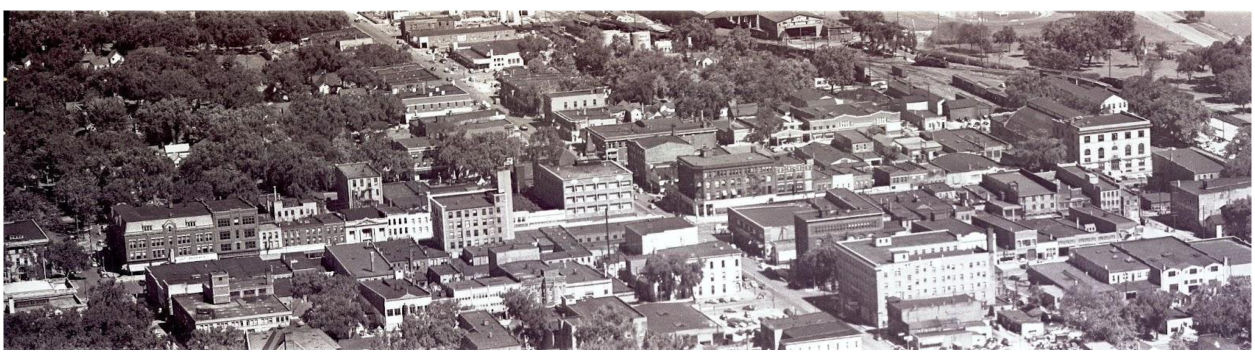
Vinnie's Lounge Rehabilitation Design Report



Submitted To: City of Clinton Iowa

By: Michael Cluchey, Bradley Batterton and Justin Cooks

The University of Iowa
IOWA INITIATIVE
FOR SUSTAINABLE COMMUNITIES

Section I - Executive Summary

The project that will be discussed in this report deals with the rehabilitation of Vinnies Lounge in Clinton, Iowa. The current building has structural damage and does not fit into what the town has envisioned for the future. The client would like for this building to attract younger people to the town and is hoping to accomplish this by renovating the exterior and interior of this building. To accomplish this goal, our team has been put in charge of redesigning the building and developing recommendations for the use of the space. This space should be designed in a way where a developer could easily adapt to. We proposed that the first floor of the building be a commercial area that would have a modern bar in it that will attract a younger demographic, and the second and third floors of the building be a residential area filled with modern luxury apartments. The existing facade on the south face of the building will be removed and restored to its original condition.

In the report, we listed various alternatives for the space in order to give the client options. These alternatives included the first commercial space being a brewery/bar, hatchet throwing, indoor virtual golf simulators, or a cafe/small shop and the second and third floor being modern apartments. We also listed the constraints and challenges we ran into while conducting the design. One of the first tasks that we completed was creating a recommendation list of how the facade should be removed by the contractor. This list does not have to be followed precisely, but we recommended not taking down more than 25ft x 6ft of the facade at a time due to safety factors. Once that facade is removed, the old brick underneath can be restored to its original condition for aesthetic purposes.

To make it easier for the developers, our team will be creating design plans for the building after conducting our architectural and structural analysis of the building. This included redesigning the location of the stairs accessing the apartments and mechanical room in the building, conducting a beam analysis, resizinging the beams, columns, and joists using the computer software robot to do so. To size the support members, we used the LRFD method to find the load that was acting on the wall at its most crucial part. After completing this, our group decided on a new layout for these floors, with the first floor being a bar with two virtual indoor simulators and seating, and the second floor still being modern luxury apartments with a patio on the second floor. The apartments were designed to have a lobby on the second and third floor to provide access to all rooms, with two main entrances being on the first floor south face of the building, a stairwell in the back left side of the building by the west lobby, and a stairwell in the back right side of the building by the east lobby to access the third floor. The apartments included all uptodate appliances such as stoves, sinks, refrigerators, microwaves, bathrooms, washer and dryers, and large bedrooms. Once our plans were created, we were able to provide the client and developer with an architectural and structural construction drawing, fire rating plan, demolition plan, 3D rendering model, a poster, presentation, and a design report incorporating all the necessary information for the project to be conducted by a developer. The design is in accordance with all guidelines, specifications, ASCE Standards, ADA Standards for Accessible Design and the City of Clinton, Iowa Code of Ordinances. With the work plan that our team had put in place, it took 12 weeks to complete, and ended up having a project cost of $1,246,795.47 after completing the engineer’s cost estimate.

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Section II - Organization Qualifications and Experience

1. We are a group of students that attend the University of Iowa and are currently enrolled in the capstone senior design course. All of us are specializing in structures within our civil engineering major. Michael Cluchey is the project manager of the group, Bradley Batterton is technical support and Justin Cooks is the editor. As a group we are providing the Vinnies Lounge with a structural assessment and redesign.

Section III - Design Services

1. **Project Scope**

   The city of Clinton, Iowa is looking to renovate the building that was previously named Vinnies Lounge and hired our team to complete this. The client desired a building that would attract young people in the community and offer a place for the citizens of the community to come and enjoy themselves as well as provide living accommodations for the younger crowd. In addition to this, the client wanted the existing façade to be removed from the face of the building and the exterior of the building restored for structural integrity and aesthetic purposes. The desired aesthetic the client was looking for was the original brick look that would blend into the rest of the town. The client also wanted the interior to be renovated to appeal to a young crowd in the community with the first floor being a commercial area and the upper floors being residential.We made sure to take this into consideration when we designed the building. The building was designed for a developer who could easily adapt to the plans. The first task that we completed for the building redesign was a structural evaluation of the building in order to find out how much of the structural framing needed to be repaired or replaced. The next task we completed was making a list of how the façade will be removed and provided the client with a model of how the face of the building will look after the restoration. Next we made floor plan drawings of all the floors. On the first floor, we took out portions of the wall, reconstructed a new bar, added in seating arrangements, included virtual golf simulators, relocated the bathrooms, changed the size of the kitchen, and reconstructed the stairwells. On the second and third floors of the building, we added in full luxury apartments and added in stairwells to access these apartments. We used these drawing plans to make a 3D rendering model of the building. The client wanted the first floor to be the main attraction of the building that would provide the community with a fun atmosphere that they will want to keep returning to. At first, we discussed with the client about adding in hatchet throwing and golf simulators, but after going through the process of designing the building, we made the decision of just adding in golf simulators due to the amount of space that would be needed for both attractions along with the risk factors associated with them. The plans that we have prepared for the client include an architectural and structural construction drawing, fire rating plan, demolition plan, 3D rendering model, a poster, presentation, and a design report incorporating all the necessary information for the project to be conducted by a developer.

2. Work Plan

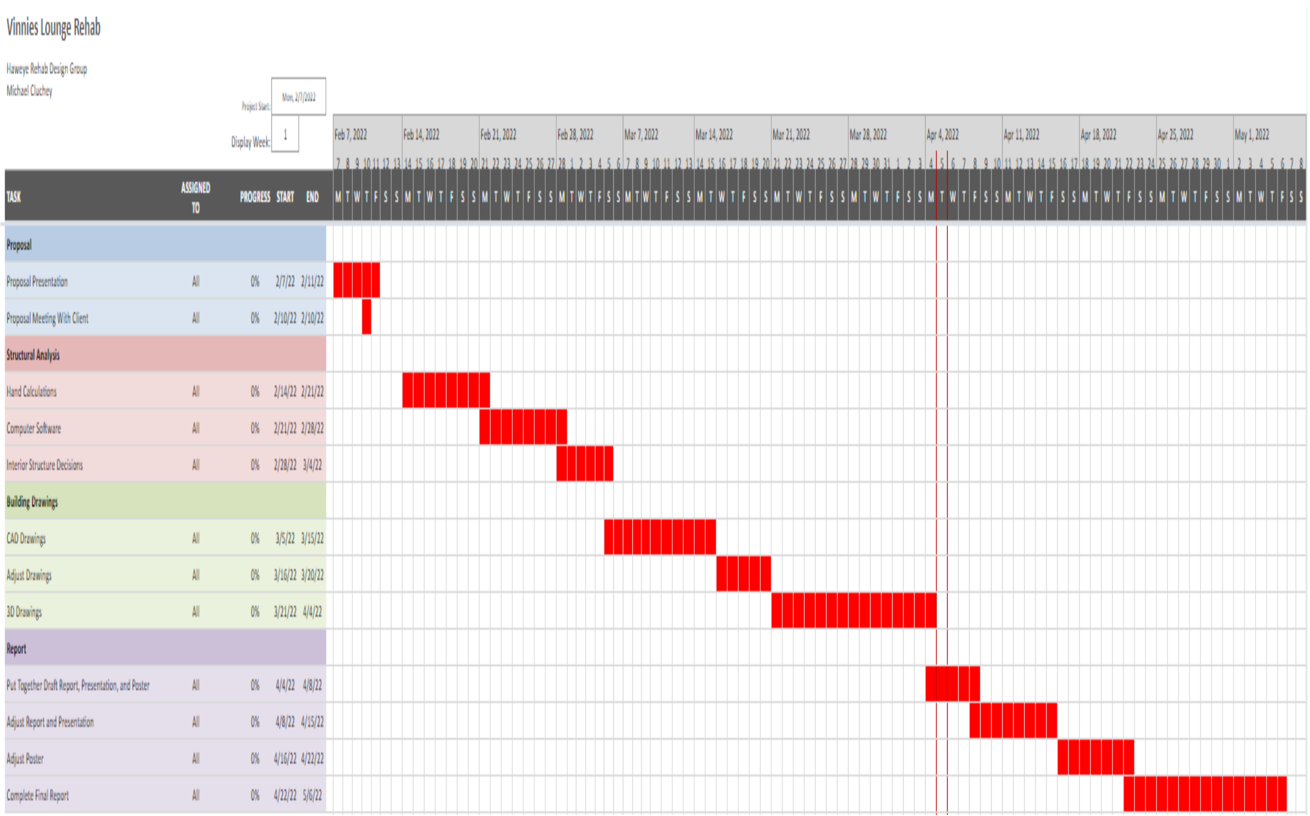


Figure 1: Work Plan

Above, depicted in figure 1, is the schedule that our design team followed in order to complete the required design tasks. There are a few key tasks that have a higher priority than others. The first primary task that was completed was the structural evaluation of the building in order to find what was absolutely necessary to the building integrity and if there were weak spots in the building's structure that needed repair. Once we were aware of the structure's assembly, we then designed a plan of action of how we wanted to adjust the building structure to best optimize the space. Once that was complete, we were then able to render the drawings for our plan and a 3D visualization was made of the design. The final report was then made and prepared for the client.

Section IV - Constraints, Challenges and Impacts

1. **Constraints**

- Budget
  - While designing the project, we had to take a few constraints into consideration. One of these constraints was a budget. The client wanted us to make a design that was not too cheap, but also not too expensive. She wanted to be able to obtain a reasonable return from the project once it was completed. With that in mind, we made sure to only remove/add in elements that were necessary in order to achieve the clients goals.
- Demographic
  - Another constraint that we had was the demographic target age group. The client wanted the demographic age to be around 35 years old. When we considered possible designs, we made sure that they would appeal to that age demographic group.
- Aesthetics
  - Another constraint that we had, was the client wanted the building to be aesthetic. She wanted it to be eye-catching, appealing, not too modern, and outstanding while still fitting into the town.
- Sound Proofing
  - The last constraint that we had was sound proofing the building. Since the first floor of the building will be a bar and the second and third floor will be apartments, we had to make sure that the walls were soundproof to prevent the residents from not wanting to live there due to the noise. We made sure to take all these constraints into consideration when implementing our final design.

2. **Challenges**

- Downtown location
  - While designing the project, we ran into a few challenges that we had to overcome. One of these challenges was the location of our building being downtown. Due to this, there were certain codes that we had to follow in order for the building to be in compliance. The City of Clinton, Iowa Code of Ordinances stated that the first floor of the building had to be commercial, and the other floors could be residential.
- Accessibility
  - Another challenge that we faced was the accessibility of the building. The building had to meet the ADA Standards for Accessible Design, which

means that we had to have wheelchair spaces, wide hallway openings, and signs in order to comply with these standards.

- Confined space
  - The other challenge we faced was having a site in a confined space downtown. We were given a small, specific area to work with, and we were not able to build outside of this area, so we had to make sure that the design did not go outside of this specific area. The buildings downtown are all built directly next to each other with no space to separate them, which made this a very critical challenge.
- Cutting out a section of masonry on the first floor of the building
  - Another challenge that we faced was cutting out a section of wall that was constructed of masonry. In order for that section of the building to be structurally stable, we had to design a steel beam that could hold the weight load in that section.
- Deciding where to build the stairs for the building in accordance with the Clinton Code.
  - We also had a challenge of figuring out where to incorporate the stairs for the building leading up to the apartments. The stairs had to be a certain length from the entrance of the building and be fire resistant by constructing them out of mortar. These factors made the design process more challenging, but we figured out a way to overcome them.

3. Societal Impact with the Community

This project is joining in on the movement to revitalize the Clinton Downtown into an eye-catching, entertaining district for young adults. Targeting a demographic of the 35 year olds or younger age bracket; lowers the mean age population allowing for higher future growth. With the construction of new apartment buildings across the street, adding a bar there will tend to lure a younger audience toward that area.

Section V - Alternative Solutions

The original design of the project we have worked on is depicted in figure 6. The first design alternative that we considered for the first floor space was a large bar/restaurant. This included designs for dining, bar, kitchen, restrooms, and storage spaces. We provided what this layout would look like in figure 7. Some possible examples of this establishment would include Whiskey Road in downtown Cedar Rapids, or Big Grove Brewery in Iowa City. A picture of these establishments are shown in figure 2 and in figure 3. Another option for the first floor that we had discussed with the client was for it to be used for an entertainment-style business. This involved a design with large open spaces, separate offices for management, restrooms and storage spaces. Indoor virtual golf simulators, and hatchet throwing were two popular options that fell into this category that we decided to include in the possible alternatives. An example of what these layouts would look like are provided in the first two diagrams of figure 8.

In addition to the alternatives that we listed above, we also considered using the first floor commercial space as two separate spaces allowing for smaller venues. This would be a perfect fit for a cafe on one side and a shop on the other side, given its location on the main street. An example of what this could look like is depicted in the last diagram of figure 8.

We also discussed turning the second and third floors into residential spaces with luxury apartments. An example of what these luxury apartments could look like is given in figure 5. The possible layouts that we discussed for these apartments are given in the last two diagrams of figure 7. We wanted to include three apartments on the second floor, with one of the apartments being built in the right-back open section in between the already existing apartment and the mechanical room. This would allow for more young adults to move into the apartment complex. We also wanted to include a lobby and elevator on this floor. The lobby would allow for residents to have easy access to their apartments, and we would only have to include two entrances from the first floor to enter the lobby instead of making a separate entrance for each apartment. The elevator would be useful because the residents would not have to take the stairs to get to their apartments and make it easier to carry groceries and appliances to their apartments. The third floor would also include three apartments with one of the apartments being above the apartment that we would build in between the back apartment on the second floor and the mechanical room. There would also be an elevator to access these apartments.

After discussing these alternatives we decided to go with a mix of the brewery/eatery, and the indoor virtual golf simulators for the first floor. We choose to eliminate the hatchet throwing option due to the associated risk factors. The client did not want to deal with the high insurance that would be associated with having hatchet throwing. Next, we eliminated the cafe/small shop alternative due to there already being a coffee shop two doors down from the building. The client was not really interested in putting a shop in the space. In order to still have the entertainment and bar/eatery aspect included in the first floor, we decided to include only two virtual golf simulators, a bar, kitchen, seating, restrooms, offices, mechanical room, refrigerator room, and a break room in the final design. An example of what the final design for the first floor will look like is depicted in the first diagram of figure 9. For the second and third floor, we decided not to include the elevator and the extra apartment built on both floors in between the back apartment and mechanical room. It would have been difficult to find room to include the elevator into the design, and the Clinton code states that if you have more than two apartments on a floor then you have to have an elevator, which was not possible. This would have also made the project more expensive overall with the additional costs of the elevator construction and extra apartments construction, so we decided to only have two apartments on each floor. We still included a lobby on both floors, but also included a stairwell on the left and right side of the front of the building to access the second floor lobby from the outside of the first floor. This would allow the residents to access their apartments from two separate entrances. In order to access the third floor, we decided to include a new stairwell in the back section of the apartment on the right of the second floor. This stairwell will be built up to the third floor and allow the residents to access their apartments from there, along with the stairwell in the left lobby. The residents will be able to exit this new stairwell to the roof on the second floor for emergency situations. We still incorporated the roof patio in our design on the second floor, and the residents are able to access this through a door in the left lobby. The roof patio will be a plus to all the residents by giving them a personal area to grill, lay down, or converse with friends while enjoying the weather. The mechanical room on the back section of the building on the second floor will still be there, we just redid the stairs to update them for safety reasons, but we are not relocating them from the original design in diagram two of figure 6. An example of what the final design will look like for the second and third floor is given in the second and third diagram of figure 9.

Figure 2: Whiskey Road

Figure 3: Big Grove Brewery

Figure 4: Cafe

Figure 5: Luxury Apartment

Figure 6: Original building layout of the first, second, and third floor respectively.

Figure 7: Alternative solution for the first floor being a brewery/eatery. The second floor being apartments with a lobby, elevator, roof patio, and mechanical room. And the third floor being apartments with an elevator.

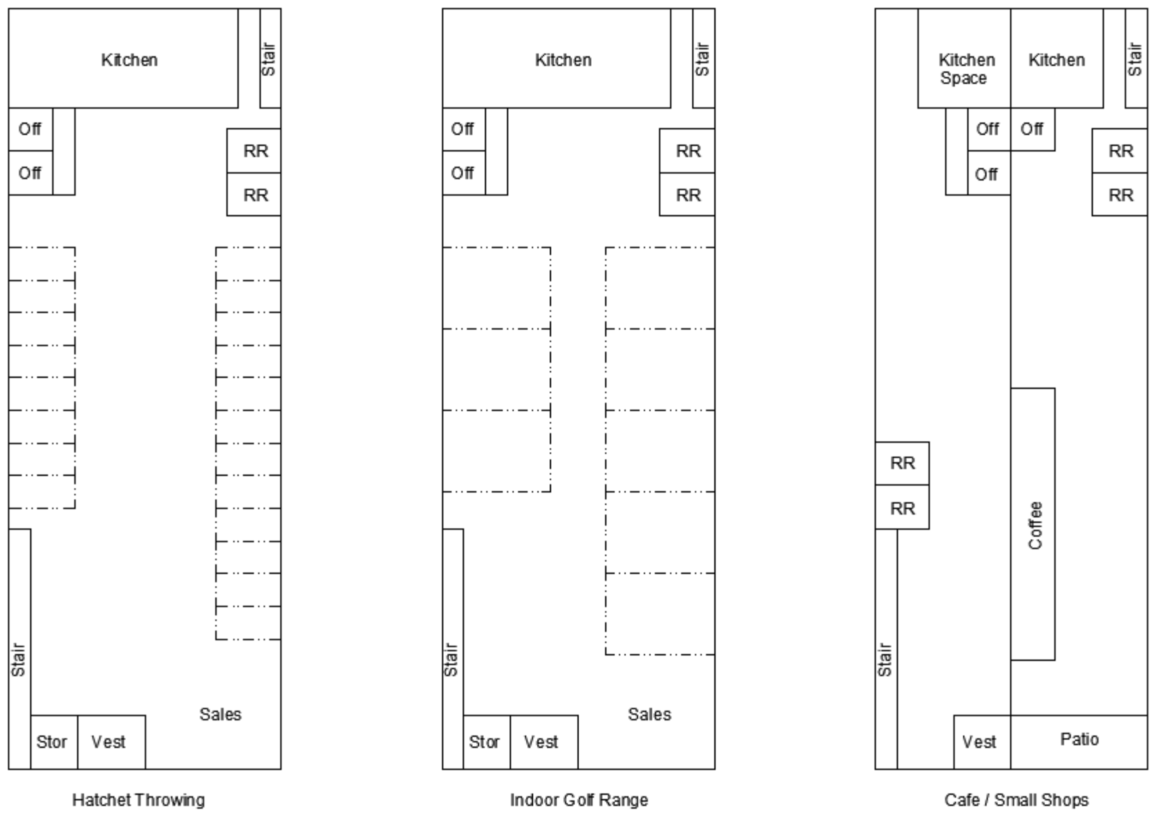


Figure 8: Alternative solutions for the first floor being a hatchet throwing place, indoor golf simulation place, and a cafe/small shop respectively.

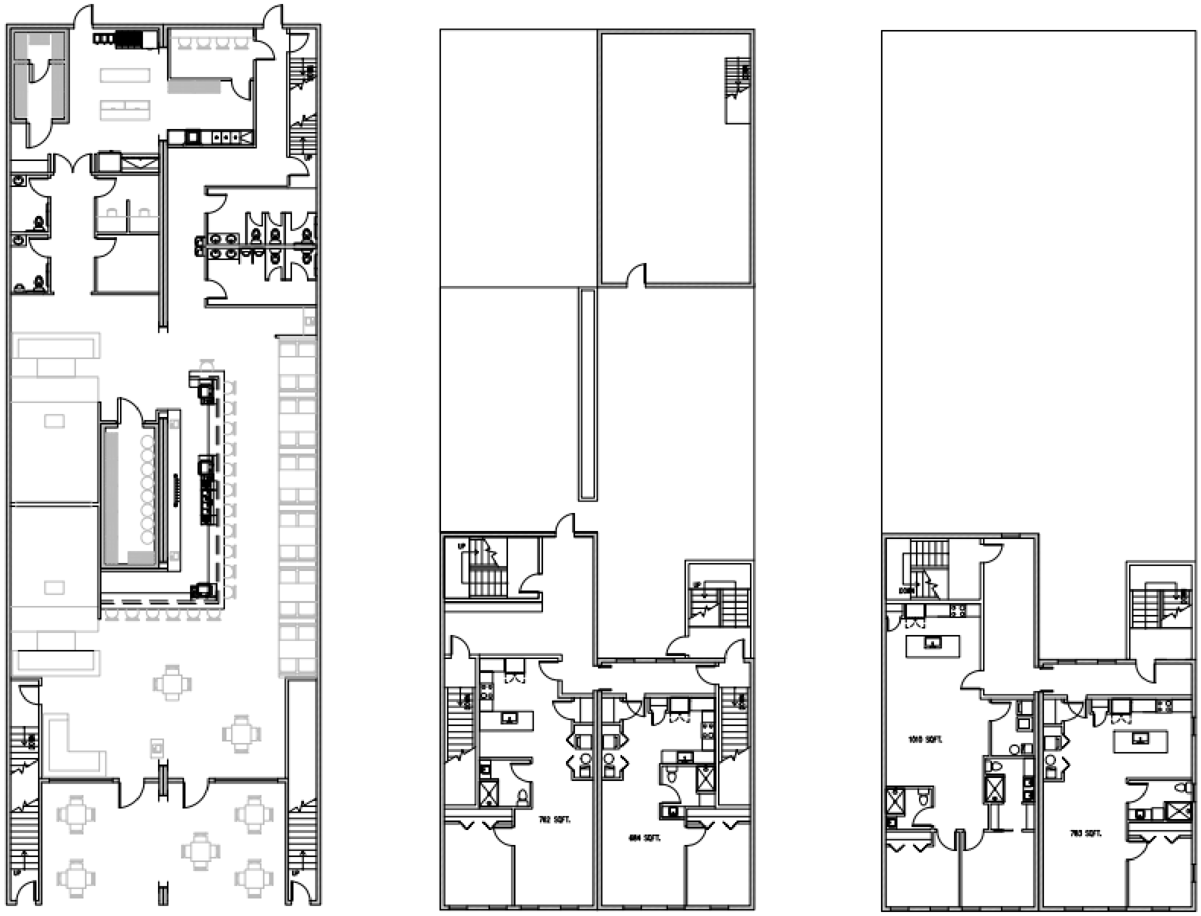


Figure 9: The final design layout we chose for the first, second, and third floor respectively.

Section VI - Final Design Details

Facade Removal

One of the first tasks that we completed for the building design was the removal of the facade. Below in figures 10 through figure 13, we listed the order that we recommend going about removing the facade. We do not recommend taking down more than 25ft x 6ft of the facade at a time due to safety factors. This order does not have to be followed specifically, it is up to the contractor to decide what would be the most efficient and safest way to remove the facade during the process of the demolition. We provided a model of what the front of the building will look like in figure 14, after the facade is removed and the brick exterior of the building is restored for structural integrity and aesthetic purposes.

Figure 10: Facade removal steps 1-9.

Figure 11: Facade removal steps 11-12.

Figure 12: Facade removal step 13

Figure 13: Facade removal steps 12, 14-17.

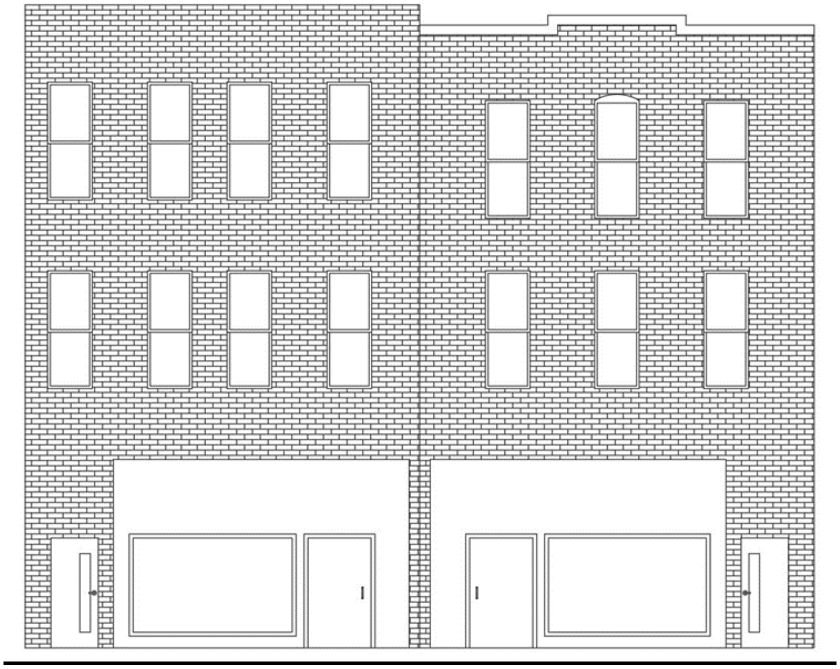


Figure 14: The front of the building after the facade is removed and the brick is restored to its original condition.

First Floor Layout

In order to design the first floor layout of the building, the client's requests were factored into it. This list included two virtual golf simulators, a bar, larger kitchen, seating, restrooms, offices, mechanical room, refrigerator room, and a break room. The seating in the design was based on a 3 foot diameter. The bathroom was made to accommodate the occupancy size of the building and have wheelchair accessible stalls. Per request from the client, the kitchen was expanded to allow more range of motion in the kitchen and ability to put out more food. Employees were made sure to have space of their own, with break rooms, offices and single use bathrooms. To follow ADA standards, all doors and entries 32 inches or larger and all hallways are over 4 feet wide. The golf simulator bay was made to accommodate a group of 4 people at a time and provide the requested atmosphere for the younger crowd. An architectural layout of what the first floor will look like are provided below in figure 15.

Figure 15: Final First Floor Architectural Layout

Redesign of Second and Third Floor Apartments

The client requested that the upper floors of the building be renovated into updated apartments. The client wanted to accommodate as many people as they could with the limited space. There was an option to add another apartment to the floor, but adding another apartment would require that the building have an elevator, which was too expensive of an option. The stair cases on the second to third floor of the building were not designed to be directly over the first floor staircase to save space for all the apartments. All of the walls for every staircase are double gypsum boarded to be fire rated walls. The apartment walls between the hallway and apartments are fire rated walls as well. To attract more people to live in these apartments, part of the roof will be renovated into a general patio space for all the tenants. Only one of the apartment layouts was large enough to have two bedrooms. The rest of the apartments are one bedroom. The apartments were each designed to have a minimum of 1 bedroom, 1 bath and following the codes of IBC, IMC, NEC, and UPC. An architectural layout of what the apartments will look like are provided below in figure 16.

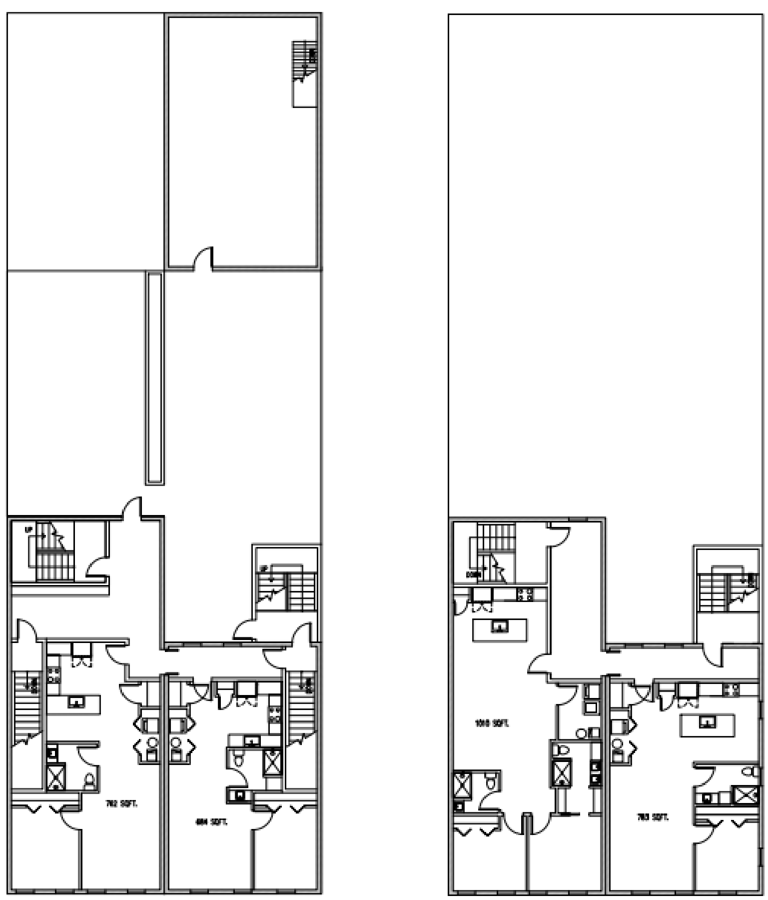


Figure 16: Final Second and Third Floor Architectural Layout

Demolition Plan

To create our ideal pan, we needed to remove many pieces of the building. First thing we will have the contractor do is to remove all the drywall and studs down to the exterior brick, as well as all of the flooring and ceiling material. Depicted below in figure 17 is our color coded demolition plan. The items in red are the stairs, walls and floors that need to be removed. The items that are highlighted in green are the stairs, floors and windows that need to be removed and replaced. Once these pieces are removed, new flooring and ceiling material will be installed.

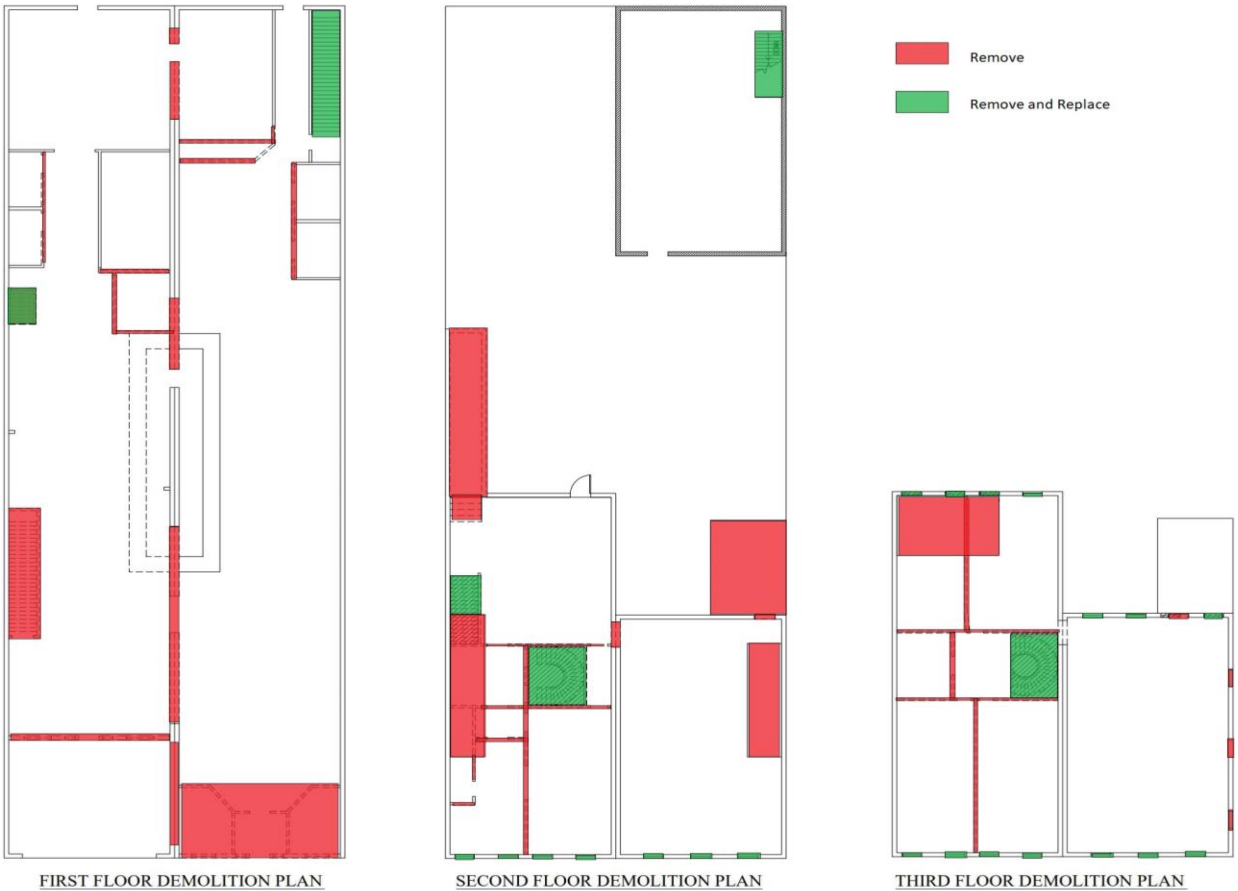


Figure 17: Color coded demolition plan.

Fire Wall Plan

Fire resistance ratings were pulled from the IBC for the varying wall types listed below in table 1 by the required hour rating. In reference to figure 18, all of the existing exterior walls surpassed the requirement of 2 hours by the code since they are a solid 8” brick masonry. The stairwell, apartment separation walls, as well as the kitchen separation wall are required by code to have a minimum of 1 hour rating. For this reason we went with a 2x6 stud wall with a double layer of gypsum drywall. This will provide noise cancellation in these areas. The two stairways leading to the basement were to be retrofitted with 12” CMU block walls for support, while also providing plenty of fire rating requirements. All remaining interior walls have no minimum fire rating but we designed them to be 2x4 stud walls with double layers of gypsum drywall, which provides a three quarter hour of fire protection.

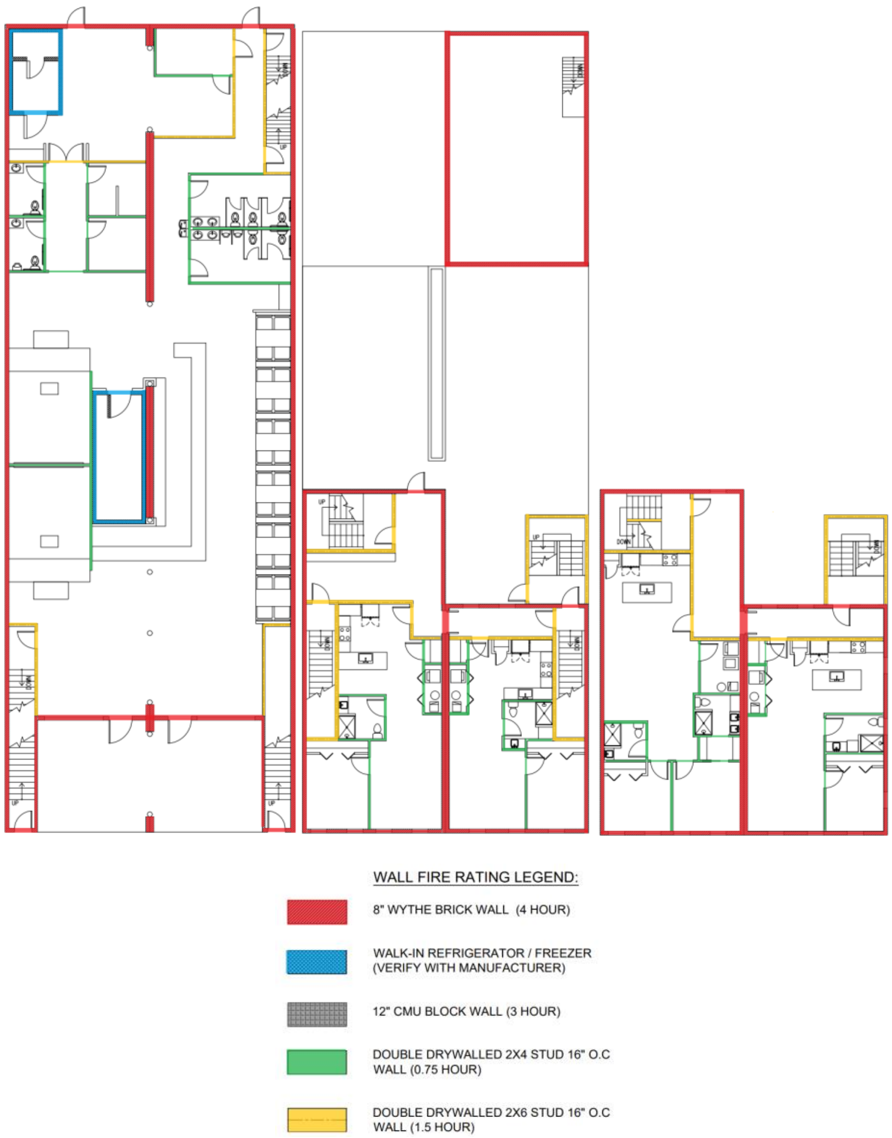


Figure 18: The Fire rating plan for the building with the legend included.

Table 1: Fire resistance rating requirements for building elements.

FIRE RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)			UL NUMBER
Structural Frame	Table 601	0 hour	N/A
Structural Components	704.2, 704.3	0 hour	N/A
Load Bearing Walls - Ext	Table 601	2 hours	
Load Bearing Walls - Int	Table 601	0 hour	N/A
Non-Load Bearing Walls & Partitions - Ext	Table 602	1 hour	
Non-Load Bearing Walls & Partitions - Int	Table 601	0 hour	N/A
Floor Construction Including Support Beams & Joists	Table 601	0 hour	N/A
Roof Construction Including Support Beams & Joists	Table 601	0 hour	N/A
Corridors at R-2 Occupancy only (2nd & 3rd Floor)	Table 1020.1	1/2 hour	
Corridors at B&A-3 Occupancy only (1st Floor)	Table 1020.1	0 hour	N/A
Stairs	713.4, 1023.7	1 hour	
Guest Room Separation	420.2, 708.1	1 hour	
1st Floor Ceiling/2nd Floor Assembley	420.3, 711.2.3	1 hour	
2nd Floor Ceiling/3rd Floor Assembley	420.3, 711.2.3	1 hour	
Enclosure Under Stairways	1011.7.3	1 hour	
Incidental Use Areas: Furnace	Table 509	1 hour	
Incidental Use Areas: Boiler	Table 509	1 hour	

Staircases

With all that in mind, we knew that we needed a way to access the apartments above, so we had to also include two stairs in the front of the building and one stairwell in the back of the building to access the mechanical room. We wanted the stairs in the front of the building to reach as far back as possible. We ended up making the stairwells 4 feet wide and with a 12 inch tread and 6 inch riser for each step, which ended up spanning the stairs 35 feet. This allowed the apartments upstairs to have more space since the stairs were not taking up as much area. When this was implemented, we were able to put basement stairs below the stairwell on the right since it reached out enough. A layout of our stairwell placement is shown below in figure 19 and a cross section view is shown in figure 20.

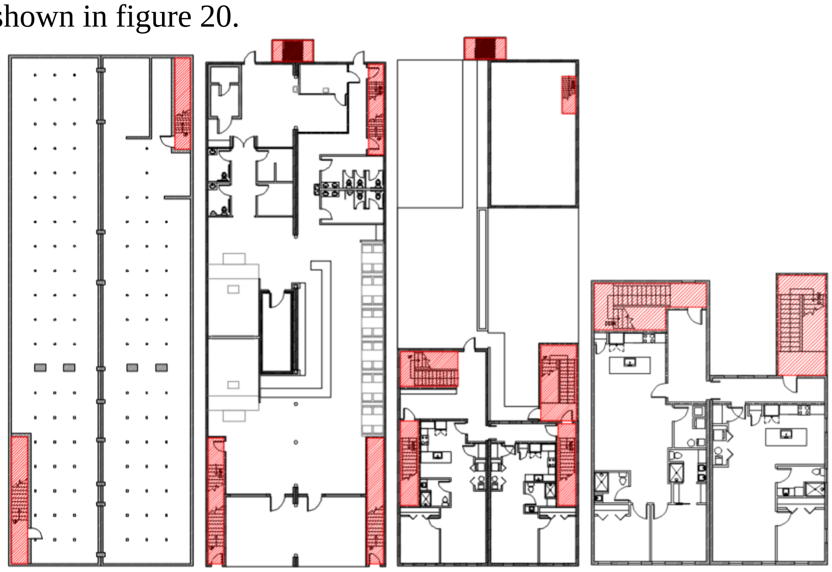


Figure 19: Staircase placement throughout the building layout

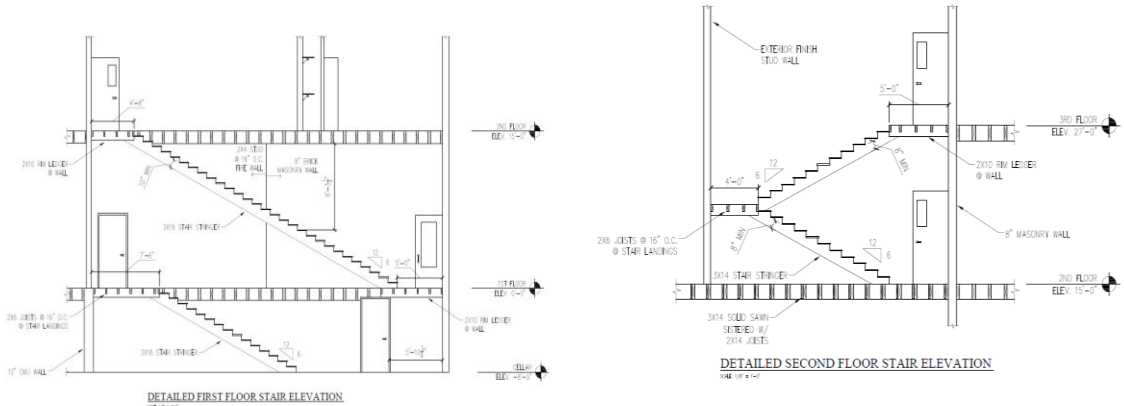


Figure 20: Staircase design cross section

Joist Analysis

With the additional weight of the rooftop patio and stairwells we knew that these areas were more than likely going to require reinforcement on the joists to support the system. We followed ASCE 7-22 and used the program of SkyCiv to run a load analysis of all the different possible joist iterations in the structure. The calculations we obtained are shown in Appendix B and a picture of the area needing additional joist support is shown in figure 21. The original structure was made up of 3x14 solid sawn lumber and was found to be sufficient in all areas of the building except for the patio and stairwell areas. These areas required the addition of a 2x14 Douglas Fir No.1 joist to be sistered to the 3x14 joist. In figure 22, you are able to see that we used standard construction practices to sister the joists. We used three 16D nails that were evenly spaced vertically on the members and spaced at 16" o.c. along the joists. 2x14's were also the members that we sized when we analyzed the areas of the old stairwell that were to be filled in, which can be seen in the stairway fill detail in figure 22.

Figure 21: Highlighted area in need of additional joist support

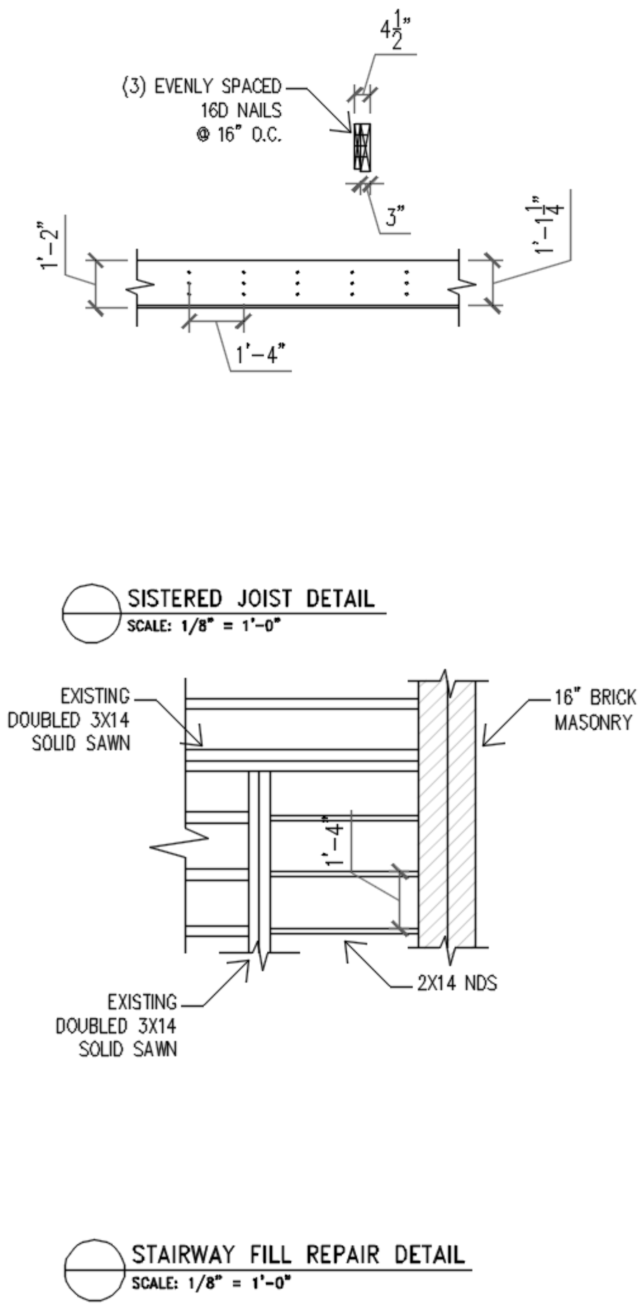


Figure 22: Sistered joint detail along with the stairway fill detail.

Beam Analysis

The client requested that the first floor of the building be more of an open floor plan because as it exists right now, there are two buildings side by side with one opening that is 5 feet wide for patrons to access the other building. A 16 inch masonry wall that supports the main load of the building is the wall type is to be torn down. In the places that we took out the brick wall we replaced with steel support members.

To size the support members, we used the LRFD method to find the load that was acting on the wall at its most crucial part. Since the building is located in a downtown area, the building is surrounded by other buildings, so the wind load would not be as much of a factor when calculating the load on the wall. The gravity load in the building was the deciding load for the building. Using dead load and live load values from ASCE 7-22, the load on the wall being taken out came out to be 17 kips per foot (Appendix A). The largest span length of missing brick was 32.5 ft and that is that span we designed for. To support masonry walls the deflection limit has to be under L/600. Using the robot analysis tool (figure 23), the spanning beam size was determined to be W24X68 A992 Steel Beam.The columns were designed to withstand the axial force of the wall. The size chosen was Pipe 10 XS A992 Steel Columns. The circular shape provided the support with an equally strong x and y axis. The columns were spanned to the foundation wall that will be just below the top of the floor and just above the floor joists.

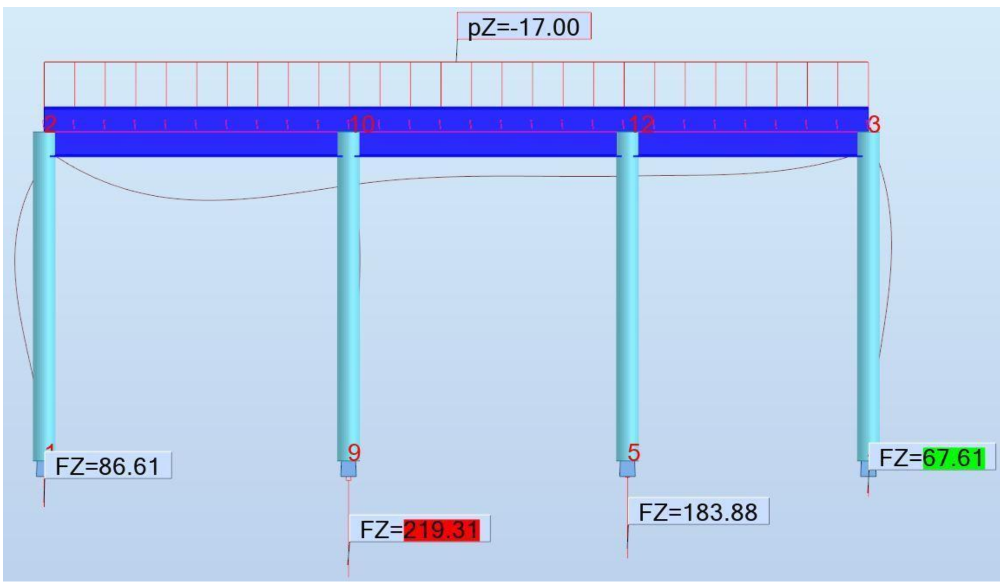


Figure 23: Robot Analysis of 32.5 ft of W24x68 Steel Beam with 4 Pipe 10X Columns

Member/Case	UX (in)	UY (in)	UZ (in)
1/ 1	-0.0001	0.0	-0.1020
2/ 1	0.0000	0.0	0.0495
3/ 1	0.0000	0.0	-0.0023
4/ 1	0.0000	0.0	-0.0290
7/ 1	0.0000	0.0	-0.0109

Figure 24: Deflection Results of 32.5 ft of W24x68 Steel Beam with 4 Pipe 10X Columns

After deciding that the longest span needed extra columns, the longest span was now 12 feet. The smaller full spans needed to be checked. The robot analysis for the 15 foot span beam is below (Figure 25 and Figure 26).

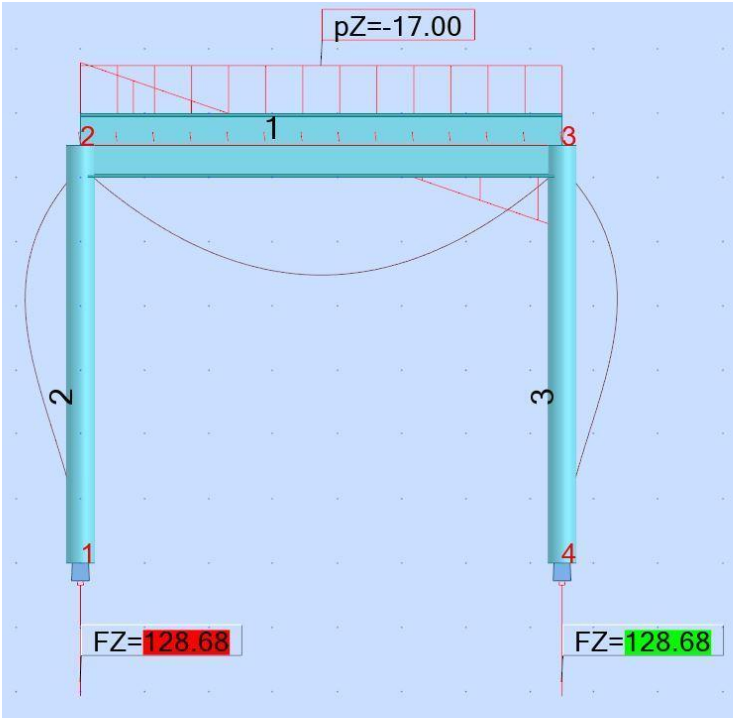


Figure 25: Robot Analysis of 15 ft of W24x68 Steel Beam with 2 Pipe 10X Columns

Member/Case	UX (in)	UY (in)	UZ (in)
1/ 1	0.0000	0.0	-0.3077
2/ 1	0.0000	0.0	0.1201
3/ 1	0.0000	0.0	-0.1201

Figure 26: Deflection Results of 32.5 ft of W24x68 Steel Beam with 4 Pipe 10X Columns

Foundation Design

With the central wall on the first floor being opened up in large sections this created large point loads on the foundation wall in the cellar. The foundation wall is a 16" brick masonry wall but we needed to provide reinforcement in the location of the columns bringing down these point loads. We used the largest axial load of 220 kips for design, following the IBC 2018 and foundation principles, we found that a minimum foundation size of 16"x12" was required due to the load force. To provide a distributed load throughout the foundation and to not allow stress concentrations to build up we increased the foundation to a 28"x12". To counteract the push force form the column we calculated that (2) #4 rebars spaced at 12" o.c. would be needed. Calculations performed are located in Appendix C.

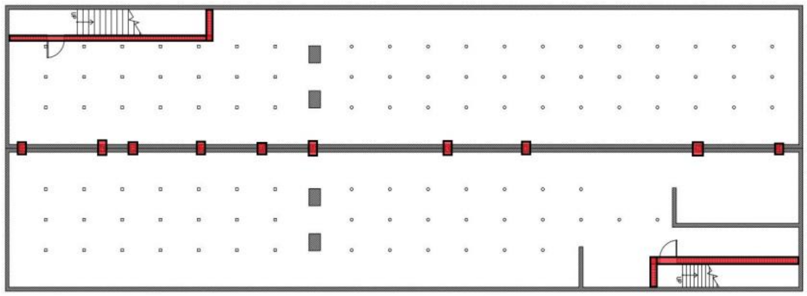


Figure 27: Foundation placement in basement

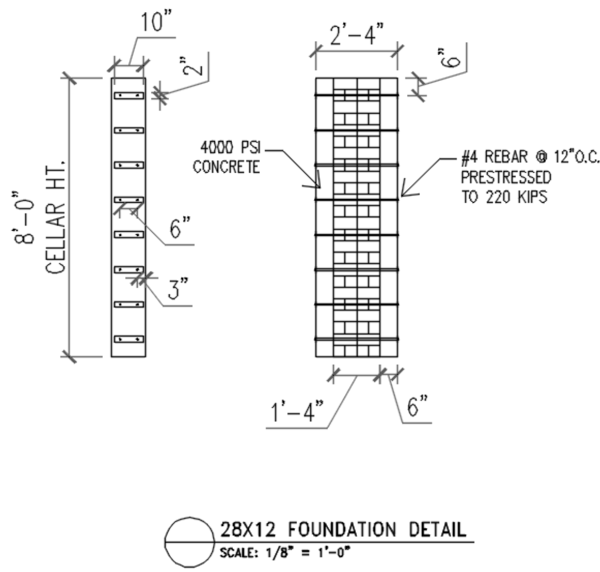


Figure 28: Typical foundation reinforcement assembly

<u>Section VII</u> - Engineer's Cost Estimate

The cost estimate was broken down into sections, the demolition, structure, shell, interior, services and furnishings. The demolition, the interior and most of the structure material unit price was based on prices from "2019 National Construction Estimator". The services and furnishing prices were based on the square footage of the building using "RS Means". The prices from these books were from 2019 and the prices in the cost estimate table (table 2) were adjusted for inflation. There was a 20% contingency and 15% construction administration price applied to the final construction subtotal. The total project cost came out to be $1,683,174.

Table 2: Cost Estimate for the Project

	Item	Description	Unit	Unit Cost	Quantity	Total
Demolition						**$ 47,088.71**
1	Brick Wall Removal	8" Brick Wall by SF	SF	$ 5.77	2230	$ 12,864.30
2	Wall Stud Removal	2"X4" Studs on Brick Walls	SF	$ 0.56	5550	$ 3,086.66
3	Gypsum Board Removal	General Gypsum Removed in Building	SF	$ 0.59	5750	$ 3,386.00
4	Interior Wall Removal	2"X4" Studs, Top & Bottom Plates, and Gyp	SF	$ 1.70	3740	$ 6,362.41
5	Exterior Wall Removal	2"X4" Studs, Top & Bottom Plates, plywood and gyp	SF	$ 2.20	720	$ 1,586.02
6	Floor Removal	2"X12" Joists, Plywood, Ceiling Gyp	SF	$ 2.00	815	$ 1,626.43
7	Remove Flooring	Laminate Flooring	SF	$ 0.43	5805	$ 2,468.84
8		Carpet, Carpet Pad	SF	$ 1.37	4815	$ 6,615.95
9	Remove Stairs	Wood Stair Case, Risers	SF	$ 3.79	300	$ 1,138.48
10		Handrail	LF	$ 1.44	67	$ 96.44
11	Window Removal	Wood Framed Window and Hardware	SF	$ 2.06	570	$ 1,174.80
12	Door Removal	Wood Door, Frame and Hardware	Each	$ 16.25	12	$ 194.98
13	Ceiling Removal	Plaster Ceiling and Board	SF	$ 0.49	10620	$ 5,211.50
14	Façade Removal	Face Sheathing and Siding	SF	$ 0.72	750	$ 539.80
15		Framing	SF	$ 0.98	750	$ 736.09
Structure						**$ 721,343.94**
16	Structural Support Beam	W24X68 Steel Beam	LF	$ 4,580.10	77	$ 352,667.70
17	Structural Column	Pipe 10 x-strong	LF	$ 2,726.25	130	$ 354,412.50
18	Structural Concrete	Concrete for Foundation Columns	CY	$ 143.95	80	$ 11,515.68
19	Foundation Rebar	Rebar for Foundation Supports	LF	$ 3.82	720	$ 2,748.06
Shell						**$ 28,191.17**
20	Floor Joists	2"X14" Floor Joists	SF	$ 6.22	1150	$ 7,148.23
21	8" Brick	Brick Repair	SF	$ 29.66	50	$ 1,483.08
22	Window	3'X7' Single-Hung Insulated Vinyl Window	Each	$ 255.50	22	$ 5,621.09
23	Exterior Doors	48"X84" Door Assembly	Each	$ 495.09	2	$ 990.17
24		36"X84" Door Assembly	Each	$ 329.33	5	$ 1,646.66
25	Roof Materials	Decking - 20'X40' - Pine Pressure Treated	SF	$ 12.08	800	$ 9,666.19
26		Roof Repair	LS	$ 1,635.75	1	$ 1,635.75
Interiors						**$ 156,936.20**
27	Partition Walls	2"X4" Stud 16" O.C. 1/2" Gyp	SF	$ 4.09	5470	$ 22,368.88
28		2"X4" Stud 16" O.C. 5/8" Gyp -Fire Rated	SF	$ 4.15	2445	$ 10,158.50
29		2"X6" Stud 16" O.C., 1/2" Gyp	SF	$ 4.81	860	$ 4,135.83
30		2"X6" Stud 16" O.C., 5/8" Gyp - Fired Rated	SF	$ 4.87	2980	$ 14,526.11
31		Wall Finishes, Paint Semi gloss	SF	$ 0.11	19950	$ 2,175.55
32	Interior Doors	36"X80" Wood Door Assembly - Hollow Core	Each	$ 112.87	30	$ 3,386.00
33		36"X80" Wood Door Assembly - Solid Core	Each	$ 231.19	12	$ 2,774.23
34		6'X7' Bi-fold Closet Door	Each	$ 185.49	4	$ 741.98
35		6'X7' Aluminum Double Door	Each	$ 441.65	2	$ 883.31
36		2'X6'10" Closet Door	Each	$ 85.71	3	$ 257.14
37	Stair Construction	12" tread 6" riser	Each	$ 219.19	84	$ 18,412.00
38		Landing	SF	$ 14.25	160	$ 2,280.45
39		Handrail	LF	$ 13.58	170	$ 2,308.04
40	Floor	Laminate Flooring	SF	$ 5.10	8350	$ 42,614.56
41		Tile Flooring -ceramic flooring - 12"x12"	SF	$ 1.58	720	$ 1,138.48
42		Plywood subfloor, 5/8" - 4'X8'	SF	$ 1.28	6840	$ 8,727.05
43		Soundproof Insulation 3-1/2", 16" O.C.	SF	$ 0.68	4815	$ 3,255.47
44	Ceiling	Gypsum board 1/2" board fire rated mold-tough	SF	$ 1.47	10620	$ 15,634.50
45		Ceiling Finishes	SF	$ 0.11	10620	$ 1,158.11
Services						**$ 235,438.95**
46	Plumbing	Plumbing fixtures, and piping install	LS	$ 57,414.83	1	$ 57,414.83
47	HVAC Unit	HVAC Unit install in aparments	LS	$ 93,063.27	1	$ 93,063.27
48	Fire Protection	Sprinkler System on upper floors	LS	$ 19,901.63	1	$ 19,901.63
49	Electrical	All electrical fixtures, fittings and install	LS	$ 65,059.23	1	$ 65,059.23
Equipment & Furnishing						**$ 57,796.50**
50	Apartment Ameneties	Kitchen Appliances and Cabinets, Washer/Dryer	LS	$ 8,942.10	1	$ 8,942.10
51	Restaurant Furnishing	Bar, Cabinets, Seating	LS	$ 22,137.15	1	$ 22,137.15
52	Patio Furnishing	Seating, Fire Pits, Tables, Architecture	LS	$ 4,907.25	1	$ 4,907.25
53	Golf Simulator	Two Commercial Golf Simulators	LS	$ 21,810.00	1	$ 21,810.00
					Construction Total	**$ 1,246,795.47**
				Contingencies	20%	$ 249,359.09
				Admin	15%	$ 187,019.32
						$ -
					Total	**$ 1,683,173.88**

Appendices

Appendix A - LRFD Gravity Load Analysis Calculation Report

Vinnies Lounge LFRD Gravity Load Analysis

Live Loads

$Apartments := 40\ \mathbf{psf}$

$Roof := 20\ \mathbf{psf}$

$Resturant := 100\ \mathbf{psf}$

$Patio := 100\ \mathbf{psf}$

$Stairs := 40\ \mathbf{psf}$

$Kitchen := 150\ \mathbf{psf}$

$AC := 200\ \mathbf{psf}$

Dead Loads

Ceilings

per 1/8 in $GypC := 0.55\ \mathbf{psf}$

$MEP := 10\ \mathbf{psf}$

$fiberboard := 1\ \mathbf{psf}$

Roof

per 1/8 in $Plywood := 0.4\ \mathbf{psf}$

$Waterproof := 1.5\ \mathbf{psf}$

Floor

2x12 - 16in spacing $Joist := 7\ \mathbf{psf}$

per 3/4 in $Subfloor := 3\ \mathbf{psf}$

per 7/8 in $Hardwood := 4\ \mathbf{psf}$

3 in $Decking := 8\ \mathbf{psf}$

Walls

per 1/2 in $GypW := 2\ \mathbf{psf}$

per 1/2 in $Insulation := 0.75\ \mathbf{psf}$

2x4 $stud := 4\ \mathbf{psf}$

8 in wythe $brick := 80\ \mathbf{psf}$

Roof Load

Live Load

$$wlr := Roof = 20\ psf$$

Dead Load

$$wdr := Plywood + Waterproof + 2 \cdot GypC + MEP + Joist = 20\ psf$$

$$wur := 1.2 \cdot wdr + 1.6 \cdot wlr = 56\ psf$$

Third Floor Load

Live Load

$$wl3 := Apartments + Stairs = 80\ psf$$

Dead Load

$$wd3 := Joist + Subfloor + Hardwood + GypC + MEP + stud + GypW + Insulation = 31.3\ psf$$

$$wu3 := 1.2 \cdot wd3 + 1.6 \cdot wl3 = 165.56\ psf$$

Second Floor Load

Live Load

$$wl2a := Apartments + Stairs = 80\ psf \qquad wl2b := Patio = 100\ psf$$

Dead Load

$$wd2a := Joist + Subfloor + Hardwood + fiberboard + MEP + stud + GypW + Insulation = 31.75\ psf$$

$$wd2b := Joist + Subfloor + Decking + fiberboard + MEP + Insulation = 29.75\ psf$$

$$wu2a := 1.2 \cdot wd2a + 1.6 \cdot wl2a = 166.1\ psf \qquad wu2b := 1.2 \cdot wd2b + 1.6 \cdot wl2b = 195.7\ psf$$

First Floor Load

Live Load

$$wl1 := Resturant + Stairs + Kitchen = 290\ psf$$

Dead Load

$$wd1 := Joist + Subfloor + Hardwood + MEP + stud + GypW + Insulation = 30.75\ psf$$

$$wu1 := 1.2 \cdot wd1 + 1.6 \cdot wl1 = 500.9\ psf$$

Appendix B - Joist Calculation Report

Tributary Width
$WT := 16\ in$

Span Length
$L := 25\ ft$

Roof Joist Load on 3rd floor wall

$Joistr := \frac{wur \cdot WT \cdot L}{2} = 933.333\ lbf$

Wall Length
$WallL3 := 60\ ft$

3rd Floor Wall Height
$WallH3 := 12\ ft$

Unit Load on third floor wall acting above second floor

$$WL3 := brick \cdot WallH3 + \frac{Joistr}{1\ ft} = 1893.333\ plf$$

3rd Floor Joist Load on 2nd floor wall

$Joist3 := \frac{wu3 \cdot WT \cdot L}{2} = 2759.333\ lbf$

Wall Length
$WallL2 := 60\ ft$

2nd Floor Wall Height
$WallH2 := 12\ ft$

Unit Load on second floor wall acting above first floor

$$WL2 := brick \cdot WallH2 + \frac{Joist3}{1\ ft} + WL3 = 5612.667\ plf$$

2nd Floor Joist Load on 1st wall

$Joist2a := \frac{wu2a \cdot WT \cdot L}{2} = 2768.333\ lbf$

$Joist2b := \frac{wu2b \cdot WT \cdot L}{2} = 3261.667\ lbf$

Wall Length
$WallL1a := 60\ ft$
$WallL1b := 80\ ft$

1st Floor Wall Height
$WallH1 := 15\ ft$

Unit Load on first floor wall acting above basement

$$WL1a := brick \cdot WallH1 + \frac{Joist2a}{1\ ft} + WL2 = 9581\ plf$$

Front 60 feet

$$WL1b := brick \cdot WallH1 + \frac{Joist2b}{1\ ft} = 4461.667\ plf$$

Back 80 feet

First Floor Center wall for steel design

The south 60 feet of building

$$WLCa := \left(WL2 + \frac{Joist2a}{1\ ft}\right) \cdot 2 = 16.762\ klf$$

The north 80 feet of building

$$WLCb := \left(\frac{Joist2b}{1\ ft}\right) \cdot 2 = 6.523\ klf$$

Apartment Floor Joist Design (25' common span)

$w_d := 27\ psf$ $w_l := 40\ psf$ $w := w_d + w_l = 67\ psf$ $L := 23\ ft + 8\ in = 23.667\ ft$

$V_{max} := \frac{w \cdot 1.33\ ft \cdot L}{2} = (1.054 \cdot 10^3)\ lbf$ $M_{max} := \frac{w \cdot 1.33\ ft \cdot L^2}{8} = (6.239 \cdot 10^3)\ lbf \cdot ft$

$b := 3\ in$ $d := 14\ in$ $I := \frac{b \cdot d^3}{12} = 686\ in^4$ $S := \frac{b \cdot d^2}{6} = 98\ in^3$

$f_b := \frac{M_{max}}{S} = 763.952\ psi$ $f_v := \frac{3 \cdot V_{max}}{2 \cdot b \cdot d} = 37.66\ psi$

$f_{c.perp} := \frac{V_{max}}{b \cdot 8\ in} = 43.936\ psi$ $C_b := \frac{8 + 0.375}{8} = 1.047$

$C_r := 1.15$ $C_D := 1.0$ $C_t := 1.0$ $C_{fu} := 1.0$ $C_i := 1.0$
$C_M := 1.0$ $C_L := 1.0$

3x14 solid sawn lumber Douglas Fir No. 1

$F_b := 1080\ psi$ $F_t := 720\ psi$ $F_v := 180\ psi$ $F_{c.perp} := 562.5\ psi$

$F_c := 1395\ psi$

$E := 1800000\ psi$ $E_{min} := 660000\ psi$

$F'_b := F_b \cdot C_D \cdot C_M \cdot C_t \cdot C_L \cdot C_{fu} \cdot C_i \cdot C_r = (1.242 \cdot 10^3)\ psi$ $f_b \le F'_b$ true

$F'_v := F_v \cdot C_D \cdot C_M \cdot C_t \cdot C_i = 180\ psi$ $f_v \le F'_v$ true

$F'_{c.perp} := F_{c.perp} \cdot C_M \cdot C_t \cdot C_i \cdot C_b = 588.867\ psi$ $f_{c.perp} \le F'_{c.perp}$ true

$w_{LT} := w_d + 0.5 \cdot w_l = 47\ psf$ $w_{ST} := 0.5 \cdot w_l = 20\ psf$

$\delta_{LT} := \frac{5\ ft \cdot w_{LT} \cdot L^4}{384 \cdot E \cdot I} = 0.269\ in$ $\delta_{ST} := \frac{5\ ft \cdot w_{ST} \cdot L^4}{384 \cdot E \cdot I} = 0.114\ in$ $\frac{L}{360} = 0.789\ in$ OK

$\delta_{TOT} := 1.5 \cdot \delta_{LT} + \delta_{ST} = 0.517\ in$ $\frac{L}{240} = 1.183\ in$ OK

Patio Area Joist Design (25' common span)

$w_d := 25\ psf \qquad w_l := 100\ psf \qquad w := w_d + w_l = 125\ psf \qquad L := 23\ ft + 8\ in = 23.667\ ft$

$$V_{max} := \frac{w \cdot 1.33\ ft \cdot L}{2} = \left(1.967 \cdot 10^{3}\right)\ lbf \qquad M_{max} := \frac{w \cdot 1.33\ ft \cdot L^{2}}{8} = \left(1.164 \cdot 10^{4}\right)\ lbf \cdot ft$$

$$b := 4.5\ in \qquad d := 14\ in \qquad I := \frac{b \cdot d^{3}}{12} = \left(1.029 \cdot 10^{3}\right)\ in^{4} \qquad S := \frac{b \cdot d^{2}}{6} = 147\ in^{3}$$

$$f_b := \frac{M_{max}}{S} = 950.188\ psi \qquad f_v := \frac{3 \cdot V_{max}}{2 \cdot b \cdot d} = 46.84\ psi$$

$$f_{c.perp} := \frac{V_{max}}{b \cdot 8\ in} = 54.647\ psi \qquad C_b := \frac{8 + 0.375}{8} = 1.047$$

$C_r := 1.15 \qquad C_D := 1.0 \qquad C_t := 1.0 \qquad C_{fu} := 1.0 \qquad C_i := 1.0$

$C_M := 1.0 \qquad C_L := 1.0$

3x14 solid sawn lumber (with a 2x14 sistered together) Douglas Fir No. 1

$F_b := 1080\ psi \qquad F_t := 720\ psi \qquad F_v := 180\ psi \qquad F_{c.perp} := 562.5\ psi$

$F_c := 1395\ psi$

$E := 1800000\ psi \qquad E_{min} := 660000\ psi$

$F'_b := F_b \cdot C_D \cdot C_M \cdot C_t \cdot C_L \cdot C_{fu} \cdot C_i \cdot C_r = \left(1.242 \cdot 10^{3}\right)\ psi \qquad f_b \le F'_b$ true

$F'_v := F_v \cdot C_D \cdot C_M \cdot C_t \cdot C_i = 180\ psi \qquad f_v \le F'_v$ true

$F'_{c.perp} := F_{c.perp} \cdot C_M \cdot C_t \cdot C_i \cdot C_b = 588.867\ psi \qquad f_{c.perp} \le F'_{c.perp}$ true

$w_{LT} := w_d + 0.5 \cdot w_l = 75\ psf \qquad w_{ST} := 0.5 \cdot w_l = 50\ psf$

$$\delta_{LT} := \frac{5\ ft \cdot w_{LT} \cdot L^{4}}{384 \cdot E \cdot I} = 0.286\ in \qquad \delta_{ST} := \frac{5\ ft \cdot w_{ST} \cdot L^{4}}{384 \cdot E \cdot I} = 0.191\ in \qquad \frac{L}{360} = 0.789\ in \text{ OK}$$

$$\delta_{TOT} := 1.5 \cdot \delta_{LT} + \delta_{ST} = 0.619\ in \qquad \frac{L}{240} = 1.183\ in \text{ OK}$$

First Floor Joist Design (12.5' long span)

$w_d := 26\ psf$ $w_l := 100\ psf$ $w := w_d + w_l = 126\ psf$ $L := 12\ ft + 6\ in = 12.5\ ft$

$V_{max} := \frac{w \cdot 1.33\ ft \cdot L}{2} = (1.047 \cdot 10^3)\ lbf$ $M_{max} := \frac{w \cdot 1.33\ ft \cdot L^2}{8} = (3.273 \cdot 10^3)\ lbf \cdot ft$

$b := 3\ in$ $d := 14\ in$ $I := \frac{b \cdot d^3}{12} = 686\ in^4$ $S := \frac{b \cdot d^2}{6} = 98\ in^3$

$f_b := \frac{M_{max}}{S} = 400.781\ psi$ $f_v := \frac{3 \cdot V_{max}}{2 \cdot b \cdot d} = 37.406\ psi$

$f_{c.perp} := \frac{V_{max}}{b \cdot 6\ in} = 58.188\ psi$ $C_b := \frac{6 + 0.375}{6} = 1.063$

$C_r := 1.15$ $C_D := 1.0$ $C_t := 1.0$ $C_{fu} := 1.0$ $C_i := 1.0$

$C_M := 1.0$ $C_L := 1.0$

3x14 solid sawn lumber Douglas Fir No. 1

$F_b := 1080\ psi$ $F_t := 720\ psi$ $F_v := 180\ psi$ $F_{c.perp} := 562.5\ psi$

$F_c := 1395\ psi$

$E := 1800000\ psi$ $E_{min} := 660000\ psi$

$F'_b := F_b \cdot C_D \cdot C_M \cdot C_t \cdot C_L \cdot C_{fu} \cdot C_i \cdot C_r = (1.242 \cdot 10^3)\ psi$ $f_b \le F'_b$ true

$F'_v := F_v \cdot C_D \cdot C_M \cdot C_t \cdot C_i = 180\ psi$ $f_v \le F'_v$ true

$F'_{c.perp} := F_{c.perp} \cdot C_M \cdot C_t \cdot C_i \cdot C_b = 597.656\ psi$ $f_{c.perp} \le F'_{c.perp}$ true

$w_{LT} := w_d + 0.5 \cdot w_l = 76\ psf$ $w_{ST} := 0.5 \cdot w_l = 50\ psf$

$\delta_{LT} := \frac{5\ ft \cdot w_{LT} \cdot L^4}{384 \cdot E \cdot I} = 0.034\ in$ $\delta_{ST} := \frac{5\ ft \cdot w_{ST} \cdot L^4}{384 \cdot E \cdot I} = 0.022\ in$ $\frac{L}{360} = 0.417\ in$ OK

$\delta_{TOT} := 1.5 \cdot \delta_{LT} + \delta_{ST} = 0.073\ in$ $\frac{L}{240} = 0.625\ in$ OK

Appendix C - Column Calculation Report

Column Foundation Design

$P_u := 220\ kip \qquad f'_c := 4000\ psi \qquad \phi := 0.85$

$$A := \frac{P_u}{0.85 \cdot \phi \cdot f'_c} = 0.529\ ft^2$$

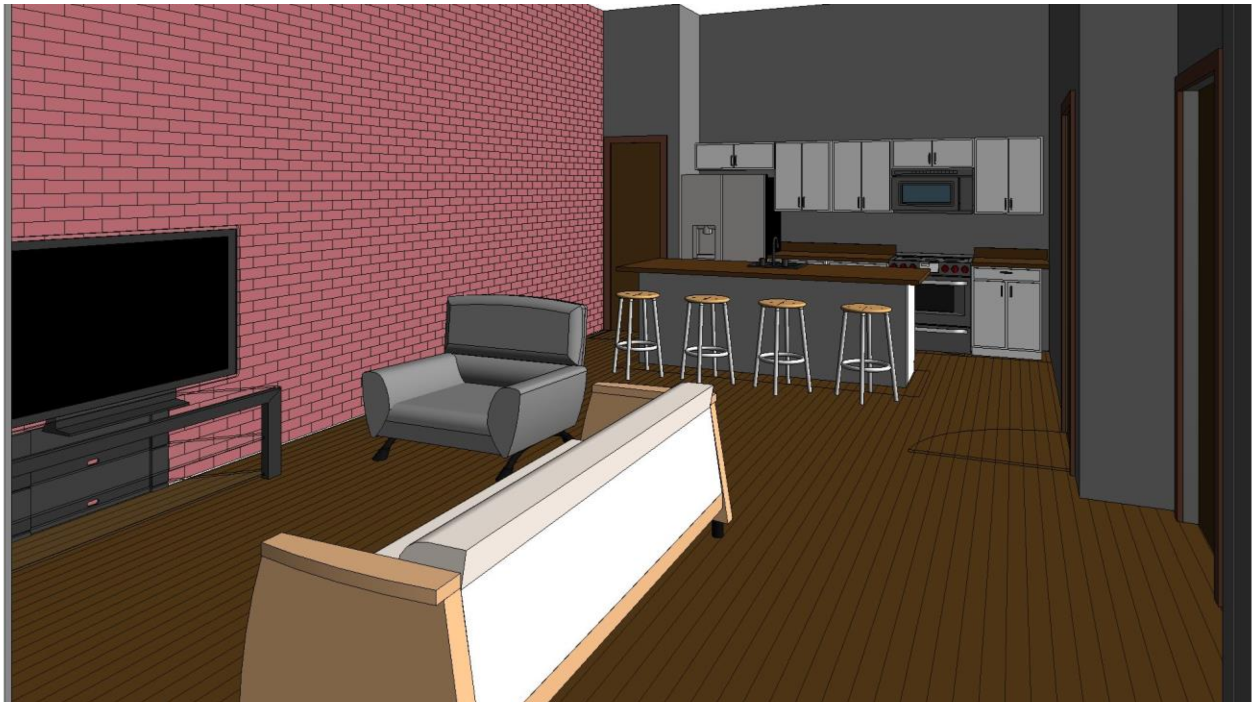
$d_4 := 0.5\ in \qquad A_g := 16\ in \cdot 1\ ft = 1.333\ ft^2 \qquad A_e := A_g - 2 \cdot \left(d_4 \cdot 16\ in\right) = 1.222\ ft^2$

Design Drawings

These were submitted separately.

Design Renderings and Models

This is a 3D rendering model of what the final design of the first floor bar will look like. The first model is a view of the bar, one of the indoor virtual golf simulators, and seating arrangements from the front west section of the building. The second model is a view from the front east section of the building. The third model is an aerial view and layout of the first floor of the building.



This is a 3D rendering model of the final design of one of the apartments on the third floor. The first model is a view of the apartment from the living room to the kitchen. The second model is a view from the kitchen to the living room. The third view is an aerial view of the apartment and the hallway leading the apartment.