Technical Report II

U.S. General Services Administration Headquarters Modernization Phase I

1800 F St. NW, Washington, D.C.

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Technical Report II

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October 12, 2012

EXECUTIVE SUMMARY

The purpose of Technical Report II is to analyze the chief features of the U.S. General Services Administration Headquarters Modernization. Located on 1800 F Street NW, Washington, D.C., this project consists of two phases, with this report focusing primarily on Phase 1. Technical Report II will analyze the primary conditions that affect project execution.

The General Services Administration Headquarters was originally built in 1917 and updated in 1935. It is renowned for its role in the architectural development of the federal office building type and its neoclassical style. Primarily used as an office building, the existing structure includes nine stories at approximately 724,000 square feet, with an additional 134,000 square feet of new office space in the building's courtyards. This project includes the replacement of interior finishes, preservation of historic features, and upgrade of all building systems.

After developing and reviewing the project schedule, it was concluded that the project team approached this project in an efficient manner. After the initial sitework and demolition was completed, the foundation and structure for the New Addition started. During this time, the rough-ins and finishes for both Wing 1 and Wing 2 were worked on, maximizing productivity.

The detailed structural estimate totaled to $3,952,648.04, which is shy of the actual costs by about 24%. However, the reason for this shortcoming is because the estimated costs for the caissons were approximately 72% less than the actual costs. Estimated costs for concrete fell short of the actual costs by only 3.7%, which is fairly accurate. Similarly, the general conditions estimate produced reasonable values, as the estimated costs were about 10% lower than the actual costs.

The Building Information Modeling (BIM) Use Evaluation exposed the deficiency of BIM utilized on the project. The primary uses of BIM on the General Services Administration include 3D coordination, which was mainly used for the clash detection of MEP systems, and engineering analysis for value engineering.

Numerous constructability challenges imposed complications throughout the project. Three of the top challenges include the atrium steel, demolition and hazardous material, and site congestion. However, the project team was able to overcome these challenges with proper preparation, planning, and personnel.

After evaluating the key facets of Technical Report II, it was concluded that it may be favorable for the project team to analyze more methods to accelerate the schedule and reduce cost. Further examination may determine that more implementation of BIM, such as site utilization planning and 4D Modeling, may be beneficial.

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DETAILED PROJECT SCHEDULE

- ***To view the Detailed Project Schedule, please reference Appendix A.***

OVERVIEW

The Detailed Project Schedule, which is available in Appendix A, illustrates the major phases of construction for the General Services Administration Headquarters Modernization. Included in the schedule are key milestones and phasing relationships. The schedule summary contains three main stages of the project:

- Design & Preconstruction Phase
- Construction Phase
- Final Closeout

DESIGN & PRECONSTRUCTION PHASE

The Design and Preconstruction Phase consists of 708 days and includes activities such as the Administrative Notice to Proceed and the Demolition/Abatement Plan. The project was awarded to Whiting-Tuner/Walsh Joint Venture on September 15, 2010. Additionally, the Procurement of Construction Services lasts 533 days and overlaps into the Construction Phase before ending on November 14, 2012.

CONSTRUCTION PHASE

The Construction Phase is broken down into five phases of work, which overlap each other throughout the project. These phases are the New Addition, Wing 1, Wing 2, Exterior, and Final Sitework. Since Wing 1 and Wing 2 are mainly being renovated in the interior, the Initial Sitework/Demolition is listed under the New Addition. The schedule for the New Addition also contains the erection of the Structure, Rough-Ins, Finishes, Chiller Plant, and Loading Dock.

Wing 1 and Wing 2 contain the Rough-Ins and Finishes as well as the construction of the Elevators, Steam Plant, and the Electric, Mechanical, and Communication Rooms. The New Addition and both Wings were worked on simultaneously. The durations of Wing 1 and Wing 2 are 238 days and 288 days, respectively.

The other phases of the Construction Phase include the Exterior and Final Sitework. The Exterior phase consists of the Exterior Renovation and Rooftop Work. Activities under the Exterior Renovation include the restoration of masonry and salvaged stone as well as the stripping and priming of the windows and window frames. The Exterior lasts 310 days to complete, while the Final Sitework lasts 97 days.

FINAL CLOSEOUT

The Final Closeout takes 35 days for the General Services Administration Headquarters Modernization. Included in this phase are the Trade and Building Final Inspections and Final Punch List. The Substantial Completion for the project is on April 15, 2013, while the Final Completion is set for May 20, 2013. The Project Schedule Overview can be seen in Figure 1.

	Duration	Start Date	Finish Date
Design & Preconstruction Phase	708	3/8/2010	11/14/2012
Construction Phase	547	3/10/2011	4/5/2013
New Addition	543	3/10/2011	4/1/2013
Initial Sitework/Demolition	184	3/10/2011	11/22/2011
Structure	239	11/23/2011	10/15/2012
Rough-Ins	155	5/14/2012	12/12/2012
Finishes	204	6/20/2012	4/1/2013
Wing 2	288	2/28/2012	3/28/2013
Rough-Ins & Finishes	288	2/28/2012	3/28/2013
Wing 1	238	5/5/2012	3/28/2013
Rough-Ins & Finishes	238	5/5/2012	3/28/2013
Exterior	310	11/1/2011	12/31/2012
Exterior Renovation	187	4/20/2012	12/31/2012
Final Sitework	97	11/22/2012	4/5/2013
Final Closeout	35	4/2/2013	5/20/2013
TOTAL	836	3/8/2010	5/20/2013

Figure 1: Project Schedule Overview – Developed by Ramuel Holgado

DETAILED STRUCTURAL SYSTEMS ESTIMATE

- ***To view the Structural Quantity Takeoffs, please reference Appendix B-1.***
- ***To view the Detailed Structural Systems Estimate, please reference Appendix B-2.***

OVERVIEW

The Detailed Structural Systems Estimate was performed on the New Addition of the General Services Administration Headquarters. Since this project is a renovation, the structural system for Wing 1 and Wing 2 were already in place. There were some areas in Wing 2 near the new elevator shaft where lightweight cast-in-place concrete on composite steel decking was used; however, these areas were not estimated for the purposes of this exercise because of its location outside of the New Addition. The New Addition was constructed using caissons and grade beams, concrete beams, slab-on-grade, columns, and elevated slabs. Furthermore, the New Addition was constructed entirely of cast-in-place concrete and steel reinforcing and did not contain any structural steel or structural masonry components.

FOUNDATION (CAISSONS & GRADE BEAMS)

The 25 caissons were driven approximately 75 to 80 feet below grade and were designed to be located beneath the loads of all the grade beams, which helped transfer the column loads. Grade beams required job-built plywood formwork and 3500 psi normal weight cast-in-place concrete with uncoated reinforcing steel. Each caisson used 4000 psi normal weight cast-in-place concrete along with epoxy-coated rebar. Additionally, all concrete was placed using a concrete pump truck.

CONCRETE BEAMS

Multiple concrete beams were used from the Ground Floor up to the Seventh Floor mainly along the perimeter of the New Addition. The spans of the concrete beams ranged from 10 feet to over 50 feet. Every component used job-built plywood formwork and 3500 psi normal weight cast-in-place concrete poured with a concrete pump truck. Reinforcing included a mix of #7 and #8 uncoated reinforcing steel.

SLAB-ON-GRADE

The slab-on-grade required edge forms before 4000 psi normal weight cast-in-place concrete was poured using a concrete pump truck. Multiple sheets of 6 x 6 W2.9 x W2.9 welded wire fabric was used to reinforce the 5-inch slab-on-grade. Per the specifications, all slabs in the New

Addition were required to be finished. Therefore, a ride-on machine float and trowel was used on the concrete surface.

COLUMNS

Columns sizes varied throughout the New Addition, but mainly consisted of 24”x24” and 24”x30” columns. Job-built plywood formwork was used along with 4000 psi normal weight cast-in-place concrete, which was poured using a concrete pump truck. All columns were reinforced with #7, #8, or #10 rebar. Each column remained the same size throughout the entire height of the building to prevent using different sizes of formwork.

ELEVATED SLABS

Elevated slabs for each floor averaged approximately 8000 square feet. Edge forms were used before 4000 psi normal weight cast-in-place concrete was poured with a concrete pump truck. In addition, uncoated reinforcing steel was used on all elevated slabs. The elevated slabs were then finished using a ride-on machine float and trowel.

ANALYSIS

As mentioned previously, the Detailed Structural Systems Estimate was for the New Addition only and may be found in Appendix B-2. All assumptions for this estimate are stated in the section below. The takeoffs were organized by CSI Masterformat and include Division 03 – Concrete and Division 31 – Earthwork, which was used for the caissons. The Detailed Structural Systems Estimate was compiled using RSMeans 2012 and adjusted for Washington, D.C. Waste factor for concrete and reinforcing steel were also taken into account and is reflected in the totals. The CSI Masterformat Estimate Summary can be observed in Table 1.

Table 1: CSI Masterformat Estimate Summary – Developed by Ramuel Holgado

Line Number	Description	Cost
03 11	Forms In Place	$ 271,433.89
03 21	Reinforcing Steel	$ 607,921.13
03 22	Welded Wire Fabric	$ 6,633.14
03 30	Cast-In-Place Concrete	$ 2,597,790.66
03 35	Concrete Finishing	$ 28,074.99
31 63	Caissons	$ 440,794.23
TOTAL		**$ 3,952,648.04**

The total for the Detailed Structural Estimate is $3,952,648.04. This includes all adjustment factors aforementioned. As expected, a majority of the cost estimate was cast-in-place concrete with an estimated value of just under $2.6M. The next largest components were the reinforcing steel at just over $600,000 followed by the caissons at around $440,000. The Detailed Structural Systems Estimate Breakdown can be found in Figure 2.

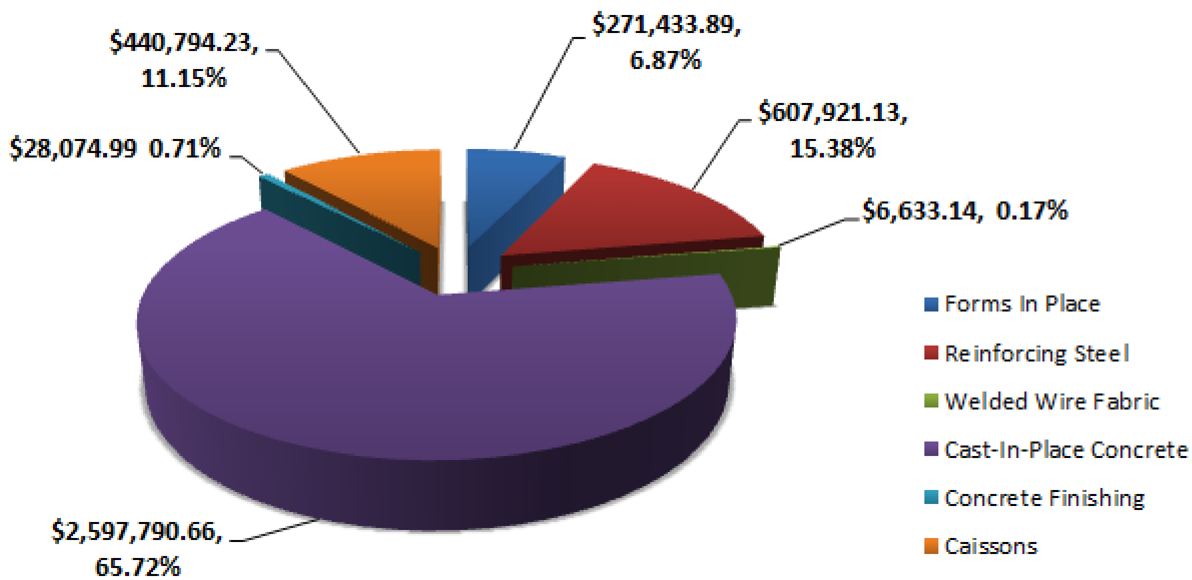


Figure 2: Detailed Structural Systems Estimate Breakdown – Developed by Ramuel Holgado

The Detailed Structural System Estimate was shy of the actual cost of $5,207,530 by 24%, which is roughly $1.2M. However, the estimated cost and actual cost of the concrete varied only by approximately $135,000, or about 3.7%, while their square foot costs were $48.78 and $50.67, respectively. The large difference between the estimated cost and actual cost is mainly due to the caissons. The estimated cost of $440,000 for caissons was short of the actual cost of $1,560,000 by 71.7%. This increased the difference between the total square foot costs of the estimated and actual costs, which were $54.91 and $72.34, respectively. The Structural Systems Comparison can be seen in Table 2.

Table 2: Structural Systems Comparison – Developed by Ramuel Holgado

Line Item	Actual Cost	Actual Cost/SF	Estimated Cost	Estimated Cost/SF
Concrete	$ 3,647,530.00	$ 50.67	$ 3,511,853.81	$ 48.78
Caissons	$ 1,560,000.00	$ 21.67	$ 440,794.23	$ 6.12
TOTAL	**$ 5,207,530.00**	**$ 72.34**	**$ 3,952,648.04**	**$ 54.91**

The estimated cost of the caissons may have been short of the actual cost because there were limited options available in RSMeans. It was assumed that the soil was stable ground, but in reality, the soil may have imposed more complications. Moreover, the estimated cost of the caissons did not include mobilization, boulder removal, or disposal. In addition, as stated before, the estimated and actual cost of the concrete may have varied by only a small amount; however, the estimate was only for the New Addition, while the actual cost includes the work done in Wing 2 near the new elevator shaft, as aforementioned. With these differences aside, the estimated cost of the structural systems appears to be reasonable and relatively accurate.

ASSUMPTIONS

- Total for concrete includes 10% waste
- Total for reinforcement includes 5% waste
- Time and Location Factors were taken into account with the RSMeans values
- All estimated items were matched to the closest possible Code in RSMeans
- Averaged dimensions were used for beam and column forms in RSMeans
- 24” x 24” column prices were used for all columns in RSMeans
- Epoxy-Coated Reinforcing Steel were used for grade beams and caissons in RSMeans
- When numerous sizes of reinforcing steel were used for a slab in one direction, the largest size was used for the purposes of this estimate
- All cast-in-place concrete was placed with a pump
- Detailed Structural Systems Estimate is for the New Addition only

GENERAL CONDITIONS ESTIMATE

- ***To view the General Conditions Estimate, please reference Appendix C.***

The General Conditions Estimate for the General Services Administration Headquarters Modernization can be broken down into three cost categories:

- Personnel
- Site Expenses
- Miscellaneous Costs

The Personnel category of the General Conditions estimate includes all members of the Project Team for the Whiting-Turner/Walsh Joint Venture. Included in the Site Expenses category are all costs associated with the site office, jobsite operations, and temporary utilities. The Miscellaneous Costs category is comprised of insurance, bonds, and labor escalation. Exclusions from the estimate include home office overhead. A General Conditions Estimate Summary can be found in Table 3.

Table 3: General Conditions Estimate Summary – Developed by Ramuel Holgado

Cost Category	Total Cost	Cost/Week	Percentage of GC Cost
Personnel	$ 2,609,488.88	$ 25,091.24	47.67%
Site Expenses	$ 1,495,487.68	$ 14,379.69	27.32%
Miscellaneous Costs	$ 1,368,905.09	$ 13,162.55	25.01%
TOTAL	**$ 5,473,881.65**	**$ 52,633.48**	

The General Conditions Estimate was created using rates from RSMeans; however, known actual rates were used for line items instead of estimated rates when available. The General Conditions Estimate of $5,473,881.65 was approximately 9.97% lower than the actual General Conditions cost of $6,079,893.00.

The difference between the estimated and actual General Conditions costs may be due to the fact that the estimated weekly rates of the Personnel may not have matched the actual rates. In addition, the quantities for the line items were all estimated and may not reflect the actual quantities used on the project. Furthermore, the percentage costs of the General Liability and Builders Risk Insurance and the Payment and Performance Bonds were estimated using RSMeans and adjusted to better match the actual rates, but still may vary from the actual costs on the project.

In conclusion, the weekly cost for the General Conditions Estimate is $52,633.48. As seen in Figure 3, the Personnel costs account for a majority of the General Conditions costs, at 47.67%, while the Site Expenses and Miscellaneous Costs amount to 27.32% and 25.01%, respectively. Overall, the General Conditions are estimated to cost approximately 6.33% of the $86,412,506.00 project, which is about average with a typical construction project. Although renovation projects may typically have higher percentages of General Conditions costs when compared to new construction projects, the relatively average General Conditions percentage on this project may be due to the construction of the New Addition as well as the expensive and advanced MEP system to be installed. With that said, it is crucial to understand the importance of keeping up with project schedule to avoid any added expenses.

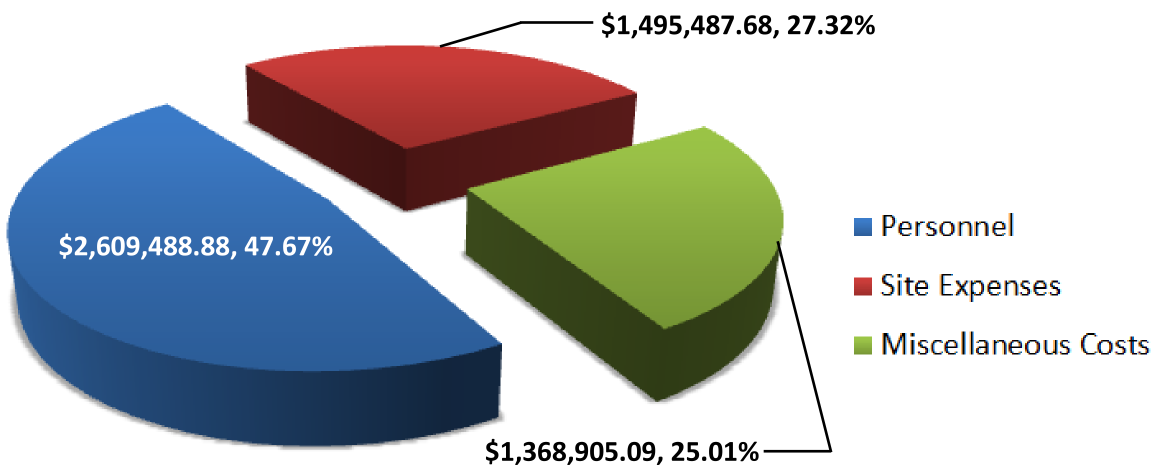


Figure 3: General Conditions Estimate by Percentages – Developed by Ramuel Holgado

BUILDING INFORMATION MODELING (BIM) USE EVALUATION

- ***To view the BIM Use List, please reference Appendix D-1.***
- ***To view the BIM Level 1 Process Map, please reference Appendix D-2.***

The General Services Administration Headquarters Modernization implemented a limited amount of Building Information Modeling (BIM) uses throughout the course of the project. The primary uses of BIM were in the Schematic Design and Design Development; however, additional uses of BIM were utilized during the construction phase, but were kept to a minimum due to the limited training and experience available on site. With that said, the key goals for the implementation of BIM on the project were to reduce schedule and cost, while increasing quality of construction.

One of the main BIM uses on the project was Engineering Analysis, which used the BIM model to decide the most efficient and methodical engineering procedures based on the specifications of design. This resulted in the value engineering of several aspects of the project, such as the light fixtures.

Another BIM use utilized on the General Services Administration Headquarters Modernization was 3D Coordination, which was mainly used for the MEP systems in the design and construction phase. This process was primarily used for clash detection to determine conflicts in the field by comparing 3D models of the different systems installed in the building. Figure 4 illustrates a 3D model used for the coordination of the MEP systems on the fifth floor of the General Services Administration Headquarters.

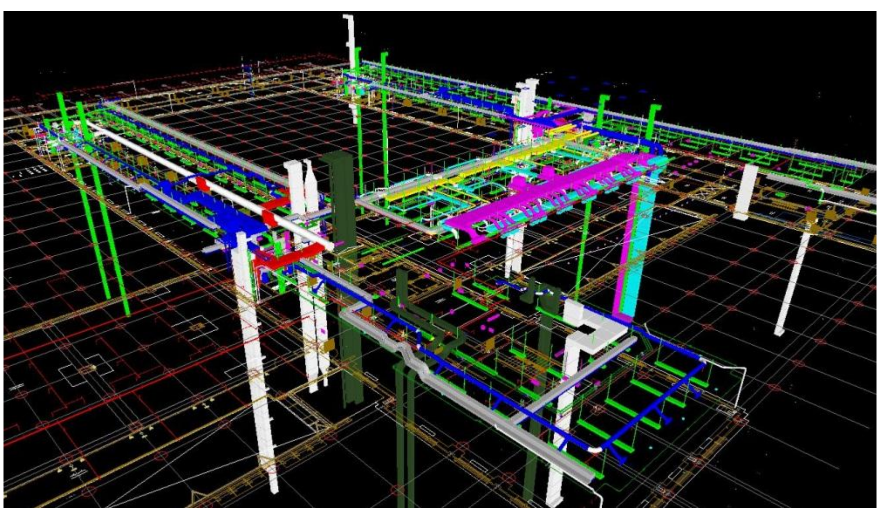


Figure 4: 3D Coordination of MEP Systems –
Courtesy of the Whiting-Turner/Walsh Joint Venture

Some of the advantageous BIM uses that were excluded from the project include Site Utilization Planning and 4D Modeling. Due to the very limited space on site, planning for each phase of construction was critical. Site Utilization Planning would allow the graphical representations of the permanent and temporary facilities on site during each phase of construction. It would also allow the linking of construction activities, labor resources, materials, and equipment locations. Visualizing the spatial relationship between objects along with the management of time and safety in the field would be increasingly beneficial to the project, especially as space becomes more limited.

Overall, the BIM uses on the General Services Administration may have been minimal, but the combination of the increased collaboration and industry experience among the members of the project team negated several of the adverse effects of not heavily utilizing BIM on a project.

CONSTRUCTABILITY CHALLENGES

The General Services Administration Headquarters Modernization contained numerous constructability challenges. Some of these challenges relate to industry issues such as disputes over the Project Labor Agreement. The following issues, however, relate more directly to the building and construction site. The top three unique and challenging constructability issues on the project are:

- Atrium Steel
- Demolition and Hazardous Material
- Site Congestion

ATRIUM STEEL

The atrium steel is located at the southern façade of the New Addition. It contains seven 60-foot built-up truss columns consisting of HSS 5x5x3/8 members that are connected to 27-foot roof trusses. A seated connection will be used to attach the roof trusses to the concrete beam on the Seventh Floor of the New Addition. A 90-ton hydraulic truck crane, which will be located on E Street NW, will erect the atrium steel into place. When fully erected, the lower 16 feet of the truss columns will be encased in concrete and enclosed by a curtain wall system, as shown in Figure 5.

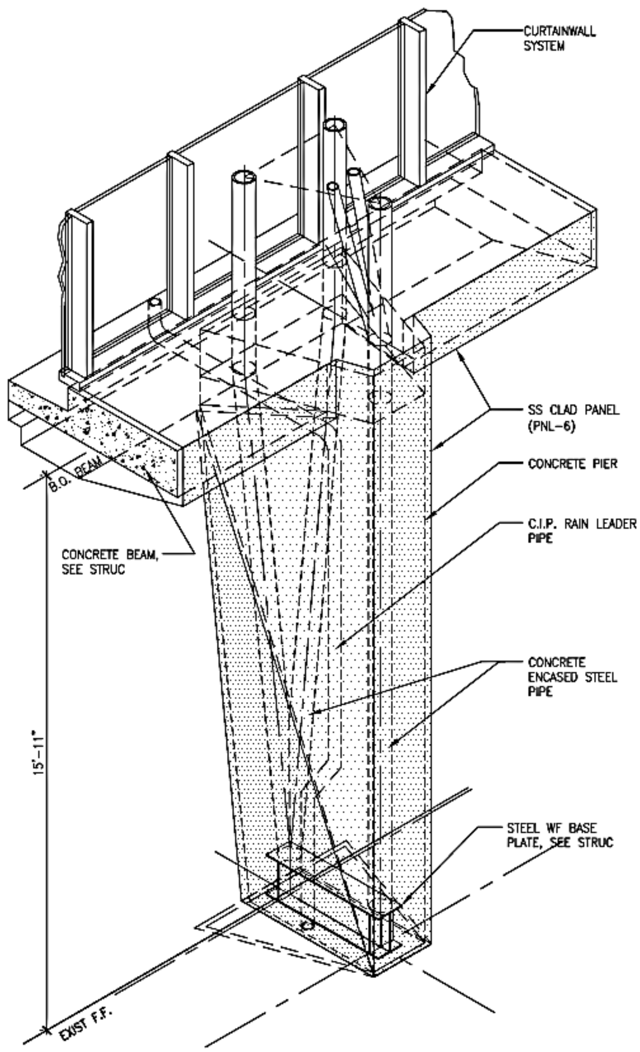


Figure 5: Axonometric of Typical Pier – Courtesy of the Whiting-Turner/Walsh Joint Venture

The main challenges of the atrium steel include the delivery of the trusses and the coordination of the 5-ton tower crane with the 90-ton hydraulic truck crane. Due to the nature of the tight and congested streets of downtown Washington, D.C., the delivery of 60-foot truss columns proved to be somewhat troublesome. When the truck deliveries arrived, the portion of E Street NW behind the building was shut down, while a certified flagger would direct oncoming traffic and pedestrians away from the delivery and toward 18th Street NW. The hydraulic truck crane would then lift each individual truss off the truck bed and place it safely on site before erecting them on the New Addition. Since the hydraulic truck crane was situated next to the tower crane during the erection of the trusses and had overlapping swing radiuses, coordination between the cranes was absolutely crucial.

To overcome these challenges, the project team had to be well prepared. Proper personnel were needed to direct traffic during deliveries and signal the crane operators during the erection of the steel. Construction work taking place near the cranes during these critical activities were put on hold to prevent overhead loads. Due to a lack of 4D modeling and 3D coordination, the project team had to coordinate these activities carefully to prevent any damage or injuries.

DEMOLITION AND HAZARDOUS MATERIAL

The demolition and removal of hazardous material remained an arduous task on the site, particularly during the early stages of construction. Since the building was originally constructed in 1917, it contained lead-based paint and asbestos on every existing floor. Additionally, the East Courtyard contained four buildings that were to be demolished before the foundation of the New Addition could begin.

These four buildings were first removed of lead-based paint and asbestos before they could be demolished. Due to the limited space on site, all other construction activities in the East Courtyard were stopped while the demolition took place. Often times, the demolition of these four buildings took place at night time, to avoid any conflicts with other construction activities. Figure 6 shows the demolition of one of the buildings in the East Courtyard.

Figure 6: Demolition in the East Courtyard – Courtesy of the Whiting-Turner/Walsh Joint Venture

The demolition of the interiors of the existing building was composed of several items including the entire MEP system, elevator shafts, and walls. Wires and pipes were checked to ensure they were not hot before demolition. Certain doors and door frames, especially in the north ends of Wing 1 and Wing 2, were designated as historic; therefore, the project team planned and coordinated ahead of time to ensure that these items would be preserved.

As mentioned previously, lead-based paint and asbestos were located on every floor of the existing building. Each floor was shut down one wing at a time to strip all the lead and asbestos before work could begin on that particular floor. If lead or asbestos was suspected at a later point of construction, that area would be roped off and removed of any hazardous material before work could start up again. This work was often done at night time when the only crew on site would be from the Hazardous Material Subcontractor. Figure 7 shows a typical protective suit that a worker must wear when removing hazardous material.

The project team approached this challenge strategically and carefully. Preparation was done weeks in advance to ensure that the proper means and methods were implemented. Plans and details of the demolition and hazardous materials drawings were studied thoroughly by members of the project team. Quality control and safety management were two extremely important aspects during this phase of construction to ensure that all activities were done correctly and safely.

Figure 7: Hazardous Material Protective Suit – Courtesy of the Whiting-Turner/Walsh Joint Venture

SITE CONGESTION

Due to the site location in downtown Washington, D.C., site congestion was a primary issue on the project. The amount of space on site decreased as the project progressed, mainly due to the construction of the New Addition in the East Courtyard. Due to the limited amount of space on site, the offices for the General Contractor, Construction Manager, and all the Subcontractors were placed in the existing building in lieu of site trailers. Laydown area and space for material and equipment storage were located in the East Courtyard and along E Street NW. In addition, parking on site was limited for deliveries, lifts, cranes, and construction vehicles. All members of the project team and construction workers found parking in local parking garages or on the street.

Some of the more critical examples of site congestion were during the Demolition and Sitework Phase, which was when four buildings in the East Courtyard were demolished, and the Superstructure Phase, which required two cranes on the site at the same time. The site logistics plan for the Superstructure Phase can be observed in Figure 8.

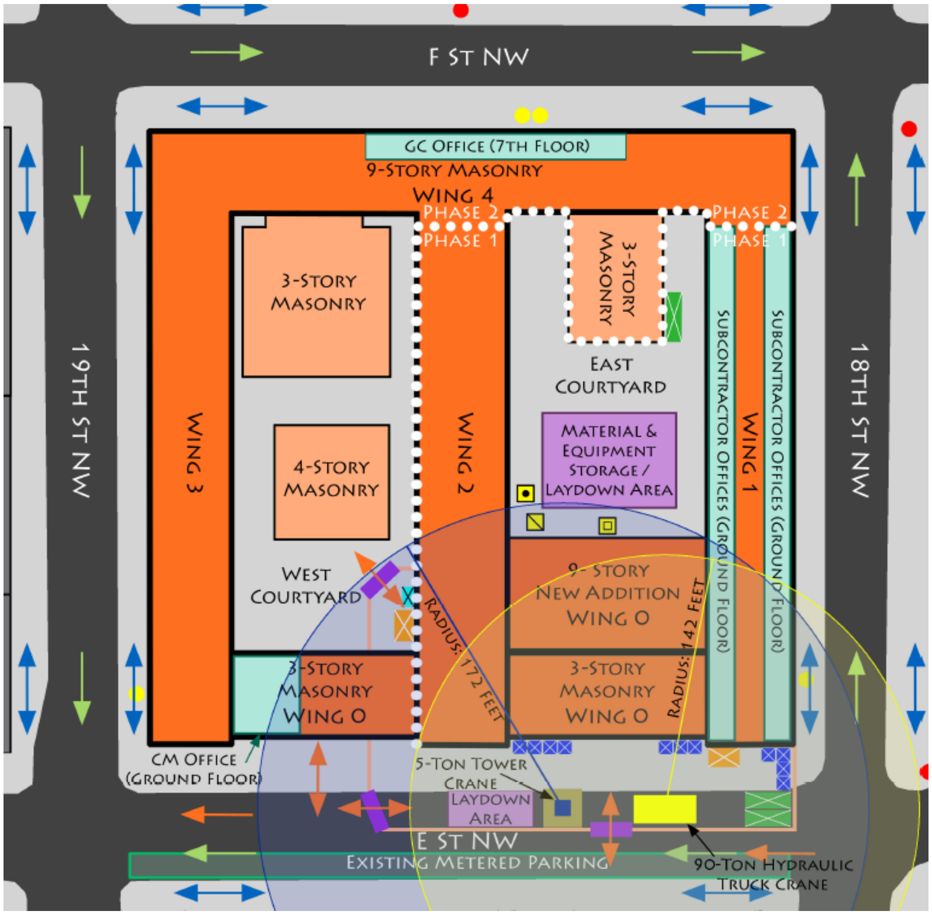


Figure 8: Site Logistics Plan of the Superstructure Phase – Developed by Ramuel Holgado

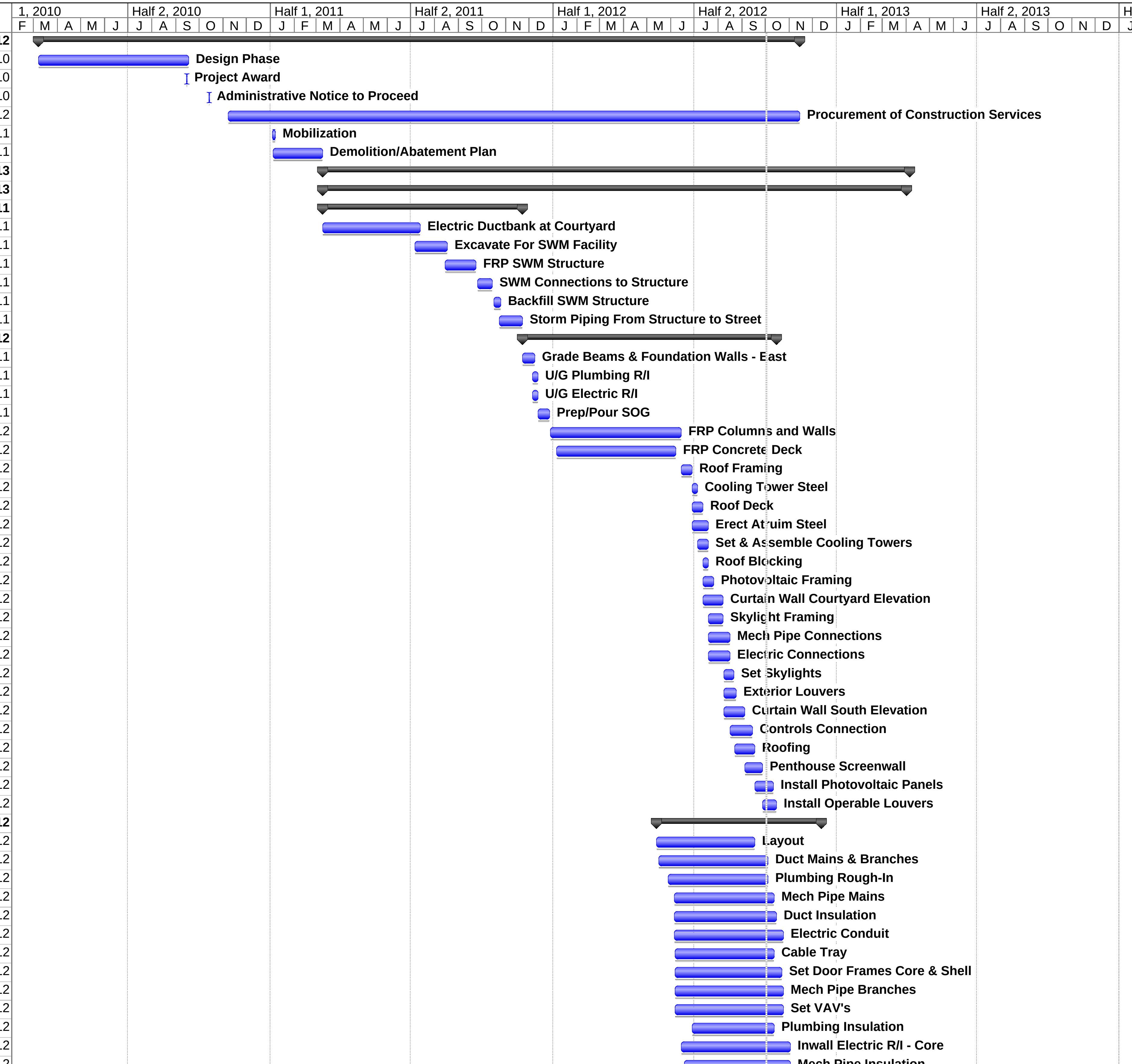
The congestion on site also raised concerns regarding the continuous occupancy on the Phase 2 side of the building. Since the building must remain fully functional and occupied during the construction of Phase 1, the safety of the tenants and public throughout construction must always remain a top priority.

The project team was able to manage the site congestion on a daily basis through weekly safety and subcontractor meetings. In addition, a full-time Safety Manager was employed on site from the start of the project. Construction fences and signs directed all pedestrians away from site and security personnel employed by the General Services Administration ensured that only individuals with the proper safety gear were allowed on site. No matter how congested the site, maintaining a clean and safe environment is always one of the main priorities of the project team.

APPENDIX A

DETAILED PROJECT SCHEDULE

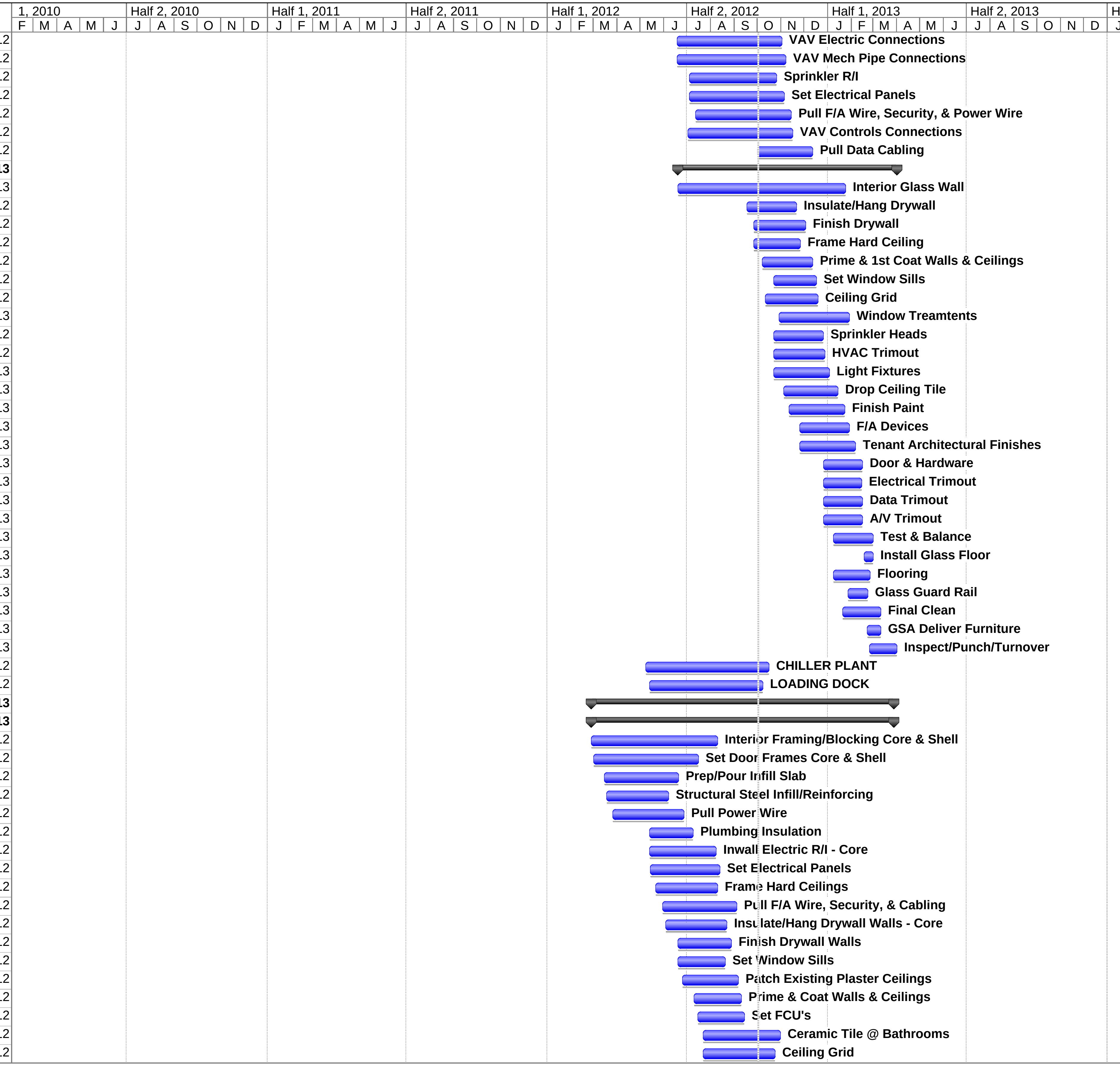
ID	Task Name	Duration	Start	Finish
1	**DESIGN & PRECONSTRUCTION PHASE**	**708 days**	**Mon 3/8/10**	**Wed 11/14/12**
2	Design Phase	140 days	Mon 3/8/10	Fri 9/17/10
3	Project Award	1 day	Wed 9/15/10	Wed 9/15/10
4	Administrative Notice to Proceed	1 day	Thu 10/14/10	Thu 10/14/10
5	Procurement of Construction Services	533 days	Mon 11/8/10	Wed 11/14/12
6	Mobilization	4 days	Tue 1/4/11	Fri 1/7/11
7	Demolition/Abatement Plan	46 days	Wed 1/5/11	Wed 3/9/11
8	**CONSTRUCTION PHASE**	**547 days**	**Thu 3/10/11**	**Fri 4/5/13**
9	**NEW ADDITION**	**543 days**	**Thu 3/10/11**	**Mon 4/1/13**
10	**INITIAL SITEWORK/DEMOLITION**	**184 days**	**Thu 3/10/11**	**Tue 11/22/11**
11	Electric Ductbank at Courtyard	90 days	Thu 3/10/11	Wed 7/13/11
12	Excavate For SWM Facility	30 days	Thu 7/7/11	Wed 8/17/11
13	FRP SWM Structure	30 days	Mon 8/15/11	Fri 9/23/11
14	SWM Connections to Structure	15 days	Mon 9/26/11	Fri 10/14/11
15	Backfill SWM Structure	7 days	Mon 10/17/11	Tue 10/25/11
16	Storm Piping From Structure to Street	22 days	Mon 10/24/11	Tue 11/22/11
17	**STRUCTURE**	**239 days**	**Wed 11/23/11**	**Mon 10/15/12**
18	Grade Beams & Foundation Walls - East	12 days	Wed 11/23/11	Thu 12/8/11
19	U/G Plumbing R/I	5 days	Tue 12/6/11	Mon 12/12/11
20	U/G Electric R/I	5 days	Tue 12/6/11	Mon 12/12/11
21	Prep/Pour SOG	11 days	Tue 12/13/11	Tue 12/27/11
22	FRP Columns and Walls	126 days	Thu 12/29/11	Thu 6/14/12
23	FRP Concrete Deck	114 days	Fri 1/6/12	Thu 6/7/12
24	Roof Framing	10 days	Fri 6/15/12	Thu 6/28/12
25	Cooling Tower Steel	5 days	Fri 6/29/12	Thu 7/5/12
26	Roof Deck	10 days	Fri 6/29/12	Thu 7/12/12
27	Erect Atruim Steel	15 days	Fri 6/29/12	Thu 7/19/12
28	Set & Assemble Cooling Towers	10 days	Fri 7/6/12	Thu 7/19/12
29	Roof Blocking	5 days	Fri 7/13/12	Thu 7/19/12
30	Photovoltaic Framing	10 days	Fri 7/13/12	Thu 7/26/12
31	Curtain Wall Courtyard Elevation	18 days	Fri 7/13/12	Tue 8/7/12
32	Skylight Framing	13 days	Fri 7/20/12	Tue 8/7/12
33	Mech Pipe Connections	20 days	Fri 7/20/12	Thu 8/16/12
34	Electric Connections	20 days	Fri 7/20/12	Thu 8/16/12
35	Set Skylights	9 days	Thu 8/9/12	Tue 8/21/12
36	Exterior Louvers	12 days	Thu 8/9/12	Fri 8/24/12
37	Curtain Wall South Elevation	19 days	Thu 8/9/12	Tue 9/4/12
38	Controls Connection	21 days	Fri 8/17/12	Fri 9/14/12
39	Roofing	18 days	Thu 8/23/12	Mon 9/17/12
40	Penthouse Screenwall	17 days	Wed 9/5/12	Thu 9/27/12
41	Install Photovoltaic Panels	18 days	Tue 9/18/12	Thu 10/11/12
42	Install Operable Louvers	12 days	Fri 9/28/12	Mon 10/15/12
43	**ROUGH-INS**	**155 days**	**Mon 5/14/12**	**Wed 12/12/12**
44	Layout	93 days	Mon 5/14/12	Mon 9/17/12
45	Duct Mains & Branches	103 days	Thu 5/17/12	Thu 10/4/12
46	Plumbing Rough-In	94 days	Tue 5/29/12	Thu 10/4/12
47	Mech Pipe Mains	94 days	Wed 6/6/12	Fri 10/12/12
48	Duct Insulation	95 days	Wed 6/6/12	Mon 10/15/12
49	Electric Conduit	102 days	Wed 6/6/12	Wed 10/24/12
50	Cable Tray	93 days	Thu 6/7/12	Fri 10/12/12
51	Set Door Frames Core & Shell	99 days	Thu 6/7/12	Mon 10/22/12
52	Mech Pipe Branches	101 days	Thu 6/7/12	Wed 10/24/12
53	Set VAV's	101 days	Thu 6/7/12	Wed 10/24/12
54	Plumbing Insulation	76 days	Fri 6/29/12	Fri 10/12/12
55	Inwall Electric R/I - Core	101 days	Fri 6/15/12	Fri 11/2/12
56	Mech Pipe Insulation	99 days	Tue 6/19/12	Fri 11/2/12



Project: Detailed Project Schedule
Date: Tue 10/2/12

Task | Summary

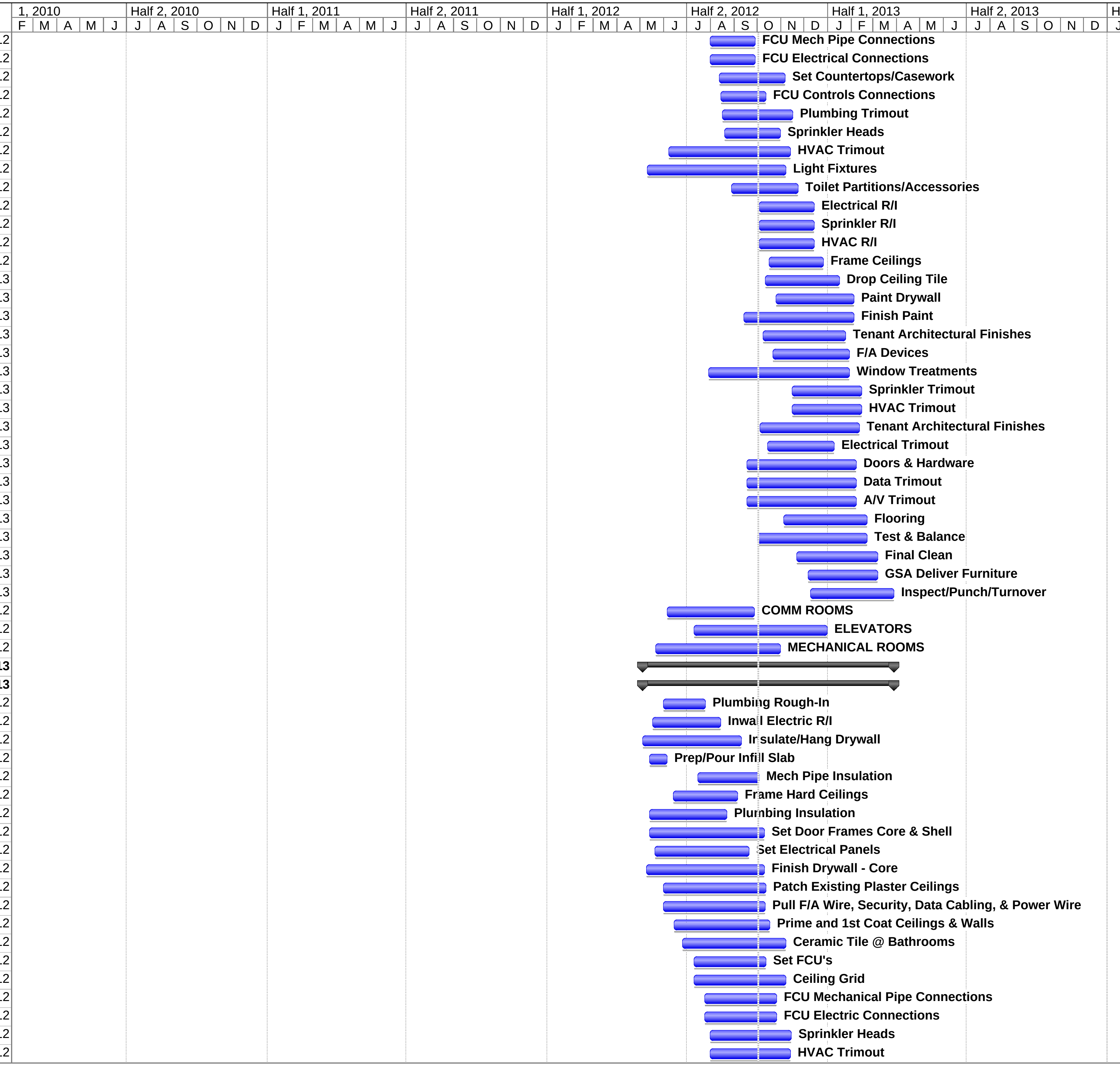
ID	Task Name	Duration	Start	Finish
57	VAV Electric Connections	99 days	Tue 6/19/12	Fri 11/2/12
58	VAV Mech Pipe Connections	102 days	Tue 6/19/12	Wed 11/7/12
59	Sprinkler R/I	82 days	Thu 7/5/12	Fri 10/26/12
60	Set Electrical Panels	88 days	Thu 7/5/12	Mon 11/5/12
61	Pull F/A Wire, Security, & Power Wire	89 days	Fri 7/13/12	Wed 11/14/12
62	VAV Controls Connections	99 days	Tue 7/3/12	Fri 11/16/12
63	Pull Data Cabling	52 days	Tue 10/2/12	Wed 12/12/12
64	**FINISHES**	**204 days**	**Wed 6/20/12**	**Mon 4/1/13**
65	Interior Glass Wall	157 days	Wed 6/20/12	Thu 1/24/13
66	Insulate/Hang Drywall	47 days	Tue 9/18/12	Wed 11/21/12
67	Finish Drywall	48 days	Thu 9/27/12	Mon 12/3/12
68	Frame Hard Ceiling	43 days	Thu 9/27/12	Mon 11/26/12
69	Prime & 1st Coat Walls & Ceilings	48 days	Mon 10/8/12	Wed 12/12/12
70	Set Window Sills	40 days	Tue 10/23/12	Mon 12/17/12
71	Ceiling Grid	49 days	Fri 10/12/12	Wed 12/19/12
72	Window Treamtents	66 days	Tue 10/30/12	Tue 1/29/13
73	Sprinkler Heads	47 days	Tue 10/23/12	Wed 12/26/12
74	HVAC Trimout	49 days	Tue 10/23/12	Fri 12/28/12
75	Light Fixtures	53 days	Tue 10/23/12	Thu 1/3/13
76	Drop Ceiling Tile	51 days	Mon 11/5/12	Mon 1/14/13
77	Finish Paint	53 days	Mon 11/12/12	Wed 1/23/13
78	F/A Devices	47 days	Mon 11/26/12	Tue 1/29/13
79	Tenant Architectural Finishes	53 days	Mon 11/26/12	Wed 2/6/13
80	Door & Hardware	37 days	Thu 12/27/12	Fri 2/15/13
81	Electrical Trimout	36 days	Thu 12/27/12	Thu 2/14/13
82	Data Trimout	37 days	Thu 12/27/12	Fri 2/15/13
83	A/V Trimout	37 days	Thu 12/27/12	Fri 2/15/13
84	Test & Balance	38 days	Wed 1/9/13	Fri 3/1/13
85	Install Glass Floor	10 days	Mon 2/18/13	Fri 3/1/13
86	Flooring	34 days	Wed 1/9/13	Mon 2/25/13
87	Glass Guard Rail	20 days	Mon 1/28/13	Fri 2/22/13
88	Final Clean	36 days	Mon 1/21/13	Mon 3/11/13
89	GSA Deliver Furniture	12 days	Fri 2/22/13	Mon 3/11/13
90	Inspect/Punch/Turnover	26 days	Mon 2/25/13	Mon 4/1/13
91	CHILLER PLANT	118 days	Wed 5/9/12	Tue 10/16/12
92	LOADING DOCK	108 days	Mon 5/14/12	Mon 10/8/12
93	**WING 2**	**288 days**	**Tue 2/28/12**	**Thu 3/28/13**
94	**ROUGH-INS & FINISHES**	**288 days**	**Tue 2/28/12**	**Thu 3/28/13**
95	Interior Framing/Blocking Core & Shell	124 days	Tue 2/28/12	Fri 8/10/12
96	Set Door Frames Core & Shell	102 days	Fri 3/2/12	Mon 7/16/12
97	Prep/Pour Infill Slab	74 days	Fri 3/16/12	Wed 6/20/12
98	Structural Steel Infill/Reinforcing	63 days	Mon 3/19/12	Thu 6/7/12
99	Pull Power Wire	72 days	Tue 3/27/12	Wed 6/27/12
100	Plumbing Insulation	43 days	Mon 5/14/12	Mon 7/9/12
101	Inwall Electric R/I - Core	65 days	Mon 5/14/12	Wed 8/8/12
102	Set Electrical Panels	67 days	Tue 5/15/12	Mon 8/13/12
103	Frame Hard Ceilings	60 days	Tue 5/22/12	Fri 8/10/12
104	Pull F/A Wire, Security, & Cabling	70 days	Thu 5/31/12	Tue 9/4/12
105	Insulate/Hang Drywall Walls - Core	59 days	Mon 6/4/12	Wed 8/22/12
106	Finish Drywall Walls	50 days	Wed 6/20/12	Tue 8/28/12
107	Set Window Sills	44 days	Wed 6/20/12	Mon 8/20/12
108	Patch Existing Plaster Ceilings	53 days	Tue 6/26/12	Thu 9/6/12
109	Prime & Coat Walls & Ceilings	44 days	Wed 7/11/12	Mon 9/10/12
110	Set FCU's	45 days	Mon 7/16/12	Fri 9/14/12
111	Ceramic Tile @ Bathrooms	73 days	Mon 7/23/12	Wed 10/31/12
112	Ceiling Grid	68 days	Mon 7/23/12	Wed 10/24/12



Project: Detailed Project Schedule
Date: Tue 10/2/12

Task | Summary

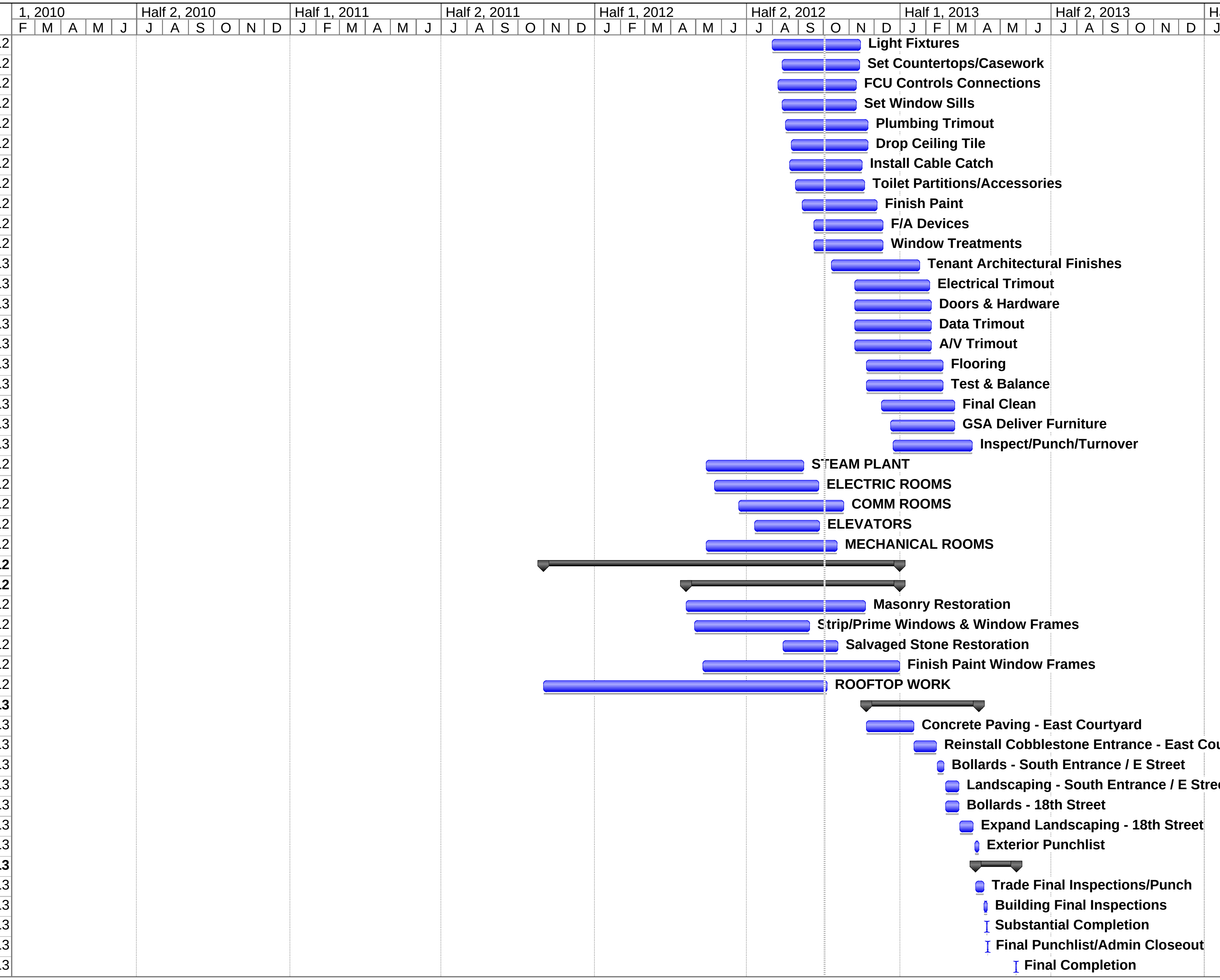
ID	Task Name	Duration	Start	Finish
113	FCU Mech Pipe Connections	43 days	Wed 8/1/12	Fri 9/28/12
114	FCU Electrical Connections	43 days	Wed 8/1/12	Fri 9/28/12
115	Set Countertops/Casework	62 days	Mon 8/13/12	Tue 11/6/12
116	FCU Controls Connections	43 days	Wed 8/15/12	Fri 10/12/12
117	Plumbing Trimout	66 days	Fri 8/17/12	Fri 11/16/12
118	Sprinkler Heads	53 days	Mon 8/20/12	Wed 10/31/12
119	HVAC Trimout	114 days	Fri 6/8/12	Tue 11/13/12
120	Light Fixtures	132 days	Fri 5/11/12	Wed 11/7/12
121	Toilet Partitions/Accessories	63 days	Wed 8/29/12	Fri 11/23/12
122	Electrical R/I	52 days	Thu 10/4/12	Fri 12/14/12
123	Sprinkler R/I	52 days	Thu 10/4/12	Fri 12/14/12
124	HVAC R/I	52 days	Thu 10/4/12	Fri 12/14/12
125	Frame Ceilings	51 days	Wed 10/17/12	Wed 12/26/12
126	Drop Ceiling Tile	69 days	Fri 10/12/12	Wed 1/16/13
127	Paint Drywall	72 days	Fri 10/26/12	Mon 2/4/13
128	Finish Paint	102 days	Fri 9/14/12	Mon 2/4/13
129	Tenant Architectural Finishes	78 days	Tue 10/9/12	Thu 1/24/13
130	F/A Devices	72 days	Mon 10/22/12	Tue 1/29/13
131	Window Treatments	132 days	Mon 7/30/12	Tue 1/29/13
132	Sprinkler Trimout	65 days	Fri 11/16/12	Thu 2/14/13
133	HVAC Trimout	65 days	Fri 11/16/12	Thu 2/14/13
134	Tenant Architectural Finishes	92 days	Fri 10/5/12	Mon 2/11/13
135	Electrical Trimout	63 days	Mon 10/15/12	Wed 1/9/13
136	Doors & Hardware	103 days	Tue 9/18/12	Thu 2/7/13
137	Data Trimout	103 days	Tue 9/18/12	Thu 2/7/13
138	A/V Trimout	103 days	Tue 9/18/12	Thu 2/7/13
139	Flooring	79 days	Mon 11/5/12	Thu 2/21/13
140	Test & Balance	103 days	Tue 10/2/12	Thu 2/21/13
141	Final Clean	76 days	Thu 11/22/12	Thu 3/7/13
142	GSA Deliver Furniture	65 days	Fri 12/7/12	Thu 3/7/13
143	Inspect/Punch/Turnover	79 days	Mon 12/10/12	Thu 3/28/13
144	COMM ROOMS	83 days	Wed 6/6/12	Thu 9/27/12
145	ELEVATORS	124 days	Wed 7/11/12	Mon 12/31/12
146	MECHANICAL ROOMS	118 days	Tue 5/22/12	Wed 10/31/12
147	**WING 1**	**238 days**	**Sat 5/5/12**	**Thu 3/28/13**
148	**ROUGH-INS & FINISHES**	**238 days**	**Sat 5/5/12**	**Thu 3/28/13**
149	Plumbing Rough-In	40 days	Fri 6/1/12	Wed 7/25/12
150	Inwall Electric R/I	65 days	Fri 5/18/12	Tue 8/14/12
151	Insulate/Hang Drywall	95 days	Sat 5/5/12	Mon 9/10/12
152	Prep/Pour Infill Slab	18 days	Mon 5/14/12	Tue 6/5/12
153	Mech Pipe Insulation	58 days	Mon 7/16/12	Wed 10/3/12
154	Frame Hard Ceilings	60 days	Thu 6/14/12	Wed 9/5/12
155	Plumbing Insulation	75 days	Mon 5/14/12	Wed 8/22/12
156	Set Door Frames Core & Shell	110 days	Mon 5/14/12	Wed 10/10/12
157	Set Electrical Panels	90 days	Mon 5/21/12	Thu 9/20/12
158	Finish Drywall - Core	113 days	Thu 5/10/12	Wed 10/10/12
159	Patch Existing Plaster Ceilings	97 days	Fri 6/1/12	Fri 10/12/12
160	Pull F/A Wire, Security, Data Cabling, & Power Wire	96 days	Fri 6/1/12	Thu 10/11/12
161	Prime and 1st Coat Ceilings & Walls	89 days	Fri 6/15/12	Wed 10/17/12
162	Ceramic Tile @ Bathrooms	97 days	Tue 6/26/12	Wed 11/7/12
163	Set FCU's	68 days	Wed 7/11/12	Fri 10/12/12
164	Ceiling Grid	86 days	Wed 7/11/12	Wed 11/7/12
165	FCU Mechanical Pipe Connections	68 days	Wed 7/25/12	Fri 10/26/12
166	FCU Electric Connections	68 days	Wed 7/25/12	Fri 10/26/12
167	Sprinkler Heads	76 days	Wed 8/1/12	Wed 11/14/12
168	HVAC Trimout	75 days	Wed 8/1/12	Tue 11/13/12



Project: Detailed Project Schedule
Date: Tue 10/2/12

Task | Summary

ID	Task Name	Duration	Start	Finish
169	Light Fixtures	76 days	Wed 8/1/12	Wed 11/14/12
170	Set Countertops/Casework	67 days	Mon 8/13/12	Tue 11/13/12
171	FCU Controls Connections	68 days	Wed 8/8/12	Fri 11/9/12
172	Set Window Sills	65 days	Mon 8/13/12	Fri 11/9/12
173	Plumbing Trimout	71 days	Fri 8/17/12	Fri 11/23/12
174	Drop Ceiling Tile	66 days	Fri 8/24/12	Fri 11/23/12
175	Install Cable Catch	63 days	Wed 8/22/12	Fri 11/16/12
176	Toilet Partitions/Accessories	59 days	Wed 8/29/12	Mon 11/19/12
177	Finish Paint	64 days	Thu 9/6/12	Tue 12/4/12
178	F/A Devices	59 days	Thu 9/20/12	Tue 12/11/12
179	Window Treatments	59 days	Thu 9/20/12	Tue 12/11/12
180	Tenant Architectural Finishes	76 days	Thu 10/11/12	Thu 1/24/13
181	Electrical Trimout	64 days	Thu 11/8/12	Tue 2/5/13
182	Doors & Hardware	66 days	Thu 11/8/12	Thu 2/7/13
183	Data Trimout	66 days	Thu 11/8/12	Thu 2/7/13
184	A/V Trimout	66 days	Thu 11/8/12	Thu 2/7/13
185	Flooring	66 days	Thu 11/22/12	Thu 2/21/13
186	Test & Balance	66 days	Thu 11/22/12	Thu 2/21/13
187	Final Clean	64 days	Mon 12/10/12	Thu 3/7/13
188	GSA Deliver Furniture	55 days	Fri 12/21/12	Thu 3/7/13
189	Inspect/Punch/Turnover	69 days	Mon 12/24/12	Thu 3/28/13
190	STEAM PLANT	87 days	Mon 5/14/12	Fri 9/7/12
191	ELECTRIC ROOMS	90 days	Thu 5/24/12	Tue 9/25/12
192	COMM ROOMS	90 days	Fri 6/22/12	Thu 10/25/12
193	ELEVATORS	56 days	Wed 7/11/12	Wed 9/26/12
194	MECHANICAL ROOMS	115 days	Mon 5/14/12	Wed 10/17/12
195	**EXTERIOR**	**310 days**	**Tue 11/1/11**	**Mon 12/31/12**
196	**EXTERIOR RENOVATION**	**187 days**	**Fri 4/20/12**	**Mon 12/31/12**
197	Masonry Restoration	158 days	Fri 4/20/12	Tue 11/20/12
198	Strip/Prime Windows & Window Frames	104 days	Mon 4/30/12	Fri 9/14/12
199	Salvaged Stone Restoration	48 days	Tue 8/14/12	Thu 10/18/12
200	Finish Paint Window Frames	171 days	Thu 5/10/12	Mon 12/31/12
201	ROOFTOP WORK	249 days	Tue 11/1/11	Fri 10/5/12
202	**FINAL SITEWORK**	**97 days**	**Thu 11/22/12**	**Fri 4/5/13**
203	Concrete Paving - East Courtyard	41 days	Thu 11/22/12	Thu 1/17/13
204	Reinstall Cobblestone Entrance - East Courtyard	19 days	Fri 1/18/13	Wed 2/13/13
205	Bollards - South Entrance / E Street	6 days	Fri 2/15/13	Fri 2/22/13
206	Landscaping - South Entrance / E Street	12 days	Mon 2/25/13	Tue 3/12/13
207	Bollards - 18th Street	12 days	Mon 2/25/13	Tue 3/12/13
208	Expand Landscaping - 18th Street	12 days	Thu 3/14/13	Fri 3/29/13
209	Exterior Punchlist	5 days	Mon 4/1/13	Fri 4/5/13
210	**FINAL CLOSEOUT**	**35 days**	**Tue 4/2/13**	**Mon 5/20/13**
211	Trade Final Inspections/Punch	8 days	Tue 4/2/13	Thu 4/11/13
212	Building Final Inspections	2 days	Fri 4/12/13	Mon 4/15/13
213	Substantial Completion	1 day	Mon 4/15/13	Mon 4/15/13
214	Final Punchlist/Admin Closeout	1 day	Tue 4/16/13	Tue 4/16/13
215	Final Completion	1 day	Mon 5/20/13	Mon 5/20/13



Project: Detailed Project Schedule
Date: Tue 10/2/12

Task | Summary

APPENDIX B-1

STRUCTURAL QUANTITY TAKEOFFS

CAISSONS

Concrete					Reinforcement				
Caisson Diameter (in)	Quantity	Combined Depth (ft)	Cubic Feet	Cubic Yards	Vertical No & Size	Weight (lbs)	Ties Size & Spacing	Weight (lbs)	Total Weight
30	2	152.25	2989.33	110.72	6 - #7	1867.19	#4 @ 18"	271.21	1.07
36	1	77.58	2193.46	81.24	8 - #8	1657.11	#4 @ 18"	155.47	0.91
42	1	77.58	2985.54	110.58	10 - #8	2071.39	#4 @ 18"	172.74	1.12
48	2	155.16	7798.96	288.85	8 - #10	5341.23	#5 @ 18"	647.33	2.99
54	3	225.83	14366.26	532.08	10 - #10	9717.46	#5 @ 18"	1020.68	5.37
66	4	301.41	28643.11	1060.86	12 - #11	19216.70	#5 @ 18"	1571.85	10.39
72	4	302.32	34190.58	1266.32	14 - #11	22487.17	#5 @ 18"	1681.71	12.08
78	2	152.25	20207.90	748.44	16 - #11	12942.47	#5 @ 18"	899.85	6.92
84	1	75.58	11634.29	430.90	18 - #11	7228.02	#5 @ 18"	472.98	3.85
90	1	76.58	13532.40	501.20	22 - #11	8951.13	#5 @ 18"	505.86	4.73
96	3	230.74	46391.66	1718.21	24 - #11	29422.12	#5 @ 18"	1604.41	15.51
102	1	76.58	17381.62	643.76	28 - #11	11392.35	#5 @ 18"	559.11	5.98
TOTAL		**1903.86**		**8242.47**					**74.48**

Caisson Diameter (in)	Depth (ft)				Combined Depth (ft)
30	74.67	77.58			152.25
36	77.58				77.58
42	77.58				77.58
48	77.58	77.58			155.16
54	74.67	75.58	75.58		225.83
66	74.67	75.58	75.58	75.58	301.41
72	75.58	75.58	75.58	75.58	302.32
78	76.67	75.58			152.25
84	75.58				75.58
90	76.58				76.58
96	76.58	76.58	77.58		230.74
102	76.58				76.58

Bar Size Designati	Weight (lbs/ft)
#3	0.376
#4	0.668
#5	1.043
#6	1.502
#7	2.044
#8	2.67
#9	3.4
#10	4.303
#11	5.313
#14	7.65
#18	13.6

http://www.unitedstatesconcrete.com/rebar_chart.html

GRADE BEAMS

	Concrete						Reinforcement						
Mark	Size			Cubic Feet	Cubic Yards	Formwork (SFCA)	Bottom Bars	Top Bars	Weight (lbs)	Stirrups		Weight (lbs)	Total Weight (tons)
	W (ft)	H (ft)	L (ft)							Bar Size	Spacing		
GB1	2.0	2.0	57.4	229.79	8.51	237.79	4 - #7	4 - #7	939.39	#3	1@3	604.81	0.77
GB2	2.0	2.0	56.3	225.14	8.34	233.14	4 - #7	4 - #7	920.37	#3	1@3	592.57	0.76
GB3	3.0	4.0	12.6	151.61	5.62	125.07	6 - #8	22 - #8	944.52	#5	1@3	685.22	0.81
GB4	2.0	2.0	28.6	114.50	4.24	122.50	4 - #7	4 - #7	468.09	#3	1@3	301.37	0.38
GB8	3.0	4.0	12.7	152.20	5.64	125.46	6 - #8	22 - #8	948.18	#5	1@3	687.88	0.82
GB9	3.0	4.0	12.6	151.44	5.61	124.96	6 - #8	22 - #8	943.47	#5	1@3	684.46	0.81
GB10	3.0	3.0	28.1	252.66	9.36	186.44	11 - #8	11 - #8	1649.01	#4	1@3	825.12	1.24
GB11	3.0	2.0	13.1	78.64	2.91	64.42	6 - #8	6 - #8	419.92	#4	1@3	315.17	0.37
GB12	3.0	2.0	28.5	171.12	6.34	126.08	6 - #7	4 - #7	582.95	#3	1@3	386.05	0.48
GB13	3.0	2.0	28.8	172.82	6.40	127.22	6 - #7	4 - #7	588.75	#3	1@3	389.89	0.49
GB14	3.0	2.0	28.9	173.53	6.43	127.69	6 - #7	4 - #7	591.17	#3	1@3	391.49	0.49
GB15	3.0	2.0	13.3	79.69	2.95	65.12	6 - #8	6 - #8	425.52	#4	1@3	319.38	0.37
GB16	2.0	2.0	54.4	217.68	8.06	225.68	6 - #8	6 - #8	1743.62	#4	1@3	1017.87	1.38
GB17	3.0	3.0	28.6	257.27	9.53	189.52	11 - #8	11 - #8	1679.14	#4	1@3	840.20	1.26
GB19	3.0	4.0	11.2	134.89	5.00	113.93	6 - #8	22 - #9	1020.91	#5	1@3	609.67	0.82
GB20	3.0	4.0	11.5	137.68	5.10	115.78	6 - #8	22 - #9	1041.98	#5	1@3	622.25	0.83
GB21	2.0	2.0	28.6	114.55	4.24	122.55	4 - #7	4 - #7	468.29	#3	1@3	301.50	0.38
GB22	3.0	3.0	28.7	257.89	9.55	189.92	11 - #8	11 - #8	1683.14	#4	1@3	842.20	1.26
GB23	3.0	4.0	11.4	136.21	5.04	114.81	6 - #8	22 - #8	848.60	#5	1@3	615.63	0.73
GB24	3.0	3.0	28.4	255.19	9.45	188.12	11 - #8	11 - #8	1665.51	#4	1@3	833.38	1.25
TOTAL					141.15	2926.22							16.51

CONCRETE BEAMS

Mark	Concrete: Size W (ft)	Concrete: Size H (ft)	Concrete: Size L (ft)	Concrete: Cubic Feet	Concrete: Cubic Yards	Concrete: Formwork (SFCA)	Reinforcement: Bottom Bars	Reinforcement: Top Bars	Reinforcement: Weight (lbs)	Reinforcement: Stirrups Bar Size	Reinforcement: Stirrups Spacing	Reinforcement: Weight (lbs)	Reinforcement: Total Weight (tons)
CB2	2.5	1.5	26.0	97.53	3.61	85.53	7 - #6	3 - #7	432.95	#4	1@3	486.47	0.46
CB3	1.5	3.6	11.0	58.86	2.18	89.23	5 - #7	5 - #7	223.84	#4	1@3	268.22	0.25
CB4	2.5	1.5	19.2	71.87	2.66	65.00	7 - #6	3 - #7	319.02	#4	1@3	358.46	0.34
CB12	2.5	1.5	25.8	96.84	3.59	84.97	5 - #7	4 - #7	475.04	#4	1@3	482.99	0.48
CB16	2.0	2.0	25.5	102.01	3.78	110.01	5 - #7	2 - #7	364.90	#4	1@3	477.01	0.42
CB17	1.5	2.0	28.0	84.00	3.11	118.00	4 - #7	2 - #7	343.40	#4	1@3	448.91	0.40
CB18	2.0	2.0	11.3	45.31	1.68	53.31	5 - #7	2 - #7	162.08	#4	1@3	211.88	0.19
1B1	2.5	1.5	52.0	194.82	7.22	163.36	7 - #6	2 - #7	758.60	#4	1@3	971.71	0.87
1B2	2.5	1.5	51.7	193.79	7.18	162.53	7 - #6	2 - #7	754.60	#4	1@3	966.59	0.86
1B3	2.5	2.0	11.1	55.61	2.06	54.48	5 - #7	5 - #7	227.31	#4	1@3	237.72	0.23
1B5	2.5	2.0	26.2	130.93	4.85	114.74	8 - #9	4 - #8	991.89	#4	1@3	559.73	0.78
1B6	2.5	2.0	16.2	80.92	3.00	74.74	8 - #9	4 - #8	613.05	#4	1@3	345.95	0.48
1B7	2.5	2.0	10.6	52.83	1.96	52.26	5 - #7	5 - #8	249.04	#4	1@3	225.86	0.24
1B8	1.5	4.0	11.2	67.13	2.49	101.51	2 x 7 - #8	2 x 5 - #8	716.99	#4	1@3	298.97	0.51
1B9	1.5	4.0	26.7	160.13	5.93	225.51	2 x 7 - #8	2 x 5 - #8	1710.23	#4	1@3	713.13	1.21
1B10	1.5	4.0	26.6	159.36	5.90	224.48	2 x 7 - #8	2 x 5 - #8	1701.96	#4	1@3	709.68	1.21
1B11	1.5	4.0	26.6	159.36	5.90	224.48	2 x 7 - #8	2 x 5 - #8	1701.96	#4	1@3	709.68	1.21
1B12	1.5	4.0	11.3	67.92	2.52	102.56	2 x 7 - #8	2 x 5 - #8	725.39	#4	1@3	302.47	0.51
1B13	3.0	2.0	25.3	152.04	5.63	113.36	7 - #8	4 - #7	569.74	#4	1@3	609.38	0.59
1B14	3.0	2.0	25.6	153.73	5.69	114.49	7 - #8	4 - #7	688.36	#4	1@3	616.16	0.65
1B15	1.5	3.0	17.6	79.24	2.93	114.65	4 - #7	4 - #7	287.93	#4	1@3	376.39	0.33
2B1	2.5	1.5	26.5	99.50	3.69	87.10	5 - #7	4 - #7	488.10	#4	1@3	496.27	0.49
2B2	2.5	1.5	52.9	198.28	7.34	166.12	5 - #7	4 - #7	972.67	#4	1@3	988.96	0.98
2B3	2.5	2.0	11.4	56.94	2.11	55.55	6 - #7	4 - #8	261.26	#4	1@3	243.41	0.25
2B4	2.5	2.0	26.7	133.68	4.95	116.94	9 - #7	4 - #8	777.38	#4	1@3	571.51	0.67
2B5	2.5	2.0	26.6	133.16	4.93	116.53	9 - #7	4 - #8	774.35	#4	1@3	569.29	0.67
2B6	2.5	2.0	26.5	132.67	4.91	116.13	9 - #7	4 - #8	771.47	#4	1@3	567.17	0.67
2B7	2.5	2.0	11.6	57.92	2.15	56.34	6 - #7	4 - #8	265.78	#4	1@3	247.62	0.26
2B8	1.5	4.0	10.9	65.35	2.42	99.13	2 x 7 - #8	2 x 5 - #8	697.90	#4	1@3	291.01	0.49
2B9	1.5	4.0	26.7	160.37	5.94	225.82	2 x 7 - #8	2 x 5 - #8	1712.73	#4	1@3	714.17	1.21
2B10	1.5	4.0	26.7	160.38	5.94	225.84	2 x 7 - #8	2 x 5 - #8	1712.86	#4	1@3	714.23	1.21
2B11	1.5	4.0	27.0	162.16	6.01	228.21	2 x 7 - #8	2 x 5 - #8	1731.83	#4	1@3	722.13	1.23
2B12	1.5	4.0	11.4	68.32	2.53	103.10	2 x 7 - #8	2 x 5 - #8	729.68	#4	1@3	304.26	0.52
2B13	3.0	2.0	51.9	311.29	11.53	219.52	9 - # 7	4 - #8	1508.49	#4	1@3	1247.63	1.38
2B14	3.0	2.0	51.8	310.72	11.51	219.14	9 - # 7	4 - # 8	1505.73	#4	1@3	1245.35	1.38
2B18	2.0	1.5	53.1	159.20	5.90	165.20	8 - # 8	2 - #8	1416.86	#4	1@3	850.75	1.13
TB1	2.5	1.5	159.9	599.75	22.21	487.30	7 - #6	4 - #7	2989.15	#4	1@3	2991.39	2.99
TB2	2.5	1.5	159.0	596.15	22.08	484.42	7 - #6	4 - #7	2971.21	#4	1@3	2973.43	2.97
TB3	2.5	2.0	33.8	168.80	6.25	145.04	7 - #7	8 - #7	1035.05	#4	1@3	721.63	0.88
TB4	2.5	2.0	79.2	396.24	14.68	326.99	7 - #8	4 - #8	2327.51	#4	1@3	1694.01	2.01
TB5	2.5	2.0	80.4	402.23	14.90	331.78	8 - #8	4 - #8	2577.46	#4	1@3	1719.59	2.15
TB6	2.5	2.0	80.4	402.23	14.90	331.78	7 - #8	4 - #8	2362.67	#4	1@3	1719.59	2.04
TB7	2.5	2.0	34.2	171.18	6.34	146.94	7 - #7	8 - #7	1049.68	#4	1@3	731.83	0.89
TB8	1.5	4.0	34.5	207.25	7.68	288.34	2 x 7 - #8	2 x 5 - #8	2213.45	#4	1@3	922.96	1.57
TB9	1.5	4.0	80.5	482.72	17.88	655.63	2 x 7 - #8	2 x 5 - #8	5155.49	#4	1@3	2149.73	3.65
TB10	1.5	4.0	80.4	482.40	17.87	655.20	2 x 7 - #8	2 x 5 - #8	3218.95	#4	1@3	2148.29	2.68
TB11	1.5	4.0	80.1	480.37	17.79	652.49	2 x 7 - #8	2 x 5 - #8	5130.31	#4	1@3	2139.23	3.63
TB12	1.5	4.0	34.2	205.43	7.61	285.91	2 x 7 - #8	2 x 5 - #8	2194.04	#4	1@3	914.87	1.55
TB13	3.0	2.0	156.1	936.63	34.69	636.42	9 - #7	4 - #8	4538.91	#4	1@3	3754.01	4.15
TB14	3.0	2.0	154.4	926.55	34.32	629.70	9 - #7	4 - #8	4490.06	#4	1@3	3713.61	4.10
7B1	2.5	1.5	53.6	201.08	7.45	168.37	9 - #8	4 - #8	1861.22	#4	1@3	1002.95	1.43
7B2	2.5	1.5	26.4	99.13	3.67	86.80	11 - #8	4 - #8	1058.68	#4	1@3	494.42	0.78
7B15	1.5	5.3	11.5	91.32	3.38	137.64	2 x 7 - #8	2 X 4 - #8	675.80	#4	1@3	386.83	0.53
7B16	1.5	5.3	26.6	210.91	7.81	297.08	2 x 7 - #8	2 X 4 - #8	1560.78	#4	1@3	893.39	1.23
7B17	1.5	5.3	26.6	210.91	7.81	297.08	2 x 7 - #8	2 X 4 - #8	1560.78	#4	1@3	893.39	1.23
7B18	1.5	5.3	26.8	213.08	7.89	299.98	2 x 7 - #8	2 X 4 - #8	1576.88	#4	1@3	902.60	1.24
7B19	1.5	5.3	11.4	90.23	3.34	136.19	2 x 7 - #8	2 X 4 - #8	667.76	#4	1@3	382.22	0.52
7B20	3.0	2.0	51.3	307.76	11.40	217.17	10 - #8	6 - #8	2191.24	#4	1@3	1233.49	1.71
7B21	3.0	2.0	51.9	311.46	11.54	219.64	9 - #9	6 - #8	2420.04	#4	1@3	1248.33	1.83
TOTAL					516.10	12567.77							74.05

SLAB-ON-GRADE

Concrete						Reinforcement				
Floor	Area (SF)	Perimeter (LF)	Depth (ft)	Volume (CY)	Formwork (SFCA)	Welded Wire Fabric	Size	Quantity	Weight (lbs/C.S.F.)	Total Weight (tons)
Basement	10874.01	421.33	0.42	167.82	175.57	6x6-W2.9xW2.9	8' x 8'	170	30	1.63
TOTAL	**10874.01**	**421.33**		**184.60**	**175.57**					**1.71**

COLUMNS

	Concrete					Reinforcement					
Mark	Size (in)	Area (SF)	Height (ft)	Volume (CY)	Formwork (SFCA)	Count	Size	Weight (lbs/ft)	Length (ft)	Weight (lbs)	Weight (tons)
J - 4.4	24"x24"	4.0	116.33	17.23	930.64	12	#8	2.670	116.33	3727.21	1.86
J - 5	24"x24"	4.0	116.33	17.23	930.64	16	#10	4.303	116.33	8009.09	4.00
J - 7	24"x30"	5.0	116.33	21.54	1046.97	26	#10	4.303	116.33	13014.77	6.51
J - 9	24"x30"	5.0	116.33	21.54	1046.97	26	#10	4.303	116.33	13014.77	6.51
J - 11	24"x24"	4.0	116.33	17.23	930.64	16	#10	4.303	116.33	8009.09	4.00
J - 11.7	24"x24"	4.0	116.33	17.23	930.64	12	#8	2.670	116.33	3727.21	1.86
H - 4.4	24"x24"	4.0	116.33	17.23	930.64	12	#8	2.670	116.33	3727.21	1.86
H - 5	24"x24"	4.0	116.33	17.23	930.64	16	#10	4.303	116.33	8009.09	4.00
H - 7	24"x30"	5.0	116.33	21.54	1046.97	26	#10	4.303	116.33	13014.77	6.51
H - 9	24"x30"	5.0	116.33	21.54	1046.97	26	#10	4.303	116.33	13014.77	6.51
H - 11	24"x24"	4.0	116.33	17.23	930.64	16	#10	4.303	116.33	8009.09	4.00
H - 11.7	24"x24"	4.0	116.33	17.23	930.64	12	#8	2.670	116.33	3727.21	1.86
F - 4.4	24"x24"	4.0	116.33	17.23	930.64	12	#8	2.670	116.33	3727.21	1.86
F - 5	24"x24"	4.0	116.33	17.23	930.64	16	#10	4.303	116.33	8009.09	4.00
F - 7	24"x30"	5.0	116.33	21.54	1046.97	26	#10	4.303	116.33	13014.77	6.51
F - 9	24"x30"	5.0	116.33	21.54	1046.97	26	#10	4.303	116.33	13014.77	6.51
F - 11	24"x24"	4.0	116.33	17.23	930.64	16	#10	4.303	116.33	8009.09	4.00
F - 11.7	24"x24"	4.0	116.33	17.23	930.64	12	#8	2.670	116.33	3727.21	1.86
E.2 - 4	16" DIA	8.4	78.83	24.46	110.07	6	#7	2.044	78.83	966.77	0.48
E.2 - 11.7	16" DIA	8.4	78.83	24.46	110.07	6	#7	2.044	78.83	966.77	0.48
D.5 - 4.4	36"x36"	9.0	24.00	8.00	288.00	20	#8	2.670	24.00	1281.60	0.64
D.5 - 11.7	36"x36"	9.0	24.00	8.00	288.00	20	#8	2.670	24.00	1281.60	0.64
D.3 - 4.4	12" DIA	3.1	15.00	1.75	11.78	6	#7	2.044	15.00	183.96	0.09
D.3 - 11.7	12" DIA	3.1	15.00	1.75	11.78	6	#7	2.044	15.00	183.96	0.09
D.1 - 5	36"x36"	9.0	24.00	8.00	288.00	20	#8	2.670	24.00	1281.60	0.64
D.1 - 7	36"x36"	9.0	24.00	8.00	288.00	20	#8	2.670	24.00	1281.60	0.64
D.1 - 9	36"x36"	9.0	24.00	8.00	288.00	20	#8	2.670	24.00	1281.60	0.64
D.1 - 11	36"x36"	9.0	24.00	8.00	288.00	20	#8	2.670	24.00	1281.60	0.64
TOTAL				**480.12**	**19421.20**						**83.21**

ELEVATED SLABS

Concrete					
Floor	Area (SF)	Perimeter (LF)	Depth (ft)	Volume (CY)	Formwork (SFCA)
Ground	2340.93	212.41	0.79	68.64	168.16
1st	10321.95	411.6	0.67	254.99	274.55
2nd	7965.79	479.5	0.67	196.78	319.84
3rd	8352.91	388.2	0.67	206.35	258.90
4th	8352.91	388.2	0.67	206.35	258.90
5th	8352.91	388.2	0.67	206.35	258.90
6th	8316.70	383.4	0.67	205.45	255.73
7th	7109.04	358.4	0.67	175.62	239.05
TOTAL	61113.14			1672.58	2034.03

Reinforcement						
Column Line	Count	Size	Weight (lbs/ft)	Length (ft)	Weight (lbs)	Weight (tons)
E	14	#6	1.502	25.00	525.70	0.26
	10	#6	1.502	14.50	217.79	0.11
	10	#6	1.502	14.50	217.79	0.11
	14	#6	1.502	23.75	499.42	0.25
F	6	#6	1.502	25.00	225.30	0.11
	12	#6	1.502	14.50	261.35	0.13
	12	#6	1.502	14.50	261.35	0.13
	6	#6	1.502	23.75	214.04	0.11
G	11	#6	1.502	25.00	413.05	0.21
	14	#6	1.502	14.50	304.91	0.15
	14	#6	1.502	14.50	304.91	0.15
	11	#6	1.502	23.75	392.40	0.20
H	19	#6	1.502	23.75	677.78	0.34
	20	#6	1.502	14.50	435.58	0.22
	20	#6	1.502	14.50	435.58	0.22
	19	#6	1.502	23.75	677.78	0.34
I	11	#6	1.502	25.00	413.05	0.21
	14	#6	1.502	14.50	304.91	0.15
	14	#6	1.502	14.50	304.91	0.15
	11	#6	1.502	23.75	392.40	0.20
J	4	#6	1.502	23.75	142.69	0.07
	6	#6	1.502	14.50	130.67	0.07
	6	#6	1.502	14.50	130.67	0.07
	4	#6	1.502	23.75	142.69	0.07
4.3	6	#6	1.502	9.00	81.11	0.04
	6	#6	1.502	14.50	130.67	0.07
	7	#6	1.502	18.50	194.51	0.10
4.6	5	#6	1.502	9.00	67.59	0.03
	5	#6	1.502	14.50	108.90	0.05
	7	#6	1.502	18.50	194.51	0.10
5	12	#6	1.502	9.00	162.22	0.08
	17	#6	1.502	14.50	370.24	0.19
	18	#6	1.502	18.50	500.17	0.25
6	10	#6	1.502	9.00	135.18	0.07
	10	#6	1.502	14.50	217.79	0.11
	14	#6	1.502	16.00	336.45	0.17
7	8	#6	1.502	9.00	108.14	0.05
	14	#6	1.502	14.50	304.91	0.15
	21	#6	1.502	16.00	504.67	0.25
8	10	#6	1.502	9.00	135.18	0.07
	10	#6	1.502	14.50	217.79	0.11
	14	#6	1.502	16.00	336.45	0.17
9	8	#6	1.502	9.00	108.14	0.05
	14	#6	1.502	14.50	304.91	0.15
	21	#6	1.502	16.00	504.67	0.25
10	10	#6	1.502	9.00	135.18	0.07
	10	#6	1.502	14.50	217.79	0.11
	14	#6	1.502	16.00	336.45	0.17
11	12	#6	1.502	9.00	162.22	0.08
	17	#6	1.502	14.50	370.24	0.19
	18	#6	1.502	19.00	513.68	0.26
11.3	5	#6	1.502	9.00	67.59	0.03
	5	#6	1.502	16.00	120.16	0.06
	7	#6	1.502	19.00	199.77	0.10
11.7	6	#6	1.502	9.00	81.11	0.04
	6	#6	1.502	16.00	144.19	0.07
	7	#6	1.502	19.00	199.77	0.10
TOTAL						8.01

APPENDIX B-2

DETAILED STRUCTURAL SYSTEMS ESTIMATE

Detailed Structural System Estimate													
Code	Item	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Bare Total	Total Incl O&P	Quantity	Project Total	Project Total Incl O&P
Division 03 - Concrete													
03 11 13.20 2650	Forms in Place, Beams and Girders, Interior Beam, Job-Built Plywood, 24" Wide, 4 Use	C2	395.00	0.122	SFCA	0.64	4.22		4.86	7.24	12567.77	$ 61,079.36	$ 90,990.66
03 11 13.25 6650	Forms in Place, Columns, Job-Built Plywood, 24" x 24" Columns, 4 Use	C1	238.00	0.134	SFCA	0.81	4.58		5.39	7.92	19421.20	$ 104,680.25	$ 153,815.87
03 11 13.35 7101	Forms in Place, Elevated Slabs, Edge Forms 7" to 12" High, 4 Use	C1	350.00	0.091	SFCA	0.17	3.11		3.28	4.97	2034.03	$ 6,671.62	$ 10,109.13
03 11 13.50 0150	Forms in Place, Grade Beams, Job-Built Plywood, 4 Use	C2	605.00	0.079	SFCA	0.85	2.77		3.62	5.20	2926.22	$ 10,592.91	$ 15,216.33
03 11 13.65 3000	Forms in Place, Slab on Grade, Edge Forms, Wood, 4 Use, On Grade, to 6" High	C1	600.00	0.053	LF	0.28	1.81		2.09	3.09	421.33	$ 880.57	$ 1,301.90
03 21 10.60 0100	Uncoated Reinforcing Steel, Reinforcing In Place, 60-100 ton lots, A615 Grade 60 Beams & Girders, #3 to #7	4 Rodm	1.60	20.000	Ton	917.04	879.06		1796.10	2423.40	74.05	$ 133,008.55	$ 179,462.69
03 21 10.60 0250	Uncoated Reinforcing Steel, Reinforcing In Place, 60-100 ton lots, A615 Grade 60 Columns, #8 to #18	4 Rodm	2.30	13.913	Ton	965.30	614.45		1579.75	2045.58	83.21	$ 131,452.85	$ 170,215.11
03 21 10.60 0400	Uncoated Reinforcing Steel, Reinforcing In Place, Under 10 Ton Job, A615 Grade 60, Elevated Slabs, #4 to #7	4 Rodm	2.90	11.034	Ton	1292.81	484.38		1777.19	2167.22	8.01	$ 14,233.35	$ 17,357.07
03 21 16.10 1050	Epoxy-Coated Reinforcing Steel, Reinforcing In Place, 10-50 Ton Job, A615 Graded, Beams & Girders, #3 to #7	4 Rodm	1.60	20.000	Ton	1524.78	879.06		2403.84	3075.47	16.51	$ 39,676.06	$ 50,761.50
03 21 16.10 1100	Epoxy-Coated Reinforcing Steel, Reinforcing In Place, 60-100 Ton Job, A615 Graded, Columns, #8 to #18	4 Rodm	2.30	13.913	Ton	1428.25	614.45		2042.70	2552.86	74.48	$ 152,130.49	$ 190,124.76
03 22 05.50 0300	Welded Wire Fabric, Sheets, 6 x 6 - W2.9 x W2.9 (6 x 6) 42 lb. per CSF, A185	2 Rodm	29.00	0.552	CSF	20.00	23.50		43.50	61.00	108.74	$ 4,730.19	$ 6,633.14
03 30 53.40 0350	Cast-In-Place Concrete, Concrete In Place Beams (3500 psi), 5 kip per LF, 25' Span	C14A	18.55	1078.000	CY	432.00	423.00	41.28	888.64	1165.71	657.25	$ 584,058.64	$ 766,162.90
03 30 53.40 0920	Cast-In-Place Concrete, Concrete In Place Columns, Square (4000 psi), 24" x24", Average Reinforcing	C14A	17.71	11.290	CY	538.67	450.00	43.34	1032.01	1342.05	480.12	$ 495,493.34	$ 644,351.16
03 30 53.40 2750	Cast-In-Place Concrete, Concrete In Place Elevated Slab (4000 psi), Flat Slab With Drops, 125 psf Sup. Load, 30' Span	C14B	50.99	4.079	CY	338.78	162.00	15.02	515.80	639.29	1857.18	$ 957,933.44	$ 1,187,276.60
03 35 29.30 0350	Tooled Concrete Finishing, Finishing Floors, Power Screed, Bull Float, Machine Float & Trowel (Ride-On)	C10E	4000.00	0.006	SF		0.22	0.06	0.28	0.39	71987.15	$ 20,156.40	$ 28,074.99
TOTAL												**$ 2,716,778.04**	**$ 3,511,853.81**
Division 31 - Earthwork													
31 63 26.13 0600	Bored Piles, Drilled Caissons, Fixed End Caisson Piles, Open Style, Machine Drilled, For 50' to 100' Deep, in Stable Ground, 72" Diameter, Excludes Mobilization, Boulder Removal, Disposal	B43	80.00	0.600	VLF	130.34	25.09	31.48	200.03	231.53	1903.86	$ 380,821.12	$ 440,794.23
TOTAL												**$ 380,821.12**	**$ 440,794.23**
DETAILED STRUCTURAL SYSTEM ESTIMATE TOTAL												**$ 3,097,599.16**	**$ 3,952,648.04**

APPENDIX C

GENERAL CONDITIONS ESTIMATE

Line Item	Quantity	Unit	Rate	Total Cost
Personnel				
Senior Project Manager	100	Week	$ 3,476.00	$ 347,600.00
Project Manager	100	Week	$ 2,821.30	$ 282,130.00
Quality Control Manager	104	Week	$ 3,158.78	$ 328,513.12
Safety Manager	104	Week	$ 1,689.98	$ 175,757.92
Senior Superintendent	104	Week	$ 3,265.23	$ 339,583.92
Superintendent	104	Week	$ 3,111.27	$ 323,572.08
MEP Manager	100	Week	$ 2,869.74	$ 286,974.00
Assistant Project Manager	100	Week	$ 1,640.66	$ 164,066.00
Project Engineer/Scheduler	104	Week	$ 1,482.00	$ 154,128.00
Assistant Project Engineer	104	Week	$ 1,127.68	$ 117,278.72
Officer Manager	104	Week	$ 864.28	$ 89,885.12
Site Expenses				
Mobilization	1	LS	$ 23,752.00	$ 23,752.00
Temporary Buildings	0	Week	$ -	$ -
Temporary Utilities	104	Week	$ 3,684.13	$ 383,149.52
Temporary Job Construction	104	Week	$ 2,936.29	$ 305,374.16
Job Office Expenses	104	Week	$ 3,784.65	$ 393,603.60
Job Maintenance	104	Week	$ 3,517.85	$ 365,856.40
Demobilization	1	LS	$ 23,752.00	$ 23,752.00
Miscellaneous Costs				
Labor Escalation	1	LS	$ 90,000.00	$ 90,000.00
General Liability and Builders Risk Insuran	0.59%	Job	$ 86,412,506.00	$ 509,833.79
Payment and Performance Bonds	0.89%	Job	$ 86,412,506.00	$ 769,071.30
TOTAL				**$ 5,473,881.65**

APPENDIX D-1

BIM USE LIST

BIM Use*	Value to Project	Responsible Party	Value to Resp Party	Capability Rating			Additional Resources / Competencies Required to Implement	Notes	Proceed with Use
	High / Med / Low		High / Med / Low	Scale 1-3 (1 = Low)					YES / NO / MAYBE
				Resources	Competency	Experience			
Record Modeling	HIGH	Contractor	MED	2	2	2	Requires training and software		**YES**
		Facility Manager	HIGH	1	2	1	Requires training and software		
		Architect	MED	3	3	3			
Cost Estimation	MED	Contractor	HIGH	2	2	1			**NO**
		Owner	HIGH	1	1	1			
		Architect	MED	2	2	1			
4D Modeling	HIGH	Contractor	HIGH	3	2	2	Requires training and software	High value to owner	**NO**
		Subcontractors	MED	1	1	1	Requires training and software		
3D Coordination (Construction)	HIGH	Contractor	HIGH	3	3	3		Review 3D model for clash detection	**YES**
		Subcontractors	HIGH	1	3	3			
		Architect	LOW	2	3	2			
Engineering Analysis	HIGH	MEP Engineer	HIGH	2	2	2			**YES**
		Architect	MED	2	2	2			
Design Reviews	MED	Architect	MED	2	3	2		Reviews to be from design model	**NO**
		Contractor	HIGH	3	3	2			
		Owner	LOW	1	1	1			
3D Coordination (Design)	HIGH	Architect	HIGH	2	2	2	Coordination software required	Contractor to facilitate coordination	**YES**
		MEP Engineer	MED	2	2	1			
		Structural Engineer	HIGH	2	2	1			
Design Authoring	HIGH	Architect	HIGH	3	3	3			**YES**
		MEP Engineer	MED	3	3	3			
		Structural Engineer	HIGH	3	3	3			

* Additional BIM Uses as well as information on each Use can be found at http://www.engr.psu.edu/ae/cic/bimex/

APPENDIX D-2

BIM LEVEL 1 PROCESS MAP

Level 1: BIM EXECUTION PLANNING PROCESS
GENERAL SERVICES ADMINISTRATION MODERNATION

Developed with the BIM Project Execution Planning Procedure by the Penn State OIC Research Team
http://www.engy/psu/edu/ae/cic/bimex