Mixed-Use Academic/Parking Structure

A Major Qualifying Project Report

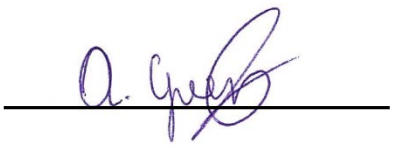
submitted to the Faculty

of the

in partial fulfillment of the requirements for the

Degree of Bachelor of Science

by



Alford Green

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Abstract

This MQP details a steel framing design for a six-story combined academic building and parking garage that is proposed as part of the future space needs of Worcester Polytechnic Institute (WPI). The structure will be located on the eastern end of Gordon C. Library Parking lot on the WPI campus in Worcester, Massachusetts. Various potential design systems and construction materials for the overall building were examined and a three-story steel-framed academic building above a three-story post-tensioned concrete parking garage was selected as the most suitable solution for the client's needs. The building is designed to satisfy WPI's most recent Master Plan and the evolving academic needs of the School of Business, while following Worcester's building permit regulations and applicable building codes.

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Executive Summary: Mixed-Use Academic/Parking Structure

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Worcester Polytechnic Institute

4/30/2013

WPI is a private engineering institution located in the city of Worcester, Massachusetts. Its student population has been gradually increasing over the past few years and as a result, the university's available physical resources have started to become inadequate. WPI has expanded its business department into a School of Business, which is in need of its own building to house classes, faculty and staff.

The increased population has also carried with it an increased lack of availability of parking spaces. A lot of this has been mitigated against with the university constructing a number of parking garages in recent years. There is still a need of parking spaces on campus, so as to make more street parking available to residents in the community. These must however be created in a way that does not restrict future expansion of the academic campus.

This MQP proposes constructing a six-story combined academic building and parking garage on the current library lot. It will satisfy WPI's most recent Campus Master Plan and the evolving academic needs of the School of Business, while following Worcester's building permit regulations and applicable building codes.

The proposed design is a mix of contemporary office space and older New England veneer that matches the surrounding buildings. There are approximately 400 parking spaces, 36 offices, 6 tech suites, 4 classrooms, 3 lecture halls, a spacious lobby area, a cafeteria and a green roof. The building also has low-flush urinals and toilets, hybrid charging stations, designated spaces for hybrid and carpool vehicles and bicycle racks. The current library lot is proposed to be turned into a green area with a brick-paved walkway that will feature as part of the WPI Arts Walk and have lighting, seating and modern artwork.

Introduction

WPI is a private engineering institution located in the city of Worcester, Massachusetts. The Institute offers over 50 undergraduate and graduate degree programs in a variety of departments. The Institute's project-based curriculum requires all students to complete at least three rigorous projects that often involve solving real life problems. The advantage gained from such an education has created great demand for a WPI degree. According to "WPI Achieves Record-Breaking Number of Undergraduate Applications", applications to WPI's undergraduate program have increased by 49 percent over the past five years. This growth has indirectly led to severe on-campus parking shortages and has put a strain on the amount of available academic space.

WPI has made efforts to alleviate the parking crisis. The Institute made the decision to construct parking structures with the new East Hall and Gateway Park buildings. However, the interview with Alfredo DiMauro gleaned that approximately four hundred more parking spaces are needed to bring the number to acceptable levels. Although it is not explicitly outlined where parking structures are to be constructed, the university's Master Plan of development admits that there is a need for a new parking structure.

In addition, WPI's School of Business plans to double its undergraduate and graduate student body within the next 3-5 years. According to Karen Hebert-Maccaro, the School of Business currently has 41 full-time faculty, which teach an increase of about 135 graduate students each year. The School of Business' administrative office is currently in Washburn Labs, while its sub-branches and academic spaces are located in a number of other locations. It is already facing challenges in providing academic spaces for its current student body. Although the majority of the School of Business' classes occur in the evenings and on the weekend, when classroom demand is not as high, the increase in students has already placed a strain on the school's resources.

The Master Plan, revised in the year 2003, details the expected population size and proposed lot-usage. The George C. Gordon Library's parking lot on Boynton Street has been identified as a part of the university's "Core Academic and Administrative Campus" (CAAC) zone and is to host a future building for WPI's School of Business. From preliminary analysis, it was concluded that a structure designed for parking and academic space for the School of Business would be in line with the Master Plan's goal of reducing the parking issue and keeping the library's lot within the CAAC, as well as providing additional academic facilities that would fulfill the School of Business' needs.

The following sections of this report outline the challenges that are considered in the design, a proposed architectural layout of the building, and a structural steel design of the academic portion.

Background

WPI Vision and Master Plan

According to the president's office, WPI will increase its undergraduate enrollment to 3500 and increase the graduate enrolment from 1000 to 1600 students by the year 2015. President Berkey seeks to establish WPI as a leader in global technological education and to develop WPI's position as a national university, while at the same time expanding WPI's educational resources and enhancing the quality of academic programs. Other mentioned plans are: to develop campus facilities according to an explicit plan for supporting academic and co-curricular needs and property maintenance, improve alumni relation and develop non-traditional sources of revenue to strengthen the university financially and keep WPI affordable.

Although the goals stated above may not directly affect this project, they create a need for it. An in increase in the number of students will increase the demand for additional academic facilities and on-campus parking. WPI has constructed and renovated several new academic and residential buildings in the past eight years. Examples of these projects are the Bartlett Center, East Hall residential building and parking garage, Gateway Park academic space and parking garage, and the new Recreational Centre of Excellence on the west side of the campus, which will open in Fall 2012. As a result of a policy enacted in 2007 and mentioned in "WPI Rated Environmentally Responsible…", WPI moved to have all the new buildings listed above be environmental friendly and LEED-certified. In addition to these improvements, President Berkey also desires to renovate Kaven Hall, Stratton Hall, Alumni Gym and the Gateway project center as well as increase and renovate the residence halls so that they can accommodate 70% of the undergraduate student body. According to "WPI Plans to Build First 'Rooftop Field'…" there is also an ongoing plan for an underground parking facility under the softball field on the west side of campus that will hold 534 vehicles.

The decision to build the new parking lot under the softball field may help the current parking issues, but it is felt that as the school grows there will be additional needs for parking space. When the school reaches its maximum expected number of enrolled students, there will be demand for at least 2200 on-campus parking spaces. Adding the new parking lot under the softball field brings the total available parking spaces to 1200. Having the additional 400 parking spaces under the School of Business, as recommended by this project, will ease the parking needs on the eastern side of the campus.

To better understand WPI's vision, Mr. Alfredo (Fred) DiMauro—WPI's Assistant Vice President of Facilities— was interviewed. According to Mr. DiMauro, WPI facilities and President Berkey developed a master plan in 2003. This plan provided an outline as to how WPI would expand and explained the uses of the land that WPI currently owns and how they want to transition into the surrounding neighborhoods. The Master Plan seeks to eliminate parking from

around academic buildings in the center of campus, except for visitors, handicapped needs and deliveries. This would create a more pedestrian friendly campus.

Mr. DiMauro indicated that WPI is seeking to designate certain areas for specific purposes. WPI is aiming to keep all academic and administrative buildings within the boundaries of its Core Academic and Administrative Campus. This is bordered by Boynton Street, Institute Road, Salisbury Street Goddard Hall, Olin Hall, Higgins Laboratories, and Alden Memorial. This was a very important piece of information that in-directly impacts the Library Parking Lot- the focus of the project.

He pointed out that the Civil Engineering department has out-grown Kaven Hall and that a building built on the northern end of the library parking lot could interfere with any future expansion of Kaven Hall. This means that any new building on the site of the library parking lot will have to be constructed on the southern end.

Mr. DiMauro also emphasized that WPI has a commitment to making the campus more sustainable. He indicated that the Arts Walk, which runs between East Hall and Founders Hall, should continue unobstructed across Boynton Street and up the hill. The Arts Walk is an attractive landscaped pathway that will connect the main campus to the Worcester Art Museum and other important buildings in the area. He also stated that it would be beneficial to have a covered walkway to the top of the hill. This would provide a safe passageway for pedestrians in the winter, especially with the snow and ice on the walkways.

In conclusion, Mr. DiMauro said that there would be access to blueprints of East Hall and its parking garage through the Department of Facilities. This interview helped to establish that WPI is seeking to:

1. Keep the library parking lot an academic area.
2. Have the School of Business building in the library parking lot.
3. Increase the parking capacity on the east side of campus.
4. Continue the Arts Walk.
5. Keeping the access road from Boynton Hall to the lower level of the library and Boynton St.
6. Have all new buildings be sustainable or LEED certified.
7. Shift parking from on the surrounding streets to on-campus parking lots.

Because WPI is planning to construct a business building in the library parking lot, it was decided that more research should be done on the School of Business's specific needs. An interview with Ms. Karen Hebert-Maccaro— the Associate Dean of the School of Business— was scheduled. From this interview, the following general goals and needs of the School of

Business were identified:

1. One Building that contains the entire School of Business.
2. Expand to approximately 350 students in 3-5 years.
    - Doubling graduate program size
3. Consist of thirty-three total full time faculty in 3-5 years.
    - Each will have their own office
4. Seven staff members in 3-5 years
    - Accommodated in a cubicle area
5. At least one class room for 70 students.
6. At least four class rooms for 30-50 students.
7. Possibly one computer lab or classroom designed for laptop use.
8. Six small (12-person capacity) conference rooms.

All of these points will be taken into consideration in the proposal and design to accommodate the School of Business' needs.

Project's Solution

The project seeks to provide a two-fold response to two of WPI's needs: 1) An increase in on-campus parking capacity and 2) An academic building for the School of Business. The first part of the project seeks to create approximately 400 spaces in a parking garage. The second part of the project will create an academic building for the School of Business above the parking garage, thus utilizing the space more efficiently. An added benefit resulting from this configuration is that the remaining area of the library parking lot can be converted into a green space. This space can be used for outdoor recreational activities. This would fulfill WPI's goal of creating more green space and give students on the east side of campus a place to do outdoor recreation. Keeping the School of Business on campus will also give it a more campus feel compared to Gateway, which is a business park.

Project Specifications for Architectural Design

The proposed building will have a number of features which meet the needs of the expanding School of Business and WPI's Master Plan. The features of the academic section include:

- Six small (12-person capacity) conference rooms/tech suites
- Four (50-person capacity) classrooms
- Three (70-person capacity) lecture halls
- Thirty-six offices

The Master Plan requires that approximately 400 parking spaces be created and that any new building be of LEED certification. This building will meet both of these requirements and attempt for LEED-NC (New Construction) Gold certification by having the following features:

- Approximately 400 parking spaces
- Solar-powered lighting
- Green roof
- Sub-grade rainwater storage
- Ten percent preferred parking spaces for hybrid vehicles
- Hybrid plug-in stations
- Five percent parking spaces for carpool vehicles
- Bicycle spaces
- Handicapped-accessible parking spaces
- Replacement of impervious surfaces with green spaces

Project Site Evaluation

WPI has a rather uniquely configured campus because of Boynton Hill. The proposed area of the project is located on the southeast corner of WPI's main campus area (Fig. 1).

A

B

Figure 1. The proposed location of the mixed-use structure on the WPI campus. (A) A topographical map (Oliver: MassGIS Online Data Viewer) of the surrounding area with the structure's footprint indicated by the blue shaded rectangle and yellow star. (B) An aerial view of the proposed site demarked by the yellow rectangle. The current access roads are displayed (Google Maps).

The building's footprint runs from the corner of the Boynton Street-Institute Road intersection to the midpoint of Boynton Hill on the south side of the WPI library. The footprint has dimensions 123 feet by 262 feet. The 262-foot dimension would run adjacent to Boynton Street.

A very important consideration in the design is how to preserve the WPI emergency access road, Skull Tomb, and Coons walkway. The access road is essential to WPI and must be preserved for fire safety and emergency reasons. With the proposed building location, the construction will possibly obstruct the access road in two areas. Therefore, the access road will have to be re-routed to the northwest before beginning construction. Another consideration that must be made is how the construction and building will affect the Skull Tomb. The Skull Society has existed since 1911 and is heavily integrated in WPI folklore. The Tomb is the meeting place of the society. Therefore it is essential that proper consideration is made of the Skull Tomb. The site includes the Skull Tomb in its south-most region and will not be affected. Finally, the Coons Walkway up the southern side of Boynton Hill provides students from

Institute and Founders Halls with a route to campus. This path will be preserved and enhanced with paved walkways, seating, green areas and lighting. Also, a new path from Kaven Hall to the structure will be created.

Geotechnical Evaluation

Foundation design is an important part of any structural design. The existing soil conditions of the site are taken from 1998 soil tests and other regional data. During the 1998 test, 10 borings were taken drilled and analyzed by Haley & Aldrich INC. from Cambridge, MA (Fig. 2). The parking lot is at an elevation of 502 ± 2 ft above sea level.

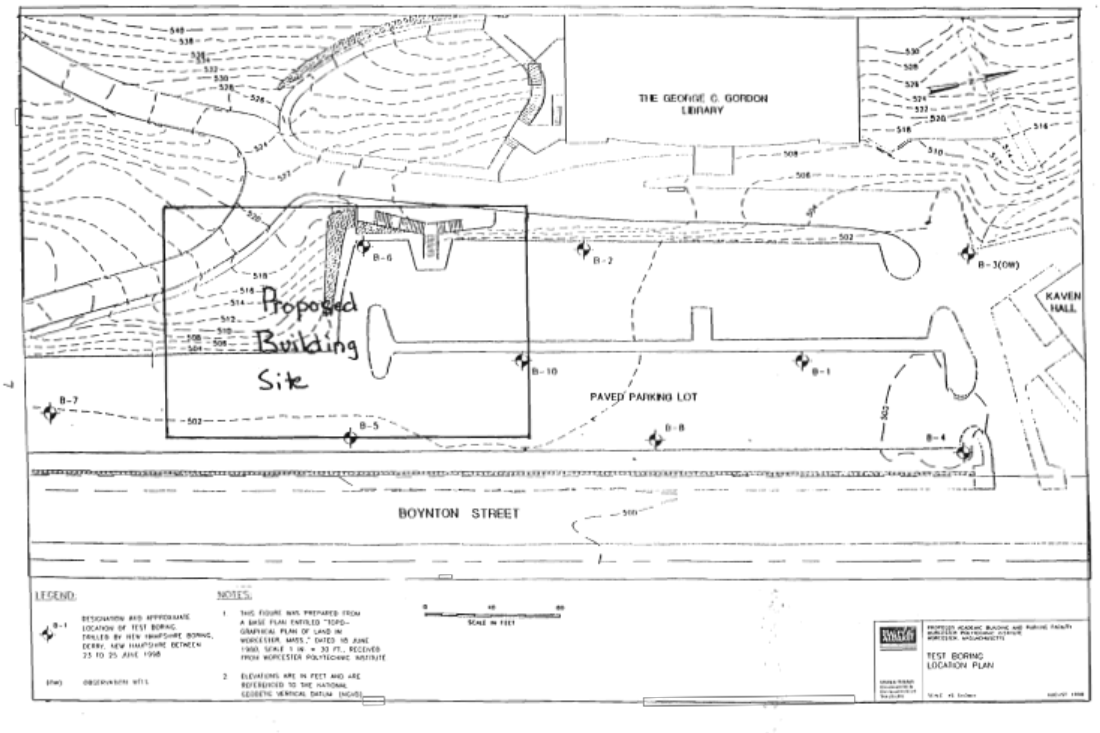

Figure 2. The location of the borings taken and analyzed in the Haley & Aldrich geotechnical report. Borings B-5, B-6 and B-10 are within the proposed area of the site of the structure.

The results of the soil survey showed that the site consists of glaciofluvial and glaciolacustrine deposits. The geotechnical report identified that the glaciofluvial deposits consisted of “medium dense to very dense light brown to olive grey coarse to fine sand with varying amounts of silt, coarse to fine gravel, cobbles, and boulders". It stated that deposits consisted of “loose to medium dense yellowish orange to tan salty fine sand to fine sandy silt with varying amounts of medium to coarse sand and fine gravel”. The above soil characteristics will be used to find the allowable bearing capacity of the soil, which will in

turn be used to calculate the minimum required area of the footings.

Sustainable Development

Sustainable development has many definitions and it is not just an environmental concept. What is sustainable for one group of people may not be sustainable for another. For some people, the idea of sustainable life can be living longer, maintaining well-being or, it can just be the capacity to endure. Sustainable development focuses on triple bottom line: economic, environmental, and societal. Brundtland defines sustainable development as that which meets a current need without limiting the ability of future needs to be met. While the definition above is internationally accepted, the reaction to it is different in every region and good practices for sustainable construction may not be the same for all societies around the world. Therefore, the developed rating systems and techniques used will differ. In an effort to a refer sustainability ideas in the United States, the topic of sustainable constructions and green buildings have been introduced. It offers to look into the life of typical constructions and buildings in any part of the developed world and implement better sustained ideas. Sustainable Construction is any type of construction (office buildings, railroads, highways, etc.), while green building focuses on improving vertical constructions. Energy efficiency is a high priority in many countries, especially cold countries like US. Consuming less energy greatly affects the economy as well as the environment. In-order to improve energy efficiency in vertical buildings US green Building Council (USGBC) developed the Leadership in Energy and Environmental Design (LEED) in 1998. It's intended is to provide building owners and operators a strategic outline on how to design, construct, operate and maintain practical and measurable green buildings. Since its start LEED Projects have grown substantially and as of October 6th 2011 there are about 35000 participating projects and over 1.5 billion square feet of LEED Certified Commercial Buildings in 90 countries. As of 2011 most companies and institutions require their new buildings to be LEED-Certified.

In February 2007, WPI's Board of Trustees voted to adopt a policy calling for all future buildings on campus to be environmentally friendly and LEED-certified structure projects. As a result of this policy there are currently two Gold-level LEED-Certified Residential and Office Buildings, as well as two other to-be LEED-Certified Buildings currently under construction. Since WPI require all its new buildings to be LEED-Certified, it was decided that the new parking lot and academic building should aim to be LEED-Certified Gold. The reasons for this decision are mentioned below.

LEED-NC 2009

Leadership in Energy and Environmental Design (LEED) is an internationally recognized green building certification system. LEED standards provide strategies and techniques intended
to improve performances such as energy savings, water efficiency, CO_2 emissions reduction,

improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts. While LEED-Certification system is a part of USGBC's 'Green Building Certification Institution – GBCI' it still operates independently in order to deliver un-influenced and unbiased conclusions.

LEED-NC 2009 Rating System

The LEED-NC 2009 rating system is the latest system delivered by USGBC. It covers most commercial, institutional and industrial projects and includes residential construction of facilities of four or more stories. In LEED 2009 there are 100 possible base points plus an additional 10 points for two other categories. The Base points are distributed between the five main categories such as, Sustainable Sites, Energy and Atmosphere, Materials and Resources and indoor Environmental Quality, while the additional points are for Regional Priorities and Innovative design. None of the credits are mandatory Besides the 8 prerequisites in LEED 2009. The credits are worth a certain number of points and a combination of credit points add up to a certain level of Certification. Under the LEED-NC 2009 system commercial buildings can receive four different levels of certification (i.e. Platinum, Gold, Silver and Certified).

LEED-NC 2009 Registration

The LEED-NC 2009 Registration Documents and forms are all online at www.GBCI.org. The Process to register a new construction project is straight forward and it is designed in a visually interactive way to ease the process for users. The Registration of a new project costs USGBC members a flat fee of $900 and it is $1200 for non-members. After Registering a Project an application and examination process follow, and certification is awarded after that process is completed. To achieve any sort of certification through the LEED-NC program, the finished building must be looked over by a LEED Accredit Professional and a LEED Green Associate.

Architectural Design

The design for the proposed building is to have an above ground parking garage with an academic building above it. The parking garage will consist of three stories and will be constructed out of cast-in-place concrete. The building above the garage will consist of three stories as well and provide office and classroom space to the School of Business at WPI.

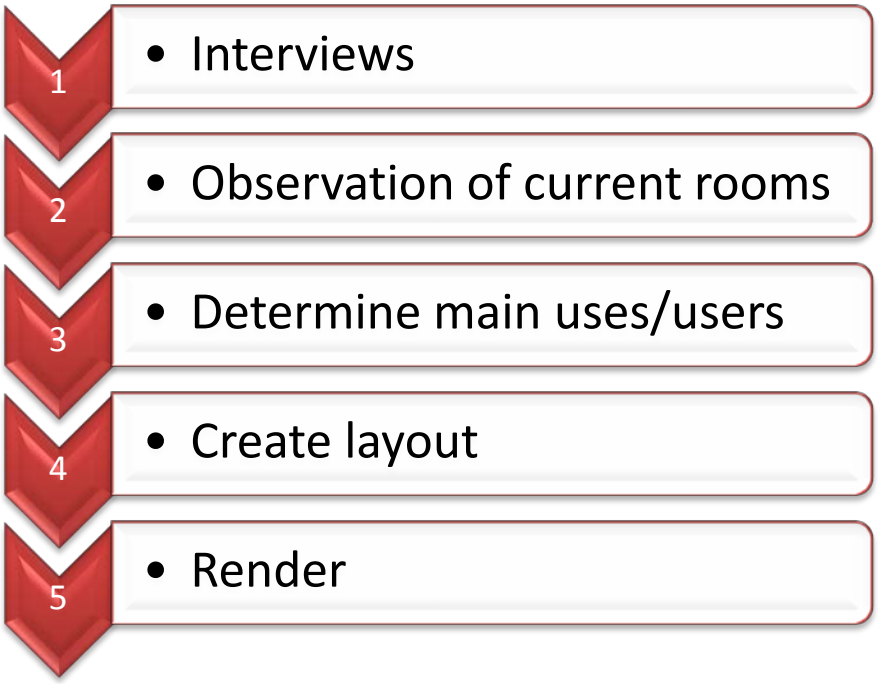

Figure 3. A series of steps were taken in arriving at the final architectural design.

In determining the layout of the academic space, a number of steps were taken (Fig. 3). The space requirements for the School of Business were first determined by interviewing the Associate Dean of the school. Once this was done, the ideal specific uses of each floor were identified. It was determined that the main/first floor should host the classrooms, lecture halls and tech suites, because they would be the most frequently trafficked by students and faculty. This would reduce the load requirements on the upper floors and make for easier exit in the event of any emergency. The second and third floors would mainly have the faculty offices. These floors would be removed from the main floor where there would be many people in transit, which would lead to more disturbances for the faculty in their offices. This layout also adds to the business feeling that the School of Business would want to foster; the higher management would be located on the upper floors. Since the main dining options that are available throughout the day are on the other side of campus, the addition of a cafeteria would be greatly welcomed. The cafeteria patio with partial green roof was decided upon so as to add to the aesthetic and sustainable characteristics of the building. It was determined that

a cafeteria patio with partial green roof facing the campus locations of higher elevation would prove to be more pleasing than a traditional roof or even an ordinary green roof.

The green roof was decided upon to greatly reduce the heating and cooling costs of the structure and to more align the building with WPI's Master Plan. Green roofs can more than half the temperatures of rooftops. Research of prior WPI studies on green roofs indicated that four- inch modular extensive roofs provided the most cost-effective option. Extensive roofs as opposed to intensive (of six-inch and greater depths) may cost 50% less and achieve very similar insulator effects.

The next step was to determine the sizing and layout of the different rooms on each floor. The room sizes were decided upon after examining those of other buildings on campus (Table 1).

Table 1. The size of each of the rooms was determined after examining the dimensions and capacities of current WPI rooms.

Room	**Size**
Classroom	27 ft. x 30 ft.
Lecture Hall	36 ft. x 40 ft.
Tech Suite	18 ft. x 20 ft.
Office	18 ft. x 15 ft. 18 ft. x 25 ft. 18 ft. x 30 ft.

The rooms were placed towards the periphery of the floors so as to capitalize on the natural light hitting the building. The configuration of the rooms- sizes and layout- was modified after the proposed steel design was done, so as to mesh both designs.

Architectural models of the entire structure were made. The process began with using AutoCAD software to draw the layout of the different floors. Each floor and construction material was placed on a separate layer. This was then imported into Revit software, which was used to generate 3D models of the building's architectural features. The design was constructed over the imported AutoCAD drawing. It was designed from the base upwards in the secondary order of walls, floors, and doors and other fixtures. The results of this are located in the Renderings section (Figs. 5-21).

Structural Design

This section details the steps that were taken to arrive at the final structural design (Fig. 4). The layout of the beams and columns of the structure was first determined based on the architectural design (Figs. 22-26).

The relevant Massachusetts, IBC and AISC codes were researched. This information was used to develop a spreadsheet for calculating the total factored loads, moments, horizontal shear, and deflections, which were used with the AISC Manual to determine the size of the columns and composite beams and the number of shear studs in each beam. The spreadsheet contained cells that were linked based on how their results factored into the calculations of others. This is available in the Appendix.

Although calculations were not made for lateral deflections, engineered diagonal bracings along each of the four outer walls should be adequate. Additional structural analysis will have to be done to determine the size of the bracings.

For the purpose of examining the composite action of the decking, slab and supporting beams, the deck was taken to be perpendicular to the beams. Also, the concrete used for the slab is of a lightweight mix. It weighs 115 pounds per cubic foot (pcf). The strength of the concrete was taken to be 4 kips per square inch (ksi), the yield strength of the steel used to make the beams was 36 ksi; and the steel's modulus of elasticity was 29000 ksi [wc = 115 pcf, f'c = 4 ksi, fy_steel = 36 ksi, E = 29000ksi]. All of these parameters- in addition to a few that are soon to be defined- were used to determine the moment capacity of each member, the maximum moment in each member, the maximum shear in each member, the number of shear studs required for full composite action and the deflection of each member, which is compared to the maximum allowed deflection for that member. For the ease of presentation, all of these figures and calculations were compiled in a Microsoft Excel spreadsheet, which has been placed in Appendix B.

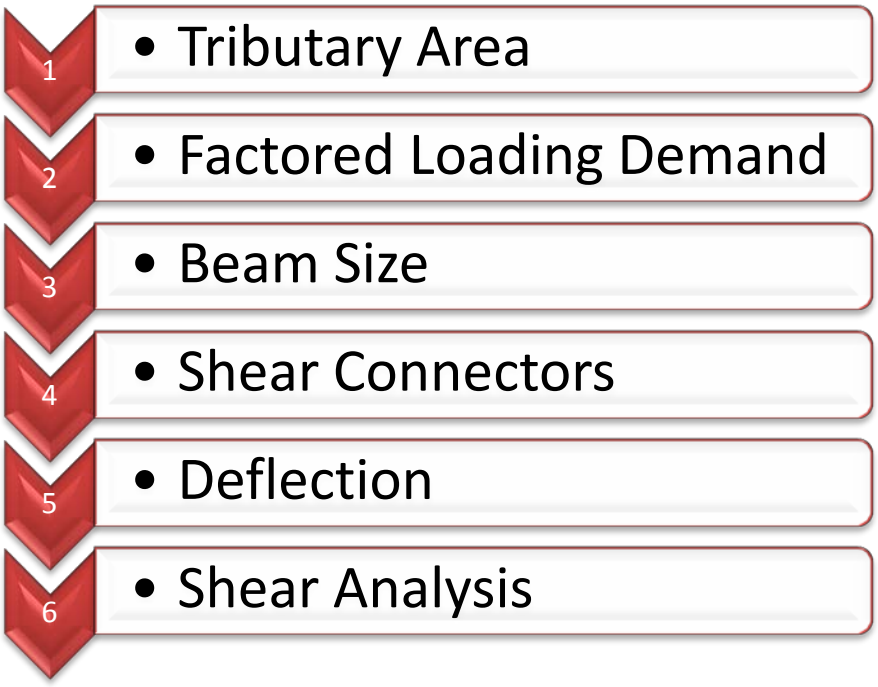

Figure 4. A series of steps were taken in arriving at the final structural design.

Tributary Area, b

This is the area of slab, equipment, etc. that a member supports. Its width, measured perpendicular to the member, is the tributary/effective width. The AISC design manual states that Load and Resistance Factor Design (LRFD) allows for three possible ways of determining the value of the tributary width, b; the least of the following values was the value used: the length of the beam, l, divided by eight; half the spacing between the member and adjacent ones; and the distance from the member to the edge of the slab. The tributary width is used to calculate the maximum bending moment in the member.

Factored Loading Demand, w

LRFD is based upon various summations of possible load combinations occurring at a certain time. There are a number of these load combinations and the one that produces the largest sum of possible loading (with built-in factors of safety) was the one that was used. This ensured that the design was able to support all of the possible scenarios. The governing loading combination was found to be

1.2D + 1.6L + 0.5S
(kips/ft.)

where, D – Dead/Gravity Load
L- Live Load
S- Snow Load

Table 2. Various loads were used in determining the factored load demand.

Dead Loads (psf)	Live Load (psf)	Snow Load (psf)
Concrete and Metal Deck- 118	100	55
Green Roof- 23[a]		
Framing, Mechanical and Ceiling- 15		

[a]Green, et al; Feasibility of Green Roofs in Main South

Of note is that the self-weight of the member was estimated for the initial calculation and then the actual weight was added as reviews and recalculations were made. Also, to move from the unfactored load (psf) to *w* (kips/ft.), the summed unfactored load was multiplied by the previously determined *b-value*.

Beam Sizes

The factored loading demand was used to calculate the factored weight (*w*l*— kips) supported by the member and the maximum moment, M, ($wl^2/8$— kips-ft.). Either of these values could be used to determine the size of the member from the tables in the AISC manual. The maximum moment was used along with AISC manual's Table 3-19 to select member sizes. These values are also available in the Excel sheets located in the Appendix.

Shear Connectors

The number of shear connectors required for full composite action was calculated. The types of connectors used were ¾-inch shear studs. The horizontal shear force that was designed for was calculated with:

$$\Sigma Qn = A_S F_y$$

where, A_S – Area of steel stud
F_y- Yield strength of steel

The strength of each of the shear studs was found using:

$$Qn = 0.5 A_{SC} (f'_c w_c)^{3/4} \text{ (kips)}$$

where, A_{SC} – Area of stud above rib of deck
f'_c – Compressive concrete strength
w_c – Weight of concrete

The number of shear studs required to achieve full-composite action was given by:

$$N = \Sigma Qn / Qn$$

A brief re-check was done to ensure that the added weight of the studs did not cause the beam sizing to go up.

Deflection

The member deflection due to the applied factored loads was calculated using the equation

$$\Delta = 5wl^4/384EI$$

where, w- Factored loading demand
l- Length of member
E- Modulus of elasticity of steel
I – Moment of Inertia of member

This was compared with an allowed deflection, Δ_{allow}, of l/360. The value of l/360 was determined by the maximum deflection that will not result in damage to drywall and other architectural features of the building.

Shear Analysis

The final step was a vertical shear analysis. The maximum shear, V, of the members was found using:

$$V = wl/2 \text{ (kips)}$$

These figures were compared with the shear force capacity of the W sections, which were found in the AISC manual Table 3-6.

Tributary Area, Beams, Columns, Trusses

The proposed architectural design of the steel-framed portion of the building required beams and columns of varying sizes to support it. In addition to these members, a truss system was needed to support the roof of the lobby area. The layout of these members took into consideration the proposed location of doorways, windows, hallways, and large rooms where open space needed to be maintained. A summary of the results for each floor is given below. The full results are shown in the Appendix.

The roof level of the structure had beams and girders of sizes W10x12 (66), W10x15 (2), W12x16 (44), W12x22 (27), W14x26 (4), W18x40 (4) and W24x62 (9). The most frequent ones were W10x12and W12x16. These had to resist moments of 35 and 70 ft-kips, respectively. Supporting these girders and beams were W10x33 (82) columns. Columns of this size were used throughout the entire design to support all the horizontal members.

The third-floor beam grid consisted of slightly more W12x16, while the second floor had an almost identical layout as the floors above.

The roof of the lobby of the building is supported by trusses. A single general design for all of the trusses that support the roof and snow load of 55 psf, which was indicated by Commonwealth of Massachusetts' 780 CMR, was chosen. It was 80 ft. in length, spanned the width of the lobby and had a height of 6 ft. RISA-3D was used to generate the truss models and analyze the resulting member forces and deflections. The truss was made to support 4200 plf at D7-D11 and E7-E11, and 4550 plf at F7-F11. It had a total of 29 members, which supported a maximum 311 kips in tension and 231 kips in compression when distributed with 4200 plf and a maximum of 96 kips in tension and 86 kips in compression when the distribution was 4550 plf.

Each of its members was HSS 7x7x10, which has a weight of 50.60 lb/ft and resulted in a calculated maximum deflection of 0.62 in. The maximum allowable deflection (l/360) is 2.7 in. The total weight of each truss is 13.9 kips (Fig. 27).

Structural models of the rest of the structure were made. The process began with using AutoCAD software to draw the beam layout of the different floors. The beams, girders and columns were drawn on separate layers within the architectural AutoCAD drawing. This was then imported into Revit software, which was used to generate 3D models of the building's beams, columns and girders. The design was constructed over the imported AutoCAD drawing. The results of this are located in the Renderings section.

Renderings

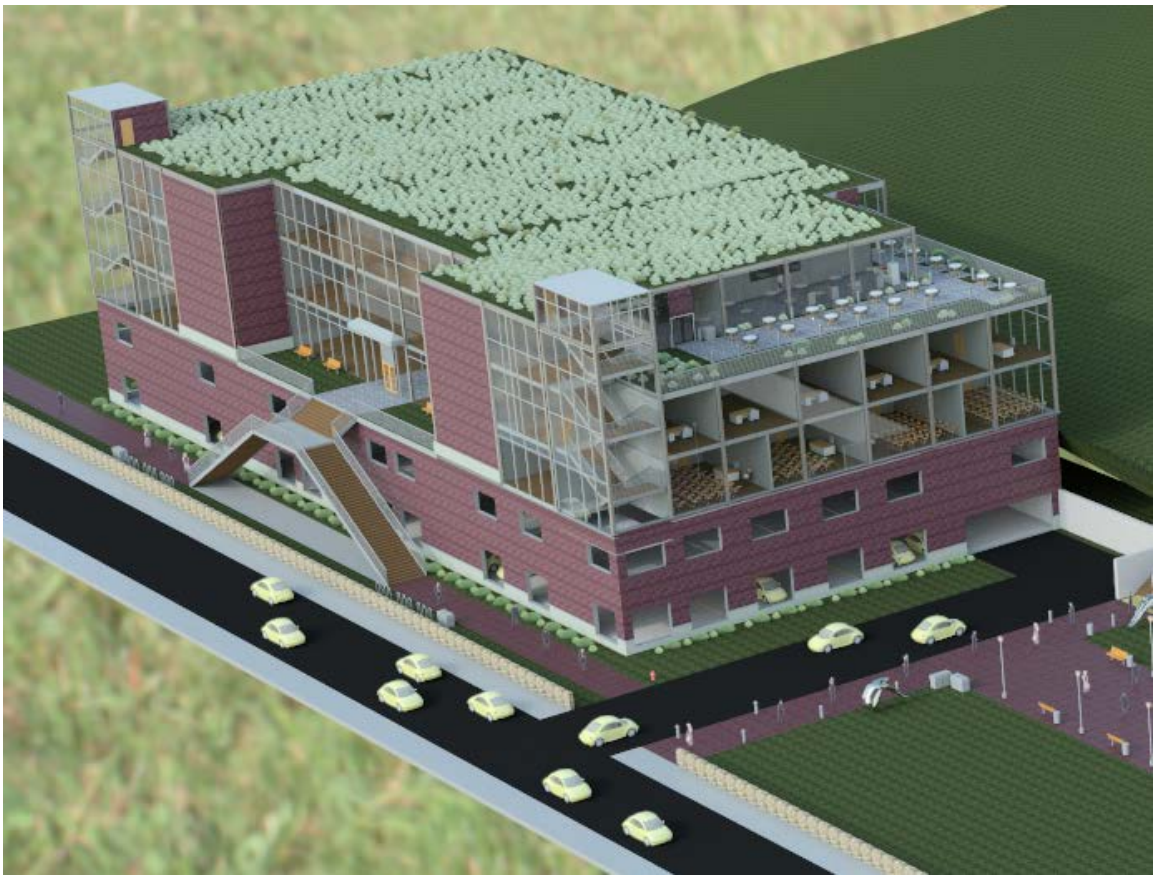

Figure 5. Aerial view of the structure from the north-east

Figure 6. Ground view of the structure from the north-east

Figure 7. View of the structure from the north

Figure 8. The patio of the cafeteria that is located on the third floor

Figure 9. The patio of the cafeteria that is located on the third floor

Figure 10. The interior layout of the cafeteria that is located on the third floor

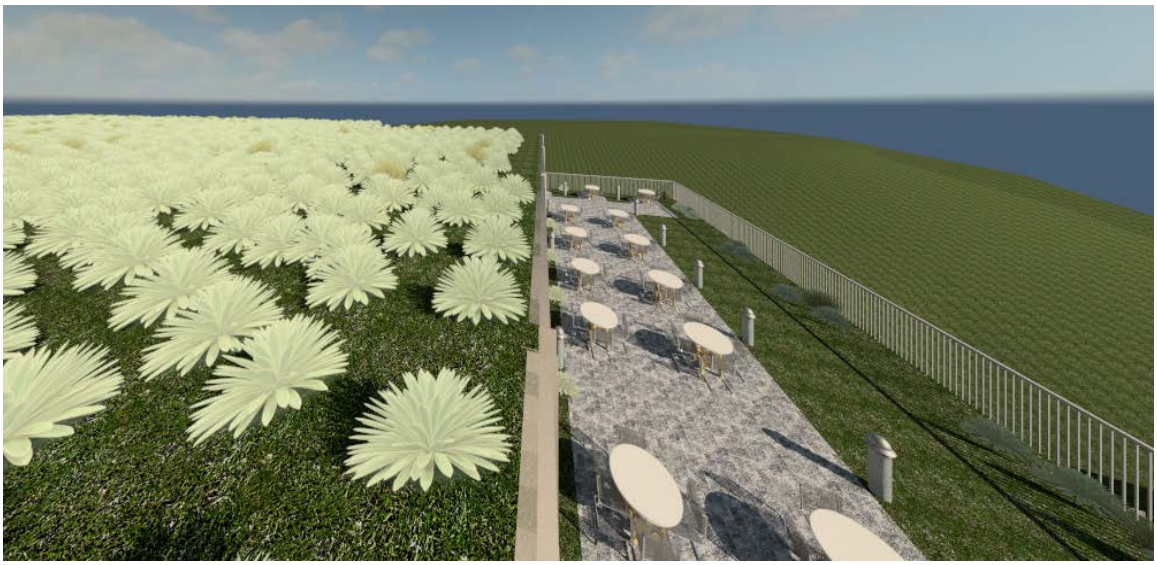

Figure 11. A partial view of the green roof of the building

Figure 12. A view of the lobby from the main entrance

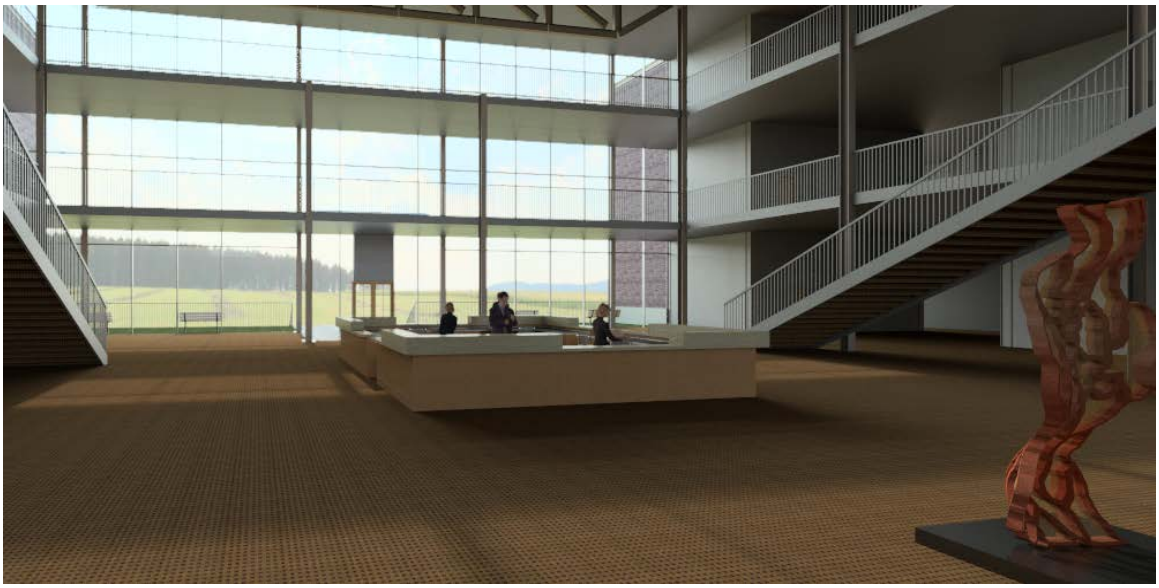

Figure 13. A view of the lobby from the rear

Figure 14. A view of the lobby from the second floor

Figure 15. There are four classrooms in the design. They are all located on the first floor.

Figure 16. There are three medium-sized lecture halls, which are located on the first floor

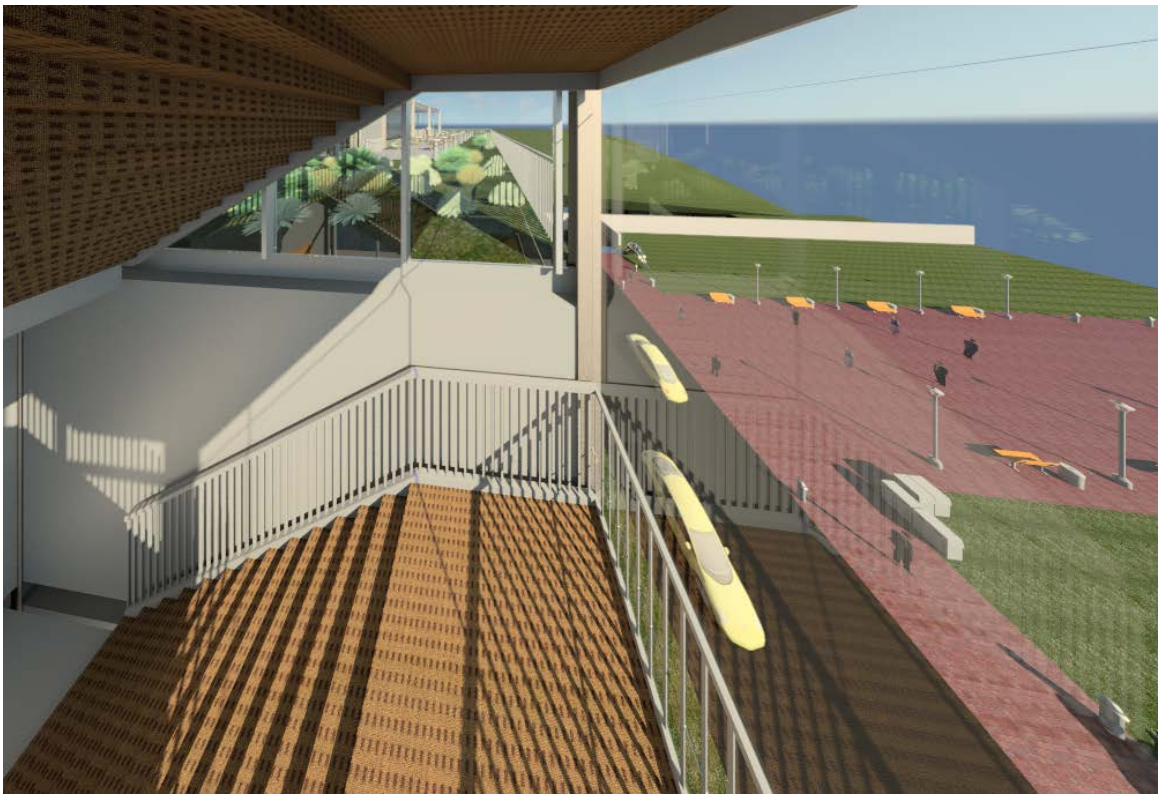

Figure 17. A view of the Arts Walk and proposed green area from the northern stairwell

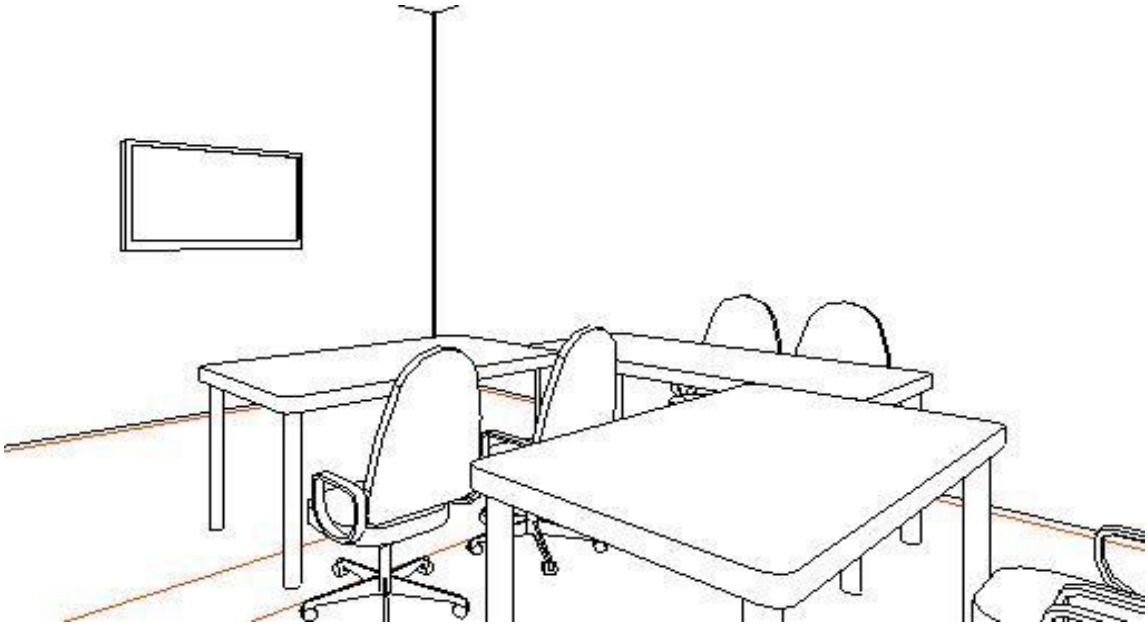

Figure 18. There are six tech suites on the first floor for small group meetings

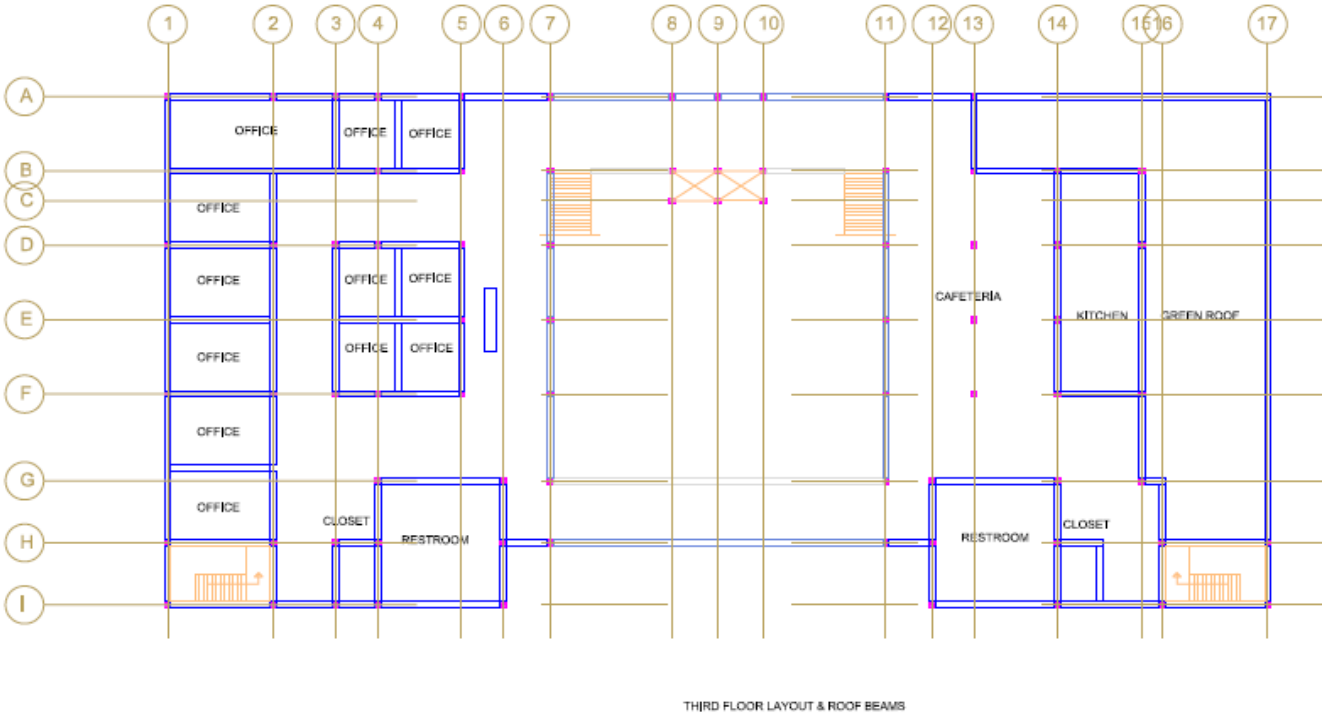

Figure 19. The third floor of the building is proposed to have a cafeteria with an outdoor patio, 12 offices, 2 storage closets and 2 restrooms

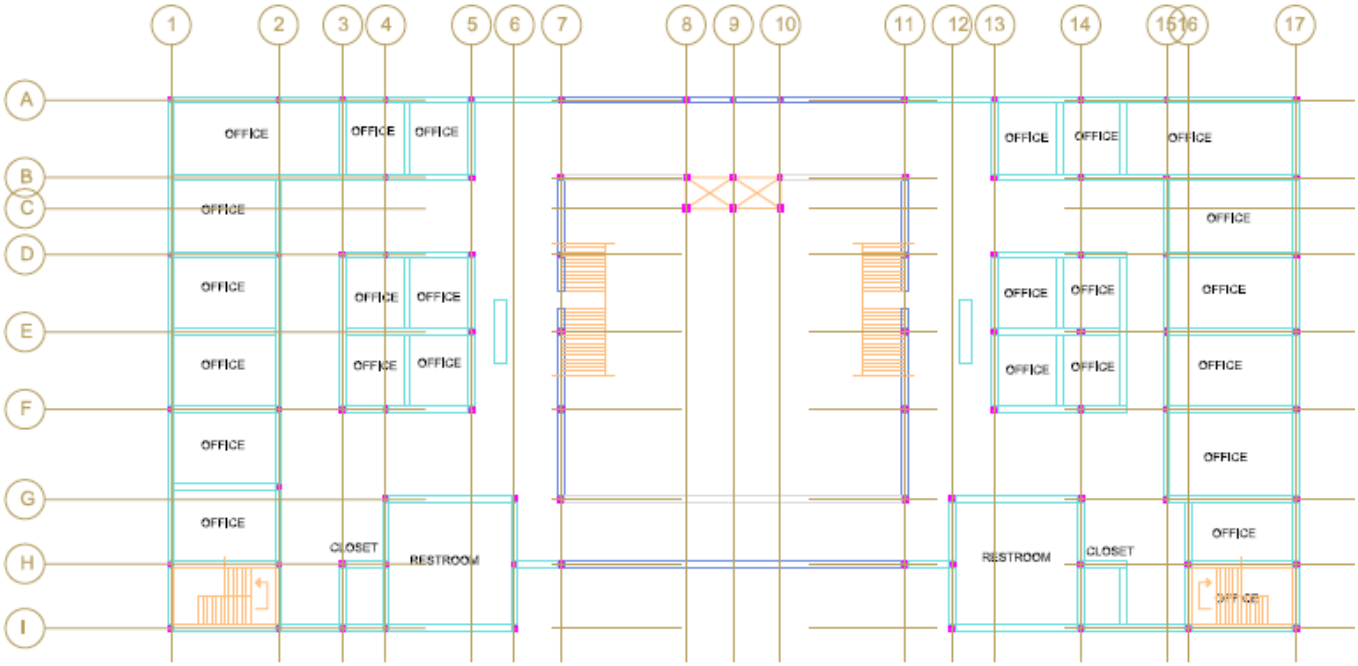

Figure 20. The second floor will have 24 offices, 2 storage closets and 2 restrooms

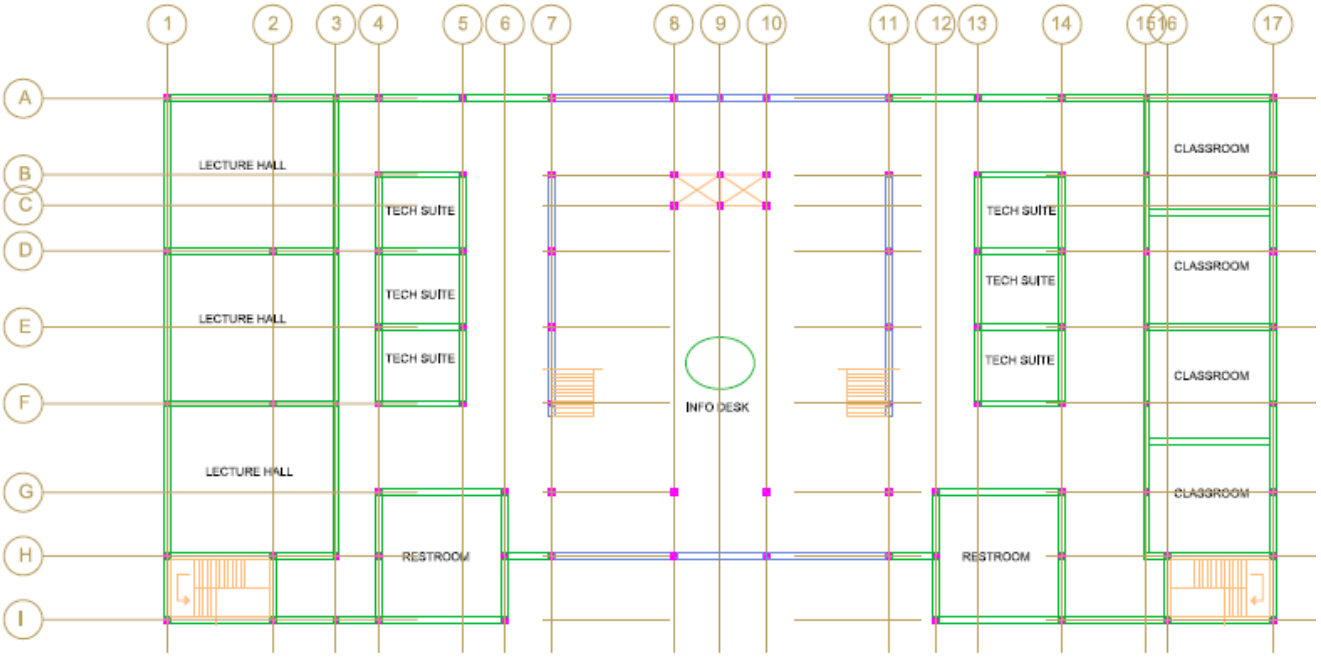

Figure 21. The first floor of the building will have 3 lecture halls, 4 classrooms, 6 tech suites, 2 restrooms and a spacious lobby area

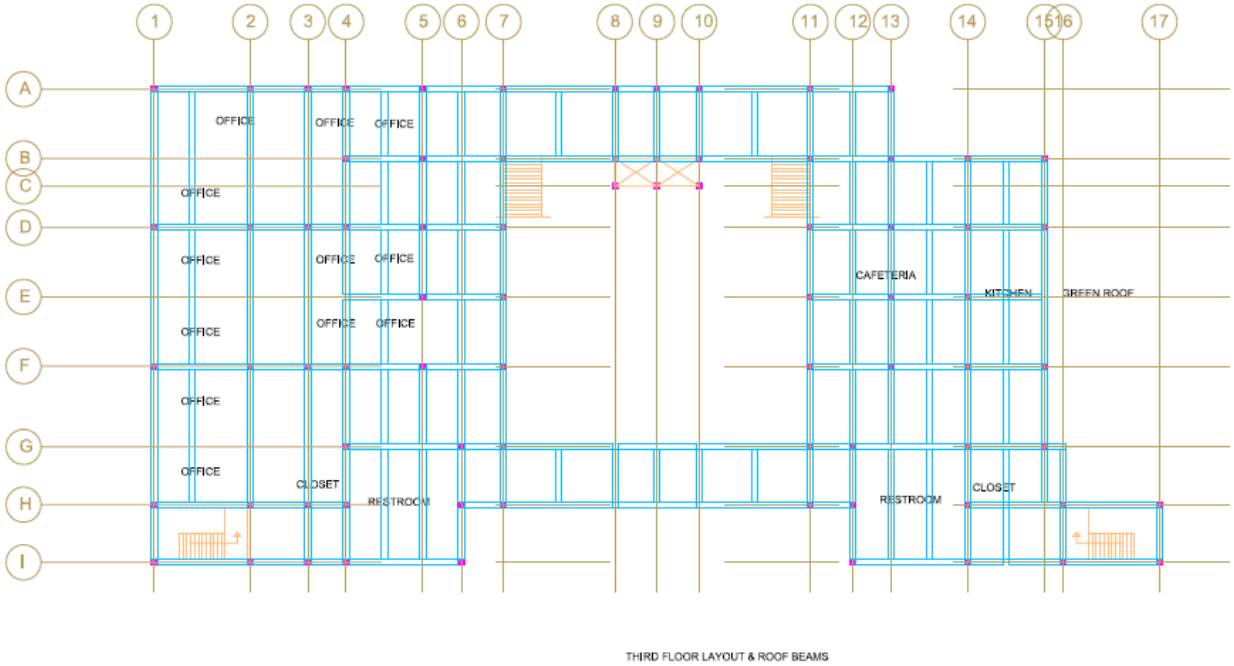

Figure 22. The layout of the beams at roof level

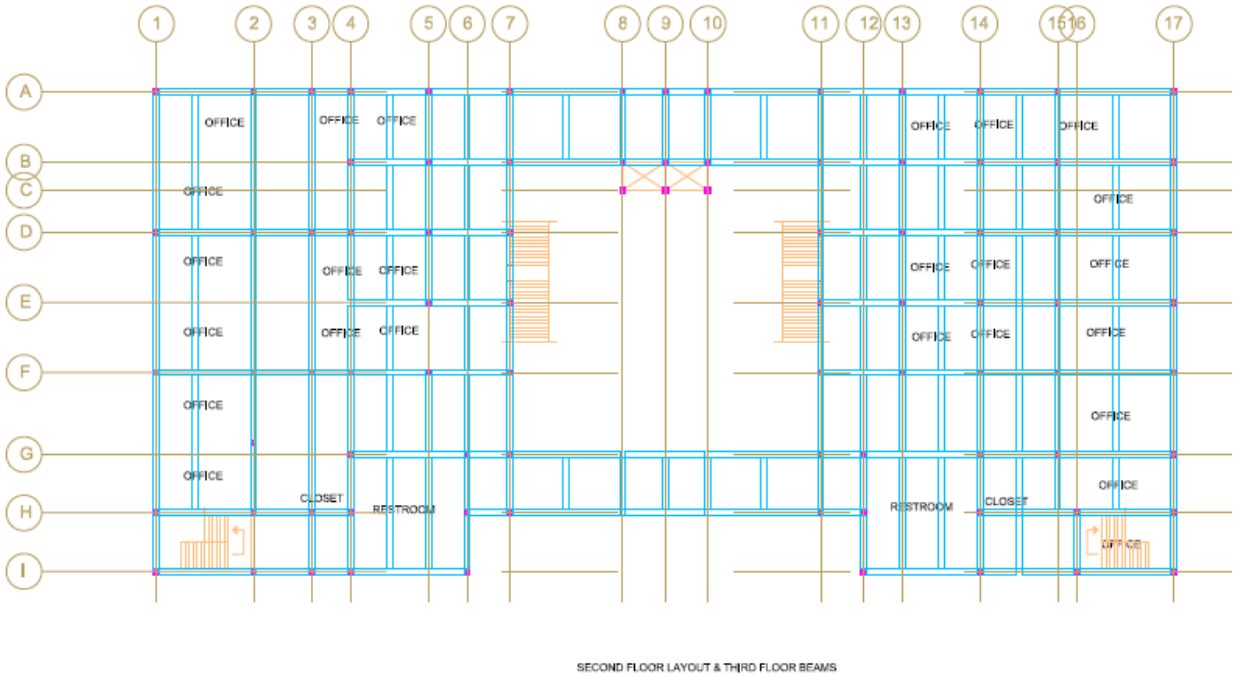

Figure 23. The layout of the beams and columns on the third floor

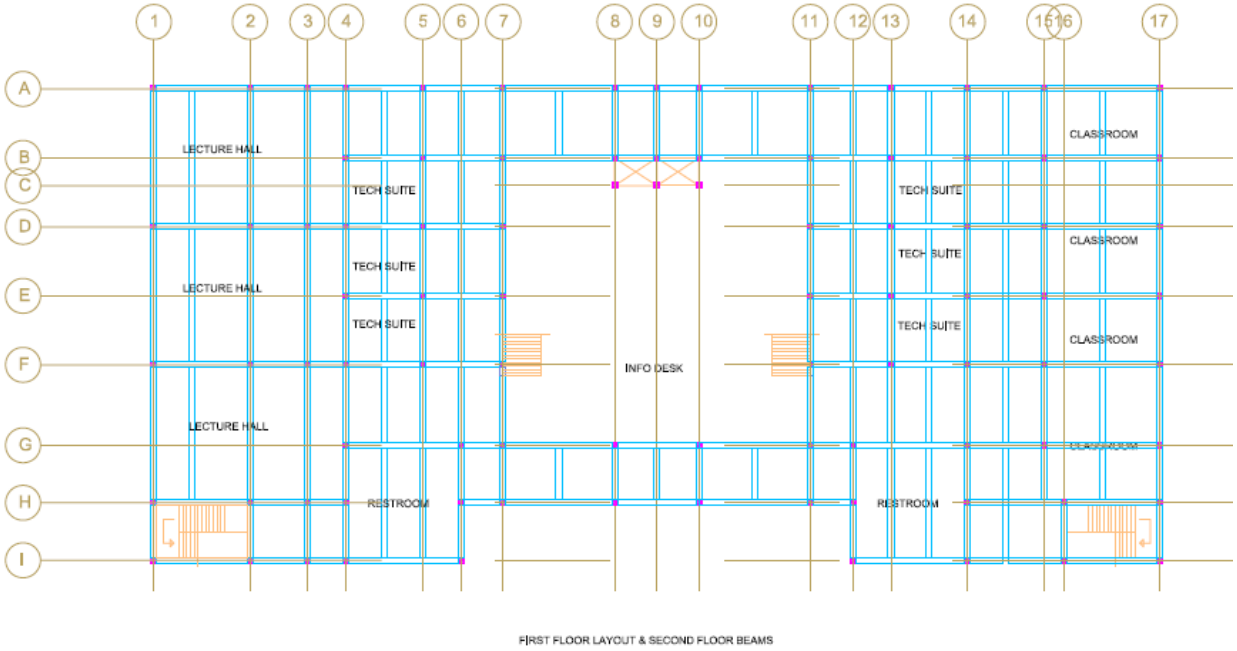

Figure 24. The layout of the beams and columns on the second floor

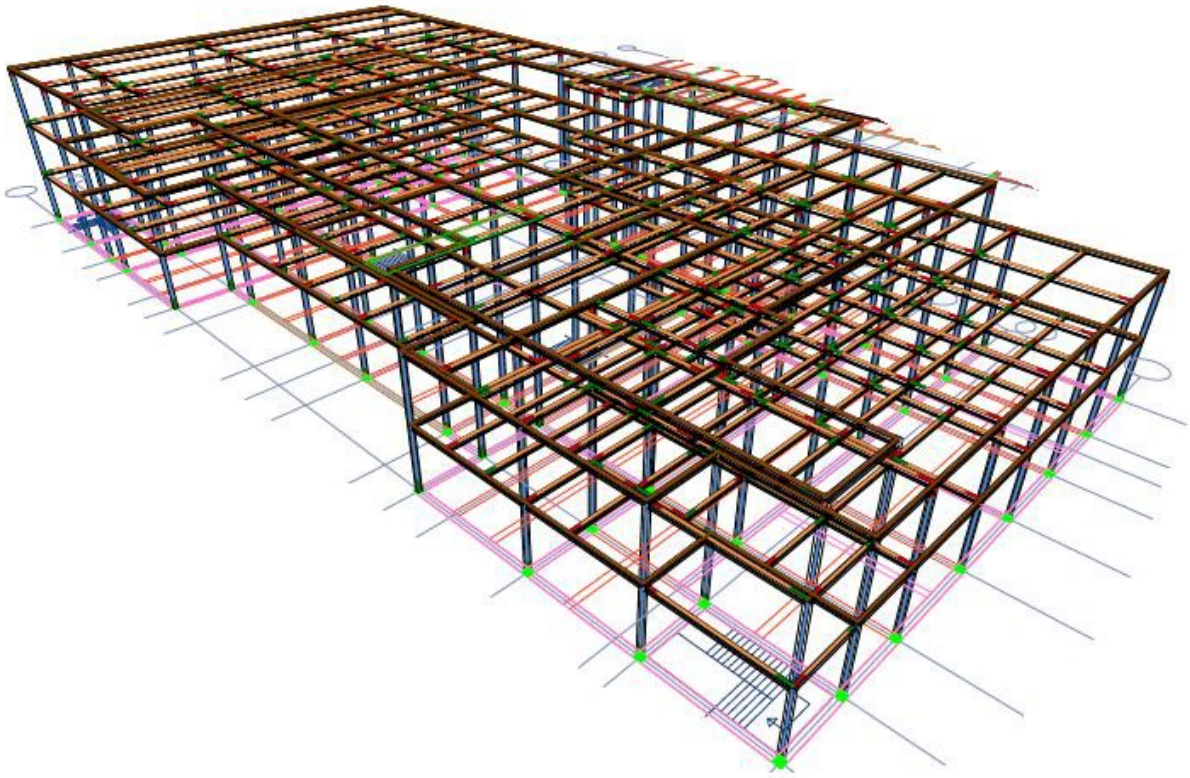

Figure 25. AutoCAD was used to create a 3D view of the beam layout from the north-east

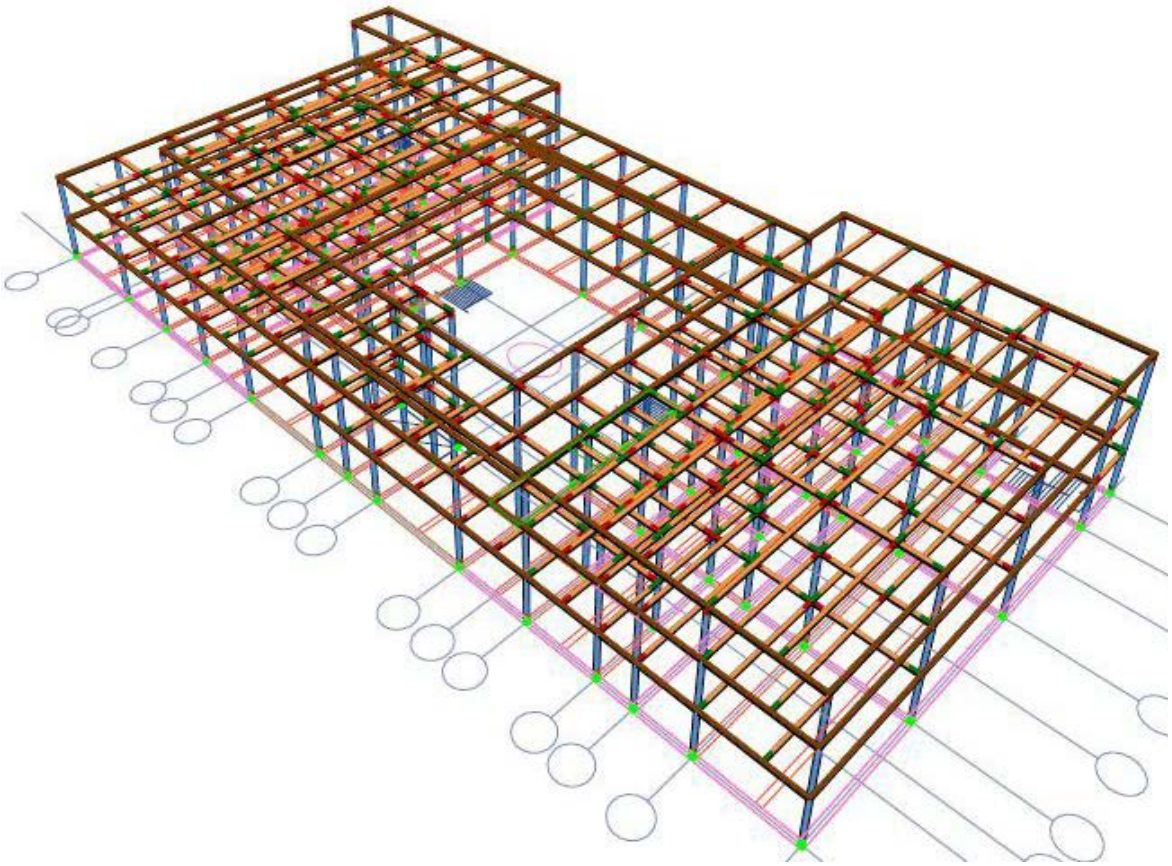

Figure 26. AutoCAD was used to create a 3D view of the beam layout from the south-west

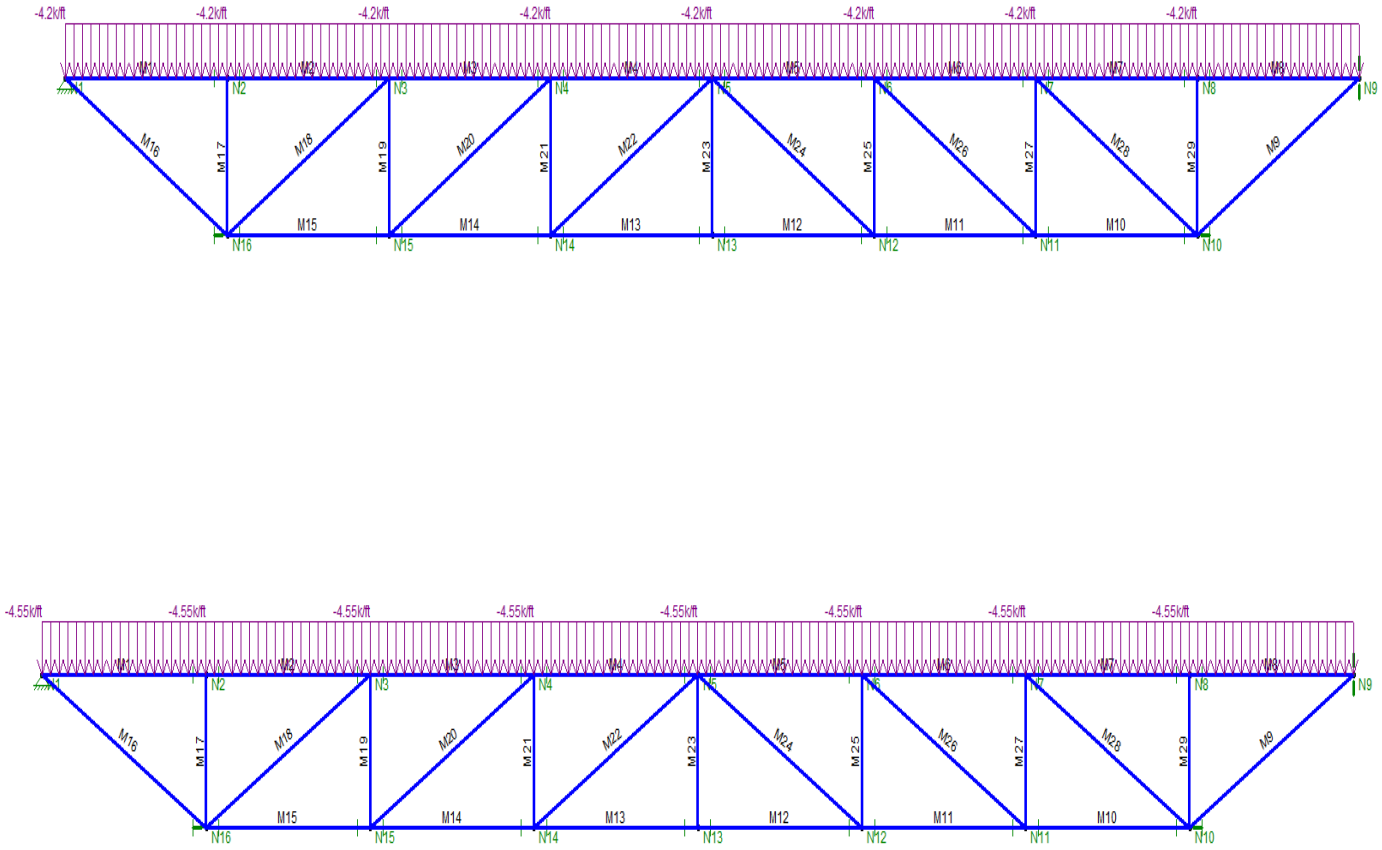

Figure 27. RISA-3D was used to do structural analyses on the truss for the lobby.

Discussion

The results show a mix of beam and girder sizes being used to support the designed structure. These variations are due to the fact that each beam is responsible for supporting a particular combination of dead, live and snow loads and/or different materials and equipment above. The supported region, called the tributary area, causes the supporting beam to be subjected to bending moments and shear forces, as well as undergo deflection. The International Building Code, the Commonwealth of Massachusetts and the American Society of Civil Engineers each have guidelines that govern these parameters. A beam size that meets the requirements of one of these parameters does not necessarily meet the minimum requirements of the others. This meant that each of the beam sizes selected had to be analyzed to ensure that it met all requirements.

The decision to have all the beams be composite was made so as to reduce the required size of the member. Composite action with the concrete slab and deck above allows the member to have additional compressive strength in its upper flange and better resist bending moments. This reduction in size means that less steel will be required and the overall cost of the construction will be reduced.

The designed roof trusses are made up of 29 members that are weld-connected. The analyses show that the members of the truss' upper chord are in compression, while those that are in the lower chord are in tension. This is expected because the truss acts as a beam, which has its upper flange in compression and its lower flange in tension as it deflects downward due to the applied loads.

Conclusion

The proposed architectural and steel-framing designs meet the objectives of the School of Business. The structure will add parking spaces, green areas and paved walkways to an area that is mainly made up of impervious layers. Natural lighting and other sustainable features will meet WPI's sustainability requirements. This project makes use of the design procedures taught in the WPI civil engineering degree program and is a fulfillment of the capstone design requirement.

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Appendix A: Interviews

A.1: Alfredo DiMauro

WPI-MQP: Mixed-Use Academic/Parking Structure
Interview with Alfredo DiMauro Minutes

9/25/11
5:08 pm

Type of Meeting: Personal Interview
Meeting Facilitator: Mark Arnold
Invitees: Mark Arnold, Tariq Azizi, Andrew MacKenzie, Alford Green

I. Description of project goals and current status of our work.

II. Questions

1. Could you give us a brief summary of your background and what your responsibilities are at WPI?
    a. Degree in Architectural Engineering.
    b. Worked for 10 years as Campus Planner and Assistant Director of Facilities Services at Skidmore College.
    c. Started working at WPI in 2007.
    d. Responsible for ground and building maintenance, construction, safety and sustainability.
2. What can you tell us about the WPI Campus Master Plan as it relates to this project?
    a. The Campus Master Plan (CMP) was made in 2003.
    b. There are currently plans to update the CMP after President (Dennis) Berkey made revisions that changed the original document.
    c. The library parking lot is marked for parking and an academic building with somewhere for pedestrians avoid snow and ice while walking.
    d. The CMP does not require any new on-campus parking, however it would be good to create more spaces so as to make more street parking available to residents. There have been complaints about the lack of parking spaces available to those in the community.
    e. Some parking should be eliminated to create more green spaces.
3. What other suggestions do you have as to how we should proceed with the design?
    a. Keep the library lot academic only.
    b. Maintain the Arts Walk as an unobstructed path from the Library to the walkway between Founders and East Halls.

c. Keep the service road from Boynton Hall to the library parking lot. It is a critical fire service road.

A.2: Karen Hebert-Maccaro (Associate Dean of the School of Business)

WPI-MQP: Mixed-Use Academic/Parking Structure
Interview with Karen Hebert-Maccaro Minutes

10/5/11

Type of Meeting: Personal Interview
Meeting Facilitator: Mark Arnold
Invitees: Mark Arnold, Tariq Azizi, Andrew MacKenzie, Alford Green

I. Description of project goals and current status of our work.

II. Questions

1. What are the spatial needs of the School of Business?
    a. The School of Business was formed a year ago and is planned to grow aggressively over the next 3 to 5 years. The approximate population at that time is 350 students.
    b. Two larger classrooms to hold approximately 70 students each.
    c. Five average-sized classrooms to hold approximately 50 students each.
    d. Thirty-three offices for faculty and spaces for staff.
    e. Six conference rooms (tech suites).
2. Is there a preference in the location of the School of Business?
    a. The preference is for it to be located on the main campus. It will give the building a feeling of being an academic building that is integrated within the Institute.

Appendix B: Results

B.1- Roof Level Beam and Girder Analysis

Beams	**Deck Perpendicular to beam**	f' = 6ksi	f_{y_conc} = 6000 psi	f_{y_steel} = 36000 psi	w_c = 115pcf	E = 29000ksi													
Grid Boundary	Beam Number	Beam Length-l (ft.)	[c] Tributary/Effective Width (ft.) - Least of Three				Factored Loading Demand-w- 1.2D + 1.6L + 0.5S (kips/ft.) Concrete and Deck- 118psf; Green Roof- 23psf Framing, Mechanical, Ceiling- 15psf, Glass Roof- 10psf; Lobby Truss- 0.2 kips/ft; Live- 100psf; Snow- 55psf	Factored Weight-wl (kips)	Maximum Moment-M-$wl^2/8$ (ft.-kips)	Beam Selection-AISC Table 3-19	Horizontal Shear Force (kips/ft.) - Least of Two (usually)			Strength of Stud- Q_n $=0.5A_{sc}(f'_cw_c)^{3/4}$ (kips)	Number of Shear 3/4-in. Studs- $N = \Sigma Q_n/Q_n$	True Number of Studs	Beam Deflection- $\Delta = 5wl^4/384EI$ (in.)	Allowed Deflection- $\Delta_{allow} = l/240$ (in.)	Shear Force-V = wl/2 (kips)	Shear Force Capacity of Beam-AISC Table 3-6 (kips)
			Beam Length/4	Beam Spacing	Distance to Slab Edge	Width to be Used - b					$0.85f'_cA_c$	A_sF_y	$\Sigma Q_n = A_sF_y$ for full composite action							
	AD1	36	9.0	5.0	0	5.0	1.9	69.2	311.3	W18x40	76.5	270	270	29.7	9.1	10	1.9	1.8	34.6	169
AD12	1	36	9.0	12.5	10	9.0	3.4	124.1	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.0	306
	AD2	36	9.0	15.0	25	9.0	3.4	124.1	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.0	306
	AD3	36	9.0	12.5	-	9.0	3.4	124.1	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.0	306
	AB4	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	BD4	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
AB45	1	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
BD45	1	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	AB5	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	BD5	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	AB6	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	BD6	18	4.5	10.0	10	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	AB7	18	4.5	12.8	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	BD7	18	4.5	5.5	0	2.3	1.1	19.9	44.7	W10x12	35.2	124	124	29.7	4.2	5	0.6	0.9	9.9	56.3
	DF1	36	9.0	5.0	0	4.5	1.7	62.4	280.9	W18x40	68.9	243	243	29.7	8.2	9	1.7	1.8	31.2	169
DF12	1	36	9.0	12.5	10	9.0	3.4	124.1	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.0	306
	DF2	36	9.0	15.0	25	9.0	3.4	124.1	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.0	306
	DF3	36	9.0	12.5	-	9.0	3.4	124.1	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.0	306
	DE4	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	EF4	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
DE45	1	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
EF45	1	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	DE5	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	EF5	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	DE6	18	4.5	10.0	10	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	EF6	18	4.5	10.0	10	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	DE7	18	4.5	5.5	0	2.3	1.1	19.9	44.7	W10x12	35.2	124	124	29.7	4.2	5	0.6	0.9	9.9	56.3
	EF7	18	4.5	5.5	0	2.3	1.1	19.9	44.7	W10x12	35.2	124	124	29.7	4.2	5	0.6	0.9	9.9	56.3
	FH1	36	9.0	5.0	0	4.5	1.7	62.4	280.9	W18x40	68.9	243	243	29.7	8.2	9	1.7	1.8	31.2	169
FH12	1	36	9.0	12.5	10	9.0	3.4	124.1	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.0	306
	FH2	36	9.0	15.0	25	9.0	3.4	124.1	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.0	306

B.1- Roof Level Beam and Girder Analysis Cont'd

	FH3	36	9.0	12.5	-	9.0	3.4	124.1	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.0	306
	FG4	21	5.3	10.0	-	5.3	2.0	41.9	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.9	69
	GH4	15	3.8	10.0	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
FG45	1	21	5.3	10.0	-	5.3	2.0	41.9	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.9	69
GI45	1	30	7.5	10.0	-	7.5	2.9	85.9	322.1	W21x44	114.8	405	405	29.7	13.6	14	1.0	1.5	42.9	106
	FG5	21	5.3	10.0	-	5.3	2.0	41.9	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.9	69
	GI5	30	7.5	10.0	10	7.5	2.9	85.7	321.6	W18x40	114.8	405	405	29.7	13.6	14	1.4	1.5	42.9	106
	FG6	21	5.3	10.0	10	5.3	2.0	41.9	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.9	69
	GH6	15	3.8	10.0	10	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	FG7	21	5.3	5.5	0	2.6	1.2	25.7	67.4	W10x15	39.8	140	140	29.7	4.7	5	1.0	1.1	12.8	69
	GH7	15	3.8	12.8	0	1.9	0.7	10.9	20.4	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.4	56.3
	HI1	15	3.8	12.5	0	1.9	0.7	10.9	20.4	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.4	56.3
	HI2	15	3.8	20.0	25	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	HI3	15	3.8	12.5	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	HI4	15	3.8	12.5	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	HI6	15	3.8	5.0	0	1.9	0.7	10.9	20.4	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.4	56.3
AB78	1	18	4.5	14.5	-	4.5	1.8	31.7	71.3	W12x16	68.9	243	243	29.7	8.2	9	0.6	0.9	15.8	56.3
GH78	1	15	3.8	14.5	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	AB8	18	4.5	12.8	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	GH8	15	3.8	12.8	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	AB9	18	4.5	11.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	GH9	15	3.8	11.0	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	AB10	18	4.5	12.8	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	GH10	15	3.8	12.8	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
AB1011	1	18	4.5	14.5	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
GH1011	1	15	3.8	14.5	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	AB11	18	4.5	12.8	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	BD11	18	4.5	5.5	-	4.5	2.0	35.3	79.4	W12x16	68.9	243	243	29.7	8.2	9	0.6	0.9	17.6	56.3
	AB12	18	4.5	10.5	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	BD12	18	4.5	10.5	10	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	AB13	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	BD13	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
BD1314	1	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	BD14	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
BD1415	1	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	BD15	18	4.5	12.5	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	DE11	18	4.5	5.5	0	2.3	1.1	19.9	44.7	W10x12	35.2	124	124	29.7	4.2	5	0.6	0.9	9.9	56.3
	EF11	18	4.5	5.5	0	2.3	1.1	19.9	44.7	W10x12	35.2	124	124	29.7	4.2	5	0.6	0.9	9.9	56.3
	DE12	18	4.5	10.5	10	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	EF12	18	4.5	10.5	10	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	DE13	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	EF13	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
DE1314	1	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
EF1314	1	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	DE14	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	EF14	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
DE1415	1	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
EF1415	1	18	4.5	10.0	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	DE15	18	4.5	12.5	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	EF15	18	4.5	12.5	-	4.5	1.7	30.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.3	56.3
	FG11	21	5.3	5.5	0	2.6	1.0	20.8	54.7	W10x15	39.8	140	140	29.7	4.7	5	0.8	1.1	10.4	69

	GH11	15	3.8	12.8	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	FG12	21	5.3	10.5	10	5.3	2.0	41.9	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.9	69
	GH12	15	3.8	10.5	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	FG13	21	5.3	10.0	-	5.3	2.0	41.9	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.9	69
	GI13	30	7.5	10.0	-	7.5	2.9	85.9	322.1	W21x44	114.8	405	405	29.7	13.6	7	1.0	1.5	42.9	106
FG1314	1	21	5.3	10.0	-	5.3	2.0	41.9	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.9	69
GI1314	1	30	7.5	10.0	-	7.5	2.9	85.9	322.1	W21x44	114.8	405	405	29.7	13.6	14	1.0	1.5	42.9	106
	FG14	21	5.3	10.0	-	5.3	2.0	41.9	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.9	69
	GH14	15	3.8	10.0	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
FG1415	1	21	5.3	10.0	-	5.3	2.0	41.9	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.9	69
GH1415	1	15	3.8	10.0	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	FG15	21	5.3	12.5	-	5.3	2.0	41.9	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.9	69
	GH15	15	3.8	12.5	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	HI12	15	3.8	10.0	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	HI14	15	3.8	10.0	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
HI1416	1	15	3.8	12.5	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	HI16	15	3.8	20.0	-	3.8	1.4	21.3	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.6	56.3
	HI17	15	3.8	12.5	0	1.9	0.7	10.9	20.4	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.4	56.3

Girders	**Deck Perpendicular to beam**	f'_c = 6ksi	f_{y_conc} = 6000 psi	f_{y_steel} = 36000 psi	w_c = 115pcf	E = 29000ksi				
Girder	Beam Length-l (ft.)	Beams Supported	Load Supported-w (kips/ft)	Load Supported-wl (kips)	Maximum Moment- M- $wl^2/8$ (kips-ft.)	Beam Selection- AISC Table 3-19	Beam Deflection- $\Delta = 5wl^4/384EI$ (in.)	Allowed Deflection- Δ_{allow} = l/240 (in.)	Shear Force- V = wl/2 (kips)	Shear Force Capacity of Beam- AISC Table 3-6
A12	25	AD12-1	1.8	43.9	137.1	W14x26	1.0	1.3	21.93	106
A23	15	-	0.012	0.2		W10x12	0.0	0.8		
A34	10	-	0.012	0.1		W10x12	0.0	0.5		
A45	20	AB45-1	0.4	8.7	21.7	W10x12	0.4	1.0	4.34	56.3
A57	20	AB6	0.9	17.3	43.4	W10x12	0.8	1.0	8.67	56.3
A78	19	AB78-1	0.9	17.0	40.3	W10x12	0.7	1.0	8.49	56.3
A89	11	-	0.012	0.1		W10x12	0.0	0.6		
A910	11	-	0.012	0.1		W10x12	0.0	0.6		
A1011	19	AB1011-1	0.9	16.5	39.1	W10x12	0.6	1.0	8.24	56.3
A1113	21	AB12	0.9	18.2	47.8	W10x12	0.9	1.1	9.10	56.3
A1314	20	AB1314-1	0.9	17.3	43.4	W10x12	0.8	1.0	8.67	56.3
A1415	20	AB1415-1	0.9	17.3	43.4	W10x12	0.8	1.0	8.67	56.3
B45	20	AB45-1, BD45-1	2.6	51.8	129.5	W14x26	0.6	1.0	25.89	106
B57	20	AB6, BD6	2.6	51.8	129.5	W14x26	0.5	1.0	25.89	106
B78	19	AB78-1	0.9	17.0	40.3	W10x12	0.7	1.0	8.49	56.3
B89	11	-	0.012	0.1		W10x12	0.0	0.6		
B910	11	-	0.012	0.1		W10x12	0.0	0.6		
B1011	19	AB10-11-1	0.9	16.5	39.1	W10x12	0.6	1.0	8.24	56.3

B.1- Roof Level Beam and Girder Analysis Cont'd

B1113	21	AB12, BD12	1.7	36.4	95.5	W12x22	0.7	1.1	18.18	96
C89	11	-	0.012	0.1		W10x12	0.0	0.6		
C910	11	-	0.012	0.1		W10x12	0.0	0.6		
D12	25	AD12-1, DF12-1	3.5	87.4	273.0	W18x40	0.8	1.3	43.68	169
D23	15	-	0.012	0.2		W10x12	0.0	0.8		
D34	10	-	0.012	0.1		W10x12	0.0	0.5		
D45	20	BD45-1, DE45-1	1.7	34.6	86.6	W12x22	0.6	1.0	17.32	96
D57	20	BD6, DE6	1.7	34.6	86.6	W12x22	0.6	1.0	17.32	96
D1113	21	BD12, DE12	1.7	36.4	95.5	W12x22	0.7	1.1	18.18	96
D1314	20	BD1314-1, DE1314-1	1.7	34.6	86.6	W12x22	0.6	1.0	17.32	96
D1415	20	BD1415-1, DE1415-1	1.7	34.6	86.6	W12x22	0.6	1.0	17.32	96
E45	20	DE45-1, EF45-1	1.7	34.6	86.6	W12x22	0.6	1.0	17.32	96
E57	20	DE6, EF6	1.7	34.6	86.6	W12x22	0.6	1.0	17.32	96
E1113	21	DE12, EF12	1.7	36.4	95.7	W12x22	0.7	1.1	18.22	96
E1314	20	DE1314-1, EF1314-1	1.7	34.6	86.6	W12x22	0.6	1.0	17.32	96
E1415	20	DE1415-1, EF1415-1	1.7	34.6	86.6	W12x22	0.6	1.0	17.32	96
F12	25	DF12-1, FH12-1	3.5	87.4	273.0	W18x40	0.8	1.3	43.68	169
F23	15	-	0.012	0.2		W10x12	0.0	0.8		
F34	10	-	0.012	0.1		W10x12	0.0	0.5		
F45	20	EF45-1, FG45-1	1.9	37.5	93.8	W12x22	0.6	1.0	18.76	96
F57	20	EF6, FG6	1.9	37.5	93.8	W12x22	0.6	1.0	18.76	96
F1113	21	EF12, FG12	1.9	39.4	103.4	W12x22	0.8	1.1	19.70	96
F1314	20	EF1314-1, FG1314-1	1.9	37.5	93.8	W12x22	0.6	1.0	18.76	96
F1415	20	EF1415-1, FG1415-1	1.9	37.5	93.8	W12x22	0.6	1.0	18.76	96
G46	30	FG45-1, FG5, GI45-1, GI5	4.9	147.9	554.5	W24x62	0.9	1.5	73.93	306
G67	10	-	0.012	0.1			0.0	0.5		
G78	19	GH78-1	0.7	13.8	32.7	W10x12	0.5	1.0	6.88	56.3
G810	22	GH9	0.7	15.9	43.8	W10x12	0.9	1.1	7.97	56.3
G1011	19	GH1011-1	0.7	13.8	32.7	W10x12	0.5	1.0	6.88	56.3
G1112	11	-	0.012	0.1		W10x12	0.0	0.6		
G1214	30	FG13, GI13, FG1314-1, GI1314-1	4.9	147.9	554.7	W24x62	0.9	1.5	73.97	306

B.1- Roof Level Beam and Girder Analysis Cont'd

G1415	20	FG1415-1, GH1415-1	1.7	34.4	86.0	W12x22	0.6	1.0	17.21	96
H12	25	FH12-1	1.8	43.9	137.1	W14x26	0.9	1.3	21.93	106
H23	15	-	0.012	0.2		W10x12	0.0	0.8		
H34	10	-	0.012	0.1		W10x12	0.0	0.5		
H67	10	-	0.012	0.1		W10x12	0.0	0.5		
H78	19	GH78-1	0.7	13.8	32.7	W10x12	0.5	1.0	6.88	56.3
H810	22	GH9	0.7	15.9	43.8	W10x12	0.9	1.1	7.97	56.3
H1011	19	GH1011-1	0.7	13.8	32.7	W10x12	0.5	1.0	6.88	56.3
H1112		-	0.012	0.0		W10x12	0.0	0.0		
H1416	25	GH1415-1, GH15, HI1416-1	2.2	54.4	170.1	W18x40	1.1	1.3	27.22	131
I12	25	-	0.012	0.3		W10x12	0.0	1.3		
I23	15	-	0.012	0.2		W10x12	0.0	0.8		
I34	10	-	0.012	0.1		W10x12	0.0	0.5		
I46	30	-	0.012	0.4		W10x12	0.1	1.5		
I1214	30	GI13, GI1314-1	2.9	87.5	328.0	W21x44	3.0	1.5	43.74	273
I1416	25	HI1416-1	0.7	18.1	56.6	W10x12	1.6	1.3	9.05	56.3
I1617	25	-	0.012	0.3		W10x12		1.3		

Column	Beams and Girders Supported	Loads Supported- Self + Girder + Truss (kips)	Beam Selection- AISC Table 4-1
A1	AD1, A12	57.01	W10x33
A2	A12, A23, AD2	84.56	W10x33
A3	A23, A34, AD3	62.69	W10x33
A4	A34, A45, AB4	20.24	W10x33
A5	A45, A57, AB5	28.85	W10x33
A7	A57, A78, AB7	33.01	W10x33
A8	A78, A89, AB8	24.40	W10x33
A9	A89, A910, AB9	15.98	W10x33
A10	A910, A1011, AB10	24.15	W10x33
A11	A1011, A1113, AB11	33.18	W10x33
A13	A1113, AB13	24.95	W10x33
B4	B45, AB4, BD4	57.08	W10x33
B5	B45, B57, AB5, BD5	82.98	W10x33
B7	B57, B78, AB7, BD7	60.16	W10x33
B8	B78, B89, AB8, BC8	24.40	W10x33
B9	B89, B910, AB9, BC9	62.60	W10x33
B10	B910, B1011, AB10, BC10	62.60	W10x33
B11	B1011, B1113, AB11, BD11	70.77	W10x33
B13	B1113, B1314, AB13, BD13	34.03	W10x33
B14	B1314, B1415, AB14, BD14	15.91	W10x33

B.1- Third Floor Column Analysis Cont'd

B15	B1415, BD15	15.91	W10x33
C8	C89, BC8	59.53	W10x33
C9	C89, C910, BC9	15.93	W10x33
C10	C910, BC10	15.90	W10x33
D1	AD1, DF1, D12	33.16	W10x33
D2	D12, D23, AD2, DF2	33.16	W10x33
D3	D23, D34, AD3, DF3	28.61	W10x33
D4	D34, D45, AD4, DF4	27.75	W10x33
D5	D45, D57, AD5, DF5	49.03	W10x33
D7	D57, AD7, DF7	80.24	W10x33
D11	D1113, AD11, DF11	80.24	W10x33
D13	D1113, D1314, AD13, DF13	80.76	W10x33
D14	D1314, D1415, AD14, DF14	38.75	W10x33
D15	D1415, AD15, DF15	28.46	W10x33
E4	B45, AB4, BD4	65.11	W10x33
E5	B45, B57, AB5, BD5	43.53	W10x33
E7	B57, B78, AB7, BD7	21.49	W10x33
E11	E1011, E1113, DE11, EF11	62.13	W10x33
E13	E1113, E1314, DE13, EF13	40.19	W10x33
E14	E1314, E1415, DE14, EF14	30.84	W10x33
E15	E1415, EF15	32.10	W10x33
F1	EF1, FG1, F12	24.70	W10x33
F2	F12, F23, EF2, FG2	79.87	W10x33

B.1- Third Floor Column Analysis Cont'd

F3	F23, F34, EF3, FG3	11.20	W10x33
F4	F34, F45, EF4, FG4	18.02	W10x33
F5	F45, F57, EF5, FG5	19.11	W10x33
F7	F57, EF7, FG7	13.20	W10x33
F11	F1113, EF11, FG11	16.78	W10x33
F13	F1113, F1314, EF13, FG13	85.11	W10x33
F14	F1314, F1415, EF14, FG14	33.05	W10x33
F15	F1415, EF15, FG15	33.07	W10x33
G4	G46, FG4, GH4	15.93	W10x33
G6	G46, G67, FG6, GH6	11.20	W10x33
G7	G67, G78, FG7, GH7	15.90	W10x33
G8	G78, G810, GH8	18.02	W10x33
G10	G810, G1011, GH10	23.81	W10x33
G11	G1011, G1112, FG11, GH11	18.02	W10x33
G12	G1112, G1214, FG12, GH12	15.84	W10x33
G14	G1214, G1415, FG14, GH14	45.35	W10x33
G15	G1415, FG15, GH15	15.99	W10x33
H1	FH1, HI1, H12	15.93	W10x33
H2	H12, H23, FH2, HI2	15.90	W10x33
H3	H23, H34, FH3, HI3	16.02	W10x33
H4	H34, GH4, HI4	59.58	W10x33

H6	H67, GH6, HI6	24.90	W10x33
H7	H67, H78, GH7	15.99	W10x33
H8	H78, H810, GH8	15.84	W10x33
H10	H810, H1011, GH10	10.43	W10x33
H11	H1011, H1112, GH11, HI11	10.43	W10x33
H12	H1112, GH12, HI12	15.84	W10x33
H14	H1416, GH14, HI14	15.84	W10x33
H16	H1416, H1617, GH16, HI16	15.84	W10x33
H17	H1617, HI17	15.84	W10x33
I1	I12, HI1	6.09	W10x33
I2	I12, I23	0.74	W10x33
I3	I23, I34, HI3	11.29	W10x33
I4	I34, I46, HI4	11.38	W10x33
I6	I46, HI6	6.12	W10x33
I12	I1214, HI12	15.84	W10x33
I14	I1214, I1416, HI14	15.84	W10x33
I16	I146, I1617, HI16	15.84	W10x33
I17	I1617, HI17	6.09	W10x33

Beams	**Deck Perpendicular to beam**	f'_c = 6ksi	f_{y_conc} = 6000 psi	f_{y_steel} = 36000 psi	w_c = 115pcf	E = 29000ksi												
Grid Boundary	Beam Number	Beam Length-l (ft.)	Tributary/Effective Width (ft.) - Least of Three				Factored Loading Demand-w- 1.2D + 1.6L + 0.5S (kips/ft.) Concrete and Deck- 118psf; Green Roof- 23psf Framing, Mechanical, Ceiling- 15psf; Live- 100psf; Snow- 55psf	Maximum Moment-M-$wl^2/8$ (ft.-kips)	Beam Selection-AISC Table 3-19	Horizontal Shear Force (kips/ft.) - Least of Two (usually)			Strength of Stud- Q_n $=0.5A_{sc}(f'_cw_c)^{3/4}$ (kips)	Number of Shear 3/4-in. Studs- N $= \Sigma Q_n/Q_n$	True Number of Studs	Beam Deflection- $\Delta = 5wl^4/384EI$ (in.)	Allowed Deflection- Δ_{allow} = 3/8in.	Shear Force- V = wl/2 (kips)	Shear Force Capacity of Beam- AISC Table 3-6
			Beam Length/4	Beam Spacing/2	Distance to Slab Edge	Width to be Used - b				$0.85f'_cA_c$	A_sF_y	$\Sigma Q_n = A_sF_y$ for full composite action						
	AD1	36	9.0	5.0	0	5.0	1.9	311.3	W18x40	76.5	270	270	29.7	9.1	10	1.9	1.8	34.59	169
AD12	1	36	9.0	12.5	10	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	AD2	36	9.0	15.0	25	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	AD3	36	9.0	12.5	-	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	AB4	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	BD4	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
AB45	1	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
BD45	1	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	AB5	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	BD5	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	AB6	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	BD6	18	4.5	10.0	10	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	AB7	18	4.5	12.8	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	BD7	18	4.5	5.5	0	2.3	0.9	35.5	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.89	56.3
	DF1	36	9.0	5.0	0	4.5	1.7	280.9	W18x40	68.9	243	243	29.7	8.2	9	1.7	1.8	31.21	169
DF12	1	36	9.0	12.5	10	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	DF2	36	9.0	15.0	25	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	DF3	36	9.0	12.5	-	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	DE4	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	EF4	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
DE45	1	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
EF45	1	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	DE5	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	EF5	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	DE6	18	4.5	10.0	10	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	EF6	18	4.5	10.0	10	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	DE7	18	4.5	5.5	0	2.3	0.9	35.5	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.89	56.3
	EF7	18	4.5	5.5	0	2.3	0.9	35.5	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.89	56.3
	FH1	36	9.0	5.0	0	4.5	1.7	280.9	W18x40	68.9	243	243	29.7	8.2	9	1.7	1.8	31.21	169
FH12	1	36	9.0	12.5	10	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	FH2	36	9.0	15.0	25	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	FH3	36	9.0	12.5	-	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	FG4	21	5.3	10.0	-	5.3	2.0	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.93	96
	GH4	15	3.8	10.0	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
FG45	1	21	5.3	10.0	-	5.3	2.0	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.93	96
GI45	1	30	7.5	10.0	-	7.5	2.9	322.1	W21x44	114.8	405	405	29.7	13.6	14	1.0	1.5	42.95	106
	FG5	21	5.3	10.0	-	5.3	2.0	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.93	96
	GI5	30	7.5	10.0	10	7.5	2.9	321.6	W18x40	114.8	405	405	29.7	13.6	14	1.4	1.5	42.87	169
	FG6	21	5.3	10.0	10	5.3	2.0	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.93	96
	GH6	15	3.8	10.0	10	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	FG7	21	5.3	5.5	0	2.6	1.0	54.7	W10x15	39.8	140	140	29.7	4.7	5	0.8	1.1	10.42	69
	GH7	15	3.8	12.8	0	1.9	0.7	20.4	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.45	56.3
	HI1	15	3.8	12.5	0	1.9	0.7	20.4	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.45	56.3
	HI2	15	3.8	20.0	25	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	HI3	15	3.8	12.5	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	HI4	15	3.8	12.5	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	HI6	15	3.8	5.0	0	1.9	0.7	20.4	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.45	56.3
AB78	1	18	4.5	14.5	-	4.5	1.8	71.3	W12x16	68.9	243	243	29.7	8.2	9	0.6	0.9	15.83	79.1
GH78	1	15	3.8	14.5	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	AB8	18	4.5	12.8	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	GH8	15	3.8	12.8	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	AB9	18	4.5	11.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	GH9	15	3.8	11.0	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	AB10	18	4.5	12.8	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	GH10	15	3.8	12.8	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
AB1011	1	18	4.5	14.5	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1

GH1011	1	15	3.8	14.5	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	AB11	18	4.5	12.8	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	BD11	18	4.5	5.5	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.9	0.9	14.23	79.1
	AB12	18	4.5	10.5	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	BD12	18	4.5	10.5	10	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	AB13	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	BD13	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
AB1314	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
BD1314	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	AB14	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	BD14	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
AB1415	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
BD1415	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	AB15	18	4.5	12.5	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	BD15	18	4.5	12.5	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
AB1517	1	18	4.5	15.0	15	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
BD1517	1	18	4.5	15.0	15	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	AB17	18	4.5	7.5	0	2.3	0.9	35.5	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.89	56.3
	BD17	18	4.5	7.5	0	2.3	0.9	35.5	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.89	56.3
	DE11	18	4.5	5.5	0	2.3	0.8	32.9	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.31	56.3
	EF11	18	4.5	5.5	0	2.3	0.8	32.9	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.31	56.3
	DE12	18	4.5	10.5	10	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	EF12	18	4.5	10.5	10	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	DE13	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	EF13	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
DE1314	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
EF1314	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	DE14	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	EF14	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
DE1415	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
EF1415	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	DE15	18	4.5	12.5	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	EF15	18	4.5	12.5	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
DE1517	1	18	4.5	15.0	15	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
EF1517	1	18	4.5	15.0	15	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	DE17	18	4.5	7.5	0	2.3	0.9	35.6	W10x15	35.2	124	124	29.7	4.2	5	0.4	0.9	7.92	56.3
	EF17	18	4.5	7.5	0	2.3	0.9	35.6	W10x15	35.2	124	124	29.7	4.2	5	0.4	0.9	7.92	56.3
	FG11	21	5.3	5.5	0	2.6	0.9	50.7	W10x15	39.8	140	140	29.7	4.7	5	0.8	1.1	9.66	69
	GH11	15	3.8	12.8	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	FG12	21	5.3	10.5	10	5.3	1.8	101.4	W10x15	80.3	284	284	29.7	9.5	10	1.6	1.1	19.32	69
	GH12	15	3.8	10.5	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	FG13	21	5.3	10.0	-	5.3	1.8	101.9	W12x22	80.3	284	284	29.7	9.5	10	0.7	1.1	19.41	96
	GI13	30	7.5	10.0	-	7.5	2.7	298.8	W21x44	114.8	405	405	29.7	13.6	14	0.9	1.5	39.84	106
FG1314	1	21	5.3	10.0	-	5.3	1.8	101.2	W12x22	80.3	284	284	29.7	9.5	10	0.7	1.1	19.29	96
GI1314	1	30	7.5	10.0	-	7.5	2.7	298.8	W21x44	114.8	405	405	29.7	13.6	14	0.9	1.5	39.84	106
	FG14	21	5.3	10.0	-	5.3	1.8	101.9	W12x22	80.3	284	284	29.7	9.5	10	0.7	1.1	19.41	96
	GH14	15	3.8	10.0	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
FG1415	1	21	5.3	10.0	-	5.3	1.8	101.9	W12x22	80.3	284	284	29.7	9.5	10	0.7	1.1	19.41	96
GH1415	1	15	3.8	10.0	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	FG15	21	5.3	12.5	-	5.3	1.8	101.9	W12x22	80.3	284	284	29.7	9.5	10	0.7	1.1	19.41	96
	GH15	15	3.8	12.5	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
FG1517	1	21	5.3	15.0	15	5.3	2.0	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.93	96
GH1517	1	15	3.8	15.0	15	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	FG17	21	5.3	7.5	0	2.6	1.0	54.7	W10x15	39.8	140	140	29.7	4.7	5	0.6	1.1	10.42	69
	GH17	15	3.8	7.5	0	1.9	0.7	20.4	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.45	56.3
	HI12	15	3.8	10.0	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	HI14	15	3.8	10.0	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
HI1416	1	15	3.8	12.5	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	HI16	15	3.8	20.0	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	HI17	15	3.8	12.5	0	1.9	0.7	19.0	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.05	56.3

Girders	**Deck Perpendicular to beam**	f'_c = 6ksi	f_{y_conc} = 6000 psi	f_{y_steel} = 36000 psi	w_c = 115pcf	E = 29000ksi			
Girder	Beam Length-l	Beams Supported	Load Supported-	Maximum Moment-	Beam Selection-	Beam Deflection- $\Delta = 5wl^4/384EI$	Allowed Deflection- Δ_{allow} = l/240 (in.)	Shear Force- V = wl/2 (kips)	Shear Force

B.1- Third Floor Beam and Girder Analysis Cont'd

A12	25	AD12-1	1.8	137.1	W14x26	0.9	1.3	21.93	84.3
A23		-			W10x12	0.0	0.0		
A34		-			W10x12	0.0	0.0		
A45	20	AB45-1	0.9	43.4	W10x12	0.2	1.0	8.67	56.3
A57	20	AB6	0.9	43.4	W10x12	0.2	1.0	8.67	56.3
A78	19	AB78-1	0.9	40.3	W10x12	0.1	1.0	8.49	56.3
A89		-			W10x12	0.0	0.0		
A910		-			W10x12	0.0	0.0		
A1011	19	AB1011-1	0.9	39.1	W10x12	0.1	1.0	8.24	56.3
A1113	21	AB12	0.8	44.4	W10x12	0.2	1.1	8.45	69
A1314	20	AB1314-1	0.8	40.2	W10x12	0.2	1.0	8.05	56.3
A1415	20	AB1415-1	0.8	40.2	W10x12	0.2	1.0	8.05	56.3
A1517	30	AB1517-1	0.8	91.9	W12x22	0.8	1.5	12.25	96
B45	20	AB45-1, BD45-1	1.7	86.6	W22x22	0.4	1.0	17.32	85.7
B57	20	AB6, BD6	1.7	86.6	W22x12	0.4	1.0	17.32	85.7
B78	19	AB78-1	0.9	40.3	W10x12	0.1	1.0	8.49	56.3
B89		-			W10x12	0.0	0.0		
B910		-			W10x12	0.0	0.0		
B1011	19	AB10-11-1	0.9	39.1	W10x12	0.1	1.0	8.24	56.3
B1113	21	AB12, BD12	1.6	88.6	W12x22	0.4	1.1	16.88	96
B1314	20	AB1314-1, BD1314-1	1.6	80.4	W12x22	0.3	1.0	16.08	85.7
B1415	20	AB1415-1, BD1415-1	1.6	80.4	W12x22	0.3	1.0	16.08	85.7
B1517	30	AB1517-1, BD1517-1	1.6	182.1	W16x31	1.7	1.5	24.28	131
C89		-			W10x12	0.0	0.0		
C910		-			W10x12	0.0	0.0		
D12	25	AD12-1, DF12-1	3.5	273.4	W21x44	1.7	1.3	43.74	169
D23		-			W10x12	0.0	0.0		
D34		-			W10x12	0.0	0.0		
D45	20	BD45-1, DE45-1	1.7	86.6	W12x22	0.4	1.0	17.32	85.7
D57	20	BD6, DE6	1.7	86.6	W12x22	0.4	1.0	17.32	85.7
D1113	21	BD12, DE12	1.6	88.6	W12x22	0.4	1.1	16.88	96
D1314	20	BD1314-1, DE1314-1	1.6	80.4	W12x22	0.3	1.0	16.08	85.7
D1415	20	BD1415-1, DE1415-1	1.6	80.4	W12x22	0.3	1.0	16.08	85.7
D1517	30	BD1517-1, DE1517-1	1.6	182.1	W16x31	1.7	1.5	24.28	131
E45	20	DE45-1, EF45-1	1.7	86.6	W12x22	0.4	1.0	17.32	85.7
E57	20	DE6, EF6	1.7	86.6	W12x22	0.4	1.0	17.32	85.7
E1113	21	DE12, EF12	1.6	88.6	W12x22	0.4	1.1	16.88	96
E1314	20	DE1314-1, EF1314-1	1.6	80.4	W12x22	0.3	1.0	16.08	85.7
E1415	20	DE1415-1, EF1415-1	1.6	80.4	W12x22	0.3	1.0	16.08	85.7
E1517	30	DE1517-1, EF1517-1	1.6	182.1	W16x31	1.7	1.5	24.28	131
F12	25	DF12-1, FH12-1	3.5	273.4	W21x44	1.7	1.3	43.74	169
F23		-			W10x12	0.0	0.0		
F34		-			W10x12	0.0	0.0		
F45	20	EF45-1, FG45-1	1.9	93.8	W12x22	0.4	1.0	18.76	96
F57	20	EF6, FG6	1.9	93.8	W12x22	0.4	1.0	18.76	96
F1113	21	EF12, FG12	1.7	96.0	W12x22	0.4	1.1	18.28	96
F1314	20	EF1314-1, FG1314-1	1.7	86.8	W12x22	0.4	1.0	17.35	96
F1415	20	EF1415-1, FG1415-1	1.7	87.1	W12x22	0.4	1.0	17.41	96

F1517	30	EF1517-1, FG1517-1	1.8	207.0	W21x44	1.9	1.5	27.60	169
G46	30	FG45-1, FG5, GI45-1, GI5	4.9	554.5	W24x62	5.1	1.5	73.93	273
G67		-				0.0	0.0		
G78	19	GH78-1	0.7	32.7	W10x12	0.1	1.0	6.88	56.3
G810	22	GH9	0.7	43.8	W10x12	0.2	1.1	7.97	56.3
G1011	19	GH1011-1	0.7	30.3	W10x12	0.1	1.0	6.39	56.3
G1112		-			W10x12	0.0	0.0		
G1214	30	FG13, GI13, FG1314-1, GI1314-1	4.6	514.5	W24x62	4.7	1.5	68.60	273
G1415	20	FG1415-1, GH1415-1	1.6	80.4	W12x22	0.3	1.0	16.09	85.7
G1517	30	FG1517-1, GH1517-1	1.7	196.2	W16x31	1.8	1.5	26.16	131
H12	25	FH12-1	1.8	137.1	W14x26	0.9	1.3	21.93	106
H23		-			W10x12	0.0	0.0		
H34		-			W10x12	0.0	0.0		
H67		-			W10x12	0.0	0.0		
H78	19	GH78-1	0.7	32.7	W10x12	0.1	1.0	6.88	56.3
H810	22	GH9	0.7	43.8	W10x12	0.2	1.1	7.97	56.3
H1011	19	GH1011-1	0.7	30.3	W10x12	0.1	1.0	6.39	56.3
H1112		-			W10x12	0.0	0.0		
H1416	25	GH1415-1, GH15, HI1416-1	2.0	157.1	W16x31	1.0	1.3	25.14	131
H1617	25	GH1517-1	0.7	56.6	W10x12	0.4	1.3	9.05	85.7
I12		-			W10x12	0.0	0.0		
I23		-			W10x12	0.0	0.0		
I34		-			W10x12	0.0	0.0		
I46		-			W10x12	0.0	0.0		
I1214	30	GI13, GI1314-1	2.7	304.7	W21x44	2.8	1.5	40.63	273
I1416	25	HI1416-1	0.7	52.5	W10x12	0.3	1.3	8.41	85.7
I1617		-							

B.1- Second Floor Column Analysis

Column	Beams and Girders Supported	Loads Supported- Self + Girder (kips)	Beam Selection- AISC Table 4-1
A1	AD1, A12	113.53	W10x33
A2	A12, A23, AD2	168.62	W10x33
A3	A23, A34, AD3	124.88	W10x33
A4	A34, A45, AB4	39.98	W10x33
A5	A45, A57, AB5	57.20	W10x33
A7	A57, A78, AB7	65.52	W10x33
A8	A78, A89, AB8	48.31	W10x33
A9	A89, A910, AB9	31.46	W10x33
A10	A910, A1011, AB10	47.80	W10x33
A11	A1011, A1113, AB11	65.87	W10x33
A13	A1113, AB13	49.40	W10x33
A14			W10x33
A15			W10x33
A17			W10x33
B4	B45, AB4, BD4	113.67	W10x33
B5	B45, B57, AB5, BD5	165.46	W10x33
B7	B57, B78, AB7, BD7	119.83	W10x33
B8	B78, B89, AB8, BC8	48.31	W10x33
B9	B89, B910, AB9, BC9	124.71	W10x33
B10	B910, B1011, AB10, BC10	124.71	W10x33

B11	B1011, B1113, AB11, BD11	141.05	W10x33
B13	B1113, B1314, AB13, BD13	67.56	W10x33
B14	B1314, B1415, AB14, BD14	31.32	W10x33
B15	B1415, BD15	31.32	W10x33
B17			W10x33
C8	C89, BC8	118.56	W10x33
C9	C89, C910, BC9	31.37	W10x33
C10	C910, BC10	31.31	W10x33
D1	AD1, DF1, D12	65.83	W10x33
D2	D12, D23, AD2, DF2	65.83	W10x33
D3	D23, D34, AD3, DF3	56.73	W10x33
D4	D34, D45, AD4, DF4	55.00	W10x33
D5	D45, D57, AD5, DF5	97.56	W10x33
D7	D57, AD7, DF7	159.21	W10x33
D11	D1113, AD11, DF11	159.21	W10x33
D13	D1113, D1314, AD13, DF13	161.02	W10x33
D14	D1314, D1415, AD14, DF14	56.06	W10x33
D15	D1415, AD15, DF15	45.78	W10x33
D17	B45, AB4, BD4	129.73	W10x33

E4	B45, B57, AB5, BD5	86.57	W10x33
E5	B57, B78, AB7, BD7	42.48	W10x33
E7	E1011, E1113, DE11, EF11	123.76	W10x33
E11	E1113, E1314, DE13, EF13	79.88	W10x33
E13	E1314, E1415, DE14, EF14	61.18	W10x33
E14	E1415, EF15	63.70	W10x33
E15	EF1, FG1, F12	48.91	W10x33
E17	F12, F23, EF2, FG2	159.25	W10x33
F1	F23, F34, EF3, FG3	21.91	W10x33
F2	F34, F45, EF4, FG4	35.55	W10x33
F3	F45, F57, EF5, FG5	37.72	W10x33
F4	F57, EF7, FG7	25.15	W10x33
F5	F1113, EF11, FG11	32.30	W10x33
F7	F1113, F1314, EF13, FG13	169.72	W10x33
F11	F1314, F1415, EF14, FG14	65.61	W10x33
F13	F1415, EF15, FG15	65.65	W10x33
F14	G46, FG4, GH4	31.37	W10x33
F15	G46, G67, FG6, GH6	21.91	W10x33
F17	G67, G78, FG7, GH7	31.31	W10x33
G4	G78, G810, GH8	35.55	W10x33

G6	G810, G1011, GH10	47.12	W10x33
G7	G1011, G1112, FG11, GH11	35.55	W10x33
G11	G1112, G1214, FG12, GH12	31.19	W10x33
G12	G1214, G1415, FG14, GH14	90.20	W10x33
G14	G1415, FG15, GH15	31.49	W10x33
G15			W10x33
G17			W10x33
H1	FH1, HI1, H12	31.37	W10x33
H2	H12, H23, FH2, HI2	31.31	W10x33
H3	H23, H34, FH3, HI3	31.55	W10x33
H4	H34, GH4, HI4	118.67	W10x33
H6	H67, GH6, HI6	49.30	W10x33
H7	H67, H78, GH7	31.49	W10x33
H8	H78, H810, GH8	31.19	W10x33
H9	H810, H1011, GH10	20.36	W10x33
H10	H1011, H1112, GH11, HI11	20.36	W10x33
H11	H1112, GH12, HI12	31.19	W10x33
H12	H1416, GH14, HI14	31.19	W10x33
H14	H1416, H1617, GH16, HI16	31.19	W10x33

H16	H1617, HI17	31.19	W10x33
H17			W10x33
I1	I12, HI1	11.69	W10x33
I2	I12, I23	0.98	W10x33
I3	I23, I34, HI3	22.09	W10x33
I4	I34, I46, HI4	22.27	W10x33
I6	I46, HI6	11.75	W10x33
I12	I1214, HI12	31.19	W10x33
I14	I1214, I1416, HI14	31.19	W10x33
I16	I146, I1617, HI16	31.19	W10x33
I17	I1617, HI17	11.69	W10x33

B.1- Second Floor Beam and Girder Analysis

Beams	**Deck Perpendicular to beam**	f'_c = 6ksi	f_{y_conc} = 6000 psi	f_{y_steel} = 36000 psi	w_c = 115pcf	E = 29000ksi												
Grid Boundary	Beam Number	Beam Length-l (ft.)	Tributary/Effective Width (ft.) - Least of Three				Factored Loading Demand-w- 1.2D + 1.6L + 0.5S (kips/ft.) Concrete and Deck- 118psf; Framing, Mechanical, Ceiling- 15psf; Live- 100psf; Snow- 55psf	Maximum Moment-M-$wl^2/8$ (ft.-kips)	Beam Selection-AISC Table 3-19	Horizontal Shear Force (kips/ft.) - Least of Two (usually)			Strength of Stud- Q_n $=0.5A_{sc}(f'_cw_c)^{3/4}$ (kips)	Number of Shear 3/4-in. Studs- N = $\Sigma Q_n/Q_n$	True Number of Studs	Beam Deflection- Δ = $5wl^4/384EI$ (in.)	Allowed Deflection- Δ_{allow} = 3/8in.	Shear Force- V = wl/2 (kips)	Shear Force Capacity of Beam-AISC Table 3-6
			Beam Length/8	Beam Spacing/2	Distance to Slab Edge	Width to be Used - b				$0.85f'_cA_c$	A_sF_y	ΣQ_n= A_sF_y for full composite action						
	AD1	36	9.0	5.0	0	5.0	1.9	311.3	W18x40	76.5	270	270	29.7	9.1	10	1.9	1.8	34.59	169
AD12	1	36	9.0	12.5	10	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	AD2	36	9.0	15.0	25	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	AD3	36	9.0	12.5	-	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	AB4	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	BD4	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
AB45	1	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
BD45	1	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	AB5	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	BD5	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	AB6	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	BD6	18	4.5	10.0	10	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	AB7	18	4.5	12.8	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	BD7	18	4.5	5.5	0	2.3	0.9	35.5	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.89	56.3
	DF1	36	9.0	5.0	0	4.5	1.7	280.9	W18x40	68.9	243	243	29.7	8.2	9	1.7	1.8	31.21	169
DF12	1	36	9.0	12.5	10	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	DF2	36	9.0	15.0	25	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	DF3	36	9.0	12.5	-	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	DE4	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	EF4	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
DE45	1	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
EF45	1	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	DE5	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	EF5	18	4.5	10.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	DE6	18	4.5	10.0	10	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	EF6	18	4.5	10.0	10	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	DE7	18	4.5	5.5	0	2.3	0.9	35.5	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.89	56.3
	EF7	18	4.5	5.5	0	2.3	0.9	35.5	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.89	56.3
	FH1	36	9.0	5.0	0	4.5	1.7	280.9	W18x40	68.9	243	243	29.7	8.2	9	1.7	1.8	31.21	169
FH12	1	36	9.0	12.5	10	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	FH2	36	9.0	15.0	25	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	FH3	36	9.0	12.5	-	9.0	3.4	558.4	W24x62	137.7	486	486	29.7	16.3	17	1.4	1.8	62.04	306
	FG4	21	5.3	10.0	-	5.3	2.0	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.93	96
	GH4	15	3.8	10.0	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
FG45	1	21	5.3	10.0	-	5.3	2.0	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.93	96
GI45	1	30	7.5	10.0	-	7.5	2.9	322.1	W21x44	114.8	405	405	29.7	13.6	14	1.0	1.5	42.95	106
	FG5	21	5.3	10.0	-	5.3	2.0	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.93	96
	GI5	30	7.5	10.0	10	7.5	2.9	321.6	W18x40	114.8	405	405	29.7	13.6	14	1.4	1.5	42.87	169
	FG6	21	5.3	10.0	10	5.3	2.0	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.93	96
	GH6	15	3.8	10.0	10	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	FG7	21	5.3	5.5	0	2.6	1.0	54.7	W10x15	39.8	140	140	29.7	4.7	5	0.8	1.1	10.42	69
	GH7	15	3.8	12.8	0	1.9	0.7	20.4	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.45	56.3
	HI1	15	3.8	12.5	0	1.9	0.7	20.4	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.45	56.3
	HI2	15	3.8	20.0	25	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	HI3	15	3.8	12.5	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	HI4	15	3.8	12.5	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	HI6	15	3.8	5.0	0	1.9	0.7	20.4	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.45	56.3
AB78	1	18	4.5	14.5	-	4.5	1.8	71.3	W12x16	68.9	243	243	29.7	8.2	9	0.6	0.9	15.83	79.1
GH78	1	15	3.8	14.5	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	AB8	18	4.5	12.8	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	GH8	15	3.8	12.8	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	AB9	18	4.5	11.0	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	GH9	15	3.8	11.0	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	AB10	18	4.5	12.8	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
	GH10	15	3.8	12.8	-	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
AB1011	1	18	4.5	14.5	-	4.5	1.7	69.1	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	15.35	79.1
GH1011	1	15	3.8	14.5	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3

$h_r \le 3$in.
$w_r \ge 2$in.
$t_c \ge 2.5$in.
$d_{sc} \le$ 0.75in.
$H_s \ge h_r +$ 1½ in.

	AB11	18	4.5	12.8	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	BD11	18	4.5	5.5	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.9	0.9	14.23	79.1
	AB12	18	4.5	10.5	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	BD12	18	4.5	10.5	10	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	AB13	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	BD13	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
AB1314	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
BD1314	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	AB14	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	BD14	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
AB1415	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
BD1415	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	AB15	18	4.5	12.5	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	BD15	18	4.5	12.5	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
AB1517	1	18	4.5	15.0	15	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
BD1517	1	18	4.5	15.0	15	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	AB17	18	4.5	7.5	0	2.3	0.9	35.5	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.89	56.3
	BD17	18	4.5	7.5	0	2.3	0.9	35.5	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.89	56.3
	DE11	18	4.5	5.5	0	2.3	0.8	32.9	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.31	56.3
	EF11	18	4.5	5.5	0	2.3	0.8	32.9	W10x12	35.2	124	124	29.7	4.2	5	0.5	0.9	7.31	56.3
	DE12	18	4.5	10.5	10	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	EF12	18	4.5	10.5	10	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	DE13	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	EF13	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
DE1314	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
EF1314	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	DE14	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	EF14	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
DE1415	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
EF1415	1	18	4.5	10.0	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	DE15	18	4.5	12.5	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	EF15	18	4.5	12.5	-	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
DE1517	1	18	4.5	15.0	15	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
EF1517	1	18	4.5	15.0	15	4.5	1.6	64.0	W12x16	68.9	243	243	29.7	8.2	9	0.5	0.9	14.23	79.1
	DE17	18	4.5	7.5	0	2.3	0.9	35.6	W10x15	35.2	124	124	29.7	4.2	5	0.4	0.9	7.92	56.3
	EF17	18	4.5	7.5	0	2.3	0.9	35.6	W10x15	35.2	124	124	29.7	4.2	5	0.4	0.9	7.92	56.3
	FG11	21	5.3	5.5	0	2.6	0.9	50.7	W10x15	39.8	140	140	29.7	4.7	5	0.8	1.1	9.66	69
	GH11	15	3.8	12.8	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	FG12	21	5.3	10.5	10	5.3	1.8	101.4	W10x15	80.3	284	284	29.7	9.5	10	1.6	1.1	19.32	69
	GH12	15	3.8	10.5	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	FG13	21	5.3	10.0	-	5.3	1.8	101.9	W12x22	80.3	284	284	29.7	9.5	10	0.7	1.1	19.41	96
	GI13	30	7.5	10.0	-	7.5	2.7	298.8	W21x44	114.8	405	405	29.7	13.6	14	0.9	1.5	39.84	106
FG1314	1	21	5.3	10.0	-	5.3	1.8	101.2	W12x22	80.3	284	284	29.7	9.5	10	0.7	1.1	19.29	96
GI1314	1	30	7.5	10.0	-	7.5	2.7	298.8	W21x44	114.8	405	405	29.7	13.6	14	0.9	1.5	39.84	106
	FG14	21	5.3	10.0	-	5.3	1.8	101.9	W12x22	80.3	284	284	29.7	9.5	10	0.7	1.1	19.41	96
	GH14	15	3.8	10.0	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
FG1415	1	21	5.3	10.0	-	5.3	1.8	101.9	W12x22	80.3	284	284	29.7	9.5	10	0.7	1.1	19.41	96
GH1415	1	15	3.8	10.0	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	FG15	21	5.3	12.5	-	5.3	1.8	101.9	W12x22	80.3	284	284	29.7	9.5	10	0.7	1.1	19.41	96
	GH15	15	3.8	12.5	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
FG1517	1	21	5.3	15.0	15	5.3	2.0	109.9	W12x22	80.3	284	284	29.7	9.5	10	0.8	1.1	20.93	96
GH1517	1	15	3.8	15.0	15	3.8	1.4	39.9	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	10.65	56.3
	FG17	21	5.3	7.5	0	2.6	1.0	54.7	W10x15	39.8	140	140	29.7	4.7	5	0.6	1.1	10.42	69
	GH17	15	3.8	7.5	0	1.9	0.7	20.4	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.45	56.3
	HI12	15	3.8	10.0	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	HI14	15	3.8	10.0	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
HI1416	1	15	3.8	12.5	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	HI16	15	3.8	20.0	-	3.8	1.3	37.0	W10x12	57.4	203	203	29.7	6.8	7	0.4	0.8	9.87	56.3
	HI17	15	3.8	12.5	0	1.9	0.7	19.0	W10x12	29.1	103	103	29.7	3.5	4	0.2	0.8	5.05	56.3

Girders	**Deck Perpendicular to beam**	f'_c = 6ksi	f_{y_conc} = 6000 psi	f_{y_steel} = 36000 psi	w_c = 115pcf	E = 29000ksi			
Girder	Beam Length-l	Beams Supported	Load Supported-	Maximum Moment-	Beam Selection-	Beam Deflection- $\Delta = 5wl^4/384EI$ (in.)	Allowed Deflection- Δ_{allow} = l/240 (in.)	Shear Force- V = wl/2 (kips)	Shear Force
A12	25	AD12-1	1.8	137.1	W14x26	0.9	1.3	21.93	84.3
A23		-			W10x12	0.0	0.0		
A34		-			W10x12	0.0	0.0		
A45	20	AB45-1	0.9	43.4	W10x12	0.2	1.0	8.67	56.3
A57	20	AB6	0.9	43.4	W10x12	0.2	1.0	8.67	56.3

A78	19	AB78-1	0.9	40.3	W10x12	0.1	1.0	8.49	56.3
A89		-			W10x12	0.0	0.0		
A910		-			W10x12	0.0	0.0		
A1011	19	AB1011-1	0.9	39.1	W10x12	0.1	1.0	8.24	56.3
A1113	21	AB12	0.8	44.4	W10x12	0.2	1.1	8.45	69
A1314	20	AB1314-1	0.8	40.2	W10x12	0.2	1.0	8.05	56.3
A1415	20	AB1415-1	0.8	40.2	W10x12	0.2	1.0	8.05	56.3
A1517	30	AB1517-1	0.8	91.9	W12x22	0.8	1.5	12.25	96
B45	20	AB45-1, BD45-1	1.7	86.6	W22x22	0.4	1.0	17.32	85.7
B57	20	AB6, BD6	1.7	86.6	W22x12	0.4	1.0	17.32	85.7
B78	19	AB78-1	0.9	40.3	W10x12	0.1	1.0	8.49	56.3
B89		-			W10x12	0.0	0.0		
B910		-			W10x12	0.0	0.0		
B1011	19	AB10-11-1	0.9	39.1	W10x12	0.1	1.0	8.24	56.3
B1113	21	AB12, BD12	1.6	88.6	W12x22	0.4	1.1	16.88	96
B1314	20	AB1314-1, BD1314-1	1.6	80.4	W12x22	0.3	1.0	16.08	85.7
B1415	20	AB1415-1, BD1415-1	1.6	80.4	W12x22	0.3	1.0	16.08	85.7
B1517	30	AB1517-1, BD1517-1	1.6	182.1	W16x31	1.7	1.5	24.28	131
C89		-			W10x12	0.0	0.0		
C910		-			W10x12	0.0	0.0		
D12	25	AD12-1, DF12-1	3.5	273.4	W21x44	1.7	1.3	43.74	169
D23		-			W10x12	0.0	0.0		
D34		-			W10x12	0.0	0.0		
D45	20	BD45-1, DE45-1	1.7	86.6	W12x22	0.4	1.0	17.32	85.7
D57	20	BD6, DE6	1.7	86.6	W12x22	0.4	1.0	17.32	85.7
D1113	21	BD12, DE12	1.6	88.6	W12x22	0.4	1.1	16.88	96
D1314	20	BD1314-1, DE1314-1	1.6	80.4	W12x22	0.3	1.0	16.08	85.7
D1415	20	BD1415-1, DE1415-1	1.6	80.4	W12x22	0.3	1.0	16.08	85.7
D1517	30	BD1517-1, DE1517-1	1.6	182.1	W16x31	1.7	1.5	24.28	131
E45	20	DE45-1, EF45-1	1.7	86.6	W12x22	0.4	1.0	17.32	85.7
E57	20	DE6, EF6	1.7	86.6	W12x22	0.4	1.0	17.32	85.7
E1113	21	DE12, EF12	1.6	88.6	W12x22	0.4	1.1	16.88	96
E1314	20	DE1314-1, EF1314-1	1.6	80.4	W12x22	0.3	1.0	16.08	85.7
E1415	20	DE1415-1, EF1415-1	1.6	80.4	W12x22	0.3	1.0	16.08	85.7
E1517	30	DE1517-1, EF1517-1	1.6	182.1	W16x31	1.7	1.5	24.28	131
F12	25	DF12-1, FH12-1	3.5	273.4	W21x44	1.7	1.3	43.74	169
F23		-			W10x12	0.0	0.0		
F34		-			W10x12	0.0	0.0		
F45	20	EF45-1, FG45-1	1.9	93.8	W12x22	0.4	1.0	18.76	96
F57	20	EF6, FG6	1.9	93.8	W12x22	0.4	1.0	18.76	96
F1113	21	EF12, FG12	1.7	96.0	W12x22	0.4	1.1	18.28	96
F1314	20	EF1314-1, FG1314-1	1.7	86.8	W12x22	0.4	1.0	17.35	96
F1415	20	EF1415-1, FG1415-1	1.7	87.1	W12x22	0.4	1.0	17.41	96
F1517	30	EF1517-1, FG1517-1	1.8	207.0	W21x44	1.9	1.5	27.60	169
G46	30	FG45-1, FG5, GI45-1, GI5	4.9	554.5	W24x62	5.1	1.5	73.93	273
G67		-				0.0	0.0		
G78	19	GH78-1	0.7	32.7	W10x12	0.1	1.0	6.88	56.3
G810	22	GH9	0.7	43.8	W10x12	0.2	1.1	7.97	56.3

G1011	19	GH1011-1	0.7	30.3	W10x12	0.1	1.0	6.39	56.3
G1112		-			W10x12	0.0	0.0		
G1214	30	FG13, GI13, FG1314-1, GI1314-1	4.6	514.5	W24x62	4.7	1.5	68.60	273
G1415	20	FG1415-1, GH1415-1	1.6	80.4	W12x22	0.3	1.0	16.09	85.7
G1517	30	FG1517-1, GH1517-1	1.7	196.2	W16x31	1.8	1.5	26.16	131
H12	25	FH12-1	1.8	137.1	W14x26	0.9	1.3	21.93	106
H23		-			W10x12	0.0	0.0		
H34		-			W10x12	0.0	0.0		
H67		-			W10x12	0.0	0.0		
H78	19	GH78-1	0.7	32.7	W10x12	0.1	1.0	6.88	56.3
H810	22	GH9	0.7	43.8	W10x12	0.2	1.1	7.97	56.3
H1011	19	GH1011-1	0.7	30.3	W10x12	0.1	1.0	6.39	56.3
H1112		-			W10x12	0.0	0.0		
H1416	25	GH1415-1, GH15, HI1416-1	2.0	157.1	W16x31	1.0	1.3	25.14	131
H1617	25	GH1517-1	0.7	56.6	W10x12	0.4	1.3	9.05	85.7
I12		-			W10x12	0.0	0.0		
I23		-			W10x12	0.0	0.0		
I34		-			W10x12	0.0	0.0		
I46		-			W10x12	0.0	0.0		
I1214	30	GI13, GI1314-1	2.7	304.7	W21x44	2.8	1.5	40.63	273
I1416	25	HI1416-1	0.7	52.5	W10x12	0.3	1.3	8.41	85.7
I1617		-							

B.1- First Floor Column Analysis

Column	Beams and Girders Supported	Loads Supported- Self + Girder (kips)	Beam Selection- AISC Table 4-1
A1	AD1, A12	170.05	W10x33
A2	A12, A23, AD2	252.68	W10x39
A3	A23, A34, AD3	187.07	W10x33
A4	A34, A45, AB4	59.73	W10x33
A5	A45, A57, AB5	85.56	W10x33
A7	A57, A78, AB7	98.03	W10x33
A8	A78, A89, AB8	72.22	W10x33
A9	A89, A910, AB9	46.94	W10x33
A10	A910, A1011, AB10	71.45	W10x33
A11	A1011, A1113, AB11	98.56	W10x33
A13	A1113, AB13	73.85	W10x33
A14			W10x33
A15			W10x33
A17			W10x33
B4	B45, AB4, BD4	170.26	W10x33
B5	B45, B57, AB5, BD5	247.94	W10x39
B7	B57, B78, AB7, BD7	179.50	W10x33
B8	B78, B89, AB8, BC8	72.22	W10x33
B9	B89, B910, AB9, BC9	186.81	W10x33
B10	B910, B1011, AB10, BC10	186.81	W10x33

B11	B1011, B1113, AB11, BD11	211.33	W10x33
B13	B1113, B1314, AB13, BD13	101.09	W10x33
B14	B1314, B1415, AB14, BD14	46.74	W10x33
B15	B1415, BD15	46.74	W10x33
B17			W10x33
C8	C89, BC8	177.59	W10x33
C9	C89, C910, BC9	46.81	W10x33
C10	C910, BC10	46.72	W10x33
D1	AD1, DF1, D12	98.49	W10x33
D2	D12, D23, AD2, DF2	98.49	W10x33
D3	D23, D34, AD3, DF3	84.85	W10x33
D4	D34, D45, AD4, DF4	82.25	W10x33
D5	D45, D57, AD5, DF5	146.09	W10x33
D7	D57, AD7, DF7	238.57	W10x39
D11	D1113, AD11, DF11	238.57	W10x39
D13	D1113, D1314, AD13, DF13	241.28	W10x39
D14	D1314, D1415, AD14, DF14	73.38	W10x33
D15	D1415, AD15, DF15	63.09	W10x33
D17	B45, AB4, BD4	194.34	W10x33

E4	B45, B57, AB5, BD5	129.60	W10x33
E5	B57, B78, AB7, BD7	63.47	W10x33
E7	E1011, E1113, DE11, EF11	185.39	W10x33
E11	E1113, E1314, DE13, EF13	119.57	W10x33
E13	E1314, E1415, DE14, EF14	91.52	W10x33
E14	E1415, EF15	95.31	W10x33
E15	EF1, FG1, F12	73.11	W10x33
E17	F12, F23, EF2, FG2	238.63	W10x39
F1	F23, F34, EF3, FG3	32.61	W10x33
F2	F34, F45, EF4, FG4	53.07	W10x33
F3	F45, F57, EF5, FG5	56.33	W10x33
F4	F57, EF7, FG7	37.48	W10x33
F5	F1113, EF11, FG11	48.20	W10x33
F7	F1113, F1314, EF13, FG13	254.33	W10x39
F11	F1314, F1415, EF14, FG14	98.17	W10x33
F13	F1415, EF15, FG15	98.23	W10x33
F14	G46, FG4, GH4	46.81	W10x33
F15	G46, G67, FG6, GH6	32.61	W10x33
F17	G67, G78, FG7, GH7	46.72	W10x33
G4	G78, G810, GH8	53.07	W10x33

G6	G810, G1011, GH10	70.44	W10x33
G7	G1011, G1112, FG11, GH11	53.07	W10x33
G11	G1112, G1214, FG12, GH12	46.54	W10x33
G12	G1214, G1415, FG14, GH14	135.05	W10x33
G14	G1415, FG15, GH15	46.99	W10x33
G15			W10x33
G17			W10x33
H1	FH1, HI1, H12	46.81	W10x33
H2	H12, H23, FH2, HI2	46.72	W10x33
H3	H23, H34, FH3, HI3	47.08	W10x33
H4	H34, GH4, HI4	177.75	W10x33
H6	H67, GH6, HI6	73.70	W10x33
H7	H67, H78, GH7	46.99	W10x33
H8	H78, H810, GH8	46.54	W10x33
H9	H810, H1011, GH10	30.30	W10x33
H10	H1011, H1112, GH11, HI11	30.30	W10x33
H11	H1112, GH12, HI12	46.54	W10x33
H12	H1416, GH14, HI14	46.54	W10x33
H14	H1416, H1617, GH16, HI16	46.54	W10x33

B.1- First Floor Column Analysis Cont'd

H16	H1617, HI17	46.54	W10x33
H17			W10x33
I1	I12, HI1	17.29	W10x33
I2	I12, I23	1.22	W10x33
I3	I23, I34, HI3	32.88	W10x33
I4	I34, I46, HI4	33.15	W10x33
I6	I46, HI6	17.38	W10x33
I12	I1214, HI12	46.54	W10x33
I14	I1214, I1416, HI14	46.54	W10x33
I16	I146, I1617, HI16	46.54	W10x33
I17	I1617, HI17	17.29	W10x33

Company : WPI
Designer : Alford Green
Job Number : W=4200plf

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Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	N1	-269.149	178.472	0	0	0	0
2	1	N7	155.928	0	0	0	0	0
3	1	N16	457.93	0	0	0	0	0
4	1	N2	-2.413	0	0	0	0	0
5	1	N3	-190.26	0	0	0	0	0
6	1	N15	123.64	0	0	0	0	0
7	1	N4	-121.762	0	0	0	0	0
8	1	N14	53.216	0	0	0	0	0
9	1	N5	-34.511	0	0	0	0	0
10	1	N13	.391	0	0	0	0	0
11	1	N6	86.828	0	0	0	0	0
12	1	N12	-18.289	0	0	0	0	0
13	1	N11	-88.56	0	0	0	0	0
14	1	N10	-388.697	0	0	0	0	0
15	1	N8	235.709	0	0	0	0	0
16	1	N9	0	157.528	0	0	0	0
17	1	Totals:	0	336	0			
18	1	COG (ft):	X: 40	Y: 10	Z: 0			

Joint Deflections (By Combination)

	LC	Joint Label	X [in]	Y [in]	Z [in]	X Rotation [rad]	Y Rotation [rad]	Z Rotation [rad]
1	1	N1	0	0	0	0	0	-4.684e-3
2	1	N2	0	-.217	0	0	0	-4.024e-4
3	1	N3	0	-.355	0	0	0	-6.987e-4
4	1	N4	0	-.461	0	0	0	-3.881e-4
5	1	N5	0	-.507	0	0	0	-7.805e-5
6	1	N6	0	-.492	0	0	0	2.467e-4
7	1	N7	0	-.416	0	0	0	5.284e-4
8	1	N12	0	-.494	0	0	0	1.699e-4
9	1	N13	0	-.507	0	0	0	-5.687e-5
10	1	N14	0	-.467	0	0	0	-3.067e-4
11	1	N15	0	-.368	0	0	0	-6.443e-4
12	1	N16	0	-.209	0	0	0	-4.304e-4
13	1	N8	0	-.304	0	0	0	4.826e-4
14	1	N9	-.069	0	0	0	0	5.779e-3
15	1	N10	0	-.296	0	0	0	4.44e-4
16	1	N11	0	-.425	0	0	0	4.862e-4

Member Section Deflections

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
1	1	M1	1	0	0	0	0	NC	NC
2			2	0	-.067	0	0	2802.834	NC
3			3	0	-.134	0	0	1396.272	NC
4			4	0	-.191	0	0	1012.32	NC
5			5	0	-.23	0	0	896.6	NC
6			6	0	-.25	0	0	929.075	NC
7			7	0	-.251	0	0	1133.056	NC
8			8	0	-.239	0	0	1724.903	NC
9			9	0	-.223	0	0	4038.417	NC
10			10	0	-.217	0	0	NC	NC
11	1	M2	1	0	-.217	0	0	NC	NC
12			2	0	-.237	0	0	NC	NC
13			3	0	-.272	0	0	5088.259	NC
14			4	0	-.309	0	0	2607.719	NC

Member Section Deflections (Continued)

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
15			5	0	-.34	0	0	1942.913	NC
16			6	0	-.36	0	0	1829.573	NC
17			7	0	-.366	0	0	2129.631	NC
18			8	0	-.362	0	0	3245.418	NC
19			9	0	-.354	0	0	8280.838	NC
20			10	0	-.355	0	0	NC	NC
21	1	M3	1	0	-.355	0	0	NC	NC
22			2	0	-.377	0	0	NC	NC
23			3	0	-.412	0	0	3664.034	NC
24			4	0	-.447	0	0	2130.474	NC
25			5	0	-.474	0	0	1676.577	NC
26			6	0	-.488	0	0	1626.934	NC
27			7	0	-.488	0	0	1928.573	NC
28			8	0	-.478	0	0	2970.692	NC
29			9	0	-.465	0	0	7600.53	NC
30			10	0	-.461	0	0	NC	NC
31	1	M4	1	0	-.461	0	0	NC	NC
32			2	0	-.478	0	0	NC	NC
33			3	0	-.506	0	0	3434.496	NC
34			4	0	-.535	0	0	2068.557	NC
35			5	0	-.554	0	0	1662.187	NC
36			6	0	-.56	0	0	1641.039	NC
37			7	0	-.552	0	0	1982.705	NC
38			8	0	-.535	0	0	3141.707	NC
39			9	0	-.516	0	0	8552.83	NC
40			10	0	-.507	0	0	NC	NC
41	1	M5	1	0	-.507	0	0	NC	NC
42			2	0	-.518	0	0	9098.837	NC
43			3	0	-.541	0	0	3226.95	NC
44			4	0	-.562	0	0	2005.909	NC
45			5	0	-.573	0	0	1643.612	NC
46			6	0	-.571	0	0	1649.641	NC
47			7	0	-.556	0	0	2030.363	NC
48			8	0	-.531	0	0	3310.088	NC
49			9	0	-.506	0	0	9645.3	NC
50			10	0	-.492	0	0	NC	NC
51	1	M6	1	0	-.492	0	0	NC	NC
52			2	0	-.498	0	0	8133.614	NC
53			3	0	-.514	0	0	3075.69	NC
54			4	0	-.527	0	0	1967.069	NC
55			5	0	-.531	0	0	1643.334	NC
56			6	0	-.521	0	0	1679.371	NC
57			7	0	-.498	0	0	2113.659	NC
58			8	0	-.466	0	0	3578.759	NC
59			9	0	-.435	0	0	NC	NC
60			10	0	-.416	0	0	NC	NC
61	1	M12	1	0	-.494	0	0	NC	NC
62			2	0	-.496	0	0	NC	NC
63			3	0	-.498	0	0	NC	NC
64			4	0	-.501	0	0	NC	NC
65			5	0	-.503	0	0	NC	NC
66			6	0	-.504	0	0	NC	NC
67			7	0	-.506	0	0	NC	NC
68			8	0	-.507	0	0	NC	NC
69			9	0	-.507	0	0	NC	NC
70			10	0	-.507	0	0	NC	NC
71	1	M13	1	0	-.507	0	0	NC	NC

Company : WPI
Designer : Alford Green
Job Number : W=4200 plf

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Member Section Deflections (Continued)

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
72			2	0	-.505	0	0	NC	NC
73			3	0	-.502	0	0	NC	NC
74			4	0	-.498	0	0	NC	NC
75			5	0	-.493	0	0	NC	NC
76			6	0	-.488	0	0	NC	NC
77			7	0	-.482	0	0	NC	NC
78			8	0	-.477	0	0	NC	NC
79			9	0	-.471	0	0	NC	NC
80			10	0	-.467	0	0	NC	NC
81	1	M14	1	0	-.467	0	0	NC	NC
82			2	0	-.461	0	0	NC	NC
83			3	0	-.452	0	0	NC	NC
84			4	0	-.441	0	0	NC	NC
85			5	0	-.429	0	0	NC	NC
86			6	0	-.416	0	0	NC	NC
87			7	0	-.402	0	0	NC	NC
88			8	0	-.389	0	0	NC	NC
89			9	0	-.378	0	0	NC	NC
90			10	0	-.368	0	0	NC	NC
91	1	M15	1	0	-.368	0	0	757.502	NC
92			2	0	-.356	0	0	818.807	NC
93			3	0	-.339	0	0	924.823	NC
94			4	0	-.319	0	0	1095.724	NC
95			5	0	-.297	0	0	1373.896	NC
96			6	0	-.274	0	0	1853.709	NC
97			7	0	-.253	0	0	2778.095	NC
98			8	0	-.234	0	0	4953.63	NC
99			9	0	-.219	0	0	NC	NC
100			10	0	-.209	0	0	NC	NC
101	1	M16	1	-.108	-.18	0	0	NC	NC
102			2	-.096	-.176	0	0	8749.988	NC
103			3	-.084	-.174	0	0	4034.055	NC
104			4	-.072	-.173	0	0	2629.593	NC
105			5	-.06	-.168	0	0	2036.85	NC
106			6	-.048	-.158	0	0	1787.734	NC
107			7	-.036	-.139	0	0	1769.904	NC
108			8	-.024	-.108	0	0	2051.974	NC
109			9	-.012	-.063	0	0	3269.654	NC
110			10	0	0	0	0	NC	NC
111	1	M17	1	.217	0	0	0	NC	NC
112			2	.217	.002	0	0	NC	NC
113			3	.216	.002	0	0	NC	NC
114			4	.215	.002	0	0	NC	NC
115			5	.214	0	0	0	NC	NC
116			6	.213	-.001	0	0	NC	NC
117			7	.212	-.002	0	0	NC	NC
118			8	.211	-.003	0	0	NC	NC
119			9	.21	-.002	0	0	NC	NC
120			10	.209	0	0	0	NC	NC
121	1	M19	1	-.368	0	0	0	NC	NC
122			2	-.366	-.003	0	0	NC	NC
123			3	-.365	-.004	0	0	NC	NC
124			4	-.364	-.003	0	0	NC	NC
125			5	-.362	0	0	0	NC	NC
126			6	-.361	.002	0	0	NC	NC
127			7	-.359	.004	0	0	NC	NC
128			8	-.358	.005	0	0	NC	NC

Company : WPI
Designer : Alford Green
Job Number :
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Member Section Deflections (Continued)

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
129			9	-.357	.004	0	0	NC	NC
130			10	-.355	0	0	0	NC	NC
131	1	M21	1	.461	0	0	0	NC	NC
132			2	.462	.002	0	0	NC	NC
133			3	.463	.003	0	0	NC	NC
134			4	.463	.002	0	0	NC	NC
135			5	.464	.001	0	0	NC	NC
136			6	.464	0	0	0	NC	NC
137			7	.465	-.001	0	0	NC	NC
138			8	.466	-.002	0	0	NC	NC
139			9	.466	-.001	0	0	NC	NC
140			10	.467	0	0	0	NC	NC
141	1	M23	1	-.507	0	0	0	NC	NC
142			2	-.507	0	0	0	NC	NC
143			3	-.507	0	0	0	NC	NC
144			4	-.507	0	0	0	NC	NC
145			5	-.507	0	0	0	NC	NC
146			6	-.507	0	0	0	NC	NC
147			7	-.507	0	0	0	NC	NC
148			8	-.507	0	0	0	NC	NC
149			9	-.507	0	0	0	NC	NC
150			10	-.507	0	0	0	NC	NC
151	1	M25	1	.492	0	0	0	NC	NC
152			2	.492	-.001	0	0	NC	NC
153			3	.492	-.002	0	0	NC	NC
154			4	.492	-.002	0	0	NC	NC
155			5	.493	-.001	0	0	NC	NC
156			6	.493	0	0	0	NC	NC
157			7	.493	0	0	0	NC	NC
158			8	.493	0	0	0	NC	NC
159			9	.493	0	0	0	NC	NC
160			10	.494	0	0	0	NC	NC
161	1	M24	1	-.254	-.423	0	0	NC	NC
162			2	-.255	-.426	0	0	NC	NC
163			3	-.255	-.428	0	0	NC	NC
164			4	-.256	-.431	0	0	NC	NC
165			5	-.257	-.432	0	0	NC	NC
166			6	-.258	-.434	0	0	NC	NC
167			7	-.259	-.435	0	0	NC	NC
168			8	-.259	-.436	0	0	NC	NC
169			9	-.26	-.435	0	0	NC	NC
170			10	-.261	-.435	0	0	NC	NC
171	1	M20	1	.237	-.396	0	0	NC	NC
172			2	.232	-.389	0	0	NC	NC
173			3	.227	-.382	0	0	NC	NC
174			4	.221	-.374	0	0	NC	NC
175			5	.216	-.365	0	0	NC	NC
176			6	.211	-.355	0	0	NC	NC
177			7	.205	-.346	0	0	NC	NC
178			8	.2	-.336	0	0	NC	NC
179			9	.195	-.326	0	0	NC	NC
180			10	.189	-.315	0	0	NC	NC
181	1	M18	1	.183	-.305	0	0	1119.165	NC
182			2	.174	-.292	0	0	1241.114	NC
183			3	.166	-.278	0	0	1423.094	NC
184			4	.158	-.262	0	0	1695.71	NC
185			5	.149	-.246	0	0	2118.129	NC

Company : WPI
Designer : Alford Green
Job Number :

MQP- Lobby Truss Design

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Member Section Deflections (Continued)

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
186			6	.141	-.229	0	0	2815.57	NC
187			7	.133	-.214	0	0	4095.288	NC
188			8	.124	-.2	0	0	6922.321	NC
189			9	.116	-.188	0	0	NC	NC
190			10	.108	-.18	0	0	NC	NC
191	1	M7	1	0	-.416	0	0	NC	NC
192			2	0	-.418	0	0	8311.284	NC
193			3	0	-.429	0	0	3187.149	NC
194			4	0	-.437	0	0	2061.659	NC
195			5	0	-.435	0	0	1745.412	NC
196			6	0	-.42	0	0	1817.522	NC
197			7	0	-.392	0	0	2360.312	NC
198			8	0	-.357	0	0	4269.819	NC
199			9	0	-.323	0	0	NC	NC
200			10	0	-.304	0	0	NC	NC
201	1	M8	1	0	-.304	0	0	NC	NC
202			2	-.008	-.307	0	0	3249.595	NC
203			3	-.015	-.318	0	0	1470.741	NC
204			4	-.023	-.323	0	0	995.077	NC
205			5	-.031	-.314	0	0	829.761	NC
206			6	-.038	-.284	0	0	808.405	NC
207			7	-.046	-.232	0	0	916.667	NC
208			8	-.054	-.163	0	0	1263.646	NC
209			9	-.061	-.081	0	0	2519.681	NC
210			10	-.069	0	0	0	NC	NC
211	1	M9	1	.059	.035	0	0	NC	NC
212			2	.069	-.045	0	0	2924.701	NC
213			3	.08	-.107	0	0	1788.517	NC
214			4	.09	-.155	0	0	1496.034	NC
215			5	.101	-.189	0	0	1456.32	NC
216			6	.111	-.214	0	0	1585.74	NC
217			7	.121	-.23	0	0	1933.785	NC
218			8	.132	-.24	0	0	2755.008	NC
219			9	.142	-.248	0	0	5405.472	NC
220			10	.152	-.254	0	0	NC	NC
221	1	M10	1	0	-.296	0	0	NC	NC
222			2	0	-.305	0	0	NC	NC
223			3	0	-.318	0	0	5617.599	NC
224			4	0	-.333	0	0	3235.649	NC
225			5	0	-.351	0	0	2196.912	NC
226			6	0	-.369	0	0	1648.299	NC
227			7	0	-.387	0	0	1326.516	NC
228			8	0	-.403	0	0	1127.418	NC
229			9	0	-.416	0	0	1003.653	NC
230			10	0	-.425	0	0	932.59	NC
231	1	M11	1	0	-.425	0	0	NC	NC
232			2	0	-.432	0	0	NC	NC
233			3	0	-.441	0	0	NC	NC
234			4	0	-.45	0	0	NC	NC
235			5	0	-.459	0	0	NC	NC
236			6	0	-.468	0	0	NC	NC
237			7	0	-.477	0	0	NC	NC
238			8	0	-.484	0	0	NC	NC
239			9	0	-.49	0	0	NC	NC
240			10	0	-.494	0	0	NC	NC
241	1	M27	1	.416	0	0	0	NC	NC
242			2	.417	-.003	0	0	NC	NC

Member Section Deflections (Continued)

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
243			3	.418	-.004	0	0	NC	NC
244			4	.419	-.003	0	0	NC	NC
245			5	.42	-.001	0	0	NC	NC
246			6	.421	0	0	0	NC	NC
247			7	.422	.002	0	0	NC	NC
248			8	.423	.003	0	0	NC	NC
249			9	.424	.002	0	0	NC	NC
250			10	.425	0	0	0	NC	NC
251	1	M29	1	.304	0	0	0	NC	NC
252			2	.303	-.003	0	0	NC	NC
253			3	.302	-.003	0	0	NC	NC
254			4	.301	-.003	0	0	NC	NC
255			5	.301	-.001	0	0	NC	NC
256			6	.3	0	0	0	NC	NC
257			7	.299	.002	0	0	NC	NC
258			8	.298	.003	0	0	NC	NC
259			9	.297	.002	0	0	NC	NC
260			10	.296	0	0	0	NC	NC
261	1	M28	1	-.152	-.254	0	0	NC	NC
262			2	-.159	-.262	0	0	NC	NC
263			3	-.166	-.272	0	0	7549.73	NC
264			4	-.173	-.284	0	0	4604.685	NC
265			5	-.18	-.297	0	0	3237.29	NC
266			6	-.187	-.31	0	0	2477.312	NC
267			7	-.193	-.324	0	0	2010.145	NC
268			8	-.2	-.336	0	0	1705.443	NC
269			9	-.207	-.347	0	0	1500.77	NC
270			10	-.214	-.357	0	0	1363.522	NC
271	1	M26	1	-.219	-.364	0	0	NC	NC
272			2	-.222	-.372	0	0	NC	NC
273			3	-.226	-.379	0	0	NC	NC
274			4	-.23	-.387	0	0	NC	NC
275			5	-.234	-.394	0	0	NC	NC
276			6	-.238	-.4	0	0	NC	NC
277			7	-.242	-.407	0	0	NC	NC
278			8	-.245	-.412	0	0	NC	NC
279			9	-.249	-.417	0	0	NC	NC
280			10	-.253	-.422	0	0	NC	NC
281	1	M22	1	.261	-.435	0	0	NC	NC
282			2	.259	-.433	0	0	NC	NC
283			3	.256	-.43	0	0	NC	NC
284			4	.254	-.427	0	0	NC	NC
285			5	.252	-.424	0	0	NC	NC
286			6	.249	-.419	0	0	NC	NC
287			7	.247	-.415	0	0	NC	NC
288			8	.245	-.41	0	0	NC	NC
289			9	.242	-.405	0	0	NC	NC
290			10	.24	-.4	0	0	NC	NC

Member Section Forces

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
1	1	M1	1	0	19.396	0	0	0	18.927
2			2	0	14.73	0	0	0	-.032
3			3	0	10.063	0	0	0	-13.805
4			4	0	5.396	0	0	0	-22.394
5			5	0	.73	0	0	0	-25.797

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Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
6			6	0	-3.937	0	0	0	-24.015
7			7	0	-8.604	0	0	0	-17.048
8			8	0	-13.27	0	0	0	-4.895
9			9	0	-17.937	0	0	0	12.442
10			10	0	-22.604	0	0	0	34.965
11	1	M2	1	0	22.312	0	0	0	42.115
12			2	0	17.645	0	0	0	19.917
13			3	0	12.978	0	0	0	2.904
14			4	0	8.312	0	0	0	-8.923
15			5	0	3.645	0	0	0	-15.566
16			6	0	-1.022	0	0	0	-17.023
17			7	0	-5.688	0	0	0	-13.295
18			8	0	-10.355	0	0	0	-4.382
19			9	0	-15.022	0	0	0	9.716
20			10	0	-19.688	0	0	0	28.999
21	1	M3	1	0	21.749	0	0	0	38.159
22			2	0	17.082	0	0	0	16.587
23			3	0	12.415	0	0	0	.199
24			4	0	7.749	0	0	0	-11.003
25			5	0	3.082	0	0	0	-17.02
26			6	0	-1.585	0	0	0	-17.852
27			7	0	-6.251	0	0	0	-13.499
28			8	0	-10.918	0	0	0	-3.96
29			9	0	-15.585	0	0	0	10.764
30			10	0	-20.251	0	0	0	30.672
31	1	M4	1	0	21.319	0	0	0	36.011
32			2	0	16.652	0	0	0	14.916
33			3	0	11.986	0	0	0	-.994
34			4	0	7.319	0	0	0	-11.718
35			5	0	2.652	0	0	0	-17.258
36			6	0	-2.014	0	0	0	-17.612
37			7	0	-6.681	0	0	0	-12.781
38			8	0	-11.348	0	0	0	-2.765
39			9	0	-16.014	0	0	0	12.436
40			10	0	-20.681	0	0	0	32.822
41	1	M5	1	0	20.909	0	0	0	33.932
42			2	0	16.242	0	0	0	13.293
43			3	0	11.575	0	0	0	-2.161
44			4	0	6.909	0	0	0	-12.43
45			5	0	2.242	0	0	0	-17.514
46			6	0	-2.425	0	0	0	-17.412
47			7	0	-7.091	0	0	0	-12.125
48			8	0	-11.758	0	0	0	-1.653
49			9	0	-16.425	0	0	0	14.004
50			10	0	-21.091	0	0	0	34.847
51	1	M6	1	0	20.463	0	0	0	31.784
52			2	0	15.796	0	0	0	11.64
53			3	0	11.129	0	0	0	-3.318
54			4	0	6.463	0	0	0	-13.092
55			5	0	1.796	0	0	0	-17.68
56			6	0	-2.871	0	0	0	-17.083
57			7	0	-7.537	0	0	0	-11.301
58			8	0	-12.204	0	0	0	-.334
59			9	0	-16.871	0	0	0	15.818
60			10	0	-21.537	0	0	0	37.156
61	1	M12	1	0	.119	0	0	0	.168
62			2	0	.119	0	0	0	.036

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
63			3	0	.119	0	0	0	-.097
64			4	0	.119	0	0	0	-.229
65			5	0	.119	0	0	0	-.361
66			6	0	.119	0	0	0	-.493
67			7	0	.119	0	0	0	-.625
68			8	0	.119	0	0	0	-.757
69			9	0	.119	0	0	0	-.889
70			10	0	.119	0	0	0	-1.021
71	1	M13	1	0	-.331	0	0	0	-2.127
72			2	0	-.331	0	0	0	-1.759
73			3	0	-.331	0	0	0	-1.391
74			4	0	-.331	0	0	0	-1.022
75			5	0	-.331	0	0	0	-.654
76			6	0	-.331	0	0	0	-.286
77			7	0	-.331	0	0	0	.082
78			8	0	-.331	0	0	0	.451
79			9	0	-.331	0	0	0	.819
80			10	0	-.331	0	0	0	1.187
81	1	M14	1	0	-.766	0	0	0	-4.464
82			2	0	-.766	0	0	0	-3.613
83			3	0	-.766	0	0	0	-2.762
84			4	0	-.766	0	0	0	-1.911
85			5	0	-.766	0	0	0	-1.06
86			6	0	-.766	0	0	0	-.209
87			7	0	-.766	0	0	0	.642
88			8	0	-.766	0	0	0	1.493
89			9	0	-.766	0	0	0	2.344
90			10	0	-.766	0	0	0	3.195
91	1	M15	1	0	-1.716	0	0	0	-8.178
92			2	0	-1.716	0	0	0	-6.271
93			3	0	-1.716	0	0	0	-4.365
94			4	0	-1.716	0	0	0	-2.458
95			5	0	-1.716	0	0	0	-.551
96			6	0	-1.716	0	0	0	1.356
97			7	0	-1.716	0	0	0	3.263
98			8	0	-1.716	0	0	0	5.169
99			9	0	-1.716	0	0	0	7.076
100			10	0	-1.716	0	0	0	8.983
101	1	M16	1	-312.637	2.069	0	0	0	5.205
102			2	-312.637	2.069	0	0	0	2.524
103			3	-312.637	2.069	0	0	0	-.158
104			4	-312.637	2.069	0	0	0	-2.839
105			5	-312.637	2.069	0	0	0	-5.52
106			6	-312.637	2.069	0	0	0	-8.202
107			7	-312.637	2.069	0	0	0	-10.883
108			8	-312.637	2.069	0	0	0	-13.565
109			9	-312.637	2.069	0	0	0	-16.246
110			10	-312.637	2.069	0	0	0	-18.927
111	1	M17	1	44.915	2.413	0	0	0	7.151
112			2	44.915	2.413	0	0	0	5.542
113			3	44.915	2.413	0	0	0	3.934
114			4	44.915	2.413	0	0	0	2.325
115			5	44.915	2.413	0	0	0	.716
116			6	44.915	2.413	0	0	0	-.892
117			7	44.915	2.413	0	0	0	-2.501
118			8	44.915	2.413	0	0	0	-4.109
119			9	44.915	2.413	0	0	0	-5.718

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Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
120			10	44.915	2.413	0	0	0	-7.326
121	1	M19	1	-71.007	-3.891	0	0	0	-11.502
122			2	-71.007	-3.891	0	0	0	-8.908
123			3	-71.007	-3.891	0	0	0	-6.314
124			4	-71.007	-3.891	0	0	0	-3.72
125			5	-71.007	-3.891	0	0	0	-1.126
126			6	-71.007	-3.891	0	0	0	1.467
127			7	-71.007	-3.891	0	0	0	4.061
128			8	-71.007	-3.891	0	0	0	6.655
129			9	-71.007	-3.891	0	0	0	9.249
130			10	-71.007	-3.891	0	0	0	11.843
131	1	M21	1	-30.387	2.013	0	0	0	6.295
132			2	-30.387	2.013	0	0	0	4.953
133			3	-30.387	2.013	0	0	0	3.61
134			4	-30.387	2.013	0	0	0	2.268
135			5	-30.387	2.013	0	0	0	.926
136			6	-30.387	2.013	0	0	0	-.416
137			7	-30.387	2.013	0	0	0	-1.758
138			8	-30.387	2.013	0	0	0	-3.1
139			9	-30.387	2.013	0	0	0	-4.442
140			10	-30.387	2.013	0	0	0	-5.784
141	1	M23	1	.45	-.391	0	0	0	-1.106
142			2	.45	-.391	0	0	0	-.846
143			3	.45	-.391	0	0	0	-.585
144			4	.45	-.391	0	0	0	-.325
145			5	.45	-.391	0	0	0	-.064
146			6	.45	-.391	0	0	0	.197
147			7	.45	-.391	0	0	0	.457
148			8	.45	-.391	0	0	0	.718
149			9	.45	-.391	0	0	0	.979
150			10	.45	-.391	0	0	0	1.239
151	1	M25	1	-9.901	-1.207	0	0	0	-3.862
152			2	-9.901	-1.207	0	0	0	-3.057
153			3	-9.901	-1.207	0	0	0	-2.252
154			4	-9.901	-1.207	0	0	0	-1.448
155			5	-9.901	-1.207	0	0	0	-.643
156			6	-9.901	-1.207	0	0	0	.162
157			7	-9.901	-1.207	0	0	0	.966
158			8	-9.901	-1.207	0	0	0	1.771
159			9	-9.901	-1.207	0	0	0	2.576
160			10	-9.901	-1.207	0	0	0	3.381
161	1	M24	1	19.956	.058	0	0	0	-.059
162			2	19.956	.058	0	0	0	-.135
163			3	19.956	.058	0	0	0	-.211
164			4	19.956	.058	0	0	0	-.286
165			5	19.956	.058	0	0	0	-.362
166			6	19.956	.058	0	0	0	-.438
167			7	19.956	.058	0	0	0	-.514
168			8	19.956	.058	0	0	0	-.589
169			9	19.956	.058	0	0	0	-.665
170			10	19.956	.058	0	0	0	-.741
171	1	M20	1	139.705	-.093	0	0	0	-.956
172			2	139.705	-.093	0	0	0	-.835
173			3	139.705	-.093	0	0	0	-.715
174			4	139.705	-.093	0	0	0	-.594
175			5	139.705	-.093	0	0	0	-.473
176			6	139.705	-.093	0	0	0	-.353

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Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
177			7	139.705	-.093	0	0	0	-.232
178			8	139.705	-.093	0	0	0	-.112
179			9	139.705	-.093	0	0	0	.009
180			10	139.705	-.093	0	0	0	.129
181	1	M18	1	217.662	-.534	0	0	0	-2.683
182			2	217.662	-.534	0	0	0	-1.991
183			3	217.662	-.534	0	0	0	-1.298
184			4	217.662	-.534	0	0	0	-.606
185			5	217.662	-.534	0	0	0	.086
186			6	217.662	-.534	0	0	0	.779
187			7	217.662	-.534	0	0	0	1.471
188			8	217.662	-.534	0	0	0	2.164
189			9	217.662	-.534	0	0	0	2.856
190			10	217.662	-.534	0	0	0	3.549
191	1	M7	1	0	20.065	0	0	0	30.411
192			2	0	15.398	0	0	0	10.709
193			3	0	10.732	0	0	0	-3.808
194			4	0	6.065	0	0	0	-13.139
195			5	0	1.398	0	0	0	-17.285
196			6	0	-3.268	0	0	0	-16.246
197			7	0	-7.935	0	0	0	-10.022
198			8	0	-12.602	0	0	0	1.387
199			9	0	-17.268	0	0	0	17.982
200			10	0	-21.935	0	0	0	39.761
201	1	M8	1	233.024	22.31	0	0	0	31.586
202			2	233.024	17.643	0	0	0	9.39
203			3	233.024	12.976	0	0	0	-7.621
204			4	233.024	8.31	0	0	0	-19.446
205			5	233.024	3.643	0	0	0	-26.087
206			6	233.024	-1.024	0	0	0	-27.542
207			7	233.024	-5.69	0	0	0	-23.812
208			8	233.024	-10.357	0	0	0	-14.897
209			9	233.024	-15.024	0	0	0	-.796
210			10	233.024	-19.69	0	0	0	18.489
211	1	M9	1	-270.733	-1.695	0	0	0	-18.489
212			2	-270.733	-1.695	0	0	0	-16.293
213			3	-270.733	-1.695	0	0	0	-14.096
214			4	-270.733	-1.695	0	0	0	-11.9
215			5	-270.733	-1.695	0	0	0	-9.703
216			6	-270.733	-1.695	0	0	0	-7.507
217			7	-270.733	-1.695	0	0	0	-5.31
218			8	-270.733	-1.695	0	0	0	-3.114
219			9	-270.733	-1.695	0	0	0	-.917
220			10	-270.733	-1.695	0	0	0	1.279
221	1	M10	1	0	1.331	0	0	0	6.735
222			2	0	1.331	0	0	0	5.256
223			3	0	1.331	0	0	0	3.777
224			4	0	1.331	0	0	0	2.298
225			5	0	1.331	0	0	0	.819
226			6	0	1.331	0	0	0	-.66
227			7	0	1.331	0	0	0	-2.139
228			8	0	1.331	0	0	0	-3.618
229			9	0	1.331	0	0	0	-5.097
230			10	0	1.331	0	0	0	-6.576
231	1	M11	1	0	.535	0	0	0	2.083
232			2	0	.535	0	0	0	1.488
233			3	0	.535	0	0	0	.893

Company : WPI
Designer : Alford Green
Job Number : W=4200 plf

MQP- Lobby Truss Design

May 2, 2013
5:55 PM
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Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
234			4	0	.535	0	0	0	.298
235			5	0	.535	0	0	0	-.297
236			6	0	.535	0	0	0	-.892
237			7	0	.535	0	0	0	-1.487
238			8	0	.535	0	0	0	-2.082
239			9	0	.535	0	0	0	-2.677
240			10	0	.535	0	0	0	-3.272
241	1	M27	1	-50.659	-2.939	0	0	0	-8.951
242			2	-50.659	-2.939	0	0	0	-6.991
243			3	-50.659	-2.939	0	0	0	-5.031
244			4	-50.659	-2.939	0	0	0	-3.072
245			5	-50.659	-2.939	0	0	0	-1.112
246			6	-50.659	-2.939	0	0	0	.848
247			7	-50.659	-2.939	0	0	0	2.807
248			8	-50.659	-2.939	0	0	0	4.767
249			9	-50.659	-2.939	0	0	0	6.726
250			10	-50.659	-2.939	0	0	0	8.686
251	1	M29	1	44.245	-2.685	0	0	0	-8.175
252			2	44.245	-2.685	0	0	0	-6.385
253			3	44.245	-2.685	0	0	0	-4.596
254			4	44.245	-2.685	0	0	0	-2.806
255			5	44.245	-2.685	0	0	0	-1.016
256			6	44.245	-2.685	0	0	0	.774
257			7	44.245	-2.685	0	0	0	2.564
258			8	44.245	-2.685	0	0	0	4.353
259			9	44.245	-2.685	0	0	0	6.143
260			10	44.245	-2.685	0	0	0	7.933
261	1	M28	1	178.655	.402	0	0	0	2.477
262			2	178.655	.402	0	0	0	1.957
263			3	178.655	.402	0	0	0	1.437
264			4	178.655	.402	0	0	0	.917
265			5	178.655	.402	0	0	0	.396
266			6	178.655	.402	0	0	0	-.124
267			7	178.655	.402	0	0	0	-.644
268			8	178.655	.402	0	0	0	-1.165
269			9	178.655	.402	0	0	0	-1.685
270			10	178.655	.402	0	0	0	-2.205
271	1	M26	1	99.893	.071	0	0	0	.027
272			2	99.893	.071	0	0	0	-.065
273			3	99.893	.071	0	0	0	-.157
274			4	99.893	.071	0	0	0	-.249
275			5	99.893	.071	0	0	0	-.34
276			6	99.893	.071	0	0	0	-.432
277			7	99.893	.071	0	0	0	-.524
278			8	99.893	.071	0	0	0	-.616
279			9	99.893	.071	0	0	0	-.708
280			10	99.893	.071	0	0	0	-.8
281	1	M22	1	59.764	-.086	0	0	0	-.87
282			2	59.764	-.086	0	0	0	-.759
283			3	59.764	-.086	0	0	0	-.647
284			4	59.764	-.086	0	0	0	-.536
285			5	59.764	-.086	0	0	0	-.425
286			6	59.764	-.086	0	0	0	-.313
287			7	59.764	-.086	0	0	0	-.202
288			8	59.764	-.086	0	0	0	-.09
289			9	59.764	-.086	0	0	0	.021
290			10	59.764	-.086	0	0	0	.133

Member Section Stresses

	LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
1	1	M1	1	0	2.385	0	-8.511	8.511	0	0
2			2	0	1.811	0	.014	-.014	0	0
3			3	0	1.237	0	6.208	-6.208	0	0
4			4	0	.663	0	10.07	-10.07	0	0
5			5	0	.09	0	11.6	-11.6	0	0
6			6	0	-.484	0	10.799	-10.799	0	0
7			7	0	-1.058	0	7.666	-7.666	0	0
8			8	0	-1.631	0	2.201	-2.201	0	0
9			9	0	-2.205	0	-5.595	5.595	0	0
10			10	0	-2.779	0	-15.723	15.723	0	0
11	1	M2	1	0	2.743	0	-18.938	18.938	0	0
12			2	0	2.169	0	-8.956	8.956	0	0
13			3	0	1.596	0	-1.306	1.306	0	0
14			4	0	1.022	0	4.013	-4.013	0	0
15			5	0	.448	0	7	-7	0	0
16			6	0	-.126	0	7.655	-7.655	0	0
17			7	0	-.699	0	5.979	-5.979	0	0
18			8	0	-1.273	0	1.971	-1.971	0	0
19			9	0	-1.847	0	-4.369	4.369	0	0
20			10	0	-2.421	0	-13.04	13.04	0	0
21	1	M3	1	0	2.674	0	-17.159	17.159	0	0
22			2	0	2.1	0	-7.459	7.459	0	0
23			3	0	1.526	0	-.09	.09	0	0
24			4	0	.953	0	4.948	-4.948	0	0
25			5	0	.379	0	7.654	-7.654	0	0
26			6	0	-.195	0	8.028	-8.028	0	0
27			7	0	-.769	0	6.07	-6.07	0	0
28			8	0	-1.342	0	1.781	-1.781	0	0
29			9	0	-1.916	0	-4.84	4.84	0	0
30			10	0	-2.49	0	-13.793	13.793	0	0
31	1	M4	1	0	2.621	0	-16.194	16.194	0	0
32			2	0	2.047	0	-6.708	6.708	0	0
33			3	0	1.474	0	.447	-.447	0	0
34			4	0	.9	0	5.27	-5.27	0	0
35			5	0	.326	0	7.761	-7.761	0	0
36			6	0	-.248	0	7.92	-7.92	0	0
37			7	0	-.821	0	5.748	-5.748	0	0
38			8	0	-1.395	0	1.244	-1.244	0	0
39			9	0	-1.969	0	-5.592	5.592	0	0
40			10	0	-2.543	0	-14.759	14.759	0	0
41	1	M5	1	0	2.571	0	-15.258	15.258	0	0
42			2	0	1.997	0	-5.977	5.977	0	0
43			3	0	1.423	0	.972	-.972	0	0
44			4	0	.849	0	5.589	-5.589	0	0
45			5	0	.276	0	7.875	-7.875	0	0
46			6	0	-.298	0	7.83	-7.83	0	0
47			7	0	-.872	0	5.452	-5.452	0	0
48			8	0	-1.446	0	.743	-.743	0	0
49			9	0	-2.019	0	-6.297	6.297	0	0
50			10	0	-2.593	0	-15.67	15.67	0	0
51	1	M6	1	0	2.516	0	-14.293	14.293	0	0
52			2	0	1.942	0	-5.234	5.234	0	0
53			3	0	1.368	0	1.492	-1.492	0	0
54			4	0	.795	0	5.887	-5.887	0	0
55			5	0	.221	0	7.95	-7.95	0	0
56			6	0	-.353	0	7.682	-7.682	0	0

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
57			7	0	-.927	0	5.082	-5.082	0	0
58			8	0	-1.5	0	.15	-.15	0	0
59			9	0	-2.074	0	-7.113	7.113	0	0
60			10	0	-2.648	0	-16.708	16.708	0	0
61	1	M12	1	0	.015	0	-.075	.075	0	0
62			2	0	.015	0	-.016	.016	0	0
63			3	0	.015	0	.043	-.043	0	0
64			4	0	.015	0	.103	-.103	0	0
65			5	0	.015	0	.162	-.162	0	0
66			6	0	.015	0	.222	-.222	0	0
67			7	0	.015	0	.281	-.281	0	0
68			8	0	.015	0	.34	-.34	0	0
69			9	0	.015	0	.4	-.4	0	0
70			10	0	.015	0	.459	-.459	0	0
71	1	M13	1	0	-.041	0	.957	-.957	0	0
72			2	0	-.041	0	.791	-.791	0	0
73			3	0	-.041	0	.625	-.625	0	0
74			4	0	-.041	0	.46	-.46	0	0
75			5	0	-.041	0	.294	-.294	0	0
76			6	0	-.041	0	.129	-.129	0	0
77			7	0	-.041	0	-.037	.037	0	0
78			8	0	-.041	0	-.203	.203	0	0
79			9	0	-.041	0	-.368	.368	0	0
80			10	0	-.041	0	-.534	.534	0	0
81	1	M14	1	0	-.094	0	2.008	-2.008	0	0
82			2	0	-.094	0	1.625	-1.625	0	0
83			3	0	-.094	0	1.242	-1.242	0	0
84			4	0	-.094	0	.86	-.86	0	0
85			5	0	-.094	0	.477	-.477	0	0
86			6	0	-.094	0	.094	-.094	0	0
87			7	0	-.094	0	-.288	.288	0	0
88			8	0	-.094	0	-.671	.671	0	0
89			9	0	-.094	0	-1.054	1.054	0	0
90			10	0	-.094	0	-1.437	1.437	0	0
91	1	M15	1	0	-.211	0	3.678	-3.678	0	0
92			2	0	-.211	0	2.82	-2.82	0	0
93			3	0	-.211	0	1.963	-1.963	0	0
94			4	0	-.211	0	1.105	-1.105	0	0
95			5	0	-.211	0	.248	-.248	0	0
96			6	0	-.211	0	-.61	.61	0	0
97			7	0	-.211	0	-1.467	1.467	0	0
98			8	0	-.211	0	-2.325	2.325	0	0
99			9	0	-.211	0	-3.182	3.182	0	0
100			10	0	-.211	0	-4.039	4.039	0	0
101	1	M16	1	-22.331	.254	0	-2.341	2.341	0	0
102			2	-22.331	.254	0	-1.135	1.135	0	0
103			3	-22.331	.254	0	.071	-.071	0	0
104			4	-22.331	.254	0	1.277	-1.277	0	0
105			5	-22.331	.254	0	2.482	-2.482	0	0
106			6	-22.331	.254	0	3.688	-3.688	0	0
107			7	-22.331	.254	0	4.894	-4.894	0	0
108			8	-22.331	.254	0	6.1	-6.1	0	0
109			9	-22.331	.254	0	7.305	-7.305	0	0
110			10	-22.331	.254	0	8.511	-8.511	0	0
111	1	M17	1	3.208	.297	0	-3.216	3.216	0	0
112			2	3.208	.297	0	-2.492	2.492	0	0
113			3	3.208	.297	0	-1.769	1.769	0	0

Company : WPI
Designer : Alford Green
Job Number : W=4200 plf
MQP- Lobby Truss Design
May 2, 2013
5:55 PM
Checked By:_____

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
114			4	3.208	.297	0	-1.046	1.046	0	0
115			5	3.208	.297	0	-.322	.322	0	0
116			6	3.208	.297	0	.401	-.401	0	0
117			7	3.208	.297	0	1.124	-1.124	0	0
118			8	3.208	.297	0	1.848	-1.848	0	0
119			9	3.208	.297	0	2.571	-2.571	0	0
120			10	3.208	.297	0	3.295	-3.295	0	0
121	1	M19	1	-5.072	-.478	0	5.172	-5.172	0	0
122			2	-5.072	-.478	0	4.006	-4.006	0	0
123			3	-5.072	-.478	0	2.839	-2.839	0	0
124			4	-5.072	-.478	0	1.673	-1.673	0	0
125			5	-5.072	-.478	0	.507	-.507	0	0
126			6	-5.072	-.478	0	-.66	.66	0	0
127			7	-5.072	-.478	0	-1.826	1.826	0	0
128			8	-5.072	-.478	0	-2.993	2.993	0	0
129			9	-5.072	-.478	0	-4.159	4.159	0	0
130			10	-5.072	-.478	0	-5.326	5.326	0	0
131	1	M21	1	-2.171	.248	0	-2.831	2.831	0	0
132			2	-2.171	.248	0	-2.227	2.227	0	0
133			3	-2.171	.248	0	-1.624	1.624	0	0
134			4	-2.171	.248	0	-1.02	1.02	0	0
135			5	-2.171	.248	0	-.417	.417	0	0
136			6	-2.171	.248	0	.187	-.187	0	0
137			7	-2.171	.248	0	.791	-.791	0	0
138			8	-2.171	.248	0	1.394	-1.394	0	0
139			9	-2.171	.248	0	1.998	-1.998	0	0
140			10	-2.171	.248	0	2.601	-2.601	0	0
141	1	M23	1	.032	-.048	0	.498	-.498	0	0
142			2	.032	-.048	0	.38	-.38	0	0
143			3	.032	-.048	0	.263	-.263	0	0
144			4	.032	-.048	0	.146	-.146	0	0
145			5	.032	-.048	0	.029	-.029	0	0
146			6	.032	-.048	0	-.088	.088	0	0
147			7	.032	-.048	0	-.206	.206	0	0
148			8	.032	-.048	0	-.323	.323	0	0
149			9	.032	-.048	0	-.44	.44	0	0
150			10	.032	-.048	0	-.557	.557	0	0
151	1	M25	1	-.707	-.148	0	1.737	-1.737	0	0
152			2	-.707	-.148	0	1.375	-1.375	0	0
153			3	-.707	-.148	0	1.013	-1.013	0	0
154			4	-.707	-.148	0	.651	-.651	0	0
155			5	-.707	-.148	0	.289	-.289	0	0
156			6	-.707	-.148	0	-.073	.073	0	0
157			7	-.707	-.148	0	-.435	.435	0	0
158			8	-.707	-.148	0	-.796	.796	0	0
159			9	-.707	-.148	0	-1.158	1.158	0	0
160			10	-.707	-.148	0	-1.52	1.52	0	0
161	1	M24	1	1.425	.007	0	.027	-.027	0	0
162			2	1.425	.007	0	.061	-.061	0	0
163			3	1.425	.007	0	.095	-.095	0	0
164			4	1.425	.007	0	.129	-.129	0	0
165			5	1.425	.007	0	.163	-.163	0	0
166			6	1.425	.007	0	.197	-.197	0	0
167			7	1.425	.007	0	.231	-.231	0	0
168			8	1.425	.007	0	.265	-.265	0	0
169			9	1.425	.007	0	.299	-.299	0	0
170			10	1.425	.007	0	.333	-.333	0	0

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
171	1	M20	1	9.979	-.011	0	.43	-.43	0	0
172			2	9.979	-.011	0	.376	-.376	0	0
173			3	9.979	-.011	0	.321	-.321	0	0
174			4	9.979	-.011	0	.267	-.267	0	0
175			5	9.979	-.011	0	.213	-.213	0	0
176			6	9.979	-.011	0	.159	-.159	0	0
177			7	9.979	-.011	0	.104	-.104	0	0
178			8	9.979	-.011	0	.05	-.05	0	0
179			9	9.979	-.011	0	-.004	.004	0	0
180			10	9.979	-.011	0	-.058	.058	0	0
181	1	M18	1	15.547	-.066	0	1.207	-1.207	0	0
182			2	15.547	-.066	0	.895	-.895	0	0
183			3	15.547	-.066	0	.584	-.584	0	0
184			4	15.547	-.066	0	.272	-.272	0	0
185			5	15.547	-.066	0	-.039	.039	0	0
186			6	15.547	-.066	0	-.35	.35	0	0
187			7	15.547	-.066	0	-.662	.662	0	0
188			8	15.547	-.066	0	-.973	.973	0	0
189			9	15.547	-.066	0	-1.284	1.284	0	0
190			10	15.547	-.066	0	-1.596	1.596	0	0
191	1	M7	1	0	2.467	0	-13.675	13.675	0	0
192			2	0	1.893	0	-4.816	4.816	0	0
193			3	0	1.319	0	1.712	-1.712	0	0
194			4	0	.746	0	5.908	-5.908	0	0
195			5	0	.172	0	7.773	-7.773	0	0
196			6	0	-.402	0	7.306	-7.306	0	0
197			7	0	-.976	0	4.507	-4.507	0	0
198			8	0	-1.549	0	-.624	.624	0	0
199			9	0	-2.123	0	-8.086	8.086	0	0
200			10	0	-2.697	0	-17.88	17.88	0	0
201	1	M8	1	16.645	2.743	0	-14.204	14.204	0	0
202			2	16.645	2.169	0	-4.223	4.223	0	0
203			3	16.645	1.595	0	3.427	-3.427	0	0
204			4	16.645	1.022	0	8.745	-8.745	0	0
205			5	16.645	.448	0	11.731	-11.731	0	0
206			6	16.645	-.126	0	12.385	-12.385	0	0
207			7	16.645	-.7	0	10.708	-10.708	0	0
208			8	16.645	-1.273	0	6.699	-6.699	0	0
209			9	16.645	-1.847	0	.358	-.358	0	0
210			10	16.645	-2.421	0	-8.314	8.314	0	0
211	1	M9	1	-19.338	-.208	0	8.314	-8.314	0	0
212			2	-19.338	-.208	0	7.326	-7.326	0	0
213			3	-19.338	-.208	0	6.339	-6.339	0	0
214			4	-19.338	-.208	0	5.351	-5.351	0	0
215			5	-19.338	-.208	0	4.363	-4.363	0	0
216			6	-19.338	-.208	0	3.376	-3.376	0	0
217			7	-19.338	-.208	0	2.388	-2.388	0	0
218			8	-19.338	-.208	0	1.4	-1.4	0	0
219			9	-19.338	-.208	0	.412	-.412	0	0
220			10	-19.338	-.208	0	-.575	.575	0	0
221	1	M10	1	0	.164	0	-3.029	3.029	0	0
222			2	0	.164	0	-2.364	2.364	0	0
223			3	0	.164	0	-1.698	1.698	0	0
224			4	0	.164	0	-1.033	1.033	0	0
225			5	0	.164	0	-.368	.368	0	0
226			6	0	.164	0	.297	-.297	0	0
227			7	0	.164	0	.962	-.962	0	0

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
228			8	0	.164	0	1.627	-1.627	0	0
229			9	0	.164	0	2.292	-2.292	0	0
230			10	0	.164	0	2.957	-2.957	0	0
231	1	M11	1	0	.066	0	-.937	.937	0	0
232			2	0	.066	0	-.669	.669	0	0
233			3	0	.066	0	-.401	.401	0	0
234			4	0	.066	0	-.134	.134	0	0
235			5	0	.066	0	.134	-.134	0	0
236			6	0	.066	0	.401	-.401	0	0
237			7	0	.066	0	.669	-.669	0	0
238			8	0	.066	0	.936	-.936	0	0
239			9	0	.066	0	1.204	-1.204	0	0
240			10	0	.066	0	1.471	-1.471	0	0
241	1	M27	1	-3.619	-.361	0	4.025	-4.025	0	0
242			2	-3.619	-.361	0	3.144	-3.144	0	0
243			3	-3.619	-.361	0	2.262	-2.262	0	0
244			4	-3.619	-.361	0	1.381	-1.381	0	0
245			5	-3.619	-.361	0	.5	-.5	0	0
246			6	-3.619	-.361	0	-.381	.381	0	0
247			7	-3.619	-.361	0	-1.262	1.262	0	0
248			8	-3.619	-.361	0	-2.144	2.144	0	0
249			9	-3.619	-.361	0	-3.025	3.025	0	0
250			10	-3.619	-.361	0	-3.906	3.906	0	0
251	1	M29	1	3.16	-.33	0	3.676	-3.676	0	0
252			2	3.16	-.33	0	2.871	-2.871	0	0
253			3	3.16	-.33	0	2.067	-2.067	0	0
254			4	3.16	-.33	0	1.262	-1.262	0	0
255			5	3.16	-.33	0	.457	-.457	0	0
256			6	3.16	-.33	0	-.348	.348	0	0
257			7	3.16	-.33	0	-1.153	1.153	0	0
258			8	3.16	-.33	0	-1.958	1.958	0	0
259			9	3.16	-.33	0	-2.763	2.763	0	0
260			10	3.16	-.33	0	-3.567	3.567	0	0
261	1	M28	1	12.761	.049	0	-1.114	1.114	0	0
262			2	12.761	.049	0	-.88	.88	0	0
263			3	12.761	.049	0	-.646	.646	0	0
264			4	12.761	.049	0	-.412	.412	0	0
265			5	12.761	.049	0	-.178	.178	0	0
266			6	12.761	.049	0	.056	-.056	0	0
267			7	12.761	.049	0	.29	-.29	0	0
268			8	12.761	.049	0	.524	-.524	0	0
269			9	12.761	.049	0	.758	-.758	0	0
270			10	12.761	.049	0	.992	-.992	0	0
271	1	M26	1	7.135	.009	0	-.012	.012	0	0
272			2	7.135	.009	0	.029	-.029	0	0
273			3	7.135	.009	0	.07	-.07	0	0
274			4	7.135	.009	0	.112	-.112	0	0
275			5	7.135	.009	0	.153	-.153	0	0
276			6	7.135	.009	0	.194	-.194	0	0
277			7	7.135	.009	0	.236	-.236	0	0
278			8	7.135	.009	0	.277	-.277	0	0
279			9	7.135	.009	0	.318	-.318	0	0
280			10	7.135	.009	0	.36	-.36	0	0
281	1	M22	1	4.269	-.011	0	.391	-.391	0	0
282			2	4.269	-.011	0	.341	-.341	0	0
283			3	4.269	-.011	0	.291	-.291	0	0
284			4	4.269	-.011	0	.241	-.241	0	0

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
285			5	4.269	-.011	0	.191	-.191	0	0
286			6	4.269	-.011	0	.141	-.141	0	0
287			7	4.269	-.011	0	.091	-.091	0	0
288			8	4.269	-.011	0	.041	-.041	0	0
289			9	4.269	-.011	0	-.01	.01	0	0
290			10	4.269	-.011	0	-.06	.06	0	0

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	N1	-291.578	193.345	0	0	0	0
2	1	N7	168.922	0	0	0	0	0
3	1	N16	496.091	0	0	0	0	0
4	1	N2	-2.614	0	0	0	0	0
5	1	N3	-206.115	0	0	0	0	0
6	1	N15	133.943	0	0	0	0	0
7	1	N4	-131.909	0	0	0	0	0
8	1	N14	57.65	0	0	0	0	0
9	1	N5	-37.387	0	0	0	0	0
10	1	N13	.423	0	0	0	0	0
11	1	N6	94.063	0	0	0	0	0
12	1	N12	-19.813	0	0	0	0	0
13	1	N11	-95.94	0	0	0	0	0
14	1	N10	-421.089	0	0	0	0	0
15	1	N8	255.351	0	0	0	0	0
16	1	N9	0	170.655	0	0	0	0
17	1	Totals:	0	364	0			
18	1	COG (ft):	X: 40	Y: 10	Z: 0			

Joint Deflections

	LC	Joint Label	X [in]	Y [in]	Z [in]	X Rotation [rad]	Y Rotation [rad]	Z Rotation [rad]
1	1	N1	0	0	0	0	0	-5.075e-3
2	1	N2	0	-.236	0	0	0	-4.359e-4
3	1	N3	0	-.385	0	0	0	-7.569e-4
4	1	N4	0	-.5	0	0	0	-4.205e-4
5	1	N5	0	-.549	0	0	0	-8.456e-5
6	1	N6	0	-.533	0	0	0	2.672e-4
7	1	N7	0	-.451	0	0	0	5.724e-4
8	1	N12	0	-.535	0	0	0	1.841e-4
9	1	N13	0	-.549	0	0	0	-6.161e-5
10	1	N14	0	-.506	0	0	0	-3.323e-4
11	1	N15	0	-.399	0	0	0	-6.98e-4
12	1	N16	0	-.227	0	0	0	-4.663e-4
13	1	N8	0	-.329	0	0	0	5.229e-4
14	1	N9	-.075	0	0	0	0	6.261e-3
15	1	N10	0	-.321	0	0	0	4.81e-4
16	1	N11	0	-.46	0	0	0	5.267e-4

Member Section Deflections

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
1	1	M1	1	0	0	0	0	NC	NC
2			2	0	-.073	0	0	2587.231	NC
3			3	0	-.145	0	0	1288.867	NC
4			4	0	-.207	0	0	934.449	NC
5			5	0	-.25	0	0	827.631	NC
6			6	0	-.271	0	0	857.608	NC
7			7	0	-.272	0	0	1045.898	NC
8			8	0	-.259	0	0	1592.218	NC
9			9	0	-.242	0	0	3727.77	NC
10			10	0	-.236	0	0	NC	NC
11	1	M2	1	0	-.236	0	0	NC	NC
12			2	0	-.256	0	0	NC	NC
13			3	0	-.294	0	0	4696.854	NC
14			4	0	-.335	0	0	2407.126	NC

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Member Section Deflections (Continued)

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
15			5	0	-.369	0	0	1793.458	NC
16			6	0	-.39	0	0	1688.837	NC
17			7	0	-.396	0	0	1965.813	NC
18			8	0	-.392	0	0	2995.771	NC
19			9	0	-.384	0	0	7643.851	NC
20			10	0	-.385	0	0	NC	NC
21	1	M3	1	0	-.385	0	0	NC	NC
22			2	0	-.408	0	0	NC	NC
23			3	0	-.446	0	0	3382.185	NC
24			4	0	-.484	0	0	1966.591	NC
25			5	0	-.514	0	0	1547.61	NC
26			6	0	-.529	0	0	1501.786	NC
27			7	0	-.529	0	0	1780.221	NC
28			8	0	-.518	0	0	2742.177	NC
29			9	0	-.504	0	0	7015.874	NC
30			10	0	-.5	0	0	NC	NC
31	1	M4	1	0	-.5	0	0	NC	NC
32			2	0	-.518	0	0	9694.905	NC
33			3	0	-.549	0	0	3170.304	NC
34			4	0	-.579	0	0	1909.437	NC
35			5	0	-.6	0	0	1534.326	NC
36			6	0	-.606	0	0	1514.805	NC
37			7	0	-.598	0	0	1830.19	NC
38			8	0	-.58	0	0	2900.037	NC
39			9	0	-.559	0	0	7894.92	NC
40			10	0	-.549	0	0	NC	NC
41	1	M5	1	0	-.549	0	0	NC	NC
42			2	0	-.562	0	0	8398.926	NC
43			3	0	-.586	0	0	2978.723	NC
44			4	0	-.608	0	0	1851.609	NC
45			5	0	-.621	0	0	1517.18	NC
46			6	0	-.619	0	0	1522.746	NC
47			7	0	-.602	0	0	1874.182	NC
48			8	0	-.576	0	0	3055.466	NC
49			9	0	-.548	0	0	8903.354	NC
50			10	0	-.533	0	0	NC	NC
51	1	M6	1	0	-.533	0	0	NC	NC
52			2	0	-.54	0	0	7507.951	NC
53			3	0	-.557	0	0	2839.098	NC
54			4	0	-.571	0	0	1815.756	NC
55			5	0	-.575	0	0	1516.923	NC
56			6	0	-.564	0	0	1550.189	NC
57			7	0	-.539	0	0	1951.07	NC
58			8	0	-.505	0	0	3303.469	NC
59			9	0	-.471	0	0	NC	NC
60			10	0	-.451	0	0	NC	NC
61	1	M12	1	0	-.535	0	0	NC	NC
62			2	0	-.537	0	0	NC	NC
63			3	0	-.54	0	0	NC	NC
64			4	0	-.542	0	0	NC	NC
65			5	0	-.544	0	0	NC	NC
66			6	0	-.546	0	0	NC	NC
67			7	0	-.548	0	0	NC	NC
68			8	0	-.549	0	0	NC	NC
69			9	0	-.549	0	0	NC	NC
70			10	0	-.549	0	0	NC	NC
71	1	M13	1	0	-.549	0	0	NC	NC

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Member Section Deflections (Continued)

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
72			2	0	-.547	0	0	NC	NC
73			3	0	-.544	0	0	NC	NC
74			4	0	-.54	0	0	NC	NC
75			5	0	-.534	0	0	NC	NC
76			6	0	-.528	0	0	NC	NC
77			7	0	-.522	0	0	NC	NC
78			8	0	-.516	0	0	NC	NC
79			9	0	-.511	0	0	NC	NC
80			10	0	-.506	0	0	NC	NC
81	1	M14	1	0	-.506	0	0	NC	NC
82			2	0	-.499	0	0	NC	NC
83			3	0	-.49	0	0	NC	NC
84			4	0	-.478	0	0	NC	NC
85			5	0	-.465	0	0	NC	NC
86			6	0	-.45	0	0	NC	NC
87			7	0	-.436	0	0	NC	NC
88			8	0	-.422	0	0	NC	NC
89			9	0	-.409	0	0	NC	NC
90			10	0	-.399	0	0	NC	NC
91	1	M15	1	0	-.399	0	0	699.233	NC
92			2	0	-.386	0	0	755.822	NC
93			3	0	-.367	0	0	853.683	NC
94			4	0	-.346	0	0	1011.437	NC
95			5	0	-.322	0	0	1268.211	NC
96			6	0	-.297	0	0	1711.116	NC
97			7	0	-.274	0	0	2564.396	NC
98			8	0	-.253	0	0	4572.581	NC
99			9	0	-.237	0	0	NC	NC
100			10	0	-.227	0	0	NC	NC
101	1	M16	1	-.117	-.195	0	0	NC	NC
102			2	-.104	-.19	0	0	8076.912	NC
103			3	-.091	-.189	0	0	3723.743	NC
104			4	-.078	-.187	0	0	2427.317	NC
105			5	-.065	-.183	0	0	1880.169	NC
106			6	-.052	-.171	0	0	1650.216	NC
107			7	-.039	-.151	0	0	1633.757	NC
108			8	-.026	-.117	0	0	1894.13	NC
109			9	-.013	-.068	0	0	3018.142	NC
110			10	0	0	0	0	NC	NC
111	1	M17	1	.236	0	0	0	NC	NC
112			2	.235	.002	0	0	NC	NC
113			3	.234	.003	0	0	NC	NC
114			4	.233	.002	0	0	NC	NC
115			5	.232	0	0	0	NC	NC
116			6	.231	-.001	0	0	NC	NC
117			7	.23	-.002	0	0	NC	NC
118			8	.229	-.003	0	0	NC	NC
119			9	.228	-.002	0	0	NC	NC
120			10	.227	0	0	0	NC	NC
121	1	M19	1	-.399	0	0	0	NC	NC
122			2	-.397	-.004	0	0	NC	NC
123			3	-.395	-.004	0	0	NC	NC
124			4	-.394	-.003	0	0	NC	NC
125			5	-.392	0	0	0	NC	NC
126			6	-.391	.002	0	0	NC	NC
127			7	-.389	.004	0	0	NC	NC
128			8	-.388	.005	0	0	NC	NC

Member Section Deflections (Continued)

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
129			9	-.386	.004	0	0	NC	NC
130			10	-.385	0	0	0	NC	NC
131	1	M21	1	.5	0	0	0	NC	NC
132			2	.501	.002	0	0	NC	NC
133			3	.501	.003	0	0	NC	NC
134			4	.502	.003	0	0	NC	NC
135			5	.503	.001	0	0	NC	NC
136			6	.503	0	0	0	NC	NC
137			7	.504	-.001	0	0	NC	NC
138			8	.504	-.002	0	0	NC	NC
139			9	.505	-.002	0	0	NC	NC
140			10	.506	0	0	0	NC	NC
141	1	M23	1	-.549	0	0	0	NC	NC
142			2	-.549	0	0	0	NC	NC
143			3	-.549	0	0	0	NC	NC
144			4	-.549	0	0	0	NC	NC
145			5	-.549	0	0	0	NC	NC
146			6	-.549	0	0	0	NC	NC
147			7	-.549	0	0	0	NC	NC
148			8	-.549	0	0	0	NC	NC
149			9	-.549	0	0	0	NC	NC
150			10	-.549	0	0	0	NC	NC
151	1	M25	1	.533	0	0	0	NC	NC
152			2	.533	-.001	0	0	NC	NC
153			3	.533	-.002	0	0	NC	NC
154			4	.533	-.002	0	0	NC	NC
155			5	.534	-.001	0	0	NC	NC
156			6	.534	0	0	0	NC	NC
157			7	.534	0	0	0	NC	NC
158			8	.534	0	0	0	NC	NC
159			9	.534	0	0	0	NC	NC
160			10	.535	0	0	0	NC	NC
161	1	M24	1	-.275	-.458	0	0	NC	NC
162			2	-.276	-.461	0	0	NC	NC
163			3	-.277	-.464	0	0	NC	NC
164			4	-.278	-.466	0	0	NC	NC
165			5	-.278	-.468	0	0	NC	NC
166			6	-.279	-.47	0	0	NC	NC
167			7	-.28	-.471	0	0	NC	NC
168			8	-.281	-.472	0	0	NC	NC
169			9	-.282	-.472	0	0	NC	NC
170			10	-.283	-.471	0	0	NC	NC
171	1	M20	1	.257	-.429	0	0	NC	NC
172			2	.251	-.422	0	0	NC	NC
173			3	.246	-.414	0	0	NC	NC
174			4	.24	-.405	0	0	NC	NC
175			5	.234	-.395	0	0	NC	NC
176			6	.228	-.385	0	0	NC	NC
177			7	.222	-.374	0	0	NC	NC
178			8	.217	-.364	0	0	NC	NC
179			9	.211	-.353	0	0	NC	NC
180			10	.205	-.342	0	0	NC	NC
181	1	M18	1	.198	-.33	0	0	1033.076	NC
182			2	.189	-.317	0	0	1145.644	NC
183			3	.18	-.301	0	0	1313.625	NC
184			4	.171	-.284	0	0	1565.271	NC
185			5	.162	-.266	0	0	1955.196	NC

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Designer : Alford Green
Job Number :

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Member Section Deflections (Continued)

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
186			6	.153	-.248	0	0	2598.987	NC
187			7	.144	-.232	0	0	3780.265	NC
188			8	.135	-.216	0	0	6389.835	NC
189			9	.126	-.204	0	0	NC	NC
190			10	.117	-.195	0	0	NC	NC
191	1	M7	1	0	-.451	0	0	NC	NC
192			2	0	-.453	0	0	7671.954	NC
193			3	0	-.464	0	0	2941.983	NC
194			4	0	-.473	0	0	1903.07	NC
195			5	0	-.471	0	0	1611.15	NC
196			6	0	-.455	0	0	1677.713	NC
197			7	0	-.425	0	0	2178.75	NC
198			8	0	-.387	0	0	3941.372	NC
199			9	0	-.35	0	0	NC	NC
200			10	0	-.329	0	0	NC	NC
201	1	M8	1	0	-.329	0	0	NC	NC
202			2	-.008	-.333	0	0	2999.626	NC
203			3	-.017	-.345	0	0	1357.607	NC
204			4	-.025	-.35	0	0	918.533	NC
205			5	-.033	-.34	0	0	765.933	NC
206			6	-.041	-.307	0	0	746.22	NC
207			7	-.05	-.252	0	0	846.155	NC
208			8	-.058	-.176	0	0	1166.443	NC
209			9	-.066	-.088	0	0	2325.86	NC
210			10	-.075	0	0	0	NC	NC
211	1	M9	1	.064	.038	0	0	NC	NC
212			2	.075	-.048	0	0	2699.724	NC
213			3	.086	-.116	0	0	1650.939	NC
214			4	.098	-.167	0	0	1380.955	NC
215			5	.109	-.205	0	0	1344.295	NC
216			6	.12	-.231	0	0	1463.76	NC
217			7	.131	-.249	0	0	1785.033	NC
218			8	.143	-.26	0	0	2543.084	NC
219			9	.154	-.268	0	0	4989.666	NC
220			10	.165	-.275	0	0	NC	NC
221	1	M10	1	0	-.321	0	0	NC	NC
222			2	0	-.33	0	0	NC	NC
223			3	0	-.344	0	0	5185.476	NC
224			4	0	-.361	0	0	2986.753	NC
225			5	0	-.38	0	0	2027.919	NC
226			6	0	-.4	0	0	1521.507	NC
227			7	0	-.419	0	0	1224.476	NC
228			8	0	-.436	0	0	1040.694	NC
229			9	0	-.45	0	0	926.449	NC
230			10	0	-.46	0	0	860.852	NC
231	1	M11	1	0	-.46	0	0	NC	NC
232			2	0	-.468	0	0	NC	NC
233			3	0	-.477	0	0	NC	NC
234			4	0	-.487	0	0	NC	NC
235			5	0	-.498	0	0	NC	NC
236			6	0	-.508	0	0	NC	NC
237			7	0	-.517	0	0	NC	NC
238			8	0	-.525	0	0	NC	NC
239			9	0	-.531	0	0	NC	NC
240			10	0	-.535	0	0	NC	NC
241	1	M27	1	.451	0	0	0	NC	NC
242			2	.452	-.003	0	0	NC	NC

Company : WPI
Designer : Alford Green
Job Number : W=4550 plf
MQP- Lobby Truss Design
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Member Section Deflections (Continued)

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
243			3	.453	-.004	0	0	NC	NC
244			4	.454	-.003	0	0	NC	NC
245			5	.455	-.001	0	0	NC	NC
246			6	.456	0	0	0	NC	NC
247			7	.457	.002	0	0	NC	NC
248			8	.458	.003	0	0	NC	NC
249			9	.459	.003	0	0	NC	NC
250			10	.46	0	0	0	NC	NC
251	1	M29	1	.329	0	0	0	NC	NC
252			2	.328	-.003	0	0	NC	NC
253			3	.327	-.003	0	0	NC	NC
254			4	.327	-.003	0	0	NC	NC
255			5	.326	-.001	0	0	NC	NC
256			6	.325	0	0	0	NC	NC
257			7	.324	.002	0	0	NC	NC
258			8	.323	.003	0	0	NC	NC
259			9	.322	.002	0	0	NC	NC
260			10	.321	0	0	0	NC	NC
261	1	M28	1	-.165	-.275	0	0	NC	NC
262			2	-.172	-.284	0	0	NC	NC
263			3	-.18	-.295	0	0	6968.982	NC
264			4	-.187	-.308	0	0	4250.479	NC
265			5	-.195	-.322	0	0	2988.268	NC
266			6	-.202	-.336	0	0	2286.75	NC
267			7	-.21	-.351	0	0	1855.518	NC
268			8	-.217	-.364	0	0	1574.255	NC
269			9	-.224	-.376	0	0	1385.326	NC
270			10	-.232	-.386	0	0	1258.636	NC
271	1	M26	1	-.237	-.395	0	0	NC	NC
272			2	-.241	-.403	0	0	NC	NC
273			3	-.245	-.411	0	0	NC	NC
274			4	-.249	-.419	0	0	NC	NC
275			5	-.253	-.427	0	0	NC	NC
276			6	-.258	-.434	0	0	NC	NC
277			7	-.262	-.441	0	0	NC	NC
278			8	-.266	-.447	0	0	NC	NC
279			9	-.27	-.452	0	0	NC	NC
280			10	-.274	-.457	0	0	NC	NC
281	1	M22	1	.283	-.471	0	0	NC	NC
282			2	.28	-.469	0	0	NC	NC
283			3	.278	-.466	0	0	NC	NC
284			4	.275	-.463	0	0	NC	NC
285			5	.273	-.459	0	0	NC	NC
286			6	.27	-.454	0	0	NC	NC
287			7	.268	-.449	0	0	NC	NC
288			8	.265	-.444	0	0	NC	NC
289			9	.263	-.439	0	0	NC	NC
290			10	.26	-.434	0	0	NC	NC

Member Section Forces

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
1	1	M1	1	0	21.013	0	0	0	20.505
2			2	0	15.957	0	0	0	-.034
3			3	0	10.901	0	0	0	-14.956
4			4	0	5.846	0	0	0	-24.26
5			5	0	.79	0	0	0	-27.947

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
6			6	0	-4.265	0	0	0	-26.016
7			7	0	-9.321	0	0	0	-18.468
8			8	0	-14.376	0	0	0	-5.303
9			9	0	-19.432	0	0	0	13.479
10			10	0	-24.487	0	0	0	37.878
11	1	M2	1	0	24.171	0	0	0	45.625
12			2	0	19.115	0	0	0	21.577
13			3	0	14.06	0	0	0	3.146
14			4	0	9.004	0	0	0	-9.667
15			5	0	3.949	0	0	0	-16.863
16			6	0	-1.107	0	0	0	-18.442
17			7	0	-6.162	0	0	0	-14.403
18			8	0	-11.218	0	0	0	-4.748
19			9	0	-16.274	0	0	0	10.525
20			10	0	-21.329	0	0	0	31.416
21	1	M3	1	0	23.561	0	0	0	41.339
22			2	0	18.506	0	0	0	17.969
23			3	0	13.45	0	0	0	.216
24			4	0	8.394	0	0	0	-11.92
25			5	0	3.339	0	0	0	-18.438
26			6	0	-1.717	0	0	0	-19.34
27			7	0	-6.772	0	0	0	-14.624
28			8	0	-11.828	0	0	0	-4.29
29			9	0	-16.883	0	0	0	11.661
30			10	0	-21.939	0	0	0	33.229
31	1	M4	1	0	23.096	0	0	0	39.012
32			2	0	18.04	0	0	0	16.159
33			3	0	12.984	0	0	0	-1.076
34			4	0	7.929	0	0	0	-12.695
35			5	0	2.873	0	0	0	-18.696
36			6	0	-2.182	0	0	0	-19.08
37			7	0	-7.238	0	0	0	-13.847
38			8	0	-12.293	0	0	0	-2.996
39			9	0	-17.349	0	0	0	13.472
40			10	0	-22.404	0	0	0	35.557
41	1	M5	1	0	22.651	0	0	0	36.759
42			2	0	17.595	0	0	0	14.4
43			3	0	12.54	0	0	0	-2.341
44			4	0	7.484	0	0	0	-13.466
45			5	0	2.429	0	0	0	-18.973
46			6	0	-2.627	0	0	0	-18.863
47			7	0	-7.682	0	0	0	-13.135
48			8	0	-12.738	0	0	0	-1.791
49			9	0	-17.794	0	0	0	15.171
50			10	0	-22.849	0	0	0	37.75
51	1	M6	1	0	22.168	0	0	0	34.433
52			2	0	17.113	0	0	0	12.61
53			3	0	12.057	0	0	0	-3.595
54			4	0	7.001	0	0	0	-14.183
55			5	0	1.946	0	0	0	-19.153
56			6	0	-3.11	0	0	0	-18.507
57			7	0	-8.165	0	0	0	-12.243
58			8	0	-13.221	0	0	0	-.362
59			9	0	-18.276	0	0	0	17.137
60			10	0	-23.332	0	0	0	40.252
61	1	M12	1	0	.129	0	0	0	.182
62			2	0	.129	0	0	0	.039

Company : WPI
Designer : Alford Green
Job Number :

MQP- Lobby Truss Design

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Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
63			3	0	.129	0	0	0	-.105
64			4	0	.129	0	0	0	-.248
65			5	0	.129	0	0	0	-.391
66			6	0	.129	0	0	0	-.534
67			7	0	.129	0	0	0	-.677
68			8	0	.129	0	0	0	-.82
69			9	0	.129	0	0	0	-.963
70			10	0	.129	0	0	0	-1.106
71	1	M13	1	0	-.359	0	0	0	-2.305
72			2	0	-.359	0	0	0	-1.906
73			3	0	-.359	0	0	0	-1.507
74			4	0	-.359	0	0	0	-1.108
75			5	0	-.359	0	0	0	-.709
76			6	0	-.359	0	0	0	-.31
77			7	0	-.359	0	0	0	.089
78			8	0	-.359	0	0	0	.488
79			9	0	-.359	0	0	0	.887
80			10	0	-.359	0	0	0	1.286
81	1	M14	1	0	-.83	0	0	0	-4.837
82			2	0	-.83	0	0	0	-3.915
83			3	0	-.83	0	0	0	-2.993
84			4	0	-.83	0	0	0	-2.071
85			5	0	-.83	0	0	0	-1.149
86			6	0	-.83	0	0	0	-.227
87			7	0	-.83	0	0	0	.695
88			8	0	-.83	0	0	0	1.617
89			9	0	-.83	0	0	0	2.539
90			10	0	-.83	0	0	0	3.461
91	1	M15	1	0	-1.859	0	0	0	-8.86
92			2	0	-1.859	0	0	0	-6.794
93			3	0	-1.859	0	0	0	-4.728
94			4	0	-1.859	0	0	0	-2.663
95			5	0	-1.859	0	0	0	-.597
96			6	0	-1.859	0	0	0	1.469
97			7	0	-1.859	0	0	0	3.534
98			8	0	-1.859	0	0	0	5.6
99			9	0	-1.859	0	0	0	7.666
100			10	0	-1.859	0	0	0	9.732
101	1	M16	1	-338.69	2.242	0	0	0	5.639
102			2	-338.69	2.242	0	0	0	2.734
103			3	-338.69	2.242	0	0	0	-.171
104			4	-338.69	2.242	0	0	0	-3.076
105			5	-338.69	2.242	0	0	0	-5.98
106			6	-338.69	2.242	0	0	0	-8.885
107			7	-338.69	2.242	0	0	0	-11.79
108			8	-338.69	2.242	0	0	0	-14.695
109			9	-338.69	2.242	0	0	0	-17.6
110			10	-338.69	2.242	0	0	0	-20.505
111	1	M17	1	48.658	2.614	0	0	0	7.747
112			2	48.658	2.614	0	0	0	6.004
113			3	48.658	2.614	0	0	0	4.261
114			4	48.658	2.614	0	0	0	2.519
115			5	48.658	2.614	0	0	0	.776
116			6	48.658	2.614	0	0	0	-.966
117			7	48.658	2.614	0	0	0	-2.709
118			8	48.658	2.614	0	0	0	-4.452
119			9	48.658	2.614	0	0	0	-6.194

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
120			10	48.658	2.614	0	0	0	-7.937
121	1	M19	1	-76.925	-4.215	0	0	0	-12.461
122			2	-76.925	-4.215	0	0	0	-9.651
123			3	-76.925	-4.215	0	0	0	-6.841
124			4	-76.925	-4.215	0	0	0	-4.03
125			5	-76.925	-4.215	0	0	0	-1.22
126			6	-76.925	-4.215	0	0	0	1.59
127			7	-76.925	-4.215	0	0	0	4.4
128			8	-76.925	-4.215	0	0	0	7.21
129			9	-76.925	-4.215	0	0	0	10.02
130			10	-76.925	-4.215	0	0	0	12.83
131	1	M21	1	-32.92	2.181	0	0	0	6.819
132			2	-32.92	2.181	0	0	0	5.365
133			3	-32.92	2.181	0	0	0	3.911
134			4	-32.92	2.181	0	0	0	2.457
135			5	-32.92	2.181	0	0	0	1.003
136			6	-32.92	2.181	0	0	0	-.451
137			7	-32.92	2.181	0	0	0	-1.905
138			8	-32.92	2.181	0	0	0	-3.358
139			9	-32.92	2.181	0	0	0	-4.812
140			10	-32.92	2.181	0	0	0	-6.266
141	1	M23	1	.488	-.423	0	0	0	-1.199
142			2	.488	-.423	0	0	0	-.916
143			3	.488	-.423	0	0	0	-.634
144			4	.488	-.423	0	0	0	-.352
145			5	.488	-.423	0	0	0	-.069
146			6	.488	-.423	0	0	0	.213
147			7	.488	-.423	0	0	0	.495
148			8	.488	-.423	0	0	0	.778
149			9	.488	-.423	0	0	0	1.06
150			10	.488	-.423	0	0	0	1.342
151	1	M25	1	-10.726	-1.308	0	0	0	-4.184
152			2	-10.726	-1.308	0	0	0	-3.312
153			3	-10.726	-1.308	0	0	0	-2.44
154			4	-10.726	-1.308	0	0	0	-1.568
155			5	-10.726	-1.308	0	0	0	-.697
156			6	-10.726	-1.308	0	0	0	.175
157			7	-10.726	-1.308	0	0	0	1.047
158			8	-10.726	-1.308	0	0	0	1.919
159			9	-10.726	-1.308	0	0	0	2.791
160			10	-10.726	-1.308	0	0	0	3.662
161	1	M24	1	21.619	.063	0	0	0	-.064
162			2	21.619	.063	0	0	0	-.146
163			3	21.619	.063	0	0	0	-.228
164			4	21.619	.063	0	0	0	-.31
165			5	21.619	.063	0	0	0	-.392
166			6	21.619	.063	0	0	0	-.474
167			7	21.619	.063	0	0	0	-.556
168			8	21.619	.063	0	0	0	-.638
169			9	21.619	.063	0	0	0	-.72
170			10	21.619	.063	0	0	0	-.802
171	1	M20	1	151.348	-.101	0	0	0	-1.035
172			2	151.348	-.101	0	0	0	-.905
173			3	151.348	-.101	0	0	0	-.774
174			4	151.348	-.101	0	0	0	-.644
175			5	151.348	-.101	0	0	0	-.513
176			6	151.348	-.101	0	0	0	-.382

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
177			7	151.348	-.101	0	0	0	-.252
178			8	151.348	-.101	0	0	0	-.121
179			9	151.348	-.101	0	0	0	.01
180			10	151.348	-.101	0	0	0	.14
181	1	M18	1	235.801	-.579	0	0	0	-2.907
182			2	235.801	-.579	0	0	0	-2.157
183			3	235.801	-.579	0	0	0	-1.407
184			4	235.801	-.579	0	0	0	-.656
185			5	235.801	-.579	0	0	0	.094
186			6	235.801	-.579	0	0	0	.844
187			7	235.801	-.579	0	0	0	1.594
188			8	235.801	-.579	0	0	0	2.344
189			9	235.801	-.579	0	0	0	3.094
190			10	235.801	-.579	0	0	0	3.844
191	1	M7	1	0	21.737	0	0	0	32.945
192			2	0	16.681	0	0	0	11.601
193			3	0	11.626	0	0	0	-4.125
194			4	0	6.57	0	0	0	-14.234
195			5	0	1.515	0	0	0	-18.726
196			6	0	-3.541	0	0	0	-17.6
197			7	0	-8.596	0	0	0	-10.857
198			8	0	-13.652	0	0	0	1.503
199			9	0	-18.707	0	0	0	19.48
200			10	0	-23.763	0	0	0	43.075
201	1	M8	1	252.442	24.169	0	0	0	34.218
202			2	252.442	19.113	0	0	0	10.173
203			3	252.442	14.058	0	0	0	-8.256
204			4	252.442	9.002	0	0	0	-21.067
205			5	252.442	3.947	0	0	0	-28.26
206			6	252.442	-1.109	0	0	0	-29.837
207			7	252.442	-6.164	0	0	0	-25.796
208			8	252.442	-11.22	0	0	0	-16.138
209			9	252.442	-16.276	0	0	0	-.863
210			10	252.442	-21.331	0	0	0	20.03
211	1	M9	1	-293.294	-1.836	0	0	0	-20.03
212			2	-293.294	-1.836	0	0	0	-17.65
213			3	-293.294	-1.836	0	0	0	-15.271
214			4	-293.294	-1.836	0	0	0	-12.891
215			5	-293.294	-1.836	0	0	0	-10.512
216			6	-293.294	-1.836	0	0	0	-8.132
217			7	-293.294	-1.836	0	0	0	-5.753
218			8	-293.294	-1.836	0	0	0	-3.373
219			9	-293.294	-1.836	0	0	0	-.994
220			10	-293.294	-1.836	0	0	0	1.386
221	1	M10	1	0	1.442	0	0	0	7.296
222			2	0	1.442	0	0	0	5.694
223			3	0	1.442	0	0	0	4.092
224			4	0	1.442	0	0	0	2.489
225			5	0	1.442	0	0	0	.887
226			6	0	1.442	0	0	0	-.715
227			7	0	1.442	0	0	0	-2.318
228			8	0	1.442	0	0	0	-3.92
229			9	0	1.442	0	0	0	-5.522
230			10	0	1.442	0	0	0	-7.125
231	1	M11	1	0	.58	0	0	0	2.256
232			2	0	.58	0	0	0	1.612
233			3	0	.58	0	0	0	.967

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
234			4	0	.58	0	0	0	.322
235			5	0	.58	0	0	0	-.322
236			6	0	.58	0	0	0	-.967
237			7	0	.58	0	0	0	-1.611
238			8	0	.58	0	0	0	-2.256
239			9	0	.58	0	0	0	-2.9
240			10	0	.58	0	0	0	-3.545
241	1	M27	1	-54.881	-3.184	0	0	0	-9.696
242			2	-54.881	-3.184	0	0	0	-7.574
243			3	-54.881	-3.184	0	0	0	-5.451
244			4	-54.881	-3.184	0	0	0	-3.328
245			5	-54.881	-3.184	0	0	0	-1.205
246			6	-54.881	-3.184	0	0	0	.918
247			7	-54.881	-3.184	0	0	0	3.041
248			8	-54.881	-3.184	0	0	0	5.164
249			9	-54.881	-3.184	0	0	0	7.287
250			10	-54.881	-3.184	0	0	0	9.41
251	1	M29	1	47.932	-2.908	0	0	0	-8.857
252			2	47.932	-2.908	0	0	0	-6.918
253			3	47.932	-2.908	0	0	0	-4.979
254			4	47.932	-2.908	0	0	0	-3.04
255			5	47.932	-2.908	0	0	0	-1.101
256			6	47.932	-2.908	0	0	0	.838
257			7	47.932	-2.908	0	0	0	2.777
258			8	47.932	-2.908	0	0	0	4.716
259			9	47.932	-2.908	0	0	0	6.655
260			10	47.932	-2.908	0	0	0	8.594
261	1	M28	1	193.543	.435	0	0	0	2.684
262			2	193.543	.435	0	0	0	2.12
263			3	193.543	.435	0	0	0	1.557
264			4	193.543	.435	0	0	0	.993
265			5	193.543	.435	0	0	0	.429
266			6	193.543	.435	0	0	0	-.134
267			7	193.543	.435	0	0	0	-.698
268			8	193.543	.435	0	0	0	-1.262
269			9	193.543	.435	0	0	0	-1.825
270			10	193.543	.435	0	0	0	-2.389
271	1	M26	1	108.217	.077	0	0	0	.029
272			2	108.217	.077	0	0	0	-.07
273			3	108.217	.077	0	0	0	-.17
274			4	108.217	.077	0	0	0	-.269
275			5	108.217	.077	0	0	0	-.369
276			6	108.217	.077	0	0	0	-.468
277			7	108.217	.077	0	0	0	-.568
278			8	108.217	.077	0	0	0	-.667
279			9	108.217	.077	0	0	0	-.767
280			10	108.217	.077	0	0	0	-.866
281	1	M22	1	64.744	-.093	0	0	0	-.943
282			2	64.744	-.093	0	0	0	-.822
283			3	64.744	-.093	0	0	0	-.701
284			4	64.744	-.093	0	0	0	-.581
285			5	64.744	-.093	0	0	0	-.46
286			6	64.744	-.093	0	0	0	-.339
287			7	64.744	-.093	0	0	0	-.219
288			8	64.744	-.093	0	0	0	-.098
289			9	64.744	-.093	0	0	0	.023
290			10	64.744	-.093	0	0	0	.144

Company : WPI
Designer : Alford Green
Job Number :

MQP- Lobby Truss Design

May 2, 2013
6:00 PM
Checked By:_____

Member Section Stresses

	LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
1	1	M1	1	0	2.583	0	-9.22	9.22	0	0
2			2	0	1.962	0	.015	-.015	0	0
3			3	0	1.34	0	6.725	-6.725	0	0
4			4	0	.719	0	10.909	-10.909	0	0
5			5	0	.097	0	12.567	-12.567	0	0
6			6	0	-.524	0	11.699	-11.699	0	0
7			7	0	-1.146	0	8.305	-8.305	0	0
8			8	0	-1.767	0	2.385	-2.385	0	0
9			9	0	-2.389	0	-6.061	6.061	0	0
10			10	0	-3.01	0	-17.033	17.033	0	0
11	1	M2	1	0	2.972	0	-20.517	20.517	0	0
12			2	0	2.35	0	-9.703	9.703	0	0
13			3	0	1.729	0	-1.415	1.415	0	0
14			4	0	1.107	0	4.347	-4.347	0	0
15			5	0	.485	0	7.583	-7.583	0	0
16			6	0	-.136	0	8.293	-8.293	0	0
17			7	0	-.758	0	6.477	-6.477	0	0
18			8	0	-1.379	0	2.135	-2.135	0	0
19			9	0	-2.001	0	-4.733	4.733	0	0
20			10	0	-2.622	0	-14.127	14.127	0	0
21	1	M3	1	0	2.897	0	-18.589	18.589	0	0
22			2	0	2.275	0	-8.08	8.08	0	0
23			3	0	1.654	0	-.097	.097	0	0
24			4	0	1.032	0	5.36	-5.36	0	0
25			5	0	.41	0	8.291	-8.291	0	0
26			6	0	-.211	0	8.697	-8.697	0	0
27			7	0	-.833	0	6.576	-6.576	0	0
28			8	0	-1.454	0	1.929	-1.929	0	0
29			9	0	-2.076	0	-5.244	5.244	0	0
30			10	0	-2.697	0	-14.942	14.942	0	0
31	1	M4	1	0	2.839	0	-17.543	17.543	0	0
32			2	0	2.218	0	-7.266	7.266	0	0
33			3	0	1.596	0	.484	-.484	0	0
34			4	0	.975	0	5.709	-5.709	0	0
35			5	0	.353	0	8.407	-8.407	0	0
36			6	0	-.268	0	8.58	-8.58	0	0
37			7	0	-.89	0	6.227	-6.227	0	0
38			8	0	-1.511	0	1.347	-1.347	0	0
39			9	0	-2.133	0	-6.058	6.058	0	0
40			10	0	-2.754	0	-15.989	15.989	0	0
41	1	M5	1	0	2.785	0	-16.53	16.53	0	0
42			2	0	2.163	0	-6.476	6.476	0	0
43			3	0	1.542	0	1.053	-1.053	0	0
44			4	0	.92	0	6.055	-6.055	0	0
45			5	0	.299	0	8.532	-8.532	0	0
46			6	0	-.323	0	8.482	-8.482	0	0
47			7	0	-.944	0	5.907	-5.907	0	0
48			8	0	-1.566	0	.805	-.805	0	0
49			9	0	-2.188	0	-6.822	6.822	0	0
50			10	0	-2.809	0	-16.976	16.976	0	0
51	1	M6	1	0	2.725	0	-15.484	15.484	0	0
52			2	0	2.104	0	-5.671	5.671	0	0
53			3	0	1.482	0	1.617	-1.617	0	0
54			4	0	.861	0	6.378	-6.378	0	0
55			5	0	.239	0	8.613	-8.613	0	0
56			6	0	-.382	0	8.322	-8.322	0	0

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
57			7	0	-1.004	0	5.505	-5.505	0	0
58			8	0	-1.625	0	.163	-.163	0	0
59			9	0	-2.247	0	-7.706	7.706	0	0
60			10	0	-2.868	0	-18.101	18.101	0	0
61	1	M12	1	0	.016	0	-.082	.082	0	0
62			2	0	.016	0	-.017	.017	0	0
63			3	0	.016	0	.047	-.047	0	0
64			4	0	.016	0	.111	-.111	0	0
65			5	0	.016	0	.176	-.176	0	0
66			6	0	.016	0	.24	-.24	0	0
67			7	0	.016	0	.304	-.304	0	0
68			8	0	.016	0	.369	-.369	0	0
69			9	0	.016	0	.433	-.433	0	0
70			10	0	.016	0	.497	-.497	0	0
71	1	M13	1	0	-.044	0	1.036	-1.036	0	0
72			2	0	-.044	0	.857	-.857	0	0
73			3	0	-.044	0	.677	-.677	0	0
74			4	0	-.044	0	.498	-.498	0	0
75			5	0	-.044	0	.319	-.319	0	0
76			6	0	-.044	0	.139	-.139	0	0
77			7	0	-.044	0	-.04	.04	0	0
78			8	0	-.044	0	-.22	.22	0	0
79			9	0	-.044	0	-.399	.399	0	0
80			10	0	-.044	0	-.578	.578	0	0
81	1	M14	1	0	-.102	0	2.175	-2.175	0	0
82			2	0	-.102	0	1.76	-1.76	0	0
83			3	0	-.102	0	1.346	-1.346	0	0
84			4	0	-.102	0	.931	-.931	0	0
85			5	0	-.102	0	.517	-.517	0	0
86			6	0	-.102	0	.102	-.102	0	0
87			7	0	-.102	0	-.313	.313	0	0
88			8	0	-.102	0	-.727	.727	0	0
89			9	0	-.102	0	-1.142	1.142	0	0
90			10	0	-.102	0	-1.556	1.556	0	0
91	1	M15	1	0	-.229	0	3.984	-3.984	0	0
92			2	0	-.229	0	3.055	-3.055	0	0
93			3	0	-.229	0	2.126	-2.126	0	0
94			4	0	-.229	0	1.197	-1.197	0	0
95			5	0	-.229	0	.268	-.268	0	0
96			6	0	-.229	0	-.66	.66	0	0
97			7	0	-.229	0	-1.589	1.589	0	0
98			8	0	-.229	0	-2.518	2.518	0	0
99			9	0	-.229	0	-3.447	3.447	0	0
100			10	0	-.229	0	-4.376	4.376	0	0
101	1	M16	1	-24.192	.276	0	-2.536	2.536	0	0
102			2	-24.192	.276	0	-1.229	1.229	0	0
103			3	-24.192	.276	0	.077	-.077	0	0
104			4	-24.192	.276	0	1.383	-1.383	0	0
105			5	-24.192	.276	0	2.689	-2.689	0	0
106			6	-24.192	.276	0	3.995	-3.995	0	0
107			7	-24.192	.276	0	5.302	-5.302	0	0
108			8	-24.192	.276	0	6.608	-6.608	0	0
109			9	-24.192	.276	0	7.914	-7.914	0	0
110			10	-24.192	.276	0	9.22	-9.22	0	0
111	1	M17	1	3.476	.321	0	-3.483	3.483	0	0
112			2	3.476	.321	0	-2.7	2.7	0	0
113			3	3.476	.321	0	-1.916	1.916	0	0

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
114			4	3.476	.321	0	-1.133	1.133	0	0
115			5	3.476	.321	0	-.349	.349	0	0
116			6	3.476	.321	0	.435	-.435	0	0
117			7	3.476	.321	0	1.218	-1.218	0	0
118			8	3.476	.321	0	2.002	-2.002	0	0
119			9	3.476	.321	0	2.785	-2.785	0	0
120			10	3.476	.321	0	3.569	-3.569	0	0
121	1	M19	1	-5.495	-.518	0	5.603	-5.603	0	0
122			2	-5.495	-.518	0	4.34	-4.34	0	0
123			3	-5.495	-.518	0	3.076	-3.076	0	0
124			4	-5.495	-.518	0	1.812	-1.812	0	0
125			5	-5.495	-.518	0	.549	-.549	0	0
126			6	-5.495	-.518	0	-.715	.715	0	0
127			7	-5.495	-.518	0	-1.979	1.979	0	0
128			8	-5.495	-.518	0	-3.242	3.242	0	0
129			9	-5.495	-.518	0	-4.506	4.506	0	0
130			10	-5.495	-.518	0	-5.769	5.769	0	0
131	1	M21	1	-2.351	.268	0	-3.066	3.066	0	0
132			2	-2.351	.268	0	-2.413	2.413	0	0
133			3	-2.351	.268	0	-1.759	1.759	0	0
134			4	-2.351	.268	0	-1.105	1.105	0	0
135			5	-2.351	.268	0	-.451	.451	0	0
136			6	-2.351	.268	0	.203	-.203	0	0
137			7	-2.351	.268	0	.856	-.856	0	0
138			8	-2.351	.268	0	1.51	-1.51	0	0
139			9	-2.351	.268	0	2.164	-2.164	0	0
140			10	-2.351	.268	0	2.818	-2.818	0	0
141	1	M23	1	.035	-.052	0	.539	-.539	0	0
142			2	.035	-.052	0	.412	-.412	0	0
143			3	.035	-.052	0	.285	-.285	0	0
144			4	.035	-.052	0	.158	-.158	0	0
145			5	.035	-.052	0	.031	-.031	0	0
146			6	.035	-.052	0	-.096	.096	0	0
147			7	.035	-.052	0	-.223	.223	0	0
148			8	.035	-.052	0	-.35	.35	0	0
149			9	.035	-.052	0	-.477	.477	0	0
150			10	.035	-.052	0	-.604	.604	0	0
151	1	M25	1	-.766	-.161	0	1.881	-1.881	0	0
152			2	-.766	-.161	0	1.489	-1.489	0	0
153			3	-.766	-.161	0	1.097	-1.097	0	0
154			4	-.766	-.161	0	.705	-.705	0	0
155			5	-.766	-.161	0	.313	-.313	0	0
156			6	-.766	-.161	0	-.079	.079	0	0
157			7	-.766	-.161	0	-.471	.471	0	0
158			8	-.766	-.161	0	-.863	.863	0	0
159			9	-.766	-.161	0	-1.255	1.255	0	0
160			10	-.766	-.161	0	-1.647	1.647	0	0
161	1	M24	1	1.544	.008	0	.029	-.029	0	0
162			2	1.544	.008	0	.066	-.066	0	0
163			3	1.544	.008	0	.103	-.103	0	0
164			4	1.544	.008	0	.14	-.14	0	0
165			5	1.544	.008	0	.176	-.176	0	0
166			6	1.544	.008	0	.213	-.213	0	0
167			7	1.544	.008	0	.25	-.25	0	0
168			8	1.544	.008	0	.287	-.287	0	0
169			9	1.544	.008	0	.324	-.324	0	0
170			10	1.544	.008	0	.361	-.361	0	0

Company : WPI
Designer : Alford Green
Job Number :

MQP- Lobby Truss Design

May 2, 2013
6:00 PM
Checked By:_____

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
171	1	M20	1	10.811	-.012	0	.466	-.466	0	0
172			2	10.811	-.012	0	.407	-.407	0	0
173			3	10.811	-.012	0	.348	-.348	0	0
174			4	10.811	-.012	0	.289	-.289	0	0
175			5	10.811	-.012	0	.231	-.231	0	0
176			6	10.811	-.012	0	.172	-.172	0	0
177			7	10.811	-.012	0	.113	-.113	0	0
178			8	10.811	-.012	0	.054	-.054	0	0
179			9	10.811	-.012	0	-.004	.004	0	0
180			10	10.811	-.012	0	-.063	.063	0	0
181	1	M18	1	16.843	-.071	0	1.307	-1.307	0	0
182			2	16.843	-.071	0	.97	-.97	0	0
183			3	16.843	-.071	0	.632	-.632	0	0
184			4	16.843	-.071	0	.295	-.295	0	0
185			5	16.843	-.071	0	-.042	.042	0	0
186			6	16.843	-.071	0	-.379	.379	0	0
187			7	16.843	-.071	0	-.717	.717	0	0
188			8	16.843	-.071	0	-1.054	1.054	0	0
189			9	16.843	-.071	0	-1.391	1.391	0	0
190			10	16.843	-.071	0	-1.729	1.729	0	0
191	1	M7	1	0	2.672	0	-14.815	14.815	0	0
192			2	0	2.051	0	-5.217	5.217	0	0
193			3	0	1.429	0	1.855	-1.855	0	0
194			4	0	.808	0	6.401	-6.401	0	0
195			5	0	.186	0	8.421	-8.421	0	0
196			6	0	-.435	0	7.914	-7.914	0	0
197			7	0	-1.057	0	4.882	-4.882	0	0
198			8	0	-1.678	0	-.676	.676	0	0
199			9	0	-2.3	0	-8.76	8.76	0	0
200			10	0	-2.921	0	-19.37	19.37	0	0
201	1	M8	1	18.032	2.971	0	-15.387	15.387	0	0
202			2	18.032	2.35	0	-4.574	4.574	0	0
203			3	18.032	1.728	0	3.712	-3.712	0	0
204			4	18.032	1.107	0	9.473	-9.473	0	0
205			5	18.032	.485	0	12.708	-12.708	0	0
206			6	18.032	-.136	0	13.417	-13.417	0	0
207			7	18.032	-.758	0	11.6	-11.6	0	0
208			8	18.032	-1.379	0	7.257	-7.257	0	0
209			9	18.032	-2.001	0	.388	-.388	0	0
210			10	18.032	-2.622	0	-9.007	9.007	0	0
211	1	M9	1	-20.95	-.226	0	9.007	-9.007	0	0
212			2	-20.95	-.226	0	7.937	-7.937	0	0
213			3	-20.95	-.226	0	6.867	-6.867	0	0
214			4	-20.95	-.226	0	5.797	-5.797	0	0
215			5	-20.95	-.226	0	4.727	-4.727	0	0
216			6	-20.95	-.226	0	3.657	-3.657	0	0
217			7	-20.95	-.226	0	2.587	-2.587	0	0
218			8	-20.95	-.226	0	1.517	-1.517	0	0
219			9	-20.95	-.226	0	.447	-.447	0	0
220			10	-20.95	-.226	0	-.623	.623	0	0
221	1	M10	1	0	.177	0	-3.281	3.281	0	0
222			2	0	.177	0	-2.56	2.56	0	0
223			3	0	.177	0	-1.84	1.84	0	0
224			4	0	.177	0	-1.119	1.119	0	0
225			5	0	.177	0	-.399	.399	0	0
226			6	0	.177	0	.322	-.322	0	0
227			7	0	.177	0	1.042	-1.042	0	0

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
228			8	0	.177	0	1.763	-1.763	0	0
229			9	0	.177	0	2.483	-2.483	0	0
230			10	0	.177	0	3.204	-3.204	0	0
231	1	M11	1	0	.071	0	-1.015	1.015	0	0
232			2	0	.071	0	-.725	.725	0	0
233			3	0	.071	0	-.435	.435	0	0
234			4	0	.071	0	-.145	.145	0	0
235			5	0	.071	0	.145	-.145	0	0
236			6	0	.071	0	.435	-.435	0	0
237			7	0	.071	0	.725	-.725	0	0
238			8	0	.071	0	1.014	-1.014	0	0
239			9	0	.071	0	1.304	-1.304	0	0
240			10	0	.071	0	1.594	-1.594	0	0
241	1	M27	1	-3.92	-.391	0	4.36	-4.36	0	0
242			2	-3.92	-.391	0	3.406	-3.406	0	0
243			3	-3.92	-.391	0	2.451	-2.451	0	0
244			4	-3.92	-.391	0	1.496	-1.496	0	0
245			5	-3.92	-.391	0	.542	-.542	0	0
246			6	-3.92	-.391	0	-.413	.413	0	0
247			7	-3.92	-.391	0	-1.368	1.368	0	0
248			8	-3.92	-.391	0	-2.322	2.322	0	0
249			9	-3.92	-.391	0	-3.277	3.277	0	0
250			10	-3.92	-.391	0	-4.231	4.231	0	0
251	1	M29	1	3.424	-.358	0	3.983	-3.983	0	0
252			2	3.424	-.358	0	3.111	-3.111	0	0
253			3	3.424	-.358	0	2.239	-2.239	0	0
254			4	3.424	-.358	0	1.367	-1.367	0	0
255			5	3.424	-.358	0	.495	-.495	0	0
256			6	3.424	-.358	0	-.377	.377	0	0
257			7	3.424	-.358	0	-1.249	1.249	0	0
258			8	3.424	-.358	0	-2.121	2.121	0	0
259			9	3.424	-.358	0	-2.993	2.993	0	0
260			10	3.424	-.358	0	-3.865	3.865	0	0
261	1	M28	1	13.824	.053	0	-1.207	1.207	0	0
262			2	13.824	.053	0	-.953	.953	0	0
263			3	13.824	.053	0	-.7	.7	0	0
264			4	13.824	.053	0	-.446	.446	0	0
265			5	13.824	.053	0	-.193	.193	0	0
266			6	13.824	.053	0	.06	-.06	0	0
267			7	13.824	.053	0	.314	-.314	0	0
268			8	13.824	.053	0	.567	-.567	0	0
269			9	13.824	.053	0	.821	-.821	0	0
270			10	13.824	.053	0	1.074	-1.074	0	0
271	1	M26	1	7.73	.009	0	-.013	.013	0	0
272			2	7.73	.009	0	.032	-.032	0	0
273			3	7.73	.009	0	.076	-.076	0	0
274			4	7.73	.009	0	.121	-.121	0	0
275			5	7.73	.009	0	.166	-.166	0	0
276			6	7.73	.009	0	.211	-.211	0	0
277			7	7.73	.009	0	.255	-.255	0	0
278			8	7.73	.009	0	.3	-.3	0	0
279			9	7.73	.009	0	.345	-.345	0	0
280			10	7.73	.009	0	.389	-.389	0	0
281	1	M22	1	4.625	-.011	0	.424	-.424	0	0
282			2	4.625	-.011	0	.37	-.37	0	0
283			3	4.625	-.011	0	.315	-.315	0	0
284			4	4.625	-.011	0	.261	-.261	0	0

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
285			5	4.625	-.011	0	.207	-.207	0	0
286			6	4.625	-.011	0	.153	-.153	0	0
287			7	4.625	-.011	0	.098	-.098	0	0
288			8	4.625	-.011	0	.044	-.044	0	0
289			9	4.625	-.011	0	-.01	.01	0	0
290			10	4.625	-.011	0	-.065	.065	0	0