

AE 481W

# TECHNICAL ASSIGNMENT 2

Submitted 10/27/2010

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Construction Management

Advisor: Dr. Robert Leicht



[The following report presents a technical summary of the Office Renovation Building project. Within this assignment an in depth discussion of the renovation project will be discussed through the exploration of the detailed project schedule, structural systems and general conditions estimate, and site plan utilization during steel erection.]

## Executive Summary

The Office Renovation Building is one of the largest civil buildings owned by the General Services Administration. Completed in 1932, the structure houses 1.8 million square feet of office space for a variety of government agencies. Located in a downtown metropolitan area in the northeastern part of the United States, the \$500 million project is scheduled for completion in multiple phases during the next 13 years. While over 3,500 workers continue to occupy the historic building, the project will use a swing space completed in phase 1 of its construction to move employees out of the construction zones. Gilbane Building Company and Grunley Construction have formed a joint venture to act as the project's general contractor for phases 1, 2, and 3.

This report's analysis will focus strictly on the second phase of the renovation. During this phase, the structure's entire façade will undergo complete restoration in addition to the abatement and demolition of the corresponding area's interior offices. Also, the construction of an Electrical Equipment Enclosure (EEE) is to be erected within one of the building's interior courtyards.

The purpose of this second technical report is to evaluate the project's schedule, structural and general conditions estimates, and site utilizing planning in great detail. Within this assignment, an in depth overview of the project schedule will be presented in a 200 line item reproduction. Additionally, a detailed breakdown of the project's site utilization plan during the erection of the Electrical Equipment Enclosure is included. A Detailed Structural Systems and General Conditions estimates are also included. Following the PACE Roundtable Event scheduled in late October, a critical industry issues summary and analysis will be included.

All of these sections under this technical assignment have been designed to help this student gain a more in depth perspective on the efforts in scheduling, logistical planning, and estimating associated with any construction project within the industry. Following this assignments completion, more time will be taken to see how Building Information Modeling can help to more easily coordinate the project's schedule with its phase planning. Also, a detailed investigation of LEED submittal tracking and execution will be analyzed to help streamline the process for future phases of the project.



This image illustrates the completed Electrical Equipment Enclosure located in the center of courtyard 1. This is a major aspect of this phase of the renovation project and will be a focus of this technical assignment.

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## Detailed Project Schedule

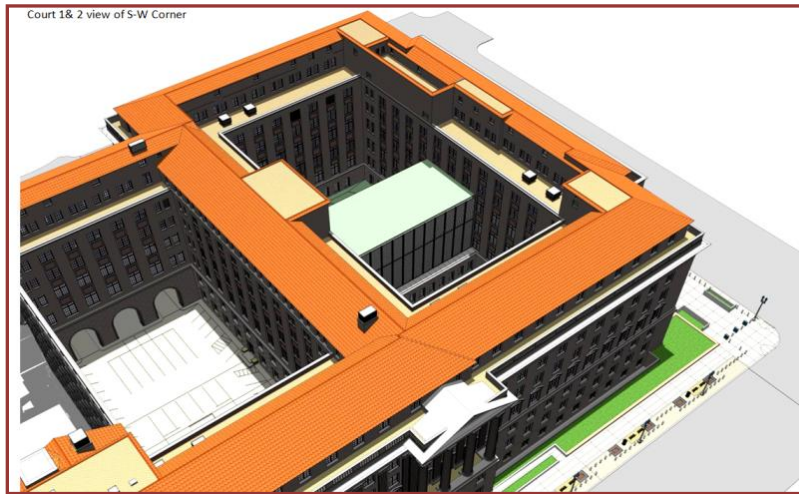
The General Services Administration began the conceptual design for the Office Renovation Building in July of 2007. GSA worked with the architect, Group Goetz Architects, and alongside with the project's structural and MEP engineering firms to develop an acceptable design for the structure's renovation design. At the 75% completion of the project's design documents, Gilbane-Grunley Joint Venture submitted a bid for phases 2 and 3 of the project. On August 5, 2009, the General Services Administration awarded GGJV a Guaranteed Maximum Price contract based on the general contractor's 'best-value' bid. Gilbane-Grunley received a Notice to Proceed on November 15<sup>th</sup>, 2009 and immediately followed with planning and procurement initiatives.

In order to properly interpret the Detailed Project Schedule, several key features must be addressed. The construction phase of the schedule is broken down in segments of major building sections: Renovation of Existing Interior Spaces, Exterior Sitework, Construction of the building's new Electrical Equipment Enclosure, and a summarized breakdown of the Exterior Façade Restoration. These subsections are displayed in order of which has the earliest starting date. Referencing the **Detailed Project Schedule (Appendix A)**, let it be noted that many events simultaneously take place during the project's development. This has been done to help facilitate the progression of the project.

In an effort to keep the Detailed Project Schedule within the prescribed limit of 200 line items, only two floors of the project's interior renovation are displayed in detail. The top-down progression of each floor contains similar scopes of work in comparable sequences; because of this, only the 8<sup>th</sup> and 7<sup>th</sup> floors are displayed in detail. Floors 1 through 6 closely resemble the progression of work described on the 7<sup>th</sup> floor. Also, please note that the schedule for the erection of the Electrical Equipment Enclosure is more extensive than other schedule elements. The effort of this schedule was focused on the EEE because future technical assignments and thesis research will be focused primarily on this building section. Furthermore, the final segment of the Detailed Project Schedule summarizes the Exterior Façade Restoration of the building. The durations and sequences of the actual restoration work are phased in smaller subsections beginning at the Southern end of the building progressing counterclockwise around the structure. The schedule element was summarized to prevent continuous redundancies.

## Project Sequencing

The entire restoration of the Office Renovation Building project has been broken down into 8 phases. This technical assignment pertains specifically to the second phase of the project of which will be completed over a 2 year time span. As previously stated, the interior renovations of existing spaces will follow a top-down sequencing schedule with the exception of the building's basement. Also, many activities will occur simultaneously to help facilitate the project's completion. This includes the erection of the structure's Electrical Equipment Enclosure and exterior façade restoration. Figure 1 illustrates the area of the building specific to Phase 2, a breakdown of the entire phased building renovation can be found on **Appendix E: Phase Sequencing**.



**Figure 1:** A rendering of the completed Office Renovation Building with the Electrical Equipment Enclosure (EEE) located in the center of courtyard 1. Interior renovations will begin on the 8<sup>th</sup> floor and will conclude on the 1<sup>st</sup> floor; this sequence of activities will be concurrent with the EEE and exterior façade restorations.

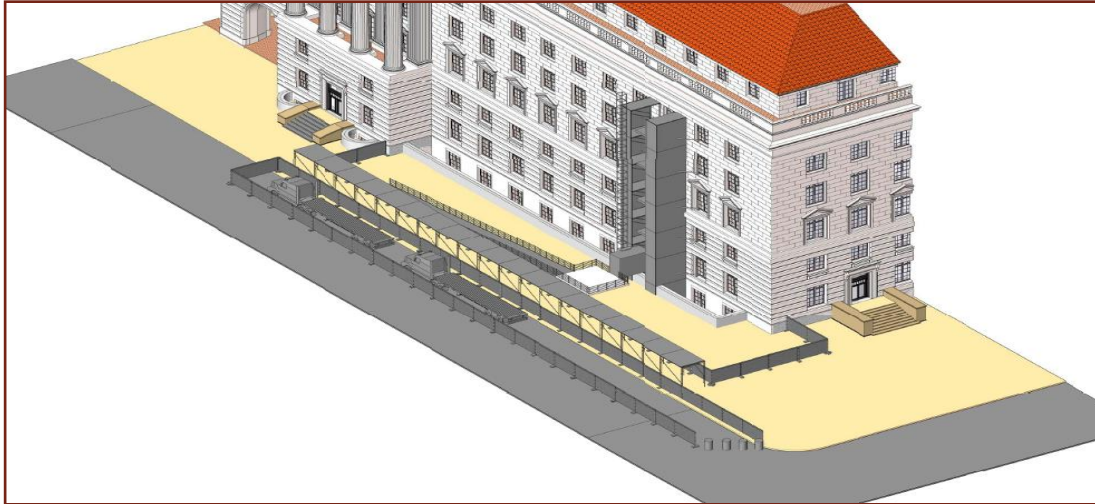
## Site Layout Plan

The Office Renovation Building is located in the downtown historical business district of a northeastern metropolitan area. The specific location of this project may not be disclosed due to owner restrictions. Due to the building's urban setting, the construction site of the project is confined within the structure's perimeter.

Because of the high pedestrian traffic surrounding the facility, public safety is a primary concern for the project's logistics planning and site management. To ensure the safety of the area's pedestrians, the construction zone will be enclosed within appropriate construction fencing as needed. Also, because Phase 2 is comprised of the building's exterior restoration; temporary fencing and overhead protection will be present wherever work is being put in place.

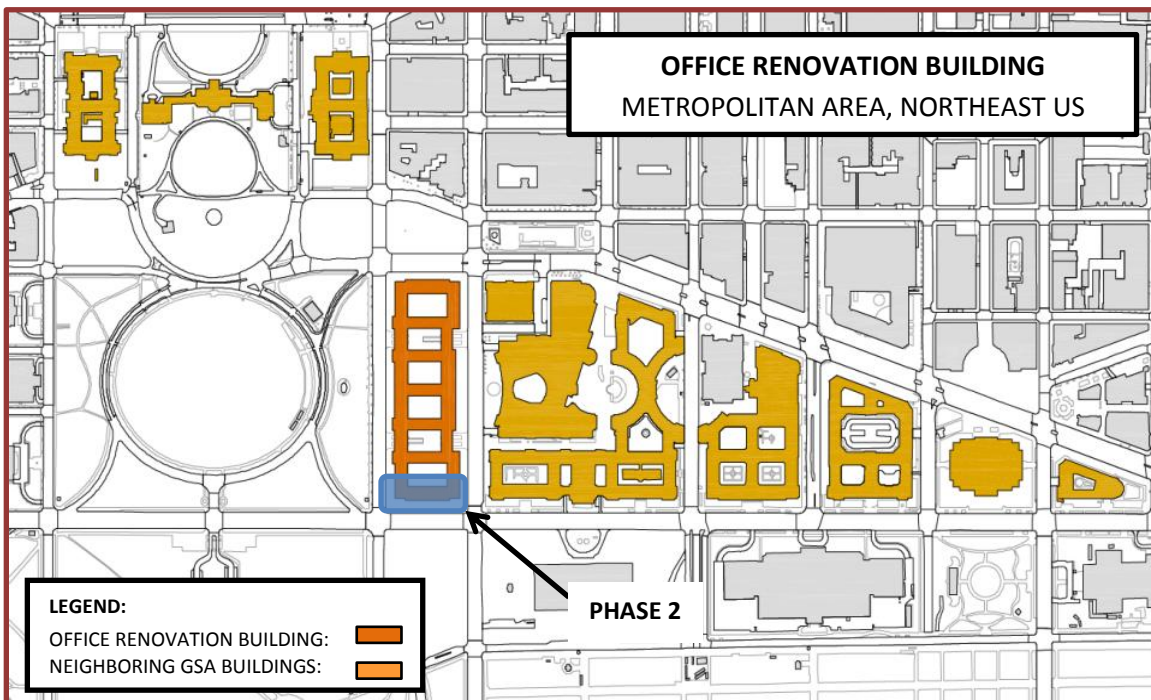
## Superstructure Site Layout

During the erection of the building's Electrical Equipment Enclosure, the site will be more congested than any other stage of construction. This is largely due to the concrete and steel contractors presence on site at this time. Due to the urban area's high congestion, coordination of trades will be crucial. Steel delivery trucks will utilize the reserved traffic lane at the Western end of the building for the erection of the EEE. Because there is no shake down area reserved for the steel; the crane located at the Southern end of the building will be forced to pick all steel members directly from the delivery trucks. Logistically, this is a crucial stage of construction, ensuring that deliveries are on time and efficiently processed. The safety of building occupants, pedestrians, and construction laborers is also a major concern during the erection of the Electrical Equipment Enclosure. In an effort to ensure the safety of all stakeholders, Gilbane-Grunley has planned to close the South-Western location of the building adjacent to the steel staging area; all concurring interior construction work will commence only on the Eastern side of Phase II in addition to the use of egress protection adjacent to the Material Staging Area.



**Figure 2:** A rendering of the Material Staging Area located at the South-Western end of the building. The crane will pick steel members directly off of delivery trucks utilizing one lane of the parallel road.

Gilbane-Grunley has recently altered their plan for coordinating the arrival of the project’s concrete trucks. Originally, these trucks were to share the designated Material Staging Area, but do to congestion, the trucks will now utilize the Southern end of the building. This will also put the concrete trucks at the Southern end of the building bringing them closer to the EEE; this will make it easier to coordinate and execute the pumping of the concrete. Most of the EEE’s concrete will be pumped through the existing structure into courtyard 1. Gilbane-Grunley also intends to use the crane to place concrete at the structures 4<sup>th</sup> floor roof level.



**Figure 3:** Site Plan and Building Location

Considering the significance of this stage of construction, it will be interesting to see how effective this site layout will be used during the erection of the Electrical Equipment Enclosure. Ensuring the efficient delivery of steel members and concrete will be a major factor in the successful implementation of this sit layout plan. Future Technical Assignments and Thesis research will be more directly focused on this stage of construction in addition to the design of the Electrical Equipment Enclosure.

Please reference **Appendix B: EEE Erection Plan** for a more detailed breakdown of this phase of construction.

### Detailed Structural Systems Estimate

The 260,000 SF Phase 2 renovation of the Office Renovation Building has limited structural work associated with the project scope. The only structural work associated with Phase 2 pertains to the erection of a new Electrical Equipment Enclosure located within the center of courtyard 1 on the Southern end of the building. The new facility is just under 20,000 SF and consists of two new stories to be building on top of existing structure. The roof of the EEE is to be built to sustain the loads associated with a green roof that will be installed later in the project.

The structure is to be primarily composed of steel columns and beams and will include three levels of elevated concrete slabs on metal decking. The steel members were accounted for in reference to the project's structural plans and details. The elevated concrete slabs and metal decking quantities were taken off utilizing specific details and structural drawings. The details of the concrete, decking, and steel characteristics were found through the project specifications and contract drawings. These measurements and quantity take offs were transferred into Excel spreadsheets and appropriately broken down into their respective categories. The spreadsheets helped to calculate the desired cubic yards, tonnages, and formwork contact area for each major structural element.

Southland Concrete and Superior are the respective concrete and steel contractors that have been elected to construct the superstructure for the Electrical Equipment Enclosure. The combined value for this scope of work resulted in a lump sum value of \$984,000 (This amount has been round per the request of Gilbane-Grunley). The following table summarizes the breakdown of the Structural Systems Estimate for the project in comparison to the estimate performed for this assignment.

Structural Systems Estimate General Breakdown				
	ACTUAL		ESTIMATED	
SYSTEM	TOTAL	\$/SF	TOTAL	\$/SF
CIP Concrete	\$ 246,000.00	\$ 12.45	\$ 66,139.84	\$ 3.34
Structural Steel	\$ 738,000.00	\$ 37.35	\$ 508,824.28	\$ 25.77

**Table 1:** Actual vs. Estimated Cost Comparison

Following the comparison of the final estimated values, it is evident that the system estimate performed for this assignment is significantly lower than the actual contract value. The considerable variance between the two values must be discussed to justify the quantity take offs and cost application of the estimate performed. Considering the renovation nature of the project, there is considerable concrete work present throughout the building. However, many of these concrete costs affiliated with other building elements are difficult to quantify with this estimate because they cannot be directly applied to the structural estimate of the Electrical Equipment Enclosure. One specific application of this discrepancy involved the concrete work associated with the construction of the building's electrical ductbank. Furthermore, Table 1 illustrates that the structural steel estimate performed is all significantly lower than the actual contract amount (%38). It is assumed that this variance is largely due to the lack of being able to accurately apply the costs associated with structure's steel connections. The variance of \$229,176 may be easily compensated with the application of connection and detailing costs. These variances in scope of work and quantifiable values that are applicable to the erection of the Electrical Equipment Enclosure are a major contributor to the differences presented in Table 1. The table below summarizes the cost and quantity for each CSI Masterformat division included in the estimate. The per

Component	Unit Cost	Unit	Quantity	Cost
0331100- Concrete Formwork	\$ 8.51	SFCA	1092	\$ 9,289.86
032100- Welded Wire Fabric	\$ 48.15	CSF	204	\$ 9,823.01
033000- CIP Concrete	\$ 146.96	CY	320	\$ 47,026.97
051223- Steel Columns	\$ 5,230.00	TON	13	\$ 66,222.70
052113- Steel Beams	\$ 49,011.00	TON	80	\$ 395,963.97
053133- Metal Decking	\$ 2.36	SF	19755	\$ 46,637.60
			<b>TOTAL:</b>	<b>\$ 574,964.11</b>

**Table 2:** Estimate Summary by CSI Masterformat Divisions

Several factors and assumptions were accounted for throughout the estimate to produce a final cost of the Electrical Equipment Enclosure's superstructure cost. *RS Means Cost Data 2011* was used for all material, labor, and equipment unit costs. The prices listed in this manual were all adjusted for accordingly in regards to the location of the Office Renovation Building. Additionally, appropriate waste factors were applied for the estimating the quantities for WWF, formwork, and concrete (10%). For the concrete placement, the elevated slabs are assumed to be pumped with an appropriately sized crew referencing the *RS Means Cost Data*. Finally, the majority of the structural steel member sizes had pricing available from *RS Means*. If a particular size was not listed, the next available member was used for unit pricing.

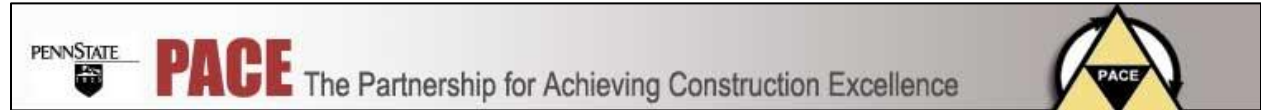
A detailed breakdown of the structural system estimate can be found in **Appendix C: Detailed Structural Systems Estimate**.



### General Conditions Estimate

\*\*\*This section has been omitted from the CPEP publication due to Owner and General Contractor restrictions. Appendix D is also excluded from this online document.\*\*\*

Professors/Advisors seeking to view this section of this report may contact Anthony (apj5011@psu.edu) for further detail.



### Critical Industry Issues- PACE Roundtable Summary



The PACE Roundtable is a collaborative event that brings industry professionals together to discuss current issues and trends within the construction industry. Students were able to communicate with experienced professionals through topic specific breakout sessions throughout the day. The discussions summarized in this report are specific to *Educating a Future Workforce for Delivering High Performance Buildings* and *Operations and Maintenance Process Integration*. These sessions were very beneficial to discover potential topics for the program's senior thesis project.

### Educating a Future Workforce for Delivering High Performance Buildings

This discussion revolved around the communication barriers that are often associated with green construction and the LEED accreditation system. I chose to sit in on this discussion because by past summer experiences on site often demonstrated similar obstacles. Most professionals suggested that significant time needs to be put into educating project owners and smaller less experienced subcontractors. Most participants agreed that project owners are most likely to understand the aspects and advantages of green construction through the overall comparison of first and life-cycle costs for various systems and technologies. It was concluded that smaller trades will become more educated with the LEED system through the ever growing interaction between other industry professionals that have been more exposed to the movement.

The discussion about educating the workforce took a surprising turn directed towards the Operations and Maintenance side of a project. Many professionals complained that facility management staffs were poorly educated in regards to running their newly advanced and efficient buildings. Several individuals felt discouraged in that their work on several projects were 'wasted efforts' because facility management teams were failing to operate the buildings to their full potential. Those involved in the discussion unanimously agreed that it is most important to educate the workforce that will be operating the building to see the greatest results within the green building movement. Many stressed the significance of life-cycle commissioning to help ensure the systems of any building are running as efficiently as possible. In future assignments, I intend to further research this issue to apply to the *Office Renovation Building* project.

### Operations and Maintenance Process Integration

This session was chosen because of its relevance of the discussion that took place during the previous breakout. As students, we often do not have much exposure to the later aspects of a project, particularly in regards to the substantial completion and hand over stage. Sitting in on this discussion allowed me to get a good perspective on how this process takes place. Most professionals stated that preparing the client to take over their building is never a smooth process. This issue ranges from maintenance personnel training all the way to the delivery of the O&M Manuals. The majority of the discussion revolved around how the client often fails to get their staff involved in the project. Most owners revert to having their facilities staff undergo training a few weeks prior to substantial completion. Participants in the discussion stressed that owners need to have their staff involved in the early stages of a project so that they may be more educated and prepared for when they take over the building. Also, professionals also offered that they have the manpower and knowledge to offer services to a client in regards to running the building effectively. It is worth noting that the discussion revolved around all of the things that the owner could do better. Not until the final minutes of the roundtable did a student ask, "Is there anything that the construction managers/contractors are doing that prevents the smooth hand off of a project?" The room jokingly adverted the question and the discussion promptly resigned. It would be interesting to hear from more client representatives, like John Bechtel from the university's OPP, to hear more about what general contractors can do to improve this process.

### Conclusion

The PACE Roundtable was a great learning experience. I thoroughly enjoy being able to learn from industry professionals; hearing what issues are particular to their careers is always interesting. It was fascinating to see how the discussions were driven from their initial topic into what was most important to those in the room. Both discussions were directed toward the strong barrier between contractors and building owners; it is evident that the industry needs to focus on such communication and client interaction. The majority of the breakout sessions revolved around how the owner limits the construction process, or how the end user fails to optimize performance. I believe the industry professionals in attendance at this event would have benefitted from similar collaborative discussions that focused on what they could be doing better. This event was extremely beneficial to the students, I thoroughly enjoyed the discussions; I was able to learn a lot about our industry and where improvements need to be made all in one day. I plan to incorporate my findings in future thesis assignments

**[APPENDIX A]**  
**DETAILED PROJECT SCHEDULE**

ID	Task Name	Duration	Start	Finish	Quarter																																
					1st Quarter			2nd Quarter			3rd Quarter			4th Quarter			1st Quarter			2nd Quarter			3rd Quarter			4th Quarter											
					Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
1	<b>PRECONSTRUCTION/PROCUREMENT</b>	<b>311 days</b>	<b>Mon 12/22/08</b>	<b>Mon 3/1/10</b>	[Gantt bar spanning from Mon 12/22/08 to Mon 3/1/10]																																
2	Estimating & Procurement	163 days	Mon 12/22/08	Wed 8/5/09	[Gantt bar from Mon 12/22/08 to Wed 8/5/09]																																
3	Phase II Notice To Proceed	0 days	Sun 11/15/09	Sun 11/15/09	[Milestone diamond at Sun 11/15/09]																																
4	Prepare BIM Model	20 days	Mon 11/16/09	Fri 12/11/09	[Gantt bar from Mon 11/16/09 to Fri 12/11/09]																																
5	Exterior Permits	20 days	Mon 11/16/09	Fri 12/11/09	[Gantt bar from Mon 11/16/09 to Fri 12/11/09]																																
6	Interior Existing Conditions Survey	10 days	Tue 2/16/10	Mon 3/1/10	[Gantt bar from Tue 2/16/10 to Mon 3/1/10]																																
7	<b>SUBMITTALS/FABRICATION/DELIVERY</b>	<b>90 days</b>	<b>Mon 11/16/09</b>	<b>Fri 3/19/10</b>	[Gantt bar from Mon 11/16/09 to Fri 3/19/10]																																
8	Structural Steel	90 days	Mon 11/16/09	Fri 3/19/10	[Gantt bar from Mon 11/16/09 to Fri 3/19/10]																																
9	Coordination Dwgs EEE	80 days	Mon 11/16/09	Fri 3/5/10	[Gantt bar from Mon 11/16/09 to Fri 3/5/10]																																
10	Electrical Equipment	45 days	Mon 11/16/09	Fri 1/15/10	[Gantt bar from Mon 11/16/09 to Fri 1/15/10]																																
11	Concrete	25 days	Mon 11/16/09	Fri 12/18/09	[Gantt bar from Mon 11/16/09 to Fri 12/18/09]																																
12	Abatement	25 days	Mon 11/16/09	Fri 12/18/09	[Gantt bar from Mon 11/16/09 to Fri 12/18/09]																																
13	Masonry Restoration	20 days	Mon 11/16/09	Fri 12/11/09	[Gantt bar from Mon 11/16/09 to Fri 12/11/09]																																
14	<b>CONSTRUCTION</b>	<b>522 days?</b>	<b>Mon 11/16/09</b>	<b>Tue 11/15/11</b>	[Gantt bar from Mon 11/16/09 to Tue 11/15/11]																																
15	<b>INTERIOR</b>	<b>522 days?</b>	<b>Mon 11/16/09</b>	<b>Tue 11/15/11</b>	[Gantt bar from Mon 11/16/09 to Tue 11/15/11]																																
16	<b>Basement &amp; Chiller Plant</b>	<b>514 days</b>	<b>Mon 11/16/09</b>	<b>Thu 11/3/11</b>	[Gantt bar from Mon 11/16/09 to Thu 11/3/11]																																
48	<b>8th Floor</b>	<b>479 days</b>	<b>Mon 11/16/09</b>	<b>Thu 9/15/11</b>	[Gantt bar from Mon 11/16/09 to Thu 9/15/11]																																
49	Dust Partitions & Construction Line	15 days	Mon 11/16/09	Fri 12/4/09	[Gantt bar from Mon 11/16/09 to Fri 12/4/09]																																
50	Demo CW Piping (8th)	60 days	Tue 12/8/09	Mon 3/1/10	[Gantt bar from Tue 12/8/09 to Mon 3/1/10]																																
51	Temporary Power & Lighting	5 days	Tue 12/8/09	Mon 12/14/09	[Gantt bar from Tue 12/8/09 to Mon 12/14/09]																																
52	Selective Demo & Salvage	10 days	Tue 12/22/09	Mon 1/4/10	[Gantt bar from Tue 12/22/09 to Mon 1/4/10]																																
53	Abatement, Abate Fittings Cut N Cap	50 days	Tue 12/22/09	Mon 3/1/10	[Gantt bar from Tue 12/22/09 to Mon 3/1/10]																																
54	Install Hangers	10 days	Thu 3/4/10	Wed 3/17/10	[Gantt bar from Thu 3/4/10 to Wed 3/17/10]																																
55	Demo	40 days	Thu 3/11/10	Wed 5/5/10	[Gantt bar from Thu 3/11/10 to Wed 5/5/10]																																
56	Install new CW Piping	60 days	Thu 3/18/10	Wed 6/9/10	[Gantt bar from Thu 3/18/10 to Wed 6/9/10]																																
57	Mechanical Rough In	20 days	Thu 5/6/10	Wed 6/2/10	[Gantt bar from Thu 5/6/10 to Wed 6/2/10]																																
58	Strip, Refurb & Prime Paint Int Windows	15 days	Thu 5/6/10	Wed 5/26/10	[Gantt bar from Thu 5/6/10 to Wed 5/26/10]																																
59	Core Drill	20 days	Thu 5/6/10	Wed 6/2/10	[Gantt bar from Thu 5/6/10 to Wed 6/2/10]																																
60	Sprinkler Rough In	40 days	Fri 6/4/10	Thu 7/29/10	[Gantt bar from Fri 6/4/10 to Thu 7/29/10]																																
61	Install FCU Riser 8th Floor	20 days	Fri 6/4/10	Thu 7/1/10	[Gantt bar from Fri 6/4/10 to Thu 7/1/10]																																
62	Pipe Steam Condensate Pumps	10 days	Fri 6/11/10	Thu 6/24/10	[Gantt bar from Fri 6/11/10 to Thu 6/24/10]																																
63	Install HW Piping (8th)	60 days	Fri 6/11/10	Thu 9/2/10	[Gantt bar from Fri 6/11/10 to Thu 9/2/10]																																
64	Install HVAC Pipe	20 days	Wed 6/30/10	Tue 7/27/10	[Gantt bar from Wed 6/30/10 to Tue 7/27/10]																																
65	FCU Run Outs	10 days	Fri 7/2/10	Thu 7/15/10	[Gantt bar from Fri 7/2/10 to Thu 7/15/10]																																
66	Install Remote Chillers	20 days	Wed 7/14/10	Tue 8/10/10	[Gantt bar from Wed 7/14/10 to Tue 8/10/10]																																
67	Controls Rough In	15 days	Fri 7/16/10	Thu 8/5/10	[Gantt bar from Fri 7/16/10 to Thu 8/5/10]																																
68	Install Packaged AHU's	10 days	Wed 7/28/10	Tue 8/10/10	[Gantt bar from Wed 7/28/10 to Tue 8/10/10]																																
69	Ductwork and Insulation	65 days	Wed 8/11/10	Tue 11/9/10	[Gantt bar from Wed 8/11/10 to Tue 11/9/10]																																
70	Install Busduct Risers	10 days	Wed 11/10/10	Tue 11/23/10	[Gantt bar from Wed 11/10/10 to Tue 11/23/10]																																
71	Connect Mech Equipment	7 days	Thu 12/16/10	Fri 12/24/10	[Gantt bar from Thu 12/16/10 to Fri 12/24/10]																																
72	Drywall Framing & Hanging	20 days	Thu 12/30/10	Wed 1/26/11	[Gantt bar from Thu 12/30/10 to Wed 1/26/11]																																
73	Drywall Finish & Paint	16 days	Thu 1/13/11	Thu 2/3/11	[Gantt bar from Thu 1/13/11 to Thu 2/3/11]																																

Project: Detailed Project Schedule Date: Tue 10/26/10

Task [Blue bar] Milestone [Diamond] Inactive Summary [Grey bar] Manual Summary [Black bar] Finish-only [White bar] Progress [Grey bar]

Split [Dotted line] Summary [Black bar] Manual Task [Black bar] Start-only [Black bar] Deadline [Green arrow]



ID	Task Name	Duration	Start	Finish																																																
					Quarter		1st Quarter			2nd Quarter			3rd Quarter			4th Quarter			1st Quarter			2nd Quarter			3rd Quarter			4th Quarter			1st Quarter			2nd Quarter			3rd Quarter			4th Quarter												
					Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
181	<b>4th Floor</b>	<b>412 days</b>	<b>Tue 3/9/10</b>	<b>Wed 10/5/11</b>	[Gantt bar spanning from 3/9/10 to 10/5/11]																																															
215	<b>3rd Floor</b>	<b>400 days</b>	<b>Tue 3/16/10</b>	<b>Mon 9/26/11</b>	[Gantt bar spanning from 3/16/10 to 9/26/11]																																															
249	<b>2nd Floor</b>	<b>409 days</b>	<b>Tue 3/23/10</b>	<b>Fri 10/14/11</b>	[Gantt bar spanning from 3/23/10 to 10/14/11]																																															
283	<b>1st Floor</b>	<b>426 days?</b>	<b>Tue 3/30/10</b>	<b>Tue 11/15/11</b>	[Gantt bar spanning from 3/30/10 to 11/15/11]																																															
318	<b>Sitework and Utilities</b>	<b>454 days</b>	<b>Sun 12/13/09</b>	<b>Thu 9/8/11</b>	[Gantt bar spanning from 12/13/09 to 9/8/11]																																															
319	Mobilization	3 days	Sun 12/13/09	Tue 12/15/09	[Gantt bar spanning from 12/13/09 to 12/15/09]																																															
320	Fence Staging/Dumpster/Hoise Area	10 days	Tue 12/15/09	Mon 12/28/09	[Gantt bar spanning from 12/15/09 to 12/28/09]																																															
321	Tree Protection and Relocation of Magnolia Trees	15 days	Wed 12/30/09	Tue 1/19/10	[Gantt bar spanning from 12/30/09 to 1/19/10]																																															
322	Storm & Sewer	185 days	Thu 1/14/10	Wed 9/29/10	[Gantt bar spanning from 1/14/10 to 9/29/10]																																															
323	General Site Demolition (Phased)	270 days	Thu 1/21/10	Wed 2/2/11	[Gantt bar spanning from 1/21/10 to 2/2/11]																																															
324	Site Improvements & Hardscape	345 days	Thu 3/11/10	Wed 7/6/11	[Gantt bar spanning from 3/11/10 to 7/6/11]																																															
325	Ductbank Reconstruction	170 days	Fri 6/11/10	Thu 2/3/11	[Gantt bar spanning from 6/11/10 to 2/3/11]																																															
326	Landscaping	80 days	Sat 5/21/11	Thu 9/8/11	[Gantt bar spanning from 5/21/11 to 9/8/11]																																															
327	<b>EEE</b>	<b>414 days</b>	<b>Mon 1/25/10</b>	<b>Thu 8/25/11</b>	[Gantt bar spanning from 1/25/10 to 8/25/11]																																															
328	<b>Basement (Existing)</b>	<b>70 days</b>	<b>Mon 1/25/10</b>	<b>Fri 4/30/10</b>	[Gantt bar spanning from 1/25/10 to 4/30/10]																																															
329	Dust Partitions (Basement)	5 days	Mon 1/25/10	Fri 1/29/10	[Gantt bar spanning from 1/25/10 to 1/29/10]																																															
330	Empty Basement Storage Area	20 days	Mon 1/25/10	Fri 2/19/10	[Gantt bar spanning from 1/25/10 to 2/19/10]																																															
331	Cut & Cap EEE	15 days	Tue 2/2/10	Mon 2/22/10	[Gantt bar spanning from 2/2/10 to 2/22/10]																																															
332	Demo AHU EEE	20 days	Thu 2/18/10	Wed 3/17/10	[Gantt bar spanning from 2/18/10 to 3/17/10]																																															
333	Demo EEE (Basement Existing)	60 days	Mon 2/8/10	Fri 4/30/10	[Gantt bar spanning from 2/8/10 to 4/30/10]																																															
334	<b>2nd Floor</b>	<b>174 days</b>	<b>Mon 4/26/10</b>	<b>Thu 12/23/10</b>	[Gantt bar spanning from 4/26/10 to 12/23/10]																																															
335	Salvage Roof Pavers for Reuse	5 days	Mon 4/26/10	Fri 4/30/10	[Gantt bar spanning from 4/26/10 to 4/30/10]																																															
336	Steel Framing 2nd Floor EEE	15 days	Mon 5/10/10	Fri 5/28/10	[Gantt bar spanning from 5/10/10 to 5/28/10]																																															
337	Concrete 2nd Floor EEE	7 days	Tue 6/1/10	Wed 6/9/10	[Gantt bar spanning from 6/1/10 to 6/9/10]																																															
338	Concrete up to Strength	15 days	Thu 6/10/10	Wed 6/30/10	[Gantt bar spanning from 6/10/10 to 6/30/10]																																															
339	Set Equipment Pads	5 days	Thu 7/1/10	Wed 7/7/10	[Gantt bar spanning from 7/1/10 to 7/7/10]																																															
340	Set/Connect Switchgear	20 days	Tue 8/3/10	Mon 8/30/10	[Gantt bar spanning from 8/3/10 to 8/30/10]																																															
341	Assemble & Protect Switchgear	10 days	Thu 8/5/10	Wed 8/18/10	[Gantt bar spanning from 8/5/10 to 8/18/10]																																															
342	Set/Connect 5KV Chiller SWGR NW	20 days	Fri 11/26/10	Thu 12/23/10	[Gantt bar spanning from 11/26/10 to 12/23/10]																																															
343	<b>4th Floor</b>	<b>141 days</b>	<b>Thu 6/10/10</b>	<b>Thu 12/23/10</b>	[Gantt bar spanning from 6/10/10 to 12/23/10]																																															
344	Steel Framing 4th Floor EEE	15 days	Thu 6/10/10	Wed 6/30/10	[Gantt bar spanning from 6/10/10 to 6/30/10]																																															
345	Concrete 4th Floor EEE	7 days	Thu 8/5/10	Fri 8/13/10	[Gantt bar spanning from 8/5/10 to 8/13/10]																																															
346	Concrete up to Strength	15 days	Mon 8/16/10	Fri 9/3/10	[Gantt bar spanning from 8/16/10 to 9/3/10]																																															
347	Set Equipment Pads	5 days	Tue 9/7/10	Mon 9/13/10	[Gantt bar spanning from 9/7/10 to 9/13/10]																																															
348	Rigg Generator & Switchgear	2 days	Tue 9/28/10	Wed 9/29/10	[Gantt bar spanning from 9/28/10 to 9/29/10]																																															
349	Assemble & Protect Generator	10 days	Thu 9/30/10	Wed 10/13/10	[Gantt bar spanning from 9/30/10 to 10/13/10]																																															
350	Set/Connect Generators 1,2,3	30 days	Thu 10/14/10	Wed 11/24/10	[Gantt bar spanning from 10/14/10 to 11/24/10]																																															
351	Set/Connect Switchgear & Transformers	20 days	Fri 11/26/10	Thu 12/23/10	[Gantt bar spanning from 11/26/10 to 12/23/10]																																															
352	<b>Roof</b>	<b>98 days</b>	<b>Tue 9/7/10</b>	<b>Thu 1/20/11</b>	[Gantt bar spanning from 9/7/10 to 1/20/11]																																															
353	Steel Framing Roof EEE	15 days	Tue 9/7/10	Mon 9/27/10	[Gantt bar spanning from 9/7/10 to 9/27/10]																																															
354	Install Louver Framing EEE	15 days	Tue 9/28/10	Mon 10/18/10	[Gantt bar spanning from 9/28/10 to 10/18/10]																																															
355	Concrete Roof EEE	7 days	Tue 10/19/10	Wed 10/27/10	[Gantt bar spanning from 10/19/10 to 10/27/10]																																															

Project: Detailed Project Schedule Date: Tue 10/26/10

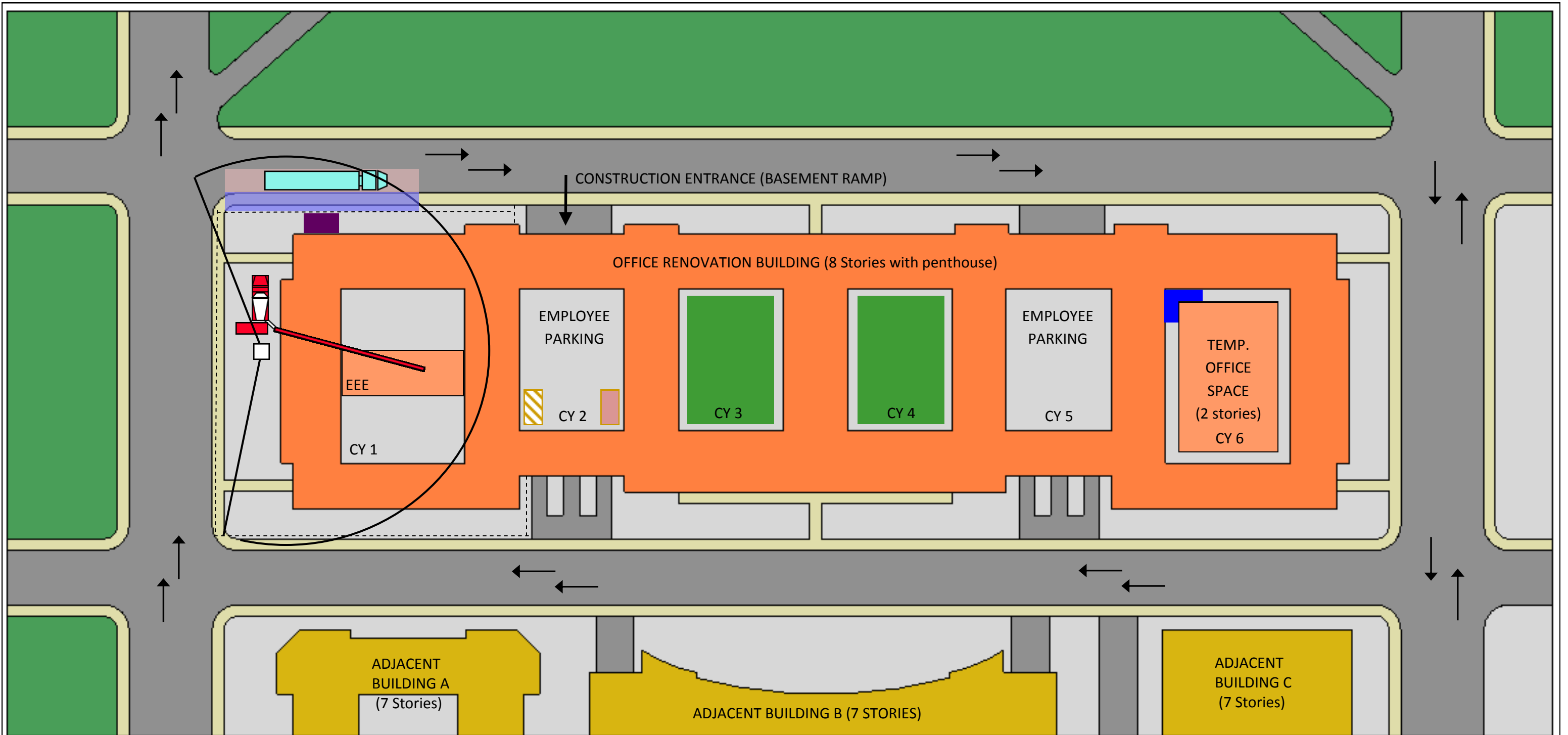
Task Milestone Inactive Summary Manual Summary Finish-only Progress Split Summary Manual Task Start-only Deadline







**[APPENDIX B]**  
**SITE UTILIZATION PLAN:**  
**EEE ERECTION PLAN**



**OFFICE RENOVATION BUILDING  
NORTHEAST, UNITED STATES**

BUILDING & STREET NAMES HAVE NOT BEEN LISTED AT THE REQUEST OF THE OWNER

**LEGEND:**

- CONSTRUCTION FENCE
- VHCULAR TRAFFIC
- GC OFFICE/TRAILER
- SUPERINTENDENT PARKING
- MATERIAL HOIST
- COVERED WALKWAY
- RESERVED LANE FOR DELIVERY
- STEEL DELIVERY TRAILER
- CONCRETE TRUCK & PUMP
- MATERIAL WASTE CONTAINERS (BASEMENT LEVEL)

**SITE UTILIZATION PLAN: EEE ERECTION PLAN**

PROJECT NUMBER: 001-01

OCTOBER 25, 2010

DRAWN BY: ANTHONY JURJEVIC

CHECKED BY:

SCALE: NTS



[APPENDIX C]  
DETAILED STRUCTURAL SYSTEM ESTIMATE

STRUCTURAL STEEL ESTIMATE TAKE-OFF CHARTS						
<b>Columns</b>						
	Metric	Type	Unit	Length (ft)	Quantity	Total
All Floors	W310x97	W12x65	LF	30	17	510
	W310x107	W12x72	LF	30	6	180
<b>Beams</b>						
	Metric	Type	Unit	Length (ft)	Quantity	Total
2nd Floor	W250x18	W10x12	LF	10.5	13	136.5
	W310x21	W12x14	LF	3.5	6	21
	W310x21	W12x14	LF	5	4	20
	W310x23	W12x16	LF	6.5	4	26
	W310x23	W12x16	LF	19	41	779
	W360x33	W14x22	LF	19	15	285
	W460x52	W18x35	LF	19	2	38
	W610x82	W24x55	LF	6.5	2	13
	W610x82	W24x55	LF	7.5	2	15
	W610x82	W24x55	LF	15	6	90
	W610x101	W24x68	LF	18.5	5	92.5
	W610x101	W24x68	LF	19	4	76
	W610x113	W24x76	LF	19	14	266
	W610x125	W24x84	LF	18.5	5	92.5
	W610x140	W24x94	LF	17.5	2	35
	W610x140	W24x94	LF	22	5	110
		Metric	Type	Unit	Length (ft)	Quantity
4th Floor	W310x21	W12x14	LF	8.5	9	76.5
	W360x33	W14x22	LF	17.5	24	420
	W360x33	W14x22	LF	17	24	408
	W360x33	W14x22	LF	18	12	216
	W360x58	W14x38	LF	13.5	2	27
	W410x46	W16x31	LF	5.5	1	5.5
	W410x46	W16x31	LF	15	1	15
	W410x46	W16x31	LF	3	1	3
	W460x52	W18x35	LF	17	4	68
	W460x52	W18x35	LF	8.5	5	42.5
	W460x74	W18x50	LF	18	2	36
	W530x66	W21x44	LF	17	3	51
	W690x125	W27x84	LF	15.5	2	31
	W690x125	W27x84	LF	18	3	54
	W690x125	W27x84	LF	30	3	90

	Metric	Type	Unit	Length (ft)	Quantity	Total
<b>Roof</b>	W310x21	W12x14	LF	8.5	2	17
	W310x45	W12x30	LF	8.5	2	17
	W360x33	W14x22	LF	8	4	32
	W460x52	W18x35	LF	17	4	68
	W460x52	W18x35	LF	17.5	4	70
	W460x52	W18x35	LF	18.5	2	37
	W460x60	W18x40	LF	15	2	30
	W460x60	W18x40	LF	17	2	34
	W460x60	W18x40	LF	18.5	4	74
	W610x82	W24x55	LF	48	14	672
<b>Metal Decking</b>						
	Type		Unit	Area	Floors	Total
<b>2,4, &amp; Roof</b>	20 Ga. Galv. G60		SF	6585	3	19755

<b>CAST-IN-PLACE CONCRETE ESTIMATE TAKE-OFF CHART</b>							
<b>Elevated Slab On Grade (3000psi)</b>							
	ID	Depth (Ft)	Area (SF)	Reinforcing	Concrete (CY)	WWF Total (CSF)	Formwork (SFCA)
<b>2nd Floor</b>	S2-1	0.46	1067	6x6 W2.9xW2.9 WWF	19.0	11.0	66.0
	S2-2	0.46	1067	6x6 W2.9xW2.9 WWF	19.0	11.0	66.0
	S2-3	0.46	1250	6x6 W2.9xW2.9 WWF	22.0	13.0	70.0
	S2-4	0.46	1067	6x6 W2.9xW2.9 WWF	19.0	11.0	66.0
	S2-5	0.46	1067	6x6 W2.9xW2.9 WWF	19.0	11.0	66.0
	S2-6	0.46	1067	6x6 W2.9xW2.9 WWF	19.0	11.0	66.0
<b>4th Floor</b>	S4-1	0.46	1067	6x6 W2.9xW2.9 WWF	19.0	11.0	66.0
	S4-2	0.46	1067	6x6 W2.9xW2.9 WWF	19.0	11.0	66.0
	S4-3	0.46	1250	6x6 W2.9xW2.9 WWF	22.0	13.0	70.0
	S4-4	0.46	1067	6x6 W2.9xW2.9 WWF	19.0	11.0	66.0
	S4-5	0.46	1067	6x6 W2.9xW2.9 WWF	19.0	11.0	66.0
	S4-6	0.46	1067	6x6 W2.9xW2.9 WWF	19.0	11.0	66.0
<b>Roof</b>	SR-1	0.33	1067	6x6 W2.9xW2.9 WWF	14.0	11.0	48.0
	SR-2	0.33	1067	6x6 W2.9xW2.9 WWF	14.0	11.0	48.0
	SR-3	0.33	1250	6x6 W2.9xW2.9 WWF	16.0	13.0	52.0
	SR-4	0.33	1067	6x6 W2.9xW2.9 WWF	14.0	11.0	48.0
	SR-5	0.33	1067	6x6 W2.9xW2.9 WWF	14.0	11.0	48.0
	SR-6	0.33	1067	6x6 W2.9xW2.9 WWF	14.0	11.0	48.0

CAST-IN-PLACE CONCRETE ESTIMATE PRICING									
Description	Div. No	Quantity	Unit	Bare Material	Bare Labor	Bare Equipment	Bare Total	Total O & P	Total Cost
<b>REBAR</b>									
Elevated Slabs	03 22 05.500300	204	CSF	\$ 23.10	\$ 23.20	\$ -	\$ 46.30	\$ 48.15	\$ 9,823.01
<b>CONCRETE</b>									
Elevated Slabs (3,000 PSI)	03 31 05.350150	320	CY	\$ 121.02	\$ 14.31	\$ 5.98	\$ 141.31	\$ 146.96	\$ 47,026.97
<b>FORMWORK</b>									
Elevated Slabs	03 11 13.357070	1092	SFCA	\$ 1.27	\$ 6.91	\$ -	\$ 8.18	\$ 8.51	\$ 9,289.86
								<b>TOTAL ESTIMATE:</b>	<b>\$ 66,139.84</b>

STRUCTURAL STEEL ESTIMATE PRICING									
Description	Div. No	Quantity	Unit	Bare Material	Bare Labor	Bare Equipment	Bare Total	Total O & P	Total Cost
<b>COLUMNS</b>									
W12x65	05 12 23.751700	510	LF	\$ 83.80	\$ 3.84	\$ 2.16	\$ 89.80	\$ 93.39	\$ 47,630.19
W12x72	05 12 23.751700	180	LF	\$ 92.65	\$ 4.14	\$ 2.53	\$ 99.32	\$ 103.29	\$ 18,592.52
								<b>TOTAL:</b>	<b>\$ 66,222.70</b>
<b>BEAMS</b>									
W10x12	05 12 23.750600	137	LF	\$ 15.46	\$ 4.42	\$ 2.70	\$ 22.58	\$ 23.48	\$ 3,217.03
W12x14	05 12 23.750600	135	LF	\$ 20.61	\$ 3.01	\$ 1.84	\$ 25.46	\$ 26.48	\$ 3,574.84
W12x16	05 12 23.750600	805	LF	\$ 20.61	\$ 3.01	\$ 1.84	\$ 25.46	\$ 26.48	\$ 21,316.62
W12x30	05 12 23.750600	17	LF	\$ 39.30	\$ 3.11	\$ 1.90	\$ 44.31	\$ 46.08	\$ 783.36
W14x22	05 12 23.751900	1361	LF	\$ 33.31	\$ 2.68	\$ 1.64	\$ 37.63	\$ 39.14	\$ 53,265.84
W14x38	05 12 23.752320	27	LF	\$ 52.05	\$ 3.27	\$ 2.00	\$ 57.32	\$ 59.61	\$ 1,609.55
W16x31	05 12 23.752320	24	LF	\$ 40.08	\$ 2.95	\$ 1.80	\$ 44.83	\$ 46.62	\$ 1,118.92
W18x35	05 12 23.751700	290	LF	\$ 45.28	\$ 3.99	\$ 1.80	\$ 51.07	\$ 53.12	\$ 15,403.77
W18x40	05 12 23.753500	138	LF	\$ 51.53	\$ 3.99	\$ 1.80	\$ 57.32	\$ 59.61	\$ 8,226.49
W18x50	05 12 23.751700	36	LF	\$ 163.44	\$ 6.54	\$ 5.49	\$ 175.47	\$ 182.49	\$ 6,569.48
W21x44	05 12 23.754100	51	LF	\$ 56.73	\$ 3.60	\$ 1.63	\$ 61.96	\$ 64.44	\$ 3,286.60
W24x55	05 12 23.751700	790	LF	\$ 181.13	\$ 7.14	\$ 6.23	\$ 194.50	\$ 202.28	\$ 159,804.49
W24x68	05 12 23.755700	170	LF	\$ 97.85	\$ 3.45	\$ 1.56	\$ 102.86	\$ 106.98	\$ 18,186.36
W24x76	05 12 23.751700	266	LF	\$ 198.83	\$ 7.74	\$ 6.97	\$ 213.54	\$ 222.08	\$ 59,073.98
W24x84	05 12 23.755700	93	LF	\$ 108.26	\$ 3.55	\$ 1.60	\$ 113.41	\$ 117.95	\$ 10,969.40
W24x94	05 12 23.755720	145	LF	\$ 120.76	\$ 3.55	\$ 1.60	\$ 125.91	\$ 130.94	\$ 18,986.62
W27x84	05 12 23.755800	90	LF	\$ 108.26	\$ 3.22	\$ 1.45	\$ 112.93	\$ 117.45	\$ 10,570.62
								<b>TOTAL:</b>	<b>\$ 395,963.97</b>
<b>METAL DECKING</b>									
20 Ga. G60	05 31 13.505140	19755	SF	\$ 1.71	\$ 0.52	\$ 0.04	\$ 2.27	\$ 2.36	\$ 46,637.60
								<b>TOTAL:</b>	<b>\$ 46,637.60</b>
								<b>TOTAL ESTIMATE:</b>	<b>\$ 508,824.28</b>

**[APPENDIX D]**  
**GENERAL CONDITIONS ESTIMATE**

\*\*\*This Appendix has been omitted from this publication\*\*\*

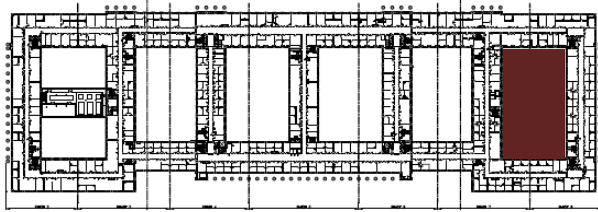


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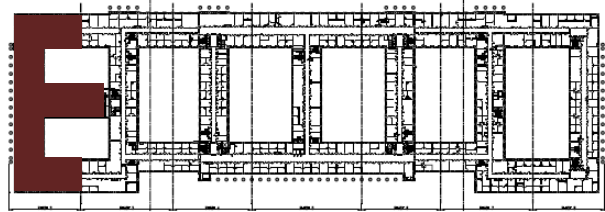
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**[APPENDIX E]**  
**PHASE SEQUENCING**

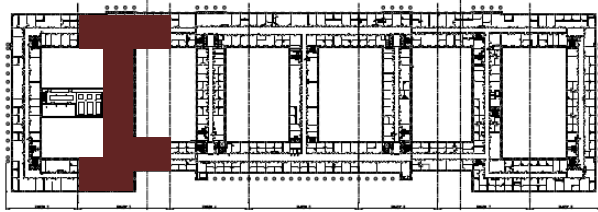
The images below illustrate the phase sequencing of construction. Phase 1 consisted of an office space for building occupants to relocate to when their building sections are under construction.



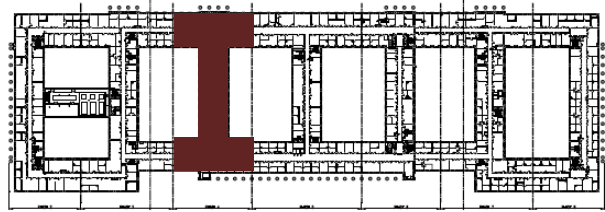
**Phase 1:** Construction of new temporary office space in courtyard 6 to house relocated occupants



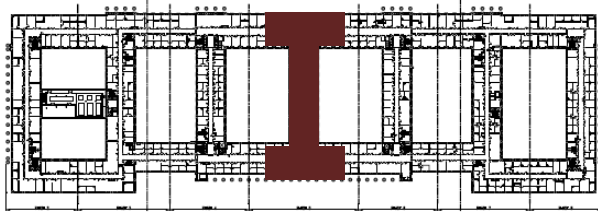
**Phase 2:** New MEP Infrastructure including chiller plant and new Electrical Equipment Enclosure in courtyard 1. Complete façade restoration and office renovations on 7 floors



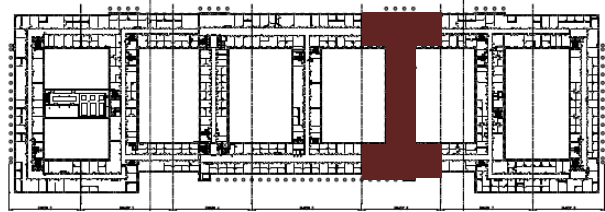
**Phase 3:** System replacement on all floors and repaving of courtyard 2



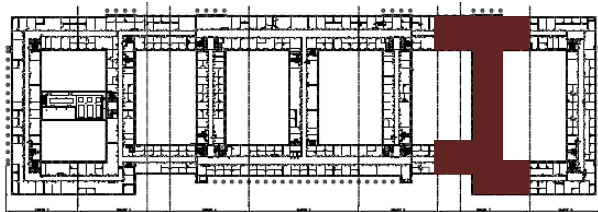
**Phase 4:** System replacement on all floors



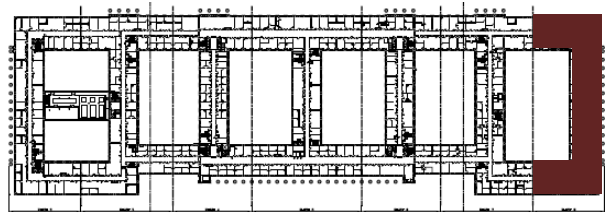
**Phase 5:** System replacement on all floors including auditorium, main entrance lobby, and mass transit tunnel



**Phase 6:** System replacement on all floors and courtyard 5 loading dock part 1



**Phase 7:** System replacement on all floors and courtyard 5 loading dock part 2



**Phase 8:** System replacement on all floors and tourist visitor center upgrades

