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Structural Option

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Proposal

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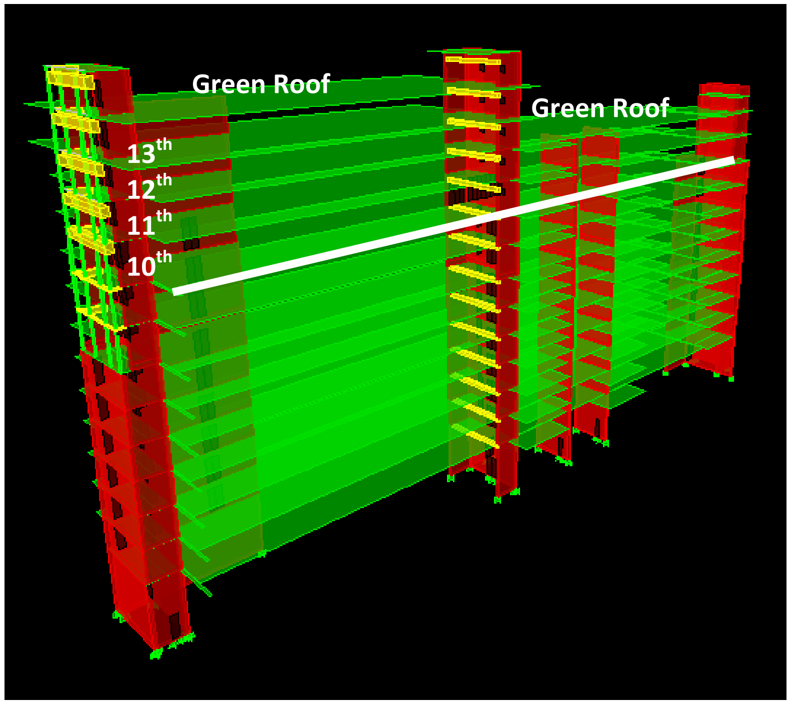
EXECUTIVE SUMMARY

The originally-designed Residence Inn by Marriott will be situated in a lively downtown Norfolk, Virginia area, surrounded on all sides by busy streets. The hotel will serve as an upscale temporary residence with extensive amenities for its extended stay patrons. There will be 160 guest suites on eight upper floors, with public functions, such as lobbies, gathering areas, and an indoor swimming pool, located on the first floor. The upper floors generally have the same layout; only minor differences exist to accommodate various room types. A main corridor connecting the emergency stairwells at either end of the building separates 10 guest suites each on the North and South sides of the building. A pair of elevators is located at a central core along this corridor.

While some of these accommodations that are exclusively designed for the extended-stay business traveler have in-room desks and workspace, none of these provides a separate residence and office space in the same building. Frequently, companies who relocate business professionals temporarily also acquire temporary office space. It can be difficult to find space that can be leased for short-term use. It is also very costly to set up these spaces, in terms of furnishing and getting technicians to set up phone and internet access. Assuming Marriott pursued this concept of residence and office space in the same building, renting rooms for each on a day-to-day basis, the building would need to increase in size to maintain the desired residence space, while adding office space. Due to the nature of the confined site, the only way to do this is to expand vertically.

To address the needs for vertical expansion and to reinforce Marriott's dedication to the planet by providing green space, the proposed Residence Inn & "Executive Suites" will feature four additional floors (above the white line shown in the 3-D view) and two separate green roof spaces, as illustrated in the figure below.



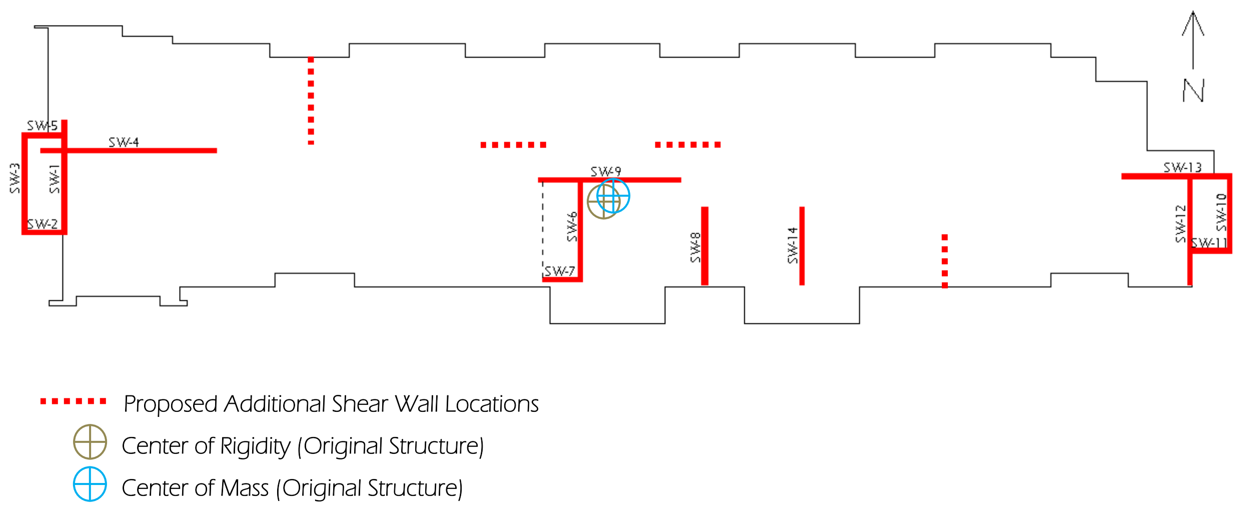
(FIGURE 1) 3-D View of Proposed Additional Floors & Green Roofs

Since Marriott's network of lodging is so expansive and constantly growing, it would be beneficial to have a prototypical structure that could be used in a number of different locations throughout the United States. This would reduce the amount of re-engineering of similar buildings required. The current location of the Residence Inn by Marriott is downtown Norfolk, Virginia, where seismic activity is relatively low. In order to develop a prototype for the structural systems for more locations across the United States, the structure would need to be designed for additional seismic loads. Increased mapped spectral response acceleration parameters of 50% and 15% of gravity for the short and long period accelerations respectively and a more severe Seismic Design Category C shall be used as criteria for the design to ensure that the structure is capable of being located in the most locations.

With the addition of four floors and increased seismic loading, both the existing gravity and lateral resisting systems will require analysis and re-design. The discontinuation of shear walls where the upper two floors project on the West side will create additional structural issues that will also need to be addressed, such as torsional and shear-related issues.

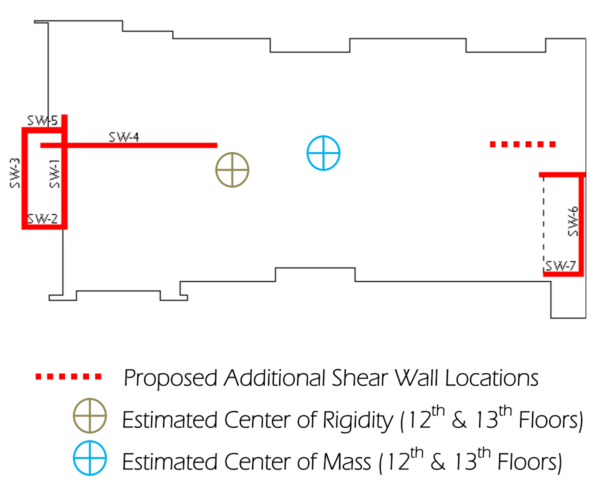
The basic layout of structural elements, such as column and core area locations that provide the necessary vertical transportation, shall remain as originally designed. Since it was determined that the flat plate floor system is one of the most economical choices for this type of building, the proposed solution will include the use of this.

One design solution for the increased lateral loads is illustrated below, where the dotted lines represent additional shear walls at all levels. These can be easily incorporated into the existing structure hidden at partition locations such that the guest room floors do not need to be re-designed architecturally.



(FIGURE 2) Proposed Design Solution for Lateral Force Resistance (Typical Floor)

Since the estimated locations of centers of mass and rigidity do not coincide at the upper floors (12th & 13th, as shown below), torsion could be an issue here and will need to be addressed once the severity of the issue is determined.



(FIGURE 3) Proposed Design Solution for Lateral Force Resistance (12th & 13th Floors)

A number of methods, codes, design guides, and design aides shall be used in the re-design and analysis of gravity and lateral structural elements. Both hand calculations and computer modeling will be used simultaneously to avoid errors. RAM Structural shall be used to construct and evaluate mainly the lateral system, but will be used also as a spot check for gravity load elements. PCA Slab will be used for two-way flat-plate design to verify hand calculations.

The introduction of a new concept in merging hotel and temporary office space, which will add four additional floors, lends itself naturally to a need to design these new spaces architecturally. Individual offices shall be designed to accommodate various types of professionals and be equipped with all the necessary furnishings, printers, fax machines, telephones, basic office supplies, and even a small kitchenette for preparing lunch and brewing coffee. The concept is based on the idea that the business traveler can come into town, get a good night's rest in his/her hotel room, travel a short distance down the hall and up the elevator to work, plug his/her laptop into the internet connection, and "voila!" he/she is ready to begin a productive day. Plans, elevations, building sections, and a 3-D Revit model of the interior spaces and green roof shall be the deliverables for this breadth.

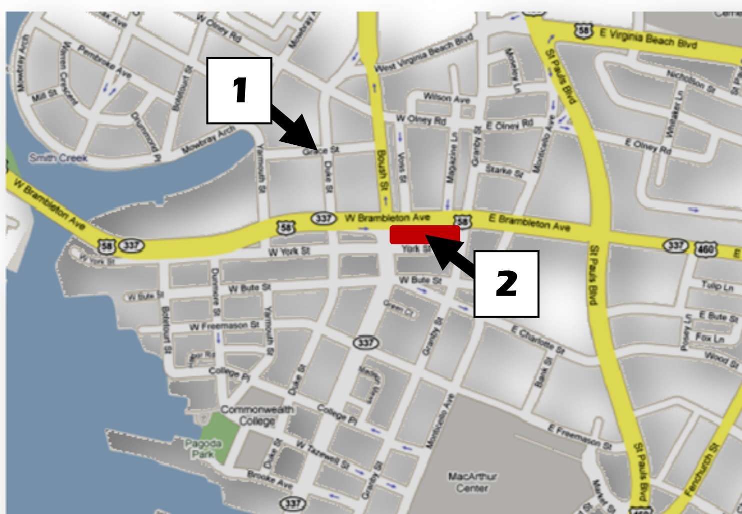
Since an important aspect of the re-design is separation of work and personal spaces, the new office space shall exhibit lighting characteristics that is both efficient and fosters productivity. As part of the design solution, the proposed research shall include consideration of natural daylight and a selection of fixture types for one of the typical offices, as well as either a conference room or corridor. In addition to providing a design that meets code requirements for a minimum number of footcandles, Luxicon will be used to portray the design in 3-D.

The ultimate goal of the proposed research will be to gain experience in seismic design and lateral load-resisting systems, while also becoming more adept at gravity systems, such as the two-way flat plate. In conjunction with these goals, this research shall serve as a practical exercise in meeting the architectural requirements for luxurious spaces and working to achieve a solution that satisfies both design parties, and ultimately the owner(s) and end occupants.

BACKGROUND

SITE & ARCHITECTURE

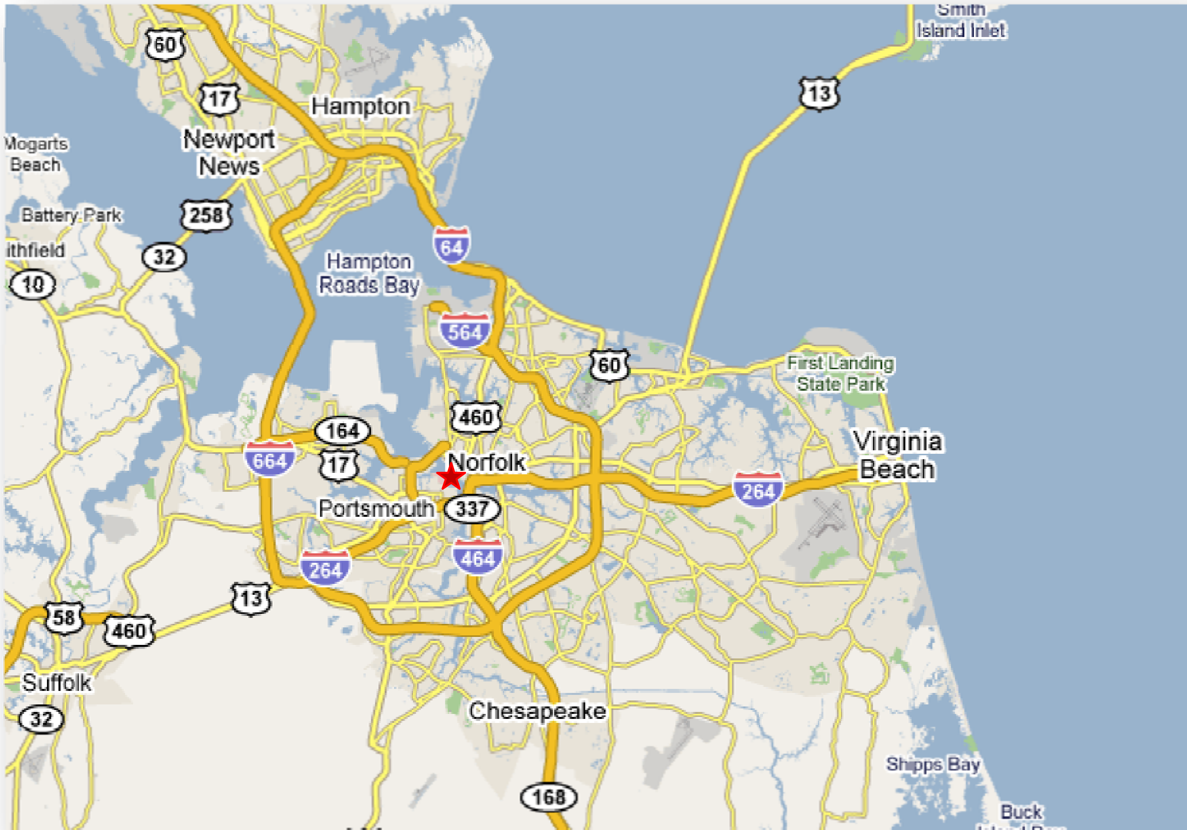
The new Residence Inn by Marriott will be situated in a lively downtown Norfolk, Virginia area, surrounded on all sides by busy streets. The hotel will serve as an upscale temporary residence with extensive amenities for its extended stay patrons. The building itself boasts a unique combination of simple structural components and fascinating architectural features. A tasteful combination of architectural precast, drainable EIFS, and curtain wall will be used to make this building an impressive and distinguished landmark in the community.



(FIGURE 4) Site Location Map – Street Level

(FIGURE 5) Aerial View from NW Looking SE

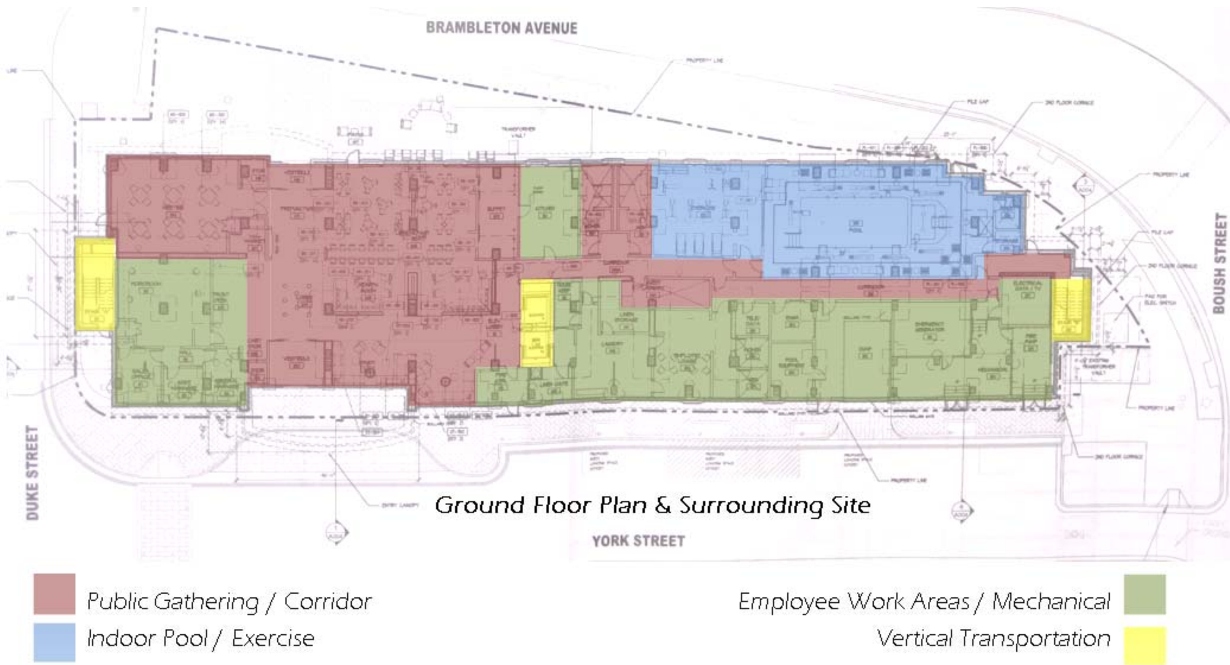
(FIGURE 6) View from Site - SE Looking NW



(FIGURE 7) Site Location Map – City & Surrounding Areas

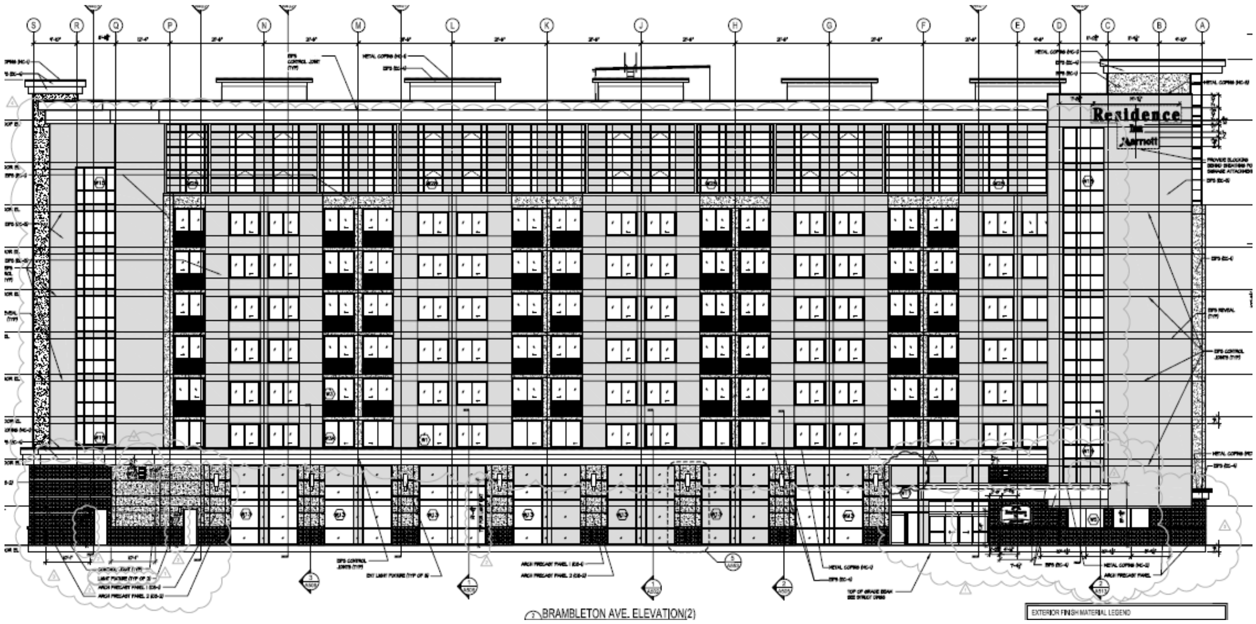
There will be 160 guest suites on eight upper floors, with public functions, such as lobbies, gathering areas, and an indoor swimming pool, located on the first floor. The extensive program on the first floor requires large open spaces desired for architectural allure. The upper floors generally have the same layout; only minor differences exist to accommodate various room types. A main corridor connecting the emergency stairwells at either end of the building separates 10 guest suites each on the North and South sides of the building. A pair of elevators is located at a central core along this corridor. Many of the upper floor suites will have magnificent views of the surrounding city and inner-coastal bays.

Typical floor-to-floor heights are 9'-4", with the first floor having a height of 19'-0". The total height of the building as designed is approximately 95 feet, excluding parapets and stair towers that extend beyond the main roof. Zoning restrictions mandate a maximum of 11 stories or 160 feet. Floor plans and building sections illustrating the architecture and general configuration of the building are shown in the figures below.

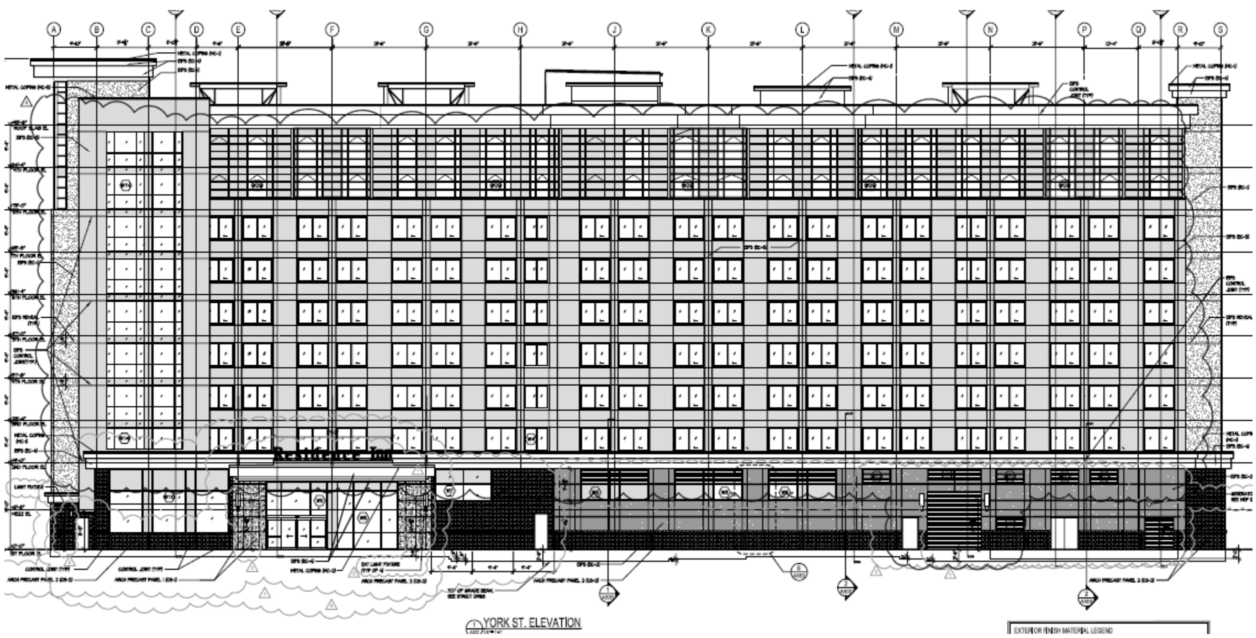


(FIGURE 8) Ground Floor Plan

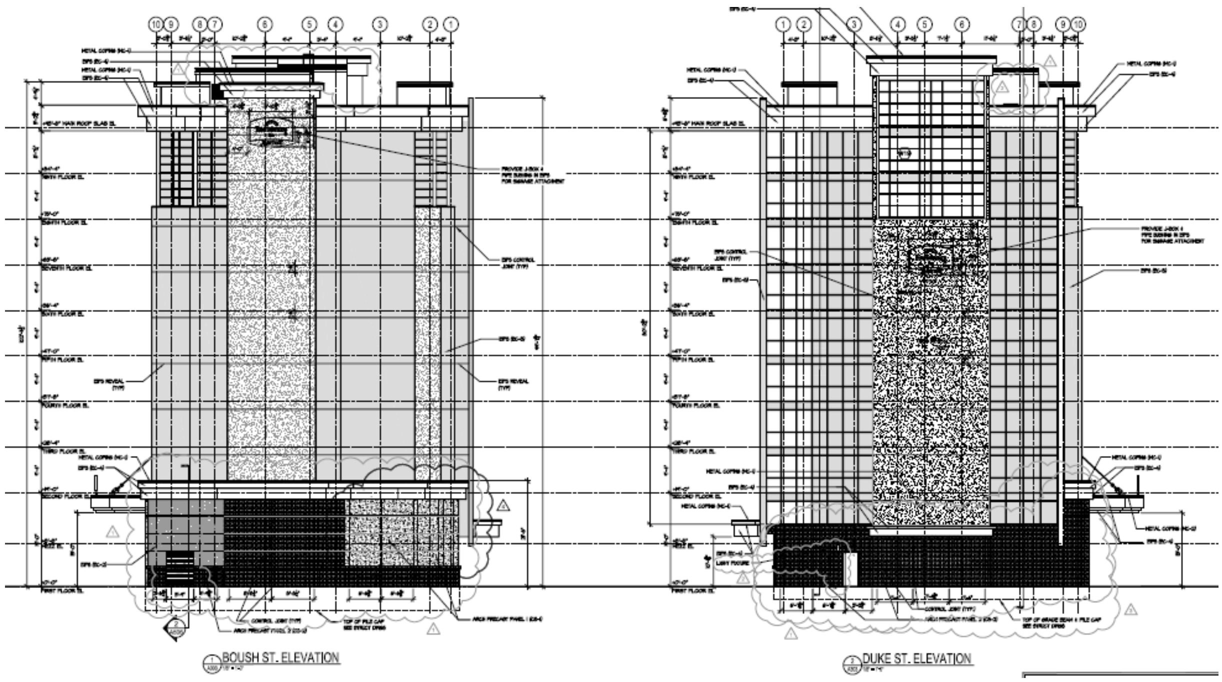
(FIGURE 9) Typical Upper Floor Plan



(FIGURE 10) Brambleton Ave. (North) Elevation



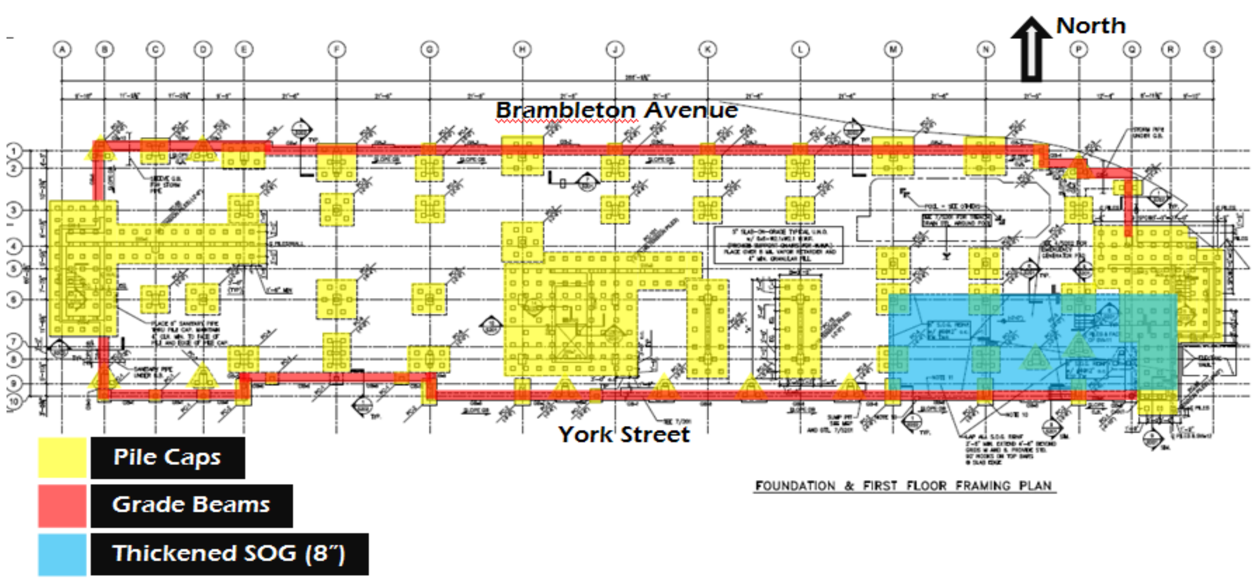
(FIGURE 11) York St. (South) Elevation



(FIGURE 12) Boush St. (East) & Duke St. (West) Elevations

SOILS & FOUNDATIONS

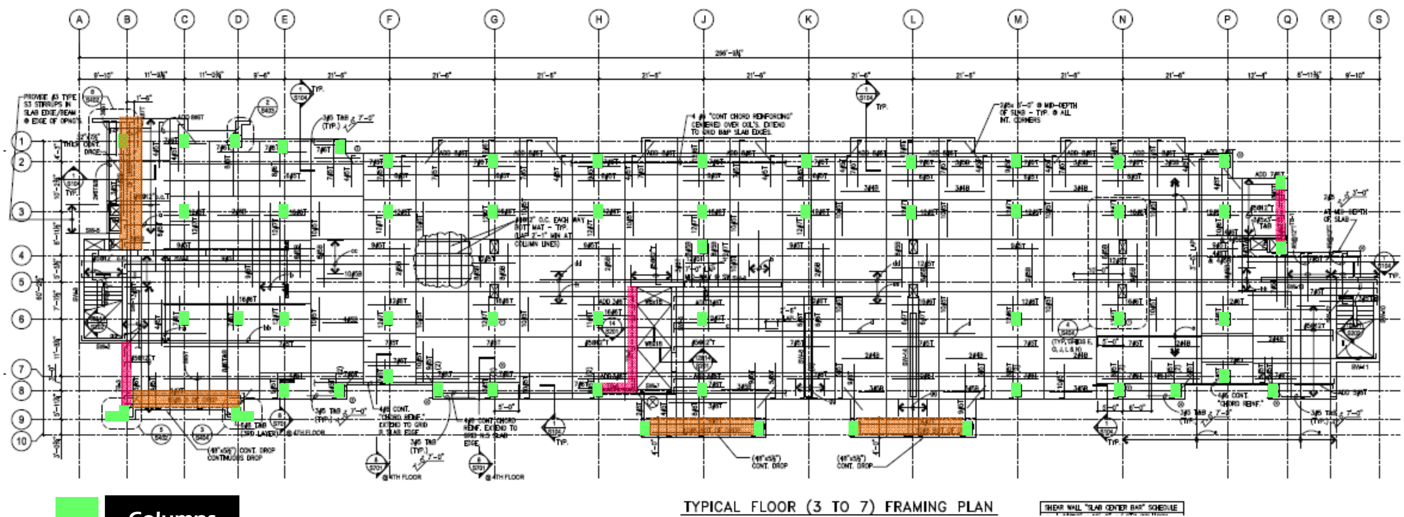
Located in a coastal area, the Residence Inn site requires friction piles because of the high water table and lack of a firm bearing stratum. Foundations consist of precast concrete piles (100 ton capacity; 35 ton uplift capacity) driven to 70', cast-in-place concrete pile caps and grade beams. The foundation plan below highlights these elements.



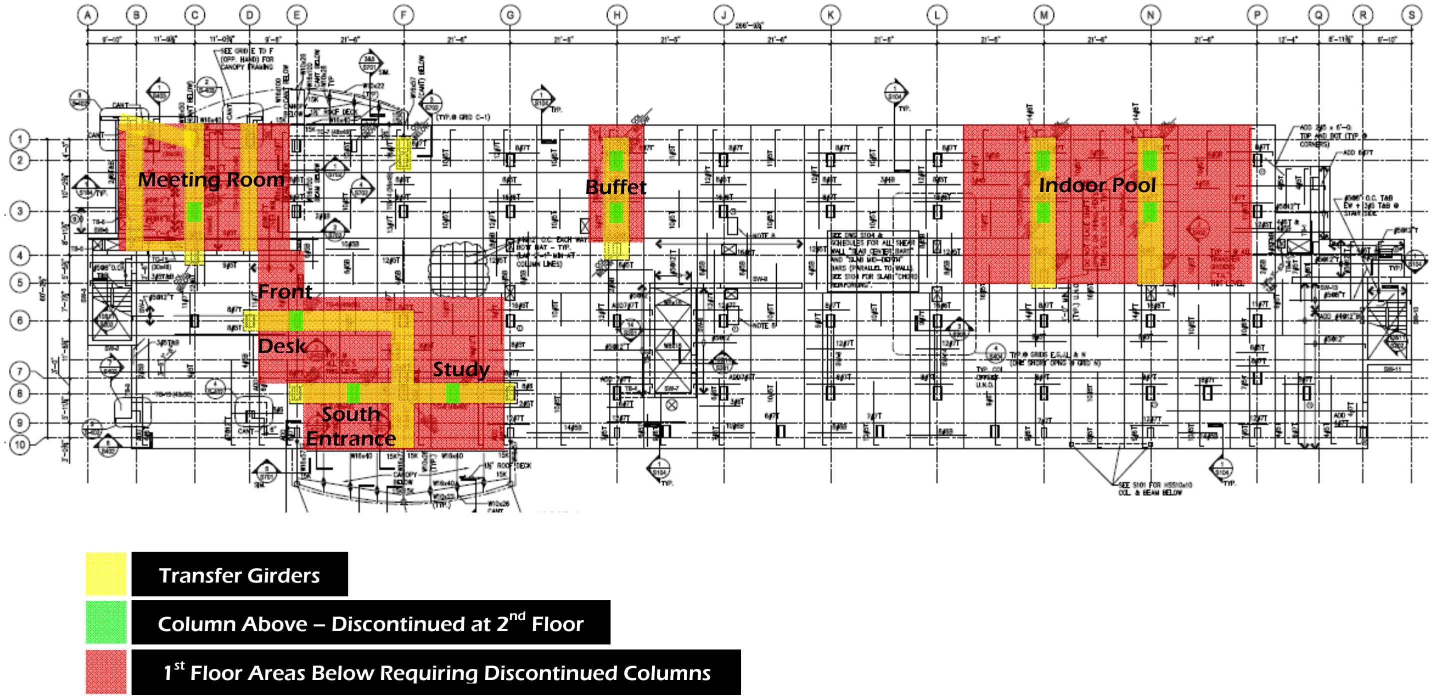
(FIGURE 13) Foundation Plan

GRAVITY LOAD SYSTEMS

Above grade, the Residence Inn is almost entirely structurally supported by reinforced concrete elements. The floor system as well as the roof consists of an 8" two-way flat plate slab. Reinforced concrete columns, ranging in size from 12"x24" on the upper floors to 20"x30" at the first floor, support the two-way slab system. Typical interior columns are 14"x30". At the second floor, reinforced concrete transfer girders are used to discontinue several columns from above, providing larger open spaces on the ground floor below. See the figures below for both a typical floor framing plan and an illustration of the transfer of loads at the second floor where columns are discontinued.



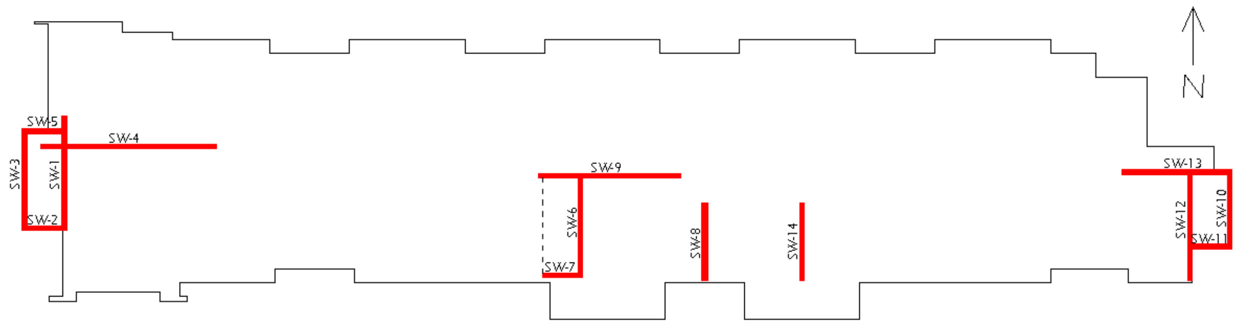
(FIGURE 14) Typical Floor Plan



(FIGURE 15) 2nd Floor Framing Plan

LATERAL LOAD SYSTEMS

Cast-in-place reinforced concrete shear walls are employed to resist lateral forces. There are a total of fourteen shear walls, the majority of which are 1'-0" thick, with a few slightly larger at 1'-2". These shear walls are continuous from the foundation to the top of the building, and behave as fixed cantilevers. Lateral loads are transmitted to the shear walls through the floor diaphragm. Several shear walls located at the west stair tower contain three stories of HSS steel tubing to support an expanse of curtain wall. These frames are rigidly connected to the surrounding concrete shear walls; however, they provide little lateral force resistance as compared with the shear walls. See the figure below for an outline of a typical floor showing shear wall locations.



(FIGURE 16) Typical Floor Diaphragm & Shear Wall Layout

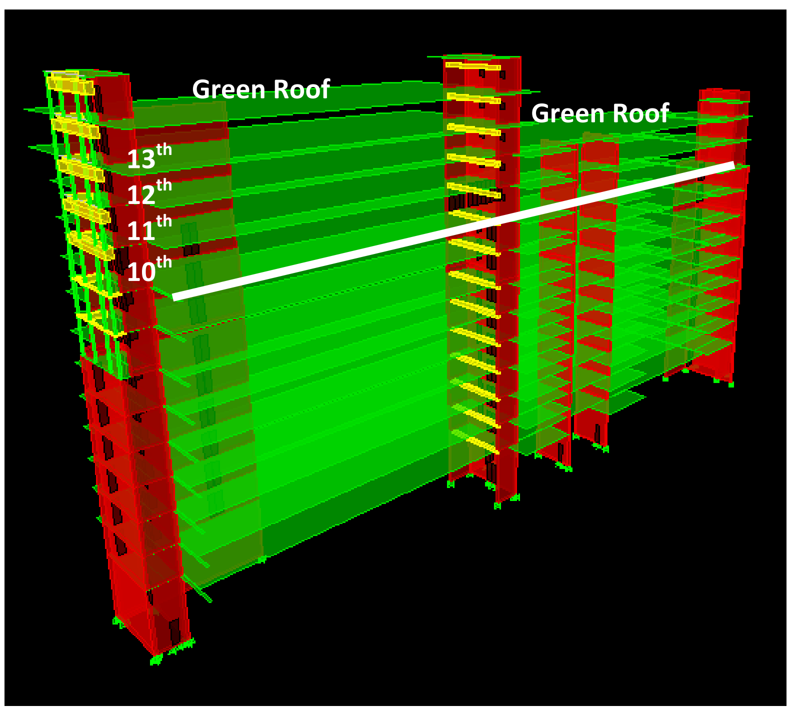
PROBLEM STATEMENT

Marriott Corporation is one of the leading lodging companies, operating and franchising over 3,000 lodging properties in the United States as well as 67 other countries and territories. The Residence Inn is just one of Marriott's fifteen brands of lodging facilities. Marriott has a variety of types of accommodations, including traditional hotels, the luxurious Ritz-Carlton® and JW Marriott® hotels, and a number of extended-stay business traveler options, including TownePlace Suites® and Marriott Executive Apartments®. While some of these accommodations that are exclusively designed for the extended-stay business traveler have in-room desks and workspace, none of these provides a separate residence and office space in the same building. Frequently, companies who relocate business professionals temporarily also acquire temporary office space. It can be difficult to find space that can be leased for short-term use. It is also very costly to set up these spaces, in terms of furnishing and getting technicians to set up phone and internet access. It is important to keep business professionals content while on the road, and it becomes necessary to invest in professional spaces in which they can meet with clients and be productive. Relative location between residence and office space is also important. Both time and money is saved when the professional does not have to travel significant distances to and from work.

Assuming Marriott pursued this concept of residence and office space in the same building, renting rooms for each on a day-to-day basis, the building would need to increase in size to maintain the desired residence space, while adding office space. Due to the nature of the confined site, the only way to do this is to expand vertically. The marketing department forecasts that the demand for office space is 25 percent of the residence space within the building.

Marriott Corporation is also currently active in the pursuit of "going green," and has proven so in a number of ways, including replacing the 24 million plastic key cards that it purchases annually in the U.S. with those made of 50 percent recycled material. This move alone will save 66 tons of plastic from entering landfills. Other ways include using purchasing pillows filled with a material made from recycled PET bottles, coreless toilet paper, and recycled paper products. Marriott's dedication to the planet can be reinforced by going one step further and incorporating green roof space on its hotels. Green roof spaces provide occupants with a natural place to get some fresh air and take in the magnificent views from soaring heights. Residents will feel more at home with a space that is almost like their own backyard.

To address the needs for vertical expansion and green space, the proposed Residence Inn & "Executive Suites" will feature four additional floors (above the white line shown in the 3-D view) and two separate green roof spaces, as illustrated in the figure below. Each of the additional floors shall have a floor-to-floor height of 10'-6", slightly higher than that of the guest room floors where a floor-to-floor height of 9'-4" was used. The proposed 13 story building will reach a new height of 158'-4". Although the zoning restriction for the original site mandates a maximum of 11 stories/160 feet, it is assumed that permission would be granted given that the 160 foot max height requirement is met. In order to avoid relocation of rooftop mechanical equipment, the first additional floor (10th floor) will be a dedicated outdoor mechanical level surrounded by an architectural louver system and accessible by hotel employees only. The 11th floor will maintain a similar footprint as the guestroom floors below, while the upper 12th and 13th floors will rise above the West half of the original building, creating adjacent green roof space directly accessible from the 12th floor.



(FIGURE 17) 3-D View of Proposed Additional Floors & Green Roofs

Since Marriott's network of lodging is so expansive and constantly growing, it would be beneficial to have a prototypical structure that could be used in a number of different locations throughout the United States. This would reduce the amount of re-engineering of similar buildings required. The current location of the Residence Inn by Marriott is downtown Norfolk, Virginia, where seismic activity is relatively low. In order to develop a prototype for the structural systems for more locations across the United States, the structure would need to be designed for additional seismic loads. Increased mapped spectral response acceleration parameters of 50% and 15% of gravity for the short and long period accelerations respectively and a more severe Seismic Design Category C shall be used as criteria for the design to ensure that the structure is capable of being located in the most locations. Wind pressures are already relatively high in this region, but it would be worthwhile to consider additional wind loading as well, although seismic loads may prove to be controlling with the proposed changes.

PROPOSED SOLUTION

STRUCTURAL DEPTH

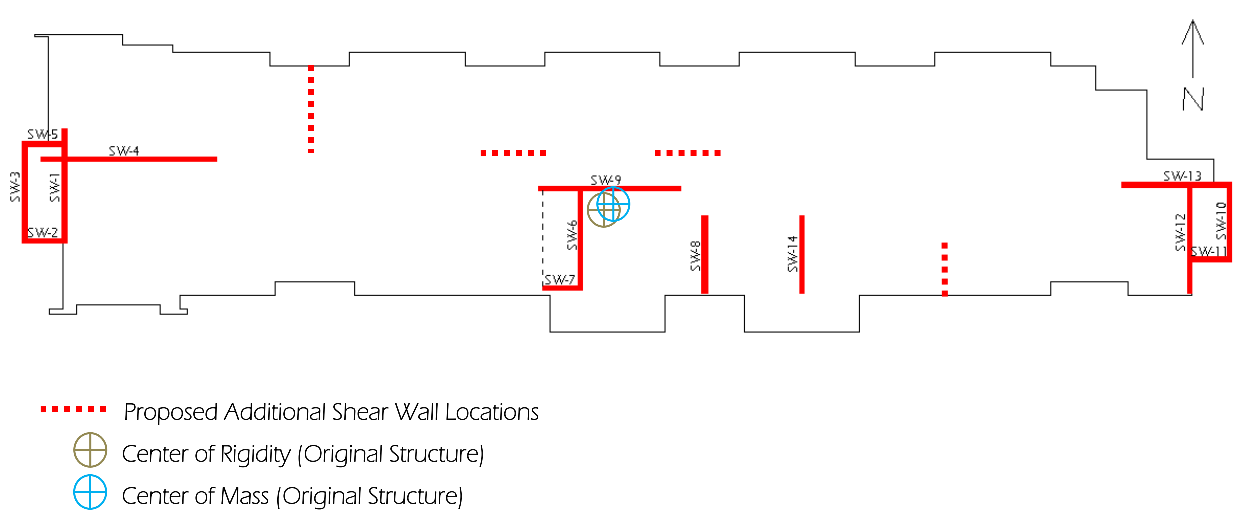
With the addition of four floors and increased seismic loading, both the existing gravity and lateral resisting systems will require analysis and re-design. The discontinuation of shear walls where the upper two floors project on the West side will create additional structural issues that will also need to be addressed, such as torsional and shear-related issues.

The basic layout of structural elements, such as column and core area locations that provide the necessary vertical transportation, shall remain as originally designed. Since it was determined that the flat plate floor system is one of the most economical choices for this type of building, the proposed solution will include the use of this, however, the original design will need to be checked for capacity with the additional loads required for office space (+10 psf for offices themselves; +40 psf for the corridors serving them; 2,000 lb concentrated load). By inspection of the results from analyzing this floor system for Technical Report 2, there appears to be adequate reserve capacity to accommodate the additional loads on these levels, although it is unclear at this stage whether or not the system would be adequate for the required concentrated design load. The floor system employed to support the green roofs will most likely be problematic, however, for the originally designed flat plate system. These loads can be in excess of 150 psf, depending on the design. As such, the need to investigate the applicability of the prototype under varying snow loading conditions is eliminated; however, it may be necessary to use a flat slab system with beams instead. The additional loads will also translate into increased axial forces on gravity columns.

Loads making their way to lower floors are anticipated to be significantly larger with the proposed structure due to the addition of four floors. The accumulation of loads will need to be assessed and all columns checked and re-designed as necessary. At the second floor, reinforced concrete transfer girders will also need to be designed for the increased load that will accumulate. All reinforced concrete structural elements shall be designed to meet the requirements set forth in ACI 318-08.

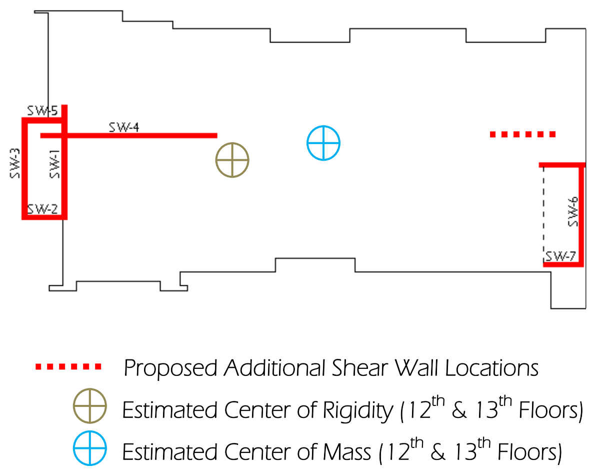
The original foundation design using friction piles will need to be assessed for adequate capacity. The prototype for the proposed design will only consider soil conditions in Norfolk, VA, given that they represent a worst case scenario. Shall the prototype be used in locations with more soil bearing capacity; the engineer may take advantage of a more economical foundation system.

An increase in the overall building weight obviously introduces additional seismic weight and consequently increased forces that will aggravate the already increased seismic loads as prescribed in the problem statement. In order to address this, first the originally designed shear walls will need to be analyzed for capacity to gage what is necessary in terms of additional lateral force resisting elements. It may be sufficient to increase the thickness of the existing shear walls; however depending on the results, may require additional shear walls. One design solution is illustrated below, where the dotted lines represent additional shear walls at all levels. These can be easily incorporated into the existing structure hidden at partition locations such that the guest room floors do not need to be re-designed architecturally. On the first floor, however, it is more difficult to locate these so as not to disturb the architecture. Some minor adjustments may need to be made to accommodate the proposed locations shown below. The location of the original design's center of mass and center of rigidity were considered as part of the proposed design to minimize the amount of induced torsion resulting in out-of-plane shear. The proposed shear walls in each direction shall be designed to have a relative rigidity of approximately one. They are strategically located in such a way that they do not influence relocation of the original center of rigidity, which would be undesirable because effects of torsion are already idealized as insignificant in the original designed. Other options will be considered as needed once the proposed solutions are evaluated.



(FIGURE 18) Proposed Design Solution for Lateral Force Resistance (Typical Floor)

The upper two floors present a challenge due to the fact that the estimated locations of centers of mass and rigidity do not coincide. Torsion could be an issue here and will need to be addressed once the severity of the issue is determined. One possible solution would be to introduce steel bracing at these levels to relocate the center of rigidity closer to the center of mass. The exact location of such braces is yet to be determined, and again will depend on the severity of the issue.



(FIGURE 19) Proposed Design Solution for Lateral Force Resistance (12th & 13th Floors)

SOLUTION METHODS & TOOLS

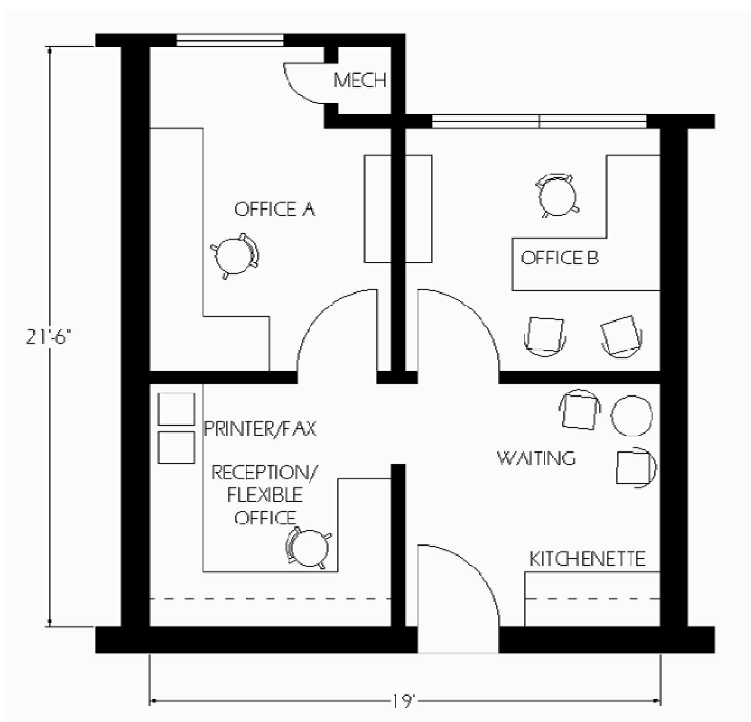
The two-way flat plate and flat slab design solutions shall be reached mainly by hand calculation following guidelines set forth by ACI 318-08 for these systems and using the Equivalent Frame Method. RAM Structural System shall be used to verify hand calculation results. Deflection criteria shall be met by using ACI 318-08, Chapter 9: Table 9.5 (c) Minimum Thickness of Slabs. The goal of this hand calculation exercise will be to demonstrate ability to incorporate all applicable codes and become more adept at navigating the code.

The lateral force resisting systems in general are anticipated to require significant altering and re-design as a result of the proposed changes. Computer modeling using ETABS and/or RAM Structural shall be used as an aid to reduce the amount of rigorous hand calculations that would otherwise be required to solve such a large and complex structure. Spot checks of the output by hand calculation will be continually used to verify that human input error has not skewed the results. A model similar to that created for Technical Report 3, which models lateral force resisting elements only connected by the floor diaphragms, will likely give valid results, as was proven in that report. Relative stiffness of each shear wall shall be determined by applying an arbitrary load to the center of mass and observing the percentage of direct shear taken by each. Lateral loads will be applied accordingly as specified for seismic in ASCE 7-05 using the Equivalent Lateral Force Procedure, and as specified in ASCE 7-05, Main Wind Force Resisting System, Method 2 for wind loads. The overall building computer model will mainly be used to determine the relative stiffness of each wall, check for torsion-related issues, and check for serviceability issues such as drift. Individual shear walls shall be sized and reinforced in accordance with ACI 318-08. PCA Wall will be used to aid in the design and analysis of these walls, again with spot checks to confirm the results.

BREADTH PROPOSALS

ARCHITECTURAL BREADTH

The introduction of a new concept in merging hotel and temporary office space, which will add four additional floors, lends itself naturally to a need to design these new spaces architecturally. Some preliminary design solutions, which inspired the idea originally, are shown below. The goal for these spaces is to create a place that professionals are able to "plug into," so to speak. Individual offices shall be designed to accommodate various types of professionals and be equipped with all the necessary furnishings, printers, fax machines, telephones, basic office supplies, and even a small kitchenette for preparing lunch and brewing coffee. The concept is based on the idea that the business traveler can come into town, get a good night's rest in his/her hotel room, travel a short distance down the hall and up the elevator to work, plug his/her laptop into the internet connection, and "voila!" he/she is ready to begin a productive day. Not only that, but he/she has a professional environment in which to meet with clients and, depending on the length of stay, can leave office work set up for the next day in a secure environment.



(FIGURE 20) Proposed Design Solution for Individual Office Space

The location of the new floors was chosen specifically such that office spaces take advantage of the surrounding magnificent views that can be enjoyed most during the waking hours of the day. The location also ensures sound isolation from the hotel rooms below, due to the mechanical level located between them. Mechanical equipment located on the existing roof just below the proposed 11th floor is not expected to create excessive sound issues for the offices above due to the fact that the original design does not incorporate additional soundproofing for the 9th floor below other than isolating the equipment to prevent vibration issues. One issue that will need to be resolved is to ensure that the proposed idea of an outdoor mechanical floor surrounded by architectural louvers receives adequate natural ventilation and fresh air for intakes and exhaust. The original design of the architectural atmosphere for the first floor lobbies and vertical transportation suit the needs for both spaces, with a professional, yet homey feel.

In the fast-paced business world today, it is important for many to separate their work life from personal life, and this seems like a logical way to do so. The proposed solution shall include floor plans, building elevations, building sections, as well as a 3-D Revit model of the interior spaces. While the hotel structure below will be part of these solutions to illustrate how the two interact, the focus of the deliverables will be on the new spaces.

In addition to the layout of spaces, exterior facades will need to be considered to fit with the existing architecture of the originally designed floors below. Since the original materials are diverse, with EIFS, architectural precast, glazed curtain wall, and a number of aluminum accent components, there are a number of ways to approach this. Once floor plans and opening locations are determined, exterior materials will be selected and exhibited on the modified elevations.

A significant aspect of the architectural design will also include two green roofs. The layout of these spaces is yet to be determined; however, the vision for these will be to create a park-like setting that fosters relaxation and is a quiet place for reflection while absorbing the vista that surrounds. The proposed design will include aspects that achieve this goal, while also being practical in terms of maintenance. A Revit model of these spaces will be used to portray the outcome of the design.

LIGHTING BREADTH

Since an important aspect of the re-design is separation of work and personal spaces, the new office space shall exhibit lighting characteristics that is both efficient and fosters productivity. As part of the design solution, the proposed research shall include consideration of natural daylight and a selection of fixture types for one of the typical offices, as well as either a conference room or corridor. Task lighting will be an important part of the design. In addition to providing a design that meets code requirements for a minimum number of footcandles, Luxicon will be used to portray the design in 3-D. The images below portray a similar vision in lighting design in which the proposed design shall model.

Cooler tones give the sense of office space as opposed to the warmer hues used to illuminate residential spaces. The proposed design shall also consider the use of Light Emitting Diode (LED) track lighting as one possible luminaire type, such that Marriott Corporation's dedication to the environment is extended in a different capacity. These lamps last much longer and use less energy than traditional lamp types.

(FIGURE 21) Inspiration for Proposed Lighting Design

TASKS & TIMETABLE

ARCHITECTURE & CODE ANALYSIS

1) Task 1: Architectural design of new floors
2) Task 2: Code analysis – egress
   - (i) IBC 2006
     1. Dead end corridor limitations
     2. Width of corridors
     3. Verify existing emergency stairwells adequately sized for egress
     4. Egress lighting requirements for lighting breadth
3) Task 3: Code Analysis – Loads
   - (i) IBC 2006 – Occupancy
   - (ii) ASCE 7-05
     1. Chapter 4
        a. Design live loads in new office space & green roof
        b. Permissible live load reductions
     2. Chapter 3 - Additional dead loads due to green roof
4) Task 4: Investigate architectural impact of mechanical level
   - (i) Intake/exhaust issues – check with mechanical faculty/research online
   - (ii) Material selection for surround
   - (iii) Sketch elevations
5) Task 5: Green roof design
   - (i) Study existing designs for ideas & estimation of dead loads
   - (ii) Consider plant compatibility with climate
   - (iii) Sketch ideas
   - (iv) Draft plans
6) Task 6: Architectural modifications
   - (i) Consider impact of shear wall design; change plans as necessary
7) Task 7: Build Revit model of interior spaces & green roof
   - (i) Consider schematic lighting design simultaneously
8) Task 8: Lighting breadth
   - (i) Choose luminaires
   - (ii) Design layout of luminaires based on IES guidelines
   - (iii) Use Luxicon software for trial designs until satisfied with design
9) Task 9: Polish architectural plans/elevations/sections
   - (i) Color code/label areas of interest
   - (ii) Adobe Photoshop views from site with photos available

GRAVITY LOAD SYSTEMS

1) Task 10: Flat plate design check
   - (i) Hand calculations using ACI 318-08: Equivalent Frame Method
   - (ii) Verify slab design meets deflection criteria per Chapter 9: Table 9.5 (c)

(iii) Verify hand calculations using RAM Structural model

2) Task 11: Accumulation of gravity loads
   (i) Excel spreadsheets to track loads based on tributary areas
   (ii) Determine loads on transfer girders at 2nd floor
3) Task 12: Check slab design using PCA Slab
4) Task 13: Build gravity elements in RAM Structural model
   (i) Investigate power of RAM Structural to perform design of columns
   (ii) Verify hand calculations based on output for slab
5) Task 14: Gravity column re-design
   (i) Choose varying locations to check by hand calculation in accordance with ACI 318-08
6) Task 15: Transfer girder re-design
   (i) Design all transfer girders at second floor to carry new loads
   (ii) Check columns below after sizes of transfer girders determined

LATERAL LOAD SYSTEMS

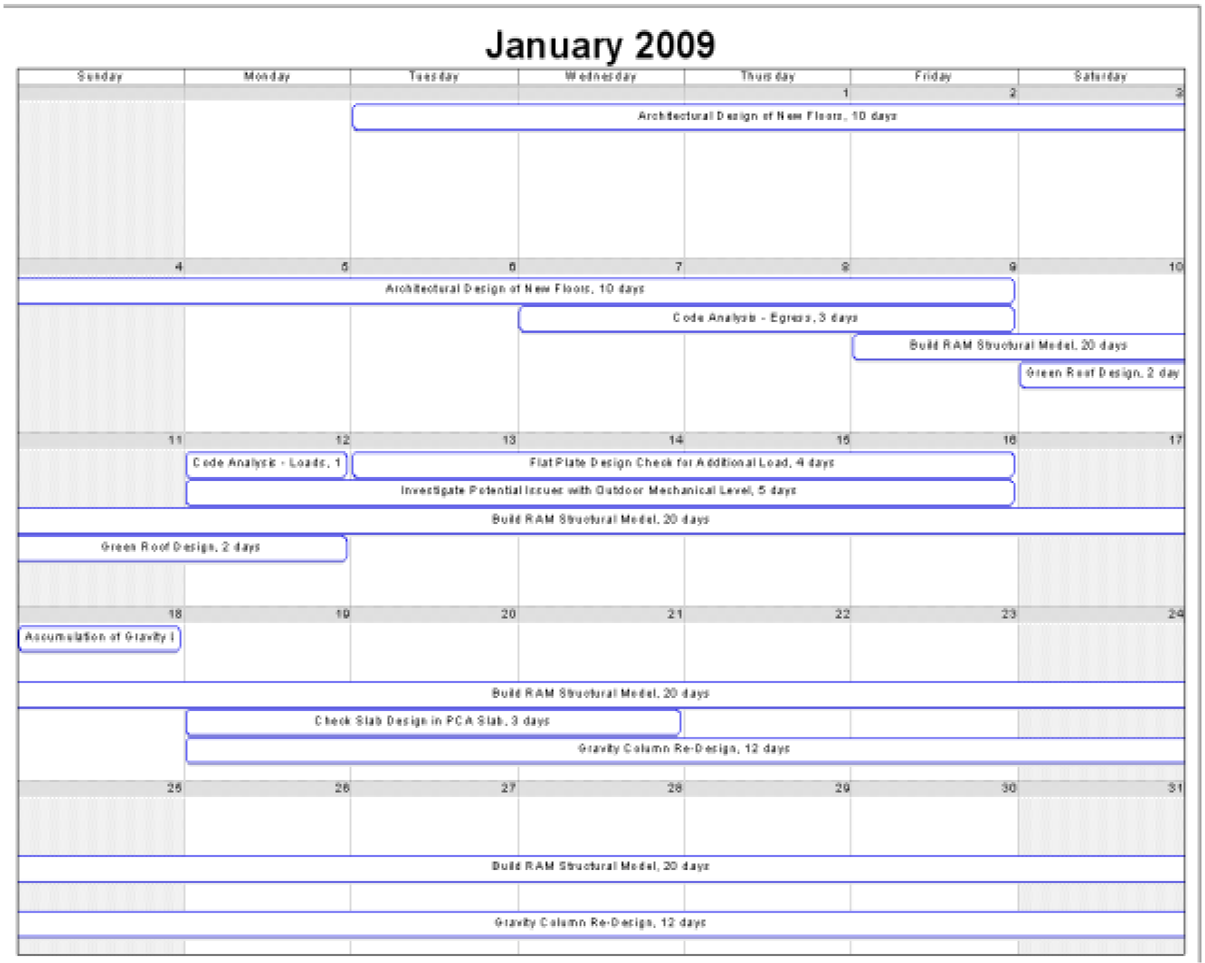
1) Task 16: Seismic load determination
2) Task 17: Wind load determination
3) Task 18: Apply lateral loads to RAM Structural model & investigate
4) Task 19: Shear wall re-design
   (i) Check for excessive shear and/or deflections
5) Task 20: Analyze/organize computer model output
6) Task 21: Perform relative stiffness/deflection hand calculations of shear walls

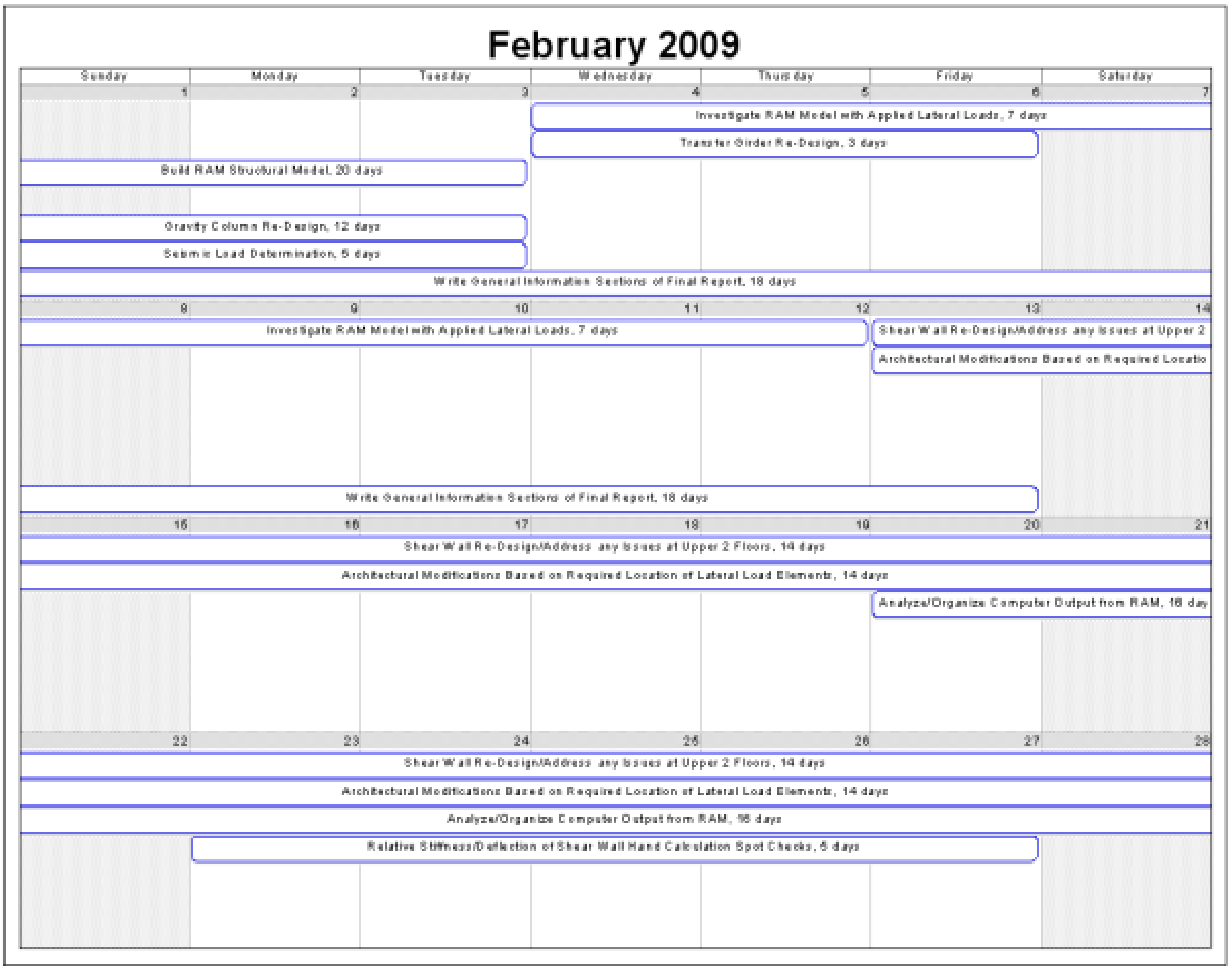
GENERAL CONCLUDING TASKS

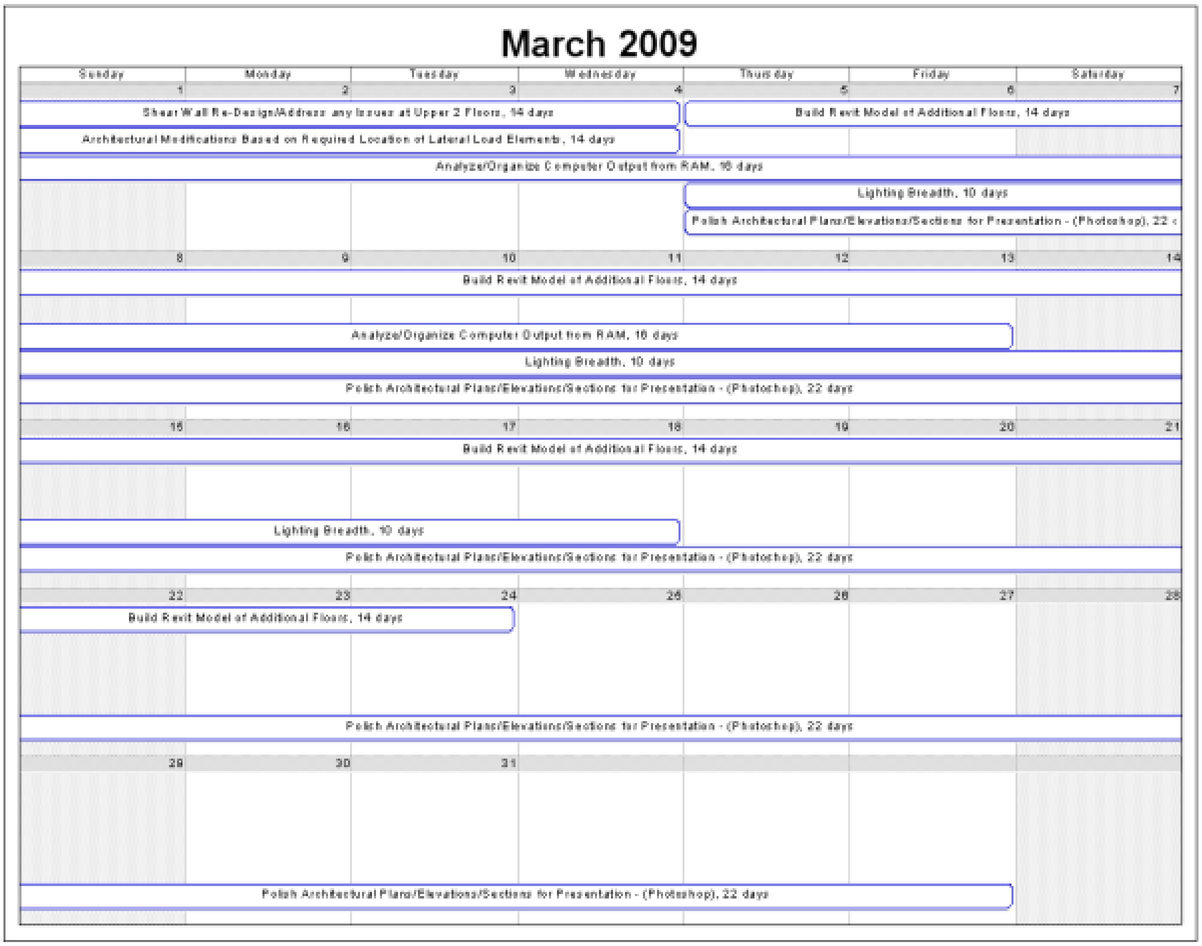
1) Task 22: Develop conclusions from research
   (i) Observe & document what was learned from the design in terms of location of lateral elements, sequencing of design
   (ii) Summarize and map out areas where prototype is applicable
   (iii) Create thorough list of criteria for using prototype
   (iv) Create figures illustrating outcome & verifying new design is adequate
      a. AutoCAD, RAM Structural model views, spreadsheets
2) Task 23: Write final report
3) Task 24: Create PowerPoint presentation
4) Task 25: Rehearse presentation
5) Task 26: Present project to faculty jury

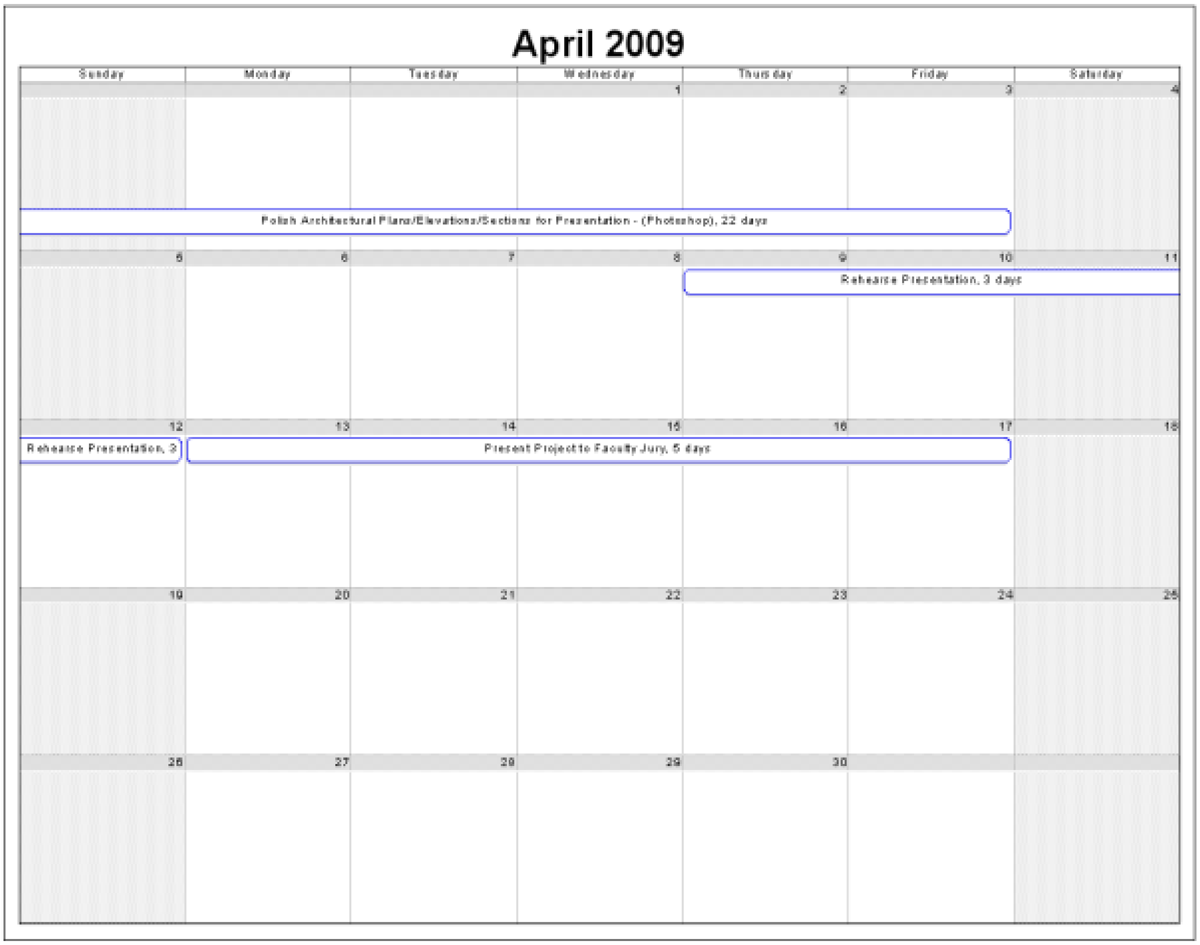
December 2008

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			
		Architectural Design of New Floors, 10 days				


January 2009
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Architectural Design of New Floors, 10 days
Code Analysis - Egress, 3 days
Build RAM Structural Model, 20 days
Green Roof Design, 2 day
Code Analysis - Loads, 1
Flat Plate Design Check for Additional Load, 4 days
Investigate Potential Issues with Outdoor Mechanical Level, 5 days
Green Roof Design, 2 days
Accumulation of Gravity l
Check Slab Design in PCA Slab, 3 days
Gravity Column Re-Design, 12 days


February 2009
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Investigate RAM Model with Applied Lateral Loads, 7 days
Transfer Girder Re-Design, 3 days
Build RAM Structural Model, 20 days
Gravity Column Re-Design, 12 days
Seismic Load Determination, 5 days
Write General Information Sections of Final Report, 18 days
Shear Wall Re-Design/Address any Issues at Upper 2 Floors, 14 days
Architectural Modifications Based on Required Location of Lateral Load Elements, 14 days
Analyze/Organize Computer Output from RAM, 16 days
Relative Stiffness/Deflection of Shear Wall Hand Calculation Spot Checks, 5 days


March 2009
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Shear Wall Re-Design/Address any Issues at Upper 2 Floors, 14 days
Build Revit Model of Additional Floors, 14 days
Architectural Modifications Based on Required Location of Lateral Load Elements, 14 days
Analyze/Organize Computer Output from RAM, 16 days
Lighting Breadth, 10 days
Polish Architectural Plans/Elevations/Sections for Presentation - (Photoshop), 22 days



(FIGURE 22) Timetable for Scheduled Tasks