6l'$ spon: $W_{D}=1416$ plf $F_{A}=30$ ft $(40$ ft) = 1200 ft 2 $)400$ ft 3 , LL reduct, required: $U_{red}=\begin{bmatrix} 0.50 \\ 0.25 + 15 \\ \sqrt{1200} \end{bmatrix} = 0.68$	
- load 28'-6" spon with OL only 40'-0" spon: Wo = 1416 plf T.A. = 30ft (40ft) = 1200 ft 2 > 400 ft 2, LL reduct, regid Lired = 0.50 0.25t 15	
- load 28-6" spon with DL only 40'-0" spon: Wo = 1416 plf I.A. = 30ft (40ft) = 1200 ft 2 > 400 ft 2, LL reduct, regid LL red = 0.50 0.25t 15	
- load 28-6" spon with 0L only 40'-6" spon: Wo = 1416 plf I.A. = 30ft (40ft) = 1200 ft 2) 400 ft 2, LL reduct, regid LL red = 0.50 0.25 t 15 = 0.68 WL = 0.68 (100)(15.75) = 1071 plf WL = 1.7 (1416) t 1.6 (1071) = 3507 FEM = 3.509 (40) 2 = 468 pt ft 173.5 UBM = 468-121 = 347 pt ft Max VBM in col 49 - 10 cd 40'-0" spon with be and LL	
- load 28-6" spon with DL only 40'-0" spon: Wo = 1416 plf I.A. = 30ft (40ft) = 1200 ft 2 > 400 ft 2, LL reduct, regid LL red = 0.50 0.25t 15	
- load zet-611 spon with DL only 401-0" spon: Wo = 1446 plf T.A. = 30ft (40ft) = 1200 ft 1 > 400 ft 1, LL reduct, regid LL red = 0.50 0.25t 15	
- load 28-6" spon with 0L only 40'-6" spon: Wo = 1416 plf I.A. = 30ft (40ft) = 1200 ft 2) 400 ft 2, LL reduct, regid LL red = 0.50 0.25 t 15 = 0.68 WL = 0.68 (100)(15.75) = 1071 plf WL = 1.7 (1416) t 1.6 (1071) = 3507 FEM = 3.509 (40) 2 = 468 pt ft 173.5 UBM = 468-121 = 347 pt ft Max VBM in col 49 - 10 cd 40'-0" spon with be and LL	
- load zet-611 spon with DL only 401-0" spon: Wo = 1446 plf T.A. = 30ft (40ft) = 1200 ft 1 > 400 ft 1, LL reduct, regid LL red = 0.50 0.25t 15	
- load zet-611 spon with DL only 401-0" spon: Wo = 1446 plf T.A. = 30ft (40ft) = 1200 ft 1 > 400 ft 1, LL reduct, regid LL red = 0.50 0.25t 15	
- load zet-611 spon with DL only 401-0" spon: Wo = 1446 plf T.A. = 30ft (40ft) = 1200 ft 1 > 400 ft 1, LL reduct, regid LL red = 0.50 0.25t 15	
- load zet-611 spon with DL only 401-0" spon: Wo = 1446 plf T.A. = 30ft (40ft) = 1200 ft 1 > 400 ft 1, LL reduct, regid LL red = 0.50 0.25t 15	
- load zet-611 spon with DL only 401-0" spon: Wo = 1446 plf T.A. = 30ft (40ft) = 1200 ft 1 > 400 ft 1, LL reduct, regid LL red = 0.50 0.25t 15	
- load 28'-6" spon with DL only 40'-0" spon: WD = 1416 pif I.A. = 30ft (40ft) = 1200 ft 2 400 ft 2, LL reduct. regid LL red = 0.50	
- load 28'-6" spon with DL only 40'-0" spon: WD = 1416 pif I.A. = 30ft (40ft) = 1200 ft 2 400 ft 2, LL reduct. regid LL red = 0.50	
- load 28'-6" spon with DL only 40'-0" spon: WD = 1416 pif I.A. = 30ft (40ft) = 1200 ft 2 400 ft 2, LL reduct. regid LL red = 0.50	

Estimate column size moment frame 1' page 12 of 13
35'-0" 30'-0" 30'-0" 324'-0"
max uBM in col 19 - locd 3s'-o" spon with be ond te 3s'-o" spon; Wo = 1s psf (17 ft) = 1615 ptf
$I,A, = 32.5 \text{ ft } (35ft) = 1138 \text{ ft}^2 > 400 \text{ ft}^2$, LL reduction regid $LL_{red} = \begin{cases} 0.56 \\ 0.25t \frac{15}{\sqrt{113}} = 0.61 \end{cases}$ $W_L = 0.64 (100)(17) = 1173 \text{ plf}$ $W_L = 1.2 (1615) + 1.6 (1173) = 3815 \text{ plf}$ $FEM = \frac{3.815(35)^2}{12} = 3.89 \text{ kft}$
max VBM in col 26 + load 35'-a" spon with be and the - load 30'-a" spon with be only 35'-o" spon: FEM= 389 Kft
301-011 Spon: Wo = 1615 plf Wu = 1.2 C1615] = 1938 plf FEM = 1.938 (30)2 = 145 Kft 12 UBM = 389-145 = 144 Kft

	Estimate column sizes	moment frame 11	pase 13 of 13
	max UBM in col 37		
	- load are of the 30'-0" spe		
3-0	- load the other 301-011 span	with blonly	
	30'- 00 span COL only): FEM	- ine ver	
	so a sport car only ; rem	" 1.42 lt 41	
	30' -0" spon col and LL): h	1617 LIC	
		A, = 32,8 ft (30ft) = 978 ft2 > 400 ft2	LL reduct woold
	w,	1 = 2013 11 E 20413	7 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 -
	LC.	red = a.so	74,5
		$max = \begin{cases} a.50 \\ 0.25 + 15 \\ \sqrt{9.75} \end{cases} = 0.73$	
		max 1978	145
		V. 12	(5) 2 94
		= 0.73 (100)(17) = 1241 pif	
	we	= 1.2 (1615) + 1.6 (1241) = 3924 pif	34.5
	FEA	12 3.924 (30)2 = 294 KFF	UBM = 294 - 145 = 145 Kft
		15	
	- load 30'-0" spon with be as	ad a s	
	- load 24'-0" spon with pl on		
	the El an Thou all		
	30'-0" spon: FEM = 294	100	
	7	294	
	241-011 spon: Wo = 1615 pif	5	93
	Wu = 1938 pif	()	ę
	FEA = 1.938 (24) 2	= 93 KFT	
	12		
		UBM = 294	-93 = 201 Kft
	max UBM in colss		
	- load 24'-0" span with be en	id LL	
	24'-0" span: Wo = 1615 plf		
		4 ft) = 780 ft 2 > 400 ft 2, LL reduct	. resid
		,	
	LL red = 0,50		
	0.354	\$ 429	
	max 0.25 t	780	98
			R
	W1 = 0.79 (100)(1		126
	W4 = 1,2 (1615) + 1.	6 (1343) = 4087 p1F	(5)
	FEM = 4.087 (24)2	2 196 KF1	
	12		
			1.6

	Estimate Column sizes			
	Moment Frame Column pesisn	eoloma line A.1		Page 1 of 2
	column 1			
		tributory oc	es per floor	or roof = 22 ft (15.75 ft) = 346.5 ft2
·T	エーーーサ	,,,,,		
		influence o	area per floo	= 42.5 ft (30ft) = 1275 ft 2
T				
371	5	" Load above	level 12: n	of t I floor
1			-	
1		LL red =	0.50 .25\$ 15 = 1	
	15.75 /	0	.254 IS = 1	.67
	1		0	
	30'	floor	level	recon roof ft2) + 30 psf (346, 5 ft2) = 33,6 K
		Ps = 15.75 ps	et C 346, 5 ft	2) = 5.5 K
		Po = (75+10)	psf (346.5 ft)) + (75+ 10) psf (346,5 f+2) = 58.9 K floor level
				floor level 6 K) + O.S (S.S.K) = 127.2 K
		N. T. S.	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	a half and Catalant a sould be
	· Load above level 10: roof + 3 fl	0065	· loc	d above level 8: rooft 5 flrs
	LL red = 10,40		L	To 1 0.46
	max 0.25+ 15 = 0.49			max 0.46 max 0.25 + 15 0.44
	max 0.25+ 15 = 0.49			max 10,25 + 15 = 0,44
	J3x127s			7
	PL = (0.49 (100 psf)(3 flrs) + 30 psf	1504 6503 - 6128	P =	10 mg - 10 c 1 2 2 2 2 2 5 6 6 7
	Ps = 15.75 (346.5) = 5.5K	7 340'7 tt = 41.3 V	P _c =	(0.44 (100) (sfirs) + 30) 346,5 = 86.6K
	Po = (85 psf (3firs) + 85 psf) 346,	s A2 = 117.8K		(85 (5 firs) + 85) 346,5 = 176,7K
	Pu = 1.2 (117.8) + 1.6 (61.3) + 0.5 (5	is)= 242.2 K	Pu: 1	2 (176.7) + 1.6 (86.6) + 0.5 (5.5) = 353.4 K
	· Load above level b: roof + 7	Clea	e too	above level 4: rooft 9 flrs
	- 1.00 10 to	1.02		
	LL red = 10,40		PL =	(0.40 C100)(9) + 30) 346.5 = 135.1 K
	0.25+ 15 -0.41		Ps =	s,sk
	Max 0.40 Max 0.25+ is = 0.41		Pos	cesca) + es) 346.5 = 294.5 k
	PL = (0.41 (100)(7) + 30) 346.5: 109.	8 K	P	2 (294,5) + 1.6 (135,1) + 0.5 (5.5) = 572,3 K
	Ps = Sisk			
	Po = (85(7) + 85) 346,5 = 235.6 K			
	Pu= 1.2(235.6)+ 1.6(109.8) + 0.5(5	(5) = 461. 2 K		
	· Load above level 2: roof + 11 f	Je.C.		
	P(= (0,4 (100)(11) + 30) 346.5 = 10	201		
	Ps = 8.5K			
	Po = (PS (11)+ PS) 346,5 = 353, 4K			
	The second secon			

Estimate Column Elzes			
Moment Frome Column Besisn		page 2 of 2	
based on pravity load analysis			
	for moment frome column sizes base	ed on combined starity	end lateral
loods analyses			
			-
			_
			4

Moment Frame A.1: Estimated column sizes based on gravity load analysis only

Column 5 Tributary Area per floor or roof= Influence Area=		Column 6		0.1 7	
Tributary Area per floor or roof= Influence Area=		Column 6		Column 7	
Influence Area=		Tributary Area		Tributary Area	
	505 ft ²	per floor or roof=	505 ft ²	per floor or roof=	623.4 ft ²
	1881 ft ²	Influence Area=	1881 ft ²	Influence Area=	2221 ft ²
Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf
Roof Dead Load= (slab+SDL+mem. self-wts)	95 psf	Roof Dead Load= (slab+SDL+mem. self-wts)	95 psf	Roof Dead Load= (slab+SDL+mem. self-wts)	95 psf
Floor Live Load= (Office Space)	100 psf	Floor Live Load= (Office Space)	100 psf	Floor Live Load= (Office Space)	100 psf
Roof Live Load= (Green roof area)	30 psf	Roof Live Load= (Terrace)	100 psf	Roof Live Load= (Terrace)	100 psf
Roof Constr. Live Load	20 psf	Roof Constr. Live Load, Lr	20 psf	Roof Constr. Live Load	20 psf
Load above level 12:	Roof+	Load above level 12:	Roof +	Load above level 12:	Roof+
	1 Floor		1 Floor		1 Floor
Ц _{яф}	0.60	Ц _{ема}	0.60	Ц _{геб}	0.57
P _L =	45.2 kips	P _L =	80.6 kips	P.=	97.8 kips
		-		-	
P ₀ =	96.0 kips	P ₀ =	96.0 kips	P ₀ =	118.4 kips
P _{tr} =	10.1 kips	P _{tr} =	10.1 kips	P _{tr} =	12.5 kips
P _u =	192.6 kips	P _u =	249.1 kips	P _o =	304.8 kips
Unbalanced Moment, M.=	35.2 kft	Unbalanced Moment, Me=	35.2 kft	Unbalanced Moment, Mu=	53.7 kft
Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, Peq=	253	Equivalent Axial Load, Pag=	309	Equivalent Axial Load, Pag=	397
		-			
Estimated Column Size:	W14x43 ФР _в =292 k	Estimated Column Size:	W14x48 ФР _n =331 k	Estimated Column Size:	W14x61 P _n =543
	•			'	
Load above level 10:	Roof +	Load above level 10:	Roof +	Load above level 10:	Roof+
	3 Floors		3 Floors		3 Floors
Щта	0.45	LL _{red}	0.45	LL _{red}	0.43
P _L =	83.3 kips	P _L =	118.6 kips	P _L =	143.5 kips
P ₀ =	191.9 kips	P _o =	191.9 kips	P _o =	236.9 kips
	10.1 kips	_	10.1 kips	P _{tr} =	12.5 kips
P _U =		P _U =			
P _U =	368.6 kips	P _U =	425.1 kips	P _U =	520.0 kips
Unbalanced Moment, M _v =	35.2 kft	Unbalanced Moment, M _e =	35.2 kft	Unbalanced Moment, M _u =	53.7 kft
Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, Peq=	429	Equivalent Axial Load, P _{eq} =	485	Equivalent Axial Load, P _{eq} =	612
Estimated Column Size:	W14x61 ФР₂=543 k	Estimated Column Size:	W14x61	Estimated Column Size:	W14x68 ФР₁=667
Estimated Column Size.	ALTHOU ALE SHOW	Estimated Coldmin Size.	MATHER ALL DANK	Estimated Column Size.	ANTHROO ALF-COL
Load above level 8:	Roof ÷	Load above level 8:	Roof +	Load above level 8:	Roof+
LO2G 2DOVE level 6:	5 Floors	Load above level 6:	5 Floors	Load above level a:	5 Floors
			0.40		
Llad	0.40	Ш _{red}		Ц _{геd}	0.40
P _L =	117.3 kips	P _L =	152.7 kips	P _L =	187.0 kips
P ₀ =	287.9 kips	P ₀ =	287.9 kips	P ₀ =	355.3 kips
P _{tr} =	10.1 kips	P _U =	10.1 kips	P _{tr} =	12.5 kips
P _U =	538.2 kips	P _u =	594.8 kips	P _u =	731.9 kips
Unbalanced Moment, M _v =	35.2 kft	Unbalanced Moment, M _e =	35.2 kft	Unbalanced Moment, M _u =	53.7 kft
Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, P _{eq} =	599	Equivalent Axial Load, P _{eq} =	655	Equivalent Axial Load, Peq=	824
Estimated Column Size:	W14x68	Estimated Column Size:	W14x74 ФР _п =667 k	Estimated Column Size:	W14x90 \$P_=1000
		-			
Load above level 6:	Roof +	Load above level 6:	Roof +	Load above level 6:	Roof +
	7 Floors		7 Floors		7 Floors
LL _{md}	7 Floors 0.40	Ц _{теб}	7 Floors 0.40	LL _{red}	7 Floors 0.40
	7 Floors		7 Floors		7 Floors
LL _{md}	7 Floors 0.40	Ц _{теб}	7 Floors 0.40	LL _{red}	7 Floors 0.40
LL _{md} P _L = P _S =	7 Floors 0.40 156.6 kips 383.8 kips	LL _{md} P _L = P _D =	7 Floors 0.40 191.9 kips 383.8 kips	$\begin{array}{c} \Pi_{rad} \\ P_L = \\ P_D = \end{array}$	7 Floors 0.40 236.9 kips 473.8 kips
Ա _{տժ} Բլ= Բ _o =	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips	Ц.,,, Р _о = Р _о =	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips	Ц _{те} Р _о = Р _о =	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips
Ll _{ad} P _c = P _c = P _c =	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips 716.1 kips	LL _{es} P _e = P _o = P _o = P _e =	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips	Ա։ Բ.= Բ.= Բ Ք	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 953.8 kips
LL _{nd} P _L = P ₀ = P _L = Unbalanced Moment, M _L	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips 716.1 kips 35.2 kft	LL _{md} P ₁ = P ₂ = P ₂ = P ₁ = Unbalanced Moment, M ₁ =	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft	LL _{md} P ₁ = P ₀ = P ₁ = P ₁ = Urbalanced Moment, M ₁ =	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft
LL _{me} P,= P _p = P _p = P _p = Unbalanced Moment, M,= Column Shapes	7 Floors 0.40 156.6 kipz 383.8 kipz 10.1 kipz 716.1 kipz 35.2 kft W14'z	LL _{md} P ₁ = P ₂ = P ₃ = P ₄ = Unbalanced Moment, M ₁ = Column Shapes	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14's	LL _{ed} P ₁ = P ₂ = P ₃ = P ₄ = P ₄ = Unbalanced Moment, M ₂ = Column Shape=	7 Floors 0.40 236.9 kips 473.6 kips 12.5 kips 953.8 kips 53.7 kft W14's
Li _{nd} P ₁ = P ₀ = P ₀ = P ₁ = Urbalanced Moment, M ₁ = Column Shapes Column Depth	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips 716.1 kips 35.2 kft W14's 14.0 in	LL _{nd} P _c = P _o = P _c = P _c = Unbalanced Moment. M _c = Column Shape= Column Depth=	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14's 14.0 in	LL _{nd} R ₂ = R ₃ = R ₄ = R ₄ = Unbalanced Moment. M ₄ = Column Shape= Column Depths	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft W14's 14.0 in
LL _{md} P _L = P _D = P _L = Unbalanced Moment. M _L = Column Shape= Column Depth= Effective Length, K=	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips 716.1 kips 352.2 kit W14's 14.0 in	LL _{md} P _c = P _c = P _c = P _c = Unbalanced Moment. M _c = Column Shape= Column Depth= Effective Length, K=	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14's 14.0 in	LL _{md} P ₁ = P ₀ = P ₀ = P ₀ = Unbalanced Moment, M ₁ = Column Shape= Column Septi= Effective Length, K=	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft W14's 14.0 in
LL _{med} P ₁ = P ₂ = P ₃ = P ₄ = Unbalanced Moment, M ₄ = Column Shapes Column Depth= Effective Length, Nc Column Length, Le	7 Floors 0.40 156.6 kipz 383.8 kipz 10.1 kipz 716.1 kipz 35.2 kft W14's 14.0 in 1.0 15.0 ft	LL _{nd} R _c = P ₀ = P ₀ = P ₀ = Unbalanced Moment, M _c = Column Shapes Column Depthe Effective Length, R _c = Column Length, Le	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14* 14.0 in 1.0 15.0 ft	LL _{nd} P _i = P _i = P _i = Unbalanced Moment, M _i = Column Depth= Effective Length, IE Column Chergit, IE	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kips 14's 14.0 in 1.0
LL _{md} P ₁ = P ₀ = P ₀ = P ₁ = Unbalanced Moment, M ₁ = Column Shapes Column Depth= Effective Length, Ke Column Length, Le Equivalent Avial Load, P ₂ =	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips 715.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776	LL _{nd} R ₁ = P ₀ = P ₁ = P ₁ = Unbalanced Moment, M ₁ = Column Shape= Column Depth= Effective Length, K ₁ = Column Length, L= Equivalent Avial Load, P _{4,4} =	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 833	LL _{set} P _c = P _o = P _s = P _s = Unbalanced Moment, M _c = Column Shapes Column Depthe Effective Length, Le Column Length, Le Equivalent Avail Load, P _e =	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft W14's 14.0 in 1.0 15.0 ft
LL _{med} P ₁ = P ₂ = P ₃ = P ₄ = Unbalanced Moment, M ₄ = Column Shapes Column Depth= Effective Length, Nc Column Length, Le	7 Floors 0.40 156.6 kipz 383.8 kipz 10.1 kipz 716.1 kipz 35.2 kft W14's 14.0 in 1.0 15.0 ft	LL _{nd} R _c = P ₀ = P ₀ = P ₀ = Unbalanced Moment, M _c = Column Shapes Column Depthe Effective Length, R _c = Column Length, Le	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14* 14.0 in 1.0 15.0 ft	LL _{met} P ₁ = P ₂ = P ₂ = P ₃ = P ₄ = Unbalanced Moment, M ₁ = Column Shape= Column Depthe Effective Length, L= Column Length, L= Equivalent Avail Good, P ₄ =	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kips 14's 14.0 in 1.0
Li _{nd} P ₁ = P ₂ - P ₃ - P ₄ - P ₄ - P ₄ - Unbalanced Moment, M ₁ - Column Shape- Column Depth- Effective Length, N- Effective Length, N- Column Length, L- Equivalent Avial Load, P ₄ - Estimated Column Size:	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 716.1 kips 35.2 kft W141s 1.0 in 1.0 ft 776 W14x90	LL _{nd} R ₂ = P ₉ = P ₄ = P ₄ = Unbalanced Moment, M ₄ = Column Shape= Column Depths Effective Length, K ₆ = Column Length, La Equivalent Asia Load, P ₈₈ = Estimated Column Size:	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 833 W14x90 ΦPa=1000 k	LL _{nd} R ₁ = R ₂ = R ₃ = R ₄ = R ₄ = Urbalanced Moment, M ₄ = Column Superior Effective Length, Iz Column Superior Effective Length, Iz Equivalent Avial Load, P ₈₄ = Estimated Column Size:	7 Floors 0.40 236.9 kips 473.8 kips 473.8 kips 12.5 kips 53.7 kft W14's 14.0 in 1.0 15.0 ft 1046 W14x99
LL _{md} P ₁ = P ₀ = P ₀ = P ₁ = Unbalanced Moment, M ₁ = Column Shapes Column Depth= Effective Length, Ke Column Length, Le Equivalent Avial Load, P ₂ =	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips 10.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14s90	LL _{nd} R ₁ = P ₀ = P ₁ = P ₁ = Unbalanced Moment, M ₁ = Column Shape= Column Depth= Effective Length, K ₁ = Column Length, L= Equivalent Avial Load, P _{4,4} =	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 352.4kf W14's 14.0 in 1.0 15.0 ft 933 W14x90	LL _{set} P _c = P _o = P _s = P _s = Unbalanced Moment, M _c = Column Shapes Column Depthe Effective Length, Le Column Length, Le Equivalent Avail Load, P _e =	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 12.5 kips 533.7 kfr W14*1 14.0 in 1.0 15.0 fr 1046 W14x99
Li _{nd} P ₁ = P ₂ - P ₃ - P ₄ - P ₄ - P ₄ - Unbalanced Moment, M ₁ - Column Shape- Column Depth- Effective Length, N- Effective Length, N- Column Length, L- Equivalent Avial Load, P ₄ - Estimated Column Size:	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 716.1 kips 35.2 kft W141s 1.0 in 1.0 ft 776 W14x90	LL _{nd} R ₂ = P ₉ = P ₄ = P ₄ = Unbalanced Moment, M ₄ = Column Shape= Column Depths Effective Length, K ₆ = Column Length, La Equivalent Asia Load, P ₈₈ = Estimated Column Size:	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 833 W14x90 ΦPa=1000 k	LL _{nd} R ₁ = R ₂ = R ₃ = R ₄ = R ₄ = Unbalanced Moment, M ₄ = Column Septis Effective Length, Iz Column Size: Estimated Column Size: Load above level 4:	7 Floors 0.40 236.9 kips 473.8 kips 473.8 kips 12.5 kips 53.7 kft W14's 14.0 in 1.0 15.0 ft 1046 W14x99
Li _{nd} P ₁ = P ₂ - P ₃ - P ₄ - P ₄ - P ₄ - Unbalanced Moment, M ₁ - Column Shape- Column Depth- Effective Length, N- Effective Length, N- Column Length, L- Equivalent Avial Load, P ₄ - Estimated Column Size:	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips 10.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14s90	LL _{nd} R ₂ = P ₉ = P ₄ = P ₄ = Unbalanced Moment, M ₄ = Column Shape= Column Depths Effective Length, K ₆ = Column Length, La Equivalent Asia Load, P ₈₈ = Estimated Column Size:	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 352.4kf W14's 14.0 in 1.0 15.0 ft 933 W14x90	LL _{nd} R ₁ = R ₂ = R ₃ = R ₄ = R ₄ = Unbalanced Moment, M ₄ = Column Septis Effective Length, Iz Column Size: Estimated Column Size: Load above level 4:	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 12.5 kips 533.7 kfr W14*1 14.0 in 1.0 15.0 fr 1046 W14x99
LL _{mel} P ₁ = P ₀ = P ₀ = P ₁ = P ₁ = Unbalanced Moment, M ₁ = Column Shapes Column Depth= Effective Length, Kic Column Length, Le Equivalent Avial Load, P _m = Estimated Column Size: Load above level 4:	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 716.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14x50	LL _{nd} R ₂ R ₂ R ₃ R ₄ R ₄ R ₅ R ₄ R ₅ R ₄ R ₅ R ₄ R ₅	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 833 W14x90	LL _{nd} R ₁ = P ₉ = P ₁ = P ₁ = P ₂ = P ₂ = Unbalanced Moment, M ₂ = Column Shapes Column Depths Effective Length, Iz- Column Length LE Equivalent Avial Load, P ₈₂ = Estimated Column Size: Load above level 4:	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 12.5 kips 53.7 kft VVI4's 14.0 in 1.0 15.0 ft 1046 VVIAx99
LL _{md} P ₁ = P ₂ = P ₂ = P ₄ = P ₄ = Unbalanced Moment, M ₁ = Column Shapes Column Shapes Column States Effective Length, Ke Column Length, Le Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LLnd P ₁ =	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips 10.1 kips 716.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14850	U. U. et el est	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14* 14.0 in 1.0 15.0 ft 333 W14x90 ₱₱,=1000 k Roof + 9 Floors 0.40 232.3 kips	LL _{nd} R = Unbalanced Moment, M = Column Shapes Column Depths Effective Length, N = Column Length, L Column Length, L Equivalent Avial Load, R = Estimated Column Size: Load above level 4: Und R =	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 12.5 kipp 953.8 kipp 53.7 kft W14's 14.0 in 1.0 15.0 ft 10.0 Floors 0.40 Ploors 0.40 286.8 kipp
LL _{nd} P _t = Urbalanced Moment, M _t = Column Shapet Column Shapet Column Ength, N= Effective Length, N= Equivalent Avial Load, P _t = Extimated Column Size: Load above level 4: Ll _{nd} P _t =	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 716.1 kips 35.2 kft W14's 1.0 in 1.0 or 15.0 ft 776 W14s90	LL _{nd} R ₂ R ₂ R ₂ R ₂ R ₂ R ₃ R ₄ Unbalanced Moment, M ₄ Column Super Column Depth Effective Length, Iz Column Size: Equivalent Avial Load, P _{ex} Estimated Column Size: Load above level 4: LL _{nd} R ₂ P ₂ P ₂	7 Floors 0.40 1919 kips 383.8 kips 101 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 633 W14x90 ΦP _n =1000 k Roof + 9 Floors 0.40 23.2 kips 479.8 kips	LL _{nd} R ₋ Urbalanced Moment, M ₋ Column Shape: Column Depti: Effective Length, Iz Column Length, Iz Column Length, Iz Equivalent Avial Load, P _{4,2} Estimated Column Size: Load above level 4: LL _{ne} R ₋	7 Floors 0.40 236.9 kips 473.8 kips 473.8 kips 12.5 kips 933.8 kips 53.7 kft VV24's 14.0 in 1.0 15.0 ft 1046 VV14x99
LL _{mel} P ₁ = P ₂ = P ₃ = P ₄ = P ₄ = Unbalanced Moment, M ₄ = Column Shapee Column Depthe Effective Length, Ke Column Length, Le Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: Line P ₂ = P ₄ = P ₅ = P ₆ = P ₇	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 35.2 kft W141s 14.0 in 1.0 15.0 ft 776 W14x50	LL _{net} R ₂ = P ₀ = P ₁ = P ₂ = Unbalanced Moment, M ₄ = Column Shapes Column Depths Effective Length, It. Column Length, Lt. Equivalent Axial Load, P _{8,8} = Estimated Column Size: Load above level 4: LL _{net} P ₁ = P ₂ = P ₂ = P ₃ = P ₄ =	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 833 W14x80	LL _{nd} R ₁ = P ₀ = P ₀ = P ₀ = Urbalanced Moment, M ₁ = Column Shapes Column Depthe Effective Length, Iz- Column Length LE Equivalent Avial Load, P ₈₂ = Estimated Column Size: Load above level 4: LL _{nd} R ₁ = P ₀ = P ₀ = P ₀ =	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft VV14's 14.0 in 1.0 15.0 ft 1046 VV14x99
LL _{nd} P ₁ = P ₂ = P ₂ = P ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = Column Shapes Column Shapes Column Shapes Column Shapes Effective Length, K= Column Length, L= Equivalent Avial Load, P ₄ = Equivalent Avial Load, P ₄ = Equivalent Avial Load, P ₄ = Extimated Column Size: Load above level 4: Lae P ₁ = P ₂ = P ₄	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 716.1 kips 35.2 kft W14's 1.0 in 1.0 or 15.0 ft 776 W14s90	LL _{ted} R ₁ = R ₂ = R ₂ = R ₂ = R ₄ = Unbalanced Moment, M ₁ = Column Shapes Column Depthe Effective Length, It= Column Length, It= Equivalent Avial Load, P _{4,2} = Estimated Column Size: Load above level 4: LL _{ted} R ₁ = R ₂ = R ₃ = R ₄	7 Floors 0.40 1919 kips 383.8 kips 101 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 633 W14x90 ΦP _n =1000 k Roof + 9 Floors 0.40 23.2 kips 479.8 kips	LL _{nd} R = R = R = P = Unbalanced Moment, M = Column Shape Column Depthe Effective Length, K= Column Length, L= Equivalent Avial Load, P _n = Estimated Column Size: Load above level 4: LL _{nd} R = R = P =	7 Floors 0.40 236.9 kips 473.8 kips 473.8 kips 12.5 kips 933.8 kips 53.7 kft VV24's 14.0 in 1.0 15.0 ft 1046 VV14x99
LL _{mel} P ₁ = P ₂ = P ₃ = P ₄ = P ₄ = Unbalanced Moment, M ₄ = Column Shapee Column Depthe Effective Length, Ke Column Length, Le Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: Line P ₂ = P ₄ = P ₅ = P ₆ = P ₇	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 35.2 kft W141s 14.0 in 1.0 15.0 ft 776 W14x50	LL _{net} R ₂ = P ₀ = P ₁ = P ₂ = Unbalanced Moment, M ₄ = Column Shapes Column Depths Effective Length, It. Column Length, Lt. Equivalent Axial Load, P _{8,8} = Estimated Column Size: Load above level 4: LL _{net} P ₁ = P ₂ = P ₂ = P ₃ = P ₄ =	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 833 W14x80	LL _{nd} R ₁ = P ₀ = P ₀ = P ₀ = Urbalanced Moment, M ₁ = Column Shapes Column Depthe Effective Length, Iz- Column Length LE Equivalent Avial Load, P ₈₂ = Estimated Column Size: Load above level 4: LL _{nd} R ₁ = P ₀ = P ₀ = P ₀ =	7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft VV14's 14.0 in 1.0 15.0 ft 1046 VV14x99
LL _{nd} P ₁ = P ₂ = P ₄ = P ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = Column Shapet Column Depth Effective Length, N: Column Length, L: Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LL _{nd} P ₄ = P ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = P ₄ = Urbalanced Moment, M ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = P ₄	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips 10.1 kips 716.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14x90	LL _{nd} R ₂ R ₂ R ₂ R ₂ R ₂ R ₃ R ₄ Unbalanced Moment, M ₄ e Column Depthe Effective Length, Iz Column Size: Load above level 4: LL _{nd} R ₁ R ₂ R ₃ R ₄ R ₄ R ₅ R ₄ R ₅ R ₆	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14* 14.0 in 1.0 15.0 ft 833 W14x90	LL _{nd} P ₁ = P ₂ = P ₄ = Urbalanced Moment, M ₄ = Column Depth= Effective Length, Iz Column Length, Iz Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LL _{nd} P ₁ = P ₂ = P ₄	7 Floors 0,40 236.9 kipp 473.8 kips 473.8 kips 12.5 kipp 953.8 kips 53.7 kft W1.4°2 14.0 in 1.0 15.0 ft 1.00 ft W1.4x99
LL _{nd} P ₁ = P ₂ = P ₂ = P ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = Column Shapes Column Shapes Column Shapes Column Shapes Effective Length, K= Column Length, L= Equivalent Avial Load, P ₄ = Equivalent Avial Load, P ₄ = Equivalent Avial Load, P ₄ = Extimated Column Size: Load above level 4: Lae P ₁ = P ₂ = P ₄	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 716.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14e30	LL _{ted} R ₁ = R ₂ = R ₂ = R ₂ = R ₄ = Unbalanced Moment, M ₁ = Column Shapes Column Depthe Effective Length, It= Column Length, It= Equivalent Avial Load, P _{4,2} = Estimated Column Size: Load above level 4: LL _{ted} R ₁ = R ₂ = R ₃ = R ₄	7 Floors 0.40 1919 kips 383.8 kips 101 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 933 W14x90	LL _{nd} R = R = R = P = Unbalanced Moment, M = Column Shape Column Depthe Effective Length, K= Column Length, L= Equivalent Avial Load, P _n = Estimated Column Size: Load above level 4: LL _{nd} R = R = P =	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 53.7 kft V24's 14.0 in 1.0 15.0 ft 1046 W14c99
LL _{ad} P ₁ = P ₂ = P ₂ = P ₄ = P ₄ = Unbalanced Moment, M ₁ = Column Shapes Column Depthe Effective Length, Ke Column Length, Le Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LL _{ad} P ₁ = P ₂ = P ₄ = Unbalanced Moment, M ₄ = Column Size: Column Shapes	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips 10.1 kips 716.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14450	LL _{ed} R ₂ R ₂ R ₂ R ₂ R ₂ R ₂ R ₃ R ₄ Unbalanced Moment, M ₄ Column Super Column Depth Effective Length, It Column Size: Load above level 4: LL _{ed} R ₁ R ₂ R ₂ Unbalanced Moment, M ₄ R ₄ R ₅ R ₆ R ₆ R ₆ R ₆ Column Size: Unbalanced Moment, M ₄ Column Size:	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14": 14.0 in 1.0 15.0 ft 833 W14x80	LL _{nd} P ₁ P ₂ P ₄ P ₄ P ₄ Unbalanced Moment, Mr, Column Shapes Column Shapes Column Bepths Effective Length, Ix Column Length, Lx Column Length, Lx Equivalent Avial Load, P ₄ Estimated Column Size: Load above level 4: Ll _{nd} P ₁ P ₂ Unbalanced Moment, Mr, Column Shapes	7 Floors 0,40 236.9 kips 473.8 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft W14*; 14.0 in 1.0 15.0 ft 1046 W14x99
LL _{ad} P _c = Urbalanced Moment, M _c = Column Shapes Column Length, Nc Column Length, Nc Column Length, Nc Equivalent Avial Load, P _{cc} = Estimated Column Size: Load above level 4: Ll _{ad} P _c = Urbalanced Moment, M _c = Column Shapes Column Shapes	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 716.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14.90	LL _{set} R _c Unbalanced Moment, M _c Column Shapee Column Depthe Effective Length, Ke Column Length, Le Equivalent Avial Load, P _{eq} Estimated Column Size: Load above level 4: LL _{set} R _c R _c R _c Unbalanced Moment, M _c Column Shapee	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 933 W14x90	LL _{nd} P ₁ P ₂ P ₄ P ₄ P ₄ P ₄ P ₄ Urbalanced Moment, M ₁ Column Shapes Column Shapes Column Bength, Le Equivalent Avial Load, P ₄₂ Estimated Column Size: Load above level 4: LL _{nd} P ₁ P ₂ P ₄ Urbalanced Moment, M ₄ Column Shapes Column Size:	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 12.5 kipp 933.8 kipp 153.7 kft W24*s 14.0 in 1.0 15.0 ft 1046 WJ4499
LL _{md} P _T Unbalanced Moment, M _T Column Shapes Column Depthe Effective Length, ke Column Length, Le Equivalent Avial Load, P _m Estimated Column Size: Load above level 4: LL _{mc} P _T P _T Unbalanced Moment, M _T Column Shape Column Depthe Effective Length, ke	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14s90	LL _{ted} P _c Rue Unbalanced Moment, M _c Column Depthe Effective Length, Is Column Energh, Is Equivalent Avial Load, P _{ec} Estimated Column Size: Load above level 4: LL _{ted} P _c P _c P _c Unbalanced Moment, M _c Column Diagra Unbalanced Moment, M _c Column Depthe Effective Length, Is Column Depthe Effective Length, Is Column Depthe Effective Length, Is Column Depthe	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 352.2 kft W14's 14.0 in 10 15.0 ft 833 W14.90	LL _{nd} R ₋ Urbalanced Moment, M ₋ Column Shapes Column Shapes Column Length, Le Column Length, Le Column Length, Le Column Length, Le Column Size: Load above level 4: LL _{ne} R ₋ Urbalanced Moment, M ₋ Column Shapes Column Depths	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 53.7 kip 14.0 in 1.0 r 15.0 r 15.0 r 16.0 s WIA-99 Po-=110 Roof+ 9 Floors 0.40 286.8 kipp 592.2 kipp 12.5 kipp 13.7 if VIA-91 15.0 r
LL _{met} P ₁ = P ₂ - P ₂ - P ₃ - P ₄ - Urbalanced Moment, M ₄ - Column Shape- Column Length, Le Equivalent Avial Load, P ₄ - Estimated Column Size: Load above level 4: LL _{met} P ₅ - P ₄ - P ₄ - P ₅ - Urbalanced Moment, M ₄ - Column Shape- Column Length, Le Effective Length, Ke Column Length, Le Equivalent Avial Load, P ₄ - Equivalent Load, P	7 Floors 0.40 156.6 kips 38.8 kips 38.8 kips 10.1 kips 716.1 kips 35.2 kft W14's 1.0 in 1.0 in 1.0 ft 776 W14s90	LL _{ed} R ₂ R ₃ R ₄ Unbalanced Moment, M ₄ Column Septha Effective Length, Iz Column Size: Load above level 4: Ll _{ed} R ₁ R ₂ R ₃ Lu ₂ Load above level 4: Ll _{ed} R ₄ R ₅ R ₅ R ₆ R ₆ R ₇ Column Size: Load above level 4:	7 Floors 0.40 1919 kips 393.8 kips 10.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 633 W14x90	LL _{nd} R ₁ = R ₂ = P ₁ = P ₂ = Urbalanced Moment, M ₄ = Column Depthe Effective Length, Iz Column Size: Load above level 4: LL _{nd} R ₁ = P ₂ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = Column Length, Lack R ₁ = Column Length, Lack R ₂ = Urbalanced Moment, M ₄ = Column Size: Load above level 4: LL _{nd} R ₂ = P ₄ = P ₄ = R ₄ = Column Size: Load above level 4: LL _{nd} R ₄ = R ₅ = R ₄ = Column Depthe Effective Length, Iz Column Length, Lack Column Length, Lack Column Length, Lack Lac	7 Floors 0.40 236.9 kips 473.8 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft VV24's 14.0 in 1.0 15.0 ft 1046 VV14x99
LL _{ad} P ₁ = P ₂ = P ₄ = Urbalanced Moment, M ₄ = Column Shapes Column Depth= Effective Length, Nc Column Length, Le Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LLad P ₄ = P ₅ = P ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = Column Shapes Column Depth= Effective Length, Nc Column Depth=	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14s90	LL _{ted} P _c Rue Unbalanced Moment, M _c Column Depthe Effective Length, Is Column Energh, Is Equivalent Avial Load, P _{ec} Estimated Column Size: Load above level 4: LL _{ted} P _c P _c P _c Unbalanced Moment, M _c Column Diagra Unbalanced Moment, M _c Column Depthe Effective Length, Is Column Depthe Effective Length, Is Column Depthe Effective Length, Is Column Depthe	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 352.2 kft W14's 14.0 in 10 15.0 ft 833 W14.90	LL _{nd} R _T R _T R _T Urbalanced Moment, M _T Column Depthe Effective Length, Its Column Length, Its Column Length, Its Column Sizes: Load above level 4: LL _{nd} R _T P ₀ = R _T Urbalanced Moment, M _T Column Sizes: Load above level 4:	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 53.7 kip 14.0 in 1.0 r 15.0 r 15.0 r 16.0 s WIA-99 Po-=110 Roof+ 9 Floors 0.40 286.8 kipp 592.2 kipp 12.5 kipp 13.7 if VIA-91 15.0 r
LL _{ad} P _e = P _e	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 716.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14s90	LL _{ed} P _e P _e P _e R _e Unbalanced Moment, M _e Column Septh Effective Length, It Column Size: Load above level 4: Ll _{ed} P _e P _e Unbalanced Moment, M _e Column Size: Load above level 4:	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 352.8 kt W14's 14.0 in 10 15.0 ft 633 W14x90	LL _{net} P ₁ = P ₂ = Urbalanced Moment, M ₁ = Column Shapes Column Depths Effective Length, Iz- Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LL _{net} P ₂ = Urbalanced Moment, M ₁ = Column Length, Iz- P ₂ = Urbalanced Moment, M ₂ = Column Depths Effective Length, Iz- Column Shapes Column Depths Effective Length, Iz- Column Length, Iz- Column Length, Iz- Column Length, Iz- Column Length, Iz- Equivalent Avial Load, P ₄ = Estimated Column Size:	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 953.8 kipp 953.8 kipp 14.0 in 1.0 in 1.0 in 1.0 in 1.0 ft 1046 WJA:99
LL _{met} P ₁ = P ₂ - P ₂ - P ₃ - P ₄ - Urbalanced Moment, M ₄ - Column Shape- Column Length, Le Equivalent Avial Load, P ₄ - Estimated Column Size: Load above level 4: LL _{met} P ₅ - P ₄ - P ₄ - P ₅ - Urbalanced Moment, M ₄ - Column Shape- Column Length, Le Effective Length, Ke Column Length, Le Equivalent Avial Load, P ₄ - Equivalent Load, P	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips 716.1 kips 716.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14850	LL _{ed} R ₂ R ₃ R ₄ Unbalanced Moment, M ₄ Column Septha Effective Length, Iz Column Size: Load above level 4: Ll _{ed} R ₁ R ₂ R ₃ Lu ₂ Load above level 4: Ll _{ed} R ₄ R ₅ R ₅ R ₆ R ₆ R ₇ Column Size: Load above level 4:	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14": 14.0 in 1.0 15.0 ft 83.8 kips 10.0 kips 10.0 kg Poort 0.00 232.3 kips 479.8 kips 479.8 kips 952.4 kips 35.2 kft W14": 14.0 in 1.0 15.0 ft 80.0	LL _{nd} R ₁ = R ₂ = P ₁ = P ₂ = Urbalanced Moment, M ₄ = Column Depthe Effective Length, Iz Column Size: Load above level 4: LL _{nd} R ₁ = P ₂ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = Column Length, Lack R ₁ = Column Length, Lack R ₂ = Urbalanced Moment, M ₄ = Column Size: Load above level 4: LL _{nd} R ₂ = P ₄ = P ₄ = R ₄ = Column Size: Load above level 4: LL _{nd} R ₄ = R ₅ = R ₄ = Column Depthe Effective Length, Iz Column Length, Lack Column Length, Lack Column Length, Lack Lac	7 Floors 0,40 236 8 kips 473.8 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft W14*; 14.0 in 1.0 15.0 ft 1046 W14x99
LL _{ad} P ₁ = P ₂ = P ₂ = P ₄ = Urbalanced Moment, M ₄ = Column Shapes Column Length, 16 Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LLad P ₄ = P ₅ = P ₄ = P ₄ = P ₄ = Column Shapes Column Depth= Effective Length, 16 Column Shapes Column Depth= Effective Length, 16 Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 2:	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 10.1 kips 11.0 kips 14.0 in 1.0 15.0 ft 776 WI4s90	LL _{set} P _c R _c P _c Unbalanced Moment, M _c Column Shapee Column Shapee Column Ength, Is Equivalent Avial Load, P _e Estimated Column Size: Load above level 4: LL _{set} P _c P _c P _c Unbalanced Moment, M _c Column Size Column Size Estimated Column Size: Load above level 4:	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 352.2 kft W14's 14.0 in 10 15.0 ft 633 W14.90	LL _{nd} R ₁ = R ₂ = R ₂ = R ₃ = Urbalanced Moment, M ₄ = Column Shapes Column Depths Effective Length, Is- Column Length, Le Equivalent Asial Load, P _{4,2} = Estimated Column Size: Load above level 4: LL _{nd} R ₂ = R ₃ = R ₄ = R ₄ = R ₅ = R ₄ = Column Depths Effective Length, Is- Column Inapes Column Depths Effective Length, Is- Column Shapes Column Depths Effective Length, Is- Column Length, Ls- Equivalent Asial Load, P _{4,2} = Estimated Column Size: Load above level 2:	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 473.8 kipp 953.8 kipp 953.7 kft VIZ4*2 14.0 in 1.0 of 15.0 ft 1046 WIA-99
LL _{met} P ₁ = P ₂ = P ₂ = P ₄ = P ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = Column Shape= Column Length, Le Eduivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: Ll _{met} P ₅ = P ₄ = Urbalanced Moment, M ₄ = Column Shapes Column Depth= Eduivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: Ll _{met} P ₅ = P ₄ = Column Shapes Column Depth= Effective Length, Isc Column Length, Le Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 2: Ll _{met} Ll	7 Floors 0.40 156.6 kips 383.8 kips 10.1 kips 716.1 kips 716.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14850	LL _{net} R ₂ R ₂ R ₂ R ₂ R ₂ R ₄ Unbalanced Moment, M ₄ Column Depth Effective Length, Le Column Size: Load above level 4: LL _{net} R ₂ R ₃ R ₄ R ₄ R ₅ R ₄ R ₅ Unbalanced Moment, M ₄ Column Size: Load above level 4: LL _{net} R ₄ R ₅ R ₆ R ₇ R ₇ R ₈ R ₈ R ₈ R ₈ R ₈ R ₉ R ₉ R ₉ Load above level A: Lunt Rape Column Shape Column Shape Column Shape Column Shape Column Shape Effective Length, Le Column Length, Le Equivalent Avial Load, P ₈₄ Estimated Column Size: Load above level 2:	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14": 14.0 in 1.0 15.0 ft 83.8 kips 10.0 kips 10.0 kg Poort 0.00 232.3 kips 479.8 kips 479.8 kips 952.4 kips 35.2 kft W14": 14.0 in 1.0 15.0 ft 80.0	LL _{nd} R ₁ R ₂ R ₂ Urbalanced Moment, M ₂ Column Depth Effective Length, La Column Size: Load above level 4: LL _{nd} R ₁ R ₂ Urbalanced Moment, M ₂ Estimated Column Size: Load above level 4: LL _{nd} R ₁ R ₂ R ₃ Load above level 4: LL _{nd} R ₄ R ₅ R ₄ R ₅ R ₄ Urbalanced Moment, M ₄ Column Size: Load above level 4: LL _{nd} R ₄ R ₅ R ₆ R ₇ R ₇ Urbalanced Moment, M ₄ Column Depth Effective Length, La Column Length, La Equivalent Avial Load, P ₄₄ Estimated Column Size: Load above level 2:	7 Floors 0,40 236 8 kips 473.8 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft W14*; 14.0 in 1.0 15.0 ft 1046 W14x99
LL _{ad} P ₁ = P ₂ = P ₂ = P ₄ = Urbalanced Moment, M ₄ = Column Shapes Column Length, 16 Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LLad P ₄ = P ₅ = P ₄ = P ₄ = P ₄ = Column Shapes Column Depth= Effective Length, 16 Column Shapes Column Depth= Effective Length, 16 Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 2:	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 10.1 kips 11.0 kips 14.0 in 1.0 15.0 ft 776 WI4s90	LL _{set} P _c R _c P _c Unbalanced Moment, M _c Column Shapee Column Shapee Column Ength, Is Equivalent Avial Load, P _e Estimated Column Size: Load above level 4: LL _{set} P _c P _c P _c Unbalanced Moment, M _c Column Size Column Size Estimated Column Size: Load above level 4:	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 352.2 kft W14's 14.0 in 10 15.0 ft 633 W14.90	LL _{nd} R ₁ = R ₂ = R ₂ = R ₃ = Urbalanced Moment, M ₄ = Column Shapes Column Depths Effective Length, Is- Column Length, Le Equivalent Asial Load, P _{4,2} = Estimated Column Size: Load above level 4: LL _{nd} R ₂ = R ₃ = R ₄ = R ₄ = R ₅ = R ₄ = Column Depths Effective Length, Is- Column Inapes Column Depths Effective Length, Is- Column Shapes Column Depths Effective Length, Is- Column Length, Ls- Equivalent Asial Load, P _{4,2} = Estimated Column Size: Load above level 2:	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 473.8 kipp 953.8 kipp 953.7 kft VIZ4*2 14.0 in 1.0 of 15.0 ft 1046 WIA-99
LL _{met} P ₁ = P ₂ = P ₂ = P ₄ = P ₄ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = Column Shape= Column Length, Le Eduivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: Ll _{met} P ₅ = P ₄ = Urbalanced Moment, M ₄ = Column Shapes Column Depth= Eduivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: Ll _{met} P ₅ = P ₄ = Column Shapes Column Depth= Effective Length, Isc Column Length, Le Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 2: Ll _{met} Ll	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 716.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14s00	LL _{net} R ₂ R ₂ R ₂ R ₂ R ₂ R ₄ Unbalanced Moment, M ₄ Column Depth Effective Length, Le Column Size: Load above level 4: LL _{net} R ₂ R ₃ R ₄ R ₄ R ₅ R ₄ R ₅ Unbalanced Moment, M ₄ Column Size: Load above level 4: LL _{net} R ₄ R ₅ R ₆ R ₇ R ₇ R ₈ R ₈ R ₈ R ₈ R ₈ R ₉ R ₉ R ₉ Load above level A: Lunt Rape Column Shape Column Shape Column Shape Column Shape Column Shape Effective Length, Le Column Length, Le Equivalent Avial Load, P ₈₄ Estimated Column Size: Load above level 2:	7 Floors 0.40 1919 kips 383.8 kips 101 kips 352 kft W14's 14.0 in 1.0 15.0 ft 933 W14x90 ФР₁=1000 k Poof+ 9 Floors 0.40 232.3 kips 10.1 kips 952.4 kips 10.1 kip	LL _{nd} R ₁ R ₂ R ₂ Urbalanced Moment, M ₂ Column Depth Effective Length, La Column Size: Load above level 4: LL _{nd} R ₁ R ₂ Urbalanced Moment, M ₂ Estimated Column Size: Load above level 4: LL _{nd} R ₁ R ₂ R ₃ Load above level 4: LL _{nd} R ₄ R ₅ R ₄ R ₅ R ₄ Urbalanced Moment, M ₄ Column Size: Load above level 4: LL _{nd} R ₄ R ₅ R ₆ R ₇ R ₇ Urbalanced Moment, M ₄ Column Depth Effective Length, La Column Length, La Equivalent Avial Load, P ₄₄ Estimated Column Size: Load above level 2:	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 53.7 kft V24'2 14.0 in 1.0 15.0 ft 1046 W14c99
LL _{ad} P ₁ = P ₂ = P ₂ = P ₄ = Urbalanced Moment, M ₄ = Column Shapes Column Depths Effective Length, N= Equivalent Avial Load, P ₄ = Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LL _{ad} P ₄ = P ₅ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = Column Depths Effective Length, N= Column Depths Effective Length, N= Column Length, L= Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 2: LL _{ad} P ₅ = P ₄ = P	7 Floors 0.40 156.6 kips 383.8 kips 383.8 kips 10.1 kips 10.1 kips 10.1 kips 11.0 in 1.0 15.0 ft 776 WI4s90	LL _{ed} R ₂ R ₃ Unbalanced Moment, M ₄ Column Depth Effective length, Is Column Length, Is Equivalent Avial Load, P _{4,2} Estimated Column Size: Load above level 4: LL _{ed} R ₂ R ₂ Unbalanced Moment, M ₄ Column Size Unbalanced Moment, M ₅ Column Size Estimated Column Size Load above level 4: LL _{ed} R ₂ Estimated Column Size Load above level 2: Load above level 2: LL _{ed} R ₄ Estimated Column Size: Load above level 2:	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 352.2 kft W14's 14.0 in 10 15.0 ft 633 W14.90	LL _{nd} R ₋ Urbalanced Moment, M ₋ Column Shapes Column Depths Effective Length, It- Column Length, It- Equivalent Asial Load, P _{ext} Estimated Column Size: Load above level 4: Ll _{nd} R ₋ R ₋ R ₋ R ₋ Urbalanced Moment, M ₋ Column Sizes Urbalanced Moment, M ₋ R ₋ Estimated Column Sizes Load above level 2: Load above level 2: Load above level 2: Load above level 2:	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 473.8 kipp 953.8 kipp 953.7 kft VI24"s 14.0 in 1.0 of 10046 WJA-99
LL _{md} P ₁ = P ₂ = P ₂ = P ₄ = P ₄ = P ₄ = Column Shapes Column Depthe Effective length, ke Column Largeth, ke Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: Llae P ₄ = P ₅ = Unbalanced Moment, M ₄ = Column Shapes Column Depthe Effective Length, ke Column Shapes Column Shapes Column Shapes Estimated Column Size: Load above level 4: Llae P ₄ = P ₅ = Load above level 4: Llae P ₆ = P ₈ = Load above level 2: Llae Estimated Column Size: Load above level 2: Llae P ₈ =	7 Floors 0.40 156.6 kips 38.8 kips 156.6 kips 38.8 kips 156.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14-90	LL _{set} R _c Unbalanced Moment, M _c Column Shapee Column Depthe Effective Length, Nr Column Length, Lr Equivalent Avial Load, P _{eq} Estimated Column Size: Load above level 4: Ll _{set} R _c R _c Unbalanced Moment, M _c Column Shapee Effective Length, Nr Column Shapee Effective Length, Nr Column Shapee Effective Langth, Nr Column Size: Load above level 2:	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14*: 14.0 in 1.0 15.0 ft 833 W14x00 ΦPa=1000 k Roof + 9 Floors 0.40 232.3 kips 479.8 kips 10.1 kips 952.4 kips 13.2 kft W14*: 14.0 in 1.0 15.0 ft 10.1 kips 952.4 kips 35.2 kft W14*: 14.0 in 1.0 15.0 ft 10.1 10.0 10.0 1	LL _{nd} P ₁ P ₂ P ₄ P ₄ P ₄ P ₄ Urbalanced Moment, M ₁ Column Shapes Column Shapes Column Bength Effective Length, Iz Equivalent Avail Load, P ₄₂ Estimated Column Size: Load above level 4: Ll _{nd} P ₁ P ₂ P ₄ Urbalanced Moment, M ₂ Column Shapes Column Size: Load above level 2: Load above level 3: Load above level 4: Ll _{nd} P ₄ P ₅ Column Size: Load above level 2: Load above level 2: Load above level 2:	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 53.7 kft VX4'2 14.0 in 1.0 15.0 ft 1046 WX4c99
LL _{md} P ₁ = P ₂ = P ₂ = P ₄ = P ₄ = P ₄ = Unbalanced Moment, M ₁ = Column Shapes Column Shapes Effective Length, ke Column Length, Le Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LLmd P ₁ = P ₂ = P ₄ = P ₄ = Column Shapes Column Shapes Column Shapes Column Shapes Effective Length, ke Column Shapes Column Shapes Column Shapes Column Shapes Column Shapes Column Shapes Effective Length, ke Column Shapes Estimated Column Size: Load above level 2: LLmd P ₄ = P ₅ = P ₄ = P ₄ = P ₄ = P ₅	7 Floors 0.40 156.6 kips 383.8 kips 156.6 kips 383.8 kips 10.1 kips 716.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14x50	U.L. Re Unbalanced Moment, Me Column Shape Column Shape Column Shape Effective Length, Ke Column Strate Effective Length, Ke Equivalent Avial Load, Page Estimated Column Size: Load above level 4: U.L. Re Re Re Re Re Re Column Size Unbalanced Moment, Me Column Depthe Effective Length, Ke Column Depthe Effective Length, Ke Column Length, Le Equivalent Avial Load, Page Estimated Column Size: Load above level 2: U.L. Re	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14* 14.0 in 1.0 15.0 ft 383 Wickelo Pe,=1000 k Roof + 9 Floors 0.40 232.3 kips 479.8 kips 10.1 kips 952.4 kips 35.2 kft W14* 14.0 in 1.0 15.0 ft 10.1 kips 952.4 kips 35.2 kft W14* 14.0 in 1.0 15.0 ft 10.1 kips 952.4 kips 35.2 kft W14* 14.0 in 1.0 15.0 ft 10.1 kips 10.2 kips 10.3 kips 10.4 kips 10.5 kips 10.	LL _{nd} R ₁ = R ₂ = R ₂ = R ₄ = Unbalanced Moment, M ₄ Column Shapes Column Shapes Column Regit, Le Effective Length, Le Equivalent Avial Load, R ₄ = Estimated Column Size: Load above level 4: Ll _{nd} R ₁ = R ₂ = R ₄ = Urbalanced Moment, M ₄ = Column Shapes Column Size: Load above level 4: Ll _{nd} R ₁ = R ₂ = R ₄ = Urbalanced Moment, M ₄ = Column Depths Effective Length, Le Equivalent Avial Load, R ₄ = Estimated Column Size: Load above level 2: Ll _{nd} R ₂ = R ₄ = R	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 12.5 kipp 953.8 kipp 53.7 kft W1.4° 14.0 in 1.0 15.0 ft 10.0 15.0 ft 10.0 266.8 kipp 952.2 kipp 1175.7 kipp
LL _{md} P ₁ = P ₂ = P ₂ = P ₄ = P ₄ = P ₄ = Column Shapes Column Depthe Effective length, ke Column Largeth, ke Column Shapes Effective length, ke Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LLae P ₁ = P ₂ = Unbalanced Moment, M ₄ = Column Shapes Column Shapes Column Shapes Effective Length, ke Column Shapes Effective Length, ke Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 2: LLae P ₄ = P ₅ = Load above level 2: LLae P ₆ = P ₇ = P ₇ = P ₈ = P	7 Floors 0.40 156.6 kips 38.8 kips 156.6 kips 38.8 kips 156.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14-90	LL _{set} R _c Unbalanced Moment, M _c Column Shapee Column Depthe Effective Length, Nr Column Length, Lr Equivalent Avial Load, P _{eq} Estimated Column Size: Load above level 4: Ll _{set} R _c R _c Unbalanced Moment, M _c Column Shapee Effective Length, Nr Column Shapee Effective Length, Nr Column Shapee Effective Langth, Nr Column Size: Load above level 2:	7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips 772.7 kips 35.2 kft W14*: 14.0 in 1.0 15.0 ft 833 W14x00 ΦPa=1000 k Roof + 9 Floors 0.40 232.3 kips 479.8 kips 10.1 kips 952.4 kips 13.2 kft W14*: 14.0 in 1.0 15.0 ft 10.1 kips 952.4 kips 35.2 kft W14*: 14.0 in 1.0 15.0 ft 10.1 10.0 10.0 1	LL _{nd} P ₁ P ₂ P ₄ P ₄ P ₄ P ₄ Urbalanced Moment, M ₁ Column Shapes Column Shapes Column Bength Effective Length, Iz Equivalent Avail Load, P ₄₂ Estimated Column Size: Load above level 4: Ll _{nd} P ₁ P ₂ P ₄ Urbalanced Moment, M ₂ Column Shapes Column Size: Load above level 2: Load above level 3: Load above level 4: Ll _{nd} P ₄ P ₅ Column Size: Load above level 2: Load above level 2: Load above level 2:	7 Floors 0.40 236.9 kipp 473.8 kipp 473.8 kipp 53.7 kft VX4'2 14.0 in 1.0 15.0 ft 1046 WX4c99
LL _{md} P _e Unbalanced Moment, M _e Column Shapes Column Depthe Effective Length, Ke Column Length, Le Equivalent Avial Load, P _e Estimated Column Size: Load above level 4: LLad P _e P _e Unbalanced Moment, M _e Column Shapes Column Shapes Column Shapes Column Shapes Column Shapes Load above level 4: LLad P _e P _e Unbalanced Moment, M _e Column Shapes Column Shapes Column Shapes Load above level 2: LLad P _e P _e Unbalanced Moment, M _e Column Shapes Column Shapes Column Shapes Load above level 2:	7 Floors 0.40 156.6 kips 383.8 kips 161.6 kips 183.8 kips 101.1 kips 716.1 kips 35.2 kft W141's 14.0 in 1.0 15.0 ft 776.1 kips 479.8 kips 101.1 kips 895.9 kips 35.2 kft W142 kd0 in 10.1 kips 895.9 kips 35.2 kft W141's 14.0 in 1.0 15.0 ft 956 W144's 15.0 kft W141's 16.0 in 17.0 kips 17.7 kips 18.2 kft W141's 18.3 kips 18.	U. Line P. C. P. Column State Load above level 4: Unbalanced Moment, M. C. Column State Estimated Column Size: Load above level 4: U. Line P. C. Column Size: U. Column Size: Load above level 4: U. Line P. Column Size: U. Column Size: U. Column Size: Load above level 2: Line P. Column Size: Load above level 2:	7 Floors 0.40 1919 kips 383.8 kips 101 kips 772.7 kips 35.2 kft W14* 14.0 in 1.0 15.0 ft 10.0 15.0 ft 10.0 232.3 kips 479.8 kips 10.1 kips 952.4 kips 35.2 kft W14* 14.0 in 1.0 15.0 ft 10.0 272.7 kips 575.7 kips	LL _{nd} P ₁ P ₂ P ₄ P ₄ P ₄ Unbalanced Moment, M ₁ Column Shapes Column Shapes Column Begths Effective Length, Ix Column Length, Lx Equivalent Avial Load, P ₄ Estimated Column Size: Load above level 4: Ll _{nd} P ₁ P ₂ Unbalanced Moment, M ₁ Column Shapes Column Shapes Column Shapes Column Shapes Column Shapes Load above level 2: Ll _{nd} P ₄ Estimated Column Size: Load above level 2: Ll _{nd} P ₄ Estimated Column Size: Load above level 2:	7 Floors 0,40 236.9 kips 473.8 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft W14*; 14.0 in 1.0 15.0 ft 1046 W14x99
LL _{ad} P ₁ = P ₂ = P ₄ = Urbalanced Moment, M ₄ = Column Shapes Column Depths Effective Length, N ₅ = Column Length, Le Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LL _{ad} P ₄ = P ₅ = P ₄ = P ₄ = Urbalanced Moment, M ₄ = Column Depths Effective Length, N ₅ = Column Depths Effective Length, N ₅ = Column Length, Le Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 2: LL _{ad} P ₅ = P ₆ = P ₈ = P ₈ = Urbalanced Moment, M ₄ = Column Size: Load above level 2:	7 Floors 0.40 156.6 kips 383.8 kips 156.6 kips 383.8 kips 10.1 kips 10.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14s90	LL _{set} R ₂ R ₂ R ₂ R ₂ R ₂ R ₄ R ₄ R ₄ Unbalanced Moment, M ₄ Column Shapee Column Depth Effective Length, Iz Equivalent Avial Load, P _{4,2} Estimated Column Size: Load above level 4: Ll _{set} R ₂ R ₄ Unbalanced Moment, M ₄ Column Depth Effective Length, Iz R ₅ R ₆ Unbalanced Moment, M ₄ Column Depth Effective Length, Iz Column Depth Effective Length, Iz Equivalent Avial Load, P _{4,2} Estimated Column Size: Load above level 2: LL _{set} R ₇ R ₉ R ₉ R ₉ R ₉ Unbalanced Moment, M ₄ Column Size: Load above level 2:	7 Floors 0.40 1919 kips 383.8 kips 10.1 kips 772.7 kips 352.2 kit W14's 14.0 in 10 15.0 ft 833 W14x90	LL _{nd} R	7 Floors 0.40 0.40 236.9 kipp 473.8 kipp 473.8 kipp 473.8 kipp 953.7 kip 14.0 in 1.0 r 15.0 r 15.0 r 16.0 s 15.0 r 15.0 r 15.0 r 15.0 r 16.0 s 16.0 s 17.5 kipp 17.5 k
LL _{md} P ₁ = P ₂ = P ₂ = P ₄ = P ₄ = P ₄ = Column Shapes Column Depthe Effective Length, Ke Column Length, Le Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LLac P ₁ = P ₂ = Unbalanced Moment, M ₁ = Column Depthe Effective Length, Ke Column Length, Le P ₄ = P ₅ = Unbalanced Moment, M ₂ = Column Shapes Column Shapes Column Size: Load above level 2: LL _{md} P ₄ = P ₅ = Estimated Column Size: Load above level 2: L _{md} P ₄ = P ₅ = P ₅ = Column Length, Le P ₆ = P ₇ = Column Size: Load above level 2:	7 Floors 0.40 156.6 kips 383.8 kips 161.6 kips 183.8 kips 101.1 kips 716.1 kips 35.2 kft W141's 14.0 in 1.0 15.0 ft 776.1 kips 479.8 kips 101.1 kips 895.9 kips 35.2 kft W142 kd pin 10.1 kips 895.9 kips 35.2 kft W141's 14.0 in 1.0 15.0 ft 956 W144's 16.0 in 16.0 in 175.7 kips 16.2 kft W14's 16.0 in 175.7 kips	LL _{set} R _c Unbalanced Moment, M _c Column Shapee Column Shapee Column State Effective Length, Ke Equivalent Avial Load, P _{eq} Estimated Column Size: Load above level 4: Ll _{set} R _c R _c R _c Unbalanced Moment, M _c Column Shapee Effective Length, Ke Column Shapee Estimated Column Size: Load above level 2: Ll _{set} R _c Estimated Column Size: Load above level 2:	7 Floors 0.40 1919 kips 383.8 kips 101 kips 772.7 kips 35.2 kft W14* 14.0 in 10 15.0 ft 1833 W14x90	LL _{nd} P _i P _i P _i P _i P _i Urbalanced Moment, M _i Column Shapes Column Shapes Column Bength Effective Length, Is Column Length, Li Equivalent Avial Load, P _i Estimated Column Size: Load above level 4: Ll _{nd} P _i P _i Urbalanced Moment, M _i Column Shapes Load above level 2: Ll _{nd} P _i Estimated Column Size: Load above level 2: Ll _{nd} P _i P _i Column Shapes Fifticive Length, N _i Column Shapes Fifticive Length, N _i Column Shapes Column Shap	7 Floors 0,40 236.9 kips 473.8 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft W14*; 14.0 in 1.0 15.0 ft 1046 W14x99 ΦP,=110 Roof + 9 Floors 0,40 286.8 kips 592.2 kips 1175.7 kips 1175.7 kips 1175.7 kips 1175.0 ft 116.0 ft 12.5 kips 1175.7 kips 13.3 kft W14*; 14.0 in 1.0 15.0 ft 12.5 kips 1175.7 kips 13.7 kft W14*; 14.0 in 15.0 ft 12.5 kips 1175.7 kips 13.7 kft W14*; 14.0 in 15.0 ft 15.0 ft 15.0 ft 15.0 ft 15.0 ft 16.0 st 170.7 kips 170
LL _{ad} P ₁ = P ₂ P ₂ P ₂ P ₄	7 Floors 0.40 156.6 kips 383.8 kips 156.6 kips 383.8 kips 10.1 kips 35.2 kft W14's 14.0 in 1.0 15.0 ft 776 W14s90	LL _{set} R ₂ R ₂ R ₂ R ₂ Unbalanced Moment, M ₁ Column Shapee Column Depthe Effective Length, It Equivalent Avial Load, P _{4,2} Estimated Column Size: Load above level 4: Ll _{set} R ₂ Unbalanced Moment, M ₄ Column Depthe Effective Length, It R ₂ R ₃ Unbalanced Moment, M ₄ Column Depthe Effective Length, It Column Depthe Effective Length, It Column Depthe Estimated Column Size: Load above level 2: Ll _{set} R ₂ Load above level 2: Ll _{set} R ₂ Load above level 2:	7 Floors 0.40 1919 kips 383.8 kips 101 kips 772.7 kips 35.2 kit W14" 14.0 in 15.0 ft 383 W14.90	LL _{ad} R ₁ R ₂ R ₂ Unbalanced Moment, M ₁ Column Shapes Column Depths Effective Length, Its Column Length Le Equivalent Avial Load, P _{4,2} Estimated Column Size: Load above level 4: Unbalanced Moment, M ₂ R ₂ Unbalanced Moment, M ₂ Column Depths Effective Length, Its Column Size: Load above level 2: Unbalanced Moment, M ₂ Estimated Column Size: Load above level 2: Load above level 2: Lu _{de} R ₂ R ₃ Estimated Column Size: Load above level 2:	7 Floors 0.40 236.9 kipp 473.5 kipp 473.5 kipp 473.5 kipp 473.5 kipp 953.7 kft VVIA*2 14.0 in 1.0 15.0 ft 10.0 ft
LL _{md} P ₁ = P ₂ = P ₂ = P ₄ = P ₄ = P ₄ = Column Shapes Column Depthe Effective Length, Ke Column Length, Le Equivalent Avial Load, P ₄ = Estimated Column Size: Load above level 4: LLac P ₁ = P ₂ = Unbalanced Moment, M ₁ = Column Depthe Effective Length, Ke Column Length, Le P ₄ = P ₅ = Unbalanced Moment, M ₂ = Column Shapes Column Shapes Column Size: Load above level 2: LL _{md} P ₄ = P ₅ = Estimated Column Size: Load above level 2: L _{md} P ₄ = P ₅ = P ₅ = Column Length, Le P ₆ = P ₇ = Column Size: Load above level 2:	7 Floors 0.40 156.6 kips 383.8 kips 161.6 kips 183.8 kips 101.1 kips 716.1 kips 35.2 kft W141's 14.0 in 1.0 15.0 ft 776.1 kips 479.8 kips 101.1 kips 895.9 kips 35.2 kft W142 kd pin 10.1 kips 895.9 kips 35.2 kft W141's 14.0 in 1.0 15.0 ft 956 W144's 16.0 in 16.0 in 175.7 kips 16.2 kft W14's 16.0 in 175.7 kips	LL _{set} R _c Unbalanced Moment, M _c Column Shapee Column Shapee Column State Effective Length, Ke Equivalent Avial Load, P _{eq} Estimated Column Size: Load above level 4: Ll _{set} R _c R _c R _c Unbalanced Moment, M _c Column Shapee Effective Length, Ke Column Shapee Estimated Column Size: Load above level 2: Ll _{set} R _c Estimated Column Size: Load above level 2:	7 Floors 0.40 1919 kips 383.8 kips 101 kips 772.7 kips 35.2 kft W14* 14.0 in 10 15.0 ft 1833 W14x90	LL _{nd} P ₁ = P ₂ = P ₄ = P ₄ = P ₄ = Urbailanced Moment, M ₁ Column Shapes Column Shapes Column Bength, Le Equivalent Avail Load, P ₄ = Estimated Column Size: Load above level 4: Urbailanced Moment, M ₂ Urbailanced Moment, M ₂ Estimated Column Size: Load above level 4: Urbailanced Moment, M ₂ = Column Shapes Column Size: Load above level 2: Ul _{nd} P ₂ = P ₃ = P ₄ = P	7 Floors 0,40 236.9 kips 473.8 kips 473.8 kips 12.5 kips 953.8 kips 53.7 kft W14*; 14.0 in 1.0 15.0 ft 1046 W14x99 ΦP,=110 Roof + 9 Floors 0,40 286.8 kips 592.2 kips 1175.7 kips 1175.7 kips 1175.7 kips 1175.0 ft 116.0 ft 12.5 kips 1175.7 kips 13.3 kft W14*; 14.0 in 1.0 15.0 ft 12.5 kips 1175.7 kips 13.7 kft W14*; 14.0 in 15.0 ft 12.5 kips 1175.7 kips 13.7 kft W14*; 14.0 in 15.0 ft 15.0 ft 15.0 ft 15.0 ft 15.0 ft 16.0 st 170.7 kips 170

Column 8		Column 9		Column 10	
Tributary Area		Tributary Area		Tributary Area	
per floor or roof=	623.4 ft ²	per floor or roof=	505 ft ²	per floor or roof=	505 ft ²
Influence Area=	2221 ft ²	Influence Area=	1881 ft ²	Influence Area=	1881 ft ²
Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf
Roof Dead Load= (slab+SDL+mem. self-wts)	95 psf	Roof Dead Load= (slab+SDL+mem. self-wts)	95 psf	Roof Dead Load= (slab+SDL+mem. self-wts)	95 psf
Floor Live Load= (Office Space)	100 psf	Floor Live Load= (Office Space)	100 psf	Floor Live Load= (Office Space)	100 psf
Roof Live Load= (Terrace)	100 psf	Roof Live Load= (Terrace)	100 psf	Roof Live Load= (Terrace)	100 psf
Roof Constr. Live Load	20 psf	Roof Constr. Live Load	20 psf	Roof Constr. Live Load	20 psf
Load above level 12:	Roof +	Load above level 12:	Roof +	Load above level 12:	Roof+
LOSG SOURCE CHE IE.	1 Floor	bose spore ere in.	1 Floor	cond above level 12.	1 Floor
III .	0.57	n .	0.60	n .	0.60
LL _{red}		Ll _{oad}		Ll _{nd}	
P _L =	97.8 kips	P _L =	80.6 kips	P _L =	80.6 kips
P _D =	118.4 kips	P _D =	96.0 kips	P _D =	96.0 kips
P _{tr} =	12.5 kips	P _{tr} =	10.1 kips	P _L ,=	10.1 kips
P _U =	304.8 kips	P _u =	249.1 kips	P _u =	249.1 kips
Unbalanced Moment, Mu=	53.7 kft	Unbalanced Moment, M _u =	35.2 kft	Unbalanced Moment, Mu=	35.2 kft
Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, Pag=	397	Equivalent Axial Load, Peg=	309	Equivalent Axial Load, P _{eq} =	309
			W14x48	1	
Estimated Column Size:	W14x61 ФР₂=543 k	Estimated Column Size:	W14x48 ΨP _n =331 κ	Estimated Column Size:	W14x48 ФР _п =331 k
•	·	,		'	
Load above level 10:	Roof +	Load above level 10:	Roof +	Load above level 10:	Roof+
	3 Floors		3 Floors		3 Floors
Щ		LL, _{set}		Ll _{ad}	
	0.43		0.45		0.45
P _L =	143.5 kips	P _L =	118.6 kips	P _L =	118.6 kips
P _D =	236.9 kips	P _D =	191.9 kips	P _D =	191.9 kips
		_			
P _L =	12.5 kips	P _{tr} =	10.1 kips	P _L =	10.1 kips
P _U =	520.0 kips	P _U =	425.1 kips	P _U =	425.1 kips
Unbalanced Moment, M,=	53.7 kft	Unbalanced Moment, M _u =	35.2 kft	Unbalanced Moment, M,=	35.2 kft
Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, P _{eo} =	612	Equivalent Axial Load, Peo=	485	Equivalent Axial Load, P=	485
Estimated Column Size:	W14x68 ФР₀=667 k	Estimated Column Size:	W14x61 ФР₁=543 k	Estimated Column Size:	W14x61 ФР₁=543 k
Load above level 8:	Roof +	Load above level 8:	Roof +	Load above level 8:	Roof+
	5 Floors		5 Floors		5 Floors
Lload	0.40	Lord	0.40	Ll _{nd}	0.40
P _L =	187.0 kips	P _L =	152.7 kips	P _L =	152.7 kips
P _D =	355.3 kips	P _D =	287.9 kips	P _D =	287.9 kips
-		_		_	
P _{tr} =	12.5 kips	P _L =	10.1 kips	P _{i,} =	10.1 kips
P _U =	731.9 kips	P _U =	594.8 kips	P _u =	594.8 kips
Unbalanced Moment, Mu=	53.7 kft	Unbalanced Moment, Mg=	35.2 kft	Unbalanced Moment, M _s =	35.2 kft
	W14's		W14's		W14's
Column Shape=		Column Shape=		Column Shape=	
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, Pec=	824		655	Equivalent Axial Load, Pec=	
Equivalent Axial Load, Peq=	824 W14-00 MP -1000 k	Equivalent Axial Load, P _{eq} =	655 W14-74 (D -667)	Equivalent Axial Load, P _{eq} =	655
Equivalent Axial Load, P _{eq} = Estimated Column Size:	824 W14x90		655 W14x74 ФР _а =667 k	Equivalent Axial Load, P _{eq} = Estimated Column Size:	
		Equivalent Axial Load, P _{eq} =			655
Estimated Column Size:	W14x90 ΦP _n =1000 k	Equivalent Axial Load, P _{eq} = Estimated Column Size:	W14x74 ФР _а =667 k	Estimated Column Size:	655 W14x74 ФР _n =667 k
	W14x90 ΦP _n =1000 k	Equivalent Axial Load, P _{eq} =	W14x74 ΦP _n =667 k		655 W14x74 ΦP _n =667 k Roof +
Estimated Column Size: Load above level 6:	W14x90 ΦP _n =1000 k Roof + 7 Floors	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6:	W14x74 ΦP _n =667 k Roof + 7 Floors	Estimated Column Size: Load above level 6:	655 W14x74 ΦΡ _n =667 k Roof + 7 Floors
Estimated Column Size: Load above level 6: Li _{ne}	W14x90 ΦP _n =1000 k Roof + 7 Floors 0.40	Equivalent Avia Load, P _{eq} = Estimated Column Size: Load above level 6: Li _{nd}	W14x74 ΦP _n =667 k Roof + 7 Floors 0.40	Estimated Column Size: Load above level 6: Li _{nd}	655 W14x74
Estimated Column Size: Load above level 6:	W14x90 ΦP _n =1000 k Roof + 7 Floors 0.40	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6:	W14x74 ΦP _n =667 k Roof + 7 Floors	Estimated Column Size: Load above level 6:	655 W14x74 ΦP _n =667 k Roof + 7 Floors 0.40 191.9 kips
Estimated Column Size: Load above level 6: Li _{ne}	W14x90	Equivalent Avia Load, P _{eq} = Estimated Column Size: Load above level 6: Li _{nd}	W14x74 ΦP _n =667 k Roof + 7 Floors 0.40	Estimated Column Size: Load above level 6: Li _{nd}	655 W14x74
Estimated Column Size: Load above level 6: Lim Pi Po	W14κ90 ΦP _n =1000 k Roof + 7 Floors 0.40 236.9 kips 473.8 kips	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LL _{ind} P _i = P ₀ =	W14x74 ΦP _n =667 k Roof + 7 Floors 0.40 191.9 kips 383.8 kips	Estimated Column Size: Load above level 6: LL _{nd} P ₁ = P ₀ =	655 W14x74 ΦP _n =667 k Roof+ 7 Floors 0.40 191.9 kips 383.8 kips
Estimated Column Size: Load above level 6: Line Pi Po Pi Pi	W14κ90 ΦP _n =1000 k Roof + 7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips	Equivalent Avia Load, P _{eq} = Estimated Column Size: Load above level 6: Li _{nd} P _i = P _i = P _i =	W14x74 ΦP _n =667 k Roof + 7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips	Estimated Column Size: Load above level 6: LL _{ind} P ₁ = P ₂ = P ₁ =	655 W14x74
Estimated Column Size: Load above level 6: Lim Pi Po	W14x90 ΦP _n =1000 k Roof + 7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LL _{ed} P _i = P _p = P _i = P _i = P _i = P _i =	W14x74 ΦP _n =667 k Roof + 7 Floors 0.40 191.9 kips 383.8 kips	Estimated Column Size: Load above level 6: LL _{nd} P _i = P _o = P _i = P _i = P _i =	655 W14x74 ΦP _n =667 k Roof+ 7 Floors 0.40 191.9 kips 383.8 kips
Estimated Column Size: Load above level 6: Line Pi Po Pi Pi	W14xS0 ΦP _n =1000 k Roof+ 7 Floors 0.40 236.9 kips 473.8 kips 12.5 kips 953.8 kips	Equivalent Avia Load, P _{eq} = Estimated Column Size: Load above level 6: Li _{nd} P _i = P _i = P _i =	W14x74 ΦP _n =667 k Roof + 7 Floors 0.40 191.9 kips 383.8 kips 10.1 kips	Estimated Column Size: Load above level 6: LL _{ind} P ₁ = P ₂ = P ₁ =	655 W14x74
Estimated Column Size: Load above level 6: Lim Pi Po Po Pu Unbalanced Moment, Mu Unbalanced Moment, Mu	W14x90	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LL _{ind} P _i = P ₀ = P _i = Unbalanced Moment, M _i = Unbalanced Moment, M _i =	W14x74	Estimated Column Size: Load above level 6: LL _{nd} P _t = P ₀ = P _t = Unbalanced Moment, M _t =	655 W14x74
Estimated Column Size: Load above level 6: LL _m P ₁ P ₂ P ₃ P ₄ P ₄ P ₄ P ₄ P ₄ P ₄ Column Shapes	W14x90	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: Ll _{ind} P _i = P _i = P _i = P _i = Unbalanced Moment, M _i = Column Shape	W14x74	Estimated Column Size: Load above level 6: Lim Pi= Po= Pu= Pu= Unbalanced Moment, Mu= Column Shape=	655 W14x74
Estimated Column Size: Load above level 6: LL _{ad} P ₁ P ₀ P ₀ Unbalanced Moment, M ₁ Column Shapes	W14x90	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LL _{ed} P _i = P _o = P _i = Unbalanced Moment, M _i = Column Shape= Colum Depth=	W14x74	Estimated Column Size: Load above level 6: LL _{md} P _i = P ₀ = P _i = Unbalanced Moment, M _i = Column Shape= Column Depth=	655 W14x74
Estimated Column Size: Load above level 6: Lim Pi Pi Pi Column Shapes Column Depth Effective Length, Ke	W14x90	Equivalent Avia Load, P _{eq} = Estimated Column Size: Load above level 6: Ll _{ind} P _i = P _i = P _i = P _i = Unbalanced Moment, M _i = Column Shape= Column Depph= Effective Length, K _i =	W14x74	Estimated Column Size: Load above level 6: Lind Pi= Po= Pi= Unbalanced Moment, Mi= Column Shape= Column Depth= Effective length, Ki=	655 W14x74
Estimated Column Size: Load above level 6: Li _{net} P ₁ P ₂ P ₃ Unbalanced Moment, M ₁ Column Shapes Column Depth. Effective Length, Kc Column Length, LC	W14x90	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LL _{ed} P _i = P _p = P _i = Unbalanced Moment, M _i = Column Size Column Depth- Effective Length, Ig Column Length, Ig	W14x74	Estimated Column Size: Load above level 6: LL _{md} P ₁ = P ₀ = P ₁ = P ₂ = Unbalanced Moment, M ₂ = Column Shapes Column Depth Effective Length, K ₂ = Column Length, L ₃ = Column Length, L ₄ =	655 W14x74
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Estimated Column Size: Load above level 6: Li _m P _C P _O P _O Unbalanced Moment, M _C Column Shapes Golumn Depthe Effective Length, Ks Column Epth. Es	W14x90	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LL _{ind} P _i = P _o = P _i = Unbalanced Moment, M _i = Column Shape= Column Depth= Effective Length, R: Column Length, L: Equivalent Avial Load, P _{eq} =	W14x74	Estimated Column Size: Load above level 6: Lu _{nd} P _i = P _o = P _i = Unbalanced Moment, M _i = Column Shape= Column Depth= Effective Length, Ks Column tength, L= Equivalent Avial load, P _{inj} =	655 W14x74
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Estimated Column Size: Load above level 6: LL _{int} P ₁ : P ₂ : P ₃ : P ₄ : Column Shapes Column Length, Ic Equivalent Avial Load, P ₄ : Estimated Column Size: Load above level 4: Lint P ₄ : Column Shapes Column Length, Ic Equivalent Avial Load, P ₄ : Estimated Column Size: Load above level 2: Lint P ₄ : Estimated Column Size: Load above level 2: Lint P ₄ : Column Shapes Column Length, Ic Equivalent Avial Load, P ₄ : Estimated Column Size: Load above level 2: Lint P ₄ : Column Shapes Column Depthe	W14x90	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LU _{red} P _i = P _g = P _i = Unbalanced Moment, M _i = Column Shapes Column Length, Le Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 4: LU _{red} P _i = Unbalanced Moment, M _i = Column Shapes Column Shapes Column Size: Load above level 4: LU _{red} P _i = P _i = P _i = Load above level 2: Load above level 2: Load above level 2: Load above level 2: Load above level 3: Load above level 4: Load above level 3: Load above level 4: Load above level 3: Load above level 4: Load above level 4: Load above level 5: Load above level 5: Load above level 6:	W14x74	Estimated Column Size: Load above level 6: LL _{md} P ₁ = P ₀ = P ₁ = P ₁ = P ₂ = Urbalanced Moment, M ₁ = Column Depth- Effective Length, K ₂ - Estimated Column Size: Load above level 4: LL _{nd} P ₁ = P ₂ = Urbalanced Moment, M ₂ = Column Size: Load above level 4: LL _{nd} P ₁ = P ₂ = Urbalanced Moment, M ₂ = Column Size: Load above level 3: LL _{nd} P ₁ = P ₂ = Load above level 3: LL _{nd} P ₂ = Load above level 3: Ll _{nd} P ₃ = Load above level 3: Ll _{nd} P ₄ = P ₄ = P ₅ = Load above level 2: Ll _{nd} P ₄ = P ₅ = P ₆ = P	655 W14x74
Estimated Column Size: Load above level 6: LL_M Pir Pir Pir Urbalanced Moment, Mir Column Bright. Is Equivalent Axial Load, Pir Estimated Column Size: Load above level 4: Lim Pir Pir Urbalanced Moment, Mir Estimated Column Size: Load above level 4: Lim Pir Pir Estimated Column Size: Load above level 4: Lim Pir Pir Urbalanced Moment, Mir Column Size: Load above level 2: Lim Pir Pir Urbalanced Moment, Mir Column Size: Load above level 2: Lim Pir Estimated Column Size: Load size Level Axial Load, Pir Estimated Column Size: Load size Load above level 2: Lim Pir Estimated Column Size: Load size Load above level 2: Lim Pir Estimated Column Size: Load size Load above level 2: Lim Pir Estimated Column Size: Load size Load above level 2: Lim Pir Estimated Column Size: Load size Load above level 2: Lim Pir	W14x90	Equivalent Avial Load, Page Estimated Column Size: Load above level 6: LL _{ind} P ₁ = P ₂ = P ₂ = P ₄ = Unbalanced Moment, M ₁ = Column Shapes Column Size: Load above level 4: Ll _{ind} P ₁ = P ₂ = Estimated Column Size: Load above level 4: Ll _{ind} P ₄ = P ₅ = Column Size: Load above level 4: Ll _{ind} P ₄ = P ₅ = P ₆ = P ₆ = P ₆ = P ₈ = Column Size: Load above level 4: Ll _{ind} P ₈ = Load above level 4: Ll _{ind} P ₈ = Column Size: Load above level 3: Lind P ₈ = Load above level 3: Lind P ₈ = Column Size: Load above level 3: Lind P ₈ = Column Size: Load above level 3: Lind P ₈ = Column Size: Load above level 3: Lind P ₈ = Column Size: Load above level 3:	W14x74	Estimated Column Size: Load above level 6: LL _{md} P _t = P ₀ = P _t = Unbalanced Moment, M _t = Column Size Column Length, La Equivalent Avial Load, P _m = Estimated Column Size: Load above level 4: LL _{md} P _t = Size Column Size: Load above level 4: LL _{md} P _t = Size Column Size: Load above level 4: LL _{md} P _t = Lize Load above level 2: Ll _{md} P _t = Lize Load above level 2: Ll _{md} P _t = Column Depth= Effective Length, Ks Column Length, Ls Column Depth= Effective Length, Ks Column Depth= Effective Length, Ks Column Depth= Effective Length, Ks Column Length, Ls Column Depth= Effective Length, Ks Column Depth= Effective Length, Ks Column Depth= Effective Length, Ks	655 W14x74
Estimated Column Size: Load above level 6: Limple Part Part Part Part Part Part Part Part	W14x90	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LU _{red} P _t = P _t = P _t = P _t = Unbalanced Moment, M _t = Column Shapes Column Shapes Column Shapes Estimated Column Size: Load above level 4: Lu _{red} P _t = Load above level 4: Lu _{red} Unbalanced Moment, M _t = Column Depths Effective Length, Ke Column Size: Load above level 2: Lu _{red} P _t = Load above level 3: Load above level 3: Lu _{red} P _t = Column Size: Load above level 3: Lu _{red} P _t = Column Size: Load above level 3: Lu _{red} P _t = P _t = Column Size: Load above level 3: Lu _{red} P _t = Column Size: Load above level 3: Lu _{red} P _t = P _t = P _t = P _t = Column Size: Load above level 3: Load above level 3: Load above level 4: Load above level 4: Load above level 5: Load above level 5: Load above level 6: Load above level 7: Load above level 8: Load above level 8: Load above level 8: Load above level 9: Load above level 9: Load above level 1: Load above level 1: Load above level 2: Load above level 3: Load above level 4: Load above level 4: Load above level 4: Load above level 5: Load above level 6: Load above level 6: Load above level 6: Load above level 8: Load above level 9: Load above level 9: Load above level 1: Load above level 2:	W14x74	Estimated Column Size: Load above level 6: LL _{md} P ₁ = P ₀ = P ₁ = P ₁ = P ₂ = P ₁ = Column Size: Unbalanced Moment, M ₁ = Column Depthe Effective Length, N ₂ = Column Length, L= Equivalent Avial Load, P _m = Estimated Column Size: Load above level 4: LL _{nd} P ₁ = P ₀ = P ₁ = Column Size: Load above level 4: LL _{nd} P ₁ = P ₀ = P ₁ = Load above level 4: LL _{nd} P ₁ = P ₀ = Column Depthe Effective Length, N ₂ = Column Length, L= Equivalent Avial Load, P _m = Estimated Column Size: Load above level 2: LL _{nd} P ₁ = P ₀ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₂ = P ₃ = Column Size: Load above level 3: Ll _{nd} P ₁ = P ₂ = P ₃ = P ₄ = P ₄ = P ₄ = P ₄ = Column Size: Load above level 3: Ll _{nd} P ₁ = P ₂ = P ₃ = P ₄	655 W14x74
Estimated Column Size: Load above level 6: LL_M Pir Pir Pir Urbalanced Moment, Mir Column Bright. Is Equivalent Axial Load, Pir Estimated Column Size: Load above level 4: Lim Pir Pir Urbalanced Moment, Mir Estimated Column Size: Load above level 4: Lim Pir Pir Estimated Column Size: Load above level 4: Lim Pir Pir Urbalanced Moment, Mir Column Size: Load above level 2: Lim Pir Pir Urbalanced Moment, Mir Column Size: Load above level 2: Lim Pir Estimated Column Size: Load size Level Axial Load, Pir Estimated Column Size: Load size Load above level 2: Lim Pir Estimated Column Size: Load size Load above level 2: Lim Pir Estimated Column Size: Load size Load above level 2: Lim Pir Estimated Column Size: Load size Load above level 2: Lim Pir Estimated Column Size: Load size Load above level 2: Lim Pir	W14x90	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LU _{red} P _t = P _t = P _t = P _t = Unbalanced Moment, M _t = Column Shapes Column Shapes Column Shapes Estimated Column Size: Load above level 4: Lu _{red} P _t = Load above level 4: Lu _{red} Unbalanced Moment, M _t = Column Depths Effective Length, Ke Column Size: Load above level 2: Lu _{red} P _t = Load above level 3: Load above level 3: Lu _{red} P _t = Column Size: Load above level 3: Lu _{red} P _t = Column Size: Load above level 3: Lu _{red} P _t = P _t = Column Size: Load above level 3: Lu _{red} P _t = Column Size: Load above level 3: Lu _{red} P _t = P _t = P _t = P _t = Column Size: Load above level 3: Load above level 3: Load above level 4: Load above level 4: Load above level 5: Load above level 5: Load above level 6: Load above level 7: Load above level 8: Load above level 8: Load above level 8: Load above level 9: Load above level 9: Load above level 1: Load above level 1: Load above level 2: Load above level 3: Load above level 4: Load above level 4: Load above level 4: Load above level 5: Load above level 6: Load above level 6: Load above level 6: Load above level 8: Load above level 9: Load above level 9: Load above level 1: Load above level 2:	W14x74	Estimated Column Size: Load above level 6: LL _{md} P ₁ = P ₀ = P ₁ = P ₁ = P ₂ = P ₁ = Column Size: Unbalanced Moment, M ₁ = Column Depthe Effective Length, N ₂ = Column Length, L= Equivalent Avial Load, P _m = Estimated Column Size: Load above level 4: LL _{nd} P ₁ = P ₀ = P ₁ = Column Size: Load above level 4: LL _{nd} P ₁ = P ₀ = P ₁ = Load above level 4: LL _{nd} P ₁ = P ₀ = Column Depthe Effective Length, N ₂ = Column Length, L= Equivalent Avial Load, P _m = Estimated Column Size: Load above level 2: LL _{nd} P ₁ = P ₀ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₂ = P ₃ = Column Size: Load above level 3: Ll _{nd} P ₁ = P ₂ = P ₃ = P ₄ = P ₄ = P ₄ = P ₄ = Column Size: Load above level 3: Ll _{nd} P ₁ = P ₂ = P ₃ = P ₄	655 W14x74
Estimated Column Size: Load above level 6: Limple Part Part Part Part Part Part Part Part	W14x90	Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LU _{red} P _t = P _t = P _t = P _t = Unbalanced Moment, M _t = Column Shapes Column Shapes Column Shapes Estimated Column Size: Load above level 4: Lu _{red} P _t = Load above level 4: Lu _{red} Unbalanced Moment, M _t = Column Depths Effective Length, Ke Column Size: Load above level 2: Lu _{red} P _t = Load above level 3: Load above level 3: Lu _{red} P _t = Column Size: Load above level 3: Lu _{red} P _t = Column Size: Load above level 3: Lu _{red} P _t = P _t = Column Size: Load above level 3: Lu _{red} P _t = Column Size: Load above level 3: Lu _{red} P _t = P _t = P _t = P _t = Column Size: Load above level 3: Load above level 3: Load above level 4: Load above level 4: Load above level 5: Load above level 5: Load above level 6: Load above level 7: Load above level 8: Load above level 8: Load above level 8: Load above level 9: Load above level 9: Load above level 1: Load above level 1: Load above level 2: Load above level 3: Load above level 4: Load above level 4: Load above level 4: Load above level 5: Load above level 6: Load above level 6: Load above level 6: Load above level 8: Load above level 9: Load above level 9: Load above level 1: Load above level 2:	W14x74	Estimated Column Size: Load above level 6: LL _{md} P ₁ = P ₀ = P ₁ = P ₁ = P ₂ = P ₁ = Column Size: Unbalanced Moment, M ₁ = Column Depthe Effective Length, N ₂ = Column Length, L= Equivalent Avial Load, P _m = Estimated Column Size: Load above level 4: LL _{nd} P ₁ = P ₀ = P ₁ = Column Size: Load above level 4: LL _{nd} P ₁ = P ₀ = P ₁ = Load above level 4: LL _{nd} P ₁ = P ₀ = Column Depthe Effective Length, N ₂ = Column Length, L= Equivalent Avial Load, P _m = Estimated Column Size: Load above level 2: LL _{nd} P ₁ = P ₀ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₁ = Column Size: Load above level 2: Ll _{nd} P ₁ = P ₂ = P ₃ = Column Size: Load above level 3: Ll _{nd} P ₁ = P ₂ = P ₃ = P ₄ = P ₄ = P ₄ = P ₄ = Column Size: Load above level 3: Ll _{nd} P ₁ = P ₂ = P ₃ = P ₄	655 W14x74

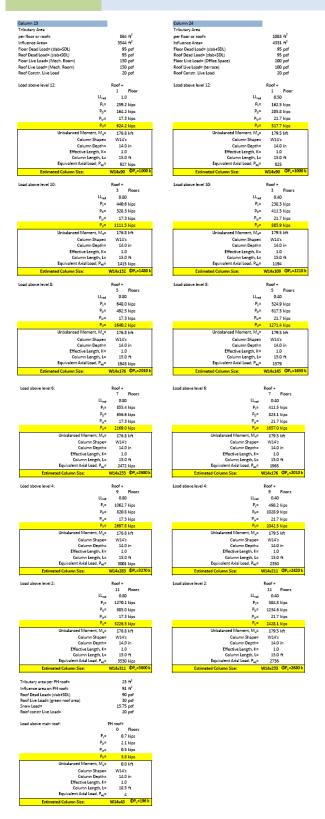
Column 11		Column 12	
Tributary Area		Tributary Area	3
per floor or roof=	623.4 ft ²	per floor or roof=	663 ft ²
Influence Area=	2221 ft ²	Influence Area=	2361 ft ²
Floor Dead Load= (slab+SDL+mem. self-wts) Roof Dead Load= (slab+SDL+mem. self-wts)	95 psf 95 psf	Floor Dead Load= (slab+SDL+mem. self-wts) Roof Dead Load= (slab+SDL+mem. self-wts)	95 psf 95 psf
Floor Live Load= (Sface Space)	100 psf	Floor Live Load= (Office Space)	100 psf
Roof Live Load= (Terrace)	100 psf	Roof Live Load= (Terrace)	100 psf
Roof Constr. Live Load	20 psf	Roof Constr. Live Load	20 psf
	•		
Load above level 12:	Roof+	Load above level 12:	Roof +
	1 Floor		1 Floor
LL _{red}	0.57	LL _{md}	0.56
P ₁ =	97.8 kips	P _L =	103.3 kips
P ₀ =	118.4 kips	P _D =	126.0 kips
P _L =	12.5 kips	P _{tr} =	13.3 kips
P _U =	304.8 kips	P _U =	323.1 kips
Unbalanced Moment, M _e =	53.7 kft	Unbalanced Moment, M _u =	72.5 kft
Column Shape=	W14's	Column Shape=	W14's
Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, P _{eq} =	397	Equivalent Axial Load, P _{eq} =	447
Estimated Column Size:	W14x61 ФР _п =543 k	Estimated Column Size:	W14x61 ФР _а =543 k
Load above level 10:	Roof + 3 Floors	Load above level 10:	Roof + 3 Floors
LL _{vel}	3 Floors 0.43	Ц _{иd}	3 Floors 0.43
P.=	143.5 kips	P _L =	151.5 kips
P ₀ =	236.9 kips	P _D =	251.9 kips
P _U =	12.5 kips	P _{I/} =	13.3 kips
Pu=	520.0 kips	P _U =	551.3 kips
Unbalanced Moment, M _e =	53.7 kft	Unbalanced Moment, M _u =	72.5 kft
Column Shape=	W14's	Column Shape=	W14's
Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K= Column Length, L=	1.0 15.0 ft	Effective Length, K=	1.0 15.0 ft
Equivalent Axial Load, P _{ex} =	612	Column Length, L= Equivalent Axial Load, P _{ec} =	676
Estimated Column Size:	W14x74 ФР₀=667 k	Estimated Column Size:	W14x82
Estimated Column Size:	W14X/4	Estimated Column Size:	A614X95 ALE-133 K
Load above level 8:	Roof+	Load above level 8:	Roof+
	5 Floors		5 Floors
LL _{ed}	0.39	Llad	0.40
P _L =	184.6 kips	P _L =	198.9 kips
P ₀ =	355.3 kips	P _D =	377.9 kips
P _U =	12.5 kips	P _{Ir} =	13.3 kips
P _u =	728.1 kips	P _u =	778.4 kips
Unbalanced Moment, M _e =	53.7 kft	Unbalanced Moment, M _u =	72.5 kft
			72.3 KIL
Column Shaper	W14'e	Column Shaper	1A/1.4%
Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in
Column Shape= Column Depth= Effective Length, K=	W14's 14.0 in 1.0	Column Shape= Column Depth= Effective Length, K=	W14's 14.0 in 1.0
Column Depth= Effective Length, K= Column Length, L=	14.0 in	Column Depth= Effective Length, K= Column Length, L=	14.0 in
Column Depth= Effective Length, K=	14.0 in 1.0	Column Depth= Effective Length, K=	14.0 in 1.0 15.0 ft 903
Column Depth= Effective Length, K= Column Length, L=	14.0 in 1.0 15.0 ft	Column Depth= Effective Length, K= Column Length, L=	14.0 in 1.0 15.0 ft 903
Column Depth= Effective Length, K= Column Length, L= Equivalent Axial Load, P _{eq} =	14.0 in 1.0 15.0 ft 820	Column Depth= Effective Length, L= Column Length, L= Equivalent Axial Load, P _{eq} =	14.0 in 1.0 15.0 ft 903
Column Depth= Effective Length, K= Column Length, L= Equivalent Axial Load, P _{eq} =	14.0 in 1.0 15.0 ft 820	Column Depthe Effective Length, Kir Column Length, Lir Equivalent Avial Load, Page Estimated Column Size:	14.0 in 1.0 15.0 ft 903 W14x90
Column Depth= Effective Length, Le Column Length, Le Equivalent Axial Load, Peg= Estimated Column Size: Load above level 6:	14.0 in 1.0 15.0 ft 820 W14x90	Column Deptise Effective Length, Ka Column Length, La Equivalent Avial Load, P _{eq} a Estimated Column Size: Load above level 6:	14.0 in 1.0 15.0 ft 903
Column Depthe Effective Length, Ke Column Length, Le Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LL _{nd}	14.0 in 1.0 15.0 ft 820 W14x90	Column Depth Effective Length, Ke Column Length, Le Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: Lind	14.0 in 1.0 15.0 ft 903 W14x90
Column Depth= Effective Length, K= Column Length, L= Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: L _{ind} P _i =	14.0 in 1.0 15.0 ft 820 W14x90	Column Depth: Effective Length, K= Column Length, L= Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LL _{nd} P _e =	14.0 in 1.0 15.0 ft 903 W14x90
Column Depth= Effective Length, I.e. Column Length, I.e. Equivalent Axial Load, Peg= Estimated Column Size: Load above level 6: Lind P,e P,e P,e	14.0 in 1.0 15.0 ft 820 W14x90	Column Depths Effective Length, Kir Column Length, Le Equivalent Avial Load, Page Estimated Column Size: Load above level 6: Llad Pge Pge	14.0 in 1.0 15.0 ft 903 W14x90
Column Depthe Effective Length, Ke Column Length, Le Equivalent Avial Load, Pete Estimated Column Size: Load above level 6: LL _{nd} P _t P _o P _o P _o P _o P _o P _o	14.0 in 1.0 15.0 ft 820 W14x90	Column Depth- Effective Length, Ke Column Length, Le Equivalent Axial Load, Page Estimated Column Size: Load above level 6: Lind Pie Po= Po= Pi=	14.0 in 1.0 15.0 ft 903 W14x90
Column Depth= Effective Length, K= Column Length, L= Equivalent Axial Load, P _{et} = Estimated Column Size: Load above level 6: LL _{nd} P _t = P _c = P _c = P _t = P _t =	14.0 in 1.0 15.0 ft 820 W14x90	Column Depths Effective Length, K= Column Length, L= Equivalent Avial Load, P _{eq} = Estimated Column Size: Load above level 6: LU _{md} P _t = P _p = P _t =	14.0 in 1.0 15.0 ft 903 W14x90
Column Depth Effective Length, Is Column Length, Is Column Length, Is Equivalent Avial Load, Pega Estimated Column Size: Load above level 6: Lind Pga Pga Pga Puz	14.0 in 10 15.0 ft 820 W14x90	Column Depths Effective Length, Kir Column Length, Le Equivalent Avial Load, Page Estimated Column Size: Load above level 6: Ll _{md} P ₁ e P ₂ e P ₃ e P ₄ e	14.0 in 1.0 15.0 ft 9003 WI4s90
Column Depthe Effective Length, Ke Column Length, Le Equivalent Axial Load, Pete Estimated Column Size: Load above level 6: LL _{md} P _c P _c P _c P _c Olumn Length Unbalanced Moment, M _c Column Size:	14.0 in 1.0 15.0 ft 820 W14x90	Column Depth Effective Length, K= Column Length, L= Equivalent Axial Load, P _{mp} = Estimated Column Size: Load above level 6: Ll _{md} P _l = P _p = P _l = Urbalanced Moment, M _e = Column Stapes	14.0 in 1.0 15.0 ft 903 W14x90
Column Depth E Effective Length, Le Column Length, Le Equivalent Avial Load, Pege Estimated Column Size: Load above level 6: Lind P, e P, e P, e Unbalanced Moment, M, e Column Shapee Column Depthe	14.0 in 10 15.0 ft 820 W14x90	Column Depth- Effective Length, Ka Column Length, La Equivalent Avial Load, Page Estimated Column Size: Load above level 6: LL _{ma} P ₁ = P ₂ = P ₃ = P ₄ = Urbalanced Momers, M ₂ = Column Snapes Column Depth-	14.0 in 1.0 15.0 ft 9003 WI4490
Column Depthe Effective Length, Is Column Length, Le Equivalent Avial Load, Peta Estimated Column Size: Load above level 6: Ll _{nd} P _t P _o P _o P _t Column Size Unbalanced Moment, M _o Column Shapee Column Spath Effective Length Effective Length	14.0 in 10 15.0 ft 820 W14x90	Column Depth Effective Length, Kr. Column Length, Lr. Equivalent Axial Load, P _{Max} Estimated Column Size: Load above level 6: Limit P ₁ = P ₀ = P ₁ = P ₁ = Urbalanced Moment, M ₁ = Column Sixpee Column Depth Effective Length, Kr.	14.0 in 1.0 15.0 ft 903 W14s90
Column Depth E Effective Length, Le Column Length, Le Equivalent Avial Load, Pege Estimated Column Size: Load above level 6: Lind P, e P, e P, e Unbalanced Moment, M, e Column Shapee Column Depthe	14.0 in 10 15.0 ft 820 W14x90	Column Depth- Effective Length, Ka Column Length, La Equivalent Avial Load, Page Estimated Column Size: Load above level 6: LL _{ma} P ₁ = P ₂ = P ₃ = P ₄ = Urbalanced Momers, M ₂ = Column Snapes Column Depth-	14.0 in 1.0 15.0 ft 9003 WI4490
Column Depthe Effective Length, Le Column Length, Le Equivalent Axial Load, Pege Estimated Column Size: Load above level 6: Ll _{ma} P _c P _c P _c Unbalanced Moment, M _c = Column Shape Column Depthe Effective Length, K Column Length, K Column Length	14.0 in 1.0 15.0 ft 20 W14x90	Column Depthe Effective Length, Kir Column Length, Le Equivalent Avial Load, P _{Max} Estimated Column Size: Load above level 6: Limit P ₁ P ₂ P ₃ P ₄ Urbalanced Mameri, M ₄ Column Shapes Column Depthe Effective Length, Kir Column Length, Le Equivalent Avial Load, P ₄ Effective Length, Kir Column Length, Le Equivalent Avial Load, P ₄	14.0 in 1.0 15.0 ft 9003 W14s90
Column Depth Effective Length, Is Column Length, Le Equivalent Avial Load, Peta Estimated Column Size: Load above level 6: Lind Peta Peta Peta Peta Peta Column Depth Effective Length, Is Column Depth Effective Length, Is Column Depth Effective Length, Is Column Length, Le Equivalent Avial Load, Peta Peta Peta Peta Peta Peta Peta Peta	14.0 in 100 15.0 ft 820 W14x90	Column Depths Effective Length, Is- Column Length, Le Equivalent Avial Load, Page Estimated Column Size: Load above level 6: Limi Pie Poge Pue Unbalanced Mament, Mie Column Shapes Column Depths Effective Length, Ke Column Length, Le Equivalent Avial Load, Pue Effective Length, Ke Column Length, Le Equivalent Avial Load, Pue	14.0 in 10 15.0 ft 903 WI4s90
Column Depth Effective Length, Is Column Length, Le Equivalent Avial Load, Peta Estimated Column Size: Load above level 6: Lind Peta Peta Peta Peta Peta Column Depth Effective Length, Is Column Depth Effective Length, Is Column Depth Effective Length, Is Column Length, Le Equivalent Avial Load, Peta Peta Peta Peta Peta Peta Peta Peta	14.0 in 100 15.0 ft 820 W14x90	Column Depths Effective Length, Kir Column Length, Le Equivalent Avial Load, Page Estimated Column Size: Load above level 6: Ll _{md} P ₁ e P ₂ e P ₃ e P ₄ e Urbalanced Moment, M ₄ e Column Siapee Column Depths Effective Length, Kie Column Length, Le Equivalent Avial Load, P _{mg} e Estimated Column Size: V	14.0 in 10 15.0 ft 903 WI4s90
Column Depth Effective Length, LE Equivalent Avial Load, Pega Estimated Column Size: Load above level 6: Lind Pega Puga Unbalanced Moment, M.g Column Shape Column Spape Column Spape Column Depth Effective Length, N.g Column Shape Effective Length, N.g Column Shape Effective Length, N.g Column Shape Effective Length, N.g Column Spape Estimated Column Spape Column Spape Effective Length, N.g Column Spape Effective Length, N.g Column Spape Estimated Column Size: Load above level 4:	14.0 in 10 15.0 ft 820 W14x90	Column Depthe Effective Length, Kiz Column Length, Liz Column Length, Liz Equivalent Avial Load, Page Estimated Column Size: Load above level 6: LL _{md} P ₁ e P ₂ e P ₃ e P ₄ e Urbalanced Moment, M ₄ e Column Snapee Column Depthe Effective Length, Ke Column Length, Liz Equivalent Avial Load, P _{mg} e Estimated Column Size: Valued above level 4:	14.0 in 1.0 15.0 ft 9003 WIAs90
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Column Depth Effective Length, I.E Column Length, I.E Equivalent Avial Load, Pega Estimated Column Size: Load above level 6: Lind Pega Puga Unbalanced Moment, M.g Column Shapee Column Depth Effective Length, N.g Column Shapee	14.0 in 10 15.0 ft 820 W14x90	Column Depthe Effective Length, Kir Column Length, Le Equivalent Avial Load, Page Estimated Column Size: Load above level 6: Lland Pge Pge Pge Urbalanced Moment, Mge Column Shapee Column Depthe Effective Length, Kie Column Length, Le Equivalent Avial Load, Page Estimated Column Size: V. Load above level 4: Lland Pge Pge	14.0 in 1.0 15.0 ft 9003 WIAs90
Column Depth Effective Length, I.E. Column Length, I.E. Equivalent Avial Load, Peta Estimated Column Size: Load above level 6: Lind Peta Pota Unbalanced Moment, Mile Column Depth Effective Length, I.E. Column Depth Effective Length, I.E. Equivalent Avial Load, Peta Estimated Column Size: Load above level 4: Lind Peta Pota Pota Peta Peta Pota Peta Pota Peta Pota Peta Pota Peta Pota Peta Pota Peta Peta Pota Peta Peta Peta Peta Peta Peta Peta Pe	14.0 in 100 15.0 ft 820 W14x90	Column Depth- Effective Length, I: Column Length, L: Equivalent Avial Load, Page Estimated Column Size: Load above level 6: Limi Pie Poge Pue Unbalanced Mament, Mie Column Shapes Column Depth- Effective Length, K: Column Length, L: Equivalent Avial Load, Pie Estimated Column Size: V. Load above level 4: Limi Pie Poge Poge Poge Poge Poge Poge Poge Pog	14.0 in 10 15.0 ft 903 WIds90
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Column Depth Effective Length, Is Column Length, Le Equivalent Avial Load, Pega Estimated Column Size: Load above level 6: Lind Policy Polic	14.0 in 10 15.0 ft 820 W14x90	Column Depths Effective Length, Kir Column Length, Le Equivalent Avial Load, Page Estimated Column Size: Load above level 6: Lland Pge Pge Pge Urbalanced Moment, Mge Column Shapee Column Depths Effective Length, Ke Column Length, Le Equivalent Avial Load, Page Estimated Column Size: V. Load above level 4: Lland Pge	14.0 in 1.0 15.0 ft 9003 WI4s90
Column Depth- Effective Length, Ka- Column Length, La- Equivalent Avial Load, Peta Estimated Column Size: Load above level 6: Lind Peta Peta Puta Unbalanced Moment, Meta Column Shapes Estimated Column Size: Load above level 4: Lind Peta Peta Peta Peta Peta Peta Peta Peta	14.0 in 100 15.0 ft 820 WI4x90	Column Depth Effective Length, I: Column Length, I: Equivalent Axial Load, P _{MP} Estimated Column Size: Load above level 6: Limit P _P P _P Urbalanced Moment, M _P Column Shapes Column Shapes Column Depth Effective Length, Ki Column Loagth, I: Equivalent Axial Load, P _{MP} Estimated Column Size: Vi Load above level 4: Limit P _P P _P P _P Urbalanced Moment, M _P Column Shapes Column Size: Vi Load above level 4:	14.0 in 10 15.0 ft 903 WI4s-90
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Column Depths Effective Length, I.s. Column Length, I.s. Equivalent Avial Load, P.e.s. Estimated Column Size: Load above level 6: L. L	14.0 in 100 15.0 ft 820 W14x90	Column Depths Effective Length, Kir Column Length, La Equivalent Avial Load, P _{Max} Estimated Column Size: Load above level 6: LL _{md} P ₁ P ₂ P ₂ P ₃ P ₄ Unbalanced Moment, M ₁ Column Shapes Column Depths Effective Length, Kis Column Length, Lis Equivalent Avial Load, P _m Estimated Column Size: V Load above level 4: Ll _{md} P ₁ P ₂ Unbalanced Moment, M ₁ Column Length, Kis Column Length, Kis Column Length, Kis Load above level 4: Limit L	14.0 in 1.0 15.0 ft 9003 WI4s90
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Column Depth Effective Length, Is Column Length, Is Equivalent Avial Load, Pega Estimated Column Size: Load above level 6: Lind Pega Unbalanced Moment, M.g Column Size Unbalanced Moment, M.g Column Size Unbalanced Moment, M.g Column Size Load above level 4: Lind Equivalent Avial Load, Pega Estimated Column Size: Load above level 4: Lind Pega Unbalanced Moment, M.g Column Size: Load above level 4:	14.0 in 10 15.0 ft 820 W14x90	Column Depths Effective Length, list Column Length, List Column Length, List Equivalent Avial Load, Page Estimated Column Size: Load above level 6: Lland Pge Pge Pge Urbalanced Moment, Mge Column Shapes Column Depths Effective Length, list Equivalent Avial Load, Page Estimated Column Size: V. Load above level 4: Lland Pge Pge Pge Pge Urbalanced Moment, Mge Column Size: V. Load above level 4: Lland Pge Pge Pge Column Size: V. Load above level 4: Lland Pge Pge Pge Pge Column Size: Column Length, List List Pge Pge Pge Pge Column Depths Effective Length, list Column Length, List Equivalent Avial Load, Page Estimated Column Size: V.	14.0 in 10 15.0 ft 9003 WHas90
Column Depths Effective Length, I.s. Column Length, I.s. Equivalent Avial Load, P.e.s. Estimated Column Size: Load above level 6: L. L	14.0 in 100 15.0 ft 820 W14x90	Column Depths Effective Length, list Column Length, List Column Length, List Equivalent Avial Load, Page Estimated Column Size: Load above level 6: Lland Pge Pge Pge Urbalanced Moment, Mge Column Shapes Column Depths Effective Length, list Equivalent Avial Load, Page Estimated Column Size: V. Load above level 4: Lland Pge Pge Pge Pge Urbalanced Moment, Mge Column Size: V. Load above level 4: Lland Pge Pge Pge Column Size: V. Load above level 4: Lland Pge Pge Pge Pge Column Size: Column Length, List List Pge Pge Pge Pge Column Depths Effective Length, list Column Length, List Equivalent Avial Load, Page Estimated Column Size: V.	14.0 in 10 15.0 ft 903 WIds90
Column Depthe Effective Length, Ke Column Length, Le Equivalent Axial Load, Pege Estimated Column Size: Load above level 6: Lind Pege Pege Unbalanced Moment, M.,e Column Shapee Column Depthe Effective Length, Ke Column Shapee Estimated Column Size: Load above level 4: Lind Pege Pege Pege Column Shapee	14.0 in 10 15.0 ft 820 W14x90	Column Depthe Effective Length, Kir Column Length, Lir Column Length, Lir Equivalent Avial Load, Page Estimated Column Size: Load above level 6: LL _{ind} P _i = Urbalanced Momers, M _i = Column Snapee Column Depthe Effective Length, Ke Column Length, Lir Equivalent Avial Load, P _{ij} = Estimated Column Size: Vi Load above level 4: LL _{ind} P _i = Column Snapee Column Depthe Effective Length, Ke Column Length, Li Equivalent Avial Load, P _{ij} = Estimated Column Size: Vi Load above level 2: Vi Load above level 2:	14.0 in 10 15.0 ft 9003 W14a90
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Column Depths Effective Length, I.s. Column Length, L.s. Equivalent Axial Load, P.4. Estimated Column Size: Load above level 6: LL _{rd} P.2. P.3. Unbalanced Moment, M.4. Column Shaper Column Depths Effective Length, I.s. Equivalent Axial Load, P.4. Estimated Column Size: Load above level 4: LL _{rd} P.2. P.3. Unbalanced Moment, M.4. Column Shaper Column Depths Effective Length, I.s. Column Length L.s. Equivalent Axial Load, P.4. P.5. P.5. P.6. P.6. P.7. Unbalanced Moment, M.4. Column Depths Effective Length, I.s. Column Depths Effective Length, I.s. Column Length, L.s. Equivalent Axial Load, P.4. Equivalent Axial Load, P.4. Estimated Column Size: Load above level 2: LL _{rd} Estimated Column Size: Load above level 2:	14.0 in 10 15.0 ft 20 W14x90	Column Depths Effective Length, Kir Column Length, Lir Column Length, Lir Equivalent Axial Load, Page Estimated Column Size: Load above level 6: Lind Region Page Page Urbalanced Moment, Mge Column Depths Effective Length, Ke Column Length, Le Equivalent Axial Load, Page Estimated Column Size: Valued above level 4: Load above level 4: Lind Region Page Column Size: Load above level 4: Lind Region Page Column Size: Load above level 4: Load above level 4: Load above level 4: Load above level 5: Load above level 5: Load above level 6: Lind Region	14.0 in 1.0 15.0 ft 903 WI4s90 ΦP _n =1000 i Roof + 7 Floors 0.40 251.9 kips 503.9 kips 13.3 kips 101.4 kips 72.5 kft WI4's 1.0 in 1.0 ft 1139 VI4s109 ΦP _n =1210 k Roof + 9 Floors 0.40 305.0 kips 629.9 kips 13.3 kips 1250.4 kips 72.5 kft WI4's 14.0 in 1.0 1.0 1.0 ft 1379 Roof + 11 Floors 0.40 378.0 kips Roof + 11 Floors 0.40 378.0 kips
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Column Depths Effective Length, I.E. Column Length, I.E. Equivalent Avial Load, Pega Estimated Column Size: Load above level 6: Lind P.E. P.E. Unbalanced Moment, M.E. Column Shape: Load above level 4: Lind P.E. P.E. P.E. Estimated Column Size: Load above level 4: Lind P.E. Estimated Kondon Moment, M.E. Column Depth: Effective Length, Is. Column Depth: Effective Length, Is. Column Depth: Effective Length, Is. Column Depth: Estimated Column Size: Load above level 2: Lind P.E. P.E. P.E. P.E. P.E. P.E. P.E. P.E	14.0 in 100 15.0 ft 820 W14x90	Column Depthe Effective Length, Kir Column Length, Lir Column Length, Lir Equivalent Avial Load, Page Estimated Column Size: Load above level 6: Lind Pic Page Pur Unbalanced Moment, Mic Column Shapes Column Depthe Effective Length, Kir Column Length, Lir Equivalent Avial Load, Page Estimated Column Size: Vi Load above level 4: Lind Pic Pige Urbalanced Moment, Mic Column Length, Kir Column Length, Lir Equivalent Avial Load, Pige Pige Pige Lind Lind Pic Estimated Column Size: Vi Load above level 4: Lind Lind Pic Estimated Column Length, Lir Column Length, Lir Equivalent Avial Load, Pige Estimated Column Size: Vi Load above level 2: Lind Pic Estimated Column Size: Vi Load above level 2:	14.0 in 10 15.0 ft 9003 WI4s-90
Column Depths Effective Length, Ka Column Length, La Equivalent Axial Load, Page Estimated Column Size: Load above level 6: Lind Page Olimn Length, La Page Page Unbalanced Moment, Mage Column Shapes Column Depths Effective Length, Ka Column Shapes Column Shapes Column Shapes Column Shapes Column Shapes Column Shapes Load above level 4: Lind Page Estimated Column Size: Load above level 4: Lind Page Column Shapes Estimated Column Shapes Column Shapes Page Unbalanced Moment, Mage Column Shapes Column Shapes Column Shapes Column Shapes Estimated Column Size: Load above level 2: Lind Equivalent Axial Load, Page Estimated Column Size: Load above level 2:	14.0 in 10 15.0 ft 20 W14x90	Column Depthe Efficience Length, Kir Column Length, Lir Column Length, Lir Equivalent Avial Load, Page Estimated Column Size: Load above level 6: LL _{mai} P _i = Column Stapes Column Depthe Effective Length, Kir Column Length, Lir Equivalent Avial Load, P _i = Estimated Column Size: Vi Load above level 4: LL _{mai} P _i = P _i = P _i = P _i = Column Stapes Column Depthe Effective Length, Kir Load above level 4: LL _{mai} P _i = P _i = P _i = Column Stapes Column Depthe Effective Length, Kir Column Length, Lir Equivalent Avial Load, P _i = Estimated Column Size: Vi Load above level 2: LL _{mai} P _i = P	14.0 in 10 10 15.0 ft 9003 W14a90
Column Depth Effective Length, Is Column Length, Is Equivalent Avial Load, Pege Estimated Column Size: Load above level 6: Lind Pege Unbalanced Moment, M.g Column Size Unbalanced Moment, M.g Column Size Unbalanced Moment, M.g Column Size; Load above level 4: Lind Pege Equivalent Avial Load, Pege Estimated Column Size: Load above level 4: Lind Pege Unbalanced Moment, M.g Column Size; Load above level 4: Lind Pege Puge Unbalanced Moment, M.g Column Size; Load above level 4: Lind Pege Estimated Column Size; Load above level 4: Lind Pege Puge Unbalanced Moment, M.g Column Size; Load above level 2: Lind Pege Puge Unbalanced Moment, M.g Estimated Column Size; Load above level 2:	14.0 in 10 15.0 ft 820 W14x90	Column Depths Effective Length, list Column Length, List Column Length, List Equivalent Avial Load, Page Estimated Column Size: Load above level 6: Lland Pge Pge Pge Urbalanced Moment, Mge Column Shapes Column Depths Effective Length, list Equivalent Avial Load, Page Estimated Column Size: V. Load above level 4: Lland Pge Pge Pge Urbalanced Moment, Mge Column Length, List Equivalent Avial Load, Page Estimated Column Size: V. Load above level 4: Lland Pge Pge Column Shapes Column Depths Effective Length, list Equivalent Avial Load, Page Estimated Column Size: V. Load above level 2: Lland Pge Estimated Column Size: V. Load above level 2: Lland Pge	14.0 in 10 15.0 ft 9003 WIAs90
Column Depths Effective Length, Ka Column Length, La Equivalent Avial Load, Page Estimated Column Size: Load above level 6: LL _{red} Pga Pga Unbalanced Moment, Mga Column Depths Effective Length, Na Column Length, La Estimated Column Size: Load above level 4: LInd Pga Estimated Column Size: Load above level 4: LInd Pga Pga Unbalanced Moment, Mga Column Length, La Equivalent Avial Load, Page Estimated Column Size: Load above level 4: LInd Pga Pga Unbalanced Moment, Mga Column Depths Effective Length, Ka Column Length, La Equivalent Avial Load, Page Estimated Column Size: Load above level 2: LInd Pga Pga Unbalanced Moment, Mga Column Size: Load above level 2:	14.0 in 10 15.0 ft 820 W14x90	Column Depths Effective Length, Kir Column Length, Lir Column Length, Lir Equivalent Axial Load, Page Estimated Column Size: Load above level 6: Lind Region Regi	14.0 in 1.0 15.0 ft 903 WI4s90 ΦP _n =1000 i Roof + 7 Floors 0.40 251.9 kips 503.9 kips 13.3 kips 13.3 kips 1014.4 kips 72.5 kft WI4's 14.0 in 1.0 15.0 ft 1139 Plak109 ΦP _n =1210 k Roof + 9 Floors 0.40 305.0 kips 629.9 kips 1250.4 kips 72.5 kft WI4's 14.0 in 1.0 15.0 ft 1379 Roof + 11 Floors 0.40 358.0 kips 72.5 kft WI4's 14.0 in 1.0 15.0 ft 1375 1375 1380 kips 72.5 kft WI4's 14.0 in 1.0 15.0 ft 1375 1375 1380 kips 72.5 kft WI4's 14.0 in 1.0 15.0 ft 1375 1375 1380 kips 72.5 kft WI4's 14.0 in 1.0 15.0 ft 1375 1380 kips 72.5 kft WI4's 14.0 in 1.0 15.0 ft 1375 1380 kips 72.5 kft WI4's 14.0 in 1.0 15.0 ft 1375 1380 kips 72.5 kft WI4's 14.0 in 15.0 ft 13.3 kips 1486.4 kips 72.5 kft WI4's 14.0 kips 72.5 kft WI4's
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Column Depths Effective Length, Ke Column Length, Le Equivalent Avial Load, Pete Estimated Column Size: Load above level 6: LL _{red} Peter Pope Unbalanced Moment, Meter Column Depths Effective Length, Ke Column Length, Le Equivalent Avial Load, Peter Estimated Column Size: Load above level 4: Lred Peter Pope Pupe Unbalanced Moment, Meter Column Depths Estimated Column Size: Load above level 4: Lund Peter Pupe Pupe Unbalanced Moment, Mage Column Depths Effective Length, Ke Column Depths Effective Length, Ke Column Depths Effective Length, Ke Column Depths Effective Length, Le Equivalent Avial Load, Peter Pupe Pupe Unbalanced Moment, Mage Column Size: Load above level 2:	14.0 in 100 15.0 ft 820 W14x90	Column Depths Effective Length, life Golumn Length, life Golumn Length, life Golumn Length, life Equivalent Axial Load, Page Estimated Column Size: Load above level 6: Llad Pgz Pgz Pgz Urbalanced Moment, Mgz Column Stapes Column Depths Effective Length, life Equivalent Axial Load, Pggz Estimated Column Size: V Load above level 4: Llad Pgz Pgz Pgz Urbalanced Moment, Mgz Column Depths Effective Length, life Lad Pgz Pgz Pgz Urbalanced Moment, Mgz Estimated Column Size: V Load above level 2: Llad Pgz Pgz Lolumn Length, Life Equivalent Axial Load, Pggz Estimated Column Size: V Load above level 2: Llad Pgz Pgz Lord Column Size: V Load above level 2: Llad Pgz Column Length, Life Column Length, Life Column Length, Life Column Length, Life Column Size: V Load above level 2: Llad Pgz Column Size: Column Length, Life Column Size: Column Size: Column Length, Life Pgz Pgz Column Size Fifective Length, Kie Fifective	14.0 in 10 15.0 ft 903 WI4s-90
Column Depthe Effective Length, Ke Column Length, Le Equivalent Avial Load, Pege Estimated Column Size: Load above level 6: Lind Pege Unbalanced Moment, M., Column Shape Column Depthe Effective Length, Ke Column Stage: Load above level 4: Lind Pege Estimated Column Size: Load above level 4: Lind Pege Estimated Column Size: Load above level 4: Lind Pege Pege Unbalanced Moment, M., Column Shape Estimated Column Size: Load above level 4: Lind Pege Pege Column Shape Column Shape Effective Length, Ke Column Shape Estimated Column Size: Load above level 2: Lind Pege Pege Unbalanced Moment, M., Column Shape Estimated Column Size: Load above level 2:	14.0 in 10 15.0 ft 820 W14x90	Column Depthe Effective Length, Kir Column Length, Lir Column Length, Lir Equivalent Avial Load, Page Estimated Column Size: Load above level 6: LL _{nd} P ₁ e P ₂ e P ₃ e P ₄ e Urbalanced Moment, M ₄ e Column Size Column Length, Le Equivalent Avial Load, P _{nd} e Estimated Column Size: Vi Load above level 4: LL _{nd} P ₁ e P ₂ e P ₃ e P ₄ e Estimated Column Size: Vi Load above level 4: LL _{nd} P ₄ e P ₅ e P ₆ e P ₆ e P ₇ e P ₈ e P ₈ e Column Length, Le Equivalent Avial Load, P _{nd} e P ₈ e Column Length, Le Equivalent Avial Load, P _{nd} e Estimated Column Size: Vi Load above level 2: LL _{nd} P ₁ e P ₂ e Estimated Column Size: Vi Load above level 2: LL _{nd} P ₁ e P ₁ e P ₂ e P ₁ e Column Size: Vi Load above level 2: LL _{nd} P ₁ e P ₂ e P ₃ e P ₄ e Column Size: Vi Load above level 2: LL _{nd} P ₁ e P ₂ e P ₃ e P ₄ e Column Size: Column Size: Column Depthe	14.0 in 10 10 15.0 ft 9003 Whas90
Column Depthe Effective Length, Ke Column Length, Le Equivalent Axial Load, Pege Estimated Column Size: Load above level 6: Lind Pege Unbalanced Moment, M.ge Column Shapee Column Depthe Effective Length, Ke Column Size: Load above level 4: Lind Pege Estimated Column Size: Load above level 4: Lind Pege Estimated Column Size: Load above level 4: Lind Pege Column Shapee Estimated Column Size: Load above level 4: Lind Pege Pege Column Shapee Estimated Column Size: Load above level 2: Lind Pege Pege Pege Column Shapee Column Shapee Estimated Column Shapee Pege Pege Pege Pege Pege Pege Pege Column Shapee Column Shapee Column Shapee Column Shapee Fifective Length, Ke Column Shapee Column Shapee Fifective Length, Ke Column Shapee	14.0 in 10 15.0 ft 20 W14x90	Column Depths Effective Length, Isr Column Length, La Equivalent Avial Load, Page Estimated Column Size: Load above level 6: Llad Pga Pga Unbalanced Moment, Mga Column Size Estimated Column Size: V. Load above level 4: Llad Pga Estimated Column Size: V. Load above level 4: Llad Pga Estimated Column Size: V. Load above level 4: Llad Pga Pga Unbalanced Moment, Mga Column Ength, La Equivalent Avial Load, Pga Pga Pga Pga Pga Unbalanced Moment, Mga Column Depths Effective Length, Ka Column Length, La Equivalent Avial Load, Pgga Estimated Column Size: V. Load above level 2: Llad Pga Pga Unbalanced Moment, Mga Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: V. Load above level 2: Llad Pga Estimated Column Size: Llad Pga Pga Estimated Column Size: Llad Pga Pga Pga Pga Estimated Column Size: Llad Pga	14.0 in 10 10 15.0 ft 9003 Wildas90

Note: Refer to Moment Frame A.1 elevation in final report for column sizes that support combined gravity and lateral loads

Moment Frame B: Estimated column sizes based on gravity load analysis only

Column 15	Column 16	Column 17	Column 18
Tributary Area per floor or roof= 559 ft ²	Tributary Area per floor or roof= 1127 ft ²	Tributary Area per floor or roof= 964.5 ft ³	Tributary Area per floor or roof= 452.5 ft ²
Influence Area 2130 ft ²	Influence Area= 4508.5 ft ²	Influence Area= 3857.4 ft ²	Influence Area= 1810 ft ²
Floor Dead Load= (slab+SDL) 95 psf	Floor Dead Load= (slab+SDL) 95 psf	Floor Dead Load= (slab+SDL) 95 psf	Floor Dead Load= (slab+SDL) 95 psf
Roof Dead Load= (slab+SDL) 95 psf Floor Live Load= (Office Space) 100 psf	Roof Dead Load= (slab+SDL) 95 psf Floor Live Load= (Office Space) 100 psf	Roof Dead Load= (slab+SDL) 95 pcf Floor Live Load= (Mech. Room) 150 pcf	Roof Dead Load= (slab+SDL) 95 psf Floor Live Load= (Mech. Room) 150 psf
Roof Live Load= (Green roof area) 30 psf	Roof Live Load= (Cooling Towers) 150 psf	Roof Live Load= (Nech. Room) 150 psf	Roof Live Load= (Mech. Room) 150 psf
Roof Constr. Live Load 20 psf	Roof Constr. Live Load 20 psf	Roof Constr. Live Load 20 psf	Roof Constr. Live Load 20 psf
Load above level 12: Roof +	Load above level 12: Roof +	Load above level 12: Roof +	Load above level 12: Roof +
1 Floor	1 Floor	Load above level 12: Root + 1 Floor	Load above level 12: Roor+ 1 Floor
LL _{red} 0.58	LL _{red} 0.50	LL _{ned} 1.00	LL _{red} 1.00
P _L = 48.9 kips	P _c = 225.4 kips	P _L = 289.4 kips	P _L = 135.8 kips
P _D = 106.2 kips	P ₀ = 214.1 kips	P _D = 183.3 kips	P _D = 86.0 kips
P _u = 11.2 kips	P _L = 22.5 kips	P _{Ir} = 19.3 kips	P _{tr} = 9.1 kips
Pu= 211.3 kips Unbalanced Moment, Mu= 178.5 kft	Pu= 628.9 kips Unbalanced Moment, M _e = 87.0 kft	Pu= 692.5 kips Unbalanced Moment, Mu= 108.0 kft	Pu= 359.6 kips Unbalanced Moment, M _u = 53.3 kft
Column Shape= W14's	Column Shape= W14's	Column Shape= W14's	Column Shape= W14's
Column Depth= 14.0 in	Column Depth= 14.0 in	Column Depth= 14.0 in	Column Depth= 14.0 in
Effective Length, K= 1.0	Effective Length, K= 1.0	Effective Length, K= 1.0	Effective Length, K= 1.0
Column Length, L= 15.0 ft Equivalent Axial Load, P _{eq} = 517	Column Length, L= 15.0 ft Equivalent Axial Load, P _{eq} = 778	Column Length, L= 15.0 ft Equivalent Axial Load, P _{eq} = 878 kips	Column Length, L= 15.0 ft Equivalent Avial Load, P _{eq} = 451 kips
Estimated Column Size: W14x61 ФР _n =543 k	Estimated Column Size: W14x90 Pp=1000 k	Estimated Column Size: W14x90 OP _n =1000 k	Estimated Column Size: W14x61 Pp.=543 I
Estimated Column Size.	Estimated Column Side. 1924450 4-18	Estimated Column Size.	Estimated Column Size.
Load above level 10: Roof+	Load above level 10: Roof +	Load above level 10: Roof +	Load above level 10: Roof +
3 Floors LL _{red} 0.44	3 Floors LL _{red} 0.40	3 Floors Li _{nd} 0.80	3 Floors LL _{red} 0.80
P _L = 90.2 kips	P _L = 304.3 kips	P _L = 491.9 kips	P _L = 230.8 kips
P ₀ = 212.4 kips	P ₀ = 428.3 kips	P _D = 366.5 kips	P _D = 172.0 kips
P _{tr} = 11.2 kips	P _L ,= 22.5 kips	P _{tr} = 19.3 kips	P _{tr} = 9.1 kips
P _U = 404.8 kips	P _U = 1012.0 kips	P _U = 1236.5 kips	P _U = 614.8 kips
Unbalanced Moment, M _u = 178.5 kft	Unbalanced Moment, M _e = 87.0 kft	Unbalanced Moment, M _u = 106.0 kft	Unbalanced Moment, M _a = 53.3 kft
Column Shape= W14's	Column Shape= W14's	Column Shape= W14's	Column Shape= W14's
Column Depth= 14.0 in Effective Length, K= 1.0	Column Depth= 14.0 in Effective Length, K= 1.0	Column Depth= 14.0 in Effective Length, K= 1.0	Column Depth= 14.0 in Effective Length, K= 1.0
Column Length, L= 15.0 ft	Column Length, L= 15.0 ft	Column Length, L= 15.0 ft	Column Length, L= 15.0 ft
Equivalent Axial Load, P _{eq} = 711	Equivalent Axial Load, Pag= 1161	Equivalent Axial Load, P _{eq} = 1422 kips	Equivalent Axial Load, P _{eq} = 706 kips
Estimated Column Size: W14x82 Pp=735 k	Estimated Column Size: W14x109 Pn=1210 k	Estimated Column Size: W14x132 Pn=1480 k	Estimated Column Size: W14x82 ФР _п =735 I
Load above level 8: Roof+	Load above level 8: Roof +	Load above level 8: Roof +	Lozd above level 8: Roof +
Load above level 8: Roof + 5 Floors	5 Floors	Load above level 8: Roof + 5 Floors	Load above level 8: Roof + 5 Floors
LL _{red} 0.40	LL _{red} 0.40	LL _{red} 0.80	LL _{red} 0.80
P _L = 128.6 kips	P _L = 394.5 kips	P _L = 723.4 kips	P _t = 339.4 kips
P ₀ = 318.6 kips	P ₀ = 642.4 kips	P ₀ = 549.8 kips	P _D = 257.9 kips
Pu= 11.2 kips Pu= 593.7 kips	P _U = 22.5 kips Pu= 1413.3 kips	P _L = 19.3 kips P _L = 1826.8 kips	P _{Ir} = 9.1 kips P _U = 891.7 kips
Unbalanced Moment, M _u = 178.5 kft	Unbalanced Moment, M _e = 87.0 kft	Unbalanced Moment, M _v = 108.0 kft	Unbalanced Moment, M _s = 53.3 kft
Column Shape= W14's	Column Shape= W14's	Column Shape= W14's	Column Shape= W14's
Column Depth= 14.0 in	Column Depth= 14.0 in	Column Depth= 14.0 in	Column Depth= 14.0 in
Effective Length, K= 1.0 Column Length, L= 15.0 ft	Effective Length, K= 1.0 Column Length, L= 15.0 ft	Effective Length, K= 1.0 Column Length, L= 15.0 ft	Effective Length, K= 1.0 Column Length, L= 15.0 ft
Column Length, L= 15.0 ft Equivalent Axial Load, P _{eq} = 900	Equivalent Axial Load, P ₄₄ = 1562	Equivalent Axial Load, P _{eq} = 2012 kips	Equivalent Axial Load, P _{eq} = 983 kips
Estimated Column Size: W14x90 Pp=1000 k	Estimated Column Size: W14x145 Pp.=1650 k	Estimated Column Size: W14x193 Pn=2210 k	Estimated Column Size: W14x90 PP _n =1000
	Entitle Column Steel 112-102-10-10		
Load above level 6: Roof +	Load above level 6: Roof +	Load above level 6: Roof +	Load above level 6: Roof +
7 Floors LL _{red} 0.40	7 Floors LL _{red} 0.40	7 Floors LL _{md} 0.80	7 Floors LL _{red} 0.80
P _L = 173.3 kips	P _L = 484.6 kips	P _L = 954.9 kips	P _L = 448.0 kips
P ₀ = 424.8 kips	P ₀ = 856.5 kips	P _D = 733.0 kips	P _D = 343.9 kips
P _u = 11.2 kips	P _{tr} = 22.5 kips	P _{tr} = 19.3 kips	P _{tr} = 9.1 kips
P _U = 792.7 kips	P _U = 1814.5 kips	P _U = 2417.0 kips	P _u = 1168.7 kips
Unbalanced Moment, M _u = 178.5 kft	Unbalanced Moment, M _e = 87.0 kft	Unbalanced Moment, M _v = 108.0 kft	Unbalanced Moment, M _e = 53,3 kft
Column Shape= W14's Column Depth= 14.0 in	Column Shape= W14's Column Depth= 14.0 in	Column Shape= W14's Column Depth= 14.0 in	Column Shape= W14's Column Depth= 14.0 in
Column Depth= 14.0 in Effective Length, K= 1.0	Column Depth= 14.0 in Effective Length, K= 1.0	Column Depth= 14.0 in Effective Length, K= 1.0	Column Depth= 14.0 in Effective Length, K= 1.0
Column Length, L= 15.0 ft	Column Length, L= 15.0 ft	Column Length, L= 15.0 ft	Column Length, L= 15.0 ft
Equivalent Axial Load, P _{eq} = 1099	Equivalent Axial Load, P _{eq} = 1964	Equivalent Axial Load, P _{eq} = 2602 kips	Equivalent Axial Load, P _{eq} = 1260 kips
Estimated Column Size: W14x99 P _n =1100 k	Estimated Column Size: W14x176 ΦP _n =2010 k	Estimated Column Size: W14x233 Pn=2680 k	Estimated Column Size: W14x120 Ppn=1340 k
Load above level 4: Roof +	Load above level 4: Roof +	Load above level 4: Roof+	Load above level 4: Roof +
9 Floors	9 Floors	9 Floors	9 Floors
LL _{rad} 0.40	LL _{red} 0.40	LL _{red} 0.80	LL _{red} 0.80
P _L = 218.0 kips	P _L = 574.8 kips	P _i = 1186.3 kips	P _L = 556.6 kips
P ₀ = 531.1 kips P ₀ = 11.2 kips	P ₀ = 1070.7 kips P _U = 22.5 kips	P _D = 916.3 kips P _U = 19.3 kips	P _D = 429.9 kips P _D = 9.1 kips
Pu= 11.2 kips Pu= 991.7 kips	P _{tr} = 22.5 kips P ₀ = 2215.7 kips	P _{tr} = 19.3 kips P _{tr} = 3007.3 kips	P _u = 9.1 kips Pu= 1445.6 kips
Unbalanced Moment, M _v = 178.5 kft	Unbalanced Moment, M _e = 87.0 kft	Unbalanced Moment, M _u = 108.0 kft	Unbalanced Moment, M _u = 53.3 kft
Column Shape= W14's	Column Shape= W14's	Column Shape= W14's	Column Shape= W14's
Column Depth= 14.0 in Effective Length, K= 1.0	Column Depth= 14.0 in Effective Length, K= 1.0	Column Depth= 14.0 in Effective Length, K= 1.0	Column Depth= 14.0 in Effective Length, K= 1.0
Column Length, L= 15.0 ft	Column Length, L= 15.0 ft	Column Length, L= 15.0 ft	Column Length, L= 15.0 ft
Equivalent Axial Load, Peq= 1298	Equivalent Axial Load, P _{eq} = 2365 kips	Equivalent Avial Load, Peg= 3192 kips	Equivalent Axial Load, P _{eq} = 1537 kips
Estimated Column Size: W14x120 ФP₁=1340 k	Estimated Column Size: W14x211 ΦP _n =2420 k	Estimated Column Size: W14x283 ΦP _n =3270 k	Estimated Column Size: W14x145 ΦP _n =1650 k
Load above level 2: Roof+	Load above level 2: Roof +	Load above level 2: Roof +	Load above level 2: Roof +
Load showle level 2: Roor + 11 Floors	Load above level 2: Room + 11 Floors	Load spove level 2: Roor + 11 Floors	Load above level 2: Hoor+ 11 Floors
LL _{red} 0.40	LL _{red} 0.40	LL _{red} 0.80	LL _{red} 0.80
P _i = 262.7 kips	P _L = 664.9 kips	P _k = 1417.8 kips	P _L = 665.2 kips
P ₀ = 637.3 kips	P ₀ = 1284.8 kips	P _D = 1099.5 kips	P ₀ = 515.9 kips
P ₀ = 11.2 kips P ₀ = 1190.7 kips	P _{tr} = 22.5 kips P _t = 2616.9 kips	P _U = 19.3 kips P _U = 3597.6 kips	P _{Ir} = 9.1 kips P _I = 1722.5 kips
Unbalanced Moment, M _s = 178.5 kft	Unbalanced Moment, M.= 87.0 kft	Unbalanced Moment, M.,= 108.0 kft	Unbalanced Moment, M.= 108.0 kft
Column Shape= W14's	Column Shape= W14's	Column Shape= W14's	Column Shape= W14's
Column Depth= 14.0 in	Column Depth= 14.0 in	Column Depth= 14.0 in	Column Depth= 14.0 in
Effective Length, K= 1.0 Column Length, L= 15.0 ft	Effective Length, K= 1.0 Column Length, L= 15.0 ft	Effective Length, K= 1.0 Column Length, L= 15.0 ft	Effective Length, K= 1.0 Column Length, L= 15.0 ft
Equivalent Axial Load, P _{eq} = 1497	Equivalent Axial Load, P _{eq} = 2766 kips	Equivalent Axial Load, P _{eq} = 3783 kips	Equivalent Axial Load, P _{eq} = 1908 kips
Estimated Column Size: W14x145 ФP₂=1650 k	Estimated Column Size: W14x257 Pn=2960 k	Estimated Column Size: W14x342 Pn=3980 k	Estimated Column Size: W14x176 ΦP _n =2010 k
			Tributary area per PH roof= 209 ft ² Influence area on PH roof= 835 ft ²
			Roof Dead Load= (slab+SDL) 90 psf Roof Live Load= (green roof area) 30 psf
			Roof Dead Load= (slab+SDL) 90 psf Roof Live Load= (green roof area) 30 psf Snow Load= 15.75 psf
			Roof Dead Load= (slab+SDL) 90 psf Roof Live Load= (green roof area) 30 psf
			Roof Dead Load= (plab=50L) 90 psf Roof Unive Load= (green roof area) 30 psf Store Load= 15.75 psf Roof constr Live Load= 20 psf Load above main roof: PH roof+
			Roof Dead Loads (pize-SDU) 90 pcf Roof Live Loads (preen roof area) 30 pcf Snow Loads 15.75 pcf Roof constr Live Loads 20 pcf Load above main roof: PH roof+ 0 Roors
			Roof Dead Loads (stabs-SQU) 90 pcf Roof Live Loads (green roof area) 30 pcf Snow Loads 15.75 pcf Roof constr Live Loads 20 pcf Load above main roof: PH roofs P ₁ = 6.3 lipp
			Roof Dead Loads (pibe-SQU) 90 pdf Roof Live Loads (green roof area) 30 pdf Snow Loads 15.75 pdf Roof constr Live Loads 20 pdf Load above main roof: PH roofet 0 Floors P _e 6.3 lipts F _p 18.8 lipts
			Roof Deed Loads (piab-SDU) 90 pet Roof Live Loads (green roof area) 30 pet Snow Loads 15.75 pet Roof constrict Ne Loads 20 pet Load above main roof: PH roof- P _T = 0.3 lique P _P = 18.8 lique P _P = 18.6 lique P _P = 4.2 lique
			Roof Dead Loads (right-SQU) 90 pcf Roof Live Loads (gree noof area) 30 pcf Snow Loads 15.75 pcf Roof constrt Live Loads 20 pcf Load above main roof: PH roofs P _c = 3.3 kips P _p = 18.8 kips P _p = 4.2 kips 4.2 kips P _p = 3.7 kips 4.7 kips
			Boof Dead Loade (trabe-501) 90 pcf
			Roof Dead Loade (rish-SOU) 90 pdf Roof Live Loade (green roof area) 30 pdf Snow Loade 15.75 pdf Roof constrict Net Loade 20 pdf Load above main roof: PH roof-0 Pig 6.3 kips Pig 18.5 kips Pig 4.2 kips Unbalanced Moment, Mig 30 kt Column Shapes WU41; Column Depthe 14.0 in
			Boof Dead Loade (rish=rSQL)
			Boof Dead Loads (19b=500) 90 pt

Colores 10		Colores 30		Col 21		Only man 22	
Column 19 Tributary Area		Column 20 Tributary Area		Column 21 Tributary Area		Column 22 Tributary Area	
per floor or roof= Influence Acea=	864 ft ² 3455 ft ²	per floor or roof= Influence Area=	1062 ft ² 4168 ft ²	per floor or roof= Influence Area=	1027 ft ² 3022 ft ²	per floor or roof= Influence Area=	452.5 ft ² 1810 ft ²
Floor Dead Load= (slab+SDL)	95 psf	Floor Dead Load= (slab+SDL)	95 psf	Floor Dead Load= (slab+5DL)	95 psf	Floor Dead Load= (slab+SDL)	95 psf
Roof Dead Load= (slab+SDL) Floor Live Load= (Office Space)	95 psf 100 psf	Roof Dead Load= (slab+SDL) Floor Live Load= (Office Space)	95 psf 100 psf	Roof Dead Load= (slab+SDL) Floor Live Load= (Office Space)	95 psf 100 psf	Roof Dead Load= (slab+SDL) Floor Live Load= (Office Space)	95 psf 100 psf
Roof Live Load= (Mech. Room) Roof Constr. Live Load	150 psf 20 psf	Roof Live Load= (Mech. Room) Roof Constr. Live Load	150 psf 20 psf	Roof Live Load= (Mech. Room) Roof Constr. Live Load	150 psf 20 psf	Roof Live Load= (Mech. Room) Roof Constr. Live Load	150 psf 20 psf
Load above level 12:	Roof + 1 Floor	Load above level 12:	Roof+ 1 Floor	Load above level 12:	Roof + 1 Floor	Load above level 12:	Roof + 1 Floor
Ll _{red}	0.51	u,	ed 0.50	LL _{red}	0.52	LL _{red}	0.60
P _L = P _O =	173.2 kips 164.2 kips	P _i P _e		P₁= Po=	207.7 kips 195.1 kips	P _L = P _D =	95.1 kips 86.0 kips
P _{Lr} =	17.3 kips	P _L	= 21.2 kips	P _L ,=	20.5 kips	P _L =	9.1 kips
P ₀ =	554.5 kips	P _k		P _U =	635.8 kips	P _U =	294.6 kips
Unbalanced Moment, M _e = Column Shape=	177.0 kft W14's	Unbalanced Moment, M, Column Shape	= W14's	Unbalanced Moment, M _u = Column Shape=	77.5 kft W14's	Unbalanced Moment, M _u = Column Shape=	40.5 kft W14's
Column Depth= Effective Length, K=	14.0 in 1.0	Column Depth Effective Length, K		Column Depth= Effective Length, K=	14.0 in 1.0	Column Depth= Effective Length, K=	14.0 in 1.0
Column Length, L=	15.0 ft	Column Length, L	= 15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, P _{eq} =	858 kips W14x90 ΦP _n =1000 k	Equivalent Axial Load, P _{eq} Estimated Column Size:	y= 922 kips W14x90 ΦP _m =1000 k	Equivalent Axial Load, P _{eq} = Estimated Column Size:	769 W14κ90 ΦΡ _n =1000 k	Equivalent Axial Load, P _{eq} = Estimated Column Size:	364 kips W14x53 ΦP _a =369 k
Load above level 10:	Roof +	Load above level 10:	Roof+	Load above level 10:	Roof+	Load above level 10:	Roof+
	3 Floors		3 Floors		3 Floors		3 Floors
LL _{ved} P _L =	0.40 233.3 kips	u, P		LL _{red} P _L =	0.41 279.6 kips	LL _{red} P _i =	0.45 129.4 kips
P ₀ =	328.3 kips	Pr		P _D =	390.3 kips	Po=	172.0 kips
P _{L/} =	17.3 kips	P _L		P _L =	20.5 kips	P _{1,1} =	9.1 kips
P _U = Unbalanced Moment, M _u =		P _E Unbalanced Moment, M _e		P _U = Unbalanced Moment, M _U =	984.9 kips 77.5 kft	P _U = Unbalanced Moment, M₂=	452.7 kips 40.5 kft
Column Shape= Column Deoth=		Column Shape	= W14's	Column Shape= Column Depth=	W14's 14.0 in	Column Shape=	W14's 14.0 in
Effective Length, K=	1.0	Column Depth Effective Length, K	(= 1.0	Effective Length, K=	1.0	Column Depth= Effective Length, K=	1.0
Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 1151 kips	Column Length, L Equivalent Avial Load, P _{eq}	= 15.0 ft	Column Length, L= Equivalent Axial Load, P _{eo} =	15.0 ft 1118	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 522
Estimated Column Size:	W14x109 ФР₁=1210 k	Estimated Column Size:	W14x120 ФР _н =1340 k	Estimated Column Size:	W14x99		W14x61 ФР₀=543 k
Load above level 8:	Roof+	Load above level 8:	Roof+	Load above level 8:	Roof+	Load above level 8:	Roof+
	5 Floors		5 Floors		5 Floors		5 Floors
LL _{red} P _L =	0.40 302.4 kips	LL _e P _i		LL _{red} P _L =	0.40 359.5 kips	LL _{red} P _L =	0.41 160.1 kips
P ₀ =	492.5 kips	Pe	= 605.3 kips	P _D =	585.4 kips	Po=	257.9 kips
P _{i,=}	17.3 kips 1155.2 kips	P _L		P _L ,=	20.5 kips 1346.8 kips	P _{tr} =	9.1 kips 604.9 kips
Unbalanced Moment, M _e =		Unbalanced Moment, M,		Pys Unbalanced Moment, M _s =	1346.8 kips 77.5 kft	Pu≡ Unbalanced Moment, M _u =	604.9 kips 40.5 kft
Column Shape=	W14's	Column Shape	= W14's	Column Shape=	W14's	Column Shape=	W14's 14.0 in
Column Depth= Effective Length, K=	14.0 in 1.0	Column Depth Effective Length, K	= 1.0	Column Depth= Effective Length, K=	14.0 in 1.0	Column Depth= Effective Length, K=	1.0
Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 1459 kips	Column Length, L Equivalent Avial Load, P _{eq}	= 15.0 ft	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 1480	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 674
Estimated Column Size:	W14x132 Pn=1480 k	Estimated Column Size:	W14x145 ФР₁=1650 k	Estimated Column Size:	W14x132		W14x82
					<u>'</u>		
Load above level 6:	Roof +	Load above level 6:	Roof+	Load above level 6:	Roof+	Load above level 6:	Roof+
u,	7 Floors 4 0.40	u	7 Floors	Ll _{nd}	7 Floors 0.40	U _{me}	7 Floors 0.40
P _i			P _L = 456.7 kips	P _L =	441.6 kips	P _L =	194.6 kips
P ₀ P _L			e= 807.1 kips tr= 21.2 kips	P ₀ = P ₁ ,=	780.5 kips 20.5 kips	P _o = P _{ir} =	343.9 kips 9.1 kips
Pu	= 1462.8 kips	P	u= 1805.8 kips	P _u =		P _U =	763.2 kips
Unbalanced Moment, M _e Column Shape		Unbalanced Moment, M Column Shap		Unbalanced Moment, Mu= Column Shape=	77.5 kft W14's	Unbalanced Moment, M _u = Column Shape=	40.5 kft W14's
Column Depth	= 14.0 in	Column Depti	h= 14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K Column Length, L	= 15.0 ft	Effective Length, I Column Length,	L= 15.0 ft	Effective Length, K= Column Length, L=	1.0 15.0 ft	Effective Length, K= Column Length, L=	1.0 15.0 ft
Equivalent Axial Load, P _{eq}	= 1766 kips	Equivalent Axial Load, P.	n= 2039	Equivalent Axial Load, P _{eq} =	1845	Equivalent Axial Load, P _{eq} =	833
Estimated Column Size:	W14x159 ФР _в =1810 k	Estimated Column Size:	W14x193	Estimated Column Size:	W14x159	Estimated Column Size:	W14x90 ФР _в =1000 k
Load above level 4:	Roof + 9 Floors	Load above level 4:	Roof+ 9 Floors	Load above level 4:	Roof + 9 Floors	Load above level 4:	Roof + 9 Floors
Щ		u		LL _{md}	0.40	Ll _{ed}	0.40
P _L P _O			P _L = 541.6 kips b= 1008.9 kips	P _L =	523.8 kips 975.7 kips	P _L = P _D =	230.8 kips 429.9 kips
P _{Lr}	= 17.3 kips	P _i	_{kr} = 21.2 kips	P _L =	20.5 kips	P _L ,=	9.1 kips
Pu Unbalanced Moment, M _u		Unbalanced Moment, M	\u= 2183.8 kips \u= 136.2 kft	P _U = Unbalanced Moment, M _u =	2078.0 kips 77.5 kft	Pu= Unbalanced Moment, Mu=	924.3 kips 40.5 kft
Column Shape	= W14's	Column Shap	e= W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth Effective Length, K		Column Dept Effective Length,		Column Depth= Effective Length, K=	14.0 in 1.0	Column Depth= Effective Length, K=	14.0 in 1.0
Column Length, L Equivalent Axial Load, P _{eq}	= 15.0 ft	Column Length, Equivalent Axial Load, P.	L= 15.0 ft	Column Length, L= Equivalent Axial Load. P=	15.0 ft 2211	Column Length, L= Equivalent Axial Load, P _{en} =	15.0 ft 994
Estimated Column Size:	W14x193 ΦP _n =2210 k	Estimated Column Size:	W14x211	Estimated Column Size:	W14x193		W14x90 ΦP _n =1000 k
Load above level 2:	Roof+	Load above level 2:	Roof+	Load above level 2:	Roof+	Load above level 2:	Roof+
	11 Floors	ц	11 Floors		11 Floors 0.40		11 Floors 0.40
LL _e			ved 0.40 P _i = 626.6 kips	LL _{md} P _L =	0.40 605.9 kips	LL _{md} P _k =	0.40 267.0 kips
P ₀	= 985.0 kips	P	e= 1210.7 kips	P ₀ =	1170.8 kips	P _D =	515.9 kips
P _L ,			k= 21.2 kips u= 2561.9 kips	P _{ir} =	20.5 kips 2404.7 kips	P _{ir} = P _{ir} =	9.1 kips 1085.4 kips
Unbalanced Moment, M _e	= 177.0 kft	Unbalanced Moment, M	L= 136.2 kft	Unbalanced Moment, M _u =	77.5 kft	Unbalanced Moment, M _u =	40.5 kft
Column Shape Column Depth	= 14.0 in	Column Shap Column Depti	h= 14.0 in	Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in
Effective Length, K Column Length, L	= 1.0	Effective Length, Column Length,	K= 1.0	Effective Length, K= Column Length, L=	1.0 15.0 ft	Effective Length, K= Column Length, L=	1.0 15.0 ft
Equivalent Axial Load, P _{eq}	2381 kips	Equivalent Axial Load, P	_{eq} = 2795 kips	Equivalent Axial Load, P _{eq} =	2538	Equivalent Axial Load, P _{eq} =	1155
Estimated Column Size:	W14x211 ФР _в =2420 k	Estimated Column Size:	W14x257	Estimated Column Size:	W14x233	Estimated Column Size:	W14x109 ФР _а =1210 k
Tributary area per PH roof=	432 ft ²	Tributary area per PH roof=	578 ft ²	Tributary area per PH roof=	355 ft ²	Tributary area per PH roof=	209 ft ²
Influence area on PH roof= Roof Dead Load= (slab+SDL)	1727 ft ² 90 psf	Influence area on PH roof= Roof Dead Load= (slab+SDL)	2231 ft ² 90 psf	Influence area on PH roof= Roof Dead Load= (slab+SDL)	1419 ft ² 90 psf	Influence area on PH roof= Roof Dead Load= (slab+SDL)	707 ft ² 90 psf
Roof Live Load= (green roof area) Snow Load=	30 psf 15.75 psf	Roof Live Load= (green roof area) Snow Load=	30 psf 15.75 psf	Roof Live Load= (green roof area) Snow Load=	30 psf 15.75 psf	Roof Live Load= (green roof area) Snow Load=	30 psf 15.75 psf
Snow Load= Roof constr Live Load=	15.75 pst 20 psf	Snow Load= Roof constr Live Load=	15.75 psf 20 psf	Snow Load= Roof constr Live Load=	15.75 psf 20 psf	Snow Load= Roof constr Live Load=	20 psf
Load above main roof:	PH roof+	Load above main roof:	PH roof+	Load above main roof:	PH roof+	Load above main roof: Pr	H roof+
P.	0 Floors = 13.0 kips		0 Floors 2= 17.3 kips	P _i =	0 Floors 10.7 kips	P _i =	0 Floors 6.3 kips
P ₀	= 38.9 kips	P	e= 52.0 kips	P _D =	32.0 kips	P _D =	18.8 kips
P _L ,			k= 11.6 kips h= 95.9 kips	P _{t/} =	7.1 kips 58.9 kips	P _{tr} =	4.2 kips 34.7 kips
	Table topic	Unbalanced Moment, M		Pu= Unbalanced Moment, Mu=	58.9 kips 0.0 kft	Unbalanced Moment, M.=	34.7 kips 0.0 kft
Unbalanced Moment, M _e	= 0.0 kft						
Unbalanced Moment, M _e Column Shape	= W14's	Column Shap		Column Shape=	W14's	Column Shape=	W14's
Unbalanced Moment, M _e Column Shape Column Depth Effective Length, K	= W14's = 14.0 in = 1.0	Column Shap Column Depti Effective Length,	h= 14.0 in K= 1.0	Column Shape= Column Depth= Effective Length, K=	14.0 in 1.0	Column Depth= Effective Length, K=	14.0 in 1.0
Unbalanced Moment, M _e Column Shape Column Depth	= W14's = 14.0 in = 1.0 = 18.5 ft = 72 kips	Column Shap Column Depti	h= 14.0 in K= 1.0 L= 18.5 ft	Column Shape= Column Depth=	14.0 in	Column Depth=	14.0 in
Unbalanced Moment, M., Column Shape Column Depth Effective Length, K Column Length, L	= W14's = 14.0 in = 1.0 = 18.5 ft	Column Shap Column Depti Effective Length, Column Length,	h= 14.0 in K= 1.0 L= 18.5 ft	Column Shape= Column Depth= Effective Length, K= Column Length, L=	14.0 in 1.0 18.5 ft	Column Depth= Effective Length, K= Column Length, L= Equivalent Axial Load, P _{eq} =	14.0 in 1.0 18.5 ft



Note: Refer to Moment Frame B elevation in final report for column sizes that support combined gravity and lateral loads

Moment Frame C: Estimated column sizes based on gravity load analysis only

Column 27		Column 28		Column 29		Column 30	
Tributary Area per floor or roof=	439 m²	Tributary Area per floor or roof=	929 ft ²	Tributary Area per floor or roof=	795 ft ²	Tributary Area per floor or roof=	359 ft ²
Influence Area=	1755 ft ²	Influence Area=	3715 ft ²	Influence Area=	3178 ft ²	Influence Area=	1435 ft ²
Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf
Roof Dead Load= (slab+SDL+mem, self-wts) Floor Live Load= (Office Space)	95 psf 100 psf	Roof Dead Load= (slab+SDL+mem. self-wts) Floor Live Load= (Office Space)	95 psf 100 psf	Roof Dead Load= (slab+SDL+mem. self-wts) Floor Live Load= (Mech. Room)	95 psf 150 psf	Roof Dead Load= (slab+SDL+mem. self-wts) Floor Live Load= (Mech. Room)	95 psf 150 psf
Roof Live Load= (Green roof area)	30 psf	Roof Live Load= (Cooling Towers)	150 psf	Roof Live Load= (Mech. Room)	150 psf	Roof Live Load= (Mech. Room)	150 psf
Roof Constr. Live Load	20 psf	Roof Constr. Live Load	20 psf	Roof Constr. Live Load	20 psf	Roof Constr. Live Load	20 psf
Load above level 12:	Roof+	Load above level 12:	Roof+	Load above level 12:	Roof+	Load above level 12:	Roof+
Load above level 12.	1 Floor	LOBO BDOVE IEVE! 12:	1 Floor	COBO BDOVE IEVEL 12:	1 Floor	coad above level 12.	1 Floor
Ll _{red}	0.61	LL _{red}	0.50	LL _{red}	1.00	LL _{red}	1.00
P _L =	39.9 kips	P _L =	185.8 kips	P _L =	238.5 kips	P _L =	107.7 kips
P ₀ =	83.4 kips	P ₀ =	176.5 kips	P ₀ =	151.1 kips	P ₀ =	68.2 kips
P _{tr} =	8.8 kips	P _{le} =	18.6 kips	P _{Ir} =	15.9 kips	P _{1/} =	7.2 kips
P _U =	168.3 kips	P _U =		P _U =	570.8 kips	P _U =	292.5 kips
Unbalanced Moment, M _e = Column Shape=	77.5 kft W14's	Unbalanced Moment, M = Column Shape=	87.0 kft W14's	Unbalanced Moment, M _e = Column Shape=	108.0 kft W14's	Unbalanced Moment, M _u = Column Shape=	53.3 kft W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L= Equivalent Axial Load, P _{ee} =	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, P _{eq} = Estimated Column Size:	301	Equivalent Axial Load, P	668 kips		756 kips	Equivalent Axial Load, Peq=	384 kips W14x61 ФР _и =54
Estimated Column Size:	W14x48	Estimated Column Size:	W14x82	Estimated Column Size:	W14x90	Estimated Column Size:	W14X61 UF ₆ -54
Load above level 10:	Roof+	Load above level 10:	Roof+	Load above level 10:	Roof+	Load above level 10:	Roof+
	3 Floors		3 Floors		3 Floors		3 Floors
LL _{red}	0.46	U _{red}	0.40 250.8 kips	LL _{sel}	0.80 405.5 kips	LL _{red}	0.80
P _L =	73.3 kips	P _L =		P _L =		P _L =	183.1 kips
P ₀ = P _k =	166.8 kips 8.8 kips	P ₀ = P _b =	353.0 kips 18.6 kips	P ₀ = P ₀ =	302.1 kips 15.9 kips	P ₀ = P ₁ =	136.4 kips 7.2 kips
Pu=	321.9 kips	P _{to} =		Pu=	1019.2 kips	Pu=	7.2 kips 494.9 kips
Unbalanced Moment, M _u =	77.5 kft	Unbalanced Moment, M _a =	87.0 kft	Unbalanced Moment, M _e =	108.0 kft	Unbalanced Moment, M _a =	53.3 kft
Column Shape=	77.3 KR W14's	Column Shape=		Column Shape=	108.0 KH W14's	Column Shape=	33.3 KTC W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 455	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 983 kips	Column Length, L= Equivalent Axial Load, P _{en} =	15.0 ft 1204 kips	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 586 kips
Estimated Column Size:	W14x61 ΦP _n =543 k	Estimated Column Size:	985 KIPS W14×90 ФР₂=1000 k		1204 κps W14x109 ΦP _n =1210 k	Estimated Column Size:	386 kips W14x68 ΦP _n =60
The state of the s	4-3-2-2	Think to be a second of the se	4. 1-1000 x	The state of the s	4. 4-4444	The state of the s	
Load above level 8:	Roof+	Load above level 8:	Roof+	Load above level 8:	Roof+	Load above level 8:	Roof+
	5 Floors		5 Floors		5 Floors		5 Floors
LL _{red}	0.41 108.2 kips	Li _{nd}	0.40 325.2 kips	Ll _{tel}	0.80 596.3 kips	LL _{red}	0.80 269.3 kips
P _L = P _O =	103.2 kips 250.2 kips	P₁= P₀=	325.2 kips 529.5 kips	P ₁ = P ₀ =	596.3 kips 453.2 kips	P _i = P ₀ =	269.3 kips 204.6 kips
F ₀ =	230.2 kips 8.8 kips	ro- Pu=	329.5 KIPS 18.6 KiPs	P ₀ =	438.2 Kips 15.9 kips	r ₀ P ₁₋ =	7.2 kips
P _U =	469.8 kips	P _U =		P ₀ =	1505.7 kips	P ₀ =	7.2 kips 714.6 kips
Unbelanced Moment, M _u =	77.5 kft	Unbalanced Moment, M _a =		Unbalanced Moment, M _e =	108.0 kft	Unbalanced Moment, M _g =	53.3 kft
Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth=	14.0 in 1.0	Column Depth=	14.0 in 1.0	Column Depth=	14.0 in 1.0	Column Depth=	14.0 in
Effective Length, K= Column Length, L=	15.0 ft	Effective Length, K= Column Length, L=	15.0 ft	Effective Length, K= Column Length, L=	15.0 ft	Effective Length, K= Column Length, L=	1.0 15.0 ft
Equivalent Axial Load, P _{eq} =	603	Equivalent Axial Load, P	1314 kips	Equivalent Axial Load, P _{eq} =	1691 kips	Equivalent Axial Load, P _{eq} =	806 kips
Estimated Column Size:	W14x68 ΦP _n =608 k	Estimated Column Size:	W14x120 Pp=1340 k		W14x159 P _n =1810 k		W14x90 ΦP _n =100
				•			
Load above level 6:	Roof+	Load above level 6:	Roof+	Load above level 6:	Roof+	Load above level 6:	Roof+
	7 Floors		7 Floors		7 Floors		7 Floors
Lled	0.40	LL _{red}	0.40	LL _{red}	0.80	LL _{red}	0.80
P _L =	136.1 kips	P _L =	399.5 kips	P ₄ =	787.1 kips	P ₁ =	355.4 kips
P ₀ =	333.6 kips	P _O =	706.0 kips	P _D =	604.2 kips	P _D =	272.8 kips
P _U =	8.8 kips	P _{tr} =	18.6 kips	P _U =	15.9 kips	P _U =	7.2 kips
P _U = Unbalanced Moment, M _u =		Pu ² Unbalanced Moment, M _u 2		P _U = Unbalanced Moment, M _u =	1992.3 kips 108.0 kft	P _{ti} = Unbalanced Moment, M _s =	934.3 kft
Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L= Equivalent Axial Load, P _{er} =	15.0 ft 755	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 1645 kips	Column Length, L= Equivalent Axial Load, P _{ax} =	15.0 ft 2177 kips	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 1026 kips
Estimated Column Size:	W14x90 ФР,=1000 k		W14x145 ФР,=1650 k		V14x193 ФР ₄ =2210 k		V14x99 ФР _и =1100
Load above level 4:	Roof+	Load above level 4:	Roof+	Load above level 4:	Roof +	Load above level 4:	Roof +
LL _{ted}	9 Floors 0.40	LL _{red}	9 Floors 0.40	LL _{sel}	9 Floors 0.80	LL _{red}	9 Floors 0.80
P _L =	171.2 kips	P _L =	473.8 kips	P _L =	977.9 kips	P _L =	441.6 kips
P ₀ =	417.1 kips	P ₀ =	882.6 kips	P _D =	755.3 kips	P ₀ =	341.1 kips
P _{tr} =		P _{to} =	18.6 kips	P _{tr} =	15.9 kips	P _{tr} =	7.2 kips
P _U =	778.8 kips	P _U =		P _o =	2478.8 kips	P _U =	1154.1 kips
Unbalanced Moment, M _u =		Unbalanced Moment, M _g =	87.0 kft	Unbalanced Moment, M _e =	108.0 kft	Unbalanced Moment, M _g =	53.3 kft
Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in
Column Depth= Effective Length, K=	14.0 in 1.0	Column Depth= Effective Length, K=	14.0 in 1.0	Column Depth= Effective Length, K=	14.0 in 1.0	Column Depth= Effective Length, K=	14.0 in 1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, P _{eq} s	912	Equivalent Axial Load, P _{eq} a	1976 kips	Equivalent Axial Load, P _{eq} =	2664 kips	Equivalent Axial Load, P _{eq} =	1245 kips
Estimated Column Size:	W14x90	Estimated Column Size:	W14x176	Estimated Column Size: V	V14x257 ФР _п =2960 k	Estimated Column Size: W	/14x120
Load above level 2:	Roof+	Load above level 2:	Roof+	Load above level 2:	Roof+	Load above level 2:	Roof+
	11 Floors		11 Floors		11 Floors		11 Floors
LL _{red}	0.40	LL _{red}	0.40	LL _{red}	0.80	LL _{red}	0.80
P _i =	206.3 kips	P _L =	548.1 kips	P ₁ =	1168.7 kips	P ₁ =	527.7 kips
Po=	500.5 kips 8.8 kips	P ₀ =	1059.1 kips 18.6 kips	P ₀ =	906.3 kips 15.9 kips	P ₀ =	409.3 kips 7.2 kips
P _{to} =	935.1 kips	P _U = P _U =	18.6 kips 2157.1 kips	P _N = P _N =	15.9 kips 2965.4 kips	P _U =	7.2 kips 1373.8 kips
Unbalanced Moment, M _n =		Unbalanced Moment, M _a =	87.0 kft	Unbalanced Moment, M _e =	108.0 kft	Unbalanced Moment, M _u =	53.3 kft
Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth=		Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K= Column Length, L=	1.0 15.0 ft	Effective Length, K= Column Length, L=	1.0 15.0 ft	Effective Length, K= Column Length, L=	1.0 15.0 ft	Effective Length, K= Column Length, L=	1.0 15.0 ft
Equivalent Axial Load, P _{eq} =	1068	Equivalent Axial Load, P _{eq} =	2306 kips	Equivalent Axial Load, P _{eq} =	3150 kips	Equivalent Axial Load, P _{eq} =	15.0 ft 1465 kips
Estimated Column Size:	W14x99		W14x211		V14x283 ФР _и =3270 к		14x132
		-		-			
						Tributary area per PH roof=	209 ft ²
						Influence area on PH roofs	835 ft ²
						Roof Dead Load= (slab+SDL) Roof Live Load= (green roof area)	90 psf 30 psf
						Snow Load=	15.75 ps1
						Roof constr Live Loed=	20 psf
						Load above main roof: PH	roof+
						Dad above main foot: PH	i roof+ 0 Floors
						P _{II} =	6.3 kips
						P ₀ =	18.8 kips
						P _U =	4.2 kips
						P ₀ =	34.7 kips
						Unbalanced Moment, M _a =	0.0 kft
						Column Shape= Column Depth=	W14's 14.0 in
						Effective Length, K=	1.0
						Column Length, L=	18.5 ft
						Equivalent Axial Load, Pag=	35 kips
						Estimated Column Size: W	V14x43 ФР _и =196 k

Column 31		Column 32		Column 33		Column 34	
Tributary Area per floor or roof=	442 m²	Tributary Area per floor or roof=	779 ft ²	Tributary Area per floor or roof=	484 m²	Tributary Area	359 ft ²
Influence Ares=	1767 ft ²	Influence Ares=	3355 ft ²	Influence Area=	2177 ft ³	Influence Ares=	1435 ft ²
Floor Dead Load= (slab+SDL+mem, self-wts)	95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf
Roof Dead Load= (slab+SDL+mem. self-wts) Floor Live Load= (Office Space)	95 psf 100 psf	Roof Dead Load= (slab+SDL+mem. self-wts) Floor Live Load= (Office Space)	95 psf 100 psf	Roof Dead Load= (slab+SDL+mem. self-wts) Floor Live Load= (Office Space)	93 psf 100 psf	Roof Dead Load= (slab+SDL+mem. self-wts) Floor Live Load= (Office Space)	95 psf 100 psf
Roof Live Load= (Mech. Room)	150 psf	Roof Live Load= (Mech. Room)	150 psf	Roof Live Load= (Mech. Room)	150 psf	Roof Live Load= (Mech. Room)	150 psf
Roof Constr. Live Load	20 psf	Roof Constr. Live Load	20 psf	Roof Constr. Live Load	20 psf	Roof Constr. Live Load	20 psf
Load above level 12:	Roof+	Load above level 12:	Roof+	Load above level 12:	Roof+	Load above level 12:	Roof+
	1 Floor		1 Floor		1 Floor		1 Floor
LL	0.61 93.1 kips	LL _{med} P ₁ =	0.51 156.5 kips	LL _{md} P _i =	0.57 100.3 kips	Ll _{red}	0.65 77.0 kips
P _C = P _O =		r.= Po=	148.0 kips	r.= Po=	92.0 kips	P _L = P _O =	68.2 kips
P _I /=		P _k =	15.6 kips	P _U =	9.7 kips	Pu=	7.2 kips
P _V =	336.9 kips	P _u =	533.4 kips	P _u =	332.5 kips	P _u =	242.2 kips
Unbalanced Moment, M _u =		Unbalanced Moment, M _e =	136.2 kft	Unbalanced Moment, M _g =	77.5 kft	Unbalanced Moment, M _e =	40.5 kft
Column Shape= Column Depth=		Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in
Effective Length, K=		Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, P _{eq} =		Equivalent Axial Load, P _{eq} =	767 kips	Equivalent Axial Load, P _{eq} =	465 kips W14x61 ΦΡ ₄ =543 k	Equivalent Axial Load, P _{eq} =	312 kips
Estimated Column Size:	W14x74	Estimated Column Size:	W14x90	Estimated Column Size:	W14x61	Estimated Column Size:	W14x48 ΦP _e =331 k
Load above level 10:	Roof+	Load above level 10:	Roof+	Load above level 10:	Roof+	Load above level 10:	Roof+
	3 Floors 0.46	LL	3 Floors 0.40		3 Floors 0.44	H _{eef}	3 Floors 0.48
LL _{mad} P _L =		P _L =	210.2 kips	LL _{md} P _L =	135.9 kips	F _L =	0.48 105.4 kips
Po=		Po=	296.0 kips	ri- Pos	183.9 kips	F ₀ =	136.4 kips
P _{tr} =		P _{lu} =	15.6 kips	P _{Li} =	9.7 kips	P _{LI} =	7.2 kips
P ₀ =		P _U =	797.0 kips	Pu=	499.8 kips	P ₀ =	369.5 kips
Unbalanced Moment, M _g =		Unbalanced Moment, M _e =	136.2 kft	Unbalanced Moment, M _e =	77.5 kft	Unbalanced Moment, M _e =	40.5 kft
Column Shape= Column Depth=		Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, P _{eq} = Estimated Column Size:	795 kips W14x90	Equivalent Axial Load, P _{eq} = Estimated Column Size:	1030 kips W14x99	Equivalent Axial Load, P _{eq} = Estimated Column Size:	633 kips W14x74	Equivalent Axial Load, P _{eq} = Estimated Column Size:	439 kips W14x61 ΦΡ ₄ =543 k
Estamated Column Size:	Фг,-1300 к	Semilated Colomia Size:	ФР4-1100 К	Casimoted Column Size:		Estalliated Column Size:	
Load above level 8:	Roof+	Load above level 8:	Roof+	Load above level 8:	Roof+	Load above level 8:	Roof +
	5 Floors 0.41		5 Floors 0.37		5 Floors 0.40		5 Floors 0.43
LL _{med} P _L =	0.41 156.8 kips	LL _{med} P _L =	0.37 259.3 kips	LL _{ed} P _L =	0.40 169.4 kips	LL _{ood} P _L =	0.43 130.5 kips
P _O =		P _i = P _o =	239.3 Kips 444.0 kips	ru= Po=	275.9 kips	r _i = P _D =	180.5 Kips 204.6 Kips
P _U =		P _{L/} =	15.6 kips	P _U =	9.7 kips	Pu=	7.2 kips
P _U =	640.3 kips	P _U =	1053.2 kips	P _u =	663.9 kips	P _o =	491.5 kips
Unbalanced Moment, M _u =		Unbalanced Moment, M _u =	136.2 kft	Unbalanced Moment, M _e =	77.5 kft	Unbalanced Moment, M _e =	40.5 kft
Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, P _{eq} = Estimated Column Size:	944 kips W14x90	Equivalent Axial Load, P _{eq} = Estimated Column Size:	1287 kips W14x120	Equivalent Axial Load, P _{eq} = Estimated Column Size:	797 kips W14x90	Equivalent Axial Load, P _{eq} = Estimated Column Size:	561 kips W14x68 ΦP _α =608 k
Estimated Column Size.	W14350 W1,-1550 K	Estimated Colomn Size.	W148120 W1,-1340 K	Estimated Column Size:	W14250 4","1000 x	Escimated Column Size.	WIANES OF TOOLK
Load above level 6:	Roof+	Load above level 6:	Roof+	Load above level 6:	Roof+	Load above level 6:	toof+
	7 Floors		7 Floors		7 Floors		7 Floors
LL _{red}	0.40	LL _{red}	0.40	LL _{red}	0.40	LL _{red}	0.40
P ₁ = P ₀ =	190.1 kips 335.9 kips	P _L = P _D =	335.0 kips 592.0 kips	P _i = P _i =	208.1 kips 367.8 kips	P ₁ = P ₁ =	154.4 kips 272.8 kips
P _U =		P _U =	15.6 kips	P _{1/} =	9.7 kips	Pu=	7.2 kips
P ₀ =		P _U =	1351.8 kips	P _U =	836.2 kips	P _U =	611.5 kips
Unbalanced Moment, M _e =		Unbalanced Moment, M _u =	136.2 kft	Unbalanced Moment, M _e =	77.5 kft	Unbalanced Moment, M _e =	40.5 kft
Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Deoth=	W14's 14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, P _{eq} =	1098 кірз W14x99 ФР _п =1100 к	Equivalent Axial Load, P _{eq} =	1385 kips W14x145	Equivalent Axial Load, P _{eq} =	969 kips	Equivalent Axial Load, P _{eq} =	681 kips /14x82 ΦΡ _α =735 k
Estimated Column Size:	W14x99 WP_=1100 K	Estimated Column Size: W	V14x145 ΨP _a =1650 K	Estimated Column Size:	W14x90	Estimated Column Size: W	/14x82 ΨP _a =/35 K
Load above level 4:	Roof+	Load above level 4:	Roof+	Load above level 4:	Roof+	Load above level 4:	toof+
LL_	9 Floors 0.40	LL	9 Floors 0.40	LL _{md}	9 Floors 0.40	LL_max	9 Floors 0.40
P _L =	225.4 kips	P _L =	0.40 397.3 kips	P _L =	0.40 246.8 kips	P _L =	183.1 kips
P _n =	419.9 kips	P ₀ =	740.1 kips	P ₀ =	459.8 kips	P ₀ =	341.1 kips
P _b =	8.8 kips	P _{L/} =	15.6 kips	P _{t/} =	9.7 kips	P _L =	7.2 kips
P _u =	951.6 kips	P _U =	1629.1 kips	P _U =	1008.5 kips	P ₀ =	739.3 kips
Unbalanced Moment, M _u =		Unbalanced Moment, Mu=	136.2 kft	Unbalanced Moment, M _e = Column Shanes	77.5 kft	Unbalanced Moment, M _e =	40.5 kft
Column Shape= Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in	Column Depth=	W14's 14.0 in	Column Shape= Column Depth=	W14's 14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 1255 kips	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 1863 kips	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 1141 kips	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 809 kips
Estimated Column Size:	W14x120 ФР _и =1340 k	Estimated Column Size: W	V14x176		V14×109 ΦP _H =1210 κ		714x90 ФР _и =1000 k
•		•	•				
Load above level 2:	Roof+ 11 Floors	Load above level 2:	Roof+ 11 Floors	Load above level 2:	Roof + 11 Floors		toof + 11 Floors
LL _{red}	0.40	LL _{sed}	0.40	LL _{red}	0.40	LL _{red}	0.40
P ₁ =	260.8 kips	P ₁ =	459.6 kips	P _L =	285.6 kips	P ₁ =	211.8 kips
P ₀ =	503.9 kips	Pos	888.1 kips	P _O =	551.8 kips	₽6=	409.3 kips
Pu=	8.8 kips	P _{t/} =	15.6 kips	P _{tr} =	9.7 kips 1180.8 kips	P _U =	7.2 kips
Pus Unbalanced Moment, M.=	1109.0 kips 177.0 kft	Pu= Unbalanced Moment, Mu=	1906.4 kips 136.2 kft	Pu= Unbalanced Moment, Mu=	1180.8 kips 77.5 kft	P ₀ = Unbalanced Moment, M ₄ =	867.1 kips 40.5 kft
Unbalanced Moment, M ₂ = Column Shape=	W14's	Column Shape=	136.2 KR W14's	Column Shape=	77.5 KR W14's	Column Shape=	40.5 kH W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K= Column Length, L=	1.0 15.0 ft	Effective Length, K= Column Length, L=	1.0 15.0 ft	Effective Length, K= Column Length, L=	1.0 15.0 ft	Effective Length, K= Column Length, L=	1.0 15.0 ft
Equivalent Axial Load, P _{eq} =	1412 kips	Equivalent Axial Load, P _{eq} =	2140 kips	Equivalent Axial Load, P _{eq} =	1314 kips	Equivalent Axial Load, P _{eq} =	937 kips
	W14x132		V14x193 ΦP _n =2210 k		V14x120 ФР _н =1340 k		/14x90
			588 ft ²				
Tributary area per PH roof= Influence area on PH roof=	498 ft ³ 1913 ft ²	Tributary area per PH roof= Influence area on PH roof=	388 ft° 2394 ft²	Tributary area per PH roof= Influence area on PH roof=	343 ft ³ 1370 ft ²	Tributary area per PH roof= Influence area on PH roof=	202 ft ² 805 ft ²
Roof Dead Load= (slab+SDL)	90 psf	Roof Dead Load= (slab+SDL)	90 psf	Roof Dead Load= (slab+SDL)	90 psf	Roof Dead Load= (slab+SDL)	90 psf
Roof Live Load= (green roof area)	30 psf 15.75 psf	Roof Live Load= (green roof area) Snow Load=	30 psf 15.75 psf	Roof Live Load= (green roof area) Snow Load=	30 psf 15.75 psf	Roof Live Load= (green roof area) Snow Load=	30 psf 15.75 psf
Commitments		Snow Load= Roof constr Live Load=	15.75 psf 20 psf	Snow Load= Roof constr Live Load=	15.75 psf 20 psf	Snow Load= Roof constr Live Load=	15.75 psf 20 psf
Snow Load=	20 psf						
Snow Load= Roof constr Live Load=	20 psf			Load above main roof: Pr	froof+	Load above main roof: PH	roof+
Snow Load= Roof constr Live Load=	20 psf PH roof+	Load above main roof: PH	roof+	code above main root.	0 Finare		0 Ele
Snow Load= Roof constr Live Load=	20 psf	Load above main roof: PH	0 Floors 17.6 kips	P _I =	0 Floors 10.3 kips	P ₁ =	0 Floors 6.1 kips
Snow Load= Roof constr Live Load= Load above main roof:	20 psf PH roof+ 0 Floors 14.9 kips 44.8 kips		0 Floors 17.6 kips 52.9 kips				
Snow Load= Roof constrictive Load= Load above main roof: Fig.	20 psf PH roof+ 0 Floors 14.9 kips 44.8 kips 10.0 kips	PLE	0 Floors 17.6 kips 52.9 kips 11.8 kips	P _L = P _D =	10.3 kips 30.9 kips 6.9 kips	P _√ ≡	6.1 kips 18.2 kips 4.0 kips
Snow Loads Roof constribing Loads Load above main roof: Figs Figs Figs Figs	20 psf PH roof+ 0 Floors 14.9 kips 44.8 kips 10.0 kips 82.7 kips	P ₁ = P ₀ = F ₁ ,= P ₀ 2	0 Floors 17.6 kips 52.9 kips 11.8 kips 97.6 kips	P _i s P _{ij} s P _{ij} s P _{ij} s	10.3 kips 30.9 kips 6.9 kips 56.9 kips	P ₁ = P ₁ = P ₂ = P ₂ =	6.1 kips 18.2 kips 4.0 kips 33.5 kips
Snow loads Roof contri Live Loads Load above main roof: Fig. Fig. Unbalanced Moment, Mig.	20 psf PH roof+ 0 Floors 14.9 kips 44.8 kips 10.0 kips 82.7 kips 0.0 kft	P _L E P _G E P _U E P _U E Unbalanced Moment, M _U E	0 Floors 17.6 kips 52.9 kips 11.8 kips 97.6 kips 0.0 kft	P ₁ = P ₀ = P ₀ = P ₁ = Unbalanced Moment, M ₁ =	10.3 kips 30.9 kips 6.9 kips 56.9 kips 0.0 kft	P _t = P ₀ = P _t = P _t = Unbalanced Moment, M _t =	6.1 kips 18.2 kips 4.0 kips 33.5 kips 0.0 kft
Snow Loads And coants' Livit Loads Load above main root: Fig. Fig. Unbalanced Moment, Column Stages Column Stages	20 psf PH rooft 0 Floors 14.9 kips 44.8 kips 10.0 kips 82.7 kips 0.0 kft W14's 14.0 in	P _L E P _U P _U P _U Unbalanced Moment, M _L Column Shapee Column Depths	0 Floors 17.6 kips 52.9 kips 11.8 kips 97.6 kips 0.0 kft W24's 14.0 in	P _U z P _D z P _U z P _U z Unbalanced Moment, M _u z Column Shapes Column Depths	10.3 kips 30.9 kips 6.9 kips 56.9 kips 0.0 kft W14's 14.0 in	P _i = Unbalanced Moment, M _i = Column Snape= Column Cepth=	6.1 kips 18.2 kips 4.0 kips 33.5 kips 0.0 kft W14's 14.0 in
Snow uodata Noof constrt (in teledata Load above main roof: Put Put Put Unbalanced Moment, Mut Column Depth Emerculary	20 psf PH rooft 0 Floors 14.9 kips 44.8 kips 10.0 kips 82.7 kips 0.0 kft W14'2 14.0 in 1.0	F _L z F _B z F _B z F _L z F _B z Unbalance Moment, N _L z Column Rapps Column Depths Effective Length, Kr	0 Floors 17.6 kips 32.9 kips 11.8 kips 11.8 kips 97.6 kips 0.0 kt W14's 14.0 in 1.0	P ₁ c P ₂ c P ₁ c P ₂ c P ₃ c P ₄ c Unbalanced Moment, M ₂ Column Dappes Column Dappes Column Dappes Effective Length, Kc	10.3 kips 30.5 kips 6.5 kips 56.5 kips 0.0 kft W14's 14.0 in 1.0	P _i c P _g r P _g r P _g r Unbalanced Moment, M _i c Column Stapes Column Depths Effective Length, Kr	6.1 kips 18.2 kips 4.0 kips 33.5 kips 0.0 kft W14's 14.0 in
Snow uodat Noel constructive Loads Load above main root: Fig. Fig. Unbalanced Moments Column Diagos Column Chages	20 psf PH rooft 0 Floors 14.9 kips 44.8 kips 10.0 kips 82.7 kips 0.0 kft W14's 14.0 in	P _L E P _U P _U P _U Unbalanced Moment, M _L Column Shapee Column Depths	0 Floors 17.6 kips 52.9 kips 11.8 kips 97.6 kips 0.0 kft W14's 14.0 in 1.0	P _U z P _D z P _U z P _U z Unbalanced Moment, M _u z Column Shapes Column Depths	10.3 kips 30.9 kips 6.9 kips 56.9 kips 0.0 kft W14's 14.0 in	P _i = Unbalanced Moment, M _i = Column Snape= Column Cepth=	6.1 kips 18.2 kips 4.0 kips 33.5 kips 0.0 kft W14's 14.0 in
Snow uodat Noel coants' Livit Loads Load above main root: P _i	20 psf PM rooft O Floors 14.9 kips 44.8 kips 40.0 kips 82.7 kips 0.0 kft W14's 14.0 in 1.0 18.5 ft	Fig. Fig. Fig. Fig. Fig. Unbalanced Moment, Nig. Column Septes Column Deptes Column Septes Effective Length, Ir. Column Length, Le Equivatent Asia Los, Fig.	0 Floors 17.6 kips 32.9 kips 11.8 kips 11.8 kips 97.6 kips 0.0 kt W14's 14.0 in 1.0	P ₁ c P ₂ r P ₁ r Unbalanced Moment, M ₂ Column Depths Column Depths Effective Length, K= Column Length, L= Equivater Asils Loo, F ₂ r	10.3 kips 30.9 kips 6.9 kips 56.9 kips 0.0 kit W14's 14.0 in 1.0 18.3 ft	F _L E F _L E F _L C F _L C F _L C Unbalanced Moment, M _L Column Stapes Column Depths Effective Length, I/s Column Length, Le Equivalent Abil Load, F _L C	6.1 kips 18.2 kips 4.0 kips 33.5 kips 0.0 kft W14's 14.0 in 1.0 18.5 ft
Snow Load= Now constructive Load= Load above main roof: Pat Pat Pat Load Load Load Load Load Load Load Load	20 per PH roofs 0 Roors 14.9 kips 44.8 kips 10.0 kips 82.7 kips 0.0 kit W142 14.0 in 1.0 18.5 ft 88 kips	Fig. Fig. Fig. Fig. Fig. Unbalanced Moment, Nig. Column Septes Column Deptes Column Septes Effective Length, Ir. Column Length, Le Equivatent Asia Los, Fig.	0 Floors 17.6 kips 23.9 kips 11.8 kips 97.6 kips 0.0 ktr W14's 14.0 in 1.0 18.3 ft 98 kips	P ₁ c P ₂ r P ₁ r Unbalanced Moment, M ₂ Column Depths Column Depths Effective Length, K= Column Length, L= Equivater Asils Loo, F ₂ r	10.3 kips 30.9 kips 6.9 kips 36.9 kips 0.0 kit W44's 14.0 in 1.0 18.5 ft 57 kips	F _L E F _L E F _L C F _L C F _L C Unbalanced Moment, M _L Column Stapes Column Depths Effective Length, I/s Column Length, Le Equivalent Abil Load, F _L C	6.1 kips 18.2 kips 4.0 kips 33.5 kips 0.0 kft W14's 14.0 in 1.0 18.5 ft 34 kips



Note: Refer to Moment Frame C elevation in final report for column sizes that support combined gravity and lateral loads

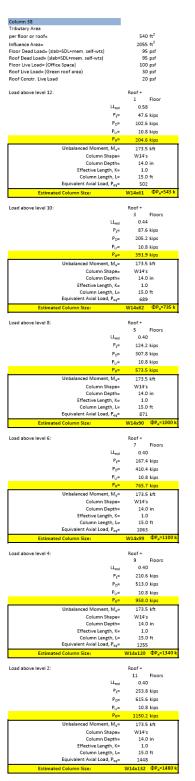
Moment Frame E: Estimated column sizes based on gravity load analysis only

This park Property	Column 49		Column 50		Column 51	
Part Design 19 19 19 19 19 19 19 1						
Martin California 150 15		339 ft ²		613 ft ²		339 ft ²
Prop	Influence Area=	1245 ft ²	Influence Area=	2366 ft ²		1245 ft ²
March Selection March Sele						
Read to Land Different and read Spiral Spi	Roof Dead Load= (slab+SDL+mem. self-wts)					
Marie Mari						
Leaf above board 12	Roof Live Load= (Green roof area)				Roof Live Load= (Green roof area)	
1	Roof Constr. Live Load	20 psf	Roof Constr. Live Load	20 psf	Roof Constr. Live Load	20 psf
1	Landaharra Jarrel 40.	Do-ef i	Landahara Israel 12.	De-ef :	Landahara larat 12.	De ef i
Commonweal	Load above level 12:		Load above level 12:		Load above level 12:	
Fig. 13.1 kg	II		II		II	
March Marc						
Common C						
Color Dept. Color Dept						
Delination of Number May 23-2-2 km Column Diagram May Colu						
Court Risper Wild						
Column Expense 14-0 m Column Expense 1						
Effective Largery, No. 1-35						
Column right						
Transmit Control Rep						
Description						
Line Boos Foot Line So						
1	Estimated Column Size:	W14x61	Estimated Column Size:	W14x43	Estimated Column Size:	W14x43 WP _n -292 K
1						
Column C	Load above level 10:		Load above level 10:		Load above level 10:	
Part						
Part 231 kps Part 232 kps Part 232 kps Part 231 kps Part 232 kps Part						
Park 1.5 kp 1.5						
Distance Nomes, No. 243 sign						
Column Expert Column Exper						
Column Slappe						
Column Slappe	Unbalanced Moment, Mu=	234.0 kft	Unbalanced Moment, Mu=	35.5 kft	Unbalanced Moment, Mu=	60.5 kft
Column Depth	Column Shape=		Column Shape=		Column Shape=	
Column Large Lack So		14.0 in				
Equipment Avail Load Fig. 190					Effective Length, K=	
Listendam Listen March Sept Content State Content St	Column Length, L=		Column Length, L=			
Land above level E						
Line	Estimated Column Size:	W14x74	Estimated Column Size:	W14x61 ΦP _n =543 k	Estimated Column Size:	W14x61
Line						
Limp	Load above level 8:		Load above level 8:		Load above level 8:	
Pro						
Part 1921 light Part 1932 light Part 1932 light Part 1932 light Part 1932 light Part 1933 light Part Part 1933 light Part						
Fig. 6.5 ligs Fig. 1.3						
Column Stape	P _D =	193.2 kips	P _D =	349.4 kips	P _D =	193.2 kips
Unbalanced Moment, M., a. 23.0 sht. Column Rapper Wat's Column Dispote Effective Length, M. a. 2.0 sht. Column Dispote Sequence All Load Above Invest 6: Sequence All Load Above	P _L =	6.8 kips	P _U =	12.3 kips	P _{tr} =	6.8 kips
Column Rappes Column Rappes Column Rappes Column Rappes Column Rappes Financial Legal, No. 6 Equivalent Facility (1) 10 10 10 10 10 10 10 10 10 10 10 10 10	P _u =	370.9 kips	P _U =	651.0 kips	P _O =	370.9 kips
Column Dappes Column Dappes Column Dappes Column Dappes Column Dappes Column Dappes Dappes Firetrie kergth, 1s Equivater Polation (e.g., 1s) Equivater Polat	Unbalanced Moment, M,=	234.0 kft	Unbalanced Moment, M,=	35.5 kft	Unbalanced Moment, M,=	60.5 kft
Column Depth		W14's	1	W14's	1	W14's
Effective Length, Iv 1.0 Column Length, Iv 1.0 Column Length, Iv 1.5 or the Equivalent Avail Load, Fig. 772 Figure 1.5 or the Equivalent Ava		14.0 in		14.0 in		14.0 in
Equivaer Avail Load P _{ij} * 772 kgs Estimated Column Sizes		1.0	Effective Length, K=	1.0		
Estimated Column Size: W14/20 69/24008		15.0 ft		15.0 ft		15.0 ft
Load above level 6:	Equivalent Axial Load, P _{eq} =	772	Equivalent Axial Load, Peq=	712 kips	Equivalent Axial Load, P _{eq} =	475 kips
Part Property Pr	Estimated Column Size:	W14x90 ΦP _n =1000 k	Estimated Column Size:	W14x74 ФР _п =667 k	Estimated Column Size:	W14x61
Part Property Pr						
Line	Load above level 6:	Roof +	Load above level 6:	Roof+	Load above level 6:	Roof +
P _P 107.6 kips		7 Floors		7 Floors		7 Floors
P _P 257,6 kips	LL _{red}	0.41	LL _{red}	0.40	LL _{red}	0.41
Pi	P _L =	107.6 kips	P _L =	190.0 kips	P _L =	107.6 kips
Pi	P _D =	257.6 kips	P _D =	465.9 kips	P _D =	257.6 kips
Part						
Unbalanced Moment, M., 234.0 kt: Column Shape W14's						
Column Shapes W14's Column Shapes Colu						
Column Depth 14.0 in Fiffetive length, 15.0 ft Equivalent Avial Load, 15.0						
Effective Langth, Ks 1.0 Column Langth, Ls 15.0 ft Equivalent Asial Load, P _m = 10 Column Langth, Ls 15.0 ft Equivalent Asial Load, P _m = 230 kips						
Column Length, Label						
Equivalent Asial Load, P _{ma} S85						
Estimated Column Size: W14:90 Pp,=1000 k					Equivalent Axial Load, Pen=	
Load above level 4: Roof + Load above level 4: Roof +						
Process						
Process	Load above level 4:	Roof +	Load above level 4:	Roof +	Load above level 4:	Roof +
P ₁						
P ₁	LL _{red}	0.40	LL _{red}	0.40	LL _{red}	0.40
P _p 322.1 kips						
P ₁						
Column Shape				,		
Unbalanced Moment, M _s 234.0 kt Column Shapee W14's Column Depth 14.0 in Effective Length, Ks 1.0 Column Ength 15.0 ft Equivalent Asial Load, P _{ma} 11.2 Column Shape W14's Column Depth 14.0 in Effective Length, Ks 1.0 Equivalent Asial Load, P _{ma} 15.0 ft Equivalent Asial Load, P _{ma} 15.0 ft Equivalent Asial Load, P _{ma} 15.0 ft Effective Length, Ks 1.0 Column Length, Ls 15.0 ft Equivalent Asial Load, P _{ma} 15.0 ft Equivalent Asial Load, P _{ma} 11.2 ftoors 11.7 ftoo						
Column Shape						
Column Depth=						
Effective Length, K 1.0 Column Length, L 1.0 Column Length,						
Column Length, Le 15.0 ft Equivalent Asial Load, P _{mil} = 10.03						
Equivalent Asial Load, P _m e 1,03 Equivalent Asial Load, P _m e 1,148 kpg Equivalent Asial Load, P _m e 7,05 kpg						
Estimated Column Size: W14x199 Op_=1100 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k Estimated Column Size: W14x109 Op_=1210 k						
Load above level 2: Roof + 11 Floors 12 Floors						
11 Floors 12 Floors 13 Floors 14 Floors 15 Floors 15 Floors 16 Floors 16 Floors 17 Floors 17 Floors 18 Floors	Estimated addition size.		Estimated Column Sizes		Estimated Column Size.	
11 Floors 12 Floors 13 Floors 14 Floors 15 Floors 15 Floors 16 Floors 16 Floors 17 Floors 17 Floors 18 Floors	Load above level 2:	Roof +	Load above level 2:	Roof ±	Load above level 2:	Roof +
Lt _{red}	=======================================					
PI = 159.3 kips PI = 288.1 kips PI = 288.1 kips PI = 159.3 kips P _D = 386.5 kips P _D = 698.8 kips P _D = 386.5 kips P _D = 722.1 kips	LL		LL		LL	
P₂= 386.5 kips P₂= 6.8 kips P₂= 386.5 kips P₂= 386.5 kips P₂= 386.5 kips P₂= 386.5 kips P₂= 6.8 kips P₂= 7.22.1 kips P₂=						
P _U = 6.8 kips P _U = 12.3 kips P _U = 6.8 kips P _U = 72.21 kips P _U = 1305.7 kips P _U = 72.21 kips Unbalanced Moment, M _U = 234.0 kft Unbalanced Moment, M _U = 35.5 kft Unbalanced Moment, M _U = 60.5 kft Column Shape = W14's Column Shape = W14's Column Depth = 14.0 in Effective Length, K = 1.0 Effective Length, K = 1.0 is 0.1 to 0.1 t						
Pu 722.1 kips Fu 1305.7 kips Fu 722.1 kips Unbalanced Moment, Mu* 234.0 kt Unbalanced Moment, Mu* 255. kt Unbalanced Moment, Mu* 60.5 kt Column Shape W14*; Column Shape W14*; Column Shape W14*; Column Depth 14.0 in Column Depth 14.0 in Column Depth 14.0 in Column Depth 14.0 in Effective Length, Ke 1.0 Column Length, Le 15.0 ft Equivalent Availa Load, F _m * 32.6 kips Equivalent Availa Load, F _m * 25.6 kips	-		•			
Unbalanced Moment, M _u = 234,0 kt Unbalanced Moment, M _u = 35.5 kt Unbalanced Moment, M _u = 60.5 kt Column Shapee W14's W14's Column Shapee W14's S15 of S15 of S1						
Column Shape= W14's Column Shape= W14's Column Shape= W14's Column Shape= W14's						
Column Depth= 14.0 in Column Depth= 14.0 in Column Depth= 14.0 in						
Effective Length, K = 1.0						
Column Length, L= 15.0 ft Column Length, L= 15.0 ft Column Length, L= 15.0 ft Equivalent Axial Load, P _{eq} = 1123 Equivalent Axial Load, P _{eq} = 1367 kips Equivalent Axial Load, P _{eq} = 8.26 kips	Column Donath					
Equivalent Axial Load, P _{eq} = 1123 Equivalent Axial Load, P _{eq} = 1367 kips Equivalent Axial Load, P _{eq} = 826 kips			I Fffertive Length K−	1.0	Effective Length, K=	1.0
	Effective Length, K=					
Estimated Column Size: W14x109 Pp_=1210 k Estimated Column Size: W14x132 Pp_=1480 k Estimated Column Size: W14x90 Pp_=100	Effective Length, K= Column Length, L=	15.0 ft	Column Length, L=			
	Effective Length, K= Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 1123	Column Length, L= Equivalent Axial Load, P _{eq} =	1367 kips	Equivalent Axial Load, Peq=	826 kips

Note: Refer to Moment Frame E elevation in final report for column sizes that support combined gravity and lateral loads

Moment Frame 1: Estimated column sizes based on gravity load analysis only

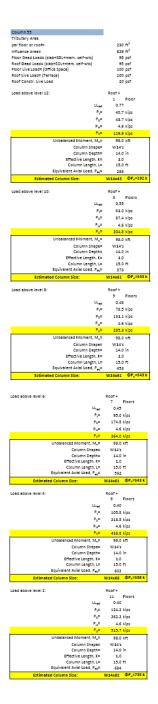
Refer to Moment Frame 2 Column 27 Refer to Moment Frame 3



Note: Refer to Moment Frame 1 elevation in final report for column sizes that support combined gravity and lateral loads

Moment Frame 1': Estimated column sizes based on gravity load analysis only

Column 14	Column 26			Column 37		Column 48	
Tributary Area per floor or roof= 323	Tributary Area 3 ft ² per floor or roof=		553 ft ²	Tributary Area per floor or roof=	510 ft ²	Tributary Area per floor or roof=	459 ft ²
Influence Area= 1186			2113 ft ²	Influence Area=	1950 ft ²	Influence Area=	1755 ft ²
	6 ft" Influence Area = 5 psf Floor Dead Load = (slab+	SDI+mem self-wts)	2113 ft" 95 psf	Influence Area = Floor Dead Load = (slab+SDL+mem. self-wts)	1950 ft" 95 psf	Influence Area= Floor Dead Load= (slab+SDL+mem. self-wts)	1755 ft* 95 psf
Roof Dead Load= (slab+SDL+mem, self-wts) 95	5 psf Roof Dead Load= (slab+)	SDL+mem. self-wts)	95 psf	Roof Dead Load= (slab+SDL+mem, self-wts)	95 psf	Roof Dead Load= (slab+SDL+mem, self-wts)	95 psf
Floor Live Load= (Office Space) 100	0 psf Floor Live Load= (Office	Space)	100 psf	Floor Live Load= (Office Space)	100 psf	Floor Live Load= (Office Space)	100 psf
	0 psf Roof Live Load= (Terrace	1)	100 psf	Roof Live Load= (Terrace/Balcony)	100 psf	Roof Live Load= (Terrace/Balcony)	100 psf
Roof Constr. Live Load 20	0 psf Roof Constr. Live Load		20 psf	Roof Constr. Live Load	20 psf	Roof Constr. Live Load	20 psf
Load above level 12: Roof+	Load above level 12:		oof+	Load above level 12:	Roof+	Load above level 12:	Roof+
	Floor		1 Floor	COSC GOOTE INTEL 12.	1 Floor	EDGG GOOTE RETER II.	1 Floor
LL _{red} 0.65	9	LL _{red}	0.58	LL _{red}	0.59	LL _{med}	0.61
	4 kips	P _L =	87.2 kips	P ₁ =	81.1 kips	P _i =	73.8 kips
	4 kips		105.1 kips	P ₀ =	96.9 kips	P _e =	87.2 kips
P _{t/} = 6.5	5 kips	P _{lu} =	11.1 kips	Pu=	10.2 kips	P _{lu} =	9.2 kips
Po= 164.0	0 kips	P _U =	271.1 kips	P ₀ =	251.1 kips	Pu=	227.3 kips
Unbalanced Moment, M _s = 194.5	5 kft U	nbalanced Moment, M _g =	122.0 kft	Unbalanced Moment, M _e =	74.5 kft	Unbalanced Moment, M _g =	100.5 kft
Column Shape= W14's	s	Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth= 14.0		Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K= 1.0 Column Length, L= 13.0	0	Effective Length, K=	1.0 15.0 ft	Effective Length, K=	1.0 15.0 ft	Effective Length, K=	1.0 13.0 ft
Column Length, L= 13.0 Equivalent Axial Load, P ₄₄ = 493	0 ft	Column Length, L= juivalent Axial Load, P _{eq} =	15.0 ft 480	Column Length, L= Equivalent Axial Load, Par=	15.0 ft 379	Column Length, L= Equivalent Axial Load, P _{ex} =	15.0 ft 400
Estimated Column Size: W14x61			480 14x61 ФР _и =543 k		W14x61 ΦP _n =543 k		W14x61 ФР₁=543 k
Estimated Column Size: W14x61	ΨF ₂ -343 K	.olumn Size: Wi	4x61 Ψr ₄ -343 k	Estimated Column Size:	W14X61 Ψr ₀ -545 K	Estimated Column Size:	W14x61 WF,-545 K
Load above level 10: Roof +	Load above level 10:	Ro	oof+	Load above level 10:	Roof+	Load above level 10:	Roof+
3	Floors		3 Floors		3 Floors		3 Floors
LL _{red} 0.50	0	LL _{red}	0.44	LL _{red}	0.45	Ligad	0.46
	9 kips	P _L =	128.0 kips	P _L =	119.3 kips	P _k =	108.8 kips
P ₀ = 122.7	7 kips		210.1 kips	P _o =	193.8 kips	P ₀ =	174.4 kips
P _{L/} = 6.5	5 kips	P _{tr} =	11.1 kips	P _{tr} =	10.2 kips	P _{to} =	9.2 kips
P ₀ = 279.5	9 kips	P _U =	462.5 kips	P _o =	428.5 kips	P _o =	388.0 kips
Unbalanced Moment, M _e = 194.	5 kft: U		122.0 kft	Unbalanced Moment, M _e =	74.5 kft	Unbalanced Moment, M _g =	100.5 kft
Column Shape= W14's	s	Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth= 14.0	0 in	Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K= 1.0		Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L= 13.0 Equivalent Axial Load, P ₄₄ = 613		Column Length, L= quivalent Axial Load, P _{eq} =	15.0 ft 672	Column Length, L= Equivalent Axial Load, Pec=	15.0 ft 336	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 560
			672 14x82 ΦΡ _α =735 k		336 W14x68 ФР _и =608 k		360 W14x68 ΦP _α =608 k
Estimated Column Size. W14X/4	Granden C	Joidinin Size. W.	14352 W1 6-155 K	Estimated Column Size.	11 T4169 41 "-000 K	Estimated Column Size.	M14789 41 1-000 K
Load above level 8: Roof +	Load above level 8:		oof+	Load above level 8:	Roof+	Load above level 8:	Roof+
	Figors		5 Floors		5 Floors		5 Floors
LL _{red} 0.44			0.40	LL _{red}	0.40	LL _{med}	0.41
P _L = 104.1			165.9 kips	P _L =	153.5 kips	P _k =	140.0 kips
P ₀ = 184.1			315.2 kips	P ₀ =	290.7 kips	P _D =	261.6 kips
	5 kips	P _L ,=	11.1 kips	P _{t/} =	10.2 kips	P _{to} =	9.2 kips
P _U = 390.6	8 kips	P _U =	649.2 kips	P _U =	599.5 kips	P _{to} =	542.6 kips
Unbalanced Moment, M _e = 194.5	5 kft U		122.0 kft	Unbalanced Moment, M _e =	74.5 kft	Unbalanced Moment, M _g =	100.5 kft
Column Shape= W14':	's	Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth= 14.0 Effective Leneth, K= 1.0		Column Depth=	14.0 in 1.0	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Leneth, K= 1.0		Effective Leneth, K=					
				Effective Length, K=	1.0	Effective Length, K=	1.0
Column Leneth, L= 15.0	0 ft	Column Leneth, L=	15.0 ft	Column Length, La	15.0 ft	Column Length, La	15.0 ft
Column Length, L= 15.0 Equivalent Axial Load, P ₄₄ = 724	0 ft 4 E6	Column Length, L= juivalent Axial Load, P _{eq} =	15.0 ft 858	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 727	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 715
Column Length, L= 15.0 Equivalent Axial Load, P ₄₄ = 724	0 ft 4 Ec	Column Length, L= juivalent Axial Load, P _{eq} =	15.0 ft	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 727	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft
Column Length, L= 13.0 Equivalent Axial Load, P ₄₄ 2 724 Estimated Column Size: W14x82	0 ft 4 Et	Column Length, L= quivalent Axial Load, P _{eq} = Column Size: Wi	15.0 ft 838 14x90	Column Length, L= Equivalent Axial Load, P _{eq} = Estimated Column Size:	15.0 ft 727 W14x82	Column Length, L= Equivalent Axial Load, P _{mi} = Estimated Column Size:	15.0 ft 715 W14x90
Column Length, L= 13.0 Equivalent Axial Load, P ₄₄ 2 724 Estimated Column Size: W14x82	0 ft 4 Et	Column Length, L= quivalent Axial Load, P _{eq} = Column Size: Wi	15.0 ft 838 14x90	Column Length, L= Equivalent Axial Load, P _{eq} = Estimated Column Size:	15.0 ft 727 W14x82	Column Length, L= Equivalent Axial Load, P _{mi} = Estimated Column Size:	15.0 ft 715 W14x90
Column Length, Ix	0 ft 4 Et 4	Column Length, L= juivalent Axial Load, P _{aq} = Column Size: W3	13.0 ft 858 14x90	Column Length, L= Equivalent Axial Load, P _m = Estimated Column Size: Load above level 6:	15.0 ft 727 W14x82	Column Length, L= Equivalent Axial Load, P _{mi} = Estimated Column Size:	13.0 ft 715 W14x90
Column Length, i.a 13.6	0 ft 4 Ec 4 Ec 4 Estimated (Description	Column Length, L= quivalent Axial Load, P _{eq} = column Size: WI Ro LL _{ed}	13.0 ft 838 14x90	Column Length, La Equivalent Axial Load, P _{mil} a Estimated Column Size: Load above level 6: Li _{mil}	15.0 ft 727 W14x82	Column Length, L= Equivalent Axial Load, P _{mi} = Estimated Column Size:	15.0 ft 715 W14x90
Column Length, Le Equivalent Asia loss, F _{1,2} 13.6 Estimated Column Size: W14482 Load above level 6: Roy 7 U _{nd} C.4 F ₁ C.5	0 ft 4 Et 4	Column Length, La quivalent Axial Load, P _{eq} a column Size: Wi Ro Li _{red} P _i =	13.0 ft 858 14x90	Column Length, Light Space Stimated Column Size: Estimated Column Size: Load above level 6: Light P _p =	15.0 ft 727 W14x82	Column Length, La Equivalent Avial Load, P _{eq} a Estimated Column Size: Load above level 6: Li _{red}	13.0 ft 715 W14x90
Column Lenges, Le 13.6	0 ft	Column Length, L= quivalent Axial Load, P _{eq} = Column Size: W: RC Lt _{red} P _i = P _i = P _i =	15.0 ft 858 Aks90 PP_=1000 k 00f + 7 Floors 0.40 210.1 kips 420.3 kips	Column Length, Le Equivatent Asia Lood, P _m = Estimated Column Size: Load above level 6: LL _{mg} P _c = P _p = P _p =	15.0 ft 727 727 Wi4482	Column Length, Let $\mathbb{E}_{q} = \mathbb{E}_{q} = \mathbb{E}_{q} = \mathbb{E}_{q}$ Estimated Column Size: $\mathbb{E}_{q} = \mathbb{E}_{q} = $	13.0 ft 713 W14x90
Column Length, Lin 13.6	0 ft	Column Length, La Column Size: W3 Re Litud Fil Fil Fil Fil Fil Fil Fil Fi	15.0 ft 858 164:90	Comme Leight, Le Equivant Airlaine Service Airlaine Service Airlaine Service S	15.0 ft 727 727 W14822	Column Length, Le Equivalent Asial Load, P _{eq} 2 Estimated Column Size: Load above level 6: Li _{eq} 1 F ₁ 2 F ₂ 2 F ₃ 3	15.0 ft 715 W14x90
Column Lengen, Le Equivater Asid Loos P, u Estimated Column Size: W14482 Load above level 6: Roof+ 7 Lim P, = 126, P, = 226, P, = 5 P, = 44, P, = 6	0 ft	Column Length, Lu Column Size: W3 Ro LL P P P P P P P P P P P P	15.0 ft 858 Aks90 PP_=1000 k 00f + 7 Floors 0.40 210.1 kips 420.3 kips	Column Leight, Le Equivant Airle Look Fig. Estimated Column Size: Load above level 6: Ling Fig. Fig. Fig. Fig. Fig. Fig.	15.0 ft 727 727 Wi4482	Count Leight, Le Equivalent Aria Lade, P _m z Estimated Column Size: Load 200ve level 6: Li _{vel} P _c P _c P _c P _c P _c	13.0 ft 713 W14x90
Column Lengen, Le Equivater Asia (Loss P. M. 2) Estimated Calumn Size: W14482 Load above level 6: Foot* 7 Lim Pic 136 Pic 136 Pic 2 Load Size (Loss Pic 2) Lim Pic 4	0 ft	Column Length, Lis Column Size: W1 Column Size: W2 Column Size: R0 Ll _{min} F ₁ = F ₂ = F ₃ = F ₁ = F ₂ = P ₃ = Rbalanced Moment, M ₂ = Column Size:	13.0 ft	Column Length, Le Equivant Avail Look F _m 2 Estimated Column Size: Load 800ve level 6: Ling F _c F _c F _c Unbalanced Konnert, M _c Column Size:	13.0 ft 727 727 728 Widekez	Count largh, Le Equivalent Arial lade, F _m 2 Estimated Column Size: Load 800ve level 6: Ling F ₁ F ₂ F ₃ Unbalanced Moment, M ₂ Column Sizes	13.0 ft 713 W14x90 ΦP,=1000 K Roof + 7 Floors 0.40 174.4 kips 348.8 kips 9.2 kips 702.3 kips 100.3 kft W14/s
Column Lengen, Le Equivater Asia (Loss P. M. 2) Estimated Calumn Size: W14482 Load above level 6: Foot* 7 Lim Pic 136 Pic 136 Pic 2 Load Size (Loss Pic 14) Load Research (Load Research (Loss Pic 14) Load Research (Load	0 ft	Column Length, Ls Column Size: W2 Ri Li _{mal} P ₁ = P ₂ = P ₃ = rebalanced Moment, M ₃ = Column Shape= Column Depth=	13.0 ft 838 1489	Column Length, Le Equivant Avail Look F _m 2 Estimated Column Size: Load 800ve level 6: Ling F _c F _c F _c Unbalanced Konnert, M _c Column Size:	13.0 ft 727 727 728 Widekez	Count larght, i.e. Equivater Asia load. F _m ² Estimated Column Size: Load above first (6: Line Fig. Fig. Urbalances Monetch, My. Column Rayar Column Rayar Column Rayar Column Rayar Column Rayar Column Rayar	13.0 ft 713 W14x90
Column Energet, i.e. 13.6 Equivater Asia Issue, F _{ac} 7.2 Estimated Calumn Size: 9/46482 Load above level 6: Roof+ 7 Li _{max} 0.6 F ₁ 136 F ₂ 2.6 F ₄ 146 Column Sizes 9/46 Vibralianced Moment, M _a 124, Column Stepen 9/46 Column Stepen 9/46	0 ft	Column Length, Lis pulvalent Avial Load, P _{ny} z column Size: W1 Ro Ll _{ing} P _i z P _i z P _i z P _i z column Size: Column Size: Ro Column Size: Ro Ro Column Size: Ro Ro Column Size: Ro Column Size: Ro Column Depths Effective Length, Kiz	15.0 ft 15.5 16490	Column Length, Le Equivalent Airs Loss Fig. 2 Estimated Column Size: Load above level 6: Li	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count larght, Le Equinar Arial lade, F _m ² Estimated Counts Size: Load above level 6: Light F _m ² F _m ² F _m ² Unbestance Mannet, M _d Column Tageta Extractive Counts The State Extractive C	13.0 ft 7.13 W14.90
Column Energet, i.e. 13.6 Equivater Asia Issue, F _{ac} 7.2 Estimated Calumn Size: 9/46482 Load above level 6: Roof+ 7 Li _{max} 0.6 F ₁ 136 F ₂ 2.6 F ₄ 146 Column Sizes 9/46 Vibralianced Moment, M _a 124, Column Stepen 9/46 Column Stepen 9/46	Off. 4 Extinated ()	Column Length, Lis upulvalent Avial Load, P _{eq} s Column Size: W2 Rt Li _{mal} P _e s Rt Li _{mal} P _e s Column Shapes Column	13.0 ft 838 1499	Column Length, Le Equivalent Airs Loss Fig. 2 Estimated Column Size: Load above level 6: Li	30.0 ft 727 727 5 k Reof* 7 Floors 0.40 kips 102.4 kips 102.4 kips 103.4 kips 104.5 kips 105.4 kips 105.4 kips 106.4 kips 106.4 kips 106.4 kips 107.4 kips 108.4 kips 109.4	Column Leight, Le Equivalent Asia Lood, P _m ² Estimated Column Size: Lood above level 6: Li _{tot} P _c P _c P _c Unbalanced Moment, M _c Column Sizes Column Eagle Column Eagle Column Eagle Effective Leight	13.0 ft 713 W2499
Column Lengen, Le Equivater Asia Loos P _a 27 Estimated Calumn Size: W14482 Load above level 6: Roof+ 7 Li _{max} 0, 64 F ₁ = 126, 68 F ₂ = 245, 69 F ₂ = 25, 69 Unbaanced Moment, Ly- Column Captas Column Captas Column Captas Employment Loop Column Captas Column Captas Column Langen, Le Column Langen, L	0 ft	Column Length, Lis quivalent Avial sude, P _q is Column Size: Wis Rid Li _{qui} F _i = F _i = F _i = F _i = Column Depths Column Depths Effective Length, Ks Column Length, Lis quivalent Avial soot, P _q = quivalent Avial soot, P _q	13.0 ft 838 8489	Commo Length, Le Equivant Asia (see See See See See See See See See See	13.0 ft 727 727 727 727 727 727 727 727 727 72	Column Length, Le Equivater Avia Lose, P _m 2 Estimated Column Size: Lose above level 6: Light P _m 2 P _m 2 P _m 2 Unbasicace Montest, M _p 2 Column Size; Column Size, Column Siz	13.0 ft 713 Wideb0 #F_1000 k Roof+ 7 Floors 0.40 174.4 kips 3448 kips 92 kips 7013 kips 100.3 kt Widfs 1.0 in 1.0 ft 875
Column Lengen, Le Equivater Asia Loos P _a 27 Estimated Calumn Size: W14482 Load above level 6: Roof+ 7 Li _{ma} 0.6 P _i 236, P _i 2.6, P _i 3.6, P _i 3.6, P _i 4.6, P _i 5.6, P _i	0 ft	Column Length, Le Column Size: Wi Re Light Fig. Fig. Fig. Fig. Fig. Column Column Column Fig. Fig. Fig. Fig. Fig. Fig. Fig. Fig.	13.0 ft 838 84890	Commo Length, I.a. Equivant Asia local of Fig. 2 Estimated Column Size: Load above level 6: Ling. P. 2 P. 2 Unablaced Staneth, M. 2 Column Depth. Effects of Column Length, I.a. Equivant Asia local of Fig. 2 Estimated Column Size: Estimated Column Size:	13.0 ft 727 727 727 727 727 727 727 727 727 72	Column Length, Le Equivater Anie Lose, P _m ² Estimated Column Size: Load above fevel 6: Light P _m ² P _m ² P _m Unbestaced Mannett, M _p Column Repta Estimated Column Length, Le Equivater Anie Lose, P _m Estimated Column Size:	13.0 ft 713 ROOf+ 7 FROOTS 0.40 174.4 Wps 348.8 Wps 52.8 Wps 720.3 Wps 100.2 ft West 100.5 ft 873.8 Wps 100.5 Wps
Column Lengen, Le Equivater Asia Loos P _a 27 Estimated Calumn Size: W14482 Load above level 6: Roof+ 7 Li _{ma} 0.6 P _i 236, P _i 2.6, P _i 3.6, P _i 3.6, P _i 4.6, P _i 5.6, P _i	0 ft	Column Length, Le Column Size: Wi Fig.	13.0 ft 838 84890	Commo Length, I.a. Equivant Asia local of Fig. 2 Estimated Column Size: Load above level 6: Ling. P. 2 P. 2 Unablaced Staneth, M. 2 Column Depth. Effects of Column Length, I.a. Equivant Asia local of Fig. 2 Estimated Column Size: Estimated Column Size:	13.0 ft 727 727 727 727 727 727 727 727 727 72	Column Length, Le Equivater Anie Lose, P _m ² Estimated Column Size: Load above fevel 6: Light P _m ² P _m ² P _m Unbestaced Mannett, M _p Column Repta Estimated Column Length, Le Equivater Anie Lose, P _m Estimated Column Size:	13.0 ft 713 ROOf+ 7 FROOTS 0.40 174.4 Wps 348.8 Wps 52.8 Wps 720.3 Wps 100.2 ft West 100.5 ft 873.8 Wps 100.5 Wps
Column Lengen, Le Equivater Asia Loss P _{ac} 27 Estimated Calumn Size: W14482	0 ft	Column Size: W1 Fig. Part Column Size: W2 Ri LL Fig. Fig. Part Column Size: W3 Ri LL Fig. Fig. Fig. Fig. Fig. Fig. Fig. Fig.	13.0 ft 838 8489	Commo Length, I.a. Equivant Asia local S _m 2 Estimated Column Size: Load above level 6: Ling P, 2 P, 2 P, 2 Unablaced Mannet, M, 2 Column Depth Effects local Size of Column Length, I.a. Equivant Asia local S _m 2 Estimated Column Size: Load above level 4:	13.0 ft 727 727 727 727 727 727 727 727 727 72	Column Length, Le Equivater Anie Lose, P _m ² Estimated Column Size: Load above fevel 6: Light P _m ² P _m ² P _m Unbestaced Mannett, M _p Column Repta Estimated Column Length, Le Equivater Anie Lose, P _m Estimated Column Size:	13.0 ft 713 R00f+ 7 FROOTS 0.40 1274.4 Wps 348.8 Wps 92.8 Mps 100.3 xt W149 100.1 t 10.0 ft 872 R00f+ 80f+ 80f+ 80f+ 7 FROOTS 10.0 T 10.0 T 872 R00f+ 9 R00f+ 9 R00f+ 9 R00f+ 9 R00f+ 9 R00f+ 9 R00f+
Column Lengen, Le Equivater A fails Look P _e 20	0 ft	Language and the second series of the second series	13.0 ft 858 14490	Column Leight, Le Equiver A fair Losd Fig. 2 Estimated Column Size: Load above level 6: Ling Fig. 7 Fig. 7 Unbalanced Moment, May Column Sizes Column Depter Column Depter Column Depter Sizes Sizes Fixes Sizes Leight Sizes S	13.0 ft 727 727 727 727 727 727 727 727 727 72	Column Langh, La Equivalent Asia Lose, F _m ² Estimated Calumn Size: Losd above level 6: Lind F ₁ F ₂ F ₃ Unbalanced Moment, M ₂ Column Size Estimated Column Size Losd above level 4:	15.0 ft 715 715 800f+ 7 Fleors 0.40 174.4 kips 144.8 kips 144.8 kips 152.3 kips 100.3 kft Widd's 100.0 ft 100.0
Column Lengen, Le Equivater Asia Loos P _a 27 Estimated Calumn Size: W14482	0 ft	Light service for the service	13.0 ft 838 14490	Commo Length, Le Equivert Advis Local Fig. 2 Estimated Column Size: Load above level 6: Ling Pg. Pg. Pg. Load above Local Fig. 2 Unoblesced Moment, M., a Column Depth Effective Local Fig. 2 Estimated Column Size: Load above level 4: Load above level 4: Ling Pg. 2 Load above level 4:	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count larght, Le Equivalent Arial lade, F _m ² Estimated Column Size: Load above level 6: Light F _m ² F _m ² F _m ² Unbearded Moment, M _m ² Column Depths Effective Length, Le Equivalent Aid lade, F _m ² Estimated Column Size: Load above level 4: Light F _m ² Load above level 4:	130 ft 712 712 800f+ 7 FRONT 0.40 1274.4 Wps 348.8 Wps 92.4 Wps 702.3 Wps 702.3 Wps 100.3 ft W442 10 15.0 ft 872 8706 8707 8707 8707 9.040
Column Length, Le Equivater A fails com, Par 23.6 Estimated Calumn Size: W14482	0 ft	Liquis Legit, Le Caller Size Par Liquis Legit Le Caller Size Par Liquis Legit	13.0 ft 858 14490	Commo Leggin, and Commo Leggin	13.0 ft 727 727 727 727 727 727 727 727 727 72	Equivalent Asia load, P _m ? Estimated Calumn Size: Load above level 6: Linu P _C P _F P _F Unbalanced Moment, M _F Column Size; Unbalanced Moment, M _F Column Size; Unbalanced Moment, M _F Load above level 6: Estimated Calumn Size; Load above level 4: Linu P _C P _F P _F P _F	13.0 ft 712 712 712 712 712 712 712 712 712 712
Column Lengen, Le Equivater Asia Loos P _a 27 Estimated Calumn Size: W14482	0 ft	Column Seight, Le Column Size: R Limit Fr Fr Fr Column Size: R Limit Fr Fr Fr Fr Fr Column Size: R R R R R R R R R R R R R	13.0 ft 838 14490	Common Length, I a Equiverent Asia Local Fig. Estimated Column Size: Load above level 6: Ling Par	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count largh, Le Equivalent Arial lade, F _m ² Estimated Column Size: Load 200ve level 6: Light F _m ² P _m ² Unbearced Woment, M _m Column Regist, Le Equivalent Arial lade, Le Column Size: Estimated Column Size: Load 200ve level 4: Light F _m ² Load 200ve level 4: Light F _m ² P _m ² F _m ² Load 200ve level 4:	13.0 ft 713
Column Length, Le Equivater A fails Length, 24 72 Estimated Calumn Size: W14482 Load above level 6: Roof+ 7 7 Umail Length	0 ft	Liquis Legit, Le Callent Size C	13.0 ft 858 14490	Commo Leggls, Legglssett Advis Local Fig. 2 Estimated Column Size: Load above level 6: Ling Property Column Size: Unbalanced Moment, Mar Column Sizes Column Sizes Column Sizes Estimated Column Sizes Estimated Column Sizes Load above level 4: Load above level 4:	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count rangh, La Equivater Ania load, P _m ² Estimated Calumn Size: Load above level 6: Linu P _C P _F P _F Unbalanced Moment, M _F Coulom Region Coulom Region Count Regio	13.0 ft 712
Column Langes, Le Equivater Asia Lise P, ar 2-10. Estimated Column Size: W14482	Off.	Column Segnt, Le Column Size: R Light Fig. Fig. Fig. Fig. Fig. Column Stage: Fig. Fig. Fig. Fig. Fig. Fig. Fig. Fig	13.0 ft 858 14490	Common Length, I a Equipment Adult Local Fig. 2 Estimated Column Size: Load above lenet 6: Ling Par	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count rangh, i.e. Equivater Asia local, Fig. Estimated Column Size: Load above level 6: Load above level 4: Load above level 6: Loa	13.0 ft 713
Column Length, Le Equivater Askil Load, Par 2-3 c. Estimated Calumn Size: W14482	0 ft	Light services and the services are services and the services and the services and the services are services and the services and the services and the services are services and the services and the services are services and the services and the services are services and t	13.0 ft 858 14490	Column Leight, Le Equiver A Leif Los Fig. 2 Estimated Column Size: Load above level 6: Ling Pic	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count rangh, La Equivalent Asia load, P _m ² Estimated Calumn Size: Load above level 6: Li _{tot} P _{tot} P _{tot} Unbalanced Moment, M _{tot} Coulom Sizes Estimated Column Sizes Load above level 6: Li _{tot} Unbalanced Moment M _{tot} Column Sizes Estimated Column Sizes Li _{tot} P _{tot} Estimated Column Sizes Load above level 4: Li _{tot} P _{tot} P _{tot} P _{tot} Unbalanced Moment, M _{tot} Column Sizes Load above level 4:	13.0 ft 712 712 712 712 712 712 712 712 712 712
Column Length, Let 13.6	0 ft	Light service for the service	13.0 ft 858 14890	Column Legal, La Equipment Asia Local Fig. 2 Estimated Column Size: Load above level 6: Ling Property Proper	13.0 ft 727 727 727 727 727 727 727 727 727 72	Coumn Length, Le Equivalent Asia Look F _a ^a Estimated Column Size: Look above level 6: Link F ₁ F ₂ F ₃ F ₄ Unbalancer Moment, M ₂ Column Size; Unbalancer Moment, M ₃ Column Length, Le Equivalent Asia Look, F _a ^a Estimated Column Size; Look above level 4: Link F ₁ F ₂ F ₃ Unbalancer Mannet, M ₃ Column Length, Le	150 ft 712 712 FROOT 0.40 174.4 Npc 144.8 Npc 144.8 Npc 150.3 Npc 100.3 Nt V142 140.0 150 ft 150 c 1
Column Length, Le Equivater Asia Loss P _a 23.6 Estimated Column Size: W14482 Load above level 6: Roof- Fig. 23.6	0 ft	column Earght, Le Light Service Servi	13.0 ft 1518 1528 1539 15490	Commo Leagh, La Estimated Column Size: Load above first is: Ling Parameter Advisor Size Load above first is: Ling Parameter Advisor Size Unbalanced Moment, Mac Column Size Column Size Column Size Estimated Column Size Ling Parameter Advisor Size Estimated Column Size Ling Parameter Advisor Size Ling Parameter Advisor Size Ling Parameter Advisor Size Unbalanced Moment, Mac Column Size Column Size Ling Parameter Advisor Size Ling Par	13.0 ft 727 727 727 727 727 727 727 727 727 72	Coumn Largh, La Equivariant Allows Fig. Estimated Column Size: Load above fevel 6: Lind Fig. Fig. Unbalanced Moment, Mage Column Size; Column Largh, La Equivariant Allows Column Size; Load above fevel 6: Lind Fig. Estimated Column Size; Load above fevel 4: Lind Fig. Fig. Unbalanced Moment, Mage Column Size; Load above fevel 4: Lind Fig. Fig. Unbalanced Moment, Mage Column Size; Load above fevel 4: Lind Fig. Fig. Unbalanced Moment, Mage Column Size; Column Size; Load above fevel 4:	13.0 ft 712
Column Lengen, Le Equivater Assistance, P _{ac} 23.6 Estimated Column Size: W14492	0 ft	Liquis Laggin, Let All Liquis Fig. Fig. Fig. Fig. Fig. Fig. Column Stage: Will William William William Fig. Fig. Fig. Fig. Column Column Column Column Column Column Fig. Fig. Fig. Fig. Fig. Fig. Fig. Fig. Fig. Column Column Fig.	13.0 ft 858 1489	Column Legal, Legal State and Column Legal State and Column Size: Load above level 6: Ling Property Column Size: Ling Property Column Size: Ling Property Column Size: Ling Property Column Size: Ling Column Legal State Stat	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count rangh, La Equivalent Ania load, F _a ² Estimated Column Size: Lind 1000 level 6: Lind F _a ² Unbalanced Moment, M _a e Column Regen Column Regen Column Regen Estimated Column Size: Lind 1000 level 6: Lind 1000 lev	150 ft 712 miles 150 ft 712 miles 150 ft 712 miles 150 ft 71000 k miles
Column Lengen, Le Equivater Assistance, P _{ac} 23.6 Estimated Column Size: W14492	0 ft	Liquis Laggin, Let All Liquis Fig. Fig. Fig. Fig. Fig. Fig. Column Stage: Will William William William Fig. Fig. Fig. Fig. Column Column Column Column Column Column Fig. Fig. Fig. Fig. Fig. Fig. Fig. Fig. Fig. Column Column Fig.	13.0 ft 1518 1528 1539 15490	Column Legal, Legal State and Column Legal State and Column Size: Load above level 6: Ling Property Column Size: Ling Property Column Size: Ling Property Column Size: Ling Property Column Size: Ling Column Legal State Stat	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count rangh, La Equivalent Ania load, F _a ² Estimated Column Size: Lind 1000 level 6: Lind F _a ² Unbalanced Moment, M _a e Column Regen Column Regen Column Regen Estimated Column Size: Lind 1000 level 6: Lind 1000 lev	13.0 ft 712
Column Length, Le Equivater A fails Length, Le Equivater A fails Length, Le Equivater A fails Length,	0.0	Liquis English Let Column Size: Will Column	13.0 ft 858 14499	Column Legal, Legal State and Column Size: Load above level 6: Ling Par	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count rangh, La Equivalent Ania load, F _a ² Estimated Column Size: Load above level 6: Lind F _c F _c F _c F _c Unbalance Moment, M _c Column Size; Unbalance Moment, M _c Column Regen Column Length, La Equivalent Ania Load, F _a ² Estimated Column Size; Unbalance Moment, M _c Column Length, La Equivalent Ania Load, F _a ² F _c F _c F _c F _c Column Length, La Equivalent Ania Load, La Equivalent La Equivalent Ania Load, La Equivalent La Equivalent Ania Load, La	13.0 ft 712
Column Langes, Le Equivater Avail Lose P _e 20-2 Estimated Column Size:	0 ft	Column Size: Limit	13.0 ft 838 838 838 837 838 97,10001 100 kips 1101 kips	Common Length, 12 Estimated Column Size: Load above lenet 6: Ling Park Column Size: Ling Size Size Size Size Size Size Size Size	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count rangh, La Equivalent Ania load, F _a ² Estimated Column Size: Load above level 6: Lind F _c F _c F _c F _c Unbalance Moment, M _c Column Size; Unbalance Moment, M _c Column Regen Column Length, La Equivalent Ania Load, F _a ² Estimated Column Size; Unbalance Moment, M _c Column Length, La Equivalent Ania Load, F _a ² F _c F _c F _c F _c Column Length, La Equivalent Ania Load, La Equivalent La Equivalent Ania Load, La Equivalent La Equivalent Ania Load, La	13.0 ft 712
Column Length, Li Equivalent Asia Look P _a 20, 20, 20, 20, 20, 20, 20, 20, 20, 20,	0 ft	column Size: Will Little Park Fig. Park Fig. Park Fig. Park Fig. Park Fig. Park Column Size: Will Fig. Park Fig. Park Fig. Park Column Size: Will Fig. Park Fig. Park Fig. Park Column Size: Will Fig. Park Column Size: Will Fig. Park Column Size: Will Fig. Park Column Size: Will Fig. Park Column Size: Will Fig. Park Fig. Park Fig. Park Column Size: Will Fig. Park Column Size: Will Fig. Park Column Size: Will C	13.0 ft 858 14490	Common Legals, Land Spare Estimated Column Size: Load above level 6: Ling Pare Pare Pare Pare Pare Pare Pare Pare	13.0 ft 727 727 727 727 727 727 727 727 727 72	Equivalent Asia Code, F _a ; Estimated Column Size: Load above level 6: Line Fig. Fig. Unbalanced Moment, M _a ; Column Size; Unbalanced Moment, M _a ; Column Size; Load above level 4: Line Fig. Fig. Unbalanced Moment, M _a ; Column Size; Load above level 4: Line Fig. Fig. Unbalanced Moment, M _a ; Column Size; Load above level 4: Line Fig. Fig. Column Size; Load above level 4: Line Fig. Fig. Column Size; Load above level 4: Line Fig. Fig. Fig. Unbalanced Moment, M _a ; Column Legin, Load Load Moment, M _a ; Column Legin, Load Load Moment, M _a ; Column Legin, Load Load Moment, M _a ; Load Load Mom	13.0 ft 712 713 713 800f + 7 716 716 716 717.4 kips 348 kips 32 kips 723.3 kips 723.3 kips 100.3 kft Wada 110.5 kft 110.5 kft 120.6 kft 120.
Column Langes, Le Equivater Avail Lose 8, avail 20,	0 ft	Column Seight, Le Limit Seight Seigh	13.0 ft 838 838 838 837 7 Pioors 7 Pioors 110.1 kips 110.0 ft	Common Length, 12 Estimated Column Size: Load above level 5: Load above level 6: Load above level 6: Load above level 6: Load above level 6: Load above level 7: Load above level 8:	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count single, La Equivariant Allow Fig. Estimated Column Size: Load above level 6: Lind April	13.0 ft 712
Column Length, Le Equivater A fails Lead, Par 23-2 Estimated Calumn Size: W14482	0 ft	column Size: Williams Size: Resident Avial Lose, P _a and P _a a	13.0 ft 858 14499	Common Legati, Land Spare Estimated Column Size: Load above level 6: Ling Pare Pare Pare Pare Pare Pare Pare Pare	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count name, to a count	13.0 ft 712 712 800f+ 7 Floors 174.4 lips 348.8 lips 52.1 lips 702.3 lips 100.3 lft 100.3 lft 100.4 lips 44.6 lips 10.0 lips 1
Column Langes, Le Equivater Avail Lose P _e 20. Estimated Column Size:	0 ft	Column Size: Limit	13.0 ft 838 838 838 837 7 Floors 7 Floors 110.1 kips 110.1 kips 111.1 kips 112.0 ft 13.0 ft 13	Common Length, Length Park Engineers Advised Sept. Estimated Column Size: Line Sport Rend Size Size Size Size Size Size Size Size	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count rangh, i.e. Equivalent Asia look, F., e. Estimated Column Size: Lood above level 6: Linu P., e. P.,	13.0 ft 712
Column Length, Le Equivater A fails Load, Par 23, 24, 24, 24, 24, 24, 24, 24, 24, 24, 24	0 ft	Limited to the control to the contro	13.0 ft 858 14490	Common Legals, Land Spare Estimated Column Size: Load above level 6: Ling Pare Pare Pare Pare Pare Pare Pare Pare	13.0 ft 727 727 727 727 727 727 727 727 727 72	Coumn cargh, i.e. Equivalent Asia local, F _a = Estimated Column Size: Lood above level 6: Lind P _c P _c P _c P _c Unbalanced Moment, M _c Column Sizes Column Sizes Lood above level 6: Lind P _c Lood Moment, M _c Column Sizes Lind P _c Lood Moment, M _c Lood Moment, M _c Lood Moment, M _c Lood Moment, M _c Lood Above level 4: Lind P _c P _c P _c Lood above level 4: Lind P _c Lood Moment, M _c Lood Moment, M _c Lood Moment, M _c Loolumn Depths Estimated Column Sizes Lind P _c Lood Moment M _c Lood Moment, M _c Loolumn Depths Estimated Column Sizes Lind P _c Lood Moment M _c Lood Mome	13.0 ft 712
Column Langes, Le Equivater Asial Load, Par 27-2 Estimated Column Size: W14482	0 ft	column Size: Column Size:	13.0 ft 838 838 838 837 7 Pioors 7 Pioors 110.1 kips 11	Common Length, 12 Estimated Column Size: Lind above lenet 5: Lind above lenet 6: Lind Application Column Size: Lind Application Si	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count rangh, i.e. Equivalent Asia look, F., et al. (1997). It is a state of count and the count of the count	13.0 ft 712
Column Engran, Le Equivater Asia Load, Para 23.6 Estimated Calumn Size:	0 ft	column Size: Williams Size: Recommend Add Loads, Parallel Column Size: Recommend Add Loads, Parallel Column Size: Recommend Add Loads, Parallel Column Size: Recommend Moment, Market Column Regions	13.0 ft 858 14490	Common Length, Land Spare Estimated Column Size: Load above level 6: Ling Pare Market Column Size: Ling Pare Pare Column Size: Ling Pare Column Size: Unbalanced Moment, Mar Column Size: Column Length Column Size: Ling Pare Pare Pare Pare Pare Pare Pare Pare	13.0 ft 727 727 727 727 727 727 727 727 727 72	Coumn Largh, La Equivariant Size: Estimated Column Size: Lood above level 6: Line Property Column Size: Lood above level 6: Line Property Column Size: Unbalanced Moment, Mare Column Region Col	13.0 ft 712
Column Larges, Le Equivater Avail Lose, P _a 20, 20, 20, 20, 20, 20, 20, 20, 20, 20,	0 ft	Column Size: Limit Column Size: Resident Avial Local Page Resident	13.0 ft 538 14490	Common Length, 12 Estimated Column Size: Load above (inite) 5: Line	13.0 ft 727 727 727 727 727 727 727 727 727 72	Coum name, to a Equipment and to	130 ft 712
Column Length, Le Equivater A Asia Load, Par 23-2 Estimated Column Size: W14482	0.0	column Eagh, Le Ling Per Column Size: R Ling Per Per Per Column Size: R Column Size: Column Size: R Column Size: Column Size: R Column Size: Column	13.0 ft 858 14490	Common Length, Le Estimated Column Size: Land above fine! 5: Ling Pare Pare Unbasticed Moment, Mac Column Size: Ling Pare Pare Unbasticed Moment, Mac Column Size: Ling Pare Estimated Column Size: Ling Pare Pare Unbasticed Moment, Mac Column Size: Ling Pare Pare Pare Unbasticed Moment, Mac Column Size: Ling Pare Pare Pare Pare Pare Pare Pare Pare	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count name, to a count	13.0 ft 712
Column Engrap. Let	0 ft	column Size: Limit Par Column Size: Research Add Load, Par Column Size: Research Add Load, Par Column Size: Research Load,	13.0 ft 858 14490	Column Earght, 12 Estimated Column Size: Load above level 6: Ling Par	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count sargh, i.e. Equivater Asia local, i.e. Equivater Asia local, i.e. Estimated Column Size: Load above level 6: Line Region Column Size: Unbestanced Moment, Mar. Column Size; Unbestanced Moment, Mar. Estimated Column Size; Load above level 4: Line Region Column Size; Load above level 4: Line Region Column Size; Load above level 4: Line Region Column Size; Line Regio	13.0 ft 712
Column Length, Le Equivater A Asia Load, Par 23-2 Estimated Column Size: W14482	0 ft	column Size: Limit Par Column Size: Research Add Load, Par Column Size: Research Add Load, Par Column Size: Research Load,	13.0 ft 838 14490	Column Earght, 12 Estimated Column Size: Load above level 6: Ling Par	13.0 ft 727 727 727 727 727 727 727 727 727 72	Count sargh, i.e. Equivater Asia local, i.e. Equivater Asia local, i.e. Estimated Column Size: Load above level 6: Line Region Column Size: Unbestanced Moment, Mar. Column Size; Unbestanced Moment, Mar. Estimated Column Size; Load above level 4: Line Region Column Size; Load above level 4: Line Region Column Size; Load above level 4: Line Region Column Size; Line Regio	13.0 ft 7:10 f



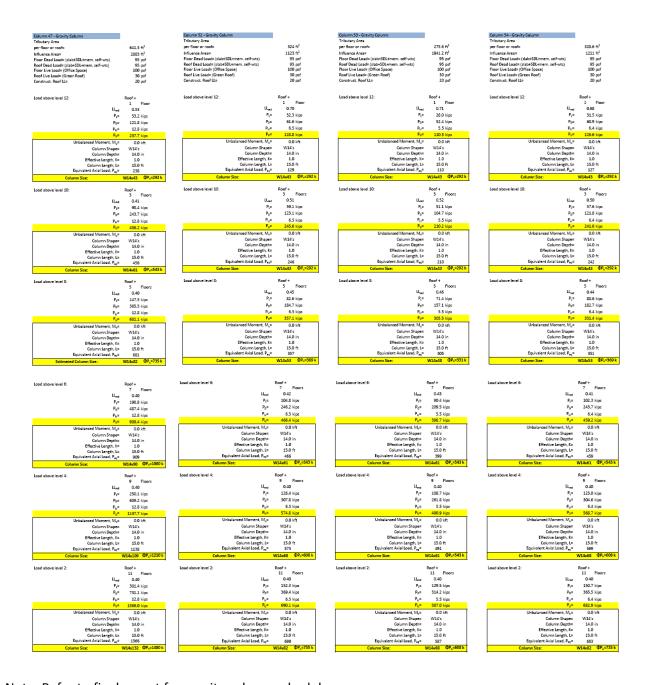
Note: Refer to Moment Frame 1' elevation in final report for column sizes that support combined gravity and lateral loads

Gravity Column Design

Column 13 - Gravity Column		Column 25 - Gravity Column		Column 36 - Gravity Column		Column 39 - Gravity Column	
Tributary Area		Tributary Area per floor or roof=	1	Tributary Area		Tributary Area	
per floor or roof=	456 ft ²		772 ft ²	per floor or roof=	712.5 ft ²	per floor or roof=	976 ft ²
Influence Area=	1608 ft ²	Influence Area=	3482 ft ²	Influence Area=	2850 ft ²	Influence Area=	3904.5 ft ²
Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf 95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf 95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf 95 psf	Floor Dead Load= (slab+SDL+mem. self-wts)	95 psf
Roof Dead Load= (slab+SDL+mem. self-wts) Floor Live Load= (Office Space)	100 psf	Roof Dead Load= (slab+SDL+mem. self-wts) Floor Live Load= (Office Space)	100 psf	Roof Dead Load= (slab+SDL+mem. self-wts) Floor Live Load= (Office Space)	100 psf	Roof Dead Load= (slab+SDL+mem. self-wts) Floor Live Load= (Office Space)	95 psf 100 psf
Roof Live Load= (Ornice Space)	100 psf	Roof Live Load= (Terrace)	100 psf	Roof Live Load= (Office Space)	100 psf	Roof Live Load= (Green Roof)	30 psf
Construct. Roof LL=	20 psf	Construct. Roof LL=	20 psf	Roof Live Load= (Green Roof)	30 psf	Construct, Roof LL=	20 psf
				Construct. Roof LL=	20 psf		
Load above level 12:	Roof +	Load above level 12:	Roof +	Load above level 12:	Roof+	Load above level 12:	Roof +
	1 Floor		1 Floor		1 Floor		1 Floor
LL _{red}	0.62	LL _{red}	0.50	LL _{red}	0.53	LL _{red}	0.50
P _L =	74.1 kips	P _L =	116.1 kips	P _L =	84.1 kips	P _L =	78.1 kips
P ₀ =	86.6 kips	P ₀ =	146.7 kips	P _D =	135.4 kips	P ₀ =	185.4 kips
P _{tr} =	9.1 kips	P _{Lr} =	15.4 kips	P _L =	14.3 kips	P _L =	19.5 kips
P _u =	227.0 kips	Pu=	369.5 kips	P _U =	304.2 kips	P _u =	357.2 kips
Unbalanced Moment, M.,=	0.0 kft	Unbalanced Moment, M _a =	0.0 kft	Unbalanced Moment, M _u =	0.0 kft	Unbalanced Moment, M _a =	0.0 kft
Column Shapes	W14's	Column Shape=	W14's	Column Shapes	W14's	Column Shapes	W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, Ka	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Column Length, L= Equivalent Axial Load, P _{eq} =	227	Column Length, L= Equivalent Axial Load, P _{eq} =	370	Column Length, L= Equivalent Axial Load, P _{eq} =	304	Column Length, L= Equivalent Axial Load, P _{eq} =	357
Column Size:	W14x43 ФР₂=292 k	Column Size:	W14x61	Column Size:	W14x48	Column Size:	W14x53 Pn=369 k
Load above level 10:	Roof + 3 Floors	Load above level 10:	Roof+	Load above level 10:	Roof+	Load above level 10:	Roof+
	3 Floors		Roof + 3 Floors		3 Floors		Roof+ 3 Floors
Ll _{red}	0.47	Lleed	0.40	LLoad	0.41	LL _{red}	0.40
P _L =	109.3 kips	P _L =	169.8 kips	P _L =	134.4 kips	P _L =	146.4 kips
P ₀ =	173.3 kips	P _o =	293.4 kips	P _D =	270.8 kips	P ₀ =	370.9 kips
P _{tr} =	9.1 kips	P _{lv} =	15.4 kips	P _L =	14.3 kips	P _L =	19.5 kips
Pu=	387.4 kips	Pu=	631.5 kips	P	547.1 kips	P	689.1 kips
Unbalanced Moment, M _e =	0.0 kft	Unbalanced Moment, M _a =		Unbalanced Moment, M _u =		Unbalanced Moment, M _u =	0.0 kft
Unbalanced Moment, M _u = Column Shape=		Unbalanced Moment, M _u = Column Shape=	0.0 kft	Unbalanced Moment, M _u = Column Shape=	0.0 kft	Unbalanced Moment, M _u = Column Shape=	
	W14's		W14's		W14's		W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0 15.0 ft	Effective Length, K=	1.0 15.0 ft	Effective Length, K=	15.0 ft	Effective Length, K=	1.0 15.0 ft
Column Length, L= Equivalent Axial Load, P _{eq} =	387	Column Length, L= Equivalent Axial Load, P _{eq} =	13.0 π 631	Column Length, L= Equivalent Axial Load, P _{eq} =	547	Column Length, L= Equivalent Axial Load, P _{eq} =	689
Column Size:	W14x61	Column Size:	W14x74	Column Size:	W14x68	Column Size:	W14x82 ФР₁=735 k
Column size.	*******	Colonial Site.	******* 41 - 10 11	Column Size.		Column Size.	
Load above level 8:	Roof +	Load above level 8:	Roof +	Load above level 8:	Roof +	Load above level 8:	Roof + 5 Floors
EDGE EDGE ICTC G.	Roof + 5 Floors	EURO REVELO.	Roof + 5 Floors	LORG BOOVE TEVE O.	Roof + 5 Floors	LONG PLOTE ILTER 6.	5 Floors
LL _{ed}	0.42	Ll _{ed}	0.40	Lload	0.40	Ll _{ed}	0.40
P _k =	140.7 kips	P _L =	231.6 kips	P _L =	188.8 kips	P _i =	224.5 kips
P ₀ =	259.9 kips	P ₀ =	440.0 kips	P _D =	406.1 kips	P ₀ =	556.3 kips
		F0-	15.4 kips	FD-	14.3 kips	F0-	19.5 kips
P _{LP} =	9.1 kips	P _L ,=		P _L =		P _L ,=	
P _u =	541.7 kips	P _U =	906.3 kips	P _U =	796.6 kips	P _u =	1036.5 kips
Unbalanced Moment, M _e =	0.0 kft	Unbalanced Moment, M _a =	0.0 kft	Unbalanced Moment, M _e =	0.0 kft	Unbalanced Moment, M _a =	0.0 kft
Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth=	14.0 in 1.0	Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
		Effective Length, K=					
Effective Length, K=	1.0	Ellective bengul, K-	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Leneth, La	15.0 ft	Column Length, L=	1.0 15.0 ft	Column Length, L=	15.0 ft
Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 542	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 906	Column Length, L= Equivalent Axial Load, P _{eq} =	1.0 15.0 ft 797	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 1037
Column Length, L=	15.0 ft	Column Leneth, La	15.0 ft	Column Length, L= Equivalent Axial Load, P _{eq} =	1.0 15.0 ft	Column Length, L=	15.0 ft
Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 542	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 906 W14x90	Column Length, L= Equivalent Axial Load, P _{eq} =	1.0 15.0 ft 797	Column Length, L= Equivalent Axial Load, P ₈₄ = Column Size:	15.0 ft 1037 W14x99
Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 542 W14x61	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 906 W14x90	Column Length, L= Equivalent Avial Load, P _{eq} = Column Size:	1.0 15.0 ft 797 W14x90	Column Length, L= Equivalent Axial Load, P ₈₄ = Column Size:	15.0 ft 1037 W14x99
Column Length, La Equivalent Avial Load, P _{Ne} Column Size: Load above level 6:	15.0 ft 542 W14x61	Column Length, Le Equivalent Avial Load, Page Column Size: Load above level 6:	15.0 ft 905 W14x90	Column Langth, La Equivalent Avial Load, P _{eq} = Column Size: Load above level 6:	1.0 15.0 ft 797 W14x90 OP _n =1000 k	Column Length, La Equivalent Avial Load, P ₄₄ = Column Size: Load above level 6:	15.0 ft 1037 W14x99
Column largth, La Equivalent Avial Load, P ₄₄ 2 Column Size: Load above level 5: LU _{nd}	15.0 ft 542 W14x61	Column Length, Le Equivalent Avial Load, Page Column Size: Load above level 6: LL _{nd}	15.0 ft 906 W14x90	Column Length, La Equivalent Avial Load, Peq= Column Size: Load above level 6: Li _{nd}	1.0 15.0 ft 797 W14x90	Column Length, La Equivalent Avial Load, Page Column Size: Load above level 6: LL _{mg}	15.0 ft 1037 W14x99
Column length, La Equivalent Avail Load, $P_{\rm Rg}$ = Column Size: Load above level 6: LL _{Rd} P _{Pa} = P	15.0 ft 542 W14x61	Column target, Le Equivalent Avial Load, $P_{\rm sq}$ = Column Size: Load above level 6: $U_{\rm reg}$ $P_{\rm g}$ =	15.0 ft 9006 W14x90	$\label{eq:column_length} Column Length, Le Equivalent Avial Load, P_{eq} = Column Size: \label{eq:column_length} Load above level 6: $$ U_{ind}$ $$ P_i = $$ P_i$	1.0 15.0 ft 797 W14s90	Column Length, Le Equivalent Avial Load, P _{N2} = Column Size: Load above level 6: LL _{N1} P _{N2}	15.0 ft 1037 W14x99
Column largth, La Equivalent Avial Load, P ₄₄ 2 Column Size: Load above level 5: LU _{nd}	15.0 ft 542 W14x61	Column Length, Le Equivalent Avial Load, Page Column Size: Load above level 6: LL _{nd}	15.0 ft 906 W14x90	Column Length, La Equivalent Avial Load, Peq= Column Size: Load above level 6: Li _{nd}	1.0 15.0 ft 797 W14x90	Column Length, La Equivalent Avial Load, Page Column Size: Load above level 6: LL _{mg}	15.0 ft 1037 W14x99
Column Length, Le Equivalent Axial Load Page Column Size: Load above level 6: Light Page Page Page Page Page	15.0 ft 542 W14x61	Column target, Le Equivalent Avial Load, $P_{\rm eq}$ = Column Size: Load above level 6: Lind P,= P,= P,=	15.0 ft 9006 W14x90	Column Length, Le Equivalent Avial Load, P _{RS} = Column Size: Load above level 6: Ll _{ad} P _I =	1.0 15.0 ft 797 W14s90	Column Length, Le Equivalent Avial Load, P _{N2} = Column Size: Load above level 6: LL _{N1} P _{N2}	15.0 ft 1037 W14x99
Column length, Le Equivalent rival Load, P _{er} e Column Size: Load above level 5: Lu _{nd} P _e P _e P _e P _e P _e P _e	15.0 ft 542 W14x61	Column Length, Le Equivalent Avial Load, P _{eq} Column Size: Load above level 6: Ling P _e	15.0 ft 906 W14.90	Column length, Le Equivalent Aial Load, P _{Ri} z Column Size: Load above level 6: LL _{nd} P _I = P _P	1.0 15.0 ft 797 W14:90	$\label{eq:column-large} (\mbox{Column-largeh}, \mbox{L} = \mbox{Equivalent Avial Load}, \mbox{P}_{nz} = \mbox{Column-Size}.$ $\mbox{Load above level 6:}$ $\mbox{U}_{nd} = \mbox{P}_{lz} = \$	15.0 ft 1037 W14x99
Column length, Le Equivalent rival Load, P _{er} e Column Size: Load above level 5: Lu _{nd} P _e P _e P _e P _e P _e P _e	15.0 ft 342 W14x61	Column Length, Le Equivalent Avial Load, P _{eq} Column Size: Load above level 6: Ling P _e	15.0 ft 90 W14.90	Column length, Le Equivalent Aial Load, P _{Ri} z Column Size: Load above level 6: LL _{nd} P _I = P _P	1.0 15.0 ft 797 W148-90	Column Length, Le Equivalent Avial Load, $P_{\rm eq}$ = Column Size: Load above level 6: $U_{\rm eq}$ $P_{\rm e}$ $P_{\rm eq}$ $P_{\rm eq}$	15.0 ft 1037 W14x99
Column Length, Lis Equivalent rivial Load, P _{er} e Column Size: Load above level 6: U _{that} P _{er} P _{er} P _{er} Urbalanced Moment, M _{er} Column Size: Urbalanced Moment, M _{er} Column Size:	15.0 ft 542 W2485	Column Length, Le Equivalent Avial Load, Paye Column Size: Load above level 6: Line Re Paye Re Unbalanced Moment, Ma	15.0 ft 905 W24.90	Column length, Iz Equivalent Aial Load, Peq2 Column Size: Load above level 6: Lund Pq	1.0 t 15.0 ft 797 WIN-50	Column Length, Le Equivalent Avial Load, P _{max} Column Size: Load above level 6: U _{md} P _l P _g P _g Unbalanced Moment, M _g Column Stages	15.0 ft 1037 W14x99
Column Length, Lie Equivalent Avial Load Pare Column Stee: Load above level 5: Liqu Pare Pare Load above Load Column Stee: Liqu Pare Load Column Steese Column Steese Column Steese	15.0 ft 542 542 8061	Column Length, Le Equivalent Avial Load, Puge Column Size: Load above level 6: Line Re Puge Rue Unbalanced Moment, Mg Column Stage	15.0 fs 906 W18490	Column Length, Le Equivalent Avail Load, Page Column Size: Load above level 6: Light Page Page Unbalanced Moment, Mge Column Sizee Column Sizee Column Sizee	1.0 f 15.0 ft 797 15.0 ft 797 1600 ft Reof + 7 Foor's 0.40 kips 541.5 kips 14.3 kips 1505.2 kips 1505.0 kips 16.0 in	Column Length, Las Equivalent Avial Load, P _{n,n} Column Size: Load above level 6: Ll _{n,n} P _n P _n P _n Unbalanced Moment, M _n Column Stages Column Stages	15.0 ft 1037 W14x99
Column Length, Lis Equivalent rivial Load, P _{er} e Column Size: Load above level 6: Lind P _{er} P _{er} P _{er} Unbalanced Moment, M _{er} Column Sizes Column Sizes Enter Length, Is	15.0 ft 542 542 W24s61	Column Length, Le Equivalent Avial Load, P _{eq} Column Size: Load above level 6: Length Size R _e R _e R _e R _e Unbalanced Moment, M _e Column Stapes Column Depths Effective Length, Ne	15.0 ft 906 906 W15-90	Column length, Le Equivalent Aial Load, P _{NE} Column Size: Load above level 6: Limit P _{NE} P _{NE} P _{NE} Unbalanced Moment, M _{NE} Column Stages Column Stages Column Depths Effective Length, No.	1.0 f 15.0 ft 797 15.0 ft 797 1000 k 1800 ft 7 Foors 0.40 255.8 lips 14.3 lips 16.3 li	Column Length, La Equivalent Avial Load, P _{max} Column Size: Load above level 6: U _{max} P _l P _l P _l Unbalanced Moment, M _{lx} Column Stapes Column Stapes Column Depths Effective Length, No	15.0 ft 1037 W14.499 OP,=1100 ls Roof + 7 Floors 0.40 kips 19.5 kips 19.5 kips 19.5 kips 1384.0 kips 1384.0 kips 14.0 kips 14.0 lin 1.0 lin
Column length, Lie Equivalent rivial load. Pare Column Size: Load above level f: Lud Pare Pare Pare Unbalanced Monent, Mare Column Stages Col	15.0 ft 542 542 W18461	Column Length, Le Equivalent Avial Load, P _{eq} Column Size: Load above level 6: Length Size R _e R _e R _e R _e Unbalanced Moment, M _e Column Stapes Column Depths Effective Length, Ne	15.0 ft 906 W18-90	Column length, La Equivalent Aial Load, Pa ₁₂ Column Size: Load above level 6: Lia P ₁ P ₂ P ₃ Urbalanced Moment, Mape Column Siapes Column Siapes Column Siapes Column Equipment	1.0 f 15.0 ft 797 WILAS90 GP_=1000 k Reof + 7 Foors 0.40 1.43 lips 1550.2 lips 0.0 ut WILAS 1.10 1.50 ft	Column Length, La Equivalent Avial Load, Page Column Size: Load above level 6: Llag Page Page Unbalanced Moment, Mage Column Stapes Column Stapes Column Deptise Effective Length, No	15.0 ft 1037 W44-99
Column Length, Lis Equivalent rivial Load, P _{er} Column Size. Load above level 6: U _{tot} P _{er} P _{er} Urbalanced Moment, M _{er} Column Stages Column Stages Effects length, Is Column Length, Lis Equivalent Airla Load, P _{er} Equivalent Airla Load, P _{er}	15.0 ft 542 W24s61	Column Length, Le Equivalent Avial Load, P _{eq} Column Size: Load above level 6: Length Size Region Region Region Unbalanced Moment, Mig. Column Stapes Column Depths Effective Length, No. Column Length, Le Equivalent Ani	15.0 fs 906 906 907, 1000 k 7 Floors 0.40 293.4 kips 956.7 kips 154.4 kips 1151.2 kips 0.0 ft WLSF2 140 in 10 150 ft 1151.1	Column length, Le Equivalent Aial Load, P _{Na} = Column Size: Load above level 6: Limit P _N = P _N = P _N = Urbalanced Moment, M ₁ = Column Depth Effective Length, Via Column Depth Effective Length, Via Column Length, Lia	1.0 ft 797 15.0 ft 797 1000 k 15.0 ft 797 1000 k 16.0 ft 7.7 Floors 0.40 0.40 0.40 15.0 ft 15.	Column Length, Lis Equivalent Avial Load, P _{max} Column Size: Load above level 6: Lu _{md} P _l P _l P _l P _l Urbalanced Moment, M _l Column Stapes Column Stapes Column Stapes Effective Length, Lis Column Length, Lis Equivalent Avial Load, P _m Equivalent Avial Load, P _m	15.0 ft 1037 W14.09
Column Length, Lis Equivalent rivial Load, P _{er} Column Size. Load above level 6: U _{tot} P _{er} P _{er} Urbalanced Moment, M _{er} Column Stages Column Stages Effects length, Is Column Length, Lis Equivalent Airla Load, P _{er} Equivalent Airla Load, P _{er}	15.0 ft 542 542 W18461	Column Length, Le Equivalent Avial Load, P _{eq} Column Size: Load above level 6: Length Size Region Region Region Unbalanced Moment, Mig. Column Stapes Column Depths Effective Length, No. Column Length, Le Equivalent Ani	15.0 ft 906 W18-90	Column length, Le Equivalent Aial Load, P _{Na} = Column Size: Load above level 6: Lu _{nd} P ₁ = P ₂ = P ₃ = Urbailanced Moment, M ₁ = Column Depth Effective Length, Via Column Depth Effective Length, Via Column Length, Lia	1.0 f 15.0 ft 797 WILAS90 GP_=1000 k Reof + 7 Foors 0.40 1.43 lips 1550.2 lips 0.0 ut WILAS 1.10 1.50 ft	Column Length, Lis Equivalent Avial Load, P _{max} Column Size: Load above level 6: Lu _{md} P _l P _l P _l P _l Urbalanced Moment, M _l Column Stapes Column Stapes Column Stapes Effective Length, Lis Column Length, Lis Equivalent Avial Load, P _m Equivalent Avial Load, P _m	15.0 ft 1037 W44-99
Column Length, Lis Equivalent rivial Load, P _{er} e Column Size: Load above level 6: U.t., P _{er} P _{er} Unbalanced Moment, M _{er} Column Stages Column Stages Column Stages Effects length, I's Column Length, Lis Equivalent rivial Load, P _{er} e Column Length, Lis Column Sizes	15.0 ft 542 W24s61	Column Length, Le Equivalent Avail Load, P _{eq} Column Size: Load above level 6: Length Size Size Size Size Size Size Size Size	15.0 ft 906 W15.490 OF_=1000 k Roof+ 7 Floors 0.40 293.4 kips 586.7 kips 154.4 kips 1151.2 kips 0.0 lft W154.2 14.0 in 1.0 15.0 ft 1181.1 W154.100 OF_=1210 k	Column length, Le Equivalent Aial Load, P _{Na} = Column Size: Load above level 6: Line P ₁ = P ₂ = P ₃ = Unbalanced Moment, M ₁ = Column Depth Effects Length, Na Column Depth Effects Length, Na Column Length, Lis Equivalent Aial Load, P _{na} = Column Size	10 f 15.0 ft 797 15.0 ft 797 1600 k Roof* 7 Foors 0.40 0.40 0.40 15.0 ft 150.2 kpt 0.0 k Wilds 150.2 kpt 150.2 kpt 150.2 kpt 150.2 kpt 150.0 ft 150.0 ft 150.0 ft	Column Length, La Equivalent Avial Load, P _{max} Column Size: Load above level 6: Limit P _{max} P _{max} P _{max} Unbalanced Moment, M _{max} Column Sizes Column Sizes Column Engths Effective Length, Na Column Length, La Equivalent Avial Load, P _{max} Column Sizes	15.0 ft 1037 W14-99 ©F _c =1100 ls Roof + 7 Floors 0.40 302.5 kips 741.8 kips 1384.0 kips 1384.0 kips 14.0 lin 15.0 ft 1384 W144.132 ©F _c =1480 ls
Column Length, Lis Equivalent rivial Load, P _{er} e Column Size: Load above level 6: U _{thef} P _{er} P _{er} Urbalanced Moment, M _{er} Column Stages Column Stages Effects length, Is Column Length, Lis Equivalent Anis Load, P _{er} Equivalent Anis Load, P _{er}	15.0 ft 542 W24s61	Column Length, Le Equivalent Avial Load, P _{eq} Column Size: Load above level 6: Length Size Region Region Region Unbalanced Moment, Mig. Column Stapes Column Depths Effective Length, No. Column Length, Le Equivalent Ani	15.0 ft 906 W16+90 GP_=1000 k Roof+ 7 Floors 0.40 (293 k)ps 158 k)ps 158 k)ps 158 k)ps 158 k)ps 11112 k)ps 0.0 sft W14-2 140 in 1.0 ft 1.0 ft 1.10 ft	Column length, Le Equivalent Aial Load, P _{Nx} = Column Size: Load above level 6: Line P ₁ = P ₂ = P ₃ = Unbalanced Moment, M ₁ = Column Super- Column Depth- Effective Length, Ns Column Length, Lis Equivalent Aial Load, P _{nx} = Column Size	1.0 f 15.0 ft 797 WILAS90 GP_=1000 k Reof + 7 Foors 0.40 1.43 Wps 1550.2 Wps 0.0 ut 1.10 1.50 ft 1.10 1.50 ft 1.85 Ft	Column Length, La Equivalent Avial Load, P _{max} Column Size: Load above level 6: U _{max} P _{la} P _{la} P _{la} Unbalanced Moment, M _{la} Column Stapes Column Stapes Column Depths Effective Length, Na Column Length, La Equivalent Avial Load, P _{max} Column Size:	15.0 ft 1037 W14.99
Column length, i.e. Equivalent rivial Load, P _{er} e Column Size. Load above level 6: U _{thef} P _{er} P _{er} Urbaianced Moment, M _{er} Column Stapes Column Stapes Column Stapes Effects length, Is Column length, Is Equivalent rivial Load, P _{er} e Column Stapes Load above level 4:	15.0 ft 542 W24s61	Column Length, Le Equivalent Avial Load, P _{eq} Column Size: Load above level 6: Length Size Size Size Size Size Size Size Size	15.0 ft 906 W16+90 GP_=1000 k Roof+ 7 Floors 0.40 (293 k)ps 158 k)ps 158 k)ps 158 k)ps 158 k)ps 11112 k)ps 0.0 sft W14-2 140 in 1.0 ft 1.0 ft 1.10 ft	Column length, Le Equivalent Aial Load, Pa _m = Column Size: Load above level 6: Lu _{mi} P ₁ = P ₂ = P ₃ = Urbalanced Moment, M ₁ = Column Super Column Depth Effective Length, Via Column Length, Via Column Length, Via Column Length, Via Column Length, Via Load above level 4:	10 ft 797 15.0 ft 797 15.0 ft 797 1600 k Roof + 7 Foors 0.40 0.40 0.40 14.3 lisps 14.3 lisps 14.3 lisps 14.4 lisps 14.0 ft 1.0	Column Length, La Equivalent Avial Load, P _{ny} z Column Size: Load above level 6: Lind P _n z P _n z P _n z Unbalanced Moment, M _n z Column Stapes Column Stapes Column Stapes Column Depths Effective Length, Na Column Length, Li Equivalent Avial Load, P _n z Column Size: Load above level 4:	15.0 ft 1037 W14.99
Column length, Lis Equivalent Avial Load, Pare Column Size: Load above level 6: Light Pare Pare Pare Pare Column Size: Column Size: Load above level 4: Load above level 4: Load above level 4: Load above level 4:	15.0 ft 542 542 W24s61	Column Length, Le Equivalent Asial Load, P _{eq} x Column Size: Load above level 6: Li _{ed} P _e P _e R _e Unbalanced Moment, Stapes Column Stapes Column Stapes Column Septes Effective Length, In Equivalent Avial Load, P _{eq} x Column Size: Load above level 4: Li _{ed} Li _e	15.0 ft 906 W16-90 GP_=1000 k Roof+ 7 Floors (0.40 kips 586.7 kips 154 kips 1581.7 kips 1181.2 kips 1	Column Sergit, La Equivalent Aial Load, Pa _n = Column Size: Load above level 6: LL _{in} P _i P _i P _i P _i Urbalanced Moment, M _i Column Sizes Load above level 4: LL _{in} L _{in} LL _{in} L _{in} LL _{in}	1.0 f 15.0 ft 797 15.0 ft 797 16x90	Column Ength, La Equivalent Airal Load, Pa ₁ a Column Size: Load above level 6: Ung Pa Pa Pa Pa Unbalanced Moment, Ma Column Stapes Column Stapes Column Ength; La Equivalent Airal Load, Pa ₁ a Equivalent Airal Load, Pa ₂ a Column Stapes Load above level 4:	15.0 ft 1037 MJ4499 ØP_c1109 lt 1037 7 Floors 0.40 302.6 kips 7.41.8 kips 195.4 kips 10.0 lift 1364 Ø kips 10.0 lift 1364 Ø kips 14.0 m 13.0 ft 13.0 f
Column Length, Lis Requisiters froid Load, Page Column Size: Load above level 6: Lind Page Page Unbalanced Moment, Mage Column Sizes Column Sizes Column Sizes Column Length, Iz Column Length, Iz Equivalent Avial Load, Page Column Sizes Load above level 4: Lind Page Load above level 4:	15.0 ft 542 W24s61	Column Length, Le Equivalent Aival Load, P _{eq} x Column Size: Load above level 6: Length P _{eq} x P _{eq} x P _{eq} x Unbalanced Moment, M _e x Column Depth Effective Length, 16 Column Length, Le Equivalent Aival Load, P _{eq} x Column Size: Load above level 4: Length Size: Length Size: Load above level 4:	15.0 ft 906 906 906 907 907 907 908 1009 1009 1009 1009 1009 1009 1009	Column length, Le Equivalent Aiai Lload, Pa _m z Column Size: Load above level 6: Ll _{md} P ₁ P ₂ P ₂ Unbalanced Moment, M ₁ Column Super Column Super Column Depth Effective Length, Nz Column Length, Lz Equivalent Aiai Load, P _m z Column Size: Load above level 4: Ll _{md} P ₁ Ll _{md} P ₂ Ll _{md} P ₃ Ll _{md} P ₄ P ₄ Ll _{md} P ₄ P ₅ Ll _{md} P ₄ P ₅ Ll _{md} P ₅ Ll _{md} P ₆ P ₅ Ll _{md} P ₆ P ₇ Ll _{md} P ₈ P ₈ Ll _{md} P ₈ R _m R _{md} R	1.0 f 15.0 ft 797 15.0 ft 797 16071 16071 17071 16071 17071 16071	Column Length, La Equivalent Avial Lload, P _{nya} Column Size: Load above level 6: U _{nya} P _i P _i P _i Unbalanced Moment, M _i Column Stapes Column Stapes Column Stapes Column Depths Effective Length, Na Column Length, La Equivalent Avial Lload, P _i Column Size: U Load above level 4: U _{nya}	15.0 ft 1037 W14.499
Column length, Lis Equivalent Avial Load, Pare Column Size: Load above level 6: Light Pare Pare Unbalanced Moment, Mare Column Sispen Effective length, Its Equivalent Avial Load, Pare Column Size Effective length, Its Column Size Light Light Light Pare Load above level 4: Light Pare Pare Pare Pare Pare Pare Pare Pare	15.0 ft 542 W124s61	Column Length, Le Equivalent Asial Load, P _{eq} x Column Size: Load above level 6: Length Size Size Size Size Size Size Size Size	15.0 ft 906 W16-90 KP_=1000 k Roof+ 7 Floors 7.0.0 k kips 586.7 kips 154. kips 154. kips 154. kips 154. kips 154. kips 154. kips 155.0 ft 1161 kips 150.0 ft 150 ft	Column Size: Load above level 6: Lud Rya Column Size: Lud Rya Rya Rya Urbalanced Moment, Mya Column Sizes Load above level 4: Ling Rya Rya Rya Rya Rya Rya Rya Ry	1.0 f 15.0 ft 797 15.0 ft 15.0 ft 797 1600 ft	Column Ength, La Equivalent Avial Load, Pa, a Column Size: Load above level 6: Llag P, a P, a P, a Load above level 6: Under Size Unbalanced Moreor. M, a Column Size: Effective Length, Lis Column Length, Lis Equivalent Avial Load, Pa, a Column Size: Load above level 4: Leaf P, a P, a Column Size: Leaf P, a Column Size: Leaf P, a	15.0 ft 1037 MJ4499
Column Length, Lis Equivalent rivial Load, P _{eri} Column Size: Load above level 6: Lind, P _{eri} P _{eri} Unbalanced Moment, M _{eri} Column Size: Column Size: Column Size: Effective Length, Iz Column Length, Iz Column Size: Load above level 4: Lind P _{eri} P _{er}	15.0 ft 542 W24s61	Column Length, Le Equivalent Aival Load, P _{eq} x Column Size: Load above level 6: Length Peq Peq Peq Unbalanced Morment Mag Column Depth Effective Length, Fix Column Length, Le Equivalent Aival Load, Peq Column Size: Load above level 4: Length Peq	15.0 fs 906 906 W15-90	Column length, Le Equivalent Aiai Lload, Pa _m z Column Size: Load above level 6: Lload above level 6: Unbalanced Moment, M ₁ Column Stages Column Stages Column Depths Effective Length, Ns Column Length, Lis Equivalent Aiai Load, R ₁ Column Sizes Load above level 4: Lload P ₁ = P ₂ = P ₃ = P ₄ = P ₄ = P ₅ = P ₅ = P ₅ = P ₆	1.0 f 15.0 ft 797 15.0 ft 797 1607 1607 1607 1607 1607 1607 1607 160	Column Length, Le Equivalent Avial Lload, P _{max} Column Size: Load above level 6: U _{max} P _{la} P _{la} Unbalanced Morence, M _{la} Column Stapes Column Stapes Column Stapes Column Repth Effective Length, Its Column Length, Its Equivalent Avial Lload, P _{max} Column Size: Uad above level 4: U _{max} P _{la} P	15.0 ft 1037 W14-99
Column length, Lis Equivalent Avial Load Pare Column Size: Load above level 6: Light Pare Pare Unbalanced Moreant, Mar Column Sizes: Effective length, bits Effective length, bits Effective length, bits Equivalent Avial Load, Pare Column Sizes Load above level 4: Light Pare Pare Pare Pare Pare Pare Pare Pare	15.0 ft 542 542 W12461	Column Length, Le Equivalent Asial Load, P _{eq} x Column Size: Load above level 6: Light P _{eq} x P _e x Column Stapes Legislater Asial Load, P _{eq} x Column Stapes Column Stapes Legislater Asial Load, P _{eq} x Load above level 4: Light P _{eq} x P _e x	15.0 ft 906 W14-90	Column Size: Load above level 6: Limit Size: Urbalianced Moment, Mig. Column Size:	10 ft 797 15.0 ft 797 1600 ft	Column Length, La Equivalent Avial Load, Paya Column Size: Load above level 6: Llag Pai Pai Pai Column Size Unbalanced Monrort, Maya Column Size Effective Length, Lis Equivalent Avial Load, Paya Column Size Effective Length, Lis Equivalent Avial Load, Paya Column Size Column Length, Lis Equivalent Avial Load, Paya Column Size Load above level 4: Llag Pai	15.0 fr 1037 W144:99
Column Length, Lis Equivalent fail Load, Pari Column Size: Load above level 6: Lind Pari Pari Unbalanced Moment, Mari Column Stapes Column Stapes Column Stapes Column Length, Its Equivalent fails Load, Pari Column Length, Its Equivalent fails Load, Pari Column Sizes Load above level 4: Lind Pari Pari Pari Pari Pari Pari Unbalanced Moment, Mari Pari Pari Pari Unbalanced Moment, Mari Unbalanced Moment, Mari Unbalanced Moment, Mari Unbalanced Moment, Mar	15.0 ft 542 W24s61	Column Length, Le Equivalent Aival Load, P _{eq} x Column Size: Load above level 6: Ly P _{eq} P _{eq} P _{eq} Unbalanced Monnett, M _{eq} Column Suppe Column Depth Effective Length, Ifa Column Length, Le Equivalent Aival Load, P _{eq} x Column Size Load above level 4: Ly P _{eq} P	15.0 fs 906 906 W15490	Column Size: Load above level 6: Lund Per	1.0 ft 797 15.0 ft 797 16.0	Column Length, La Equivalent Airal Load, P _{ny} = Column Size: Load above level 6: Ling P _n = P _n = Unbalanced Moment, M _n = Column Stapes Column Stapes Column Depths Effective Length, No Column Length, Lis Equivalent Airal Load, P _{ny} = Column Size: Load above level 4: Ling P _n =	15.0 fr 1037 W14.99
Column Length, Lis Equivalent Airal Load Regi Column Size: Load above level 6: Light Regi Regi Column Size: Unbalanced Moneant, Mo	15.0 ft 542 542 W124s61	Column Length, Le Equivalent Asial Load, P _{eq} x Column Size: Load above level 6: Light Report Repo	15.0 ft 906 W16-90 (Pp-1000 k) Roof + 7 Floors 7.0 Floors 193.4 kips 194.4 kips 195.6 7 kips 114.2 kips 10.0 kft 115.2 kips 1.0 in 1.5.0 ft 1.10 in 1.5.0 ft 1.10 in 1.5.0 ft 1.5.1 kips 1.5.4 kips 1.5.5 kips 1.5.4 kips 1.5.5 kip	Column Size: Load above level 6: Lud Rya Column Size: Lud Rya Rya Rya Urbalanced Moment, Mya Column Size: Column Size: Column Size Lud Ria Ria Ria Ria Ria Ria Ria Ri	10 ft 797 15.0 ft 797 160e1 16	Column Ength, La Equivalent Airal Load, Paya Column Size: Load above level 6: Umage Paya Unbalanced Moment, M., a Column Ength, Lia Equivalent Airal Load, Paya Column Size: Umage Paya Effective Length, Na Column Ength, Lia Equivalent Airal Load, Paya Column Size Load above level 4: Umage Paya Umbalanced Moment, M., a Paya Paya Umbalanced Moment, M., a Column Size	15.0 ft 1037 MJ4499
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Column length, Lis Equivalent rivial load. Fige Column Size: Load above level 6: Light Rep Rep Rep Unbalanced Moment, Mg Column Stapes Column Stapes Column Septim Golumn Septim Golumn Size: Load above level 4: Light Rep Rep Rep Rep Column Size: Load above level 4: Light Rep	15.0 ft 542 W24s61	Column Length, Le Equivalent Asial Load, P _{eq} x Column Size: Load above level 6: Line Ric Ric Roll Column Stapes Column Stapes Column Stapes Column Stapes Column Length, Le Equivalent Asial Load, Ric Ric Rick Rick Rick Rick Rick Rick Ri	15.0 ft 906 W16+90 GP_=1000 k W16+90 GP_=1000 k W16+90 GP_=1000 k W16+90 GP_=1000 k W16+90 GP_=1000 GP_=1000 GP_=1100 GP	Column length, La Equivalent Aial Load, Page Column Size: Load above level 6: Ling Page Page Unbalanced Moment, Mage Column Stages Column Depthe Effective Length, No Equivalent Aial Load, Page Column Stages Column Depthe Effective Length, No Equivalent Aial Load, Page Column Sizes Load above level 4: Ling Page Page Page Page Urbalanced Moment, Mage Page Page Page Column Sizes Urbalanced Moment, Mage Page Page Page Column Sizes Column Size	10 f 15.0 ft 797 15.0 ft 797 7 Foors 0.40 245.8 lips 245.8 lips 16.3 lips 16.3 lips 16.0 in 1.0 in 1	Column Length, La Equivalent Airal Load, Paya Column Size: Load above level 6: Llag Paya Paya Unbalanced Moment, Maya Column Stapes Golumn Stapes Golumn Besters Effective Length, Nr. Equivalent Airal Load, Paya Column Sizes Load above level 4: Llag Paya Paya Column Sizes Load above Level 4: Llag Paya Paya Paya Column Sizes Load above Level 4: Llag Paya Paya Paya Column Sizes Load above Level 4: Llag Paya Paya Paya Paya Lubalanced Moment, Maya Column Sizes Effective Leveth, Nr. Column Sizes Effective Leveth, Nr. Effe	15.0 fr 1037 W14.499
Column Sergit. List Equivalent Avial Load Fige Column Size: Load above level 6: Light Fig. Fig. Fig. Column Size: Unbalanced Moment. M.a. Column Size: Column Size: Column Size: Equivalent Avial Load. Fig. Column Size: Equivalent Avial Load. Fig. Column Size: Load above level 4: Light Fig. Column Size: Load above level 4: Light Fig. Fig. Fig. Fig. Fig. Fig. Fig. Fig.	15.0 ft 542 W24s61	Column Length, Le Equivalent Aival Load, P _{eq} x Column Size: Load above level 6: Length Size Size Size Size Size Size Size Size	15.0 ft 906 W16-90	Column Size: Load above level 6: Lund Pare Pare Unbalanced Moment, M., a Column Size: Unbalanced Moment, M., a Column Size: Unbalanced Moment, M., a Column Depthe Englished Size: Load above level 4: Lund Pare Unbalanced Moment, M., a Column Size: Load above level 4: Lund Pare Pare Unbalanced Moment, M., a Column Size: Load above level 4:	1.0 ft 797 15.0 ft 797 16.0 ft 797 16.0 ft 797 16.0 ft 7 Floors 0.40 0.40 0.40 0.40 14.3 lists 14.3 lists 14.3 lists 14.3 lists 14.3 lists 150.2 lists 0.0 list W142 15.0 ft	Column Length, Le Equivalent Avial Load, Page Column Size: Load above level 6: Light Page Page Page Column Stages Column Stages Effective Length, Kis Column Stages Column Stages Column Stages Column Stages Effective Length, Kis Column Stages Column Sta	15.0 ft 1037 M14.499
Column Length, Lis Equivalent Arial Load, Pare Column Size: Load above level 6: Light Pare Pare Unbalanced Moment, Mare Column Stages Golumn Stages Golumn Stages Golumn Stages Column Stages Column Stages Load above level 4: Light Pare Pare Column Stages Column Stages Column Stages Column Stages Load above level 4: Light Pare Column Stages Load above level 4: Light Pare Column Stages Column Length, Light Column Light Light Column Light Light Column Light	15.0 ft 542 W24s61	Column Length, Le Equivalent Asial Load, P _{eq} x Column Size: Load above level 6: Li _{ed} R ₂ R ₂ R ₃ Unbalanced Moment, M ₄ Column Sizes Column Sizes Column Sizes Column Sizes Effects Length, Iz Equivalent Asial Load, P _{eq} x Column Sizes Column Sizes Column Sizes Load above level 4: Li _{ed} R ₃ R ₄ R ₅ R ₆ R ₆ R ₇ R ₇ R ₇ Column Sizes	15.0 ft 906 W16+90 GP_=1000 k Roof+ 7 Floors (.40 ft 15 ft	Column length, La Equivalent Airal Load, Pequi Column Size: Load above level 6: Ling Piqui Piqui Piqui Piqui Unbalanced Moment, Miqui Column Stapes Column Stapes Column Depths Effective Length, No Equivalent Airal Load, Piqui Piqui Column Size: Load above level 4: Ling Piqui Column Stapes Column Depths Effective Length, No Column Depths Equivalent Airal Load, Piqui Equivalent Airal Load, Piq	10 f 15.0 ft 797 15.0 ft 797 7 Foors 0.40 245.8 lives 245.8 lives 14.3 lives 1500.2 lives 1.0.0 in 1.00 15.0 ft 7 Foors 0.0 lit Wild's 1.0 in	Column Length, La Equivalent Airal Load, Page Column Size: Load above level 6: Ung Page Unbalanced Moment, Mage Column Stapes	15.0 ft 1037 NO.4.99
Column Length, Lis Equivalent Arial Load, Pare Column Size: Load above level 6: Light Pare Pare Unbalanced Moment, Mare Column Stages Golumn Stages Golumn Stages Golumn Stages Column Stages Column Stages Load above level 4: Light Pare Pare Column Stages Column Stages Column Stages Column Stages Load above level 4: Light Pare Column Stages Load above level 4: Light Pare Column Stages Column Length, Light Column Light Light Column Light Light Column Light	15.0 ft 542 W24s61	Column Length, Le Equivalent Asial Load, P _{eq} x Column Size: Load above level 6: Li _{ed} R ₂ R ₂ R ₃ Unbalanced Moment, M ₄ Column Sizes Column Sizes Column Sizes Column Sizes Effects Length, Iz Equivalent Asial Load, P _{eq} x Column Sizes Column Sizes Column Sizes Load above level 4: Li _{ed} R ₃ R ₄ R ₅ R ₆ R ₆ R ₇ R ₇ R ₇ Column Sizes	15.0 ft 906 W16-90	Column length, La Equivalent Airal Load, Pequi Column Size: Load above level 6: Ling Piqui Piqui Piqui Piqui Unbalanced Moment, Miqui Column Stapes Column Stapes Column Depths Effective Length, No Equivalent Airal Load, Piqui Piqui Column Size: Load above level 4: Ling Piqui Column Stapes Column Depths Effective Length, No Column Depths Equivalent Airal Load, Piqui Equivalent Airal Load, Piq	1.0 ft 797 15.0 ft 797 16.0 ft 797 16.0 ft 797 16.0 ft 7 Floors 0.40 0.40 0.40 0.40 14.3 lists 14.3 lists 14.3 lists 14.3 lists 14.3 lists 150.2 lists 0.0 list W142 15.0 ft	Column Length, La Equivalent Airal Load, Page Column Size: Load above level 6: Ung Page Unbalanced Moment, Mage Column Stapes	15.0 ft 1037 M14.499
Column Length, Lis Requisiters froid Load, Pape Column Size: Load above level 6: Light Pape Rep Unbalanced Moment, May Column Stages Golumn Stages Golumn Stages Golumn Stages Golumn Stages Load above level 4: Light Pape Rep Light Rep Rep Column Size Load above level 4: Light Pape Rep Rep Light Rep Rep Rep Rep Rep Column Stages Column Stages Load above level 4: Light Pape Rep Rep Rep Light Rep Rep Rep Light Rep Column Stages Column Repths Light Column Stages Column Repths Light Column Stages Column Stages Column Repths Light Column Length, Light Column Light Light Column Light Light Column Light Light Column Light Light Light Column Light Light Light Column Light Light Light Light Light Column Light Ligh	15.0 ft 542 W24s61	Column Length, Le Equivalent Asial Load, P _{eq} Column Size: Load above level 6: Line Re Re Re Load above level 6: Unbalanced Moment, Ma Column Stapes Column Stapes Column Stapes Column Stapes Column Stapes Received Asial Load, Re R	15.0 ft 906 W16+90	Column Sergit, La Equivalent Aiai Lload, Page Column Size: Load above level 6: Ling Page Page Unbalanced Moment, Mage Column Stages Column Stages Column Stages Column Regist Equivalent Aiai Lload, Page Column Stages Page Column Stages Column Regist Equivalent Aiai Load, Page Column Regist Column Regist Equivalent Aiai Load, Page Column Stages	10 f 15.0 ft 797 15.0 ft 797 7 Poors 0.40 255.8 layes 254.5 layes 16.3 layes 16.3 layes 16.3 layes 16.3 layes 16.0 lift 16.0 l	Column Ength, La Equivalent Airal Load, Paya Column Size: Load above level 6: Llag Re Column Size: Unbalanced Moment, Me Column Sapes Column Ength: Ength III Equivalent Airal Load, Paya Column Size: Load above level 4: Llag Re	15.0 ft 1037 Noaf+ 7 Floors 0.40 302.6 kips 195.8 kips
Column Length, Lis Equivalent Arial Load, Pare Column Size: Load above level 6: Light Pare Pare Unbalanced Moment, Mare Column Stages Golumn Stages Golumn Stages Golumn Stages Column Stages Column Stages Load above level 4: Light Pare Pare Column Stages Column Stages Column Stages Column Stages Load above level 4: Light Pare Column Stages Load above level 4: Light Pare Column Stages Column Length, Light Column Light Light Column Light Light Column Light	15.0 ft 542 742 7542 7542 754451 754	Column Length, Le Equivalent Asial Load, P _{eq} x Column Size: Load above level 6: Li _{ed} R ₂ R ₂ R ₃ Unbalanced Moment, M ₄ Column Sizes Column Sizes Column Sizes Column Sizes Effects Length, Iz Equivalent Asial Load, P _{eq} x Column Sizes Column Sizes Column Sizes Load above level 4: Li _{ed} R ₃ R ₄ R ₅ R ₆ R ₆ R ₇ R ₇ R ₇ Column Sizes	15.0 ft 906 W14-90	Column Sergit, La Equivalent Aiai Lload, Page Column Size: Load above level 6: Ling Page Page Unbalanced Moment, Mage Column Stages Column Stages Column Stages Column Regist Equivalent Aiai Lload, Page Column Stages Page Column Stages Column Regist Equivalent Aiai Load, Page Column Regist Column Regist Equivalent Aiai Load, Page Column Stages	1.0 ft 15.0 ft 797 15.0 ft 15.0 ft 797 15.0 ft	Column Length, La Equivalent Airal Load, Paya Column Size: Load above level 6: Uhat Re Re Re Re Re Re Re Re Re Column Size: Urbalanced Moment, Ma Column Eagth, La Equivalent Airal Load, Paya Column Size: Load above level 4: Uhat Re Re Re Re Re Re Re Re Re Column Size: Uhat Re	15.0 ft 1037 W144.99 GP_=1100 k Roof + 7 Floors 0.40 300.5 kips 741.8 kips 1381.0 kips 1381.0 kips 1381.0 kips 130 ft 130 ft 130 ft 130 ft 130 ft 131 ft 133 ft 133 ft 133 ft 133 ft 134 ft 135 ft 135 ft 136 ft 1373
Column Steeph. Let Equivalent Avial Load. Fig. Column Stee. Load above level 6: Liquid Repair Column Stee. Load above level 6: Liquid Repair Column Steeph. Column Steeph. Column Steeph. Effects Length. In Equivalent Avial Load. Fig. Column Steeph. Let Column Steeph. Column Steeph. Column Steeph. Column Steeph. Let Column Steeph. Let Column Steeph. Let Column Length. Let	15.0 ft 542 W24s61	Column Length, Le Equivalent Asial Load, P _{eq} x Column Size: Load above level 6: Line Ric	15.0 ft 906 W16490	Column Size: Load above level 6: Lung Page Column Size: Lung Page Page Unbalanced Moment, Mage Column Size: V	10 f 15.0 ft 797 15.0 ft 797 16.000 k Reof - 7 Feors 0.40 245.8 lipts 14.3 lipts 14.3 lipts 15.0 ft 150.0 ft 150.0 ft 160.0 ft 16	Column Ength, La Equivalent Airal Load, Paya Column Size: Load above level 6: Ling Re Re Re Re Re Column Sizes Unbalanced Moment, Me Column Sizes Column Sizes Equivalent Airal Load, Paya Column Sizes Column Sizes Column Sizes Load above level 4: Load above level 2:	15.0 ft 1037 W14.499
Column Steps. List Equivalent Avial Load Fig. Column Step. Load above level 5: Liquit Pipe Column Steps. Load above level 5: Liquit Pipe Column Steps. Load above level 4: Load above level 4: Load above level 4: Load above level 5: Load above level 5: Load above level 6: Load above level 6: Load above level 1: Load above level 1: Load above level 2: Load above level 2: Load above level 2:	15.0 ft 542 742 804 1005 1005 173.3 kips 365.6 kips 365.6 kips 365.6 kips 40.0 kips 140.0 kips 140.0 kips 140.0 kips 140.0 kips 150.0 ft 998 1000 1000 1000 1000 1000 1000 1000	Column Length, Le Equivalent Asial Load, Puge Column Size: Load above level 6: Lue Re Re Re Re Re Unbalanced Moment, Me, Column Stapee Effective Length, Ite Equivalent Asial Load, Puge Column Size: Load above level 4: Length Re Re Re Re Re Column Size: Load above level 4: Unbalanced Moment, Me, Re	15.0 ft 906 W14-90	Column Size: Load above level 6: Ling Region Column Size: Load above level 6: Ling Region Column Size: Urbainared Moment, Mya Column Size: Effective Length, 16: Column Size: Effective Length, 16: Column Size: Column Size: Load above level 4: Ling Region Column Size: Urbainared Moment, Mya Column Size: Load above level 4: Ling Region Size: Urbainared Moment, Mya Column Size: Column Size: Load above level 4: Ling Region Size: Load above level 4: Ling Region Size: Load above level 4: Ling Region Size: Column Size: Column Size: Column Size: Column Size: Column Size: Column Size: Load above level 2: Load above level 2:	10 ft 797 15.0 ft	Column Length, La Equivalent Avial Lload, Paya Column Size: Load above level 6: Llag Pya Pya Pya Load above level 6: Undatanced Moment, Mya Column Sizes Equivalent Avial Load, Pya Column Sizes Load above level 4: Load above level 4: Load above level 5: Load above level 2: Load above level 3:	15.0 ft 1037 MIA-4-99 GP_=1100 L Roof + 7 Floors 0.40 302.5 kips 741.5 kips 1381.0 kips 100.0 kips
Column Steep Equivalent Airal Load Paye Column Size: Load above level 6: Liquit Paye Paye Paye Paye Paye Paye Paye Column Steep Lad Paye Paye Paye Paye Column Steep Column Steep Load above level 4: Liquit Liquit Paye Paye Paye Paye Column Steep Load above level 2: Load above level 2: Load above level 2: Liquit Liquit Liquit Liquit Liquit Paye Column Steep Load above level 2: Liquit	15.0 ft 542 W24s61	Column Length, Le Equivalent Asial Load, P _{eq} x Column Size: Load above level 6: Line Ric	15.0 ft 906 W16+90	Column Size: Load above level 6: Lund Page Pope Pope Column Size: Uthal Region Size: Uthal Region Size: Uthal Region Size: Uthal Region Size: Column Size: Uthal Region Lib	1.0 ft 15.0 ft 797 1000 k 15.0 ft 797 1000 k 15.0 ft 7 Feors 0.40 0.40 0.45 8.10 pt 14.3 10 pt 15.0 ft	Column Ength, La Equivalent Airal Load, Paya Column Size: Load above level 6: Llag Rea Paya Unbalanced Moment, Maya Column Stapes Column Stapes Column Stapes Golumn Engths Equivalent Airal Load, Paya Column Stapes Column Stapes Column Stapes Column Stapes Column Stapes Column Stapes Rea Rea Load above level 4: Llag Rea Rea Column Stapes Rea Load above level 4: Llag Rea Load above level 4: Llag Load above level 2: Llag Load above level 2:	15.0 ft 1037 W14.499
Column Steps. Let Land above level 4: Load above level 5: Land above level 5: Land above level 5: Land Bergin	15.0 ft 542 542 W24s61	Column Sares Load above level 6: Lund above level 4: Lund above level 2: Lund above level 2: Lund above level 2:	15.0 ft 906 W154:90	Column Size: Load above level 6. Ling Repair Repa	1.0 ft 797 15.0 ft 797 16.0 ft 174.112	Column Length, Le Equivalent Avial Load, Pa, a Column Size: Load above level 6: Ll., P. e P. e P. e Load above level 6: Unbalanced Moment, M. e Column Stapes Column Stapes Column Stapes Effective Length, Kis Column Length, Le Equivalent Avial Load, Pa, e Column Size: Unbalanced Moment Avial Load, Pa, e P. e P. e P. e P. e Column Size: Column Size: Column Size: Load above level 4: Load above level 5: Load above level 2: Load above level 2: Load above level 2: Load above level 2: Load above level 3:	15.0 ft 1037 W144-99
Column Sergit. List Equivalent Avial Load. Fig. Column Size: Load above level 5: Light Part Column Size: Undaisneed Moment. Mg. Column Size: Equivalent Avial Load. Fig. Column Size: Load above level 4: Light Part Column Size: Load above level 2: Load above level 3: Light Part Column Size: Load above level 2: Load above level 3:	15.0 ft 542 W24s61	Column Length, Le Equivalent Asial Load, Page Column Size: Load above level 6: Line Re Re Re Unbalanced Moment, Me Column Size Column Stapes Column Size Effects Length, Ire Equivalent Asial Load, Page Column Size Column Size Equivalent Asial Load, Page Column Size Column Size Load above level 4: Line Re Re Re Re Re Re Re Re Column Size	15.0 ft 906 W16+90	Column Size: Load above level 6: Lud above level 6: Lud P _q = P _p = P _p = Urbalanced Moment, M _q = Column Size: Column Size: Lud Spivolent Avial Load, P _q = Column Sizes Column Depths Entirely Legisla, No. Equivalent Avial Load, P _q = Load above level 4: Lud P _p = P _p = Urbalanced Moment, M _q = Column Sizes Column Sizes Lud Spivolent Avial Load, P _q = Column Sizes Lud Spivolent Avial Load, P _q = Load above level 2: Lud Lud Spivolent Avial Load, P _q = Load above level 2: Lud Lud Lud Spivolent Sizes Load above level 2: Lud	10 f 15.0 ft 797 15.0 ft 797 16.000 k Reof + 7 Feors 0.40 255.8 lips 254.5 lips 16.3 lips 16.3 lips 16.3 lips 16.0 ft 15.0 ft 15.0 ft 15.0 ft 30.2 lips 676.9 lips 14.3 lips 15.0 ft 16.0 ft 16.0 ft 17.0 ft 18.0 ft 18.0 ft 18.0 ft 18.0 ft 18.0 ft 18.0 ft 19.0 ft 1	Column Length, La Equivalent Avial Load, Paya Column Size: Load above level 6: Uhat Re Re Re Re Re Re Re Column Size: Urbalanced Moment, Me Re Re Re Column Size: Load above level 4: Load above level 2: Load above level 2:	15.0 ft 1037 No.4.99
Column Steep . Le .	15.0 ft 542 W12461	Column Sares Load above level 6: Lund above level 4: Lund Begin above level 6: Lund above level 2: Load above level 2: Load above level 2:	15.0 ft 906 W154:90	Column Size: Load above level 6: Ling Region Size: Load above level 6: Ling Region Size: Unbalanced Moment. M. a Column Size: Column Size: Load above level 4: Load above level 4: Load above level 4: Load above level 2: Load above level 2: Load above level 2: Load above level 3:	1.0 ft 797 15.0 ft	Column Length, La Equivalent Avial Load, Pa, a Column Size: Load above level 6: Ll., P. Column Size: Unbalanced Moment, M., Column Length, La Equivalent Avial Load, Pa, a Column Stapes Column Size: Load above level 4: Load above level 4: Load above level 2: Load above level 2: Load above level 2: Load above level 3: Load above level 3: Load above level 4: Load above level 4: Load above level 4: Load above level 4: Load above level 3: Load above level 4: Load above level 4: Load above level 3: Load above level 4: Load above level 5: Load above level 5: Load above level 6: Load above level 9: Load above level	15.0 ft 1037 W144-99
Column Serget, Lis Equivalent Avial Load, Pare Column Size: Load above level 6: Light Pare Res Unbalanced Moneth, My- Column Sispen Effective length, 1s Equivalent Avial Load, Pare Column Size Effective length, 1s Equivalent Avial Load, Pare Column Size Load above level 4: Light Pare Light Light Size Load above level 2: Load above level 3: Light Pare Column Size Load above level 2: Load above level 3: Light Pare Res Res Res Res Res Res Res Res Res Re	15.0 ft 542 W24s61	Column Length, Le Equivalent Asial Load, Paya Column Size: Load above level 6: Line Re Re Re Unbalanced Moment, Ma Column Size Column Stapes Column Size Equivalent Asial Load, Paya Column Size Load above level 4: Line Re Re Re Re Re Column Size Load above level 2: Load above level 2: Load above level 2: Line Re Re Column Size Load above level 2: Line Re	15.0 ft 906 W16.490 GP_=1000 k Roof+ 7 Floors 0.40 293 4 kips 586.7 kips 13.4 kips 13.4 kips 13.4 kips 13.4 kips 13.1 kips 13.1 kips 13.0 ft 13.4 kips 14.5 ft 15.4 kips 15.4 kips 15.5 kips 15.4 kips 15.5 kips 15.5 kips 15.5 kips 15.6 kips 16.6 k	Column Size: Load above level 6: Lud Page Pye Urbalanced Moment, Mye Column Size: Lud above level 4: Lud Pye Column Size Load above level 4: Lud Pye Pye Pye Column Size Load above level 4: Lud Pye Pye Column Size Load above level 4: Lud Lud Pye Column Size Load above level 4: Lud Lud Pye Column Size Load above level 4: Lud Lud Pye Pye Column Size Load above level 2: Lud Lud Lud Pye Pye Lud Load above level 2: Lud Pye Pye Ry Lud Lud Pye	10 f 15.0 ft 797 15.0 ft 797 16.000 k Reof* 7 Feors 0.40 255.8 lays 16.3 lays 16.3 lays 16.3 lays 16.3 lays 16.0 lib 150.0 ft 150.0 ft 16.0 lib 16.0 ft 16.0 f	Column Ength, La Equivalent Avial Load, Pa, a Column Size: Load above level 6: Uh _{at} P _e P _e P _e P _e Urbalanced Moment, M _e Column Size: Under Size: Un	15.0 ft 1037 **Nu14.99
Column Steet Load above level 5: Load above level 4: Load above level 5: Load above level 6:	15.0 ft 542 742 804 1005 1005 173.3 kips 365.6 kips 365.6 kips 365.6 kips 365.6 kips 140.0 kips 140	Column Length, Le Equivalent Asial Load, Page Column Size: Load above level 6: Lue Re Re Re Re Re Unbalanced Moment, Me Column Sizes Column Sizes Column Sizes Load above level 4: Length Re Column Sizes Load above level 4: Length Re Re Re Re Re Re Re Re Column Sizes Column Sizes Load above level 4: Length Re Column Sizes Column Sizes Column Sizes Load above level 2: Load above level 2: Load above level 3:	15.0 ft 906 W14-90	Column Stage Load above level 6: Load above level 4: Load above level 4: Load above level 4: Load above level 6: Load above level 8: Load above level 9: Load above level 8: Load above level 9: Load above level 1: Load above level 9: Load above level 1: Load above level 2: Load above level 3:	1.0 ft 797 15.0 ft 797 16.0 ft 797 16.0 ft 797 16.0 ft 7 Feors 0.40 0.40 0.40 0.40 14.3 lips 14.3 lips 14.3 lips 14.3 lips 150.2 lips 0.0 lit W142 15.0 ft 15.	Column Length, La Equivalent Avial Load, Paya Column Size: Load above level 6: Llay Pya Pya Pya Libablanced Moment, Mya Column Stages Column Length, La Equivalent Avial Load, Pya Column Stages Libablanced Moment, Mya Column Sizes Libablanced Moment, Mya Pya Libablanced Moment, Mya Pya Libablanced Moment, Mya Libabl	15.0 ft 1037 W144-99
Column Steps. Load above level 6: Load above level 8: Load above level 9: Load above leve	15.0 ft 542 W24s61	Column Length, Le Equivalent Asial Load, Page Column Size: Load above level 6: Line Pige Pige Pige Unbalanced Moment, Mige Column Sizes Column Sizes Column Sizes Column Sizes Column Sizes Effective Length, 16 Fige Column Sizes Column Depth Equivalent Asial Load, Page Pige Pige Column Sizes Column Sizes Column Sizes Load above level 4: Line Rig Pige Pige Column Sizes Load above level 4: Line Rig Pige Pige Column Sizes Load above level 2: Line Line Line Line Line Rig Pige Pige Line Line Line Line Line Rig Pige Pige Column Sizes Load above level 2: Line Line Line Line Line Line Line Lin	15.0 ft 906 W16+90	Column Size: Load above level 6: Ludy Page Pope Pope Column Size: Ludy Page Pope Pope Column Size: Ludy Page Column Size: Ludy Page Column Size: Column Size: Ludy Page Column Size: Column Size: Ludy Page Column Size: Ludy Page Pope Pope Pope Pope Pope Pope Pope Pop	1.0 f 1.5.0 ft 797 1.5.0 ft 797 1.5.0 ft 7.7 Picors 0.40 2.45.8 lipts 2.45.8 lipts 1.43 lipts 1.63 lipts 1.63 lipts 1.63 lipts 1.63 lipts 1.60 ft 1.60	Column Ength, La Equivalent Airal Load, Paya Column Size: Load above level 6: Ling Re	15.0 ft 1037 W04.499
Column Engrit, Lie Equivalent Avial Load Regi Column Stee: Land above level 6: Light Regi Regi Regi Regi Regi Regi Regi Regi	15.0 ft 542 542 W12461	Column Length, Le Equivalent Asia I Load, Page Column Size: Load above level 6: Lugary Resident Resi	15.0 ft 906 W15490	Column Sergits, Le Equivalent Airal Load, Page Column Size: Load above level 6: Ling Page Column Size: Urbalanced Moment, Mge Column Size: Column Size: Column Size: Column Size: Load above level 4: Ling Pge Pge Pge Pge Pge Pge Pge Pge Pge Pg	1.0 ft 797 15.0 ft 797 15.0 ft 797 1607 1607 1607 1607 1607 1607 1607 160	Column Ength, La Equivalent Avial Load, P _{ex} Column Size: Load above level 6: Ll _{ext} P _{ex} P _{ex} P _{ex} P _{ex} Unbalanced Monroor. M _{ex} Column Size: Load above level 4: Load above level 4: Load above level 4: Load above level 4: Load above level 2: Load above level 2: Load above level 2: Load above level 3: Load above level 4: Load above level 3: Load above level 3: Load above level 4: Load above level 4: Load above level 3: Load above level 4:	15.0 ft 1037 W144.99
Column Engrit, Lie Equivalent Avial Load Regi Column Stee: Land above level 6: Light Regi Regi Regi Regi Regi Regi Regi Regi	15.0 ft 542 W24s61	Column Length, Le Equivalent Asia I Load, Page Column Size: Load above level 6: Lugary Resident Resi	15.0 ft 906 W16490	Column Sergits, Le Equivalent Airal Load, Page Column Size: Load above level 6: Ling Page Column Size: Urbalanced Moment, Mge Column Size: Column Size: Column Size: Column Size: Load above level 4: Ling Pge Pge Pge Pge Pge Pge Pge Pge Pge Pg	1.0 ft 797 15.0 ft 797 16.0 ft 797 17 Picors 0.40 0.40 0.40 125.8 kilps 14.3 kilps 1650.2 kips 16.0 kilps 16.0 ft 16.0	Column Ength, La Equivalent Avial Load, P _{ex} Column Size: Load above level 6: Ll _{ext} P _{ex} P _{ex} P _{ex} P _{ex} Unbalanced Monroor. M _{ex} Column Size: Load above level 4: Load above level 4: Load above level 4: Load above level 4: Load above level 2: Load above level 2: Load above level 2: Load above level 3: Load above level 4: Load above level 3: Load above level 3: Load above level 4: Load above level 4: Load above level 3: Load above level 4:	15.0 ft 1037 **NOTA-99 GP_=100 k **Roof+ 7 Floors 0.00 kips 10.5 kips 10.6
Column Engrit, Lis Equivalent Avial Load Regi Column Stee: Land above level 6: Light Regi Light Light Regi Light	15.0 ft 542 W18a61	Column Length, Le Equivalent Asia I Load, Page Column Size: Load above level 6: Lund Reg Reg Reg Reg Unbalanced Moment Mag. Effective largeh, its Column Size: Load above level 4: Lund Reg Reg Column Size: Load above level 4: Lund Reg Reg Unbalanced Moment Mag. Reg Unbalanced Moment Mag. Reg Reg Unbalanced Moment Mag. Reg Reg Unbalanced Moment Mag. Column Size: Load above level 2: Lund Reg Reg Unbalanced Moment Mag. Column Size Reg Reg Reg Reg Reg Reg Reg Reg Reg Re	15.0 ft 906 W18-90	Column length, Le Equivalent Airi Lload, Pa,= Column Size: Load above level 6: Liange Pa,= Pa,= Pa,= Pa,= Urbairaced Moment, Ma,= Column Sizee Effective Length, No. Column length, Le Equivalent Airial Load, Pa,= Column Sizee Load above level 4: Liange Pa,= Urbairaced Moment, Ma,= Equivalent Airial Load, Pa,= Column Sizee Load above level 4: Liange Pa,= Urbairaced Moment, Ma,= Pa,= Pa,= Urbairaced Moment, Ma,= Column Sizee Load above level 2: Liange Pa,= Load above level 3: Liange Pa,= Load above level 2: Liange Pa,= Load above level 2: Liange Pa,= Load above level 2: Liange Pa,= Pa,= Load above level 2: Liange Pa,= Pa,= Load above level 2: Liange Pa,= Load above level 3: Liange Pa,= Load above level 3: Liange Pa,= Load above level 3: Liange Pa,= Load above level 4: Liange Pa,= Load above level 4: Liange Pa,= Load above level 4: Liange Pa,= Liange Pa,	1.0 ft 797 15.0 ft 797 15.0 ft 797 1607 1607 1607 1607 1607 1607 1607 160	Column Length, La Equivalent Avail Load, Page Column Size: Load above level 6: Llag Page Page Libbalanced Moneror. M.g Column Size: Load above level 4: Load above level 5: Load above level 5: Load above level 6:	15.0 ft 1037 W144.99
Column Engrit, Lis Equivalent Avial Load Regi Column Stee: Land above level 6: Light Regi Light Light Regi Light	15.0 ft 542 W24s61	Column Length, Le Equivalent Asia I Load, Page Column Size: Load above level 6: Lund Reg Reg Reg Reg Unbalanced Moment Mag. Effective largeh, its Column Size: Load above level 4: Lund Reg Reg Column Size: Load above level 4: Lund Reg Reg Unbalanced Moment Mag. Reg Unbalanced Moment Mag. Reg Reg Unbalanced Moment Mag. Reg Reg Unbalanced Moment Mag. Column Size: Load above level 2: Lund Reg Reg Unbalanced Moment Mag. Column Size Reg Reg Reg Reg Reg Reg Reg Reg Reg Re	15.0 ft 906 W16490	Column length, Le Equivalent Airal Load, Page Column Size: Load above level 6: Ling Rea	1.0 ft 797 15.0 ft 797 16.0 ft 797 17 Picors 0.40 0.40 0.40 125.8 kilps 14.3 kilps 1650.2 kips 16.0 kilps 16.0 ft 16.0	Column Length, La Equivalent Avail Load, Page Column Size: Load above level 6: Llag Page Page Libbalanced Moneror. M.g Column Size: Load above level 4: Load above level 5: Load above level 5: Load above level 6:	15.0 ft 1037 **M04-99 GP_=100 k **Roof + 7 Floors 0.40 30.2 kips 741.8 kips 19.5 ki
Column Engrit, Lis Equivalent Avial Load Regi Column Stee: Land above level 6: Light Regi Light Light Regi Light	15.0 ft 542 W18a61	Column Length, Le Equivalent Asia I Load, Page Column Size: Load above level 6: Lund Reg Reg Reg Reg Unbalanced Moment Mag. Effective largeh, its Column Size: Load above level 4: Lund Reg Reg Column Size: Load above level 4: Lund Reg Reg Unbalanced Moment Mag. Reg Unbalanced Moment Mag. Reg Reg Unbalanced Moment Mag. Reg Reg Unbalanced Moment Mag. Column Size: Load above level 2: Lund Reg Reg Unbalanced Moment Mag. Column Size Reg Reg Reg Reg Reg Reg Reg Reg Reg Re	15.0 ft 906 W18-90	Column length, Le Equivalent Airal Load, Page Column Size: Load above level 6: Ling Rea	1.0 ft 797 15.0 ft 797 15.0 ft 797 1607 1607 1607 1607 1607 1607 1607 160	Column Length, La Equivalent Avail Load, Page Column Size: Load above level 6: Llag Page Page Libbalanced Moneror. M.g Column Size: Load above level 4: Load above level 5: Load above level 5: Load above level 6:	15.0 ft 1037 W144.99

Column 40 - Gravity Column					
estation to startly column		Column 41 - Gravity Column		Column 42 - Gravity Column	
Tributary Area	,	Tributary Area	,	Tributary Area	,
per floor or roof=	745 ft ²	per floor or roof=	200 ft ²	per floor or roof=	203 ft ²
Influence Area= Floor Dead Load= (slab+SDL+mem, self-wts)	2808 ft ² 95 psf	Influence Area=	1010 ft ²	Influence Area= Floor Dead Load= (slab+SDL+mem, self-wts)	1417 ft ²
Roof Dead Load= (slab+SDL+mem. self-wts) Roof Dead Load= (slab+SDL+mem. self-wts)	95 psf 95 psf	Floor Dead Load= (slab+SDL+mem. self-wts) Roof Dead Load= (slab+SDL+mem. self-wts)	95 psf 95 psf	Roof Dead Load= (slab+SDL+mem. self-wts)	95 psf 95 psf
Floor Live Load= (Office Space)	100 psf	Floor Live Load= (Office Space)	100 psf	Floor Live Load= (Office Space)	100 psf
Roof Live Load= (Green Roof)	30 psf	Roof Live Load= (Green Roof)	30 psf	Roof Live Load= (Green Roof)	30 psf
Construct. Roof LL=	20 psf	Construct. Roof LL=	20 psf	Construct. Roof LL=	20 psf
Load above level 12:	Roof+	Load above level 12:	Roof + 1 Floor	Load above level 12:	Roof +
Lloren	1 Floor 0.53	LL _{red}	1 Floor 0.72		1 Floor 0.65
144				LL _{red}	
P _L =	62.1 kips	P _L =	20.4 kips	P _L =	19.3 kips
P _D =	141.6 kips	Po=	38.0 kips	P _D =	38.6 kips
P _L ,=	14.9 kips	P _{Lr} =	4.0 kips	P _{tr} =	4.1 kips
P _U =	276.6 kips	P _U =	80.3 kips	P _U =	79.1 kips
Unbalanced Moment, M _u =	0.0 kft	Unbalanced Moment, M _u =	0.0 kft	Unbalanced Moment, Mu=	0.0 kft
Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, P _{eq} =	277	Equivalent Axial Load, P _{eq} =	80	Equivalent Axial Load, P _{eq} =	79
Column Size:	W14x43 ΦP _n =292 k	Column Size:	W14x43 ΦP _n =292 k	Column Size:	W14x43 ΦP _n =292 k
Load above level 10:	Roof + 3 Floors	Load above level 10:	Roof + 3 Floors	Load above level 10:	Roof + 3 Floors
LL _{red}		LL _{red}	0.52	LL _{red}	0.48
P _L =	114.8 kips	P _L =	37.4 kips	P _L =	35.3 kips
P _D =	283.1 kips	P _D =	76.0 kips	P _D =	77.1 kips
P _{Lr} =	14.9 kips	P _{Lr} =	4.0 kips	P _{tr} =	4.1 kips
P _U =	530.8 kips	P _U =	153.0 kips	P _U =	151.1 kips
Unbalanced Moment, Mu=	0.0 kft	Unbalanced Moment, M _u =	0.0 kft	Unbalanced Moment, Mu=	0.0 kft
Column Shape=		Column Shape=	W14's	Column Shape=	W14's
Column Depth=	14.0 in	Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L=	15.0 ft	Column Length, L=	15.0 ft	Column Length, L=	15.0 ft
Equivalent Axial Load, Peq=	531	Equivalent Axial Load, Peq=	153	Equivalent Axial Load, Peq=	151
Column Size:	W14x61	Column Size:	W14x43	Column Size:	W14x43
Load above level 8:	Roof +	Load above level 8:	Roof +	Load above level 8:	Roof +
	5 Floors		5 Floors		5 Floors
LL _{red}	0.40	LL _{red}	0.46	LL _{red}	0.43
P _L =	171.4 kips	P _L =	52.1 kips	P _L =	49.6 kips
Po=	424.7 kips	P _D =	114.0 kips	P _D =	115.7 kips
P _{ir} =	14.9 kips	P _{Lr} =	4.0 kips	P _{Lr} =	4.1 kips
Pu=	791.2 kips	Pu=	222.2 kips	P _u =	220.2 kips
Unbalanced Moment, M _u =	0.0 kft	Unbalanced Moment, Mu=	0.0 kft	Unbalanced Moment, Mu=	0.0 kft
Column Shape=	W14's	Column Shape=	W14's	Column Shape=	W14's
Column Depth=		Column Depth=	14.0 in	Column Depth=	14.0 in
Effective Length, K=	1.0	Effective Length, K=	1.0	Effective Length, K=	1.0
Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 222	Column Length, L= Equivalent Axial Load, P _{eq} =	15.0 ft 220
Equivalent Axial Edau, 1 eq-				Equivalent Axial Coau, 1 eq-	
	791				
Column Size:	W14x90 ΦP _n =1000 k	Estimated Column Size:	W14x43 ΦP _n =292 k	Estimated Column Size:	W14x43 ΦP _n =292 k
Column Size:				Estimated Column Size:	
Column Size: Load above level 6:	W14x90 ΦP _n =1000 k		W14x43 ΦP _n =292 k Roof +	Estimated Column Size: Load above level 6:	W14x43 ΦP _n =292 k Roof +
Load above level 6:	W14x90	Estimated Column Size: Load above level 6:	W14x43 ΦP _n =292 k Roof + 7 Floors	Load above level 6:	W14x43 ΦP _n =292 k Roof + 7 Floors
Load above level 6:	W14x90	Estimated Column Size:	W14x43 ΦP _n =292 k Roof +	Load above level 6:	W14x43 ΦP _n =292 k Roof +
Load above level 6:	W14x90	Estimated Column Size: Load above level 6:	W14x43 ΦP _n =292 k Roof + 7 Floors	Load above level 6:	W14x43 ΦP _n =292 k Roof + 7 Floors
Load above level 6:	W14x90	Estimated Column Size: $\label{eq:Load_above_level} \mbox{Load_above_level 6:}$ $\mbox{$L_{\text{red}}$}$	W14x43 ΦP _n =292 k Roof + 7 Floors 0.43	Load above level 6:	W14x43 ΦP _n =292 k Roof + 7 Floors 0.40
Load above level 6: $\label{eq:logical_logical} \text{LL}_{\text{red}}$ $P_{L^{\text{red}}}$	W14x90 ΦP _n =1000 k Roof+ 7 Floors 0.40 231.0 kips	Estimated Column Sizes Load above level 6: Li _{red} P _i =	W14x43 ΦP _n =292 k Roof + 7 Floors 0.43 66.0 kips	Load above level 6: Ling P _L =	W14x43 ΦP _n =292 k Roof + 7 Floors 0.40 63.0 kips
Load above level 6: LL _{res} P _L P _P	W14x90	Estimated Column Size: $\label{eq:Load} \mbox{Load above level 6:}$ $\mbox{L}_{rad} \mbox{ $P_{\rm c}$=} \mbo$	W14x43	Load above level 6: LL _{ed} P _L = P _D =	W14x43 ΦP _m =292 k Roof + 7 Floors 0.40 63.0 kips 154.3 kips 4.1 kips
Load above level 6: LL _{res} P _L = P _D P _L = P _D	W14x90	Estimated Column Sizes Load above level 6: Lt _{red} P _C P _O P _O P _O	W14x43	Load above level 6: LL _{nc} P _L = Pon P _L = P _U = P _U =	W14x43 ΦP _m =292 k Roof + 7 Floors 0.40 63.0 kips 154.3 kips 4.1 kips 288.0 kips
Load above level 6: LL _{ed} P _C Po P _U Unbalanced Moment, M _I	W14x90	Estimated Column Size: Load above level 6:	W14x43 ΦP _n =292 k Roof + 7 Floors 0.43 66.0 kips 152.0 kips 4.0 kips 290.0 kips 0.0 kft	Load above level 6: Ll _{ng} P _L = P _o n P _L = P _o n Unbalanced Moment, M _o =	W14x43 ΦP _n =292 k Roof + 7 Floors 0.40 63.0 kips 154.3 kips 4.1 kips 288.0 kips 0.0 kft
Load above level 6: LL _{red} P _L = P _P = P _L P _U Unbalanced Moment, M _s = Column Shapes	W14x90	Estimated Column Sizes Load above level 6: LL _{red} P _L P _D P _L P _U Unbalanced Moment, M _E Column Shape	W14x43 ΦP _n =292 k Roof + 7 Floors 0.43 66.0 kips 152.0 kips 4.0 kips 290.0 kips 0.0 kft W14's	Load above level 6: LL _{red} P _L = P _{O**} P _{L**} F _{U**} Unbalanced Moment, M _{L**} Column Shape**	W14x43
Load above level 6: LL _{res} P _C Po Po Unbalanced Moment, M _C Column Shapes Column Depths	W14x90	Estimated Column Sizes Load above level 6: LL _{red} P ₁ P ₀ P ₂ Unbalanced Moment, M ₁ Column Shapee Column Depe	W14x43 ΦP _n =292 k Roof + 7 Floors 0.43 66.0 kips 152.0 kips 4.0 kips 290.0 kips 0.0 kft	Load above level 6: LL _{red} P ₂ = P ₂ m P ₂ m P ₃ m P ₄ m Unbalanced Moment, M ₄ = Column Shapes Column Depth	W14x43 ΦP _n =292 k Roof + 7 Floors 0.40 63.0 kips 154.3 kips 4.1 kips 288.0 kips 0.0 kft
Load above level 6: LL _{RS} P_= Po= Pu= Unbalanced Moment, M_= Column Shapes Column Depth= Effective Length, Ke	W14±90	Estimated Column Sizes Load above level 6: LL _{red} P ₁ = P ₀ = P ₁ = P ₀ = Unbalanced Moment, M ₂ = Column Depth= Effective Length	W14x43 ΦP _n =292 k Roof+ 7 Floors 0.43 66.0 kips 152.0 kips 4.0 kips 290.0 kips 0.0 kft W14's 14.0 in 1.0	Load above level 6: LL _{res} P ₁ = P ₂ P ₃ P ₄ Unbalanced Moment, M ₄ = Column Shapes Column Depths Effective Length, K ₁ s	W14x43
Load above level 6: LL _{res} P _C Po Po Unbalanced Moment, M _C Column Shapes Column Depths	W14x90	Estimated Column Sizes Load above level 6: LL _{red} P ₁ P ₀ P ₂ Unbalanced Moment, M ₁ Column Shapee Column Depe	W14x43	Load above level 6: LL _{red} P ₂ = P ₂ m P ₂ m P ₃ m P ₄ m Unbalanced Moment, M ₄ = Column Shapes Column Depth	W14x43
Load above level 6: LL _{ed} P _C Po Po Unbalanced Moment, M _C Column Shapes Column Egeths Effective Length, Ke Column Length, Le	W14x90	Estimated Column Sizes Load above level 6: Lt _{rid} P _t = P ₀ = P _t = Unbalanced Moment, M _t = Column Shapes Column Depth= Effective Length, K= Column Length, K= Column Length, K=	W14x43	Load above level 6: LL_ed PL= Pon Pun Unbalanced Moment, ML= Column Shapes Column Depth Effective Length, Ka Column Length, L= Equivalent Avial Load, Penn Equivalent Avial Load, Penn	W14x43
Load above level 6: LL _{red} P _L Pon P _L Unbalanced Moment, M _L Column Shapes Column Depths Effective Length, ks Column Length, Ls Equivalent Asial Load, F _{equ}	W14±90	Estimated Column Sizes Lind Pt= Pp= Pp= Pp= Column Shapes Column Shapes Column Length, Ke Equivalent Akial Load, Peq= Equivalent Akial Load,	W14x43	Load above level 6: LL_ed PL= Pon Pun Unbalanced Moment, ML= Column Shapes Column Depth Effective Length, Ka Column Length, L= Equivalent Avial Load, Penn Equivalent Avial Load, Penn	W14x43
Load above level 6: LL _{red} P _L Pon P _L Unbalanced Moment, M _L Column Shapes Column Depths Effective Length, ks Column Length, Ls Equivalent Asial Load, F _{equ}	W14±90	Estimated Column Sizes Lind Pt= Pp= Pp= Pp= Column Shapes Column Shapes Column Length, Ke Equivalent Akial Load, Peq= Equivalent Akial Load,	W14x43	Load above level 6: LL_ed PL= Pon Pun Unbalanced Moment, ML= Column Shapes Column Depth Effective Length, Ka Column Length, L= Equivalent Avial Load, Penn Equivalent Avial Load, Penn	W14x43
Load above level 6: LL _{ed} P _L Pos P _V Unbalanced Moment, M _L Column Shapes Column Depths Effective Length, Ke Column Length, Le Equivalent Avial Load, P _{EV} Column Size: Load above level 4:	W14x90	Estimated Column Sizes Load above level 6: LL _{red} P _{Le} P _{De} P _{Le} Unbalanced Moment, M _c = Column Shapes Column Depth- Effective Length, Ke Column Length, Le Equivalent Axial Load, P _{eq} e Column States	W14x43	Load above level 6: LLng Pt= Ppn Pt= Lang Run Load Moment, Mu= Column Shapes Column Depth= Effective Length, Ka Column Length, L= Equivalent Axial Load, Peq* Column State: Load above level 4:	W14x43
Load above level 6: LL _{res} P ₁ = Pon P ₄ = Unbalanced Moment, M ₁ - Column Shapes Column Depths Effective Length, Ks Column Legths Effective Length, Ks Column Legths Column States Load above level 4:	W14±90	Estimated Column Sizes Load above level 6: LL _{red} P ₁₌ P ₀ = P ₁₋ P ₁₋ Unbalanced Moment, M ₁₋ Column Depthe Effective Length, Li- Equivalent Axial Load, P _{eq} e Column Sizes Load above level 4:	W14x43	Load above level 6: LL_ed PL= Ppa Ppa Unbalanced Moment, ML= Column Shapes Column Depth= Effective Length, Ka Column Length, La Equivalent Axial Load, Pege Column Size: Load above level 4:	W14x43
Load above level 6: LL _{ed} P _L Pos P _V Unbalanced Moment, M _L Column Shapes Column Depths Effective Length, Ke Column Length, Le Equivalent Avial Load, P _{EV} Column Size: Load above level 4:	W14x90	Estimated Column Sizes Load above level 6: LL _{red} P _{Le} P _{De} P _{Le} Unbalanced Moment, M _c = Column Shapes Column Depth- Effective Length, Ke Column Length, Le Equivalent Axial Load, P _{eq} e Column States	W14x43	Load above level 6: LLng Pt= Ppn Pt= Lang Run Load Moment, Mu= Column Shapes Column Depth= Effective Length, Ka Column Length, L= Equivalent Axial Load, Peq* Column State: Load above level 4:	W14x43
Load above level 6: LL _{res} P ₁ = Pon P ₄ = Unbalanced Moment, M ₁ - Column Shapes Column Depths Effective Length, Ks Column Legths Effective Length, Ks Column Legths Column States Load above level 4:	W14±90	Estimated Column Sizes Load above level 6: LL _{red} P ₁₌ P ₀ = P ₁₋ P ₁₋ Unbalanced Moment, M ₁₋ Column Depthe Effective Length, Li- Equivalent Axial Load, P _{eq} e Column Sizes Load above level 4:	W14x43	Load above level 6: LL_ed PL= Ppa Ppa Unbalanced Moment, ML= Column Shapes Column Depth= Effective Length, Ka Column Length, La Equivalent Axial Load, Pege Column Size: Load above level 4:	W14x43
Load above level 6: LL _{res} P _L Pos P _V Unbalanced Moment, M _L Column Shapes Column Depths Effective Length, Ke Column Length, Le Equivalent Avial Load, P _{EV} Column Size: Load above level 4: LL _{res} P _L	W14±90	Estimated Column Sizes Load above level 6: Lind PL= Po= PL= Column Shapes Column Depths Effective Length, Ls Equivalent Axial Load, Pept Column Sizes Load above level 4: Lind PL= Po= Po=	W14x43	Load above level 6: LL _{nd} Pt= Ppn Ptu= Unbalanced Moment, Mtu= Column Shapes Colum Depth= Effective Length, Ka Column Length, L= Equivalent Axial Load, Ptuq= Column Size: Load above level 4: LL _{td} Ptuq= Ppn=	### W14x43
Load above level 6: LL _{nd} P ₁ = P ₀ P ₁ P ₁ Unbalanced Moment, M ₁ = Column Shapes Column Depths Effective Lorgity, Na Column Length, Le Equivalent Asial Load, P ₈ aa Column Size: Load above level 4:	W14:90	Estimated Column Sizes Load above level 6: LL _{red} P _{ce} P _{ce} P _{ce} Unbalanced Moment, M _e Column Septhe Column Depthe Effective Langth, Le Equivalent Axial Load, P _{eq} e Column Sizes Load above level 4: LL _{red} P _{ce} P _{ce} P _{ce}	W14v43	Load above level 6: LL _{red} P _C = P _O = P _{Ur} = Unbalanced Moment, M _c = Column Stepte Column Depthe Effective Length, Ka Column Length, La Equivalent Axial Load, P _{reg} e Column Size: Load above level 4: LL _{red} P _C =	W14x43
Load above level 6: Lique Pl= Pl= Pl= Unbalanced Moment, Ml= Column Shapes Column Depths Effective Length, Ks Column Length, Ls Equivalent Axial Load, Paqs Column Size: Load above level 4: Lique Pl=	W14:90	Estimated Column Sizes Load above level 6: LL _{red} P _c = P _o = P _c = Unbalanced Moment, M _o = Column Sizes Column Lepth= Effective Langth, Ka Equivalent Axial Load, P _{eq} = Column Sizes Load above level 4: LL _{red} P _c = P _c	W14v43	Load above level 6: LL _{red} P _L = Pon P _{UR} = Plue Unbalanced Moment, M _{UR} = Column Shapes Column Depths Effective Length, Ka Column Length, L= Equivalent Axial Load, P _{Ref} * Column Sizer Load above level 4: LL _{red} P _{UR} P _U	W14x43
Load above level 6: LLigs P_c Por Pur Unbalanced Moment, M_c Column Shapes Column Eepth. Effective Length, Ke Column Eepth. LE Equivalent Axial Load, Pege Column Sizes Load above level 4: LLigs P_c Pur Pur Unbalanced Moment, M_c Pur Unbalanced Moment, M_c Pur Unbalanced Moment, M_c	W14±90	Estimated Column Sizes Load above level 6: Lind Pi= Pp= Pp= Column Shape= Column Shape= Column Depth= Effective Length, i= Equivalent Axial Load, Pede Column Sizes Load above level 4: Lind Pi= Pp= Pp= Pp= Pp= Pp= Pp= Unbalanced Moment, Mi=	W14x43	Load above level 6: LL _{HS} PL= Pps Pgs Pus Unbalanced Moment, Mgs Column Shapes Column Depths Effective Length, Ks Column Length, Ls Equivalent Axial Load, Pags Column Size: Load above level 4: LL _{HS} PL= Pps Pps Pus	W14x43
Load above level 6: LLec Per Por Por Pur Unbalanced Moment, Mar Column Shapee Column Length, Le Equivalent Axial Load, Page Column Shapee Load above level 4: LLec Per Por Por Unbalanced Moment, Mar Column Shapee Column Shapee Column Shapee Column Length, Le Equivalent Axial Load, Page Column Shapee Column Shapee Column Shapee	W14±90	Estimated Column Sizes Load above level 6: LL _{red} P _{ce} P _{ce} P _{ce} Unbalanced Moment, M _e Column Depthe Effective Length, Le Equivalent Axial Load, P _{eq} e Column Sizes Load above level 4: LL _{red} P _{ce} P _{ce} P _{ce} P _{ce} P _{ce} Column Sizes Load above level 4:	### W14v43	Load above level 6: LL _{red} P _L = P _D = P _U = Unbalanced Moment, M _u = Column Shapes Column Ength, L= Equivalent Axial Load, P _{red} * Column Size: Load above level 4: LL _{red} P _L = P _D = Unbalanced Moment, M _u = Column Size:	W14x43
Load above level 6: LLigs P_1= Pos Pur Unbalanced Moment, M_1= Column Shapes Column Length, k= Column Length, k= Column Length, k= Column Length, k= Equivalent Avial Load, Pege Column Sizes Load above level 4: LLigs P_1= P_2= P_2= P_3= Unbalanced Moment, M_1= Column Shapes Column Shapes Column Shapes Column Shapes	W14±90	Estimated Column Sizes Load above level 6: Lind Pi= Pp= Pp= Pi= Column Shape= Column Depth= Effective Length, L= Equivalent Axial Load, Pi= Column Sizes Load above level 4: Lind Pi= Pp= Pp= Pp= Pp= Column Sizes Lind Pi= Pp= Pp= Pp= Column Sizes Lind Pi= Pp= Pp= Pp= Pp= Column Sizes Lind Pi= Pp= Pp= Pp= Pp= Pp= Pp= Column Shape= Column Shape= Column Shapes	W14x43	Load above level 6: LL _{nd} Pt= Ppn Ptu= Unbalanced Moment, Mtu= Column Shapes Column Depth= Effective Length, Ka Column Length, La Equivalent Axial Load, Ptuq= Column Size: Load above level 4: LL _{td} Ptuq= Ppn Ptuq= Unbalanced Moment, Mtu= Column Shapes Column Sizes	W14x43
Load above level 6: LLec Per Por Por Pur Unbalanced Moment, Mar Column Shapee Column Length, Le Equivalent Axial Load, Page Column Shapee Load above level 4: LLec Per Por Por Unbalanced Moment, Mar Column Shapee Column Shapee Column Shapee Column Length, Le Equivalent Axial Load, Page Column Shapee Column Shapee Column Shapee	W14±90	Estimated Column Sizes Load above level 6: LL _{red} P _{ce} P _{ce} P _{ce} Unbalanced Moment, M _e Column Depthe Effective Length, Le Equivalent Axial Load, P _{eq} e Column Sizes Load above level 4: LL _{red} P _{ce} P _{ce} P _{ce} P _{ce} P _{ce} Column Sizes Load above level 4:	W14x43	Load above level 6: LL_{TE} P_1= P_0* P_1- P_0* Unbalanced Moment, M_1- Equivalent Axial Load, P _{eq} * Column Length, Le Equivalent Axial Load, P _{eq} * Column Size: Load above level 4: LL_{TE} P_1* P_0* Unbalanced Moment, M_2- Column Shapes Column Depth= Ffective Length, Ks.	W14x43
Load above level 6: LLec Per Por Pur Pur Unbalanced Moment, Mur Column Shapes Column Length, Le Equivalent Axial Load, Pur Column Shapes Column Length, Le Equivalent Axial Load, Pur Column Shapes Pur Unbalanced Moment, Mur Column Depths Effective Length, Re Column Depths Effective Length, Re	W14x90	Estimated Column Sizes Load above level 6: LL _{red} P _c = P _c = P _c = Unbalanced Moment, M _c = Column Sepane Column Depthe Effective Length, Ls Equivalent Axial Load, P _{eq} = Column Sizes Load above level 4: LL _{red} P _c = P _c = P _c = P _c = Column Sizes Load above level 4:	W14v43	Load above level 6: LL _{red} P _L = P _D = P _D = F _U = Unbalanced Moment, M _s = Column Shapes Column Leght, L= Equivalent Axial Load, P _{eq} = Column Size: Load above level 4: LL _{red} P _L = P _D = P _D = Unbalanced Moment, M _s = Column Size:	W14x43
Load above level 6: LLeg Pe Po Po Pu Unbalanced Moment, M, Column Shapes Column Length, Le Equivalent Asial Load, Page Column Shapes Column Shapes Column Length, Le Equivalent Asial Load, Page Column Shapes Load above level 4:	W14±90	Estimated Column Sizes Load above level 6: Lind Pi= Pp= Pi= Pi= Column Shape= Column Depth- Effective Length, L= Equivalent Axial Load, Pi= Column Sizes Load above level 4: Lind Pi= Pi= Pi= Pi= Column Sizes Load above level 4:	W14x43	Load above level 6: LL _{red} P _c = P _o = Unbalanced Moment, M _o - Column Shapea Column Deptha Effective Length, Ka Column Length, La Equivalent Axial Load, P _{eq} e Column Size: Load above level 4: LL _{red} P _o = Column Shapea Column Deptha Effective Length, Ka Column Length, La Equivalent Axial Load, P _{eq} e	W14x43
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Load above level 6: LL _{red} Poe Poe Poe Pue Unbalanced Moment, Mue Column Shapes Column Depths Effective Load, Page Column Stages Column Stag	W14±90	Estimated Column Sizes Load above level 6: LLred Pt= Pp= Pt= Pu= Unbalanced Moment, Mt= Column Depthe Effective length, Ls Equivalent Axial Load, Pt= Pt= Pt= Pt= Pt= Column Sizes Load above level 4: LLred Pt= Pt= Pt= Pt= Pt= Pt= Column Sizes Load above level 4: Ltred Pt= Pt= Pt= Pt= Pt= Pt= Column Sizes Load above level 4: Ltred Pt= Pt= Pt= Pt= Pt= Pt= Column Sizes Load above level 4: Ltred Pt= Pt= Pt= Pt= Pt= Pt= Pt= Pt= Pt= Column Sizes Load above level 2: Load above level 2:	W14x43	Load above level 6: LL _{TRE} P ₁ = P ₂ = P ₃ = P ₁ - P ₄ = Run- P ₄ = Unbalanced Moment, M ₁ , Column Shapes Column Stepts Effective Length, K- Column Length, L- Equivalent Asiat Load, F _{eq} e Column Size: Load above level 4: LL _{TRE} P ₁ = P ₂ - P ₄ = P ₄ - Column Size Unbalanced Moment, M ₁ = Column Shapes Column Shapes Column Shapes Column Septs Effective Length, K- Column Length, L- Equivalent Asiat Load, F _{eq} e Column States	W14x43
Load above level 6: LL _{res} P _c P _c P _c P _c Unbalanced Moment, M _{re} Column Depths Effective Longth, Ks Column Stages Column Stages Column Stages Column Stages Load above level 4: LL _{res} P _c	W14±90	Estimated Column Sizes Load above level 6: LLred Pt= Pp= Pr= Pu= Unbalanced Moment, Mt= Column Depthe Effective length, Ls Equivalent Axial Load, Pt= Pt= Pt= Pt= Column Sizes Load above level 4: LLred Pt=	W14v43	Load above level 6: LL _{TRE} P ₁ = P ₂ = P ₃ = P ₁ - P ₄ = Run- P ₄ = Unbalanced Moment, M ₁ , Column Shapes Column Stepts Effective Length, K- Column Length, L- Equivalent Asiat Load, F _{eq} e Column Size: Load above level 4: LL _{TRE} P ₁ = P ₂ - P ₄ = P ₄ - Column Size Unbalanced Moment, M ₁ = Column Shapes Column Shapes Column Shapes Column Septs Effective Length, K- Column Length, L- Equivalent Asiat Load, F _{eq} e Column States	W14x43
Load above level 6: Ling Por Por Por Por Pur Unbalanced Moment, Mur Column Shapes Column Length, 1s Equivalent Axial Load, Page Unbalanced Moment, Mur Column Shapes Column Length, 1s Equivalent Axial Load, Page Por Por Unbalanced Moment, Mur Column Shapes Column Begge Unbalanced Moment, Mur Column Shapes Column Shapes Column Shapes Column Shapes Effective Length, 1s Equivalent Axial Load, Page Column Length, 1s Equivalent Axial Load, Page Column Stapes	W14:90	Estimated Column Sizes Load above level 6: LL _{red} P _{re} P _{ps} P _{re} P _{re} Unbalanced Moment, M _{re} Column Sizes Column Septhe Effective Langth, Le Equivalent Avial Load, P _{ref} P _{re} Column Sizes Load above level 4: LL _{red} P _{re} Unbalanced Moment, M _{re} Column Sizes Load above level 4: LL _{red} P _{re} P _{re} Effective Langth, Le Equivalent Avial Load, P _{ref} P _{re} Equivalent Avial Load, P _{ref} P _{re} Column Sizes Load above level 4:	W14x43	Load above level 6: LL _{red} P _C = P _O a P _U = F _V a Unbalanced Moment, M _o a Column Shapea Column State Column State Load above level 4: LL _{red} P _C a Unbalanced Moment, M _o a Column State Load above level 4: LL _{red} P _C a P _O a Unbalanced Moment, M _o a Column State Load above level 4: LL _{red} P _C a P _O a Unbalanced Moment, M _o a Column Shapea	W14x43
Load above level 6: Live Pier Pier Pier Pier Pier Pier Pier Pie	W14±90	Estimated Column Sizes Load above level 6: Lind Pi= Pi= Pi= Pi= Pi= Column Shapes Column Depths Effective Length, L= Equivalent Axial Load, Pi= Pi= Pi= Column Sizes Load above level 4: Lind Pi= Lind Lind Lind Pi= Lind Lind Lind Lind Lind Lind Lind Lind	W14x43	Load above level 6: LL _{red} P ₁ = Pon Pur= Prec Unbalanced Moment, Mur= Column Shapes Column Depth- Effective Length, Ka Column Length, L= Equivalent Axial Load, P _{Re} Column Sizer Load above level 4: LL _{rec} P ₁ = P ₁ = P ₁ = Unbalanced Moment, Mur= Column Sizer Unbalanced Moment, Mur= Column Depth- Effective Length, Ka Column Length, L= Equivalent Axial Load, P _{rec} Column Depth- Effective Length, Ka Column Length, L= Equivalent Axial Load, P _{rec} Column Sizer Load above level 2: LL _{rec} P ₁ = Load above level 2:	W14x43
Load above level 6: LL _{ad} Pe Pr Pr Pr Unbalanced Moment, M., Column Shapes Column State Column State Column State Column State Load above level 4: LLad Pr Pr Unbalanced Moment, M., Column State Load above level 4: LLad Pr Pr Column State Column State Load above level 4: LLad Pr Re Pr Column Shapes Load above level 2: LLad Pr Re Pr R	W14×90	Estimated Column Sizes Load above level 6: LLred Pt= Pp= Pt= Pu= Unbalanced Moment, Mt= Column Depth= Effective length, Ls Equivalent Axial Load, Pt= Pt= Pt= Pt= Pt= Pt= Pt= Equivalent Axial Load, Pt= Effective Load, Pt= Pt= Pt= Pt= Pt= Pt= Pt= Load above level 4: LLred Pt= Load above level 4: LLred Ltred Pt= Load above level 4: LLred Ltred Pt= Load above level 4: LLred Pt= Load above level 4: LLred Ltred Pt= Load above level 2: LLred Pt= Llred Ltred Pt= Llred Pt= Pt= Pt= Pt= Llred Pt= Pt= Pt= Pt= Pt= Llred Pt= Pt= Pt= Pt= Llred Pt= Pt= Pt= Pt= Llred Pt= Pt= Pt= Pt= Pt= Pt= Pt= Pt= Llred Pt= Pt= Pt= Pt= Pt= Pt= Llred Pt= Pt= Pt= Pt= Pt= Llred Pt= Pt= Llred Pt= Pt= Pt= Llred Pt= Pt= Llred Pt= Pt= Pt= Llred Pt= Llred Pt= Llred Pt= Pt= Llred Llred Pt= Llred Llred Pt= Llred L	W14v43	Load above level 6: LL _{res} P _c = P _o s P _{Us} Unbalanced Moment, M _c Column Shapes Column Depths Effective Length, Ke Equivalent Axist Load, P _{eq} s Column Stee Load above level 4: LL _{res} P _{Us} Unbalanced Moment, M _c Column Stee Column Length, Le P _{Os} P _{Us} P _{Us} Column Stee Column Length, Le Equivalent Axist Load, P _{eq} s Column Stee Load above level 2: LL _{res} P _{Us} P _{Us} Column Stee Column Stee Column Stee Column Stee Column Stee Column Stee	W14x43
Load above level 6: Lige	W14:90	Estimated Column Sizes Load above level 6: Lited Pt= Pt= Pt= Column Shape= Column Shape= Column Ength, K= Column Ength, K= Equivalent Akial Load, Pt= Equivalent Akial Load, Pt= Pt= Load above level 4: Lited Pt= Load above level 4: Lited Pt= Effective Langth, K= Column Ength, L= Column Shape= Column Ength, L= Effective Langth, K= Column Shape= Column Shape= Column Shape= Column Shape= Column Shape= Column Shape= Column Ength, L= Effective Langth, K= Column Langth, L= Equivalent Akial Load, Pt= Column Shape= Colu	W14v43	Load above level 6: LL _{red} P ₁ = P ₀ n P ₁ = F ₀ n P ₁ = Unbalanced Moment, M ₂ - Column Shapes Column Length, L= Equivalent Axial Load, P _{eq} n Column Size: Load above level 4: LL _{red} P ₁ n P ₂ n Column Sizes Load above level 4: LL _{red} L _{red} P ₁ n P ₂ n Column Sizes Column Length, L= Column Sizes Load above level 4: LL _{red} P ₁ n P ₂ n Column Sizes Load above level 4: LL _{red} L _{red} P ₂ n Column Sizes Load above level 4: LL _{red} L _{red} P ₂ n Load above level 4: LL _{red} L _{red} Column Sizes Load above level 2: Ll _{red} P ₁ n P ₂ n P ₂ n P ₃ n P ₄ n P ₅	### W14x43
Load above level 6: LL _{red} Per Por Pur Unbalanced Moment, M _{re} Column Depthe Effective Length, ke Column Shape Column Shape Column Size: Load above level 4: LL _{red} P _{re} Unbalanced Moment, M _{re} Column Size: Load above level 4: LL _{red} P _{re} Column Size: Load above level 4: LL _{red} P _{re} Por P _{re} Column Size: Load above level 4: LL _{red} P _{re} Por P _{re} Column Shape Column Depthe Effective Length, ke Column Length, Le Equivalent Avial Load, P _{re} Column Size: Load above level 2: LL _{red} P _{re} P _r	W14:90	Estimated Column Sizes Load above level 6: Lust Pt= Pp= Pp= Pp= Pp= Column Shape= Column Depth= Effective length, i= Equivalent Axial Load, Pe= Column Sizes Load above level 4: Lust Pt= Column Sizes Load above level 4: Lust Pt= Pp= Pp= Column Sizes Load above level 4: Lust Pt= Pp= Pp= Column Shape= Co	W14x43	Load above level 6: LL _{TRE} P ₁ e P ₂ e P ₃ e P ₁ r Ru Unbalances Moment, M ₁ e Column Shapee Column Sength, La Equivalent Axial Load, P _{eq} e Column Sength, La Equivalent Axial Load, P _{eq} e Column Size: Load above level 4: LL _{TRE} P ₁ e P ₂ e P ₃ e Column Shapee	W14x43
Load above level 6: Line Pop Pop Pop	W14×90	Estimated Column Sizes Load above level 6: LI _{red} P _t = Column Sizes Column Septh, Is Equivalent Axial Load, P _t = P _t = P _t = P _t = Column Sizes Load above level 4: LI _{red} P _t = Column Sizes Load above level 4: LI _{red} P _t = P _t = P _t = P _t = Column Sizes Load above level 4: LI _{red} P _t = P _t = P _t = Column Sizes Load above level 2: Li _{red} Li _{red} Li _{red} P _t = Column Sizes Load above level 2: Li _{red} P _t = P _t	W14v43	Load above level 6: LL _{red} P _C = P _O = P _U = P _O = P _U = Unbalanced Moment, M _o = Column Depthe Effective Length, Ka Column Length, La Equivalent Axial Load, P _{red} = Column Size: Load above level 4: Ll _{red} P _C = P _O = P _U = Column Size: Unbalanced Moment, M _o = Column Length, La Equivalent Axial Load, P _{red} = Column Size: Load above level 2: Lag Load above level 2: Load above level 2: Load above level 3: Load above level 3: Load above level 3: Ll _{red} P _O = P _U =	W14x43
Load above level 6: LL _{res} P _{re} Unbalanced Moment, M _{re} Column Shape Column Shape Column Shape Column Shape Column Shape Column Steel Load above level 4: LL _{res} P _{re} P _{re} Unbalanced Moment, M _{re} Column Steel Column Steel Column Steel Column Shape Column Steel Column Shape	W14±90	Estimated Column Sizes Load above level 6: Lind Pi= Pi= Pi= Pi= Pi= Column Shape= Column Depth- Effective Length, L= Equivalent Axial Load, Pi= Equivalent Axial Load, Pi= Unbalanced Moment, Mi= Column Sizes Load above level 4: Lind Pi= Pi= Pi= Equivalent Axial Load, Pi= Effective Length, L= Equivalent Axial Load, Pi= Effective Length, L= Column Shape= Column Length, L= Equivalent Axial Load, Pi= Pi= Pi= Load above level 2: Lind Pi= Load above Level 2: Lind Pi=	W14v43	Load above level 6: LL_{TE} P_1= P_0** P_1- P_0** P_1- Unbalanced Moment, M_1- Equivalent Axial Load, P_{m_1^0} Column Stze: Load above level 4: LL_{TE} P_1** Unbalanced Moment, M_2- Column Stapes Load above level 2: LL_{TE} P_1** Column Stapes Column Stapes Column Stapes Load above level 2:	### W14x43
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Load above level 6: Li _{res} P _L P _C P _P P _V Unbalanced Moment, M _V Column Shapes Column Length, k Equivalent Axial Load, P _{EQ} P _V P _V Column Shapes Column Length, L Equivalent Axial Load, P _{EQ} P _V P _V P _V Unbalanced Moment, M _V Column Shapes P _V P _V P _V Unbalanced Moment, M _V Column Shapes	W14:90	Estimated Column Sizes Load above level 6: Lind Pi= Pi= Pi= Pi= Pi= Column Shape= Column Depth= Effective Length, L= Equivalent Axial Load, Pi= Pi= Pi= Pi= Column Sizes Load above level 4: Lind Pi= Load above level 4: Lind Pi= Pi= Pi= Load above level 4: Lind Pi= Load above level 4: Lind Pi= Pi= Pi= Pi= Load above level 4: Lind Pi= Load above level 4: Lind Pi= Pi= Pi= Pi= Load above level 4: Lind Pi= Load above level 4: Lind Pi= Pi= Pi= Pi= Load above level 2: Lind Pi= Column Shape Column Sizes Load above level 2: Lind Pi=	W14v43	Load above level 6: LL_{TE} P_1= P_0** P_1- P_0** P_1- Unbalanced Moment, M_1- Equivalent Axial Load, P_{m_1^m} Column Stages Column Stze: Load above level 4: LL_{TE} P_1** Unbalanced Moment, M_2- Column Stages Column Stages Column Stages Column Stages Load above level 4: LL_{TE} P_1** Unbalanced Moment, M_2- Column Stages Column Stages Column Stages Column Stages Load above level 2: LL_{TE} P_1** Unbalanced Moment, M_2- Column Stages Column Stages Column Stages Load above level 2:	## W14x43
Load above level 6: Ling Pre Pre Pre Pre Pre Pre Pre Pre Unbalanced Moment, M,- Column Shapes Column Length, is- Column Shapes Column Shapes Column Shapes Column Shapes Column Length, is- Equivalent Asial Load, Paya Column Shapes Column Length, is Effective Length, K- Column Length, is	W14×90	Estimated Column Sizes Load above level 6: LL _{red} P _{re} P _{re} P _{re} P _{re} P _{re} Unbalanced Moment, M _{re} Column Depthe Effective Langth, Le Equivalent Axial Load, P _{ref} P _{re} P _{re} Column Shape Column Shapes Column Sapes Frective Langth, Ka	W14v43	Load above level 6: LL _{red} P _C = Unbalanced Moment, M _C = Column Depthe Effective Length, Ka Column Length, L= Equivalent Axial Load, P _{Ref} = Column Size: Load above level 4: LL _{red} P _C = P _C = P _C = Column Size: Unbalanced Moment, M _C = Column Length, L= Equivalent Axial Load, P _{Ref} = Column Length, Ka Column Length, L= Equivalent Axial Load, P _{Ref} = Column Size: Load above level 2: LL _{red} P _C = P _C = P _C = Column Size: Load above level 2:	W14x43
Load above level 6: Li _{es} Po Po Po Po Pu Unbalanced Moment, M _i Column Shapes Column Length, Le Equivalent Axia Load, P _{eq} Po Unbalanced Moment, Mi Column Shapes	W14:90	Estimated Column Sizes Lind P1= P2= P2= P4= Column Shape= Column Sizes Lind P1= Column Shape= Column Sizes Load above level 4: Lind P1= P2= Unbalanced Moment, M2= Column Sizes Load above level 4: Lind P1= P2= Load above level 4: Lind P1= P2= Load above level 4: Lind P2= P2= Load above level 4: Lind P2= Load above level 2: Lind P2= Load above level 3: Lind P2= Load above level 4: Lind P2= Load above level 4: Lind P2= Load above level 5: Lind P2= Load above level 5: Lind P4= Load above level 6: Lind P4= P2= P2= P3= Load above level 6: Lind P4= P4= P4= P4= Column Sizes Load above level 7: Lind P4= P4= P4= P4= P4= P4= Column Sizes Load above level 8: Lind P4= P4= P4= P4= P4= P4= Column Ceptha Effective Length, Length Column Shape= Column Ceptha Effective Length, Length Column Rapth Effective Length, Length Column Rapth Effective Length, Length Lind P4= Lind P4= Rapth Lind P4=	W14x43	Load above level 6: LL _{reg} P ₁ = P ₂ = P ₃ = P ₄ = P ₄ = P ₅ = P ₄ = D ₄ = D ₄ = Unbalanced Moment, M ₄ = Column Depth- Effective Length, Ka- Column Length, L- Equivalent Axial Load, P _{eq} = P ₄ = P ₅ = P ₆ = P ₄ = P ₆ = Column Shapes- Column Shapes- Column Shapes- Column Ength, L- Equivalent Axial Load, P _{eq} = Column Size: Load above level 2: LL _{reg} P ₄ = P ₆ = Column Size: Load above level 2: Ll _{reg} P ₆ = Column Shapes- Col	### W14x43
Load above level 6: Li _{eg} Po Po Po Po Po Po Po Unbalanced Moment, M _s Column Stage Column Length, ka Column Stage Colum	W14×90	Estimated Column Sizes Load above level 6: LL _{red} P _{re} P _{re} P _{re} P _{re} P _{re} Unbalanced Moment, M _{re} Column Depthe Effective Langth, Le Equivalent Axial Load, P _{ref} P _{re} P _{re} Column Shape Column Shapes Column Sapes Frective Langth, Ka	W14v43	Load above level 6: LL _{reg} P ₁ = P ₂ = P ₃ = P ₄ = P ₄ = P ₅ = P ₄ = D ₄ = D ₄ = Unbalanced Moment, M ₄ = Column Depth- Effective Length, Ka- Column Length, L- Equivalent Axial Load, P _{eq} = P ₄ = P ₅ = P ₆ = P ₄ = P ₆ = Column Shapes- Column Shapes- Column Shapes- Column Ength, L- Equivalent Axial Load, P _{eq} = Column Size: Load above level 2: LL _{reg} P ₄ = P ₆ = Column Size: Load above level 2: Ll _{reg} P ₆ = Column Shapes- Col	W14x43

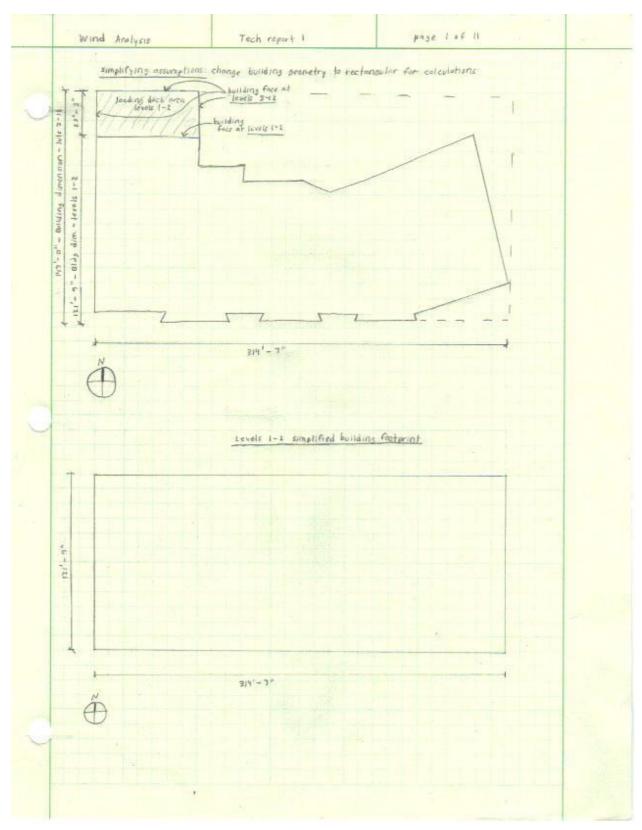
Column 43 - Gravity Column	Column 44 - Gravity Column	Column 45 - Gravity Column	Column 46 - Gravity Column
Tributary Area per floor or roofs 256 ft ²	Tributary Area per floor or roofs 772 ft ²	Tributary Area per floor or roofs 290 ft ²	Tributary Area
per floor or roof= 256 ft ² Influence Area= 1025 ft ²	per floor or roof= 772 ft ² Influence Area= 1082 ft ²	per floor or roof= 290 ft ² Influence Area= 1130 ft ²	per floor or roof= 551 ft ² Influence Area= 2944 ft ²
Floor Dead Load= (slab+SDL+mem. self-wts) 95 psf	Influence Area= 1062 π: Floor Dead Load= (slab+SDL+mem. self-wts) 95 psf	Floor Dead Load= (slab+SDL+mem, self-wts) 95 psf	Floor Dead Load= (slab+SDL+mem. self-wts) 95 psf
Roof Dead Load= (slab+SDL+mem. self-wts) 95 psf	Roof Dead Load= (slab+SDL+mem. self-wts) 95 psf	Roof Dead Load= (slab+SDL+mem. self-wts) 95 psf	Roof Dead Load= (slab+SDL+mem. self-wts) 95 psf
Floor Live Load= (Office Space) 100 psf	Floor Live Load= (Office Space) 100 psf	Floor Live Load= (Office Space) 100 psf	Floor Live Load= (Office Space) 100 psf
Roof Live Load= (Green Roof) 30 psf Construct, Roof LL= 20 psf	Roof Live Load= (Green Roof) 30 psf Construct. Roof LL= 20 psf	Roof Live Load= (Green Roof) 30 psf Construct. Roof LL= 20 psf	Roof Live Load= (Green Roof) 30 psf
Construct. Roof LL= 20 psf	Construct. Hoor LL= 20 psr	Construct. Roof LL= 20 psr	Construct. Roof LL= 20 psf
		Load above level 12: Roof +	
Load above level 12: Roof + 1 Floor	Load above level 12: Roof + 1 Floor	Load above level 12: Roof + 1 Floor	Load above level 12: Roof + 1 Floor
Li _{nd} 0.72	LL _{med} 0.71	LL _{md} 0.70	LL _{red} 0.53
P _i = 26.1 kips	P _L = 77.7 kips	P _i = 28.9 kips	P _L = 45.5 kips
P _D = 48.6 kips	Ph= 146.7 kips	P _b = 55.1 kips	P ₀ = 104.7 kips
P _b = 5.1 kips	P _L = 15.4 kips	P _k = 5.8 kips	P _{tr} = 11.0 kips
Pu= 102.6 kips	Pu= 308.0 kips	P _U = 115.2 kips	Pu= 204.0 kips
Unbalanced Moment, M _u = 0.0 kft	Unbalanced Moment, M _a = 0.0 kft	Unbalanced Moment, M _g = 0.0 kft	Unbalanced Moment, M _a = 0.0 kft
Column Shape= W14's	Column Shape= W14's	Column Shape= W14's	Column Shape= W14's
Column Depth= 14.0 in	Column Depth= 14.0 in	Column Depth= 14.0 in	Column Depth= 14.0 in
Effective Length, K= 1.0	Effective Length, K= 1.0	Effective Length, K= 1.0 Column Length L= 15.0 ft	Effective Length, K= 1.0
Column Length, L= 15.0 ft Equivalent Axial Load, P _{eq} = 103	Column Length, L= 15.0 ft Equivalent Avial Load, P _{eq} = 308	Column Length, L= 15.0 ft Equivalent Axial Load, P _{eq} = 115	Column Length, L= 15.0 ft Equivalent Axial Load, P _{eq} = 204
Column Size: W14x43	Column Size: W14x48	Column Size: W14x43 ΦP _n =292 k	Column Size: W14x43
Column 328: W14343 4P3-132 K	Column Size: W14845 4FA-331 K	Column Size: W14x43 Grn-252 K	Column Size: W14x43 VF1=152 K
Load above level 10: Roof +	Load above level 10: Roof +	Load above level 10: Roof +	Load above level 10: Roof+
3 Floors	3 Floors Llow 0.51	3 Floors Llast 0.51	3 Floors
	LL _{red} 0.51 P _L = 142.0 kips	LL _{md} 0.51 P _i = 52.9 kips	
P _k = 47.7 kips P _D = 97.3 kips	P ₀ = 142.0 kps P ₀ = 293.4 kips	P ₀ = 52.9 kips P ₀ = 110.2 kips	P ₁ = 84.2 kips P ₀ = 209.4 kips
P _b = 5.1 kips	P _U = 15.4 kips	P _b = 5.8 kips	P ₀ = 209.4 kips P ₀ = 11.0 kips
P _U = 5.1 kips P _U = 195.5 kips	Pu= 15.4 tops Pu= 587.0 kips	P _L = 5.8 kips Pu= 219.7 kips	Pu= 11.0 kips Pu= 391.5 kips
Unbalanced Moment, M _u = 0.0 kft	Unbalanced Moment, M _u = 0.0 kft	Unbalanced Moment, M _g = 0.0 kft	Unbalanced Moment, M _s = 0.0 kft
Column Shape= W14's	Column Shape= W14's	Column Shape= W14's	Column Shape= W14's
Column Depth= 14.0 in	Column Depth= 14.0 in	Column Depth= 14.0 in	Column Depth= 14.0 in
Effective Length, K= 1.0	Effective Length, K= 1.0	Effective Length, K= 1.0	Effective Length, K= 1.0
Column Length, L= 15.0 ft	Column Length, L= 15.0 ft	Column Length, L= 15.0 ft	Column Length, L= 15.0 ft
Equivalent Axial Load, P _{eq} = 196 Column Size: W14x43 ΦP _e =292 k	Equivalent Avial Load, P _{eq} = 587 Column Size: W14x68 ФР _n =608 k	Equivalent Axial Load, P _{eq} = 220 Column Size: W14x43	Equivalent Axial Load, P _{eq} = 392 Column Size: W14x61
Load above level 8: Roof + 5 Floors	Load above level 8: Roof + 5 Floors	Load above level 8: Roof + 5 Floors	Load above level 8: Roof + 5 Floors
Ll _{ed} 0.46	LL _{md} 0.45	Ll _{ad} 0.45	LL _{md} 0.40
P _L = 66.5 kips	P _L = 198.4 kips	P _k = 73.9 kips	P _L = 126.7 kips
Pp= 145.9 kips	Pp= 440.0 kips	P _D = 165.3 kips	P ₀ = 314.1 kips
P _{t/} = 5.1 kips	P _{ir} = 15.4 kips	P _{tr} = 5.8 kips	P _{tr} = 11.0 kips
P _U = 284.1 kips	P _U = 853.2 kips	P _U = 319.5 kips	P _U = 585.2 kips
Unbalanced Moment, M _u = 0.0 kft	Unbalanced Moment, M _e = 0.0 kft	Unbalanced Moment, M _e = 0.0 kft	Unbalanced Moment, M _e = 0.0 kft
Column Shape= W14's	Column Shape= W14's	Column Shape= W14's	Column Shape= W14's
Column Depth= 14.0 in Effective Length, K= 1.0	Column Depth= 14.0 in Effective Length, K= 1.0	Column Depth= 14.0 in Effective Length, K= 1.0	Column Depth= 14.0 in Effective Length, K= 1.0
Column Length, L= 15.0 ft	Column Length, L= 15.0 ft	Column Length, L= 15.0 ft	Column Length, L= 15.0 ft
			Equivalent Axial Load, P _{eq} = 585
Equivalent Axial Load, P _{eq} = 284	Equivalent Axial Load, Peq= 853	Equivalent Axial Load, P _{eq} = 319	Equivalent Axial Coad, Pag- 365
Equivalent Axial Load, P _{eq} = 284 Estimated Column Size: W14x43 ΦP _e =292 k	Equivalent Avial Load, P _{eq} = 853 Estimated Column Size: W14x90 ΦP _n =1000 k	Equivalent Axial Load, P _m = 319 Estimated Column Size: W14x48 ΦP _n =331 k	Estimated Column Size: W14x68
Equivalent Axial Load, P _{eq} = 284 Estimated Column Size: W14x43 ΦP _a =292 k	Estimated Column Size: W14x90 P _n =1000 k	Estimated Column Size: W14x48	Estimated Column Size: W14x68
Equivalent Avial Load, P _m = 294 Estimated Column Size: W14x43	Equivalent Avial Load, P _{eq} = 853 Estimated Column Size: W14x90		Captivated Column Size: W14x68 ФР,=608 k
Equivalent Avial Load, P _m = 294 Estimated Column Size: W14x43	Estimated Column Size: W14x90	Estimated Column Size: W14x48	Estimated Column Size:
Equivalent Avial Load, P _m = 294	Estimated Column Size: W14x90 PP_=1000 k	Estimated Column Size: W14x45	Estimated Column Size: ₩1.4x68 ФР, =608 k Load above level 6: Roof+ 7 Floors LL _{mt} 0.40 P;= 170 8 kips
Equivalent Avial Load, P_{m_i} 284 Estimated Column Size: W14x43 ΦP_i =292 k Load above level 6: Roof + 7 Roors $L_{int} = 0.43$	Estimated Column Size: WIAed9	Estimated Column Size: W14x48	Estimated Column Size:
Equivalent Avail Lood, P _m = 284 Estimated Column Size: W13443 ΦP _m =2921x Load above level 6: Roof+ 7 Floors 7 Floors F ₁ = 84.2 lips F ₂ = 194.6 lips F ₂ = 1.3 lips	Estimated Column Size: W14x00 (\$\overline{\pi}_{\pi}\$1000 k} Load above level 6: 7 Picors Li _{\tilde{\pi}\$ 0.42 P_{\overline{\pi}\$ 2.514 Mps P_{\overline{\pi}\$ 566.7 Mps P_{\overline{\pi}\$ 134 Mps}}}}	Estimated Column Size: Wiladds	Estimated Column Size: W2.4468 OF _p =608 k
Equivalent Arial Lood, P _R = 284 Estimated Column Size: W134x3	Estimated Column Size: WIA-69 (\$\phi_{\sigma}\$=1000 k] Load above level 6: 7 Roofs L _{max} 0.42 P(= 251.4 kips P _{\tilde{\phi}\$= 557. kips P_{\tilde{\phi}\$= 15.4 kips P_{\tilde{\phi}\$= 11.4 kips P_{\tilde{\phi}\$= 11.4 kips}}}}	Estimated Column Sze: WIA468 ©P,=331 k Load above level 6:	Estimated Column Size: W1.4x68
Equivalent Avial Lood, P _m = 284 Estimated Column Size: W13463 MP _m =292 k Load above level 6: P _c = 7 P _c	Estimated Column Size: W14x00 (\$\frac{4}{9}\pi^2\$1000\$) Load above level 6: 7 Picors Lipu 0.42 Pi = 2514 lips Pi = 568.7 lips Pi = 114.0 lips Urbalanced Moment Mi = 0 oil ft	Estimated Column Size: Wiladds	Estimated Column Size: WJ.4x68 ØP _p =608 k
Equivalent Avial Lood, P _m = 284 Estimated Column Size: W134x3	Estimated Column Size: W18.69	Cartinated Column Size: Wilded OP,=331 k	Estimated Column Size: W1.468
Equivalent Avial Lood, P _m = 284 Estimated Column Size: W134x3	Estimated Column Size: WIA-69	Estimated Column Size: WIA48 OP_#331 k	Estimated Column Size: W1.4x68
Equivalent Avial Lood, P _m = 284 Estimated Column Size: W134x3	Estimated Column Size: WIA-69	Estimated Column Size: WIA48 OP_#331 k	Estimated Column Size: W1.4x68
Equivalent Avial Lood, P _m = 284 Estimated Column Size: W18483 ⟨Φ⟩ _m =292 k Load above level d: Pool + 7 Ploors L _{st} 0.43 F _c = 56.2 kips F _c = 19.4 kips F _c = 51.1 kips (Unbalanced Normers, M _c = 0.0 bt Column Deppte 14.0 in Effective Length, fic = 1.5 0 ft Equivalent Avial Look P _c = 371 li Equivalent Avial Look P _c = 371 li Equivalent Avial Look P _c = 371 li Estimated Column L	Estimated Column Size: W18-09 dP _p =1000 k	Column C	Estimated Column Size: W1.4x68
Equivalent Avial Lood, P _m = 284 Estimated Column Size: W134x3	Estimated Column Size: W14e00 GP _p -18000	Estimated Column Size: WIA48 OP_#331 k	Estimated Column Size: W3.4x68 ØF _p =608 k
Equivalent Avial Load, P _m = 284	Estimated Column Size: W14e00 GP _p -18000	Column Size: Wilded OP_=331 k	Estimated Column Size: WJ.4468
Equivalent Avial Load, Pur 284	Estimated Column Size: W14x00	Continued Column Size: Wil-Aud OF,=33.1 k	Estimated Column Size: W2.4-68 OF _p =508 k
Equivalent Avial Lood, Pur 234	Estimated Column Size: W14x00 dP _e -1000 k	Column Size: Wilded OP_=231 k	Estimated Column Size: WJ.4468 OF_p=608 k
Equivalent Avial Load, Pur 214	Estimated Column Size: W14-09 dPp-18000	Continued Column Size: Wil-Aud OP_c=33 k	Estimated Column Size: W2.4-68 6F _p =608 k
Equivalent Avial Load, P _{er} 284	Estimated Column Size: W14x00 dP _e -1000 k	Continued Column Size: Wilded OP_=331 k	Estimated Column Size: WJ.4468 OF_#008 k
Equivalent Avial Load, Pur 284	Estimated Column Size: W14e00 GP _P -18000	Column Size	Estimated Column Size: W2.4-66 OF_p=608 k
Equivalent Avial Load, P _m 284	Estimated Column Size: W14e00 GP _P -18000	Column Size	Estimated Column Size: W3.4x68 ØP _p =608 k
Equivarient Avial Lood, Pur 284	Estimated Column Size: W14x00 GP _e -1000 k	Commons Comm	Estimated Column Size: W1.4-68 6P _p =608 k
Equivalent Avial Load, Pur 284	Estimated Column Size: W14x00 GP _r -18000	Column Size: WIA-68	Estimated Column Size: W2.4-68 6P _p =608 k
Equivalent Avial Load Par 284	Estimated Column Size: W14x00	Continued Column Size: Wilded OP_=231 k	Estimated Column Size: WJ.4468
Equivalent Avail Load, Par. 284	Estimated Column Size: W14x00	Cost above level 6: Roof + Roof +	Estimated Column Size: WJ.4x68 OF_p=008 k
Equivalent Avail Load, Pur 284	Estimated Column Size: W14x00	Column Size: Wilded	Estimated Column Size: W1.4-66 6Fg-#68 k
Equivalent Avial Load, Par. 234	Estimated Column Size	Column Size: Wilded OP,=331 k	Estimated Column Size: W3.4x68 ØF _p =608 k
Equivalent Avail Load, Par. 234	Estimated Column Size: W14-09 GP _r -18000	Coulomb Size	Estimated Column Size: W2.4-66 6P _p =608 k
Educated Column Size:	Estimated Column Size: W14x00	Continued Column Size: Wilded OP_=231 k	Estimated Column Size: W2.4-66 6P _p =608 k
Equivalent Avail Load, Par. 284	Report	Court Cour	Fatimated Column Size: WJ.4-68 OF_p=008 k Load above level 6: Foot +
Educated Column Size:	Estimated Column Size: W14x00	Continued Column Size: Wilded OP_=231 k	Estimated Column Size: WJ.4668 OF_p=608 k
Equivalent Avail Load, Par. 284	Estimated Column Size: W14e00 GP _r -18000	Cost above level 6: Roof + Roof +	Fatimated Column Size: WJ.4-68 OF_p=008 k
Equivalent Avail Load, P _{eff} 284	Estimated Column Size: W14x00	Continued Column Size: Wiladd GP_c=331 k	Estimated Column Size: W1.4-66 6P _p =608 k
Equivalent Avial Load, Pur 284	Estimated Column Size	County C	Estimated Column Size: W2.4-66 6P _p =608 k
Estimated Column Size:	Estimated Column Size: W14x00	Continued Column Size: Wilded OP_=331 k	Estimated Column Size: W2.4-66 6P _p =608 k
Equipment Avail Load, Par. 284	Estimated Column Size: W14x09	Continued Column Size: Wilded OP_=331 k	Estimated Column Size: W2.468 6P _p =608 k
Estimated Column Size:	Estimated Column Size: W14x00	Continued Column Size: Wilded OP_=331 k	Estimated Column Size: W1.4-66 6Fg-608 k
Estimated Column Size:	Land above level 6: Foor +	Continued Column Size: Wilded OP_=331 k	Estimated Column Size: W3.4-66 6Fg-608 k
Estimated Column Size:	Estimated Column Size: W14x00	Continued Column Size: Wilded OP_=331 k	Estimated Column Size: W1.4-66 6Fg-608 k
Estimated Column Size:	Land above level 6: Foor +	Continued Column Size: Wilded OP_=331 k	Estimated Column Size: W1.4-did OF_=608 k

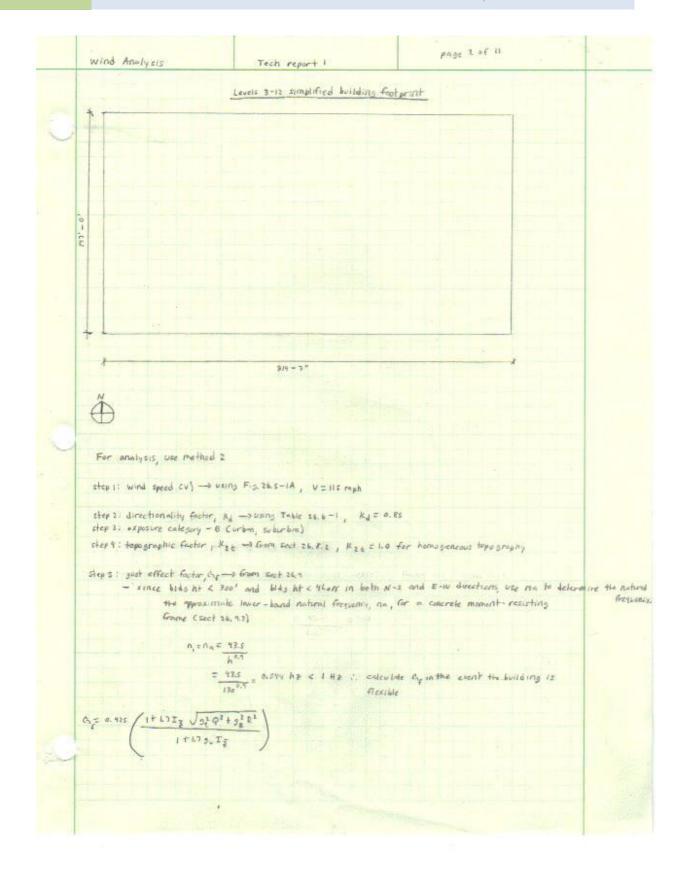


Note: Refer to final report for gravity column schedule

Appendix B: Wind Load Calculations

Existing Concrete System Wind Analysis





	Wind Analysis	Tech I	page 3 of 11	
	9g = 9v = 34			
	ST.			
	9r= Jzin (3,600 (0,544))+		4.042	
		Jain (3,600 (0,544))	3,2136	-
1				
1	R= Rn Rh Rg Co.53 to.4	>£_)		
1	JP			
1	Pa = 7.47. N ₄ C13 10.3 N ₄) ^{2/3}			
	CI 1 10:3 N 1) 2/3			
	W = 0.6=			-1
	N, = 0, C =			
	== 0.6 h = 0.6 (130) = 78 ft	> Zmin = 20ft of L		
	from table 26,9-1 0 = 11	140 , T = 0.45 , c = 0.20 , A	= 320 Ft = 43.0	
	$E_{\frac{1}{2}} = C \left(\frac{23}{3} \right)^{\frac{1}{2} \frac{1}{2}} = 0.30 \left(\frac{3}{76} \right)^{\frac{1}{2}}$	2 0.24		Н
ł	L= = L (= 33) = 320 (7)	\ ⁴³ = 426.24		Н
ı	(1)			
	$V_{\overline{g}} = \overline{b} \left(\frac{\widetilde{g}}{23} \right)^{\widetilde{g}} \left(\frac{gg}{bo} \right) V = 0.1$	5 / 28 \ "/4 / 88 \ (115) = 94.11		
1	8-0 (23) (40)	(1		-
	N1 = 0,594 (426,26) = 2,46			
ŀ				-
1	$R_{N} = \frac{7.47(2.46)}{(1+10.3(2.46))^{5/3}} = 0.0^{\circ}$	788		
	(1+10.3(5.41)) 2/3			
1				
	damping ratio, B = 0.010	(from section case a in As	ICE 7-10, 1% is recommended for concr	ele
			building	17)
ŀ				
ı				
ı				
I				
ŀ				
				-
	31			
1				
1				
				4

	Wind Analysis	Tech 1	page 4 of 11	
	North-south birection c	levels 1-2)		
	h= 134 ft			
	L= 121.75 ft			
-	8 = 314.5F ft			
	Mh = 4.6 M = 4.6 ((d,544) (130) = 3.46		
	$R_h = \frac{1}{\pi} - \frac{1}{2\pi^2} cI$	$= e^{-27L} = \frac{1}{3.74} - \frac{1}{2(3.74)^2}$ $= 0.289 - 0.0418$		
	MB = 460 1 = 46 (0.	74.11 = 5,36		
	$R_{B} = \frac{1}{\pi} - \frac{1}{2\pi^2} CI - e^{-2}$	$= \frac{1}{F.36} = \frac{1}{2(F.36)^2} < 1.00$ $= 0.0116 - 0.00715(1.00)$		
	$n_{L} = 15.4 \eta_{1} \frac{L}{\sqrt{\xi}} = 15.4 \eta_{2}$	(0,544) (121,75) = 10,84		
1	$R_{\perp} = \frac{1}{\eta_{\perp}} - \frac{1}{2\eta_{\perp}} c_1 - e^{-\frac{1}{2}\eta_{\parallel}}$) = 1		
	# = \(\frac{1}{0.01} \) co. 07PP) (0.797) 0 = 0.353	(a. Hz) [a.sz+ a.47(a.arps]		
	$Q = \sqrt{\frac{1}{14.0.63 \left(\frac{B+h}{6}\right)^{6+2}}} = \sqrt{\frac{1}{14.0.63 \left(\frac{B+h}{6}\right)^{6+2}}}$	1 1+0.03(214,55+130)0.63 =	4,7/	
	Cot = 0.252 (1+1.2 (0.28)) 3.4	(0.78)2 + 4.042 (0.757)		
	= 0.861			
	- y			
				0.03

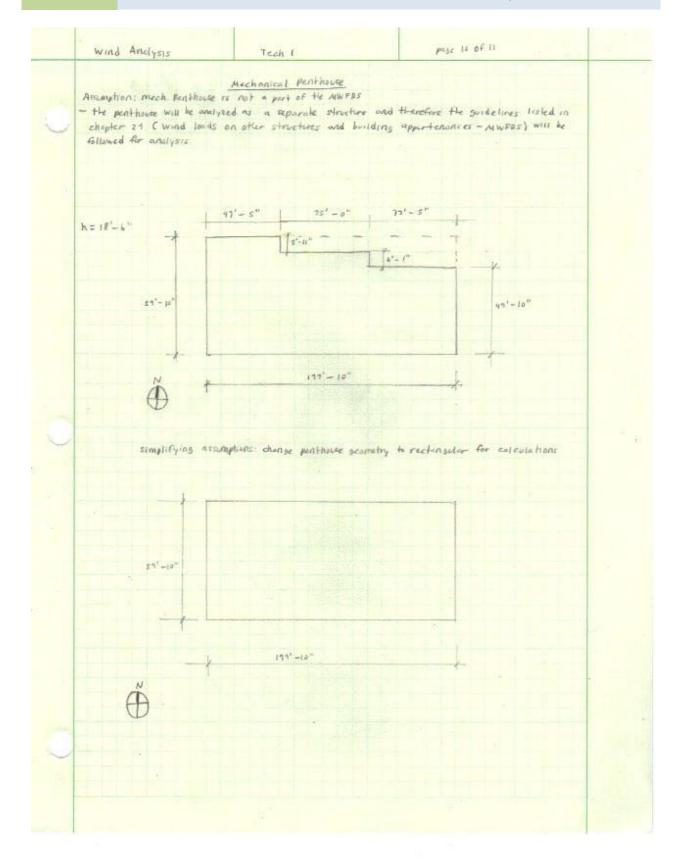
	Wind Analysis	Tech 1	page s of 11	1
	E ast- West birection cleve in = 130 ft L = 319.58 ft B = 121.78 ft	els (1-1)		
	The sign Care Nos dire			
	$M_{B} = \frac{4.6 \cdot Cs.544}{44.41} \frac{C(21.75)}{44.41} = R_{B} = \frac{1}{3.24} - \frac{1}{2 \cdot C(2.24)^{2}} = 0.305 - 0.4976 \cdot C.8.197$	3,24 -2(\$24))		
	ML 2 15,4 (0,594) (314,58) =	28,00		
	$R_{L} = \frac{1}{2P_{col}} = \frac{1}{2C2F} \frac{C1}{2}$ $= 6.6357 - 6.00063F = 0.$	e ¹²⁽²³⁾)		
0	= 0.527	= 0.83		
	$G_{1} = 0.925 \left(\frac{1 + 1.7(0.24)}{925, 26} \right)^{0.6}$ $G_{2} = 0.925 \left(\frac{1 + 1.7(0.24)}{1 + 1.7(0.24)} \right)^{0.6}$ $G_{3} = 0.995$	and the second s		
1				
0				

	Wind Analysis	Tech 1	pase 6 of 11	
	North - South birection C h = 130 ft L = 147 ft B = 319.58 ft	levels 3-12)		
	$P_{h} = \frac{4.6 \left(0.549\right) \left(120\right)}{49.11} = 3$ $R_{h} = \frac{1}{3.96} - \frac{1}{20.3943} = 61$	E, 76 € 1€ 8,90}) = 0.247		
	716 = 4.6 (0.544) (314.58) = P	.36		
	$R_B = \frac{1}{2c\pi n_b^2} - \frac{1}{2c\pi n_b^2}$	c1 - e (1.36) = a.u.z		201
	ME = 12.4 (0.544) (147) = 13.			
	$R = \int_{0.01}^{1} \frac{1}{(2.07)} - \frac{1}{2(12.04)^2} C_{0.247}(0.11)$			
	$\int \frac{1}{\delta_{(\alpha)}} \left(\frac{1}{\delta_{(\alpha)}} \right)^{-1} $ $= 0.351$			
	Q = 1 1 + 0,63 (3/4,58 + 120)0.6	= 0.7F		
3	Cif = 0.725 (1+17 (0.26)) 24	2 (0.78)2 + 4.042 2 (d.351)2)		
	T [a, Fe t]			
K				
				1 31

	Wind Analysis	tech 1	pase 7 of 11	
	Wille Marysis	1 sch 1		
	East - west birection cle	tuels 2-11		
		1111 - 111		
	h = 130 ft L = 314 58 ft			
	State Carlo			
_/	B = 147 F1			
			#6	
	My z 3.46 Care N-S direction	on)		
	Rh = 0.247 Cree N-S direct	ion)		
	MB 5 4.6 (0.549)(147) = 3.1	1		
	79.0			
	RB = 1 - 1 - (1-6	-1(A1)) = 0.3)		
	wh =	7 - 0.12		
	2 (3.41)			
	2 2222			
	M = 15,4 (0,594) (214,58) =	₹₽,00		
	44,0			
		1018)		
	$R_L = \frac{1}{2F} - \frac{1}{2(2F)^2} \cdot CI - C$) = 0.035		
	2 2 (28)1			
				1
	R = \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Cars + axyraoxy		1
	a di			
	J 5,51			1
	= 0,484			
0	Q= 1 + 0,63 (147 + 130)4	= 0,82		
	1 + 0.63 / 143 + 130	146.3		
	J C 426, 11			
	CTE = 0.925 / 1+1.7(0.26)	122 Cares + 1 ans Carens +		
	1 11.77	3,4 (0,82) + 4,042 (0,484) + 3,4) (0,26)		
	= 0.116			
				1

wild An	alyses	Tech I		pase P of li	
stop 6: Enclos	starc elassificati	or - Fully enclosed			
1		efficient - susing tal	The second second		
step F: velocit	y pressure exp	sure defficients, K	z or Kh -> vai	ng tobe 27,3-1, see excel spread skeet	-
step 9; velocit	y pressure (2	or th -> from suct.	27.9.2 , 12 = 1	o, oozso kz kat kd v 2 (lbiffz)	-
			see	ducel spread sheet for values	
stepla: extern	sal Pressure ear	efficient, cp -> un	ns Fis. 27, 1-1		
	W	all Pressure coefficient	ents, Cp		4
winds	word wall -3	All 40> cps o	of		
side w		eil Ulb —> Ep I - o Valves	.7		
Leewar	d well?	levels i-Z			
	2001091	- delatera :			
	N-5				
	482	121.75 = 0.37	0 2 0 37 21 =	=) Cp = -0.5	
		314.58			
	E-W 1	wind			-
			2 < 2,58 < 4 =	to cp -0 interpolate based on figure	elver
				$\frac{c_{P}-c_{P_{i}}}{c_{I_{P}}-c_{P_{i}}}=\frac{(4B)-(4B)_{i}}{(4B)e-(4B)_{i}}$	
					- Cp
				cp = (40) - (40); (Cto - cp.) +	-Cp
					+ Cp;
				$C_{p} = \frac{(4_{B}) - (4_{B})}{(4_{B}) - (4_{B})} (C_{fg} - C_{F_{f}}) + \frac{(4_{B}) - (4_{B})}{(4_{B}) - (4_{B})} + (4_{B})$ $= 2.5P - 2. (-0.2+0.3) + (-0.3)$	- Cp
				$C_{F} = \frac{(4)}{(4)} \cdot (4) \cdot (6) \cdot $	+C _P ;
	less	els 7+2		$C_{F} = \frac{(4)}{(4)} \cdot (4) \cdot (6) \cdot $	+Cp;
				$C_{F} = \frac{(4)}{(4)} \cdot (4) \cdot (6) \cdot $	+ Cp;
	N-2	ivind		$C_{p} = \frac{(4_{B}) - C^{4}/b}{(4_{B})_{F} - C^{4}/b}, (C_{f_{G}} - C_{F_{f_{G}}}) + \\ \frac{(4_{B})_{F} - C^{4}/b}{4 - 2}, (-0.2 + 0.3) + C - 0.3}{4 - 2}$ $= -0.271$	+ Cp
	N-2	ivind		$C_{p} = \frac{(4_{B}) - C^{4}/b}{(4_{B})_{F} - C^{4}/b}, (C_{f_{G}} - C_{F_{f_{G}}}) + \\ \frac{(4_{B})_{F} - C^{4}/b}{4 - 2}, (-0.2 + 0.3) + C - 0.3}{4 - 2}$ $= -0.271$	+ Cp
	N-5 L/E.	wind = 147 = d.47 ; wind	0 (8,47)(1 =)	$C_{p} = \frac{(48) - C^{4}/6}{C^{4}/6}; (C_{fg} - C_{fg}) + \frac{1}{C^{4}/6}; (C_{fg} $	
	N-5 LIE:	wind = 147 = d.47 wind = 214.5P = 2.14 Z =	0 (8,47)(1 =)	$C_{p} = \frac{(4_{B}) - C^{4}/b}{(4_{B})_{F} - C^{4}/b}, (C_{f_{G}} - C_{F_{f_{G}}}) + \\ \frac{(4_{B})_{F} - C^{4}/b}{4 - 2}, (-0.2 + 0.3) + C - 0.3}{4 - 2}$ $= -0.271$	
	N-5 LIE:	wind = 147 = d.47 ; wind	2.14 < 4 => 6	$C_p = \frac{(48) - (40)i}{(40)i} (C_{fg} - C_{fi}) + \frac{(40)i}{(40)j} (C_{fg} - C_{fi}) + \frac{2.58 - 2}{4 - 2} (-0.240.3) + (-0.3)$ $= -0.271$ $C_p = -0.5$ $p \rightarrow interpolate bized an 18 bigs.$	
	N-5 LIE:	wind = 147 = d.47 wind = 214.5P = 2.14 Z =	0 < 0.47 < 1 =) 2.14 < 4 => c cp = 1	$C_{p} = \frac{(48) - C^{4}/6}{C^{4}/6}; (C_{fg} - C_{fg}) + \frac{1}{C^{4}/6}; (C_{fg} $	
	N-5 LIE:	wind = 147 = d.47 wind = 214.5P = 2.14 Z =	0 < 0.9721 = 1 $2.19 < 9 = 1$ $0 < 0.9721 = 1$ $0 < 0.97221 = 1$	$C_{p} = \frac{(48) - C^{4}/6}{C^{4}/6}; (C_{fg} - C_{p_{1}}) + (46) \cdot (66) \cdot (6$	

1	wind analysis	Tech 1	pase 9 of 11
		Roof Pressures coefficients	
9		HOUT PIESONES ZEEFICIENTS,	*
1	0=0"		
	N-5 V	wind	
	h/L =	130 Z 0. FF 4.5 C 0. FF C 1	6
		197	
-	4000		
	hari z	ontal dictance Gram	tess'=> cp -> interpolate based an
		windsward sage; o sells -> o	his values
			ALC BRIDES
			Cp = 0,88 - 0,5 (-1,2 + 0,4) + C-0
			1-015
			= -1.204
		h/2 to h -> 65'40	72" => Cp = 0,88 = 0,5 (-0.7+0.1) + 0-0.7
			l = 0,5
			= -0.748
-		h 183h -> 134' to	250 => Cp = 0.88 - 0.5 (-0.7 + 0.5) + 0-0.5.
			1= 0.5
			= -0,651
		2002 2 12	
		>2h -> N/A	
	E-w wind		
	h/2 = 130	_ = 0, 41 < 0.3	
	314, 5		
	. London	distance from	to the second se
-		word edge : ote h = 0 0 to	(s' -) C+=-0.5
			-130" => Cp = -0,9
			= \$40° = > Cy = -0.3
		> 2h -> > 21	0, = => ch = -0.1
el.		Con Carl 22 H 2 H - CA C	74 (45) (these)
31	Pressures	from sect. 17,41 p = q Cof Cp	e' carb') cattel
	179/00/12	prodd tured totals	P= to Cof cp - th cacpi)
		A THE STATE OF THE	~ .~
		becwood walls	external internal pressure
	- see excel spread shee	and the second s	= th car cp - th carry
-	for press wes	reof	enternal internal
			pressure pressure
		THE RESERVE AND ADDRESS OF THE PERSON OF THE	W 1700 200 1700 1700 1700 1700 1700 1700
			were respected in educations the design
			internal pressures to not contribute
		towards the external wa	ad Pressures actions on the building



Willia	artely six	Tech I	page 11 of 11
step1:	risk enlegory ->	using table 1, e-1, risk eats	eguev II
step 2:	V= Hs myh		
	Kd = 0.90		
	exposure calesory	γ, θ	
	Kat the	-) from seel 26.2 1 to 2.1	A SE Cook do ha
		\rightarrow from sect. 24.2.1, $C_{1g} = 0$ 0.3 table 29.2-1, $k_2 = 1.13$	AND THE PHACE STREET
		, , , , , , , , , , , , , , , , , , , ,	
step #:	13 -> raind ter	et. 29, 3, 2 , 2 = 0,00256	K2 K2+ K4 VI
			(1.17)(La)(a,20)(115)2
		= 34, 43 psf	
Step 7: f	orce suefficient co	-> using Fig. 27.5 -1	
Company of the Compan	The second second	and the state of	
	G T PARTICIPANT TO THE PARTICIPA		
h/1	p = height of str	ichre = 130 = 2,17	=) Cf = 7.17 - 1 (1.4 - 1.3) + 1.3
-	Section	51, cress - 21, 73	= 1.32
step 10: W	und force, F ->	voting sect 27,5 , F= 12	C. C. A.
step ia: W	and force, F — 1	using sect 27,5 , F= 13	c ce ae
			¢ cf Af
	ojecked area norma		C. C. A.
	ojecko orta norma	i to the wind	
At - pr	N-s pirection	i totle wind	E-w birection
At - pr	ojecko orta norma	i totle wind	
At - pr	N-5 Direction Af = 8h = 177.83(1	1 to the wind 1	E-w birection Ap = 52,85(18.5)= 1146,86 ft L
At - pr	N-5 Direction Af = 8h = 177.83(1	i totle wind	E-w birection Ap = 52,85(18.5)= 1146,86 ft L
Λε - pr	N-5 pirection Af = 8h = 177, PICI = 24.42 psf (8.85)	1 to the wind 1 (1,5) = 3676, 86 Ft 1 (1,52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 57,83(18.5) = 1106,86 ft 1 F = 34,43(0,85)(1,92)(1106,86) = 42.88
Λε - pr	N-5 pirection Af = 8h = 177, PICI = 24.42 psf (8.85)	1 to the wind 1	E-w birection Ap = 57,83(18.5) = 1106,86 ft 1 F = 34,43(0,85)(1,92)(1106,86) = 42.88
Λε - pro	N-5 pirection Af = 8h = 177, PICI = 24.42 psf (8.85)	1 to the wind 1 (1,5) = 3676, 86 Ft 1 (1,52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 57,83(18.5) = 1106,86 ft 1 F = 34,43(0,85)(1,92)(1106,86) = 42.88
At - pr	N-S birection Af = Oh = 177.87CI = 24.43 pse Co.85X	2. to the wind 2. (6.5) = 3696, 86 Ft 1 (6.52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 52, P3 (18.5) = 11 a6, 86 ft 4 F = 34,43 (0.85) (1.72) (1106, P6) = 42,84
At - pr	N-S birection Af = Oh = 177.87CI = 24.43 pse Co.85X	2. to the wind 2. (6.5) = 3696, 86 Ft 1 (6.52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 57,83(18.5) = 1106,86 ft 1 F = 34,43(0,85)(1,92)(1106,86) = 42.88
At - pr	N-S birection Af = Oh = 177.87CI = 24.43 pse Co.85X	2. to the wind 2. (6.5) = 3696, 86 Ft 1 (6.52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 52, P3 (18.5) = 11 a6, 86 ft 4 F = 34,43 (0.85) (1.72) (1106, P6) = 42,84
At - pr	N-S birection Af = Oh = 177.87CI = 24.43 pse Co.85X	2. to the wind 2. (6.5) = 3696, 86 Ft 1 (6.52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 52, P3 (18.5) = 11 a6, 86 ft 4 F = 34,43 (0.85) (1.72) (1106, P6) = 42,84
At - pr	N-S birection Af = Oh = 177.87CI = 24.43 pse Co.85X	2. to the wind 2. (6.5) = 3696, 86 Ft 1 (6.52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 52, P3 (18.5) = 11 a6, 86 ft 4 F = 34,43 (0.85) (1.72) (1106, P6) = 42,84
At - pr	N-S birection Af = Oh = 177.87CI = 24.43 pse Co.85X	2. to the wind 2. (6.5) = 3696, 86 Ft 1 (6.52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 52, P3 (18.5) = 11 a6, 86 ft 4 F = 34,43 (0.85) (1.72) (1106, P6) = 42,84
At - pr	N-S birection Af = Oh = 177.87CI = 24.43 pse Co.85X	2. to the wind 2. (6.5) = 3696, 86 Ft 1 (6.52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 52, P3 (18,5) = 11 a6, 86 ft 4 F = 34,43 (0.85) (1,72) (1106, P6) = 42,84
At - pr	N-S birection Af = Oh = 177.87CI = 24.43 pse Co.85X	2. to the wind 2. (6.5) = 3696, 86 Ft 1 (6.52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 52, P3 (18,5) = 11 a6, 86 ft 4 F = 34,43 (0.85) (1,72) (1106, P6) = 42,84
At - pr	N-S birection Af = Oh = 177.87CI = 24.43 pse Co.85X	2. to the wind 2. (6.5) = 3696, 86 Ft 1 (6.52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 52, P3 (18,5) = 11 a6, 86 ft 4 F = 34,43 (0.85) (1,72) (1106, P6) = 42,84
At - pr	N-S birection Af = Oh = 177.87CI = 24.43 pse Co.85X	2. to the wind 2. (6.5) = 3696, 86 Ft 1 (6.52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 52, P3 (18,5) = 11 a6, 86 ft 4 F = 34,43 (0.85) (1,72) (1106, P6) = 42,84
At - pr	N-S birection Af = Oh = 177.87CI = 24.43 pse Co.85X	2. to the wind 2. (6.5) = 3696, 86 Ft 1 (6.52) (3616, 86 Ft 2) = 142, 8 K	E-w birection Ap = 52, P3 (18,5) = 11 a6, 86 ft 4 F = 34,43 (0.85) (1,72) (1106, P6) = 42,84

N-S Direction				E-W Direction			
	h _i (ft)	L _i (ft)			h _i (ft)	L _i (ft)	
Level	(Height above grade of level i)	(Building Length at level i)	h _i *L _i	Level	(Height above grade of level i)	(Building Length at level i)	h _i *L _i
1	0	121.75	0	1	0	314.58	0
2	12.54	121.75	1526.75	2	12.54	314.58	3944.833
3	23.17	147	3405.99	3	23.17	314.58	7288.819
4	33.79	147	4967.13	4	33.79	314.58	10629.66
5	44.42	147	6529.74	5	44.42	314.58	13973.64
6	55.04	147	8090.88	6	55.04	314.58	17314.48
7	65.67	147	9653.49	7	65.67	314.58	20658.47
8	76.29	147	11214.63	8	76.29	314.58	23999.31
9	86.92	147	12777.24	9	86.92	314.58	27343.29
10	97.54	147	14338.38	10	97.54	314.58	30684.13
11	108.17	147	15900.99	11	108.17	314.58	34028.12
12	118.79	147	17462.13	12	118.79	314.58	37368.96
Main roof	130	147	19110	Main roof	130	314.58	40895.4
∑=	852.34		124977.35	Σ=	852.34		268129.1
L _{eff} =	146.63			L _{eff} =	314.58		

Building Effective Length, L_{eff} , used to determine the natural frequency of the building according to Sect. 26.9 of ASCE 7-10

Velocity Pressure Coefficients, K ₂ , and					
Velocity Pressures, q _z					
Level	Elevation (ft)	K _z	q _z		
1	0	0.57	16.40		
2	12.54	0.57	16.40		
3	23.17	0.66	18.99		
4	33.79	0.76	21.87		
5	44.42	0.81	23.31		
6	55.04	0.85	24.46		
7	65.67	0.89	25.61		
8	76.29	0.93	26.76		
9	86.92	0.96	27.63		
10	97.54	0.99	28.49		
11	108.17	1.04	29.93		
12	118.79	1.04	29.93		
Main Roof	130	1.09	31.37		
PH Roof	148.5	1.13	34.43		

Gust Factor-MWFRS						
Variable	N-S	Wind	E-W Wind			
n ₁ =n _a	0.544					
g _Q =g _v	3.4					
g _R	4.042					
Z _{mean}	78					
I _{z, mean}	0.26					
L _{z, mean}	426.26					
V _{z,mean}	94.11					
N ₁	2.46					
R _n	0.0788					
β	0.01					
n _h	3.46					
R _h	0.247					
	Levels 1-2 Levels 3-12 Levels 1-2 Levels 3-12					
η _B	8.36	8.36	3.24	3.91		
R _B	0.112	0.112	0.261	0.22		
η _L	10.84	13.09	28	28		
R_L	0.088	0.073	0.035	0.035		
R	0.353	0.351	0.527	0.484		
Q	0.78	0.78	0.83	0.82		
G _f	0.861	0.861	0.945	0.926		
Gust Factor-Mechnical Penthouse						
Variable	N-S	Wind	E-W Wind			
G _f	0	.85	0.85			

Velocity pressures (above) and gust factors (below) for the MWFRS

	Wall Pre	ssure Coeffcie	nts, C _p			
Description	N-S	Wind	E-W Wind			
	Levels 1-2	Levels 3-12	Levels 1-2	Levels 3-12		
L/B	0.39	0.47	2.58	2.14		
Windward Walls		0	1.8			
Side Walls		-().7			
Leeward Walls	-0.5	-0.5	5 -0.271 -0.29			
Force Coefficient, C _f						
Description	N-S	Wind	E-W Wind			
	Mech	nnical Penthou	ıse			
h/D	1	.32	1	.32		

Roof Pres	Roof Pressure Coefficients, (
Description	N-S Wind	E-W wind					
h/L	0.88	0.41					
0 to h/2	-1.204	-0.9					
h/2 to h	-0.748	-0.9					
h to 2h	-0.652	-0.5					
>2h	N/A	-0.3					

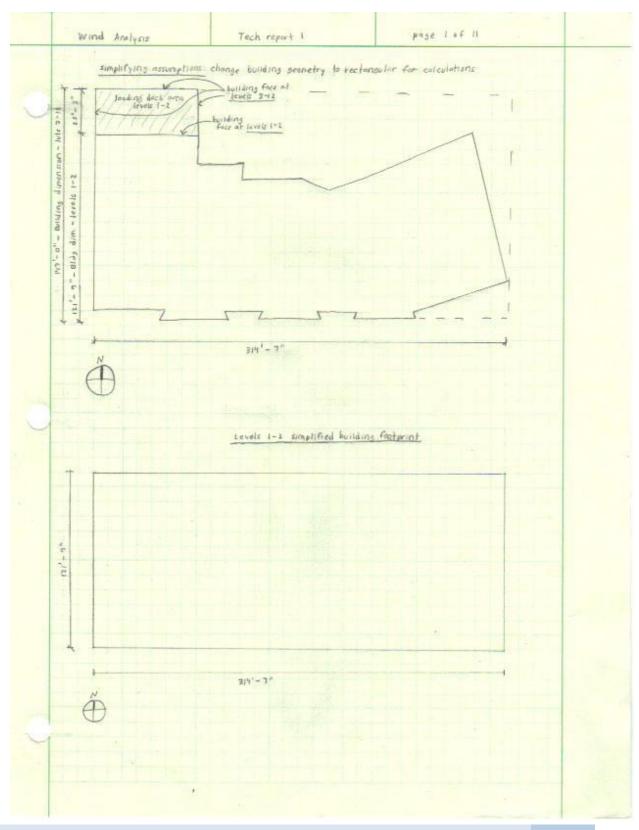
Pressure coefficients

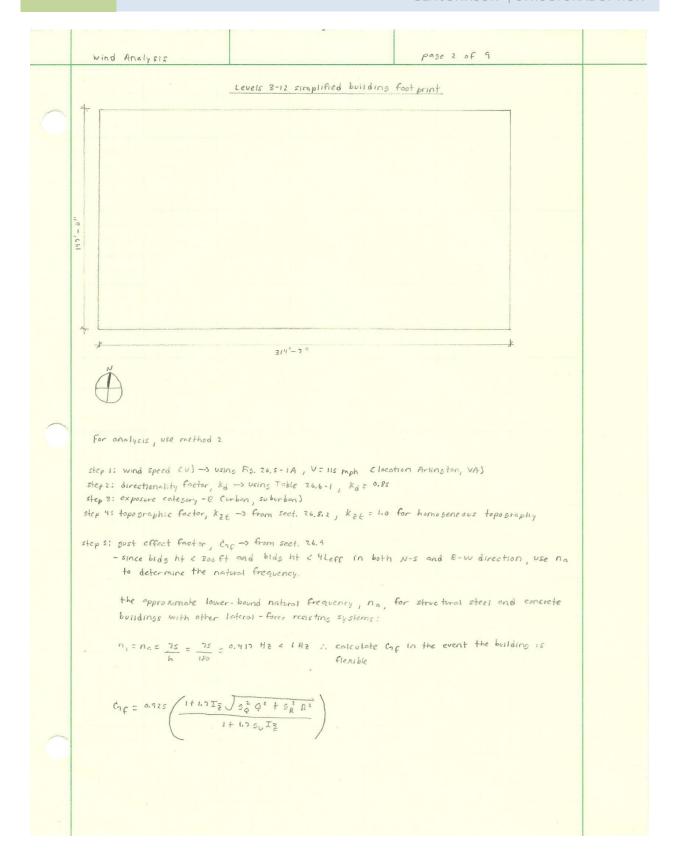
	CASE 3 W	/IND LOAD			(CASE 2 WIND I	LOAD	
/ind Forces	- N-S Direction	Wind Forces	- E-W Direction	Wind	d Forces - N-S D	irection	Wind Forces	- E-W Directio
	Story Force		Story Force		Story Force	Μ _τ	Story Force	Mτ
Floor	(Kips)	Floor	(Kips)	Floor	(Kips)	(k-ft)	(Kips)	(k-ft)
PH Roof	107.11	PH Roof	32.07	PH Roof	107.11	3210.7	32.07	287.8
Main Roof	44.01	Main Roof	20.68	Main Roo	f 44.01	2076.5	20.68	455.9
12	86.77	12	36.57	12	86.77	4094.5	36.57	806.3
11	85.53	11	35.94	11	85.53	4035.9	35.94	792.5
10	84.29	10	35.32	10	84.29	3977.2	35.32	778.7
9	82.30	9	34.32	9	82.30	3883.4	34.32	756.7
8	80.81	8	33.57	8	80.81	3813.1	33.57	740.2
7	79.07	7	32.69	7	79.07	3731.0	32.69	720.9
6	77.08	6	31.70	6	77.08	3637.3	31.70	698.9
5	75.09	5	30.70	5	75.09	3543.5	30.70	676.9
4	72.86	4	29.57	4	72.86	3437.9	29.57	652.1
3	69.13	3	27.42	3	69.13	3262.1	27.42	604.6
2	70.01	2	22.42	2	70.01	3303.7	22.42	409.5
1	36.69	1	11.70	1	36.69	1731.3	11.70	213.7

		CASE 4 WIND LO	DAD		
Wind	Forces - N-S D	irection	Wind Forces	- E-W Direction	
	Story Force	Mτ	Story Force	Μ _τ	M _{TN-3} + M _{TS-W}
Floor	(Kips)	(k-ft)	(Kips)	(k-ft)	(k-ft)
PH Roof	80.41	2410.1	24.07	216.1	2626.2
Main Roof	33.03	1558.8	15.52	342.2	1901.0
12	65.14	3073.6	27.45	605.2	3678.8
11	64.20	3029.6	26.98	594.9	3624.5
10	63.27	2985.6	26.51	584.6	3570.1
9	61.78	2915.2	25.76	568.0	3483.2
8	60.66	2862.4	25.20	555.6	3418.0
7	59.35	2800.8	24.54	541.2	3341.9
6	57.86	2730.4	23.79	524.6	3255.0
5	56.37	2660.0	23.04	508.1	3168.1
4	54.69	2580.8	22.20	489.5	3070.2
3	51.89	2448.7	20.58	453.9	2902.6
2	52.56	2480.0	16.83	307.4	2787.4
1	27.54	1299.6	8.78	160.4	1460.0

Story forces for wind loads cases 2 through 4

New Steel System Wind Analysis





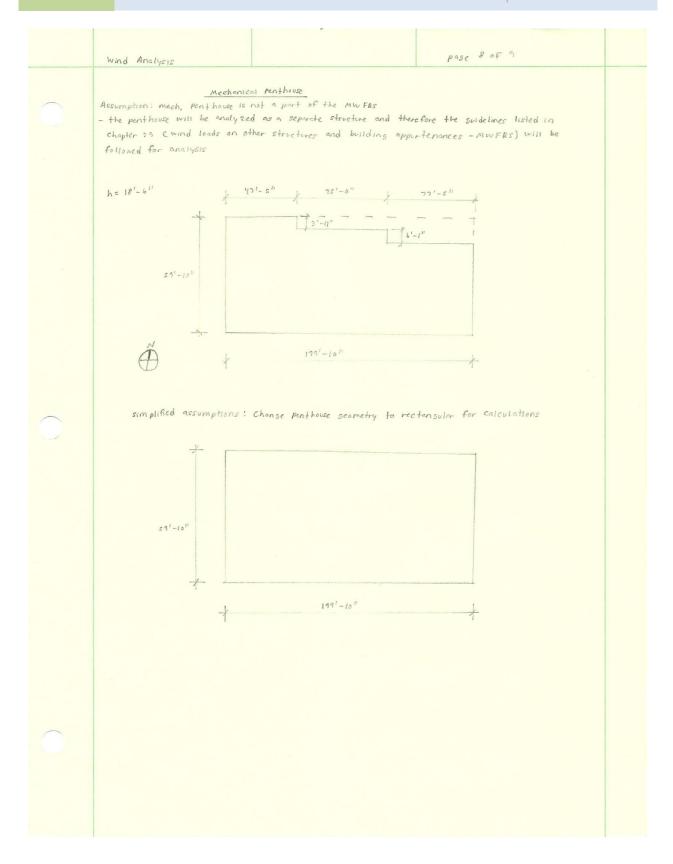
wind Analysis	pase 3 of 9
$9_{R} = 9_{V} = 3.4$ $9_{R} = \sqrt{2 \ln (3,600 (0.417))} + \frac{0.577}{\sqrt{2 \ln (3,600 (0.417))}} = 3.825$	s + 0.577 2 3,976 3,825
$R = \int \frac{1}{\beta} R_{n} R_{h} R_{B} \left(0.53 \pm 0.47 R_{L}\right)$ $R_{n} = \frac{7.47 N_{n}}{\left(1 \pm 10.3 N_{n}\right)^{5/3}}$	
$V_1 = \frac{n_1 L_2}{V_2}$ $\overline{Z} = 0.6 h = 0.6 C(P0) = 108 ft > 2 min = 30 ft ok V$	
From table 26.9-1, $\overline{\mathcal{A}} = 1/9.0$, $\overline{b} = 0.95$, $C = 0.30$, $\mathcal{L} = 320$ ft, $T_{\overline{d}} = C \left(\frac{33}{\overline{2}}\right)^{1/6} = 0.30 \left(\frac{33}{10F}\right)^{1/6} = 0.246$ $L_{\overline{d}} = \mathcal{L} \left(\frac{\overline{2}}{33}\right)^{\overline{6}} = 320 \left(\frac{10F}{32}\right)^{1/3} = 475.10$	€ = ' _{3,0}
$ \frac{\sqrt{2}}{2} = \frac{1}{6} \left(\frac{2}{33} \right)^{\frac{1}{60}} \left(\frac{88}{60} \right) V = 0.45 \left(\frac{108}{33} \right)^{\frac{1}{4}} \left(\frac{88}{60} \right) C 115 \right) = 102.09 $ $ N_{1} = \frac{0.417 \left(\frac{475,10}{102,09} \right)}{102,09} = 1.94 $	
Rn = 2,47 (1,74) = 14,45 = 0,0908 (1+10.3(1.74)) 5/3 = 157,62	
domping ratio, B= 170 = 0.010 (from sect. (26.9 in ASCE 7-10) concrete buildings at service abil.	

 Wind Analysis		pase 4 of 9	
North-south pirection Clevels 1 h= 180ft L= 121,75 ft B= 314,58 ft	-2)		
Mn = 4.6 M, h = 4.6 (0, 417) C18			
$R_{h} = \frac{1}{\eta} - \frac{1}{2\eta^{2}} \left(1 - e^{-2\eta}\right) = \frac{1}{2,38}$		= 0,296 ~ 0,0438 (0,999) = 0,252	
$\eta_{B} = 4.6 \eta_{1} \frac{B}{\overline{V_{2}}} = 4.6 (0.417) \frac{(314.5)^{2}}{102.05}$ $R_{B} = \frac{1}{\eta} - \frac{1}{2\eta^{2}} (1 - e^{-2\eta}) = \frac{1}{5.91} = \frac{1}{5.9$		1692 - 0.0143 (1.00) = 0.155	
$\eta = \frac{2\eta^2}{\sqrt{\frac{L}{v_{\bar{z}}}}} = \frac{15.4 (0.417) (121.7)}{102.6}$			
$R_L = \frac{1}{\eta} - \frac{1}{2\eta^2} (1 - e^{-2\eta}) = \frac{1}{7.6}$	$\frac{1}{6} - \frac{1}{2(7.66)^2} (1 - e^{-2(7.66)})$) = 0.1305 - 0.00852 (1.00) = 0.122	
R= \int_{d,01} (0,0908) (0,252) (0,155) (0.	52+ 0.47(0.122)) = 0.456		
$\varphi = \int \frac{1}{1 + 0.63 \left(\frac{E + h}{L_2^2}\right)^{0.63}} = \int \frac{1}{1 + 0.63}$	475.10		<i>x</i>
(1 = 0,925 (1+ 1,7 (0,246)) 3,42 (1+1,7 (3,4	(0.246)		

Wind Analysis		page s of q	
East - West pirection Clevels h = 180 ft L = 314, sp ft B = 121, 25 ft	1-2]		
Mr = 3.38 (see N-s direct Rh = 0.282 (see N-s direct m = 4.6 (0.417) (121,25)	nenj		
	-2(2.29)) = 0.437 - 0,0953 C0,98	97) = 0, 343	
$ \eta_{L} = 15, 4 (0.417) (314.58) = 1 $ $ R_{L} = \frac{1}{19.79} - \frac{1}{2(19.79)^{2}} (1 - e) $	-2 C ^{19,79}) = 0.0505 - 0.00128 = 0.0	492	
$R = \int_{0.01}^{1} (0.090F)(0.252)(0.3)$ $Q = \int_{0.01}^{1} \frac{1}{1 + 0.63} (121.35 + 160)^{0.63}$	93)(0,53 + 0,47 (0,0492)) = 0.659 = 0.82		
	/3,42 (0,82)2 + 3,9762 (0,659)2 1 (3,4) (0,246)	o, ९९ <i>५</i>	
	(3-12) - for Caf, refer to excel		

Wind Analysis		page bof 9	
 1070			
step 6: enclosure classification	- fully enclosed		
step 7: Internal pressure coeffi	cient -> using Table 26.11-1, Ca Cp;	= ± 0.1P	
cla 61 hat al	W 00 K -3 W	Tople 22 2 . See excel Sweed sheet	
step 6. Velocity pressure exposi	re caetticients , re	rins Table 27,3-1, see excel Spread sheet	
step 9: velocity pressure 92 or	2h -> From sect. 27,3,2, 22:0	100256 Kz Kzt Kd V2 (16/5/2)	
	4	ee exect spread sheet for values	
sten 10: external pressive energy	scient, Cp -> using Fis. 27.4-1		
of bearing berself court	icient, cp => Using Fis, 22, 4-1		
wall	pressure coefficients, cp		
windward wall ! -> all va			
sidewall: -> all	C		
val			
Leeward wall: level	s 1-2		
N-S WIR			
1/B = 1	21.75 = 0,39 0 < 0.39 < 1 =>	CPE -0.50	
E-W win			
Av.		-> merpolate based on all values	
151	75		
	Cp	= 2,5P-2 (-0,2+0,3) + (-0,3)	
		4-2	
	£	-0.291	
facet.	-		
levels	5-12		
N-s wind			
	17 = 0,47 , 0 < 0.47 <1 => cp=	~ 0.50	
3/8	.58		
E-w wind			
L/B = 314.	58 = 2,14 , 2 < 2,14 < 4 -> Interp	plate based on the values	
147			
	(p: 2,	(-0.2 + 0.3) + (-0.3)	
	=-0,7	75	

Wind Analysis Pass Pressures crefticients, cp $Rost Pressures crefticients, cp$ $Rost Pressures crefticients, cp Rost Pressures crefticients, cp Ros$			
Roof Pressures eserticients, cp $ \frac{N-5 \text{ wind}}{h_{12} = \frac{155}{1475}} = 1.22 1.22 \ge 1.00 $ The interplat distance, of to $\frac{1}{12} = \frac{1}{2} = \frac{1}{2$	wind And		ness 7 of 9
$\frac{N-s \text{ wind}}{h_{ z} = \frac{100}{100}} = 1.22 1.22 \geq 1.00$ $\frac{h_{ z} = \frac{100}{100}}{h_{ z} = \frac{100}{100}} = 1.22 1.22 \geq 1.00$ $\frac{h_{ z} = \frac{100}{100}}{h_{ z} = \frac{100}{2}} = 0.57 0.50 0.50 < 0.57 < 1.00$ $\frac{E-w \text{ wind}}{h_{ z} = \frac{100}{2}} = 0.57 0.50 < 0.57 < 1.00$ $\frac{E-w \text{ wind}}{h_{ z} = \frac{100}{2}} = 0.57 0.50 < 0.57 < 1.00$ $\frac{E-w \text{ wind}}{h_{ z} = \frac{100}{2}} = 0.57 0.50 < 0.57 < 1.00$ $\frac{E-w \text{ wind}}{h_{ z} = \frac{100}{2}} = 0.57 0.50 < 0.57 < 1.00$ $\frac{E-w \text{ wind}}{h_{ z} = \frac{100}{2}} = 0.57 0.50 < 0.57 < 1.00$ $\frac{(pz = 0.577 - 0.50)}{1 - 0.50} = (-1.2 + 0.5) + (-0.5)$ $\frac{(-1.2 + 0.5) + (-0.5)}{1 - 0.50} = (-0.7 + 0.5) + (-0.5)$ $\frac{(-0.77 + 0.5) + (-0.5)}{1 - 0.50} = (-0.7 + 0.5) + (-0.5)$ $\frac{(-0.75 + 0.5) + (-0.5)}{1 - 0.50} = (-0.75 + 0.5) + (-0.5)$	WINO MINITYSIS		P 136 7 07 1
$\frac{N-s \text{ wind}}{h_{ _{L}} \in \frac{18s}{14\eta}} = 1.22 j 1.22 \geq 1.00$ $\frac{h_{_{L}} = \frac{18s}{14\eta}}{h_{_{L}} = \frac{1}{1}.22} j 1.22 \geq 1.00$ $\frac{h_{_{L}} = h_{_{L}} = h_$	Roof	Pressures exefficients, cp	
$\frac{N-s \text{ wind}}{h_{ _{L}}} = \frac{1.22}{1.95} = \frac{1.22}{1.22} \text{i.22 2 l.o}$ $\frac{h_{1}}{h_{1}} = \frac{1.85}{1.91} = \frac{1.22}{1.91} \text{of } h_{ _{L}} \rightarrow \text{o' fo } 90' \Rightarrow \text{Cpc} = 1.3$ $\frac{h_{1}}{h_{1}} = \frac{180}{219.56} = 0.57 \text{o' fo } 90' \Rightarrow \text{Cpc} = 0.70$ $\frac{E-w \text{ wind}}{h_{ _{L}}} = \frac{180}{219.56} = 0.57 \text{o' fo } 90' \Rightarrow \text{Cpc} \rightarrow \text{o' for } 90' \Rightarrow \text{Cpc} \rightarrow \text{co' for } 90' \Rightarrow \text{Cpc} \rightarrow \text{Cpc} \rightarrow \text{co' for } 90' \Rightarrow \text{Cpc} \rightarrow \text{Cpc} \rightarrow c$			
hinzer/k! distance; o to h1z \rightarrow a' to 90' \Rightarrow cp = -1,3 from wind word edge $> h/_2 \rightarrow > 70' \Rightarrow cp = -0.70$ E-w wind $h_{1z} = \frac{180}{219.50} = 0.57$ horizontal distance from windword edge: $o to h/_2 \rightarrow o' to 90' \Rightarrow cp = 0.50 \rightarrow 0.50$ $(p = 0.50 - 0.50) = (-1.2 + 0.5) + (-0.5)$ $= -0.956$ $h_{1z} to h \rightarrow 90' to 180' \Rightarrow cp = 0.50 - 0.50 (-0.7 + 0.9) + (-0.5)$ $= -0.872$ $h to 2h \rightarrow 180' to 30' \Rightarrow cp = 0.50 - 0.50 (-0.7 + 0.9) + (-0.5)$ $= -0.528$	8 = 0		
historial distance; o to hiz \rightarrow o' to 90' \Rightarrow cp = -1,3 from windward edge $\Rightarrow h/_2 \rightarrow \Rightarrow 70' \Rightarrow cp = -0.70$ E-w wind $h/_1 = \frac{180}{214.58} \pm 0.57$ horizontal distance from windward edge: $0 \pm 0 h/_2 \rightarrow 0' \pm 0.70' \Rightarrow 0 + 0.7$	N-S wind		
historial distance; o to hiz \rightarrow o' to 90' \Rightarrow cp = -1,3 from windward edge $\Rightarrow h/_2 \rightarrow \Rightarrow 70' \Rightarrow cp = -0.70$ E-w wind $h/_1 = \frac{180}{214.58} \pm 0.57$ horizontal distance from windward edge: $0 \pm 0 h/_2 \rightarrow 0' \pm 0.70' \Rightarrow 0 + 0.7$	h/L = 186 = 1,22	1,22 2 1.0	
$ \begin{array}{c} E-w \text{ wind} \\ \hline h _{L} = \frac{180}{21^{41}.58} = 0.57 \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} $ $ \begin{array}{c} horizon to 1 \text{ distance from} \\ \text{windward edge} : \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} $ $ \begin{array}{c} horizon to 1 \text{ distance from} \\ \text{windward edge} : \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} , 0.5 < 0.57 < 1.0 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \qquad 0.57 < 0.50 \\ \hline \end{array} , 0.5 < 0.57 < 0.50 \\ \hline \qquad 0$	homzontal distance		=> Cp = -1,3
E-w wind $ \frac{E-w \text{ wind}}{h/L} = \frac{180}{219.58} = 0.57 $ horizontal distance from windward edge: $ 0 + 0 h/2 -> 0' + 0 70' => Cp -> \text{ in terpolate based on } h/L \text{ valves} $ $ Cp = \frac{0.57 - 0.50}{1 - 0.5} (-1.8 + 0.7) + (-0.7) $ $ = -0.956 $ $ h/2 + 0 h -> 70' + 0 180' => Cp = \frac{0.57 - 0.50}{1 - 0.50} (-0.7 + 0.9) + (-0.7) $ $ = -0.872 $ $ h + 0 2h -> 180' + 0 360' => Cp = \frac{0.57 - 0.50}{1 - 0.50} (-0.7 + 0.5) + (-0.5) $ $ = -0.528 $		> h/, -> > 20' =>	Cp = -0.70
$h_{12} = \frac{180}{214.58} \pm 0.57$ $horizontal distance from windward edge: 0 to h_{12} - 0.0' + 0.70' = 0.00'$			
horizontal distance from windward edge: $0 + 0 + 1/2 - 0 = 0 + 1/2 - 0 = 0 + 1/2 - 0 = 0 + 1/2 - 0 = 0 + 1/2 - 0 = 0 + 1/2 - 0 = 0 = 0 + 1/2 - 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0$	E-w wind		
horizontal distance from windward edge: $0 + 0 + 1/2 - 0 = 0 + 1/2 - 0 = 0 + 1/2 - 0 = 0 + 1/2 - 0 = 0 + 1/2 - 0 = 0 + 1/2 - 0 = 0 = 0 + 1/2 - 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0$	h/L = 180 = 0.57	, 0.5 < 0,57 < 1.0	
windward edge: $0 + 0 + 1/2 - 0 = 0 + 1/2 - 0 = 0 = 0 + 1/2 + 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0$	2,1,20		
$(p = \frac{0.57 - 0.50}{1 - 0.5} (-1.2 + 0.9) + (-0.9)$ $= -0.956$ $h_{12} + 0 h \rightarrow \frac{90'}{10} + 0 \frac{90'}{10} = 0 \cdot \frac{90'}$			
$h_{12} + 0 h \rightarrow 20' + 0 180' \Rightarrow Cp = \frac{0.57 - 0.50}{1 - 0.50} (-0.7 + 0.9) + (-0.9)$ $= -0.872$ $h + 0 2h \rightarrow 180' + 0 350' \Rightarrow Cp = \frac{0.57 - 0.50}{1 - 0.50} (-0.7 + 0.5) + (-0.5)$ $= -0.528$	wind nord edge;	0 to h/2 -> 0' to ?0'	
$h_{12} + 0 h \rightarrow 20' + 0 180' \Rightarrow Cp = \frac{0.57 - 0.50}{1 - 0.50} (-0.7 + 0.9) + (-0.9)$ $= -0.872$ $h + 0 2h \rightarrow 180' + 0 360' \Rightarrow Cp = \frac{0.57 - 0.50}{1 - 0.50} (-0.7 + 0.5) + (-0.5)$ $= -0.528$			(p= 0,57-0,50 (-1,3+0,9)+(-0,9)
$1-0.50$ $= -0.872$ h to 2h -> 180' to 360' => $C_p = \frac{0.57 - 0.50}{1 - 0.50}$ (-0.7+0.5) + (-0.5) $= -0.528$			
$1-0.50$ $= -0.872$ h to 2h -> 180' to 360' => $C_p = \frac{0.57 - 0.50}{1 - 0.50}$ (-0.7+0.5) + (-0.5) $= -0.528$			
		hlz to h -> 90' to 180'	
= -0,528			
= -0,528		h to zh -> 180' to 360' :	=> (p= -0.57 -0.50 (-0.7+0.5) + (-0.5)
			1-0,50
>24 -> N/A			= - 0, 528
		72h -> N/A	
step 11: design wind pressures -> from sect. 27.4.2, P= q Cop cp - ?; (Cocp.) (16/642)	step 11: design wind pressures -	from sect. 27.4.2 , P= 9 Gf C	p = (; (cacp;) (16/ft)
wind word wells -> P= 22 Cif cp - 24 (ca(p;))		wind word wells -> P= 93	the ch - sty (cuch!)
external internal	- Sea excel en . Johan		external internal
- see excel spreadsheet for pressure for pressures			pressure
leeward wells			
roof external internal		side wolls p= 91	h cap cp - 2h (ca cp;)
external internal pressure pressure		e. P	xternal Internal pressure pressure
		note: internal wind pressures	were nestarted in calculation the design
note: internal wind pressures were replacted in calculation the design		teri - I	
note: internal wind pressures were restacted in calculating the design wind pressures because the internal pressures of the same mosnitude will concel and thus do not contribute towards the external wind pressures authors as all		pressures because	the internal pressures of the same magnitude



Wind Analysis		page 9 of 9
al		
	s table list, risk category II	
step 2: V= lis mph		
step 3! Kd = 0,90		
step 4: exposure category, B		
steps: Kzt = 110		
	om sect. 26, 1.1, Caf = 0.85 for o	ther claustines
step 7: Ka or Ki a using tob	le 29,3-1, K2=1,20 (PH roof 198	o'-b" above errend!
	1 . 5 - 100 (111 100)	J. College
Sten St. G. D. and Dec		1 2
step o. 12 - Osing sect. C.	1.3,2, 92 = 0,00256 Kz Kz kd	
	= 0.00256 (1.20)(1.0)	(0,90)(115)2
	= 36.56 pcf	
step ?: force coefficient, cp.	-> using Fig. 29.5-1	
his the structure	_ 180 3.01 => CC = 3.01-	1 714 401112
least dim of sa	= 180 3.01 => Cf = 3.01-	(1.4-1.3) 7 1.3
cross-Jection	= 1,33	
	£ 1, 25	
step 10: wind force, F -> usin	ns sect. 29.5, F= 92 Ca Cf Af	
Af - projected area normo	.1 to the wind	
N-s pirection		E-w birection
		And the second section and the sectio
ACE Bh = 199.83 (1815) = 36	96 86 Ft 2	Af= 59,83 (18,5) = 1106,86 Ft 2
The court of the c		
E = 34 st == ((0.85) (1.33)	(26 96 86 F+2) = 153 8 K	F = 36.56 (0.85) (1.33) (1106.86) = 45.7K
1 - 30, 36 ps + C-113)	(20 10/10 11) = 13 (1) K	1- 20,20 (0,82) (1,08,00) - 10,11
- see excel spread sheet for e	calculated story forces, base she	ors, and overturning moments for
in final report		both the N-s and E-W directions
report		

		Build	ling Effecti	ve Length, l	-eff		
	N-S Direc	tion			E-W Dire	ction	
	h _i (ft)	L _i (ft)			h _i (ft)	L _i (ft)	
Level	(Height above grade of level i)	(Building Length at level i)	h _i *L _i	Level	(Height above grade of level i)	(Building Length at level i)	h _i *L _i
1	0	121.75	0	1	0	314.58	0
2	15	121.75	1826.25	2	15	314.58	4718.7
3	30	147	4410	3	30	314.58	9437.4
4	45	147	6615	4	45	314.58	14156.1
5	60	147	8820	5	60	314.58	18874.8
6	75	147	11025	6	75	314.58	23593.5
7	90	147	13230	7	90	314.58	28312.2
8	105	147	15435	8	105	314.58	33030.9
9	120	147	17640	9	120	314.58	37749.6
10	135	147	19845	10	135	314.58	42468.3
11	150	147	22050	11	150	314.58	47187
12	165	147	24255	12	165	314.58	51905.7
Main roof	180	147	26460	Main roof	180	314.58	56624.4
Σ=	1170		171611.25	Σ=	1170		368058.6
L _{eff} =	146.68			L _{eff} =	314.58		

Building Effective Length, L_{eff} , used to determine the natural frequency of the building according to Sect. 26.9 of ASCE 7-10

Volosity	Drossura Cooff	isionts V	and			Cu	ıst Factor-MV	MEDE	
Velocity Pressure Coefficients, K₂, and			_						
	Velocity Pressures, q₂			٧	Variable	N-S Wind E-W Wi			Wind
Level	Elevation (ft)	Kz	q _z		n ₁ =n _a	0.417			
1	0	0.57	16.40		$g_Q = g_v$		3	.4	
2	15	0.57	16.40		g _R		3.9	976	
3	30	0.70	20.14		Z_{mean}		10	08	
4	45	0.81	23.31		I _{z, mean}	0.246			
5	60	0.85	24.46		L _{z, mean}	475.1			
6	75	0.93	26.76		V _{z,mean}	102.1			
7	90	0.96	27.63		N ₁	1.94			
8	105	1.04	29.93		R _n	0.0908			
9	120	1.04	29.93		β	0.01			
10	135	1.09	31.37		η _h	3.38			
11	150	1.13	32.52		R _h	0.252			
12	165	1.17	33.67			Levels 1-2 Levels 3-12 Levels 1-2 Levels 3-			
Main Roof	180	1.17	33.67		η _B	5.91 5.91 2.29 2.3		2.76	
PH Roof	198.5	1.2	36.56		R _B	0.155	0.155	0.343	0.297
					η _L	7.66	9.25	19.79	19.79
					R_L	0.122	0.102	0.0492	0.0493
					R	0.456	0.453	0.659	0.613
					Q	0.78	0.78	0.82	0.817
					G_f	0.895	0.894	0.994	0.972
						Gust Fact	or-Mechnical	l Penthouse	2
				V	Variable	N-S	Wind	E-W	Wind
					G _f	0.	.85	0	.85

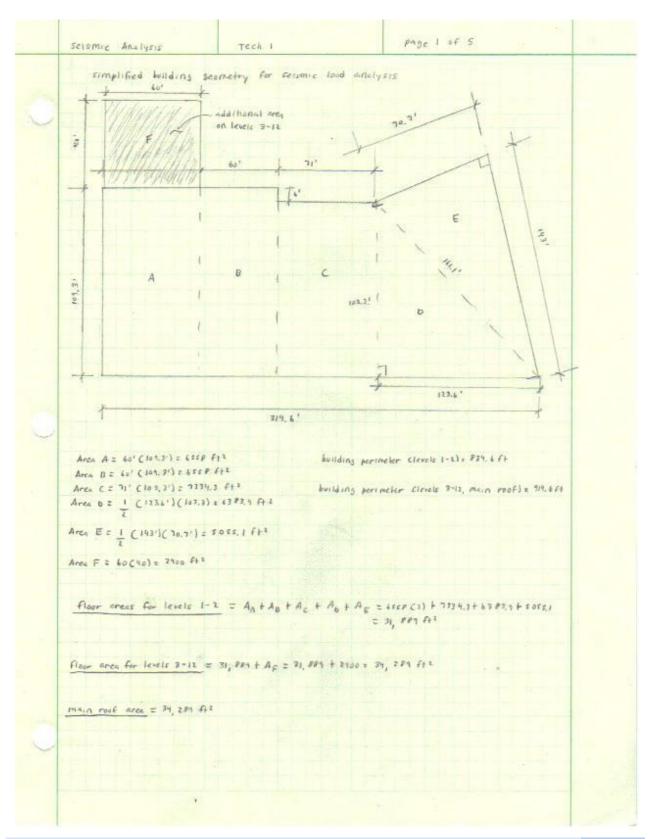
Velocity pressure and gust factors for the MWFRS

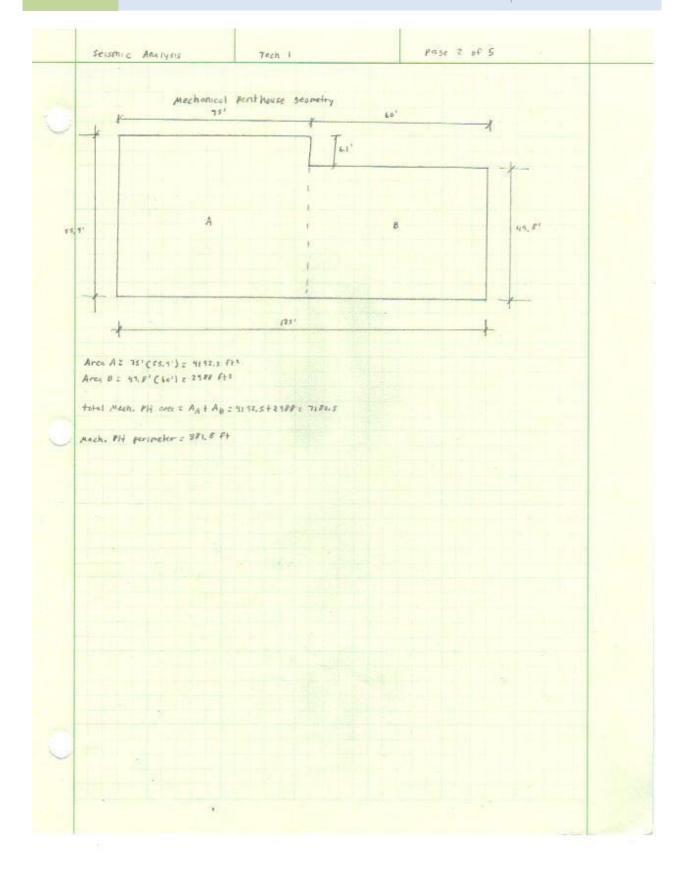
Wall Pressure Coeffcients, C _p				
Description	N-S Wind		E-W	Wind
	Levels 1-2	Levels 3-12	Levels 1-2	Levels 3-12
L/B	0.39	0.47	2.58	2.14
Windward Walls	·	0.8		
Side Walls		-0	.7	
Leeward Walls	-0.5	-0.5	-0.271	-0.293
	Force	Coefficient, (Ç _f	
Description	N-S	Wind	E-W	Wind
	Mech	nical Penthou	se	
h/D 1.33 1.33				

Pressure coefficients

Appendix C: Seismic Load Calculations

Existing Concrete System Seismic Load Analysis





	Seismic Analysis	Tech 1	pasc 3 4 f 5	T.
	Building weight:			
	a designing			
	- neglect let level weigh	t because level I will not a	entribule towards resistins the	
1	seismic lands		and a part of the second secon	
	- for easer lation simplic	ity, slab openings due to st	nurways and elevator shofts were restecti	ed,
	therefore realthras in a	mure conservative conservati	eri .	
	and level			
	Dead lands;			
-	8" thick normal int conci	rele = 150 pcf x P fr = 100 p	tf.	
1	Sul = in psf			
+	curtain wall = 250 pif			
	calumn wit 2 488k			
	brop ported who stark			
	Value of Value			
	Wand level = clos 1 10) psi	(CII, 214 FAT) + ZEODIE CE	eroff) + ypokt eroke 4452 k	
	levels 2-12			
1	- dead lands are the s	ome as an level t		
-	A CONTRACT OF A	est v	N POWER TO A STATE OF THE STATE	
	M = 5110 bit) (34, 284)	41.1 + 520 PIE (JULY 41) + N.B.	K + 248K = 4736 K/flor (10flor) = 473	ed te
	mein roof			
-	Dead loads;			
4	In thick normal we ca	and the state of the tark		
1	FOL to per	HERETE SHIRE HAVE		
	curtain wat = 250 plf			
1	- 1-20.0071 leadings from			
	Wyman roof = (110 prf)(39, 229 ftt) + 250 NF (717.6)	r+) = 4000 K	
1	Mechanical Penthouse	roof:		
-	head loads:			
	p" slek tipo ps			
	able s pat	-		
	W = = 0 (02)	pre (7181 862) = 754 K		
	617 4906			
1	Tates building dead i	load = 4952 + 47764 + 4000	+754 = 56, 870 K	
1				
-				
1				-
				7

	seismie analysis	Tech 1		page t of 5
8	oteps: site class -> oven	in seat-echnical repor	+, "c" Cuer	y dense soil and hard rock, from
-	DOMESTIC TO THE RESIDENCE OF THE PROPERTY OF T	and the second		take 20,9-
8+	rep 2: Spectral response	periods, so -> fr		
	cat snort	periods, 25 "	on -15 21-1,	25 = 0.10
	at 1 - secon	d period, si - from	F/9, 21-1	5, = 0,06
				W.
ste	sp3; site coefficients and		considered i	E. Q. spectral response
	acceleration parame	NOTE THE PARTY OF		
	Sas = Fas	from table 11.4-1		
		and sile class c	-	
	Fa = 1.1 =0	Smg = 1.2 co.20) = 0.	2.1	
		on table 11,4-2		
	Sm, = FyS,	and sile class C		
	The same of the sa	Sm, = 1.7(0,06) = 0,101		
		THE STATE OF THE S		
Step	14: Design Spectral respon			
	et 1-sec. period , so,	for 2 to diving =)	from Tech L	1,4,9
	She = 2/2 Sme = 2/2	(0,24) = 0.16		
	Sbs = 2/3 Sms = 2/3			
	$s_{bz} = \frac{2}{3} s_{chz} = \frac{2}{3}$ $s_{b1} = \frac{2}{3} s_{ch_1} = \frac{2}{3} c_0$			
	S13 1 107/ 12 1/0//			
step	S13 1 107/ 12 1/0//	0.1021 0.068		
step	5 _{b1} = 2/3 5m, = 2/3 C	0.1021 0.068		
step	$S_{b_1} = 2I_3 S_{m_1} = 2I_3 C_1$ $g : occupancy calegory$	0.1021 0.068	lorş	
step	so couponcy calesary ecouponcy calesary	ond importance fect The start back is	m3	
step	so couponcy calesary ecouponcy calesary	o tozze o. os 8 and importance feet	m3	
	soccupancy calesary eccupancy calesary importance factor,	and importance feel The from table is,	m3	
	Sb1 = 213 Sm, = 213 Co 15: occupancy calesary occupancy calesary importance factor, 16: seismic design cale	e. 1023 c 0.068 and importance feet I -> from table 1 I -> from table 1.5, 850ry, 80c	tors .s-1 . T = 1.0	
	Sb1 = 213 Sm, = 213 Co 15: occupancy calesary occupancy calesary importance factor, 16: seismic design cale	e. 1023 c 0.068 and importance feet I -> from table 1 I -> from table 1.5, 850ry, 80c	tors .s-1 . T = 1.0	rameter — s from take 11.6-1
	Sb1 = 213 Sm, = 213 Co ss: occupancy calesary occupancy calesary importance factor importance factor so: tessins design cale soc based on short	e.1021: 0.068 and importance feet I -> from table is, esery, soc period response acc	tors if-1 if To he reference Poi	
	Sb1 = 213 Sm, = 213 Co ss: occupancy calesary occupancy calesary importance factor importance factor so: tessins design cale soc based on short	e. 1023 c 0.068 and importance feet I -> from table 1 I -> from table 1.5, 850ry, 80c	tors if-1 if To he reference Poi	
	Sb1 = 213 Sm, = 213 Co ss: occupancy calesary occupancy calesary importance factor importance factor so: tessins design cale soc based on short	e.1021: 0.068 and importance feet I -> from table is, esery, soc period response acc	tors if-1 if To he reference Poi	
	Sb1 = 213 Sm, = 213 Co ss: occupancy calesary occupancy calesary importance factor importance factor so: tessins design cale soc based on short	e. 1021: 0.068 and importance feet I -> from table i.s., esury, suc period response accord acc. II - suc 2	tors 1.5-1 2. T=1.0 relevation for	
	Sb1 = 213 Sm, = 213 Co ps: occupancy calesary eccupancy calesary importance factor, importance factor, bi: Sessinc design cale soc based on short for Sb2 = 0.16 of soc based on 1-sec.	e. 1023 c 0.068 and importance feet I -> from table i.s., esury, suc period response acc end acc. II - suc c response acceleration	tors 1.5-1 2. T=1.0 relevation Point 11.4" 1. perameter	
	Sb1 = 213 Sm, = 213 Co ps: occupancy calesary eccupancy calesary importance factor, importance factor, bi: Sessinc design cale soc based on short for Sb2 = 0.16 of soc based on 1-sec.	e. 1021: 0.068 and importance feet I -> from table i.s., esury, suc period response accord acc. II - suc 2	tors 1.5-1 2. T=1.0 relevation Point 11.4" 1. perameter	
	Sb1 = 213 Sm, = 213 Co ps: occupancy calesary eccupancy calesary importance factor, importance factor, bi: Sessinc design cale soc based on short for Sb2 = 0.16 of soc based on 1-sec.	e. 1021: 0.068 and importance feet I -> from table i.s. Foury, suc Period response according occ. II - suc = 111 occ. II - suc = 111 occ. II - suc = 111	tors 1.5-1 2 , T=1.0 relevation point 1.4" 1 porameter 3 "	rameter — From take 11.6-1
	Sb1 = 213 Sm, = 213 Co ps: occupancy calesary eccupancy calesary importance factor, importance factor, bi: Sessinc design cale soc based on short for Sb2 = 0.16 of soc based on 1-sec.	e. 1021: 0.068 and importance feet I -> from table is, esory, suc Period response acc and acc. II - suc = response acceleration oce. II - suc = h since	tors 1.5-1 2 , T=1.0 relevation point 1.4" 1 porameter 3 "	

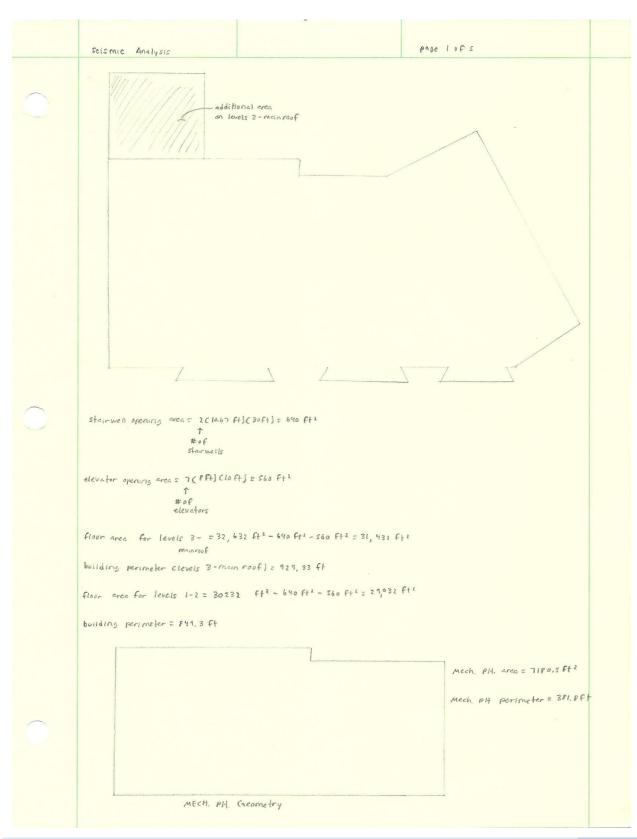
	Seismie Analysis	Tech 1	page 5 of 5	1		
1	du 3: see as di Bres	ha full has fa				
1	step 7: response modification factor, A -> from table 12.2-1					
1	for ordinary reinf	forced concrete moment for	ares, Re3			
1						
1	Equivalent Luteral Force	e Procedure used for or	Pely sis			
1	step 8: approximate fundam	mental period T -> fior	n feet, 12,8, 2,1			
1		AND DESCRIPTION OF THE PARTY OF				
1	Tez céhn	from table 12, 1-2,	concrete moment resisting frame;			
1	Te = 0.016 C 120) 0,5		CE = \$.016 , X = 0.9			
ı	= 6279 s					
I				1		
ŀ	long transitional	period -> from fip, 22-	(2, T _L = 62	1		
	step 1: seismic vesponse o	coefficient, Co -) from	n Fect 17, P. 1,1			
1	es = sps	= 0.16 = 0.0833				
+	(R/z)	(3/1.0)				
1						
1	T = 1,278 s <	T(=65 => C5 < 5	$\frac{a_{1}a_{2}}{a_{2}a_{3}} = \frac{a_{1}a_{0}F}{a_{2}^{2}(a_{1}a_{2}a_{2})} = a_{1}a_{1}a_{2}a_{3}$			
1		(P(E) + (3/1)(1.23e)			
-			I V SK	+		
1			3 1.100 (1986)			
ı			eantrols and thus it is the value			
ŀ	that is used for	calculating the base street	K.			
ŀ				1		
404	step 14: base sheer, V					
-		(5(520) = 1001 K		1		
1	V= (5 W = 4.0177	C363 101 E 10-1 K				
100	itep 11: bistribule seismic base :	sheer, u, to story leach -	-> From Sect. 17, 8,7	1		
ŀ	FRE CUA V			1		
ı		K = 1,278 - 1	ns (2-1) +1 = 1.789	1		
ľ	CULE WE hE	Z. ç — o,		1		
ŀ	₹ w, h, r			I		
ŀ	(2)			1		
	A story forces and ove	rturning manual calculate	In excel sprendsheet			
	1					
1						
-						
-						
1						

Existing Superstructure Weight

Floor Weight Calculations									
Floor	Area	Perimeter	8" slab weight	Superimposed DL	Curtain Wall	Total Weight			
	(ft ²)	(ft)	(psf)	(psf)	Weight (plf)	(Kips)			
2	31889.00	834.6	100	10	250.00	3716			
3	34289.00	914.6	100	10	250.00	4000			
4	34289.00	914.6	100	10	250.00	4000			
5	34289.00	914.6	100	10	250.00	4000			
6	34289.00	914.6	100	10	250.00	4000			
7	34289.00	914.6	100	10	250.00	4000			
8	34289.00	914.6	100	10	250.00	4000			
9	34289.00	914.6	100	10	250.00	4000			
10	34289.00	914.6	100	10	250.00	4000			
11	34289.00	914.6	100	10	250.00	4000			
12	34289.00	914.6	100	10	250.00	4000			
Main Roof	34289.00	914.6	100	10	250.00	4000			
PH Roof	7181.00	381.8	100	5	N/A	754			
				Total	Floor Weight=	48475			

	Typical Floor Colun	nn Weight (4th I			
Size		Length	Unit Weight	Volume	Weight
(in x in)	Quantity	Clear Span(ft)	(lbs/ft ³)	(ft ³)	(Kips)
18X36	4	9.96	150	179.25	26.89
16X32	7	9.96	150	247.85	37.18
18X28	1	9.96	150	34.85	5.23
18X42	3	9.96	150	156.84	23.53
24X30	6	9.96	150	298.75	44.81
24X24	10	9.96	150	398.33	59.75
24 dia	12	9.96	150	375.2	56.28
16X48	2	9.96	150	106.22	15.93
16X66	1	9.96	150	73.03	10.95
14X48	2	9.96	150	92.94	13.94
12X24	5	9.96	150	99.58	14.94
22X26	1	9.96	150	39.56	5.93
20.5X24	1	9.96	150	34.02	5.10
22X24	1	9.96	150	36.51	5.48
14X96	1	9.96	150	92.94	13.94
24X36	2	9.96	150	119.50	17.93
28X28	3	9.96	150	162.65	24.40
12X48	1	9.96	150	39.83	5.98
11X24	4	9.96	150	73.03	10.95
16X96	1	9.96	150	106.22	15.93
14X66	1	9.96	150	63.90	9.58
28 dia	8	9.96	150	340.5	51.07
18X64	1	9.96	150	79.67	11.95
		Column Weigh	t per floor (11	total flrs)=	488
			Total Colum	n Weight=	5365
	Typical Floor Drop Pa	anel Weight (4th			
Size		Thickness		Volume	Weight
(in x in)	Quantity	(in)	(lbs/ft ³)	(ft ³)	(Kips)
	Continuous Drop (around				
36 wide	perimeter of all floors)	3.50	150	800.28	120
min. 68X68	40	8.00	150	856.3	128
	Dro	p Panel Weigh	t per floor (11	total flrs)=	248
			otal Drop Pan		2733

New Steel System Seismic Load Analysis



seismic analysis		pose 2 of 5	
Estimated			
Building weight:			
- neglect 1st level weight becau	use level win not contribute towards	resisting the seismie loads	
- for design purposes, assume	member weight Cincluding beams, Bir	ders, and columns) will be is psf	
, and the second second	alloworke		
and level			
pead loads: - 3VL120 composit	te deck ul 71/2" slab depth = 78 pst	c	
- member ut cellou			
- curtain wall = 25			
~ Sb1 = 10 psf			
tu cant in training (29 020 (12) 1 200 010 0010 201 - 21	of K	
Wand level = Cast 15 +10 1 psf C	29,032 ft2) + 250 pif (849, 3ft) = 31	19 K	
4			
levels 3-12			
- bead loads are the same as on	level 2		
W = C100 psf 1(31, 432 ft2) f 250	pif (929, 33 ft) = 3376 K		
11 = 3376 K. (10 Chall - 2376)	V		
W = 3376 K/fir (10 firs) = 33760			
main roof			
- pead loads are the same as ar	level 2		
Wmain roof = 3376 K			
mechanical Penthouse roof			
bead loads: - 3 VL 120 composite	leck w/ 7"2" slab depth = 75 psf		
- 501 = 5 psf			
WPH roof = (7sts) psf (718a.s f	C+2) = 574 K		
PH roof			
estimated total building dead li	and = 3116 + 33760 + 3376 + 574 =	40 826 K	
		,	
-refer to excel spread sheets for ac	to a building second		
		othered the leteral curden	
	s found that the wind load case I con		
seeign and were designing the in	oteral system the actual total building v	er, ma carculated)	

Seismic Analysis		page 3 of S					
	estechnical report, "L" (very dense	e soll and hard rock, from table 20.3-1 in ASCE 7-10)					
step 2: spectral response accelered at short period, s	700 s -> from Fig. 22-1, S5 = 15 70 = 0.15						
at 1-second period, s, -> from Fis. 22-2, s, = 670 = 0.06							
step 3: site coefficients and adjusted maximum considered E. Q. Spectral acceleration parameters from table 11.4-1							
$S_{MS} = F_{\alpha} S_{S}$ with $S_{S} < 0.25$ and site class c $F_{\alpha} = I_{12} \implies S_{MS} = I_{12}(0.15) = 0.180$							
Smi = FV Si							
with s, < 0.1 and Fv: 1.7 => 5m;	site class C s 1.7 (0.06) s 0,102						
step 4: design spectral response a for 5 % damp => from se	cceleration parameters of short person of 11.4.4	ids, sos, and at 1-sec. penad, soi,					
SDS = 2/3 SmS 2 2/3 (0.180)	= 0.120						
Sp1 = 2/3 Sm1 = 2/3 (0.102)	2 0.068						
step s: occupancy eategory and i	importance factors						
occupancy category II -	s from table list						
importance factor, I ->	from table 1.5-2, I= 1.0						
step 6: seismic design category	SOC						
SDC based on short per	ried response acceleration parameter	> from table 11.6-1					
for sps = 0.12 and occ.	II - SDC : A						
SDC based 1-sec response	acceleration parameter -> from table	C 11.6-2					
for sois along and occ. II	- SOCIB						
	Since risk cotegory B is more set use soc $z^{(i)}B^{(j)}$	rere than risk category A,					
step 7: response modification for	ictor, 12 -> from table 12.2-1						
steel systems not specific	ially detailed for seismic resistance ,	R = 3					
Fauivalent Lateral Force	procedure used for energysis						

Seismic Analysis Page 40	F S	
step 8: approximate findamental period, T -> from sect, 12.8.2.1		
Ta= cthox		
N-s direction - resisted by both braced frames and moment frames		
from table 12.8-2 "All other systems" (= 0.02, X=0.75		
Tas 0.02 (180) 0.75 2 0.9835		
E-w direction		
from table 12.8-2, " steel moment-resisting fromes" (t=0.028, x=0.80		
Ta=0.028(180)0.80=1.7845		
Tq = 0.028 (180) = 1.1745		
long transitional period -> from Fig. 22-12, Ti = 85		
step ?: seismic response coefficient, (s -> from Sect. 12.8.1		
$\frac{c_{S}}{c_{S}} = \frac{c_{DS}}{c_{S}} = \frac{c_{12}}{c_{3}/l_{10}} = \frac{c_{10}q_{0}}{c_{10}q_{0}}$		
. ("17) (3/1,0)		
N-s direction		
$\frac{N-s \text{ direction}}{T = 6.983s \times T_L = 8s} = 0.068 = 0.068 = 0.023 \text{ not ok}$ $\frac{(R/I)T}{(2/I)(6.983)} = 0.023 \text{ not ok}$		
> 0.61 V 0K		
since $(s=0.040\ 3\ 0.023)$, $(s=0.023\ controls\ end\ thus\ it is the value the for calculating the base shear, V, in the N-s direction.$	not is used	
E-W direction		
T= 1.784 5 < T(= 85 =) <5 < 0.068 = 0.0127		
> 0.0) V 4K		
since (s= 0.040) 0.012), (s= 0.012) controls and thus it is the value the	at is used for calculating	
the base shear, v, in the E-w direction.		
step 10: base shear, V		
V = es w		
VN-S = 0.023 (38, 942 K) = 896 KIPS		
VE-W= 0.0127 (38, 942 K) = 495 Kips		

Seismic Analysis	page s of s	
step 11: distribute seismic base shear, V, to $F_{X2} = C_{VX} V$ $C_{VX} = W_X h_X k$ $= W_X k$	E-w direction K=1.784-0.5 (2-1)+1= 1.642 2.5-0.5	
-refer to the excel spreadsheets in the report for in the N-s and E-w directions	r the base sheers, story forces, and overturning moments	

New Steel Superstructure Weight

	Gravity Beam Weight (Typical Floor- 3rd Level)							
Bay	Size	Quantity	Span	Unit Weight	Weight			
			(ft)	(lb/ft)	(Kips)			
28'-6"	W16x26	15	28.5	26	11.12			
35'-0"	W18x40	7	35	40	9.80			
30'-0"	W12x19	3	30	19	1.71			
	W12x19	6	4.5	19	0.51			
	W12x19	2	14	19	0.53			
	W16x31	10	30	31	9.30			
19'-4"	W12x19	4	19.33	19	1.47			
25'-0"	W14x22	9	25	22	4.95			
17'-6"	W10x15	6	17.5	15	1.58			
	W12x19	2	17.5	19	0.67			
42'-6"	W21x44	1	36	44	1.58			
	W21x44	1	31.33	44	1.38			
38'-0"	W18x35	1	33	35	1.16			
	W16x26	1	28.4	26	0.74			
	W14x22	1	23.5	22	0.52			
24'-4"	W16x26	1	24.33	26	0.63			
	W12x22	2	24.33	22	1.07			
	W12x16	1	24.33	16	0.39			
16'-6"	W10x15	8	16.5	15	1.98			
31'-0"	W14x26	1	31	26	0.81			
	W16x26	7	31	26	5.64			
	W16x31	7	31	31	6.73			
	Total Be	am Weight per floo	or (11 typical	framing levels)=	64.2			
		Total Beam We	ight on Leve	ls 3-Main Roof	707			

I			Gravity Beam We	ight (2nd Level)		
Γ	Bay	Size	Quantity	Span	Unit Weight	Weight
ı				(ft)	(lb/ft)	(Kips)
Г	28'-6"	W16x26	9	28.5	26	6.67
Т	35'-0"	W18x40	7	35	40	9.80
Г	30'-0"	W12x19	3	30	19	1.71
Ι		W12x19	6	4.5	19	0.51
Ι		W12x19	2	14	19	0.53
		W16x31	10	30	31	9.30
Т	19'-4"	W12x19	4	19.33	19	1.47
Ι	25'-0"	W14x22	9	25	22	4.95
Г	17'-6"	W10x15	6	17.5	15	1.58
		W12x19	2	17.5	19	0.67
	42'-6"	W21x44	1	36	44	1.58
		W21x44	1	44	44	1.94
Ι	38'-0"	W18x35	1	33	35	1.16
Τ		W16x26	1	28.4	26	0.74
T		W14x22	1	23.5	22	0.52
Г	24'-4"	W16x26	1	24.33	26	0.63
		W12x22	2	24.33	22	1.07
Ι		0	0	0	0	0.00
Ι	16'-6"	W10x15	8	16.5	15	1.98
T	31'-0"	W14x26	1	31	26	0.81
		W16x26	6	31	26	4.84
L		W16x31	7	31	31	6.73
			Total Beam We	eight Suppprti	ng Level 2=	59.2

	Gravity Girder Wei				
Bay	Size	Quantity	Span	Unit Weight	Weight
			(ft)	(lb/ft)	(Kips)
40'-0"	W24x76	1	40	76	3.0
	W24x55	1	40	55	2.2
28'-6"	W21x50	1	28.5	50	1.4
	W21x44	1	28.5	44	0.0
30-0"	W21x50	1	30	50	1.5
	W21x44	1	30	44	1.3
	W16x26	2	30	26	1.5
	W18x40	1	30	40	1.2
	W14x22	3	30	22	1.9
	W12x19	2	30	22	1.3
	W24x55	1	30	55	1.6
41'-0"	W27x84	5	41	84	17.2
	W24x68	4	41	68	11.1
24'-0"	W16x31	3	24	31	2.2
	WIGAST		24	31	
30'-0"	W21x44	2	30	44	2.6
35'-0"	W27x84	1	35	84	2.9
44'-0"	W24x76	1	44	76	
	Total Gir	der Weight per flo	or (11 typical	framing levels)=	56
		Total Girder We	eiaht on Leve	ls 3-Main Roof	624

			Gravity Girder We	ight (2nd Level)		
Ва	ay	Size	Quantity	Span	Unit Weight	Weight
				(ft)	(lb/ft)	(Kips)
28'	'-6"	W21x50	1	28.5	50	1.43
		W21x44	1	28.5	44	1.25
30	-0"	W21x50	1	30	50	1.50
		W21x44	1	30	44	1.32
		W16x26	2	30	26	1.56
		W18x40	1	30	40	1.20
		W14x22	3	30	22	1.98
		W12x19	2	30	22	1.32
		W24x55	1	30	55	1.65
41'	'-0"	W27x84	5	41	84	17.22
		W24x68	4	41	68	11.15
24'	'-0"	W16x31	3	24	31	2.23
30'	'-0"	W21x44	2	30	44	2.64
35'	'-0"	W27x84	1	35	84	2.94
44'	'-0"	W24x76	1	44	76	3
			Total Girder We	eight Supporti	ng Level 2=	52.7
				,		

		me A.1 Beam We	ight		
Bay	Size	Quantity	Span (ft)	Unit Weight (lb/ft)	Weight (kips)
28'-6"	W21x48	1	28.5	48	1.37
	W27x129	2	28.5	129	7.35
	W27X146	4	28.5	146	16.64
	W27X161	1	28.5	161	4.59
	W27X178	1	28.5	178	5.07
	W27X194	1	28.5	194	5.53
	W30x90	2	28.5	90	5.13
				Total Weight =	46
17'-6"	W16x26	10	17.5	26	4.55
	W27x129	8	17.5	129	18.06
	W27x146	10	17.5	146	25.55
	W27x161	8	17.5	161	22.54
	W27x178	4	17.5	178	12.46
	W27x194	15	17.5	194	50.93
	W30x90	5	17.5	90	7.88
				Total Weight =	142
25'-0"	W27x84	1	25	84	2.10
	W27x129	6	25	129	19.35
	W27x146	5	25	146	18.25
	W27x161	5	25	161	20.13
	W27x178	2	25	178	8.90
	W27x194	4	25	194	19.40
	W30x90	1	25	90	2.25
				Total Weight =	90
30'-0"	W21x62	2	30	62	3.72
	W27x84	2	30	84	5.04
	W27x129	7	30	129	27.09
	W27x146	15	30	146	65.70
	W27x161	2	30	161	9.66
	W27x178	1	30	178	5.34
	W27x194	3	30	194	17.46
	W30x99	4	30	99	11.88
				Total Weight =	146
		Total Beam Wei	aht in Mome		424

	Moment F	rame B Beam Weigl	ht		
Bay	Size	Quantity	Span	Unit Weight	Weight
			(ft)	(lb/ft)	(kips)
28'-6"	W21x48	1	28.5	48	1.37
	W27x84	1	28.5	84	2.39
	W27X129	2	28.5	129	7.35
	W27X146	3	28.5	146	12.48
	W27X161	2	28.5	161	9.18
	W27x194	2	28.5	194	11.06
	W30x90	1	28.5	90	2.57
				Total Weight =	46
35'-0"	W27x84	1	35	84	2.94
	W27x129	2	35	129	9.03
	W27x146	6	35	146	30.66
	W27x194	1	35	194	6.79
	W30x90	1	35	90	3.15
	W30x99	1	35	99	3.47
	VV30X33	'	33	Total Weight =	56
19'-4"	W27x129	3	19.33	129	7.48
13-4	W27x129	4	19.33	146	11.29
	W27x140	2	19.33	161	6.22
	W27x178	1	19.33	178	3.44
	W27x176	10	19.33	194	37.50
	W30x90	2	19.33	90 99	3.48
	W30x99	2	19.33		3.83
401.00	11107.04		40.07	Total Weight =	73
10'-8"	W27x84	2	10.67	84	1.79
	W27x129	3	10.67	129	4.13
	W27x146	4	10.67	146	6.23
	W27x161	2	10.67	161	3.44
	W27x194	5	10.67	194	10.35
	W30x90	1	10.67	90	0.96
	W30x99	9	10.67	99	9.51
		+ .		Total Weight =	36
42'-6"	W24x104	1	42.5	104	4
	W24x117	2	42.5	117	10
	W24x146	2	42.5	146	12
	W27x129	1	42.5	129	5
	W27x146	12	42.5	146	74
	W27x161	4	42.5	161	27
	W27x178	1	42.5	178	8
	W27x194	1	42.5	194	8
				Total Weight =	150
30'-0"	W27x84	2	30	84	5
	W27x129	2	30	129	8
	W27x146	4	30	146	18
	W27x161	1	30	161	5
	W27x178	1	30	194	6
	W27x194	1	30	194	6
	W30x90	1	30	90	3
	W30x99	1	30	99	3
				Total Weight =	52
		Total Beam We	eight in Mor	ment Frame B =	414

	Moment Fra	me E Beam Weig	ght		
Bay	Size	Quantity	Span	Unit Weight	Weight
			(ft)	(lb/ft)	(kips)
28'-6"	W21x55	1	28.5	55	1.57
	W27X84	1	28.5	84	2.39
	W27X129	3	28.5	129	11.03
	W27X146	5	28.5	146	20.81
	W27x161	3	28.5	161	13.77
	W27x178	3	28.5	178	15.22
	W27x194	4	28.5	194	22.12
	W30x99	2	28.5	99	5.64
		Total Beam W	eight in Mon	nent Frame E =	93
	Moment Fro	me 1 Beam Weig	abt		
Bay	Size	Quantity	Span	Unit Weight	Weight
Day	SIZE	Quantity	(ft)	(lb/ft)	(kips)
41'-0"	W24x104	11	41	104	46.90
41.0	W24x131	1	131	131	17.16
	112 12 10 1	· ·		Total Weight =	64
30'-0"	W21x55	1	30	55	1.65
	W27x84	11	30	84	27.72
				Total Weight =	29
28'-6"	W27x84	12	28.5	84	28.73
				Total Weight =	29
40'-0"	W24x104	11	40	104	45.76
				Total Weight =	46
		Total Beam W	eight in Mon	nent Frame 1 =	168
	11	4l D W-i	-1-1		
Davi		me 1' Beam Weig		11-2114-1-1-1	18/-:
Bay	Size	Quantity	Span	Unit Weight	Weight
35'-0"	W27X84	3	(ft) 35	(lb/ft) 84	(kips) 8.82
35-0	W27x129	7	35	129	31.61
	W30x99	2	35	99	6.93
	1100/20	_	33	Total Weight =	47
30'-0"	W27X84	5	30	84	12.60
	W27x129	14	30	129	54.18
	W30x90	2	30	90	5.40
	W30x99	3	30	99	8.91
		_		Total Weight =	81
24'-0"	W27x84	3	24	84	6.05
	W27x129	3	24	129	9.29
	W27x146	4	24	146	14.02
	W30x99	2	24	99	4.75
				Total Weight =	34
		Total Beam We	eight in Mom	ent Frame 1' =	163

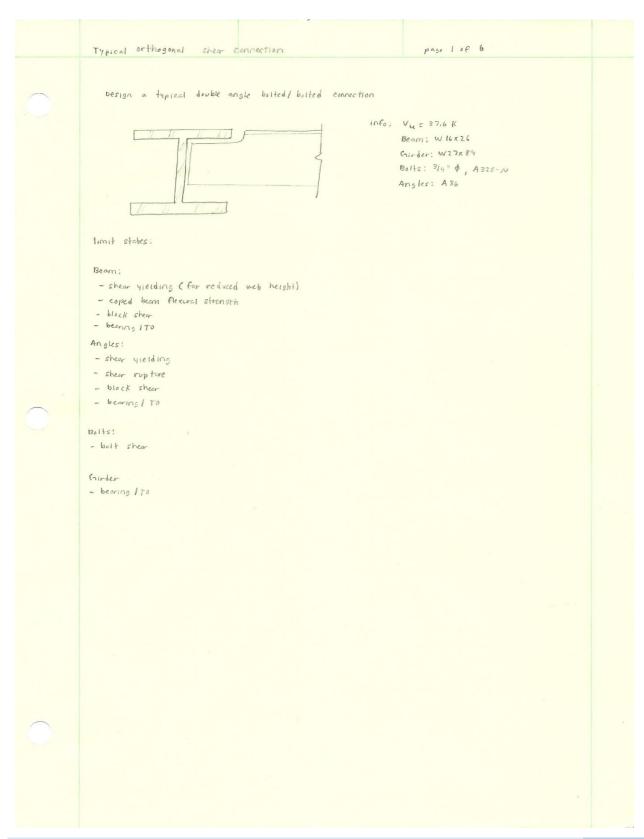
	Moment Frame Column Weight					
Size	Quantity	Span - 2 tier	Unit Weight	Weight		
		(ft)	(lbs/ft)	(Kips)		
W14x43	1	30.00	43	1.29		
W14x193	53	30.00	193	306.87		
W14x211	19	30.00	211	120.27		
W14x233	23	30.00	233	160.77		
W14x257	54	30.00	257	416.34		
W14x283	10	30.00	283	84.90		
W14x311	46	30.00	311	429.18		
W14x342	6	30.00	342	61.56		
W14x370	2	30.00	370	22.20		
W14x500	1	30.00	500	15.00		
W14x550	4	30.00	550	66.00		
W14x605	2	30.00	605	36.30		
W14x665	8	30.00	665	159.60		
W14x730	11	30.00	730	240.90		
T	otal Colun	nn Weight in Mome	ent Frames =	2121		

		Bracing Weigh	t	
Size	Quantity	Span	Unit Weight	Weight
		(ft)	(lbs/ft)	(Kips)
W6x15	5	33.54	15	2.52
W8x28	1	33.54	28	0.94
W8x31	6	33.54	31	6.24
W8x35	1	33.54	35	1.17
W10x39	2	33.54	39	2.62
W10x45	3	33.54	45	4.53
W10x49	6	35.25	49	10.36
W10x77	4	33.54	77	10.33
W12x35	1	33.54	35	1.17
W12x35	1	35.25	35	1.23
W12x53	3	33.54	53	5.33
W12x58	5	33.54	58	9.73
W12x65	3	33.54	65	6.54
W12x65	1	35.25	65	2.29
W12x72	1	33.54	72	2.41
W12x87	2	33.54	87	5.84
W12x96	2	33.54	96	6.44
W12x106	2	33.54	106	7.11
W12x120	4	33.54	120	16.10
W12x136	4	33.54	136	18.25
W12x152	2	33.54	152	10.20
W12x170	2	33.54	170	11.40
W12x190	1	33.54	190	6.37
W12x210	4	33.54	210	28.17
W12x230	1	33.54	230	7.71
W12x252	3	33.54	252	25.36
W12x279	2	33.54	279	18.72
W12x305	1	33.54	305	10.23
W12x336	23	33.54	336	259.20
W14x193	7	33.54	193	45.31
		Total Brad	ing Weight =	544

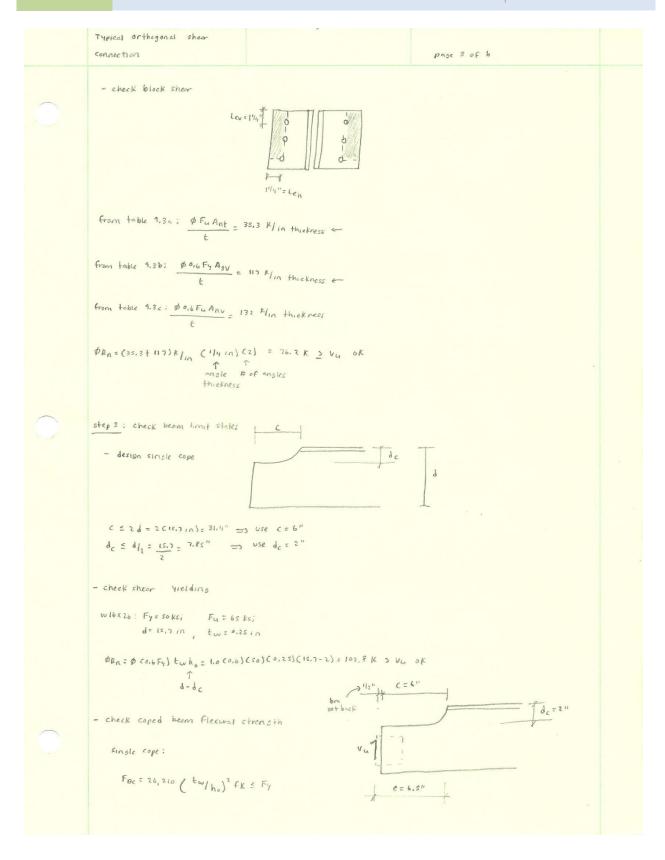
Total Superstructure Weight= 5713

Appendix D: Typical Connections Design and Analysis

Typical Orthogonal Shear Connection



	Typical orthogonal shear connection	page 2 of 6
	step 1: Design bolts	
	- bolt shear	
	orn = 35,8 K/bilt	
	Vu = ØRn (# of bolts)	
	# of bolts = $\frac{37.6 \text{ K}}{35.8 \text{ K/bolt}}$ = 1.05 => need to use at least 2 bolts	1+s
	according to table 10-1 in steel construction manual, for a dou a wib using 314" boilts, use at least 3 rows of boilts	rble angle connection supporting
	step 2: peston Angles	
	- shear yielding	
	ΦRA = Φ (0,6 Fy) ASV 2 V4	
	Agy 2 37.6 k 1.0 (0.6) (36 kc;) = 1.74 in2 => try 26464X 44 -	-0'-812" WIASV = 3,64 102
,	- check shear rupture ORn= O (0.6Fu) Anu 2 Vu Anu = 3.64 m² - Aholes = 3.	# of hales 1641112 - (3/4"+"116"+"116")(1/4")(2)(3)
	= 0,75 (0.6)(SP ks;)(2,32 in 2)	I have ansle # of angles thickness
	= 60,8 K > 37.6 K OK = 2.	33 m²
		ten=14"
		0 11/4" = Lev
	L	9" = Lev

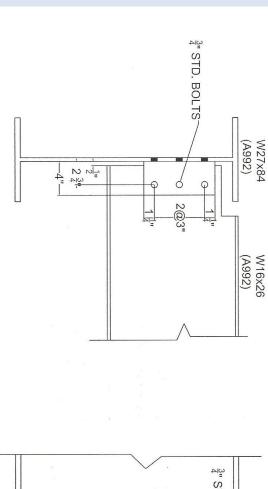


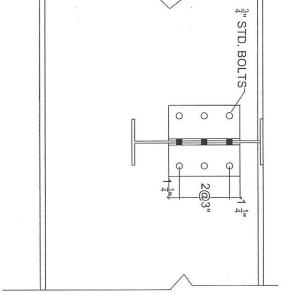
Typical orthogonal sheer		
connection	page 4 of 6	
	page 7 or 0	
c = 6 = 0.382 < 1.0 => f= 2 (<th></th> <th></th>		
c = 6 = 0,438 < 1.0 => K = 2.2 (ho/c) 1.65 = 8.59		
FBC = 262(0 (0,250) 2 (0.764)(8.59) = 57.8 ksi & Fy = 50 ksi Controls		
BMn= ØFy Snet = 0.90 (50)(11.6 in3) = 522 K-in		
\$ Vn = \frac{e}{6.5 in} = \frac{6.5 in}{6.5 in} = \frac{60.3 \text{ K 3 V4 ok}}{10.3 \text{ K 3 V4 ok}}		
- check block shear		
Lev = 2" + 0		
100		
1 - 1 - 1 44 " = 3/4" = 2 "		
1		
"Iz" set back t additional "Is" for design		
from table 9.3a: OFu Ant = 76,2 Klin +		80.
From table 9.36: \$0.6 Fy Asv = 180 Klin		
from table 9.3c: \$0.6 F4 Anv = 120 Klin +		
\$Pn = (76,2 + 170) k/in (0.25 in) = 61.55 K > Vu OK		

	7.		
	Typical orthogonal sheer		
	connection	page s of 6	
	bolt steer and		
	step 4: check bearing I to an angle, beam, and sinder		
	and the second s		
	bolt sheer: drn = 35,8 K = all bolts		
	succession - 22, K C all boils		
	to the second to		
	bearing on angles: using table 7-9 S = 3"	.0	
		2 0	
	$F_{ij} = SP(ks)$	0	
	db = 314" std	3 0	
	prn = 78,3 klin (14 in) (2)		
	↑ # 6 F		
	· poste		
	= 39.15 K & all bilts		
	tear-out on engles; using table 7-s		
	edge dist, Le = 1.25"		
	Fu = SF ks;		
	86 = 3/4"		
	prn = 44 k/m ("14in)(2) = 22 k < bolt 1		
	bearing on beam; using table 7-4		
	SE 3"		
	Fu = 65 kci		
-	db = 3/4" s+d		
	4 and a N. G. att. Little		
	pro: 87.8 K/10 (0.25) = 22 K ← all bolts		
	to the transfer of		
	teor-out on beam: Using table 7-5		
	edge dist, Le = 2"		
	Fu = 65 K=; d b = 3/4"		
	46 = -14		
	Ørn = 87.8 Klin (0.25) = 22 K ← bolt 1		
	ALV - 6.10 E(1) (6.10) : (1)		
	bearing on sirder: using table 7-4		
	S= 3"	111 0	
	Fy = 65 ks;		
	11 - 3/ //	Section of the sectio	
	ab = 214"	06	
	Prn=87.8 Klin (0.460 in) = 40.4 K & all boils		
	1 U = 0 1 L L(U - 100 UL) = 10.4 L C - 011 00112		
	tecr-out on sinder: will not control by inspection		
	Shaer. Will har country by inspection		
	\$ 10 min = 22 k + 22 k + 22 k = 66 k 3 V4 0 K		
	Ul'wild		

Typical orthogonal shear			
Connection		page 6 of 6	
step s: check the connection's spacing	s and edge distance lin	nitatrons	
who were the controlled			
using po. 16.1-122 of AISC stee	I construction menual o	and table 13,4	
connection	Cannes	tion spacing and	
spacing and edge dist.		distance limitations	
spacing between bolds	min. ctr-to-ctr space	ins : 36 = 363/4) = 2,25"	
Shardid yet west anish	between bolts		
edge dist, from etr of	min. edge dist. from	: 1" for 3/4" \$ bolts	
std hole to edge of engles! 1.25"	std. hale to connected	pert	
edge dist. from etr. of std. hole to edge of beam; 2"	of std. have to cannech		
		5 smaller of the thicknesses	
		of the connected	
		Anole t= 1/4 (2) = 1/2"	
		beam tw= 1411 & controls	
The designed connection meets all spacing	, and edge distance him.	tahons	
Final besign:			
wz7x £q	W161.56		g.
0 7141			
1 140 11 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1			
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
26 4x 4x 44			
Control of the Contro	1 1		
-refer to Auto CAD drawing for final details	d desitu		

TYPICAL ORTHOGONAL SHEAR CONNECTION

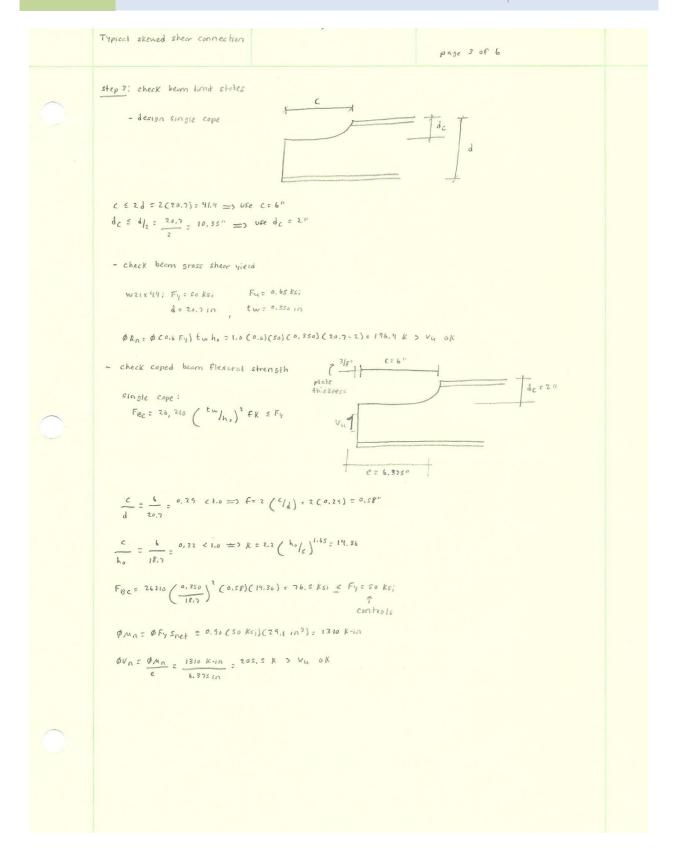




Typical Skewed Shear Connection

- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1		
Typical skewed sheer		
Connection	page 1 of 6	
pesisn a typical skewed shear connection	1	
	info: V4= 81.8 K	
	Beam! WZIX 44	
	Cairder: W24x26	
	plate: A36	
W 21 x 44 35° (72		
W 21 x 44 25° (3		
For besign, use Alse Journal "orthogonal and skew	ed shear connections design and detailing	
requirements" and chop	ter to of Asse steel manual	
limit states:		
Beom!		
- beam gross shear yield (depth of cored beams)		
- coped beam flexural strength		
weld:		
- check min, weld		
- weid reptire		
- base metal		
plate:		
- sheer yield		
- shear rupture - black shear		
- bearing ITO		
botts:		
= bolt shear		
sirder:		
= bearing / To		

Typical skewed shear	
connection	pase 2 of 6
step 1: Design bolts	
1.00	
- bolt sheer	
using table 7-1 in steel monual	
6 Ca = 12.9 4/ 601+	
(bs) †	g = 3 4/2 "
Vu = Pra C # of bolts)	
# of bolts = 81.8K 4.5) = use 6 bolts	0 1 1/4"
17.9 F/bs 1+	0 0 2 0 3"
	0 1 0 + 144"
	<u> </u>
step 2: Design plate	6.
- plate grass shear	
ØVn= ØCO.6F4) C2 Cp tp) ≥ Vu	
7.11	
tp 2 81.8 k = 0.22" => use "ly" thick plate	
1.0 (0.6) (36 \$51)(2)(8.510)	
- shear rupture	
8 = 314" + 415 + 415" = 218"	
Anet = (8.5 - 3x 7/6)(t)(2) = 11.75tp	
Anet = (1.5	
Nn = 0.75 (0.6 Fu) An ≥ Vu	
tp ? 81.8k = 0.27" => use 3/8" thick pla	te
0,75(0.6)(SP Ks;)(11.75) T	
Cathles	
t and the state of	
- check block sheer 17 6" x 218" x 0'-8'12"	1003
teh= 144", Lev=144"	d l
P	9
from table 9.34: \$Fu Ant = 35.3 Klin +	0//
t t	
from table 9.36: \$0.6 Fy Agy = 117 Klin =	
t t	
from table 9.3c: \$ 0.6 Fu Anv = 132 Klin	
\$ Rn = (35.3 + 112) Flor (3/8 in)(2) = 114.2 K > Va OK	
T # of	
block shear	
plones	



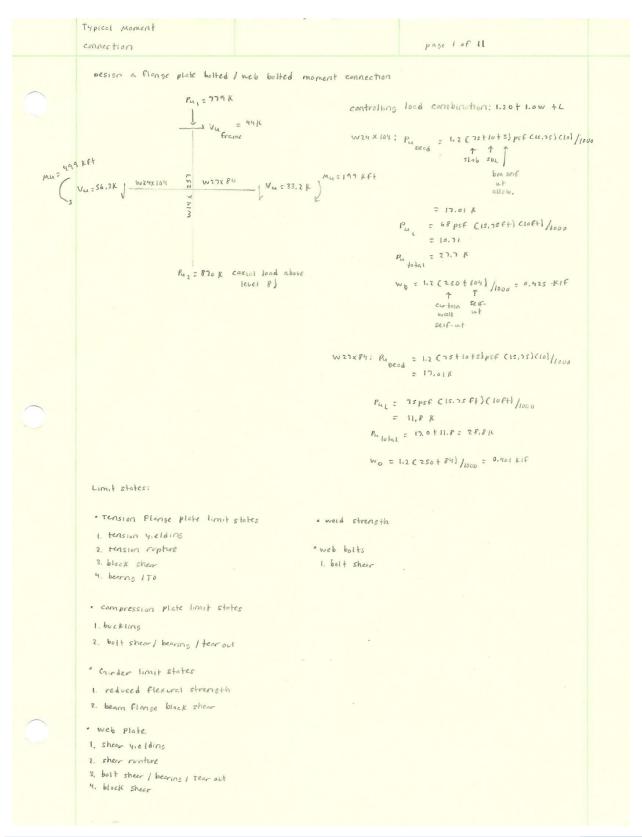
Typical skewed shear		
connection	pase 4 of 6	
Step 4: check bolt shear, bearn 5170 on plate, bearing 170 on sire	der	
bolt sheer: Ørn = 17.9 K/bolt & all bolts		
bearing on plate: using table 7-4	0 1 0	
5 = 3"		
Fy = SP ks;	0 0	
d b = 3/4" std	0 0	
pro= 78.3 1/10 (3/810)		
= 29,9 k 1 bolt & all belts		
teor-out on plate: using table 7-s		
edge dist, Le=1.25"		
Fu: sf Ksi		
\$ 6 2 3/4"		
prn: 49 Klin (3/Pin) = 16.5 Kl bulf & bolts I and 2		
begins on girder; using table 7-4		
Fur 65 kg		
9 P = 3/4"		
-6- 14.		
\$rn = 87,8 k/in (0,440 in) = 38.6 K/ bolt < all bolts	\$	
tear-out on sirder; will not control by inspection		
ØRA = € rni, min = 16.5 + 16.5 + 17.4 + 17.4 + 17.4 + 17.4 = 104.6 k >	VL, OK	
step s:		
- check min. weld		
using table 32.4 in steel manual,		
the mat, thickness of thinner part Joined is the beam with	tw=0.35" 1. min weld size = 3/16"	
- beam web strength at weld		
ΦVn = 0.75 co.6 Fu) (cp - 2 tweld) t ≥ Vu	,	
8.5 - 2 t weld = 81.8 0.75 (0.6)(65) (0.35)		
tweld = 8.0 - 8.5 = 11," => use tweld = 3/16"		

Typical skewed sheer		
connection		pase s of 6
dun: fx 1.352 (f.s-2('14)) = according to "orthogonal and the strength on the acute s size w+s on the obtuse side	89.1 K 3 Va ok skewed shear connections " journal , ide by maintaining a constant file	the Assc method increases t size w while the increased of the sap g and the geometrical
Required orthogonal weld for the designed connection	1/3 p = 3/16" 3 = 1/8" = 3/16" ax	W= 1/4" W+5= 1/4"+ 1/8" = 3/8"
Final besign: Wix44 -> besim	W24x76 Sirder	3/12" O O Z @ 3" Z @ 3" L'14"

	Typical skewed shear connection		page 6 of 6	
	step 6: check the connection's spacing and edge distance limitations using po.16.1-122 of Aisc steel construction manual and table 12.4 (sect 33)			
	Connection Spacing and edge dist. Ctr-to-ctr spacing; between boils;	ed	se distance limitations cing: 3d = 3(3/4") = 2.25"	
	edge dist. from etr of std. : 1.25" hole to edge of plate	std. hole to connected	part part	
		of std. hole to Conne	smaller of the thicknesses of the connected parts plate t = 0.375" beam tw = 0.35" 4 controls	
0	The designed connection meets all spacing and edge distance limitations			
	- refer to Auto CAD drawing for fi	nal defailed design		

TYPICAL SKEWED SHEAR CONNECTION 3" STD. BOLTS

Typical Moment Connection



Typical Moment			
connection		page 2 of 11	
All wide flonge shopes are As All plates are A36 Design moment connection for secondario properties: girder W	the wanx84	, te= 0.640 in, be= 10.0 in, 5x = 213 in	n ³
- check been available flexural assume 2 rows of balts in Afg = bftf = 10 in (0.690 in) = Afn = Afg - 2 (db + 48) tf = 6.	strength standard holes; use 7/8" bolts 6.40 in2 40 - 2 (7/8+ 1/8) (0.640) = 5.12 in 2		
Fy Age = Cho(So ks)(6.40) = 3		eb yield does not control	
· design sheer strength of bolt	14"x 4" x 0" - 9 12", with (3) 7/8"	\$ A325- A bolts and 3/16" Fillet weld	
	= 1.36 bolts < 3 bolts : eK	2 0 2 0 3" 2 0 3"	
φrn = 11.4 Klin best (14) = 33,2 K = 1.45 best 22,4 Klbest	= 22.7 K boilt & all boilts	from table 33.4, for 7/8" botts, min. edge dist = 1"18" use 12/4" and 2 "14" : ak	
• check teor-out φrn = 0.75 (1.2) [1.5-0.5 ΦRn= 13.65 + 22.9 + 22.9 = 5 • plate shear yieldins	E (7/8+ 1/8)] (SF) (1/4) = 13.05 K/bo	it - bolt 1	
	36) (9) (44) = 48.6 K > 33,2 K ?	Þ.F.	

Tural format Consertion	
Typical moment connection	
page 3 of 11	
* plate Sheer rupture	
ΦRn = Φ 0.6 F4 Anu Ahale = C3 bolts) (7/e + 4/e) (44) = 3/4 in2	
= 8.75 (0.6) (58) (1.5)	
= 31.2 K > 32.2 K OK Anv = 1(4) - 3/4 = 1.5 (02	
the state of the s	
· block shear rupture strength of the plate	
Ren = 1.75"	
T930: 0 F. Ant. 540 F.	
T9.3a: # Fu Ant = 54.4 Elin	
E E	
79.36; \$0.6 Fy Asy 121 Flin =	
79.3 b; \$\phi \ 0.6 \ F_V Asy	
10 10	
Teevens.	
T9.3c. 00.6F. Any	
T9.3c: \$0.6F4 Anv = 131 Klin	
t	
PAn=1 (54.4 + 121) = 43,9 K > 33,2 K 1 OK	
4	
· weed strength	
ØRnz 1.392 b. (2)	
= 1.372 (3 sixteenths) (91n) (2) = 75,2 K 5 33,2 K 6K	
- besign tension flance plate and connection	
$F_{f_{11}} = \frac{A_{11}}{d} = \frac{(199 \text{ kft})(12)}{26.7 \text{ in}} = 89.4 \text{ k}$	
d 36,2 in	
Mu	
F _{Cu}	
try a P 1/2" x 8" with 7/8" \$ A-325N boilts, \$rn = 24.3 K/boilt	
, the tip of both	
· bearing on flange	
Pro= (102 Klin) (0.640 in) = 65,3 K bolt > 24.3 K bolt	
7 (10) Flin (0.040 (1)) = 100 1	
France	
table 7-4	
· bearing on plate	
Pro = (91.4 Klin) (0.50 in) = 45.7 Klbst > 24.3 Klbst	
↑	
from	
table	
7-4	
P AA-A	
shear controls: the number of boilts required is: n = Ifu 87.4 K = 3.67 => use 6 boilts	
shear controls : the number of boilts required is : n min = Ffu # 1.4 K = 3.67 => use 6 boilts	

	Typical moment	
	connection	pase 4 of N
	Connection - check florise plate tension yielding $P_n = F_y A_g = (36)(8)(42) = 194 \text{ K}$ $F_{fu} = \frac{Mu}{d+t_P} = \frac{(119 \text{ kft})(12)}{(26.7 + 42) \text{ in}} = 87.8 \text{ K}$ $\Phi P_n = 0.9 (194) = 129.6 \text{ K} > F_{fu} = 87.8 \text{ K} :. \text{ ok to use } 42^{11} \times 8^{11} \text{ plate}$ - check florise plate tension suptime $A_n \leq 0.85 A_g = 0.85 (8_{10})(4_{210}) = 3.4_{10}^2$ $A_n = [b_p - 2(d_b + 116)] t_p = [8-2(718 + 116)](4_{210}) = 3.4_{10}^2$ $A_c = UA_n = 1.0(3_{10}^2) = 3_{10}^2$	pase 4 of N
	PPn = 0.75 Fy Ae = 0.75 (58 Ksi) (3 in2) = 130.5 K > 87.8 K . 6K - check flanse plate block shear	
0 1 1	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
	by inspection, case I is more critical since it results in a smaller black shear area Leh z 1.25", Lev = 1.5"	
	T1.34; 32.6 Flin T1.3b; 121 Flin T1.3c: 131 Flin	
tearn	# of block the planes - check flanse plate but shear / bearns / Tear-out out proz 0.75 (1.2) [1.5 - 0.5 (7/8+ 1/16)] (SF) (1/2) : 26,9 k/belt = bolt shear, pro = 24.3 k/bolt = all bolts	botts 1 and 2
	bearing, Orn = 91.4 Klinfbolt (12) = 45.7 Klbolt & all bolts ORn = 24.3(6) = 145.8 K > 87.8 K 1. OK	

		-		
	Typical moment			
	connection		page 5 of 11	
	- besign compression flanse plate	and connection		
	try 12 "x 8"			
	· flexural buckling		100	
	assume kz 0.65 and Lz 2" (1.5	" edse dist. + "12" set back		
	ki 2/2/21		was all files and all are received all files and all files are seen are seen and all files are seen are seen and all files are seen are seen are seen are seen are seen and all files are seen are	
	r = 0.65(2) = 9 (25 : Fe	r = Fy	1	
			192" 1/2"	
	t _p		L	
	As = (12")(f") = 4 m 2			
	ΦPn = 0.5 (36) (4) = 129,6 K > Fe	1, 2 87.8K 2. 6K		
	A. E. As			
	· check local buckling			
	11 6 51/14	stiffened ecement		
	b= 1/4/1	$\frac{bf}{E_{p}} \le \frac{253}{\sqrt{Fy}}$		
	€p='/,"	tp JE		
	11/14 51/2" 11/4"	$\frac{s.s}{\eta_{\lambda}} \leq \frac{253}{\sqrt{36}}$		
		11 5 42.2 1. OK		
		unstiffened element		
		b & 75		
		CP JEY		
		1,25 = 1,25 \(\frac{45}{\frac{36}{36}} = 15,P	- 0K	
		J36	W 6.	
	- check beam florge black shear			
	11/2 0			
T ,	Year VIIIIII	ten=2'14", Lev=1'12" t9.3a: 85.3 Min T9.7b: 186 Min		
1011 511	+ +10000	+92 , 853 11		
1 '	5- FELL	T9 3h . 186 11		
21/1	" t thunns	T9.36: 168 Klin		
	The same of the sa			
		PRn= (85.3+168) Klin Co.6401	a)=162 K > Ff4 = 87.8K :. OK	

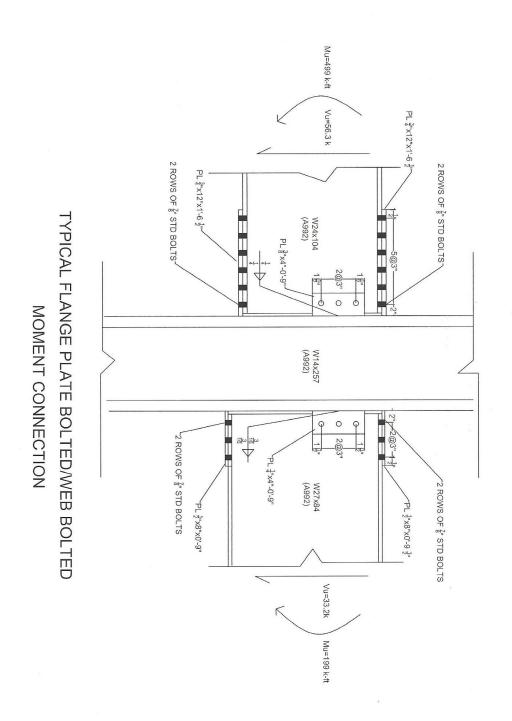
Typical Moment					
connection		page 6 of 11			
besign moment connection for	r wzux lou				
geometrie properties: oirder	weak 104; tw= 0.500 in, d= 24.1	in, tf = 0.750 in , bf = 12.8 in, SX = 258 in 3			
- check beam available flexural st					
assume 2 rows of bolts in st					
Afg = bf tf = 12.8(0,750) = 7.611					
Afn = Afg - 2 (db + 1/8) tf = 7.6	-2 (718+ 48) (0.750) = 5.7 in2				
Fu = 50 = 0.769 < 0.80 : 46	= 1.0				
Fu Afn= 65 ks; (5.7102)= 370.5	K				
46 Fy Afs = 1.0 (50 Ksi) (9.6 in2) =	480 K > 370.5 K :. flonse reptire	I web yield will control			
Mn = Fu An Sx 65(5,7)(258)	9957,2 K-10= 830 Kft				
Mn = Fu An Sx = 65(5.7)(258)	- 2				
φ6Mn = 0.9 (830)= 747 kft > My	: 499 kft 1. ok				
- besign single plate web connect	ian				
		4 A325-N bolts and "14" fillet weld			
· design shear strength of boilts		1.75			
single sheor : from table 7-1	, orn = 24.3k/bolt to all bolts	1'/2"			
# of boits = 56.3 K	2.32 boils & 3 boils : 0/c	0 +			
24.3 K/ balt		203"			
		30			
bearing strength of boilts boilt spacing = 3", from tobi	2-4 · Ar - 91 · 11	1 112"			
and specific a	and the dia				
Pro= 91.4 Kling his C 3/8 in	1 = 34,3 K /bolt - all bolts				
T 64 2 W					
minimum = 1.64 bolts C	3 bolts ! ok				
34,34/6017					
· check tecr-out					
Drn = 0.75(1.2) [1.5-0.5 67/8	+ 1/8)] (SP) (3/8) = 17.6 k/bolt 6	polf 1			
PRn= 17.6 + 24.3 + 24.3 = 68.2	K > V4 = 56.3 K ', 0K				
· plate shear yieldins	17.1				
pan= 1.0 (0.60)(36)(9)(3	18)=72,9 K > 86.3 K % OK				

	Typical Moment			
	connection		page for n	
	110		page 5 51 H	
	f. a life of			
	FF4 2 499 (12) 241 K			
	C24.1+3/4)			
	4	3.		
	φρη = 0.4 (36)(12)(3(4) = 1.1.8 k	> 241 K 2. 0 K to use 3/4" x 12"	plete	
	- check flonge plate tension n	volt - a		
	there was pure the same	Place		
	An & 0.85 Ag = 0.85 (12) (3/4) =	7.65 in 2 controls		
	An=[12,8-2(7/8+1/8)](3/	4) = 8.1 in 2		
	Ac = 1.0 An = 1.0 (7.65 (n2) = 7.65	102		
	ΦPn = 0.75 (SF Ksi) (7.65 in2) = 3	32.8K > 241K : 0K		
	Cl			
	- check flanse plate black shear			
	1.5" = lev			
3,2 5 0	11/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1			
	100000000000000000000000000000000000000	0 000	0 0 0 0	
12" 0 = 5.5"		5-> FEW ////	1/1/1/1/	
	2 4 6 8 10 3	2	Ffu S-> Ffu	
3,25"	10,000000	00	0 0 000	
		And the second s	of the country was about a series of the country of	
	esse 1			0475
		case	420 - 5 (26214) 1 113) C	
	by inspection, case 2 is more a		Anu = 2 [16.5 - 5.5 (718+ 118	
	since it results in a smaller shear area	#10EK		6.5 In 2
	TISCAL AND TH		Ant = (sis - (7/8+ 1/8))	375 in 2
	use leh = 2.75" and leve 1.	\$ 11		
	intebles		DUBS Fu Ant = 146, 9 K	
	T9.34; 97.4 Flin	BRn = 3/4 in (97.9 + 267)(2) = 547.	4 K > 241K DO.6 FU Any = 430.65 K	
	19.36: 267 Flin	† # of	6.6K \$ 0.6 Fy Asy = 401 K	
	T9.30: 287 1/10	Cailure	ORn = 146,9 +401= 547,9 K	
		planes		
	- check florise plate bolt shear 1		Latter Lands	
tear-out	: DLU = 0112 (115) [112 - 0'8 (,16)	116)] (SF)(3/4) = 40.4 K/bolt 6	BOLFS 1 GRA 1	
	bolt shear , prn = 24.3 k/bolt (From table 7-1)		
	T all boils			
	bearing on plate pro = 91.4 kg	bolf (3/4) = 68.6 K/ balt & all boll	ts .	
	prn= 12 (24.3 k/bolf)= 271,6	K > 241 K : 6K		

	Typical moment		
	Frame		pase 3 of 11
	- pesisn compression florse plate and conn	rection	
	try 17 3/9" x 12"		
	- Clause I I		. 1
	oftexeral buckling assume K=0.65 and L=2" (1.5"ed	or dist & 11.11 set beek	
	assume keplos and the time	Se seal. I is set seele	'
	KL = 0.65(2) = 6 < 25 : Far = Fy		
	KL = 0.65(2) = 6 < 25 i. Fer = Fy		12"
	tp		172"
			L
	Ag = (3/9")(12")= 9 in2		
	PPA = 0.9 (36)(9) = 271.6 K > Fac = 241 K 1.	· V	
	eu contra		
	· check tocal buckling		
		stiffered elemen	ŧ
	b= 3 1/4" b= 3 1/4"	bf = 253	
	tp= 3/4"	tr JRy	
	3'14" 1 1 3'14"	£15 € 7.33 €	253 2 42,2 i. oK
	5 1/2 11	3/4	J36
		unshiftened eler	nent
		to s 95	
		/	
		3'/4 = 4.33 = =	95 2 15.8 1. 0 K
		7/4	J 36
	- check been florige black sheer		
T	- 1-1		1
	5.5" 2 4 6 8 12 -> Fan	0 0 0	
12,800	S.S. 1 3 5 7 9 11 5 5 6	111111111111111111111111111111111111111	Ffu Ffu
	2 4 6 8 10 12 -> Ffin	1111111111	all Db
_	3.65"		
	case I	case 2	· ·
	by inspection, case 2 is more	use leh = 2.75 " and le	v = 1.5"
	critical since it results in a		
	smaller block shew orea	Tf.34: 110 Klin	
		19.36: 371 Klin	
		T 9.3c: 322 Min	
		dRn= 0.75 (110 + 322) 1	Klin (2) = 648 K > Ffu = 241 K 1. OK
			# of shear
	floase		plones
	- check bean boil shear bearing I tear-out		
	bolt sheer, orn = 24.3 K/bolt e all bolts		4h - 24 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 -
	bearing, orn = lozk /in/bill Co.75 in)=	76.5 K/ bolt 6 411 bolts	ØRn = 24.3 K / bolt C12)
	from table 7-4		= 271.6 K > 241 K 2.0K
		2 4 160 - 1 116 2 4	- balts I and 2
	teor-out, orn = 0.75 (1.2) [1.5- 0.5(7/8+1	116)] (65) (0.75) = 15, 2 =	- 11 M &

August 1997			
Typical moment			
France		pase to of 11	
besish the column ride shifti member information: Column		= 16", Ec = 1.89", Kdesion = 2.49"	
Tet=2416 24.91 27.21	Tu=87.8K Mulcet = 499 kf Mulcet = 499 kf Mulcet = 199 kf		
column flonge bending: \$\Phi R_n = 0.9 (6.25) to For Fyc = 0.	5 (6.25)(1.85)2 (50) = 1005 K > Tu	= 241K :, do not need half depth shifteress @ 1 and 2 for this loadins condition	
		64.1 K 3 Turisht and Curisht = 87.5K 75.8 K > Turisht and Curisht = 2241K	
		do not need half depth stiffeners el, z, for this limit state	3,014
for "12" thick plate:	tp for this problem 3 (\frac{\ell_b}{d_c}) (\frac{twc}{\ell_c}) 1.5] \frac{\text{EFywtfc}}{twc}		
= 0.75(0.80)(1.18)2 1 + 3 (for 314" thick plate:	16.4 \(\left(\frac{1.8}{1.8} \right) \left(\frac{1.18}{1.86} \right) \) 1.18	depti shff	half
= 1273(1,068)= 1359 K > Cur	isht = 241 K : do not need stiffene	Compn T at 3 Flonse	

Typical Moment	page 11 of 11	
Connection	page of of st	
φρη = 0.9 (24) two JEFyc = 0.9 (24)(1.18) 2 J21000(50) =	de	pth Stifferers
the wilaxes column subjected to the design loads do not require stiffeners	for s t	- this limit ite
- refer to auto CAB drawing for final design		



Appendix E: Construction Management Breadth Analysis

Detailed Superstructure Cost

					STRUCTU	RAL STEEE	L					
					GRAVIT	TY BEAMS						
Bay	Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Span (ft)	Total
28'-6"	05 12 23.75 2700	W16x26	L.F.	174	\$20.50	\$3,567.00	\$4.50	\$783.00	\$2.49	\$433.26	28.5	\$136,323
35'-0"	05 12 23.75 3500	W18x40	L.F.	84	\$55.00	\$4,620.00	\$4.07	\$341.88	\$1.69	\$141.96	35	\$178,634
30'-0"	05 12 23.75 1300	W12x19 *	L.F.	36	\$26.13	\$940.50	\$3.07	\$110.52	\$1.70	\$61.20	30	\$33,367
	05 12 23.75 1300	W12x19	L.F.	72	\$26.13	\$1,881.36	\$3.07	\$221.04	\$1.70	\$122.40	4.5	\$10,012
	05 12 23.75 1300	W12x19	L.F.	24	\$26.13	\$627.12	\$3.07	\$73.68	\$1.70	\$40.80	14	\$10,382
	05 12 23.75 2900	W16x31	L.F.	120	\$42.50	\$5,100.00	\$3.00	\$360.00	\$1.66	\$199.20	30	\$169,776
19'-4"	05 12 23.75 1300	W12x19	L.F.	48	\$26.13	\$1,254.24	\$3.07	\$147.36	\$1.70	\$81.60	19.33	\$28,670
25'-0"	05 12 23.75 1300	W14x22*	L.F.	108	\$30.50	\$3,294.00	\$3.07	\$331.56	\$1.70	\$183.60	25	\$95,229
17'-6"	05 12 23.75 0620	W10x15	L.F.	72	\$20.50	\$1,476.00	\$4.50	\$324.00	\$2.49	\$179.28	17.5	\$34,637
	05 12 23.75 1300	W12x19	L.F.	24	\$26.13	\$627.12	\$3.07	\$73.68	\$1.70	\$40.80	17.5	\$12,978
42'-6"	05 12 23.75 4100	W21x44	L.F.	12	\$60.50	\$726.00	\$3.67	\$44.04	\$1.53	\$18.36	36	\$28,382
	05 12 23.75 4100	W21x44	L.F.	12	\$60.50	\$726.00	\$3.67	\$44.04	\$1.53	\$18.36	31.33	\$24,701
38'-0"	05 12 23.75 3300	W18x35	L.F.	12	\$48.00	\$576.00	\$4.07	\$48.84	\$1.69	\$20.28	33	\$21,289
	05 12 23.75 2700	W16x26	L.F.	12	\$36.00	\$432.00	\$2.07	\$24.84	\$1.50	\$18.00	28.4	\$13,485
	05 12 23.75 1300	W14x22	L.F.	12	\$30.50	\$366.00	\$3.07	\$36.84	\$1.70	\$20.40	23.5	\$9,946
24'-4"	05 12 23.75 2700	W16x26	L.F.	12	\$36.00	\$432.00	\$2.07	\$24.84	\$1.50	\$18.00	24.33	\$11,553
	05 12 23.75 1300	W12x22	L.F.	24	\$30.50	\$732.00	\$3.07	\$73.68	\$1.70	\$40.80	24.33	\$20,595
16'-6"	05 12 23.75 0620	W10x15	L.F.	96	\$20.50	\$1,968.00	\$4.50	\$432.00	\$2.49	\$239.04	16.5	\$43,544
31'-0"	05 12 23.75 2700	W14x26	L.F.	12	\$36.00	\$432.00	\$2.73	\$32.76	\$1.51	\$18.12	31	\$14,969
	05 12 23.75 2700	W16x26	L.F.	72	\$36.00	\$2,592.00	\$2.07	\$149.04	\$1.50	\$108.00	31	\$88,320
	05 12 23.75 2900	W16x31	L.F.	84	\$42.50	\$3,570.00	\$3.00	\$252.00	\$1.66	\$139.44	31	\$122,805
		·								Total Gravity	Beam Cost	\$1,109,598

					GPAVIT	Y GIRDERS				<u> </u>		
_				I							- (5)	
Bay	Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Span (ft)	Total
40'-0"	05 12 23.75 5500	W24x76	L.F.	11	\$105.00	\$1,155.00	\$3.52	\$38.72	\$1.46	\$16.06	40	\$48,391
	05 12 23.75 4900	W24x55	L.F.	11	\$75.50	\$830.50	\$3.52	\$38.72	\$1.46	\$16.06	40	\$35,411
28'-6"	05 12 23.75 4300	W21x50	L.F.	12	\$69.00	\$828.00	\$3.67	\$44.04	\$1.52	\$18.24	28.5	\$25,373
	05 12 23.75 4100	W21x44	L.F.	12	\$60.50	\$726.00	\$3.67	\$44.04	\$1.53	\$18.36	28.5	\$22,469
30'-0"	05 12 23.75 4300	W21x50	L.F.	12	\$69.00	\$828.00	\$3.67	\$44.04	\$1.52	\$18.24	30	\$26,708
	05 12 23.75 4100	W21x44	L.F.	12	\$60.50	\$726.00	\$3.67	\$44.04	\$1.53	\$18.36	30	\$23,652
	05 12 23.75 2700	W16x26	L.F.	24	\$36.00	\$864.00	\$2.07	\$49.68	\$1.50	\$36.00	30	\$28,490
	05 12 23.75 3500	W18x40	L.F.	12	\$55.00	\$660.00	\$4.07	\$48.84	\$1.69	\$20.28	30	\$21,874
	05 12 23.75 1300	W14x22*	L.F.	36	\$30.50	\$1,098.00	\$3.07	\$110.52	\$1.70	\$61.20	30	\$38,092
	05 12 23.75 1300	W12x19 *	L.F.	24	\$26.13	\$627.00	\$3.07	\$73.68	\$1.70	\$40.80	30	\$22,244
	05 12 23.75 4900	W24x55	L.F.	12	\$75.50	\$906.00	\$3.52	\$42.24	\$1.46	\$17.52	30	\$28,973
41'-0"	05 12 23.75 5800	W27x84	L.F.	60	\$116.00	\$6,960.00	\$3.28	\$196.80	\$1.36	\$81.60	41	\$296,774
	05 12 23.75 5300	W27x68	L.F.	26	\$93.50	\$2,431.00	\$3.52	\$91.52	\$1.46	\$37.96	41	\$104,980
24'-0"	05 12 23.75 2900	W16x31	L.F.	25	\$42.50	\$1,062.50	\$3.00	\$75.00	\$1.66	\$41.50	24	\$28,296
30'-0"	05 12 23.75 4100	W21x44	L.F.	24	\$60.50	\$1,452.00	\$3.67	\$88.08	\$1.53	\$36.72	30	\$47,304
35'-0"	05 12 23.75 5800	W27x84	L.F.	12	\$116.00	\$1,392.00	\$3.28	\$39.36	\$1.36	\$16.32	35	\$50,669
44'-0"	05 12 23.75 5500	W24x76	L.F.	12	\$105.00	\$1,260.00	\$3.52	\$42.24	\$1.46	\$17.52	44	\$58,069
										Total Gravity	Girder Cost	\$907,770

				N	OMENT FRAME	A.1 BEAMS/G	GIRDERS					
Bay	Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Span (ft)	Total
28'-6"	05 12 23.75 4300	W21x48*	L.F.	1	\$66.00	\$66.00	\$3.67	\$3.67	\$1.52	\$1.52	28.5	\$2,029
	05 12 23.75 5940	W27x129*	L.F.	2	\$177.38	\$354.75	\$3.39	\$6.78	\$1.41	\$2.82	28.5	\$10,384
	05 12 23.75 5940	W27X146	L.F.	4	\$201.00	\$804.00	\$3.39	\$13.56	\$1.41	\$5.64	28.5	\$23,461
	05 12 23.75 5960	W27X161	L.F.	1	\$221.00	\$221.00	\$3.39	\$3.39	\$1.41	\$1.41	28.5	\$6,435
	05 12 23.75 5960	W27X178*	L.F.	1	\$244.75	\$244.75	\$3.39	\$3.39	\$1.41	\$1.41	28.5	\$7,112
	05 12 23.75 5960	W27X194*	L.F.	1	\$266.75	\$266.75	\$3.39	\$3.39	\$1.41	\$1.41	28.5	\$7,739
	05 12 23.75 6100	W30x90*	L.F.	2	\$123.75	\$247.50	\$3.25	\$6.50	\$1.35	\$2.70	28.5	\$7,316
17'-6"	05 12 23.75 2700	W16x26	L.F.	10	\$36.00	\$360.00	\$2.70	\$27.00	\$1.50	\$15.00	17.5	\$7,035
	05 12 23.75 5940	W27x129	L.F.	8	\$177.38	\$1,419.00	\$3.39	\$27.12	\$1.41	\$11.28	17.5	\$25,505
	05 12 23.75 5940	W27X146	L.F.	10	\$201.00	\$2,010.00	\$3.39	\$33.90	\$1.41	\$14.10	17.5	\$36,015
	05 12 23.75 5960	W27X161	L.F.	8	\$221.00	\$1,768.00	\$3.39	\$27.12	\$1.41	\$11.28	17.5	\$31,612
	05 12 23.75 5960	W27X178	L.F.	4	\$244.75	\$979.00	\$3.39	\$13.56	\$1.41	\$5.64	17.5	\$17,469
	05 12 23.75 5960	W27X194	L.F.	15	\$266.75	\$4,001.25	\$3.39	\$50.85	\$1.41	\$21.15	17.5	\$71,282
	05 12 23.75 6100	W30x90	L.F.	5	\$123.75	\$618.75	\$3.25	\$16.25	\$1.35	\$6.75	17.5	\$11,231
25'-0"	05 12 23.75 5800	W27x84	L.F.	1	\$116.00	\$116.00	\$3.28	\$3.28	\$1.36	\$1.36	25	\$3,016
	05 12 23.75 5940	W27x129	L.F.	6	\$177.38	\$1,064.25	\$3.39	\$20.34	\$1.41	\$8.46	25	\$27,326
	05 12 23.75 5940	W27x146	L.F.	5	\$201.00	\$1,005.00	\$3.39	\$16.95	\$1.41	\$7.05	25	\$25,725
	05 12 23.75 5960	W27x161	L.F.	5	\$42.50	\$212.50	\$3.00	\$15.00	\$1.66	\$8.30	25	\$5,895
	05 12 23.75 5960	W27x178	L.F.	2	\$244.75	\$489.50	\$3.39	\$6.78	\$1.41	\$2.82	25	\$12,478
	05 12 23.75 5960	W27x194	L.F.	4	\$266.75	\$1,067.00	\$3.39	\$13.56	\$1.41	\$5.64	25	\$27,155
	05 12 23.75 6100	W30x90	L.F.	1	\$123.75	\$123.75	\$3.25	\$3.25	\$1.35	\$1.35	25	\$3,209
30'-0"	05 12 23.75 4500	W21x62	L.F.	2	\$85.50	\$171.00	\$3.77	\$7.54	\$1.56	\$3.12	30	\$5,450
	05 12 23.75 5800	W27x84	L.F.	2	\$116.00	\$232.00	\$3.28	\$6.56	\$1.36	\$2.72	30	\$7,238
	05 12 23.75 5940	W27x129	L.F.	7	\$177.38	\$1,241.63	\$3.39	\$23.73	\$1.41	\$9.87	30	\$38,257
	05 12 23.75 5940	W27x146	L.F.	15	\$201.00	\$3,015.00	\$3.39	\$50.85	\$1.41	\$21.15	30	\$92,610
	05 12 23.75 5960	W27x161	L.F.	2	\$221.00	\$442.00	\$3.39	\$6.78	\$1.41	\$2.82	30	\$13,548
	05 12 23.75 5960	W27x178	L.F.	1	\$244.75	\$244.75	\$3.39	\$3.39	\$1.41	\$1.41	30	\$7,487
	05 12 23.75 5960	W27x194	L.F.	3	\$266.75	\$800.25	\$3.39	\$10.17	\$1.41	\$4.23	30	\$24,440
	05 12 23.75 6100	W30x99	L.F.	4	\$136.00	\$544.00	\$3.25	\$13.00	\$1.35	\$5.40	30	\$16,872
								Tota	l Moment Frame A	A.1 Beam/Gird	er Cost	\$575,329

				ı	MOMENT FRAME	B BEAMS/G	IRDERS					
Bay	Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Span (ft)	Total
28'-6"	05 12 23.75 4300	W21x48*	L.F.	1	\$66.00	\$66.00	\$3.67	\$3.67	\$1.52	\$1.52	28.5	\$2,029
	05 12 23.75 5800	W27x84	L.F.	1	\$116.00	\$116.00	\$3.28	\$3.28	\$1.36	\$1.36	28.5	\$3,438
	05 12 23.75 5940	W27x129*	L.F.	2	\$177.38	\$354.75	\$3.39	\$6.78	\$1.41	\$2.82	28.5	\$10,384
	05 12 23.75 5940	W27X146	L.F.	3	\$201.00	\$603.00	\$3.39	\$10.17	\$1.41	\$4.23	28.5	\$17,596
	05 12 23.75 5960	W27X161	L.F.	2	\$221.00	\$442.00	\$3.39	\$6.78	\$1.41	\$2.82	28.5	\$12,871
	05 12 23.75 5960	W27X194*	L.F.	2	\$266.75	\$533.50	\$3.39	\$6.78	\$1.41	\$2.82	28.5	\$15,478
	05 12 23.75 6100	W30x90*	L.F.	1	\$123.75	\$123.75	\$3.25	\$3.25	\$1.35	\$1.35	28.5	\$3,658
35'-0"	05 12 23.75 5800	W27x84	L.F.	1	\$116.00	\$116.00	\$3.28	\$3.28	\$1.36	\$1.36	35	\$4,222
	05 12 23.75 5940	W27x129	L.F.	2	\$177.38	\$354.75	\$3.39	\$6.78	\$1.41	\$2.82	35	\$12,752
	05 12 23.75 5940	W27x146	L.F.	6	\$201.00	\$1,206.00	\$3.39	\$20.34	\$1.41	\$8.46	35	\$43,218
	05 12 23.75 5960	W27x194	L.F.	1	\$266.75	\$266.75	\$3.39	\$3.39	\$1.41	\$1.41	35	\$9,504
	05 12 23.75 6100	W30x90	L.F.	1	\$123.75	\$123.75	\$3.25	\$3.25	\$1.35	\$1.35	35	\$4,492
	05 12 23.75 6100	W30x99	L.F.	1	\$136.00	\$136.00	\$3.39	\$3.39	\$1.35	\$1.35	35	\$4,926
19'-4"	05 12 23.75 5940	W27x129	L.F.	3	\$177.38	\$532.13	\$3.39	\$10.17	\$1.41	\$4.23	19.33	\$10,564
	05 12 23.75 5940	W27x146	L.F.	4	\$201.00	\$804.00	\$3.39	\$13.56	\$1.41	\$5.64	19.33	\$15,912
	05 12 23.75 5960	W27x161	L.F.	2	\$221.00	\$442.00	\$3.39	\$6.78	\$1.41	\$2.82	19.33	\$8,729
	05 12 23.75 5960	W27X178*	L.F.	1	\$244.75	\$244.75	\$3.39	\$3.39	\$1.41	\$1.41	19.33	\$4,824
	05 12 23.75 5960	W27x194	L.F.	10	\$266.75	\$2,667.50	\$3.39	\$33.90	\$1.41	\$14.10	19.33	\$52,491
	05 12 23.75 6100	W30x90	L.F.	2	\$123.75	\$247.50	\$3.25	\$6.50	\$1.35	\$2.70	19.33	\$4,962
	05 12 23.75 6100	W30x99	L.F.	2	\$136.00	\$272.00	\$3.39	\$6.78	\$1.35	\$2.70	19.33	\$5,441
10'-8"	05 12 23.75 5800	W27x84	L.F.	2	\$116.00	\$232.00	\$3.28	\$6.56	\$1.36	\$2.72	10.67	\$2,574
	05 12 23.75 5940	W27x129	L.F.	3	\$177.38	\$532.13	\$3.39	\$10.17	\$1.41	\$4.23	10.67	\$5,831
	05 12 23.75 5940	W27x146	L.F.	4	\$201.00	\$804.00	\$3.39	\$13.56	\$1.41	\$5.64	10.67	\$8,784
	05 12 23.75 5960	W27x161	L.F.	2	\$221.00	\$442.00	\$3.39	\$6.78	\$1.41	\$2.82	10.67	\$4,819
	05 12 23.75 5960	W27x194	L.F.	5	\$266.75	\$1,333.75	\$3.39	\$16.95	\$1.41	\$7.05	10.67	\$14,487
	05 12 23.75 6100	W30x90	L.F.	1	\$123.75	\$123.75	\$3.25	\$3.25	\$1.35	\$1.35	10.67	\$1,369
	05 12 23.75 6100	W30x99	L.F.	9	\$136.00	\$1,224.00	\$3.39	\$30.51	\$1.35	\$12.15	10.67	\$13,515
42'-6"	05 12 23.75 5740	W24x104	L.F.	1	\$143.00	\$143.00	\$3.72	\$3.72	\$1.54	\$1.54	42.5	\$6,301
	05 12 23.75 5760	W24x117	L.F.	2	\$161.00	\$322.00	\$3.72	\$7.44	\$1.54	\$3.08	42.5	\$14,132
	05 12 23.75 5780	W24x146	L.F.	2	\$201.00	\$402.00	\$3.72	\$7.44	\$1.54	\$3.08	42.5	\$17,532
	05 12 23.75 5940	W27x129	L.F.	1	\$177.38	\$177.38	\$3.39	\$3.39	\$1.41	\$1.41	42.5	\$7,742
	05 12 23.75 5940	W27x146	L.F.	12	\$201.00	\$2,412.00	\$3.39	\$40.68	\$1.41	\$16.92	42.5	\$104,958
	05 12 23.75 5960	W27x161	L.F.	4	\$221.00	\$884.00	\$3.39	\$13.56	\$1.41	\$5.64	42.5	\$38,386
	05 12 23.75 5960	W27x178	L.F.	1	\$244.75	\$244.75	\$3.39	\$3.39	\$1.41	\$1.41	42.5	\$10,606
	05 12 23.75 5960	W27x194	L.F.	1	\$266.75	\$266.75	\$3.39	\$3.39	\$1.41	\$1.41	42.5	\$11,541
30'-0"	05 12 23.75 5800	W27x84	L.F.	2	\$116.00	\$232.00	\$3.28	\$6.56	\$1.36	\$2.72	30	\$7,238
	05 12 23.75 5940	W27x129	L.F.	2	\$177.38	\$354.75	\$3.39	\$6.78	\$1.41	\$2.82	30	\$10,931
	05 12 23.75 5940	W27x146	L.F.	4	\$201.00	\$804.00	\$3.39	\$13.56	\$1.41	\$5.64	30	\$24,696
	05 12 23.75 5960	W27x161	L.F.	1	\$221.00	\$221.00	\$3.39	\$3.39	\$1.41	\$1.41	30	\$6,774
	05 12 23.75 5960	W27x178	L.F.	1	\$244.75	\$244.75	\$3.39	\$3.39	\$1.41	\$1.41	30	\$7,487
	05 12 23.75 5960	W27x194	L.F.	1	\$266.75	\$266.75	\$3.39	\$3.39	\$1.41	\$1.41	30	\$8,147
	05 12 23.75 6100	W30x90	L.F.	1	\$123.75	\$123.75	\$3.25	\$3.25	\$1.35	\$1.35	30	\$3,851
	05 12 23.75 6100	W30x99	L.F.	1	\$136.00	\$136.00	\$3.39	\$3.39	\$1.35	\$1.35	30	\$4,222
								Tot	al Moment Frame	B Beam/Gird	er Cost	\$583,416

				1	MOMENT FRAME	C BEAMS/G	IRDERS					
Bay	Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Span (ft)	Total
28'-6"	05 12 23.75 4300	W21x48*	L.F.	1	\$66.00	\$66.00	\$3.67	\$3.67	\$1.52	\$1.52	28.5	\$2,029
	05 12 23.75 5940	W27x129*	L.F.	2	\$177.38	\$354.75	\$3.39	\$6.78	\$1.41	\$2.82	28.5	\$10,384
	05 12 23.75 5940	W27X146	L.F.	3	\$201.00	\$603.00	\$3.39	\$10.17	\$1.41	\$4.23	28.5	\$17,596
	05 12 23.75 5960	W27X161	L.F.	1	\$221.00	\$221.00	\$3.39	\$3.39	\$1.41	\$1.41	28.5	\$6,435
	05 12 23.75 5960	W27X178*	L.F.	1	\$244.75	\$244.75	\$3.39	\$3.39	\$1.41	\$1.41	28.5	\$7,112
	05 12 23.75 5960	W27X194*	L.F.	2	\$266.75	\$533.50	\$3.39	\$6.78	\$1.41	\$2.82	28.5	\$15,478
	05 12 23.75 6100	W30x90*	L.F.	1	\$123.75	\$123.75	\$3.25	\$3.25	\$1.35	\$1.35	28.5	\$3,658
	05 12 23.75 6100	W30x99	L.F.	1	\$136.00	\$136.00	\$3.25	\$3.25	\$1.35	\$1.35	28.5	\$4,007
35'-0"	05 12 23.75 5800	W27x84	L.F.	1	\$116.00	\$116.00	\$3.28	\$3.28	\$1.36	\$1.36	35	\$4,222
	05 12 23.75 5940	W27x129	L.F.	3	\$177.38	\$532.13	\$3.39	\$10.17	\$1.41	\$4.23	35	\$19,128
	05 12 23.75 5940	W27x146	L.F.	5	\$201.00	\$1,005.00	\$3.39	\$16.95	\$1.41	\$7.05	35	\$36,015
	05 12 23.75 5960	W27x161	L.F.	1	\$221.00	\$221.00	\$3.39	\$3.39	\$1.41	\$1.41	35	\$7,903
	05 12 23.75 5960	W27x194	L.F.	1	\$266.75	\$266.75	\$3.39	\$3.39	\$1.41	\$1.41	35	\$9,504
	05 12 23.75 6100	W30x90	L.F.	1	\$123.75	\$123.75	\$3.25	\$3.25	\$1.35	\$1.35	35	\$4,492
19'-4"	05 12 23.75 5800	W27x84	L.F.	1	\$116.00	\$116.00	\$3.28	\$3.28	\$1.36	\$1.36	19.33	\$2,332
	05 12 23.75 5940	W27x129	L.F.	3	\$177.38	\$532.13	\$3.39	\$10.17	\$1.41	\$4.23	19.33	\$10,564
	05 12 23.75 5940	W27x146	L.F.	6	\$201.00	\$1,206.00	\$3.39	\$20.34	\$1.41	\$8.46	19.33	\$23,869
	05 12 23.75 5960	W27x161	L.F.	2	\$221.00	\$442.00	\$3.39	\$6.78	\$1.41	\$2.82	19.33	\$8,729
	05 12 23.75 5960	W27X178	L.F.	2	\$244.75	\$489.50	\$3.39	\$6.78	\$1.41	\$2.82	19.33	\$9,648
	05 12 23.75 5960	W27x194	L.F.	7	\$266.75	\$1,867.25	\$3.39	\$23.73	\$1.41	\$9.87	19.33	\$36,743
	05 12 23.75 6100	W30x90	L.F.	1	\$123.75	\$123.75	\$3.25	\$3.25	\$1.35	\$1.35	19.33	\$2,481
	05 12 23.75 6100	W30x99	L.F.	2	\$136.00	\$272.00	\$3.39	\$6.78	\$1.35	\$2.70	19.33	\$5,441
10'-8"	05 12 23.75 5800	W27x84	L.F.	2	\$116.00	\$232.00	\$3.28	\$6.56	\$1.36	\$2.72	10.67	\$2,574
	05 12 23.75 5940	W27x129	L.F.	2	\$177.38	\$354.75	\$3.39	\$6.78	\$1.41	\$2.82	10.67	\$3,888
	05 12 23.75 5940	W27x146	L.F.	3	\$201.00	\$603.00	\$3.39	\$10.17	\$1.41	\$4.23	10.67	\$6,588
	05 12 23.75 5960	W27x161	L.F.	1	\$221.00	\$221.00	\$3.39	\$3.39	\$1.41	\$1.41	10.67	\$2,409
	05 12 23.75 5960	W27x194	L.F.	12	\$266.75	\$3,201.00	\$3.39	\$40.68	\$1.41	\$16.92	10.67	\$34,769
	05 12 23.75 6100	W30x90	L.F.	2	\$123.75	\$247.50	\$3.25	\$6.50	\$1.35	\$2.70	10.67	\$2,739
	05 12 23.75 6100	W30x99	L.F.	4	\$136.00	\$544.00	\$3.39	\$13.56	\$1.35	\$5.40	10.67	\$6,007
42'-6"	05 12 23.75 5760	W24x117	L.F.	2	\$161.00	\$322.00	\$3.72	\$7.44	\$1.54	\$3.08	42.5	\$14,132
	05 12 23.75 5780	W24x131*	L.F.	1	\$180.13	\$180.13	\$3.72	\$3.72	\$1.54	\$1.54	42.5	\$7,879
	05 12 23.75 5780	W24x146	L.F.	3	\$201.00	\$603.00	\$3.72	\$11.16	\$1.54	\$4.62	42.5	\$26,298
	05 12 23.75 5940	W27x146	L.F.	5	\$201.00	\$1,005.00	\$3.39	\$16.95	\$1.41	\$7.05	42.5	\$43,733
	05 12 23.75 5960	W27x194	L.F.	1	\$266.75	\$266.75	\$3.39	\$3.39	\$1.41	\$1.41	42.5	\$11,541
30'-0"	05 12 23.75 5800	W27x84	L.F.	2	\$116.00	\$232.00	\$3.28	\$6.56	\$1.36	\$2.72	30	\$7,238
	05 12 23.75 5940	W27x129	L.F.	2	\$177.38	\$354.75	\$3.39	\$6.78	\$1.41	\$2.82	30	\$10,931
	05 12 23.75 5940	W27x146	L.F.	4	\$201.00	\$804.00	\$3.39	\$13.56	\$1.41	\$5.64	30	\$24,696
	05 12 23.75 5960	W27x161	L.F.	2	\$221.00	\$442.00	\$3.39	\$6.78	\$1.41	\$2.82	30	\$13,548
	05 12 23.75 5960	W27x194	L.F.	2	\$266.75	\$533.50	\$3.39	\$6.78	\$1.41	\$2.82	30	\$16,293
	05 12 23.75 6100	W30x99	L.F.	1	\$136.00	\$136.00	\$3.39	\$3.39	\$1.35	\$1.35	30	\$4,222
								Tot	al Moment Frame	C Beam/Girde	er Cost	\$487,257

					MOMENT FRAME	E BEAMS/GI	IRDERS					
Bay	Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Span (ft)	Total
28'-6"	05 12 23.75 3900	W21x55*	L.F.	1	\$75.50	\$75.50	\$4.28	\$4.28	\$1.77	\$1.77	28.5	\$2,324
	05 12 23.75 5800	W27x84	L.F.	1	\$116.00	\$116.00	\$3.28	\$3.28	\$1.36	\$1.36	28.5	\$3,438
	05 12 23.75 5940	W27x129*	L.F.	3	\$177.38	\$532.13	\$3.39	\$10.17	\$1.41	\$4.23	28.5	\$15,576
	05 12 23.75 5940	W27X146	L.F.	5	\$201.00	\$1,005.00	\$3.39	\$16.95	\$1.41	\$7.05	28.5	\$29,327
	05 12 23.75 5960	W27X161	L.F.	3	\$221.00	\$663.00	\$3.39	\$10.17	\$1.41	\$4.23	28.5	\$19,306
	05 12 23.75 5960	W27X178*	L.F.	3	\$244.75	\$734.25	\$3.39	\$10.17	\$1.41	\$4.23	28.5	\$21,337
	05 12 23.75 5960	W27X194*	L.F.	4	\$266.75	\$1,067.00	\$3.39	\$13.56	\$1.41	\$5.64	28.5	\$30,957
	05 12 23.75 6100	W30x99	L.F.	2	\$136.00	\$272.00	\$3.25	\$6.50	\$1.35	\$2.70	28.5	\$8,014
								Tot	tal Moment Frame	E Beam/Girde	er Cost	\$130,278
					MOMENT FRAME	1 BEAMS/GI	IRDERS					
Bay	Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Span (ft)	Total
41'-0"	05 12 23.75 5740	W24x104	L.F.	11	\$143.00	\$1,573.00	\$3.72	\$40.92	\$1.54	\$16.94	41	\$66,865
	05 12 23.75 5780	W24x131*	L.F.	1	\$180.13	\$180.13	\$3.72	\$3.72	\$1.54	\$1.54	41	\$7,601
30'-0"	05 12 23.75 3900	W21x55*	L.F.	1	\$75.50	\$75.50	\$4.28	\$4.28	\$1.77	\$1.77	30	\$2,447
	05 12 23.75 5800	W27x84	L.F.	11	\$116.00	\$1,276.00	\$3.28	\$36.08	\$1.36	\$14.96	30	\$39,811
28'-6"	05 12 23.75 5800	W27x84	L.F.	12	\$116.00	\$1,392.00	\$3.28	\$39.36	\$1.36	\$16.32	28.5	\$41,259
40'-0"	05 12 23.75 5740	W24x104	L.F.	11	\$143.00	\$1,573.00	\$3.72	\$40.92	\$1.54	\$16.94	40	\$65,234
										Total Gravity	Girder Cost	\$223,217
				Į.	MOMENT FRAME	1' BEAMS/G	IRDERS					
Bay	Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Span (ft)	Total
35'-0"	05 12 23.75 5800	W27x84	L.F.	3	\$116.00	\$348.00	\$3.28	\$9.84	\$1.36	\$4.08	35	\$12,667
	05 12 23.75 5940	W27x129*	L.F.	7	\$177.38	\$1,241.63	\$3.39	\$23.73	\$1.41	\$9.87	35	\$44,633
	05 12 23.75 6100	W30x99	L.F.	2	\$136.00	\$272.00	\$3.39	\$6.78	\$1.35	\$2.70	35	\$9,852
30'-0"	05 12 23.75 5800	W27x84	L.F.	5	\$116.00	\$580.00	\$3.28	\$16.40	\$1.36	\$6.80	30	\$18,096
	05 12 23.75 5940	W27x129	L.F.	14	\$177.38	\$2,483.25	\$3.39	\$47.46	\$1.41	\$19.74	30	\$76,514
	05 12 23.75 6100	W30x90*	L.F.	2	\$123.75	\$247.50	\$3.25	\$6.50	\$1.35	\$2.70	30	\$7,701
	05 12 23.75 6100	W30x99	L.F.	3	\$136.00	\$408.00	\$3.25	\$9.75	\$1.35	\$4.05	30	\$12,654
24'-0"	05 12 23.75 5800	W27x84	L.F.	3	\$116.00	\$348.00	\$3.28	\$9.84	\$1.36	\$4.08	24	\$8,686
	05 12 23.75 5940	W27x129	L.F.	3	\$177.38	\$532.13	\$3.39	\$10.17	\$1.41	\$4.23	24	\$13,117
	05 12 23.75 5940	W27x146	L.F.	4	\$201.00	\$804.00	\$3.39	\$13.56	\$1.41	\$5.64	24	\$19,757
	05 12 23.75 6100	W30x99	L.F.	2	\$136.00	\$272.00	\$3.25	\$6.50	\$1.35	\$2.70	24	\$6,749
										Total Gravity	Girder Cost	\$230,425

				GR	AVITY COLUN	INS					
Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Span (ft)	Total
05 12 23.75 2320	W14x43	L.F.	23	\$59.00	\$1,357.00	\$3.34	\$76.82	\$1.85	\$42.55	30	\$44,291
05 12 23.17 7350	W14x48*	L.F.	4	\$66.00	\$264.00	\$2.75	\$11.00	\$1.52	\$6.08	30	\$8,432
05 12 23.75 2340	W14x53	L.F.	5	\$73.00	\$365.00	\$3.38	\$16.90	\$1.87	\$9.35	30	\$11,738
05 12 23.17 7350	W14x61*	L.F.	16	\$83.88	\$1,342.00	\$2.75	\$44.00	\$1.52	\$24.32	30	\$42,310
05 12 23.17 7350	W14x68*	L.F.	6	\$93.50	\$561.00	\$2.75	\$16.50	\$1.52	\$9.12	30	\$17,599
05 12 23.17 7350	W14x74	L.F.	2	\$102.00	\$204.00	\$2.75	\$5.50	\$1.52	\$3.04	30	\$6,376
05 12 23.17 7400	W14x82*	L.F.	5	\$112.75	\$563.75	\$2.82	\$14.10	\$1.56	\$7.80	30	\$17,570
05 12 23.75 2380	W14x90	L.F.	8	\$124.00	\$992.00	\$3.65	\$29.20	\$2.02	\$16.16	30	\$31,121
05 12 23.75 6100	W14x99	L.F.	4	\$136.00	\$544.00	\$3.25	\$13.00	\$1.35	\$5.40	30	\$16,872
05 12 23.17 7400	W14x109*	L.F.	4	\$149.88	\$599.50	\$2.82	\$11.28	\$1.56	\$6.24	30	\$18,511
05 12 23.17 7400	W14x120	L.F.	2	\$165.00	\$330.00	\$2.82	\$5.64	\$1.56	\$3.12	30	\$10,163
05 12 23.17 7450	W14x132*	L.F.	4	\$181.50	\$726.00	\$2.96	\$11.84	\$1.64	\$6.56	30	\$22,332
05 12 23.17 7450	W14x145*	L.F.	3	\$199.38	\$598.13	\$2.96	\$8.88	\$1.64	\$4.92	30	\$18,358
05 12 23.17 7450	W14x159*	L.F.	2	\$218.63	\$437.25	\$2.96	\$5.92	\$1.64	\$3.28	30	\$13,394
05 12 23.17 7450	W14x193*	L.F.	1	\$265.38	\$265.38	\$2.96	\$2.96	\$1.64	\$1.64	30	\$8,099
									Total Gravity	Column Cost	\$287,164
				MOME	NT FRAME CO	DLUMNS					
Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Span (ft)	Total
05 12 23.17 7350	W14x43*	L.F.	1	\$59.13	\$59.13	\$2.75	\$2.75	\$1.52	\$1.52	30	\$1,902
05 12 23.17 7450	W14x193*	L.F.	53	\$265.38	\$14,065	\$2.96	\$156.88	\$1.64	\$86.92	30	\$429,260
05 12 23.17 7450	W14x211*	L.F.	19	\$290.13	\$5,512.38	\$2.96	\$56.24	\$1.64	\$31.16	30	\$167,993
05 12 23.17 7450	W14x233*	L.F.	23	\$320.38	\$7,368.63	\$2.96	\$68.08	\$1.64	\$37.72	30	\$224,233
05 12 23.17 7450	W14x257*	L.F.	54	\$353.38	\$19,082	\$2.96	\$159.84	\$1.64	\$88.56	30	\$579,920
05 12 23.17 7450	W14x283*	L.F.	10	\$389.13	\$3,891.25	\$2.96	\$29.60	\$1.64	\$16.40	30	\$118,118
05 12 23.17 7450	W14x311*	L.F.	46	\$427.63	\$19,671	\$2.96	\$136.16	\$1.64	\$75.44	30	\$596,471
05 12 23.17 7450	W14x342*	L.F.	6	\$470.25	\$2,821.50	\$2.96	\$17.76	\$1.64	\$9.84	30	\$85,473
05 12 23.17 7450	W14x370*	L.F.	2	\$508.75	\$1,017.50	\$2.96	\$5.92	\$1.64	\$3.28	30	\$30,801
05 12 23.17 7450	W14x500*	L.F.	1	\$687.50	\$687.50	\$2.96	\$2.96	\$1.64	\$1.64	30	\$20,763
05 12 23.17 7450	W14x550*	L.F.	4	\$756.25	\$3,025.00	\$2.96	\$11.84	\$1.64	\$6.56	30	\$91,302
05 12 23.17 7450	W14x605*	L.F.	2	\$831.88	\$1,663.75	\$2.96	\$5.92	\$1.64	\$3.28	30	\$50,189
05 12 23.17 7450	W14x665*	L.F.	8	\$914.38	\$7,315.00	\$2.96	\$23.68	\$1.64	\$13.12	30	\$220,554
05 12 23.17 7450	W14x730*	L.F.	11	\$1,003.75	\$11,041	\$2.96	\$32.56	\$1.64	\$18.04	30	\$332,756
								Total Mome	ent Frame Colu	ımn Cost	\$2,350,577

					BRACES						
Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Span (ft)	Tota
05 12 23.75 0120	W6x15	L.F.	5	\$20.50	\$102.50	\$4.50	\$22.50	\$2.49	\$12.45	33.54	\$4,61
05 12 23.75 0370	W8x28	L.F.	1	\$38.50	\$39	\$4.91	\$4.91	\$2.72	\$2.72	33.54	\$1,54
05 12 23.75 0500	W8x31	L.F.	6	\$42.50	\$255.00	\$4.91	\$29.46	\$2.72	\$16.32	33.54	\$10,0
05 12 23.75 0520	W8x35	L.F.	1	\$48.00	\$48.00	\$4.91	\$4.91	\$2.72	\$2.72	33.54	\$1,86
05 12 23.75 0900	W10x39*	L.F.	2	\$53.63	\$107	\$4.91	\$9.82	\$2.72	\$5.44	33.54	\$4,10
05 12 23.75 0900	W10x45*	L.F.	3	\$61.88	\$185.63	\$4.91	\$14.73	\$2.72	\$8.16	33.54	\$6,99
05 12 23.75 0900	W10x49	L.F.	6	\$67.50	\$405	\$4.91	\$29.46	\$2.72	\$16.32	35.25	\$15,8
05 12 23.75 0900	W10x77*	L.F.	4	\$105.88	\$423.50	\$4.91	\$19.64	\$2.72	\$10.88	33.54	\$15,2
05 12 23.75 1520	W12x35	L.F.	1	\$48.00	\$48.00	\$3.34	\$3.34	\$1.85	\$1.85	33.54	\$1,78
05 12 23.75 1520	W12x35	L.F.	1	\$48.00	\$48.00	\$3.34	\$3.34	\$1.85	\$1.85	35.25	\$1,87
05 12 23.75 2340	W12x53	L.F.	3	\$73.00	\$219.00	\$3.38	\$10.14	\$1.87	\$5.61	33.54	\$7,8
05 12 23.75 1580	W12x58	L.F.	5	\$80.00	\$400.00	\$3.60	\$18.00	\$2.00	\$10.00	33.54	\$14,3
05 12 23.75 3920	W12x65	L.F.	3	\$89.50	\$268.50	\$4.34	\$13.02	\$1.80	\$5.40	33.54	\$9,6
05 12 23.75 3920	W12x65	L.F.	1	\$89.50	\$90	\$4.34	\$4.34	\$1.80	\$1.80	35.25	\$3,3
05 12 23.75 1700	W12x72	L.F.	1	\$99.00	\$99.00	\$4.22	\$4.22	\$2.34	\$2.34	33.54	\$3,5
05 12 23.75 1740	W12x87	L.F.	2	\$120.00	\$240.00	\$4.22	\$8.44	\$2.34	\$4.68	33.54	\$8,4
05 12 23.75 1740	W12x96*	L.F.	2	\$132.00	\$264.00	\$4.22	\$8.44	\$2.34	\$4.68	33.54	\$9,2
05 12 23.75 3980	W12x106	L.F.	2	\$60.50	\$121.00	\$3.67	\$7.34	\$1.52	\$3.04	33.54	\$4,4
05 12 23.75 2500	W12x120	L.F.	4	\$165.00	\$660.00	\$3.75	\$15.00	\$2.08	\$8.32	33.54	\$22,9
05 12 23.75 1740	W12x136*	L.F.	4	\$187.00	\$748.00	\$4.22	\$16.88	\$2.34	\$9.36	33.54	\$25,9
05 12 23.75 1740	W12x152*	L.F.	2	\$209.00	\$418.00	\$4.22	\$8.44	\$2.34	\$4.68	33.54	\$14,4
05 12 23.75 7600	W12x170	L.F.	2	\$234.00	\$468.00	\$3.39	\$6.78	\$1.41	\$2.82	33.54	\$16,0
05 12 23.75 1740	W12x190*	L.F.	1	\$261.25	\$261.25	\$4.22	\$4.22	\$2.34	\$2.34	33.54	\$8,9
05 12 23.75 1740	W12x210*	L.F.	4	\$288.75	\$1,155.00	\$4.22	\$16.88	\$2.34	\$9.36	33.54	\$39,6
05 12 23.75 1740	W12x230*	L.F.	1	\$316.25	\$316.25	\$4.22	\$4.22	\$2.34	\$2.34	33.54	\$10,8
05 12 23.75 1740	W12x252*	L.F.	3	\$346.50	\$1,039.50	\$4.22	\$12.66	\$2.34	\$7.02	33.54	\$35,5
05 12 23.75 1740	W12x279*	L.F.	2	\$383.63	\$767.25	\$4.22	\$8.44	\$2.34	\$4.68	33.54	\$26,1
05 12 23.75 1740	W12x305*	L.F.	1	\$419.38	\$419.38	\$4.22	\$4.22	\$2.34	\$2.34	33.54	\$14,2
05 12 23.75 1740	W12x336*	L.F.	23	\$462.00	\$10,626	\$4.22	\$97.06	\$2.34	\$53.82	33.54	\$361,
05 12 23.75 2500	W14x193*	L.F.	7	\$265.38	\$1,857.63	\$3.75	\$26.25	\$2.08	\$14.56	33.54	\$63,6
									Total Br	ace Cost	\$764.8

^{*-} the section was unavailable in the RS means, therefore the next higher section was used as a reference. To find the material cost, the sections unit weight was multiplied by \$1.375/lb

COLUMN BASE PLATE CONNECTIONS Cost Code	0.139	Total \$389.58 \$4,562.80 \$4,952 Total 5 \$1,323.44 \$136,884.00 \$138,207
1	0.139	\$389.58 \$4,562.80 \$4,952 Total 5 \$1,323.44 \$136,884.00
Section Sec	connections Area (ft²) 0.0625	\$4,562.80 \$4,952 Total \$1,323.44 \$136,884.00
** Design assumption	onnections Area (ft²) 0.0625 connections	\$4,952 Total \$1,323.44 \$136,884.00
#* Design assumption	onnections Area (ft²) 0.0625 connections	Total \$1,323.44 \$136,884.00
Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Unit Cost Equip. Cost 05 12 23.65 0450 3/4"x12" plate** S.F. 550 \$38.50 \$21,175.00 - <td< td=""><td>0.0625</td><td>\$1,323.44 \$136,884.00</td></td<>	0.0625	\$1,323.44 \$136,884.00
Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Equip. Unit Cost Equip. Cost Code 3/4"x12" plate** S.F. 550 \$38.50 \$21,175.00 - - - - - - - - -	0.0625	\$1,323.44 \$136,884.00
05 12 23.65 0450 3/4"x12" plate** S.F. 550 \$38.50 \$21,175.00 - - - - - -	0.0625	\$1,323.44 \$136,884.00
So	onnections at Area (ft²)	\$136,884.00
** Design assumption	t Area (ft²)	
**Design assumption	t Area (ft²)	V136,207
Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Unit Cost Equip. Unit Cost Equip. Cost 05 12 23.65 0300 3/8"x6"plate S.F. 132 \$19.15 \$2,527.80 -		
Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Unit Cost Equip. Unit Cost Equip. Cost 05 12 23.65 0300 3/8"x6"plate S.F. 132 \$19.15 \$2,527.80 -		
05 12 23.65 0300 3/8"x6"plate S.F. 132 \$19.15 \$2,527.80 - - - - - - -		Total
05 05 23.25 0220 A325-7/8" Φ bolt x 3" long Ea. 792 \$3.20 \$2,534 \$3.43 \$2,717 Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Labor Cost Equip. Unit Cost Equip. Co	0.0156	\$39
Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Unit Cost Equip. Co	0.0130	\$5,251
	t Weight (lb)	Total
05 12 23.40 0400 L4x4x1/4 angle Lb. 5730 \$0.73 \$4,182.90 \$2.73 \$15,643 \$0.28 \$1,604.4		\$141,439
Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Unit Cost Equip.		Total
05 05 21.90 1500 1/4" thick weld L.F. 132 \$0.63 \$83 \$8.20 \$1,082 \$2.43 \$320.75	0.708	\$1,053
Total Skewed Sh		\$147,783
		V2117100
ORTHOGONAL SHEAR CONNECTIONS		
Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Unit Cost Equip. Co	t Weight (lb)	Total
05 12 23.40 0400 L4x4x1/4 angle Lb. 5730 \$0.73 \$4,182.90 \$2.73 \$15,643 \$0.28 \$1,604.4	6.6	\$141,439
05 05 23.25 0220 A325-3/4" Φ bolt Ea. 17190 \$3.20 \$55,008 \$3.43 \$58,962	-	\$113,970
Total Orthogonal S	iear Cost	\$255,409
SKEWED SHEAR CONNECTIONS		
Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Co	st Area (ft²)	Total
05 12 23.65 0300 3/8"x6"plate S.F. 132 \$19.15 \$2,527.80	0.0156	\$39
05 05 23.25 0220 A325-3/4" Φ bolt x 3" long Ea. 792 \$3.20 \$2,534 \$3.43 \$2,717	-	\$5,251
Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Co	t Length (ft)	Total
05 05 21.90 1500 1/4" thick weld L.F. 132 \$0.63 \$83 \$8.20 \$1,082 \$2.43 \$320.76	0.708	\$1,053
05 05 21.90 1800 3/8" thick weld L.F. 132 \$1.05 \$139 \$13.70 \$1,808 \$4.05 \$534.60	0.708	\$1,758
Total Skewed Sh	ar Cost	\$8,101
MOMENT CONNECTIONS		
Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Unit Cost Equip. Co	at Area (ft²)	Total
05 12 23.65 0450 3/4"x12"plate S.F. 1980 \$38.50 \$76,230.00	0.0625	\$4,764
05 12 23.65 0300 3/8"x4"plate S.F. 990 \$19.15 \$18,958.50	0.0104	\$197
05 05 23.25 0365 A325-7/8" Φ bolt x 3"long Ea. 26730 \$4.41 \$117,879 \$3.59 \$95,961	- 0.0104	\$213,840
Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Unit Cost Equip. Cost	t Length (ft)	Total
05 05 21.90 1500 11/4" thick weld L.F. 1980 \$0.63 \$1,247 \$8.20 \$16,236 \$2.43 \$4,811.4		\$16,721
Total Moment Conn		\$235,523
STEEL FLOOR DECK		1
STEEL FLOOR DECK Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Unit Cost Equip. Co	st Area (ft²)	Total
STEEL FLOOR DECK		Total \$985,470
STEEL FLOOR DECK Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Unit Cost Equip. Co	381965	
STEEL FLOOR DECK	381965	\$985,470
STEEL FLOOR DECK	381965 eck Cost	\$985,470 \$985,470
STEEL FLOOR DECK STEEL FLOOR DECK S	381965 eck Cost	\$985,470 \$985,470
STELFLOOR DECK STEL	381965 eck Cost st - 8 -	\$985,470 \$985,470 Total \$52,869
STEEL FLOOR DECK STEEL FLOOR DECK S	381965 eck Cost st - 8 -	\$985,470 \$985,470
STELL FLOOR DECK	381965 eck Cost st - 8 -	\$985,470 \$985,470 Total \$52,869
STELL FLOOR DECK Cost Code Item Units Quantity Mat'l Unit Cost Mat'l Cost Labor Unit Cost Labor Cost Equip. Unit Cost Equip. Cost Code S.F. 1 \$2.01 \$2.01 \$0.53 \$0.53 \$0.04 \$0.04 \$0.04	381965 eck Cost st	\$985,470 \$985,470 Total \$52,869
STELL FLOOR DECK STELL FLOOR DECK STELL FLOOR DECK STELL F	381965 eck Cost st	\$985,470 \$985,470 Total \$52,869 \$52,869
STELL FLOOR DECK	381965 eck Cost st	\$985,470 \$985,470 Total \$52,869 \$52,869

					SHEAR STUD	S	<u> </u>				
Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	-	Total
05 05 23.85 0900	3/4" diameter stud, 6" long	Ea.	25296	\$0.77	\$19,477.92	\$0.89	\$22,513	\$0.43	\$10,877.28	-	\$52,869
								Total	Shear Stud C	ost	\$52,869
				SPRAYED CEN	MENTITIOUS I	FIREPROOFING					
Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Area (ft²)	Total
	flat decking, beams										
07 81 16.10 0700	and columns	S.F.	1	\$0.59	\$0.59	\$0.81	\$0.81	\$0.12	\$0.12	381965	\$580,587
								Total Fireproofing Cost			\$580,587
				E	LEVATED SLA	BS					
Cost Code	Item	Units	Quantity	Mat'l Unit Cost	Mat'l Cost	Labor Unit Cost	Labor Cost	Equip. Unit Cost	Equip. Cost	Volume (y³)	Total
03 31 05.35 0300	Normal wt. concrete ready mix, 4000 psi	C.Y.	1	\$103.00	\$103.00	-	-	-	-	14146.9	\$1,457,126
03 31 05.70 1500	elevated slab, 6-10" thick pumped with crane	C.Y.	1	-	-	\$15.10	\$15.10	\$4.82	\$4.82	14146.9	\$281,805
03 31 05.70	high rise, for more than 5 stories, pumped, add per story	C.Y.	1	-	-	\$1.15	\$1.15	\$0.37	\$0.37	14146.9	\$21,503
								Total Elevated Slab Cost			\$1,760,434
SYSTEM	COST										
B-4 SOG	\$400,000										
Building Foundations											
(footings & strap	\$725,000										
beams)											
Lower level (B-4 to	ć1 200 000 00										
1st flr) foundation walls	\$1,200,000.00										
Columns and elevated	\$3,140,000.00										
decks (B-4 to 1st flr)	\$5,140,000.00										
Misc. subcontractor											
costs (submittals, gen.	osts (submittals, gen. \$250,000.00										
conditions, tower crane,	\$230,000.00										
etc.)											

Note: Refer to final report for total superstructure cost

Appendix F: Acoustics and Lighting Breadth Analyses

Lighting Analysis

PENTRON® T5 FLUORESCENT LAMPS
PENTRON® T5 Imps are designed to operate on dedicated electronic programmed rapid start (also know as programmed start) ballasts only. These lamps are globally standardized and are designed to operate with their peak light output at 35°C (95°F) ambient temperature. For comparison purposes and to accommodate existing lamp measurement standards, ratings are given at both 25°C (77°F) and 35°C (95°F). The new lamp dimensions allow for innovative fixture designs and improved fixture performance

PENTRON® High Performance T5 Lamps

Nominal Wattage	Bylb	Nominal Length (iri)	MOL (n)	Base	Product Number	Ordering Abbreviation	Pkg Qty	Avg Rated Life @3hrs/start (@12hrs/start)	OCT (K)	CRI	Approx Lumen: Initial Mean @25°C/77°F (@35°C/95°F)	
28 Ţ5	T5	48	45.8	Mini Bipin	20868	FP28/830/EC0	40	20000	3000	85	2600 2418 2900 2697	▲ 13133348. 74,76
					20901	FP28/835/EC0	40	20000	3500	85	2600 2418 2900 2697	<u>.</u> 1
					20902	FP28/841/EC0	40	20000	4100	85	2600 2418 2900 2697	₽₽₩3133348 74,76
					22203	FP28/850/EC0	40	20000	5000	85	2545 2367 2840 2641	▲ 31 33 38 48. 74,76
					20990	FP28/865/EC0	40	20000	6500	85	2400 2232 2750 2558	₩ 1353848. 74,76
					20977	FP28RED 40/C8 1/8KU	40	20000			2100	1531,攻果434
					20978	FP28GREEN 40,CS 1/SKU	140	20000			3500	1531,333,44,74
					20988	FP28BLUE 40/CS 1/SKU	40	20000			700	1531,23,24,74
14 T5	Ţ5	24	22.2	Mini Bipin	20907	FP14/830/EC0	40	20000	3000	85	1200 1116 1350 1256	₽ 13 33348. 74,76
					20908	FP14/835/EC0	40	20000	3500	85	1200 1116 1350 1256	♣ 3 31 333848. 74,76
					20914	FP14/841/EC0	40	20000	4100	85	1200 1116 1350 1256	♣ □ 31,333,48, 74,76
				20988	FP14/865/EC0	40	20000	6500	85	1100 1045 1300 1209	♣ □■31 33:38.48. 74,76	
21 T5	Ţ5	36	34	Mini Bipin	20919	FP21/830/EC0	40	20000	3000	85	1900 1767 2100 1953	♣ 11333848 74,76
					20921	FP21/835/EC0	40	20000	3500	85	1900 1767 2100 1953	▲ (14 35 38 48 74.76
					20924	FP21/841/EC0	40	20000	4100	85	1900 1767 2100 1953	₽ ■31 35 35 45. 74,76
					20989	FP21/865/EC0	40	20000	6500	85	1750 1662 2000 1860	▲ □ 31,333,43, 74,76
35	T5	60	57.6	Mini Bipin	20925	FP35/830/EC0	40	20000	3000	85	3300 3069 3650 3394	₩ 1353848. 74,76
					20926	FP35/835/EC0	40	20000	3500	85	3300 3069 3650 3394	♣ ⊠31353848. 74.76
					20927	FP35/841/EC0	40	20000	4100	85	3300 3069 3650 3394	▲ 131 333 334 43. 74,76
PENTE	RON® PI	REMIER	™ Hig	jh Perfo	rmanc	e T5 Lamps						
Nominal Vallage	Bylb	Nominal Length (iri)	MOL (n)	Base	Product Number	Ordering Abbreviation	Pkg Qty	Avg Rated Life @3hrs/start (@12hrs/start)	OCT (K)	CRI	Approx Lumen: Initial Mean @25°C/77°F (@35°C/95°F)	
8	T5	48	45.8	Mini Bipin	20948	FP28/830PM/ECO	40	20000	3000	85	2730 2594 3050 2898	₽ ■ 31 32 33 48. 74,78
					20943	FP28/835PM/ECO	40	20000	3500	85	2730 2594 3050 2898	₽ □ 3133348. 7478

For more complete product information visit www.sylvania.com

Symbols/Footnotes on page 160-165

₽ 3133343

The luminaire/Lamp catalog sheet with selected lamp highlighted can be seen in yellow

20000

4100 85 2730

3050

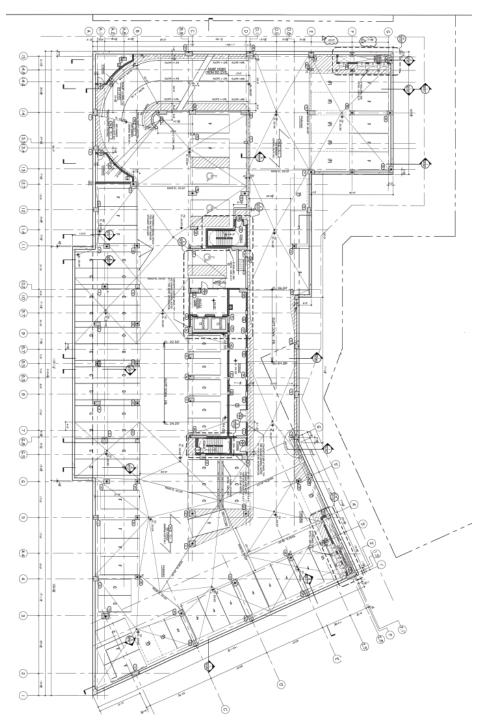
2594

2898

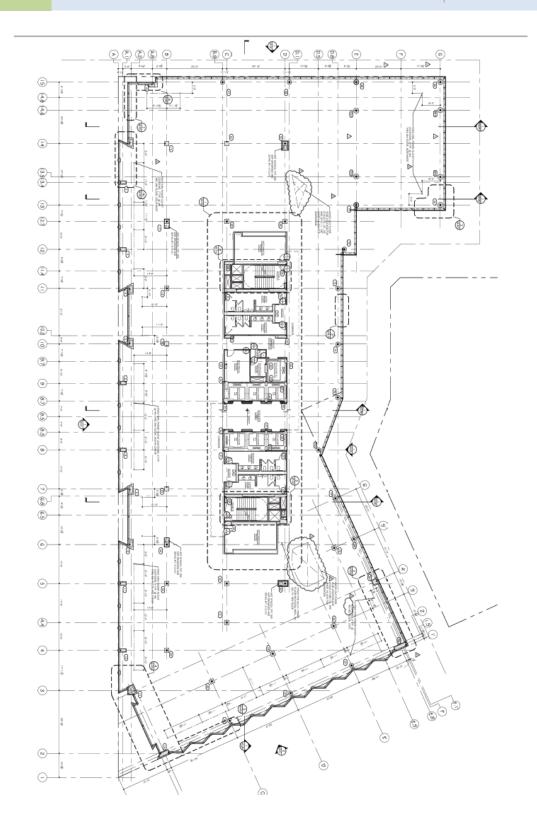
FP28/841PM/ECO

Appendix G: Typical Floor Plans

Existing System Typical Floor Plans and Building Sections

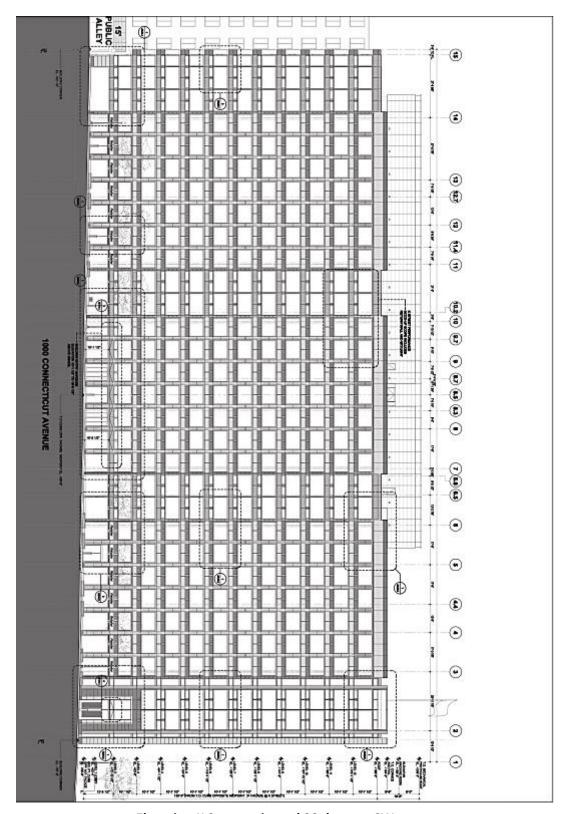


Typical underground parking plan rotated 90 degrees CW *Image obtained from Sheet A2.03 from existing Architectural drawings*



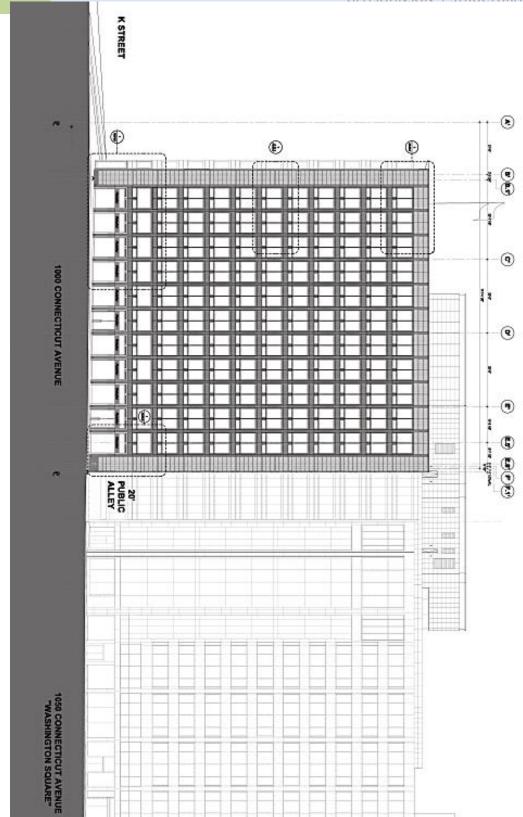
Typical Floor plan oriented 90 degrees CW

Image obtained from Sheet A2.08 from existing Architectural drawings



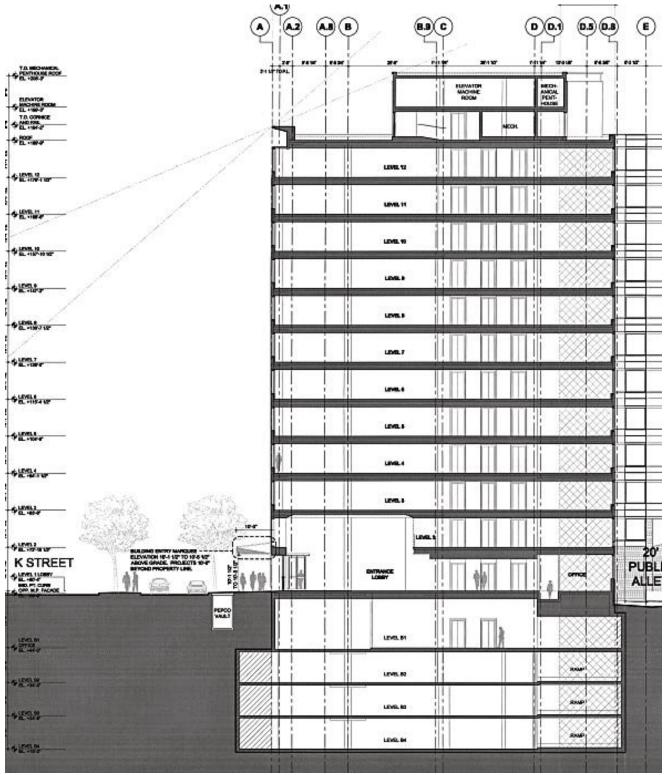
Elevation K Street oriented 90 degrees CW

Image obtained from Sheet A3.01 from existing Architectural drawings



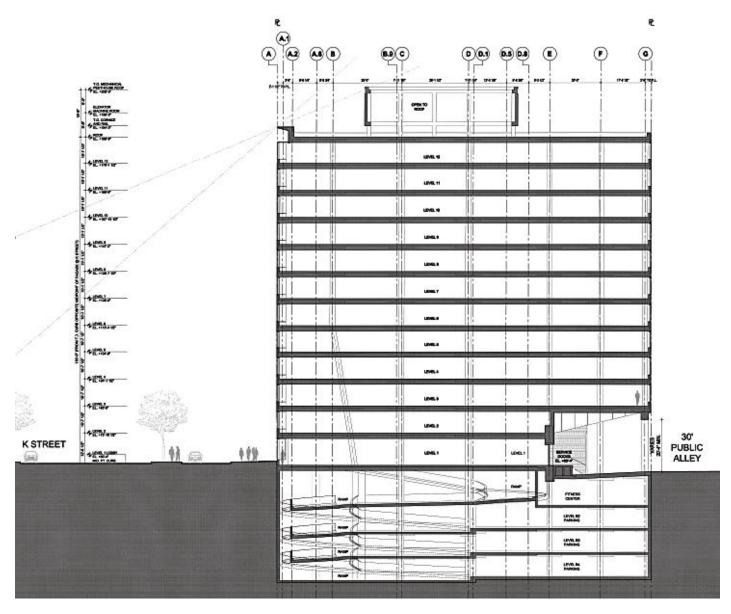
Elevation Connecticut Avenue oriented 90 degrees CW

Image obtained from Sheet A3.02 from existing Architectural drawings



Building section A

Image obtained from Sheet A3.05 from existing Architectural drawings



Building section B

Image obtained from Sheet A3.06 from existing Architectural drawings