GOUVERNEUR HEALTHCARE SERVICES

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TECHNICAL ASSIGNMENT III

ALEX D DESPOTOVICH | CONSTRUCTION MANAGEMENT

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EXECUTIVE SUMMARY

The purpose of Technical Report III is to analyze various aspects of construction to the Gouverneur Healthcare Services facility, including constructability issues, schedule acceleration scenarios, value engineering topics, and critical industry issues. These studies, in addition to information that was gathered during the 2011 Partnership for Achieving Construction Excellence Roundtable conference, will assist in identifying areas of the project that have the potential to serve as good areas of research for future thesis studies.

The Gouverneur Healthcare Services facility is undergoing a major modernization that includes a complete renovation of the existing thirteen story building, existing mechanical infrastructure upgrades, and addition to the existing facility. The facility will remain active during the six phases of construction, which causes many constructability issues for the project team including the life safety of the active facility, site logistics and schedule phasing, and the modernization of the existing MEP infrastructure. All of the challenges the project team faces revolve on the issue that the facility will remain open 24 hours a day, 365 days a year.

A further analysis of the projects highly complex, phased schedule served as a better understanding for understanding the critical path of the schedule. Turnover of the new building to the owner is a critical date that delays the demolition and renovation construction to the existing floors. Also, the current schedule indicates that there is the potential to accelerate the schedule by six months by re-phasing turnover of floors to construction at an earlier date

During the preconstruction and design phase for the Gouverneur Healthcare Services facility, two of the major value engineering studies that were performed involved the structural support system for the new building podium and tower and the possibility of incorporating a green garden roof to the new sixth floor roof.

After furthering an understanding for the constructability issues, schedule acceleration scenarios, value engineering topics, and critical industry issues that affect the Gouverneur Healthcare Services project, four technical analysis topics were determined for further studies and include the following: Analysis #1: Building Information Modeling, Analysis #2: Schedule Acceleration, Analysis #3: Site Logistics and Schedule Phasing, and Analysis #4: Sustainable Design and Construction.

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CONSTRUCTABILITY ISSUES

The Gouverneur Healthcare Services project poses many challenges to the construction management team during new construction, demolition and renovation, and modernization of the existing MEP infrastructure. Throughout the duration of construction, the existing facility will remain active which poses many issues related to constructability that the team would have to overcome. Many of the challenges that arise are due to the relationship between the facility remaining active, site logistics, and schedule phasing. The top three unique and challenging constructability issues on the project include the following:

1. Life Safety of Active Facility
2. Site Logistics and Schedule Phasing
3. Modernization of the Existing MEP Infrastructure

The information collected on the constructability issues for the project was made available by James Palace, Project Executive of Hunter Roberts Construction Group and Michael Creighton, Senior Project Manager of Hunter Roberts Construction Group.

LIFE SAFETY OF ACTIVE FACILITY

The most challenging constructability issue with the Gouverneur Healthcare Services project revolves around the fact that the facility will remain open 24 hours a day, 365 days a year for staff, patients, and visitors. Every decision that is made between the owner and construction management team during construction considers the occupants of the building and how it could potentially affect them. Considering the occupants of the building and maintaining the life safety components of the building is the biggest challenge that the project team will face throughout the duration of construction.

In particular, one of the biggest constructability issues the team faces occurs during the demolition of the existing conditions. Asbestos was applied through various methods of construction including flooring, window and door caulking, block tar coating, pipe insulation, mechanical equipment and materials, and electrical components. The abatement process for this project lasts almost the full duration of the project schedule. Every floor of the existing building will undergo an asbestos removal program created by the construction management team. Because the building remains occupied during construction, there are very strict codes and

regulations that the construction team must abide by, in addition to standard methods of asbestos removal. The project team works closely with the New York City and State Department of Environmental Protection and Department of Health to meet the requirements necessary during this process. The project team works with the owner in filing notices of asbestos removal throughout the facility and nearby community to keep them informed of the material being removed from the jobsite. In the process of removal, all areas where abatement occurs must be completely isolated and negatively pressurized, which can be seen in Diagram 1. All contaminated materials will be specially bagged and removed from the building. Also, a plan is put enforced to assist in meeting clean air regulations to prevent untreated air from entering a non-construction zone in the facility. Maintaining all of these requirements for the entire duration of the demolition and renovation process poses a huge construability challenge for the project team because the process occurs at individual time on thirteen floors.

Diagram 1: Isolation of 13th Floor Abatement

SITE LOGISTICS AND SCHEDULE PHASING

One of the biggest challenges that most New York City construction projects face is related to site logistics. The Gouverneur Healthcare Services project particularly faces challenges related to site logistics and its relationship to the phasing of the schedule. The phasing of the schedule resulted in many challenges the project team would have to face in terms of site logistics and material handling. During the first major phase of construction, the new building location served as construction access for all deliveries for materials. The team worked closely with the New York City Department of Transportation and the Department of Design and Construction during new building construction in coordinating temporary vehicular and pedestrian lane closures. This coordination allowed for an efficient method of receiving material deliveries, erecting the structural steel and curtain wall systems, installing superstructure concrete, and installation of

new sidewalks and curbs. However, the problem occurs upon the turnover of the new building to the owner. Nearly all exterior construction site access is turned over to the owner and site logistics for the site moves to the inside of the building. The transition of phases and the challenges of site logistics can be seen in Diagram 2 and 3; with orange representing site access to construction. The problem with interior site logistics is there simply is not enough space inside the building. Floors are turned over one at a time to the construction team so the only available material storage locations are on the floor of construction.

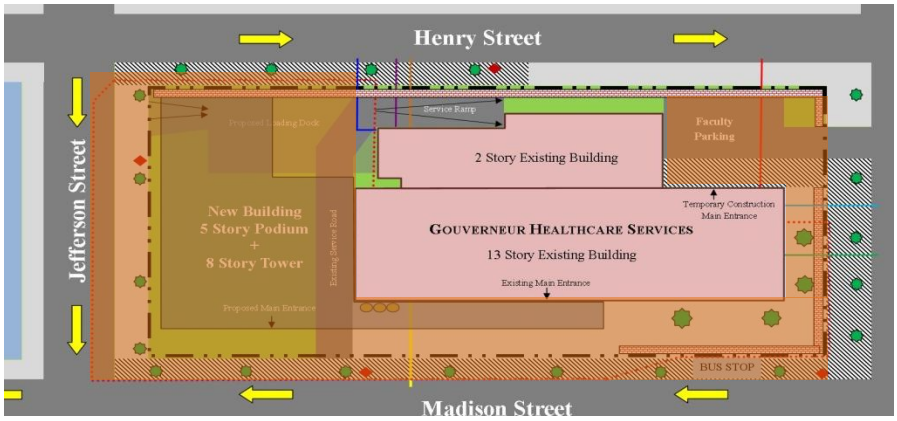


Diagram 2: New Construction Site Access

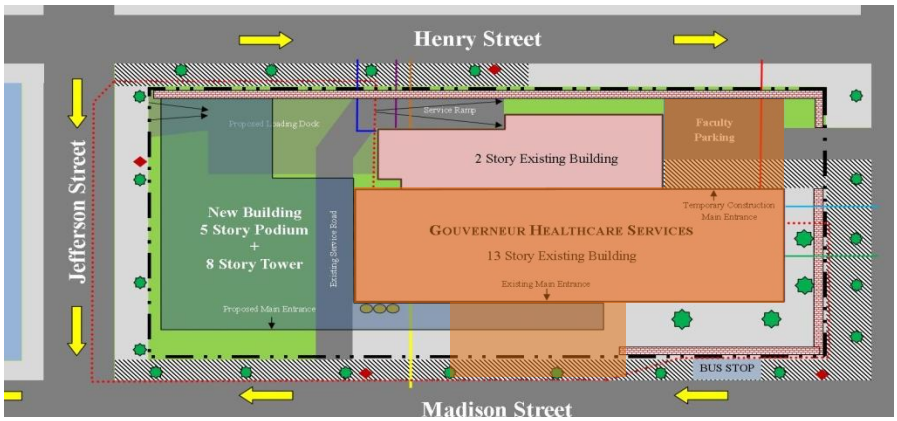


Diagram 3: Existing Construction Site Access

Because of this, deliveries of material are strategically planned to create as little site congestion as possible. Subcontractors are required to store materials off site in a warehouse and deliver materials as needed on the job. The lack of space becomes a problem in terms of providing construction "trailers" for the contractors and subcontractors. To prevent moving trailer space from floor to floor throughout the building, the owner agreed to give up the existing parking lot to allow for placement on construction trailers. Additionally, providing temporary utilities to the construction workers becomes a challenge as well due to the lack of space.

Transportation of material and construction workers also serves as a challenge for the project team. During the demolition and renovation phases of construction the project team needs to rely on the facilities loading dock for deliveries, which can conflict with other facility deliveries. To transport material and workers to their floor of construction, the project team uses a facility elevator that has been designated as a construction elevator. The elevator limits the size of

material that can be delivered to the floors, as well as quantity of workers it can transport at a time. This elevator is typically responsible for transporting about 200 workers a day to the floors they are working on. This elevator also serves as a means for transporting construction waste from the floors of construction to the basement for disposal.

MODERNIZATION OF THE EXISTING MEP INFRASTRUCTURE

As with many healthcare facilities, the Gouverneur Healthcare Services project team faces many unique challenges involving the MEP infrastructure that supports the building. Particularly with the Gouverneur Healthcare Services facility, a challenging part of the scope of work involves the modernization of the existing MEP infrastructure. Being that the facility will remain active from start to finish of construction, the project team faces many challenges not only in design, but also during construction. The facility must remain active in all aspects and the team works very closely with the owner to minimize disruption to the facility during the entire modernization process. Another challenge the team faces within this scope of work includes tying in the renovated MEP infrastructure to the new MEP infrastructure that supports the building.

In the design process of modernizing the existing MEP infrastructure, one of the challenges the design consultants and construction management team was faced with was the logistics of how the major equipment would be installed, commissioned, and turned over to the owner. The original design was planned to install the new equipment in the same location as the existing equipment that was being replaced. Had the facility not been occupied during construction, the original design would have worked well. Since the facility remains active during construction, the new equipment needed to be installed and functional before the existing systems are turned off line and removed. The logistics of the penthouse became a unique challenge in determining what systems need to be in place to support the facility before the existing equipment can be turned off and removed. This was particularly challenging because, although the major pieces of equipment were being replaced, the new equipment would be tied into existing system components such as duct risers or long runs of piping in some parts of the design. It was essential that if systems were offline that there were temporary services set up to support to the facility so they can proceed with normal operations.

Referring back to the first constructability issue, any decision that is made during modernization may directly affect life safety systems that support the building. To prevent disruptions to the staff and patients of the active facility, all shut downs that are required during construction must be coordinated with the owner to prevent disruption. Overall, it is most challenging to install the new MEP equipment mostly because of the fact that the facility will remain active during the process.

SCHEDULE ACCELERATION SCENARIOS

From architectural design and preconstruction services to final project substantial completion the Gouverneur Healthcare Services facility will serve as a four year project. Throughout the entire project, the healthcare facility will remain fully operational for staff and patients. To prevent disruption to the staff and patients of the facility, the construction management team and owner have worked closely in phasing the schedule into six major phases. Please refer to Figure 1 and Figure 2 to establish the difference between the new and existing building. Additionally, please note for the new building, the podium is considered floors 1-6 and the tower is considered floors 7-13. These titles will be referenced throughout this section of the report.

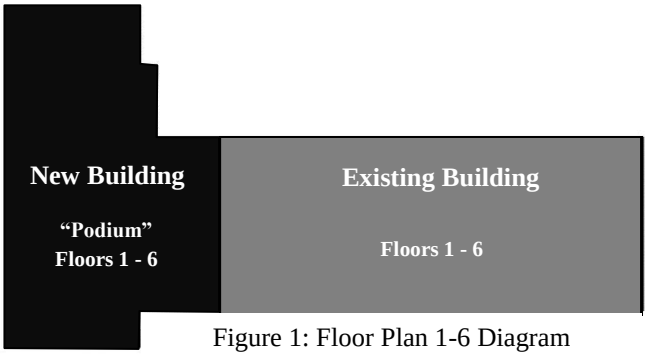


Figure 1: Floor Plan 1-6 Diagram

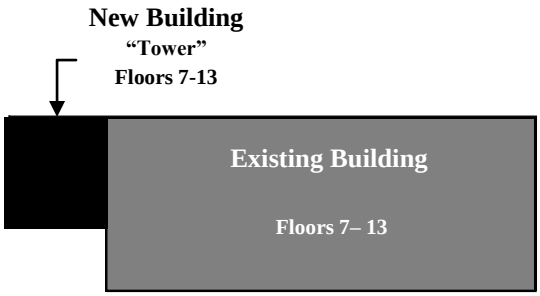


Figure 2: Floor Plan 7-13 Diagram

The information collected on the schedule acceleration scenarios for the project was made available by James Palace, Project Executive of Hunter Roberts Construction Group and Michael Creighton, Senior Project Manager of Hunter Roberts Construction Group.

CRITICAL PATH AND ACCELERATION SCENARIOS

Defining the critical path of the project is quite difficult because of the phasing and type of construction that is occurring on the project. The schedule is broken down into two major types of construction including new building construction and existing conditions demolition and renovation. Each scope of work has its own critical path that is crucial to achieving the overall project completion date. Also, each critical path directly affects each other due to the set up for schedule phasing for the project. The phasing for the project was strategically planned in order to accommodate the owner's needs in maintaining a specific number bed count and to disruption to functionality of the active facility.

The first major turnover to the owner includes completion of the new podium and tower, as well as completion of the demolition and renovation of the thirteenth floor. Within this part of the schedule lies a critical path that ultimately affects the duration of the entire job. One of the biggest risks to the schedule lies within the first major phase. Upon completion of this phase, the owner can transfer faculty and patients into the new building and begin the turnover process of existing floors to the construction team to begin demolition and renovation. Any delays that occur within the first phase directly affect when demolition and renovation can start on the existing floors. Please refer to Diagram 4 for a better understanding of the critical path for new construction and how it can cause delays in existing construction.

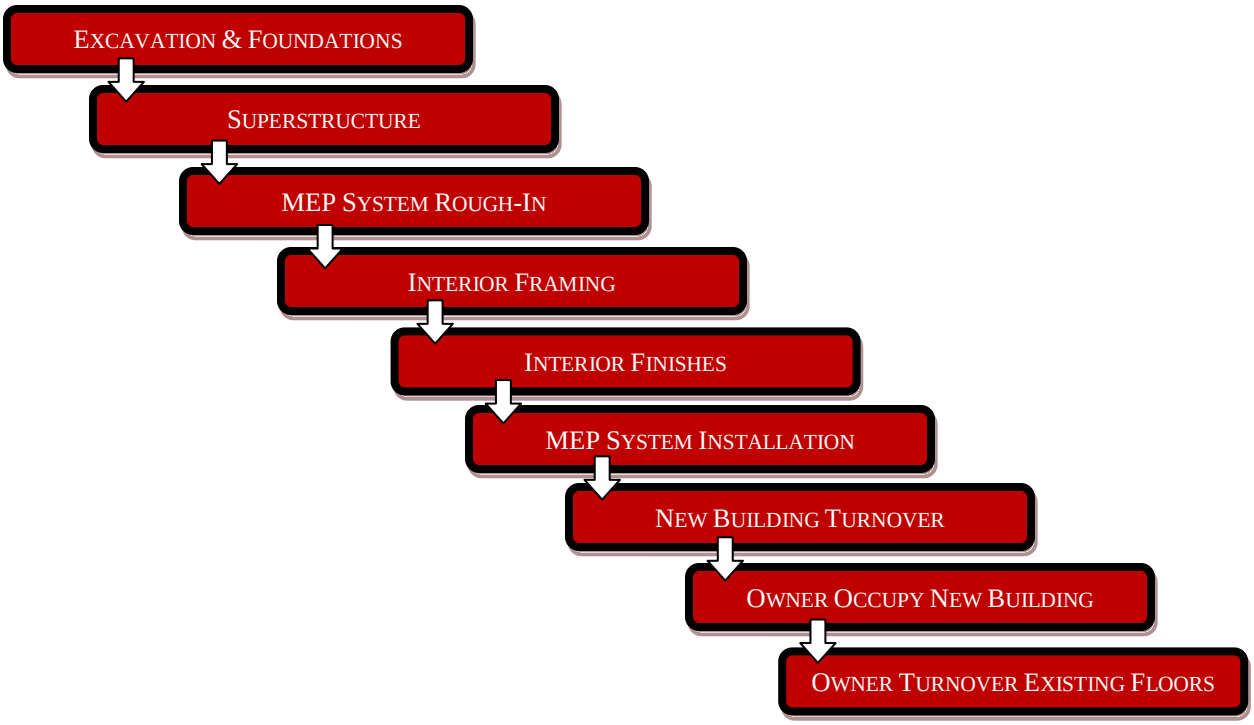


Diagram 4: New Building Construction Critical Path

In order to accelerate the schedule for new building construction and maintain the scheduled turnover dates, Hunter Robert Construction Group enforced an overtime schedule to prevent work delays. Because of unforeseen condition delays in the schedule during the first major phase, the overtime plan that was put in place was enforced for four months preceding turnover which allowed contractors and subcontractors to work an extra three to four hours a day during the work, as well as Saturdays. This was deemed an effective approach to achieving the scheduled turnover date because of how much a delay would impact the overall project schedule.

Although the overtime plan cost the owner more money at the time, it ultimately saved money by preventing major delays in the schedule.

The following phases of the schedule involve the owner turning over existing floors to the construction team to proceed with demolition and renovation. The schedule is phased so that certain floors are turned over to construction at certain times to help the owner maintain a required number of beds and adjust their census accordingly by transferring patients to nearby facilities if necessary. Please refer to Diagram 5 for a better understanding of the critical path for existing building construction. The diagram shows the critical path for each floor because it is very difficult to define the ultimate critical path for existing building construction because of the complexity of phasing for the schedule.

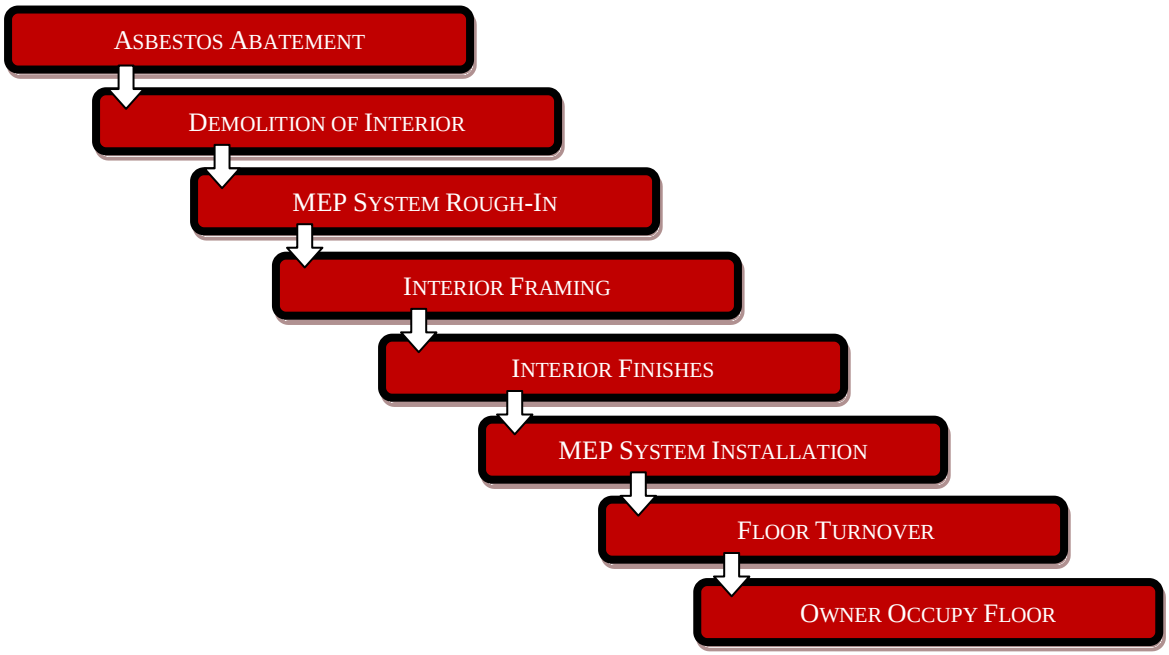


Diagram 5: Existing Building Construction Critical Path

One of the biggest potentials for schedule acceleration occurs in the existing building construction aspect of the schedule. As previously mentioned, the schedule greatly depends on when the owner is able to turnover floors to the construction team to begin demolition and renovation. An area of acceleration, which can possibly serve as a technical analysis area, occurs with the turnover dates from the owner of floors 1, 9, 10, and 11. Referring to Diagram 6, there is a large schedule gap between the start of construction between the fourth floor and ninth floor.

Previous owner turnovers in the schedule typically occur less than a month apart from each other but there is a six month gap between the fourth and ninth floor. A further analysis of the reasoning and possibility of schedule analysis will be studied to see the potential of saving six months off the total project schedule. This acceleration scenario has the potential to save the owner an estimated $1.8 million in construction management general condition costs alone.

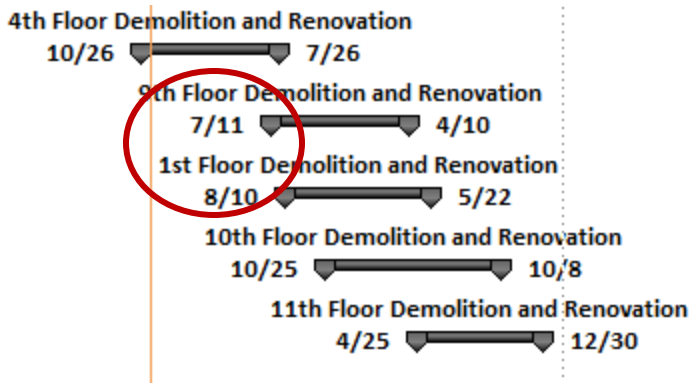


Diagram 6: Schedule Acceleration Scenario

A summary schedule can be seen in Appendix A for a better understanding of the turnover sequence and schedule relationships that have been strategically developed by the owner and construction manager.

VALUE ENGINEERING TOPICS

During the preconstruction and design phase for the Gouverneur Healthcare Services facility, two of the major value engineering studies that were performed involved the structural support system for the new building podium and tower and the possibility of incorporating a green garden roof to the new sixth floor roof. The information collected on the value engineering topics for the project was made available by James Palace, Project Executive of Hunter Roberts Construction Group and Michael Creighton, Senior Project Manager of Hunter Roberts Construction Group.

STRUCTURAL ANALYSIS

The value engineering study of the structural support system for the new building included a comparison of using a concrete structural system or a structural steel system. The cost, schedule impacts, constructability, and functionality of both systems were considered in order to benefit both the owner and the construction team. The study eliminated the possibility of a concrete structure design but sparked another major analysis. The major analysis within this value engineering study included a comparison between the types of steel members that would be used in the design. It was determined that an integrated castellated and wide flange beam design would most benefit the construction team and owner in the four categories previously mentioned. Diagram 7 and Diagram 8 show the castellated beam system that was used for the Gouverneur Healthcare Services project.

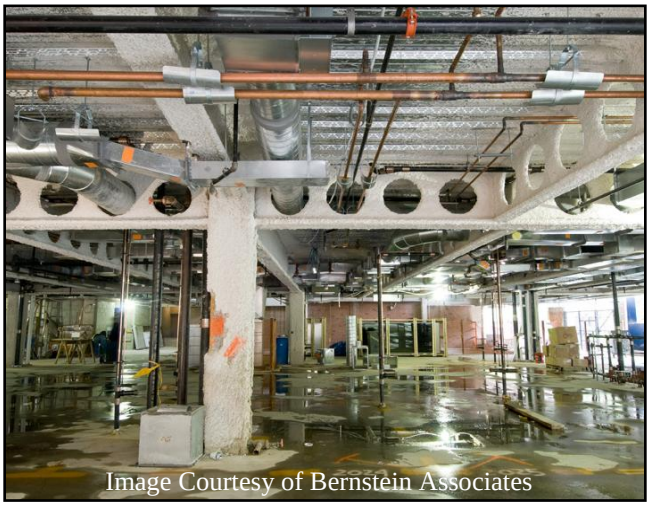


Diagram 7: Castellated Beam Design

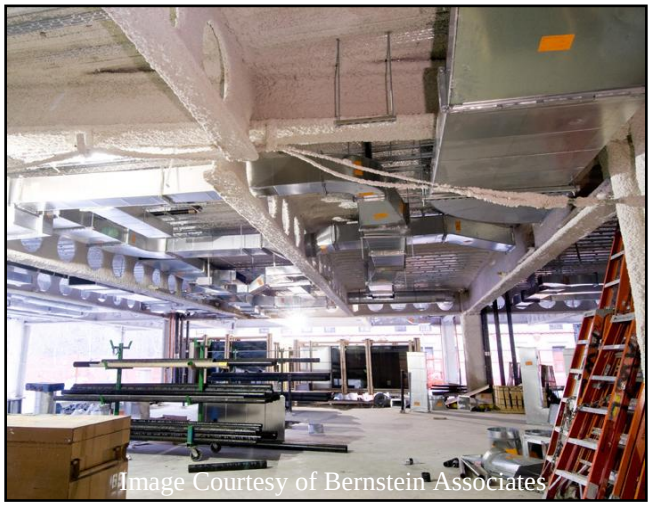


Diagram 8: Castellated Beam Design

The integrated castellated and wide flange beam design would benefit the project in many aspects including the following:

- Cost savings to the owner by incorporating castellated beams in the design
- Schedule savings to the construction management team and owner compared to a concrete structural system
- Maximum allowable heights achievable between floors with equal floor elevations between the new and existing buildings structure as depicted in Diagram 9

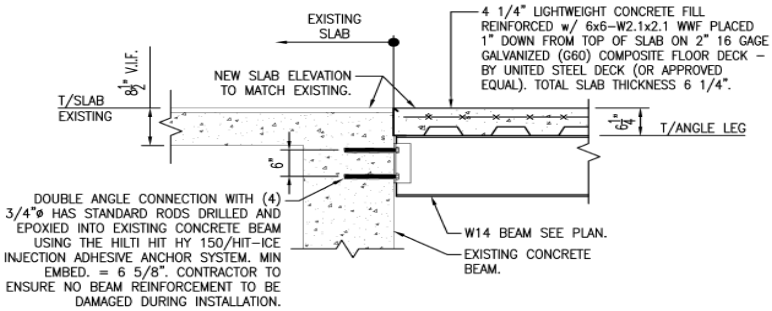


Diagram 9: Slab Elevations

- Flexible design with relations to the high volume of MEP equipment and material that will be installed overhead as previously seen in Diagram 7 and Diagram 8

GREEN ROOF ANALYSIS

The second value engineering topic, which served more as an alternate to the design by the architect, was the possibility of including a green roof in the design. Although the Gouverneur Healthcare Services facility is not putting forth efforts to acquire a LEED rating, the architect designed an alternate sixth floor roof for the new building that featured a roof garden for the use of patients of the hospital that will house multiple benches and a variety of vines, shrubs, and perennial herbs as seen in Diagram 10 and Diagram 11.

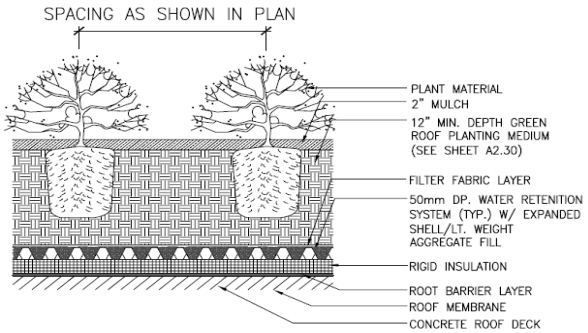


Diagram 10: Shrub Planting Detail

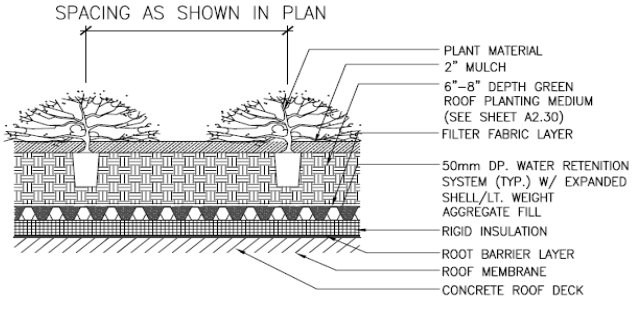


Diagram 11: Ground-Cover Planting Detail

The green roof garden was presented to the owner as an alternate to the design but was not implemented due to the assumed costs involved in the design, construction, and maintenance. Also, since the owner and construction team are not putting forth efforts to achieving a LEED certification, sustainability was not an area where much cost would be put forth, aside from energy efficient mechanical equipment in the process of modernizing the MEP infrastructure. However, a full analysis of the green roof was not performed to understand the ultimate benefits of incorporating it in the design. There is potential for both a construction depth and out of option breadth in performing a study pertaining to sustainable design and construction including studying the cost of the green roof in terms of material and maintenance, the payback period of the system, and how it may affect other building systems such as the plumbing, electrical, or structural system.

CRITICAL INDUSTRY ISSUES

Attending the 20th Annual Partnership for Achieving Construction Excellence Roundtable on November 9, 2011 provided one with a great opportunity to become familiarized with some of the unique challenges and issues the construction industry is currently facing. The day was organized such that students would attend two break-out sessions in the morning that focused on critical topics of the construction industry. In the afternoon, students had the opportunity to participate in two panel board discussions between industry professionals and students, as well as a focus group meeting to elaborate on possible thesis research topics for the students.

The break-out sessions were divided into three main categories discussing the topic of energy and sustainability, integrated project delivery methods, and building information modeling methods. The first breakout session consisted of the following topics:

1. Energy Management Services
2. Assembling/Procuring an Integrated Team
3. BIM Services for the Owner- The Role of the Design and Construction Professional

The second breakout session consisted of the following topics:

1. Learning Systems for Training a Sustainable Workforce
2. Integrated Decisions for High Performance Retrofit Projects
3. Strategies and Opportunities for Taking BIM into the Field

The two sessions that were attended and deemed most related to the Gouverneur Healthcare Service project conditions and methods of design and construction include BIM Services for the Owner - The Role of the Design and Construction Professional and Integrated Decisions for High Performance Retrofit Projects.

BIM SERVICES FOR THE OWNER - THE ROLE OF THE DESIGN AND CONSTRUCTION PROFESSIONAL

The purpose of the BIM Service for the Owner break-out session was to discuss the variety of means and methods for applying BIM to a project and how the owner may benefit from a construction team applying these methods. This session was particularly beneficial because the perspective of BIM to the construction management industry professionals, as well as owner

representatives who attended was considered and discussed in terms of the benefits, challenges, and concerns of using BIM methods through design, construction, and operations.

From an owner's perspective on BIM services, the interest level is rapidly increasing by owners but it was concluded that many owners are still confused on what BIM actually is and how they can benefit from it. Feedback from both the owner and construction manager concluded that, ultimately, owners want to know where they can benefit from BIM services not only during design and construction, but where they can use it during facilities management and operations in order to maximize its long term value. The concerns that arose during the facilities management discussion on BIM is whether the owner even has the tools and technology to effectively use BIM services as a method of facilities management. Also, many owners question taking the risk the use BIM when current means and methods of facilities management has worked for them in the past. During construction, owners seem to favor using BIM methods to assist in reducing change orders and mitigating delays. However, construction managers argue that BIM would serve more as a method of managing change orders and reducing their impact, rather than reducing the quantity because many change orders arise at the decision of the owner.

From the design and construction professional's perspective on Building Information Modeling services, many agree that BIM will become the "standard of care" but are concerned when. Industry professionals concluded that there is a big gap in getting the BIM information produced from office to field personnel of contractors and subcontractors. Upon questioning how many construction management firms in the room are currently selling BIM methods to owners, only two industry professionals raised their hands. It became apparent that because owners still aren't sure what they want at the end of the day in terms of BIM, many firms aren't sure what to sell to the owner and aren't willing to take such a big risk doing so. Many senior people on both the owner and construction side of the industry are resistant to new technology and have a difficult time making such a commitment to BIM. Additionally, design firms face big risks and liabilities in order to make the changes and fully commit to BIM in terms of software and personnel necessary to implement these strategies.

The owner for the Gouverneur Healthcare Services project, New York City Health and Hospitals Corporation, faces many of the challenges discussed in this break-out session. When this project was bid by the construction management team in 2007, the BIM approach to design, construction, and operations was just being introduced to the industry. As a result, BIM methods

were not and will not be applied throughout life of a project. A possible technical analysis that could be performed as a result of attending this break-out session involves understanding why the owner, design consultants, and construction management team did not implement BIM methods and how all parties could have benefitted had they incorporated these methods. Another possible technical analysis that could be performed includes understanding how BIM methods can be used to increase productivity and efficiency in the field during construction by decreasing the gap in technology between the office and the field. A main contact for more information relating to BIM and the Gouverneur Healthcare Services project is Sonali Kumar, a graduate student of The Pennsylvania State University, who particularly studies the use of BIM methods on healthcare projects. Additional contacts include Dr. Robert Leicht and Dr. John Messner, both faculty of the Department of Architectural Engineering.

INTEGRATED DECISIONS FOR HIGH PERFORMANCE RETROFIT PROJECTS

The purpose of the Integrated Decisions for High Performance Retrofit Projects break-out session was the discuss the challenges involved in decision making for retrofit project and different strategies that can be used to effectively make decisions on such a project. This project was particularly beneficial to attend because a major scope of work for the Gouverneur Healthcare Services project includes thirteen stories of demolition and renovation, as well as a complete modernization of the existing MEP infrastructure.

When an owner determines the need to retrofit an existing building, there are many steps the design and construction team must take to effectively make decisions considering the cost and schedule requirements of the owner. First and most importantly, it is critical to involve all parties at an early stage of planning and design development. All parties involved with the job must be included in the initial meeting that concludes the overall achievements projected for the design, define the scope of work for all systems, and then proceeding with design. For example, if an initial conversation determined that the architectural glazing will feature low-emissivity glass, a smaller HVAC system could be implemented from the beginning of design, preventing redesign of the system later on in the project. In a retrofit project, the needs of the owner greatly impact the decision process for retrofitting a building. For example, there is a huge difference between completely gutting and renovating a space compared to replacement of the mechanical equipment. Much of the discussion that occurred in this break-out session related to the methods of decision making for the replacement of the mechanical infrastructure.

In the process of defining the scope of work for mechanical infrastructure upgrades, it is essential to perform elaborate building reconnaissance and existing conditions surveys in order to fully understand the existing systems. As part of this process, industry professionals deemed it cost effective to the owner to hire a balancer to assess the existing mechanical equipment and base the design off the conclusion of the assessment. This assessment can conclude the conditions, life expectancies, and efficiencies of the existing equipment and help determine whether it's necessary to perform full system replacement or if system component replacement will be suffice. There is potential for cost savings on a retrofit project if the team can determine that some major systems can be utilized in the design with an upgrade to the equipment controls. Related to the first break-out session, BIM methods such as laser scanning can assist in understanding the existing conditions of the project and assist in making decisions during design.

The owner, design consultants, and construction management team of the Gouverneur Healthcare Services project faced many of challenges and approaches to integrated decision making that were discussed in the attended break-out session. As previously mentioned, a major scope of work for the project includes a complete modernization of the existing MEP infrastructure. A possible technical analysis that could be performed as a result of attending this break-out session involves understanding how the owner, design consultants, and construction management team approached the decision making process for the modernization of the MEP infrastructure and how it affected the project costs. Main contacts for more information relating to the integrated decision approach to high performance retrofit projects include Dr. Robert Leicht and Dr. John Messner, both faculty members of the Department of Architectural Engineering.

INDUSTRY AND STUDENT PANEL

In the afternoon, students had the opportunity to participate in two panel board discussions between industry professionals and students discussing Differentiation in a Down Economy and Hands-On Learning in Design and Construction. Industry professionals discussed how economy is affecting the job market from the perspective of students and companies. The economy has played a huge role in how companies not only handle employment, but also how they have reacted to the economy in terms bidding projects. Many companies have agreed that in order to be successful, they have put forth efforts into reaching out into different market sectors to bid work that they typically wouldn't in a good economy. Also, when bidding jobs, companies take

more chances in terms of fee for how much they will charge an owner for construction management services because of how competitive the market place is. As students, the biggest concerns that arise with the economy are how it relates to the job market for construction industry. Despite the economy, industry professionals ensured that architectural engineers focusing on construction management are still in high demand in this economy because of the level of skills that we are able to provide upon graduation.

INDUSTRY MEMBER FOCUS GROUP

The last activity for the day involved a small group break-out session between students and industry professionals. Students Alex Despotovich, Steven Conroe, and Michael Beam discussed possible areas of study for technical analyses with Brian Goodykoontz of Barton Malow Construction Company and Matt Orosz of Truland Systems Corporation. These industry professional will serve as key contacts that may be able to further advise construction management technical analyses. Particularly related to the Gouverneur Healthcare Services project, it was questioned as to why BIM was not implemented on through design, construction, and operations. Some possible areas of study that resulted from the discussion include questioning why the team did not implement BIM methods, understanding how the team performed system coordination, analyze how the project can specifically benefit from the use of BIM during all phases of the job, and the value that BIM methods could present to the owner.

CONCLUDING PACE ROUNDTABLE 2011

Overall, attending the 20th Annual Partnership for Achieving Construction Excellence Roundtable on November 9, 2011 provided one with a great opportunity to become familiarized with some of the unique challenges and issues the construction industry is currently facing. It was definitely beneficial to discuss the industry challenges and issues with construction professionals including construction managers, owners, contractors, and subcontractors that face these issues on a day to day basis. The BIM Services for the Owner break-out session was particularly beneficial because the perspective of BIM to the construction management industry professionals, as well as owner representatives who attended was considered and discussed in terms of the benefits, challenges, and concerns of using BIM methods through design, construction, and operations. The Integrated Decisions for High Performance Retrofit Projects break-out session was beneficial to learn the challenges involved in decision making for retrofit

project and different strategies that can be used to effectively make decisions on such a project, especially the Gouverneur Healthcare Services project that includes thirteen stories of demolition and renovation, as well as a complete modernization of the existing MEP infrastructure. Key contacts that may serve as good advisors to future thesis studies include the following:

- Sonali Kumar- Graduate Student at The Pennsylvania State University
- Dr. Robert Leicht- Faculty Member of the Department of Architectural Engineering
- Dr. John Messner- Faculty Member of the Department of Architectural Engineering
- Dr. Craig Dubler- Faculty Member of the Department of Architectural Engineering
- Brian Goodykoontz- Barton Malow Construction Company
- Matt Orosz- Truland Systems Corporation

PROBLEM IDENTIFICATION

There are many challenges that arise on the Gouverneur Healthcare Services project that the project team faces relating to phasing requirements, site conditions, existing conditions, and type of construction. The unique aspect of this project is the scope of work includes new building construction; existing building demolition and renovation of thirteen stories; and modernization of the MEP infrastructure, all occurring while providing the owner with a safe environment to maintain day to day operations in the active facility. In the process of problem identification, this part of the report discusses aspects of the projects where the team actually faced problems during construction, much consideration and preplanning was put forth, and where the project could have been improved.

SITE LOGISTICS, MATERIAL HANDLING, AND SAFETY

The phasing of the schedule resulted in many challenges the project team would have to face in terms of site logistics and material handling. Because the facility is remaining active during construction, safety is of the upmost important on a job of this magnitude for the construction workers, hospitals staff, hospital patients, and pedestrians. During the first major phase of construction, the new building location served as construction access for all deliveries for materials. The team had to work closely with the New York City Department of Transportation and the Department of Design and Construction during new building construction in coordinating temporary vehicular and pedestrian lane closures. This coordination allowed for an efficient method of receiving material deliveries, erecting the structural steel and curtain wall systems, installing superstructure concrete, and installation of new sidewalks and curbs. However, the problem occurs upon the turnover of the new building to the owner. Nearly all exterior construction site access is turned over to the owner and site logistics for the site moves to the inside of the building. Schedule phasing played a big role in creating issues for project team. Because floors are turned over one at a time to the construction team, there is no material storage available on site because there is strictly no room for any extra material. Also, during the demolition and renovation of the existing building, the construction team will utilize the interior elevator cabs as a method for delivering materials to their designated floors, as well as removing construction waste that is produced.

COORDINATION OF MEP INFRASTRUCTURE

As with all healthcare facilities, there is a high volume of MEP equipment implemented in the design to support the buildings function. With a complete modernization of the existing MEP infrastructure included in the scope of work, there are many problems that can arise with the logistics of installing new equipment. Coordination of demolition of the existing and installation of the new equipment in the mechanical penthouse is quite a challenge for the project team because new systems must support the building before existing systems can be turned off line. The MEP equipment that is to be installed also requires a large amount of coordination to prevent clashes in the field. Additionally, the coordination of the MEP infrastructure goes far beyond coordinating the systems. Because this is an active facility, it is critical to coordinate all work with the owner involving life safety systems that support the staff and patients that are using the space. Regardless of the large amount of coordination required for the MEP systems of the building, Building Information Modeling methods were not used in the process of coordination. There is a huge potential to reduce the number of conflicts in the field through the use of BIM methods such as 3D coordination.

SUSTAINABILITY

An important aspect related to where the construction industry is heading is sustainability through design and construction. There is a big push in the industry to put forth money to implement sustainable solutions in the design of the building to make them more efficient and environmentally friendly. Aside from energy efficient equipment, which basically comes standard in system design, there were no efforts put forth by the owner to achieve any type of LEED certification. The alternate design for the green garden roof would have served as a great stepping stone in the process to achieving a LEED certification. Implementing such a system into the building's design can be explored further to understand the advantages and disadvantages of the system.

EXISTING CONDITIONS

During the demolition and renovation of the existing thirteenth floor and fourteenth floor roof, one of the problems the construction team faced was related to the existing roof slab. Although the roof was waterproofed with new materials, the team faced many problems with leaks that

occurred through existing penetrations in the roof slab. This caused a big problem during interior framing and finishes because water leaks are one of the most difficult things to trace in an existing structure, especially a roof. The roof leaks caused a lot of damage to work that was already put in place on the thirteenth floor which ultimately had to be redone on multiple occasions because of new leaks occurring in different locations that hadn't previously been present.

ATRIUM WOOD CONSTRUCTION

The designed atrium of the new building features a two story tall architectural wood panel system, as well as other wood panel treatment throughout the lobby. One of the problems that the construction team faced was maintaining a correct humidity level in the space to create a safe environment for the wood to be installed in. Because humidity was such a concern, delays were caused in the delivery of the wood because of the risk involved if the conditions in the space weren't correct. Another issue with the wood panel construction was utilizing equipment that can fit through the doors of the building and safely operate to reach the top of the wood panel wall.

DESIGN CHANGES

Design changes that occurred on this project may serve as a great case study to the importance of integrated decisions in design and construction. The thirteenth floor is the first of five residential floors to be demolished and renovated and will be turned over during the first major phase of construction to the owner. One of the problems that the construction and design team faced was producing a final design for the new residential prior to construction. Because of a gap of communication between representatives of the owner, many design changes occurred on the thirteenth floor. The demolition and renovation of the thirteenth floor occurred for a duration of about 500 days for construction that should have only taken 200-300 days. Fortunately, the owner turned over the thirteenth floor to the construction team early in the project, so the 500 day duration did not result in any major delays to the project schedule.

TECHNICAL ANALYSIS OPTIONS

TECHNICAL ANALYSIS #1: BUILDING INFORMATION MODELING

Through studies involved in Technical Assignment 2 and Technical Assignment 3, it was determined that Building Information Modeling methods were not applied to the Gouverneur Healthcare Services facility during the design, construction, and operations phase of the project. A healthcare facility of this magnitude can greatly benefit through the use of BIM methods in a variety of ways. Efforts will be put forth in how this project can benefit from the use of BIM methods, relating to both new and existing construction.

The first step of this analysis requires understanding why the construction management team and owner did not implement BIM methods to this project. Understanding the needs and capabilities of both the owner and construction team is critical to this study. Studies will be performed to better understand how the construction team can benefit from BIM methods such as 3D coordination and 4D, while efforts will be put forth to understanding how BIM methods can assist the owner in facilities management upon completion of construction. Both the owner and construction manager can benefit from the use of 4D modeling and site logistics by understanding the phasing and delivering construction in a more efficient manner in the field. Also, this study will look further into understanding the capabilities of the prime and subcontractors on the job and understand their experiences with BIM. Last, a detailed comparison will be performed comparing and contrasting the costs involved in implemented BIM methods versus how the money that could potentially be saved by taking a further look at the quantity of change orders to date that have occurred due to coordination issues.

TECHNICAL ANALYSIS #2: SCHEDULE ACCELERATION

The phasing for the project was strategically planned in order to accommodate the owner's needs in maintaining a specific number bed count and to prevent disruption to the functionality of the facility. Turnover of the new building is a critical milestone in maintaining the ultimate scheduled completion date. Upon turnover of the new building to the owner, the owner can proceed with turning over existing floors to the construction management team.

After further analysis of the schedule, it was determined that, in no specific order, the owner turns a floor over to construction at an average of one floor per month. However, as discussed earlier in this report, the schedule contains a big gap between owner turnover to construction of the fourth and ninth floor. There is a great potential for schedule acceleration by accelerating the owner turnover date of the ninth floor to one month following the fourth floor. Details of this situation can be seen in Diagram 12. As part of the analysis, a study must be performed to understand the reasoning to why this schedule gap occurs. A study will be performed to how the hospital will maintain their bed count and how a possible schedule acceleration may affect their census. This schedule acceleration will also be analyzed from the perspective how much savings will incur to the owner following this acceleration.

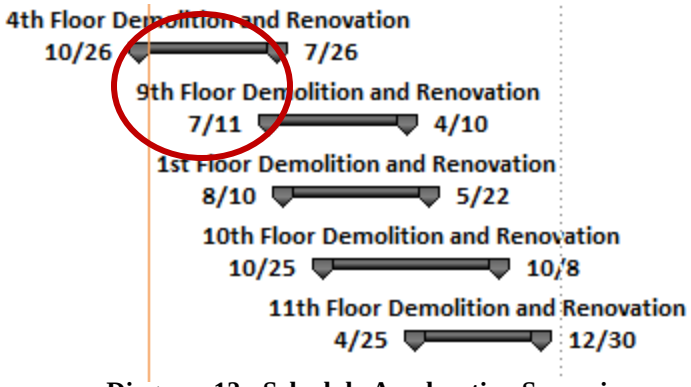


Diagram 12: Schedule Acceleration Scenario

Other schedule acceleration options include major phasing changes to the schedule to organize the existing building construction to occur in a top down construction manner rather than in a scattered order. Part of this study would include understanding the owners needs in transferring patients and faculty to completed floors through the building and the reasoning behind a scattered turnover of floors to construction. This study could greatly affect the schedule because an efficient flow of work can be developed from floor to floor and the site logistics of the job may completely change if top down construction is used. If this schedule phasing has the potential to work, a short interval production schedule could be developed for similar floors throughout the building, including five identically designed residential floors.

TECHNICAL ANALYSIS #3: SITE LOGISTICS AND SCHEDULE PHASING

The site logistics of this project served as a challenge for the project team due to the complex phasing of the schedule and the fact that the facility will remain active during the entire duration

of construction. During demolition and renovation, the project team faces issues related to site congestion because of how the schedule is phased by the owner to turnover one floor at a time to construction. To enhance the logistics of the site during these phases, a study will be performed related to Technical Analysis #3 related to creating short interval production schedule to efficiently deliver construction and eliminate issues related to site congestion on the floor of construction. In order to properly perform this study, an analysis must be performed understanding the flow of trades between the space and their relationship to one another.

Because material handling is an issue for this project, an analysis can be performed to study the use of mass off-site staging that allows multiple subs to store and deliver their materials as an integrated delivery. Additionally, an analysis can be performed to look at alternative means of transporting materials and manpower to the floors by the use of an exterior hoist. If an exterior hoist were implemented, this study could be combined with the use of prefabrication of materials and well as a structural breadth to determine how the existing structure can support the hoist. Also, to prevent trash from building up on the floors and having to be delivered through the interior elevator, the use of a trash chute will be studied.

TECHNICAL ANALYSIS #4: SUSTAINABLE DESIGN AND CONSTRUCTION

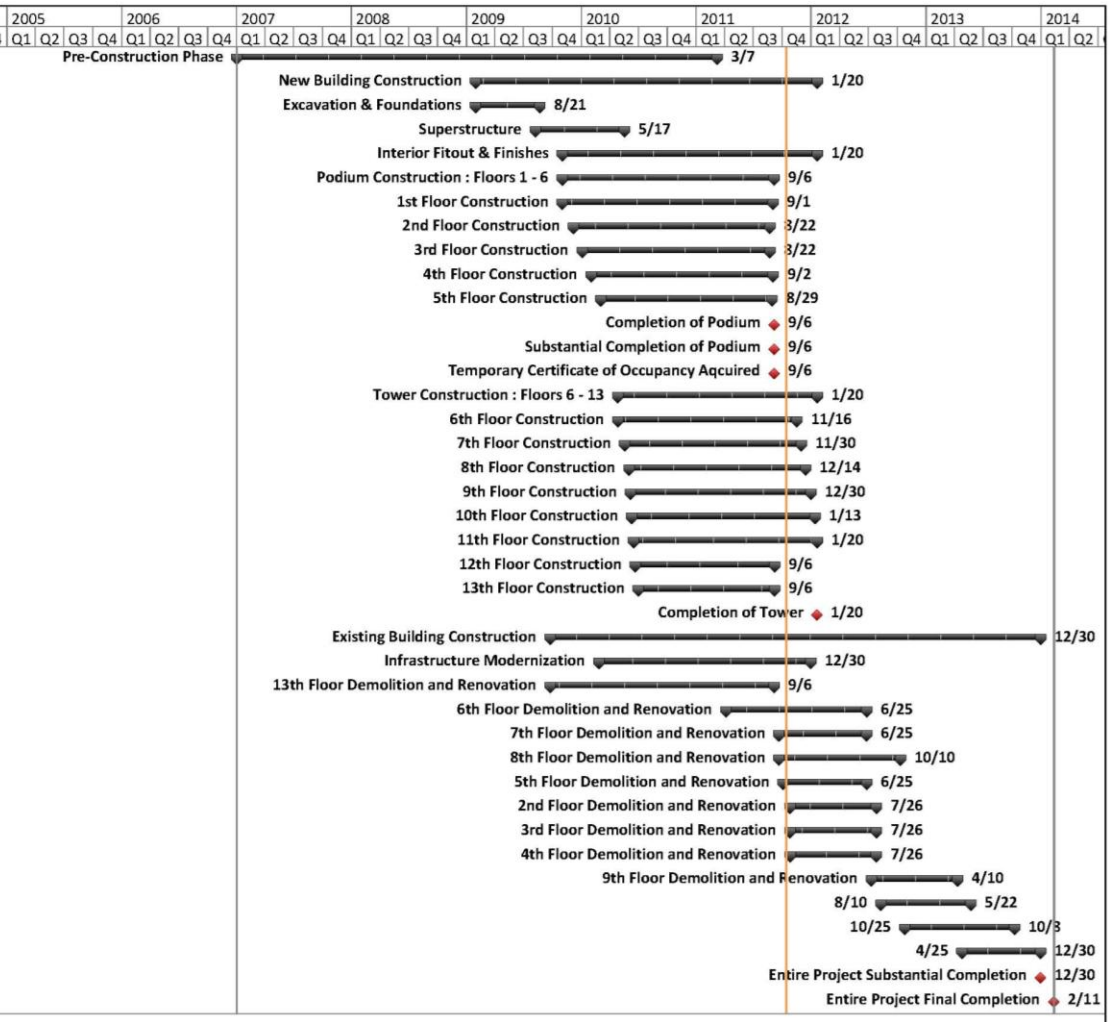
In the value engineering section of this report, it was determined that an alternate to the design included a sustainable green roof garden on the sixth floor of the new building. Assumed costs to the owner was the primary reasoning for not implementing the green roof garden into the design but no studies were performed on the potential benefits of incorporating such a design. As part of this study, a full analysis of the green roof was not performed to understand the ultimate benefits of incorporating in the design. The analysis will include determining the constructability issues of the green roof, the cost of the green roof in terms of material and maintenance, the payback period of the system, and how it may affect other building systems such as the plumbing, electrical, or structural system. There is potential for both a construction depth and out of option breadth in performing a study pertaining to sustainable design and construction. Possible out of option breadth studies include a structural analysis to see if the current structural design can accommodate the load sustained by the green roof system.

APPENDIX A

PROJECT SUMMARY SCHEDULE

GOUVERNEUR HEALTHCARE SERVICES SUMMARY SCHEDULE

ID	Task Name	Duration	Start	Finish
1	**Pre-Construction Phase**	**1090 days**	**Tue 1/2/07**	**Mon 3/7/11**
4	**New Building Construction**	**776 days**	**Fri 1/30/09**	**Fri 1/20/12**
5	**Excavation & Foundations**	**146 days**	**Fri 1/30/09**	**Fri 8/21/09**
13	**Superstructure**	**201 days**	**Sat 8/8/09**	**Mon 5/17/10**
39	**Interior Fitout & Finishes**	**580 days**	**Mon 11/2/09**	**Fri 1/20/12**
40	**Podium Construction : Floors 1 - 6**	**481 days**	**Mon 11/2/09**	**Tue 9/6/11**
41	**1st Floor Construction**	**479 days**	**Mon 11/2/09**	**Thu 9/1/11**
46	**2nd Floor Construction**	**446 days**	**Mon 12/7/09**	**Mon 8/22/11**
51	**3rd Floor Construction**	**426 days**	**Mon 1/4/10**	**Mon 8/22/11**
56	**4th Floor Construction**	**415 days**	**Mon 2/1/10**	**Fri 9/2/11**
61	**5th Floor Construction**	**388 days**	**Thu 3/4/10**	**Mon 8/29/11**
66	**Completion of Podium**	**0 days**	**Tue 9/6/11**	**Tue 9/6/11**
67	Substantial Completion of Podium	0 days	Tue 9/6/11	Tue 9/6/11
68	Temporary Certificate of Occupancy Aqcuired	0 days	Tue 9/6/11	Tue 9/6/11
69	**Tower Construction : Floors 6 - 13**	**454 days**	**Tue 4/27/10**	**Fri 1/20/12**
70	**6th Floor Construction**	**407 days**	**Tue 4/27/10**	**Wed 11/16/11**
75	**7th Floor Construction**	**401 days**	**Wed 5/19/10**	**Wed 11/30/11**
80	**8th Floor Construction**	**401 days**	**Wed 6/2/10**	**Wed 12/14/11**
85	**9th Floor Construction**	**410 days**	**Mon 6/7/10**	**Fri 12/30/11**
90	**10th Floor Construction**	**417 days**	**Thu 6/10/10**	**Fri 1/13/12**
95	**11th Floor Construction**	**418 days**	**Wed 6/16/10**	**Fri 1/20/12**
100	**12th Floor Construction**	**316 days**	**Tue 6/22/10**	**Tue 9/6/11**
106	**13th Floor Construction**	**309 days**	**Thu 7/1/10**	**Tue 9/6/11**
112	**Completion of Tower**	**0 days**	**Fri 1/20/12**	**Fri 1/20/12**
114	**Existing Building Construction**	**1113 days**	**Thu 9/24/09**	**Mon 12/30/13**
115	**Infrastructure Modernization**	**481 days**	**Fri 2/26/10**	**Fri 12/30/11**
122	**13th Floor Demolition and Renovation**	**508 days**	**Thu 9/24/09**	**Tue 9/6/11**
132	**6th Floor Demolition and Renovation**	**319 days**	**Wed 4/6/11**	**Mon 6/25/12**
141	**7th Floor Demolition and Renovation**	**199 days**	**Wed 9/21/11**	**Mon 6/25/12**
150	**8th Floor Demolition and Renovation**	**276 days**	**Wed 9/21/11**	**Wed 10/10/12**
159	**5th Floor Demolition and Renovation**	**189 days**	**Wed 10/5/11**	**Mon 6/25/12**
168	**2nd Floor Demolition and Renovation**	**197 days**	**Wed 10/26/11**	**Thu 7/26/12**
177	**3rd Floor Demolition and Renovation**	**197 days**	**Wed 10/26/11**	**Thu 7/26/12**
186	**4th Floor Demolition and Renovation**	**197 days**	**Wed 10/26/11**	**Thu 7/26/12**
195	**9th Floor Demolition and Renovation**	**196 days**	**Wed 7/11/12**	**Wed 4/10/13**
204	**1st Floor Demolition and Renovation**	**204 days**	**Fri 8/10/12**	**Wed 5/22/13**
213	**10th Floor Demolition and Renovation**	**249 days**	**Thu 10/25/12**	**Tue 10/8/13**
222	**11th Floor Demolition and Renovation**	**178 days**	**Thu 4/25/13**	**Mon 12/30/13**
231	**Entire Project Substantial Completion**	**0 days**	**Mon 12/30/13**	**Mon 12/30/13**
232	**Entire Project Final Completion**	**0 days**	**Tue 2/11/14**	**Tue 2/11/14**



Gouverneur Healthcare Services
Alex Despotovich
October 19, 2011

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only
Summary	Inactive Task	Duration-only	Finish-only

Appendix A