

GOVERNMENT OFFICE CENTER
MID-ATLANTIC U.S.

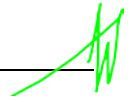
TECHNICAL ASSIGNMENT 2

19 October 2011

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Construction Management
Dr. Craig Dubler



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EXECUTIVE SUMMARY

This report is designed to provide further insight into the Government Office Center renovation and modernization project through analysis of important schedule characteristics and the costs of a key building system. Continuous occupancy of the building throughout the construction process will impact project schedule requirements and the cost of performing many construction activities. As a result, a detailed project schedule, curtain wall system estimate, and project general conditions estimate have been developed in addition to LEED performance and Building Information Modeling (BIM) use evaluations for future use as resources when analyzing key features that affect project execution.

In order to more accurately illustrate the project schedule, significant detail has been added to the previous schedule summary in order to reflect the project phasing and specific trade-level activities that directly affect the planned completion date of January 31, 2014. Also, a detailed curtain wall system estimate based on actual unit prices proved to be much more accurate than the R.S. Means estimate by including a greater level of detail in terms of specific line items investigated, resulting in a total estimated cost of \$9.25 million for the scope of work pertaining to the new curtain wall system. The detailed project schedule will prove useful when analyzing alternative production management methods, while the curtain wall system estimate will provide a baseline for substitute system comparisons in later research efforts.

A general conditions estimate for the Government Office Center project indicates that total general conditions costs make up \$3.3 million, roughly 8%, of the total project cost. Excluding contingency, there are weekly general conditions costs of approximately \$17,000. This information will be useful in future analyses when determining overall project cost impacts due to increases or decreases in project schedule time.

Based on a LEED for Existing Buildings Scorecard evaluation for this project, the Government Office Center renovation should be able to achieve a LEED Gold performance rating. This achievement is certainly suitable for the project, due to nationwide goals of the General Services Administration as well as the specific energy efficiency goals for this particular renovation project.

As part of a BIM Use Evaluation for this renovation, eight potential BIM uses were identified for utilization in the Government Office Center project. These eight uses are intended to meet nine value adding objectives for the project, such as planning phased occupancy requirements and improving owner and project participants' understanding of the phasing schedule through 4D modeling and coordination. While it is possible that not all BIM uses identified as value-adding in this evaluation are being implemented by the project team, the evaluation illustrates which BIM uses could benefit the project while identifying the project delivery stages that pertain to each BIM use identified.

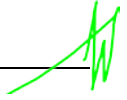


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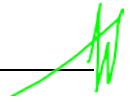
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DETAILED PROJECT SCHEDULE

*See Appendix A for the Detailed Project Schedule

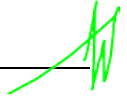
Since this project is a fairly complex renovation of a government building, design and preconstruction services were critical in determining the feasibility of this project before commitment of substantial federal spending was made. Preconstruction services were awarded to the construction manager in late November 2009 and limited to a period of one year. Notice to proceed was given on August 1, 2011. The renovation and modernization of the Government Office Center is scheduled for completion on January 31, 2014.

The project schedule is divided into six phases of work, which often overlap over the course of the renovation. The critical aspects of the renovation of the Government Office Center include the demolition of existing curtain wall and mechanical systems, followed by installation of new, more energy efficient systems to replace them. In order to minimize the impact of the construction project on the ongoing activities within the building, there will be significant overlaps between demolition and construction activities in an effort to shorten the duration of the overall construction process.

Construction activities began with demolition of a section of curtain wall on the South building elevation to allow for installation of a temporary material hoist. In preparation for the curtain wall replacement process, temporary weather walls will be installed between October and November 2011 inside the North façade of the building and between November and December 2012 inside the South façade. Demolition and replacement of the curtain wall on the North façade of the Government Office Center will take place between November 2011 and April 2012, while corresponding work on the South façade will take place between December 2012 and May 2013.

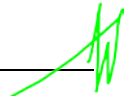
To handle increased building loads and improve the stability of the existing structural system, a set of structural steel members will be installed during the renovation of the Government Office Center. Truss reinforcement on levels 9-13 will take place in October 2011 after ceiling demolition activities are completed in these areas. Hollow Structural Section (HSS) steel beams will be installed on levels 3 through 14 on the building perimeter to support the new curtain wall system.

Due to the need for continuous occupancy of the Government Office Center throughout the construction process, a temporary air handling unit will be installed on the South parking deck starting in late October 2011 in order to meet the heating, ventilating, and air conditioning loads while permanent units in the building are replaced. In late November 2011, renovation of mechanical rooms in levels 1 and 14 will begin. The new natural gas boilers and automatic temperature control (ATC) systems will undergo the commissioning process in March 2012. Demolition and renovation of the West toilet stack will take place between November 2011 and September 2012, while corresponding demolition and renovation of the East toilet stack will take place between December 2012 and October 2013.



Finishes in the North and South building areas will be installed during the five months following completion of their respective curtain wall renovations. The final major phase of construction work for the Government Office Center involves roofing renovation in August of 2013, reinforcement of the CMU walls in level 2 during October 2013, and installation of a photovoltaic panel array in September and October 2013. The need to maintain the building envelope

A key scheduling concern for this project is the need to maintain occupancy during the entire construction period. Significant coordination must be in place in order to ensure that building occupants, files, and furniture are appropriately relocated to allow demolition and construction activities to take place while minimizing the impact on ongoing functions within the building. Major construction processes that occupy substantial interior spaces must be optimized for minimum schedule requirements such that these spaces may be promptly returned to the building occupants to serve their intended purposes.



DETAILED CURTAIN WALL SYSTEM ESTIMATES

*See Appendix B for Detailed Curtain Wall System Estimates

Due to the nature of the Government Office Center renovation project, there is minimal new structural work in relation to the overall size of the project. Therefore, a detailed estimate of the curtain wall system and the new required structural members to support it was performed based on cost information from R.S. Means Building Construction Cost Data 2011 and actual unit pricing from the subcontractor responsible for this scope of work. This estimate is formed through an extrapolation of the quantities that pertain to a typical floor. Specifically, quantities for the North curtain wall on the seventh floor were identified, then multiplied by twenty-two (22) to account for the eleven (11) stories of curtain wall as well as the respective curtain wall on the South façade.

Structural Steel

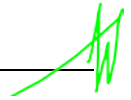
New Hollow Structural Section steel members will be installed on the North and South facades to support the load of the new curtain wall.

Curtain Wall

The existing curtain wall on the North and South facades will be replaced with a unitized, aluminum-framed curtain wall assembly. Pricing components for this system include the demolition of the existing curtain wall system, design assist and mock-ups, the curtain wall panels, powder coat finishing for exterior and interior surfaces, slab edge trim, and an allowance for design revisions. However, as shown in Appendix B, R.S. Means Building Construction Cost Data is limited to very general options for glazed curtain wall systems. Therefore, the estimate derived from R.S. Means data was produced as a comparison baseline for a more detailed estimate that was derived from actual unit rates provided by the subcontractor and construction management team responsible for this scope of work (Note: True unit rates have been altered slightly to protect the parties involved).

Summary

The estimate for the curtain wall system based on R.S. Means data suggests a total cost of approximately \$10.6 million, while the estimate based on industry unit prices suggests a total cost for the system of approximately \$9.25 million. The R.S. Means estimate is nearly 11% greater than the actual contracted value for this scope of work, while the more detailed estimate based on industry unit prices is less than 3% lower than the actual contracted value of \$9.5 million. Clearly, the R.S. Means estimate ignores a fairly substantial level of detail in exchange for a quicker estimating process, resulting in a less accurate result. Also, since the detailed estimate produced a total system cost that was slightly lower than the actual value, it is safe to assume that there were minor discrepancies in either quantity take-off or the specific line items identified and examined for the estimate.



GENERAL CONDITIONS ESTIMATE

*See Appendix C for General Conditions Estimate

The costs of general conditions items for the Government Office Center renovation project are summarized by category in the table below. While some data represents accurate costs for the project, the majority of cost information for this estimate was derived from R.S. Means Building Construction Cost Data 2011. Without including contingency, this project has weekly general conditions expenses of approximately \$17,000.

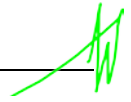
Line Item	Unit Rate	Unit	Quantity	Cost
Project Supervision and Staffing	\$ 15,205.00	Week	130	\$ 1,976,650.00
Temporary Facilities & Safety	\$ 1,844.38	Week	130	\$ 239,770.00
Temporary Utilities	\$ 40.85	Week	130	\$ 5,310.00
Contingency	\$ 1,100,000.00	LS	1	\$ 1,100,000.00

The Project Supervision and Staffing category shown above represents the greater part of the total general conditions costs, and includes the project management staff for the Government Office Center renovation project. These staff members include the Vice President, Senior Project Manager, Superintendents, Project Engineer, Accountant, and labor. All unit rates for these positions were determined using R.S. Means aside from the unit rate for the Vice President. The cost of this position for the project was reached based on the assumption that the Vice President has a higher weekly cost than the Senior Project Manager, but does not devote all of his time to this specific project.

The Temporary Facilities & Safety category includes rented trailers for storage and field office purposes, construction site fencing, dumpster costs, signage, and builder's risk insurance. The assumption that personal protective equipment is included as needed in subcontractor bids eliminates its cost impact on the general conditions for this project. All other items in this category aside from fencing are derived from R.S. Means cost data.

Because the Government Office Center will remain occupied and functional throughout the course of the renovation project, nearly all temporary utilities will be provided directly by the owner, rather than be included in project costs for mark-up. A line item for temporary toilets on site was included, based on R.S. Means cost information.

Overall, the general conditions items included in this estimate make up \$3.3 million, or approximately 8%, of the total project cost. This value is typical for construction projects, and the breakdown of these general conditions cost items seems reasonable based on the specifics of the Government Office Center renovation project.



LEED EVALUATION

*See Appendix D for LEED Scorecard

With the support of sustainability consultant William McDonough + Partners, the Government Office Center renovation project is expected to earn a Gold performance rating under the U.S. Green Building Council's (USGBC) LEED 2009 for Existing Buildings: Operations and Maintenance (LEED EBO&M) rating system. In order to achieve a Gold rating, at least 60 of 110 available points must be earned in addition to all prerequisite requirements for certification.

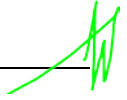
Based on an analysis of project goals, specifications, and discussions with project management staff, the Government Office Center renovation project should expect to earn 62 points, with 35 additional points achievable via minimal to moderate increase to the project scope and budget. Earning a Gold rating exceeds the typical certification goals of the General Services Administration for most of its recent construction projects throughout the country. However, because this construction project is intended to modernize the existing building and drastically reduce its carbon footprint, a LEED Gold performance rating is a much more appropriate level of certification than simply LEED Certified.

LEED 2009 for Existing Buildings: Operations & Maintenance Point Summary

Category	Y	?	N	Total
Sustainable Sites	10	9	7	26
Water Efficiency	9	4	1	14
Energy and Atmosphere	20	11	4	35
Materials and Resources	7	2	1	10
Indoor Environmental Quality	12	3	0	15
Innovations in Operations	3	3	0	6
Regional Priority Credits	1	3	0	4
Total	62	35	13	110

The majority of projected points under the Sustainable Sites category come from Credit 4: Alternative Commuting Transportation. Due to the urban characteristics of the surrounding environment, on-site parking is limited and most occupants will need to carpool or use available public transportation. Other points, such as those from Credit 1: LEED Certified Design and Construction and Credit 5: Site Development – Protect or Restore Open Habitat, are irrelevant for the Government Office Center renovation project, since the existing building is not previously LEED certified, nor will the project restore significant site space to native vegetation.

Water efficiency efforts are important to this renovation projects. As a result, the project team aims to earn points through water metering and improved indoor plumbing fixture and fitting efficiency. The Water Efficiency category is a worthwhile pursuit for the Government Office



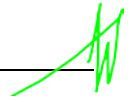
Center renovation and modernization project, since the existing building is already in need of upgraded restroom facilities.

Since the vast majority of the scope of this renovation project is intended to optimize energy performance, the Energy and Atmosphere category is perhaps the most important LEED category in relation to the project goals. Most points projected for achievement by the Government Office Center renovation project in this category will come from Credit 1 for optimizing energy efficiency performance and from Credits 2.1-2.3 for existing building commissioning efforts. The anticipated point totals coming from the Energy and Atmosphere category are in line with the goals of the project.

As a renovation project, the Materials and Resources category is not a major priority. However, the project specifications require purchase of a certain percentage of recycled or renewable materials, as well as a substantial demolition and construction waste salvage and recycling program. While most points in this category apply directly to purchases and waste stream management during the life of the building, the Government Office Center renovation project will reduce its carbon footprint using the previously mentioned methods, regardless of the fact that these efforts will earn almost no points under the LEED EBO&M rating system.

Indoor Environmental Quality is certainly a concern for a 14-story urban office building like the Government Office Center. With a wide selection of single-point credits, this renovation project should earn most with ease, and is projected to earn nearly all points in this category. For example, improved lighting through daylighting, views, and lighting controls will be achieved as part of the renovation effort.

The Innovation in Operations and Regional Priority Credits categories have the smallest relative value when compared to the other LEED rating sub-categories. With a variety of available options, it is safe to assume that the Government Office Center project will earn a few points in these categories. Overall, the LEED Scorecard produced for this report suggests a fairly even distribution of points among the categories, with emphasis on the Energy and Atmosphere and Indoor Environmental Quality categories over the other remaining categories.



BUILDING INFORMATION MODELING USE EVALUATION

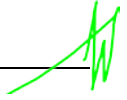
*See Appendix E for Building Information Modeling Use Evaluation Graphics

Based on the BIM uses described in the *BIM Project Execution Planning Guide*, eight potential BIM uses were identified for the benefit of the Government Office Center project. These eight uses are intended to meet nine value adding objectives for the project. By ranking the importance of these goals on a three-tiered priority rating scale, the project team members can later determine whether to pursue the BIM uses identified by this process.

The BIM uses of greatest importance to the Government Office Center renovation project include Phase Planning (4D Modeling), Building Systems Analysis, and Existing Conditions Modeling. Phase Planning through 4D Modeling helps the project team to plan the phased occupancy requirements that will be critical to successful delivery of the project. The 4D Model will also greatly benefit the current occupants of the building, who will be able to more easily visualize how the phasing schedule will impact ongoing building functions. Building Systems Analysis will help the project delivery team to ensure that the mechanical, electrical, and curtain wall systems of the Government Office Center perform to the design and sustainability standards specified. Finally, Existing Conditions Modeling will generate a representative model based on the building as it stands prior to the initiation of renovation work. Modeling the existing building and site conditions will prove to be a vital asset to the design and construction team as they engage in the renovation and modernization efforts.

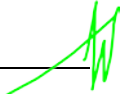
Moderately important BIM uses for this project include Construction System Design (Virtual Mock-up), 3D Coordination, and Sustainability (LEED) Evaluation. Through the Construction System Design process, the project management team seeks to improve the constructability of the curtain wall by evaluating virtual mock-ups. Virtual mock-ups have also been implemented for this project to improve the temporary weather wall design regarding worker and building occupant safety concerns. By implementing 3D Coordination on this project, the project delivery team strives to eliminate costly field conflicts and improve on-site productivity through use of clash detection processes and design reviews. In order to achieve the project goal of optimizing building performance, the project delivery team will utilize the Sustainability (LEED) Evaluation BIM process to enable tracking of energy use and indoor air quality in the Government Office Center for comparison against LEED standards.

The final BIM uses for the Government Office Center also provide value for the project, but not to the extent that the previously mentioned BIM uses reach. These third-tier BIM uses include Design Authoring and Cost Estimation. With the Design Authoring BIM process, the design team for this renovation project created a means to visualize the design and improve collaboration between the users of BIM and the building occupants. Generation of accurate quantity take-off and cost estimates through use of a BIM Cost Estimation process enabled the early project team to determine the changes in project costs due to additions or modifications to



the design during its development. Sustainability (LEED) Evaluation also falls in this category as a means to complete a project goal that differs from the goal mentioned in the previous paragraph. At this priority level, the Sustainability Evaluation tool can be used to align scheduling and material quantities tracking, which can directly lead to the achievement of certain LEED points, such as Materials and Resources credits for sustainable purchasing.

As shown in the Level 1 Process Map in Appendix E, the ways in which BIM was used for the Government Office Center renovation project varies depending on the stage of the project. During the Schematic Design phase, existing conditions were modeled for later use, preliminary cost estimates were generated for go-no-go decision making, 3D coordination was performed to identify early space challenges, virtual prototypes for replacement systems were developed, phase planning began to identify occupancy concerns, and initial systems analyses were performed to provide a baseline for the renovation effort. Aside from existing conditions modeling, each of these BIM uses are carried through the Design Development and Construction Documents phases with increasing levels of accuracy and detail included. In these phases of the project, construction system design through virtual mock-ups provides a means to analyze a construction method for constructability and safety concerns prior to implementing the construction method on site. In particular, the temporary weather wall that will separate occupied office space from construction activities and the environment during the curtain wall replacement process was analyzed in this manner. Finally, sustainability (LEED) evaluation efforts will occur primarily during the construction operations phases in order to track actual systems performances and other building aspects for adherence to attempted LEED requirements.



APPENDIX A – DETAILED PROJECT SCHEDULE

Technical Assignment 1

ID	Task Mode	Task Name	Duration	Start	1																							
					November 1			October 1		September 1		August 1		July 1		June 1		May 1		April 1								
					5/13	10/21	3/30	9/7	2/15	7/26	1/3	6/13	11/21	5/1	10/9	3/18	8/26	2/3	7/14	12/22	6/1							
1		Government Office Center Project Lifecycle	1473 days	Wed 6/11/08																								
2		General Activities	1472 days	Wed 6/11/08																								
3		Design Phase	261 days	Wed 6/11/08																								
4		Procurement of Construction Services	262 days	Thu 6/11/09																								
5		Preconstruction Services	262 days	Tue 11/24/09																								
6		NTP	0 days	Mon 8/1/11																								
7		Mobilize	15 days	Mon 8/1/11																								
8		Material Procurement	60 days	Mon 8/1/11																								
9		Site Demo & Protection	15 days	Mon 8/22/11																								
10		Furniture Relocation Level 6-13	20 days	Mon 8/22/11																								
11		Ceiling Demo at Truss Reinforcement Level 9-13	15 days	Mon 8/22/11																								
12		Hoist/Chute Erection	20 days	Tue 9/13/11																								
13		Hoist Available	0 days	Mon 10/10/11																								
14		Relocate Files	15 days	Tue 11/1/11																								
15		North Site Restoration	20 days	Thu 10/25/12																								
16		Remove Hoist	15 days	Tue 9/17/13																								
17		Curtainwall Punchlist / Final Clean	20 days	Tue 10/29/13																								
18		Curtainwall Complete	0 days	Mon 11/25/13																								
19		Northeast Site Restoration	20 days	Tue 11/26/13																								
20		Project Complete	0 days	Fri 1/31/14																								
21		Phase 1A - North Curtain Wall	586 days	Mon 8/1/11																								
22		Relocate Tenants from North Elev Level 3-5, 7, & 8	10 days	Mon 8/1/11																								
23		Weather Wall at Hoist	10 days	Mon 8/15/11																								
24		Demo Curtainwall at Hoist	11 days	Mon 8/29/11																								
25		Core Drill for HWS&R Riser	5 days	Tue 9/13/11																								
26		Truss Reinforce Level 9-13	15 days	Tue 10/11/11																								
27		Dust Partition / Weather Wall Level 3-13	30 days	Tue 10/11/11																								

Project: Tech 2 Detailed Project S Date: Mon 10/17/11	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone		External Milestone		Manual Task		Start-only			
	Summary		Inactive Task		Duration-only		Finish-only			

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ID	Task Mode	Task Name	Duration	Start	1		November 1		October 1		September 1		August 1		July 1		June 1		May 1		April 1	
					5/13	10/21	3/30	9/7	2/15	7/26	1/3	6/13	11/21	5/1	10/9	3/18	8/26	2/3	7/14	12/22	6/1	
28		Ceiling Removal East Corridor	7 days	Tue 10/11/11																		
29		HWS&R Riser & Mech. at East Corridor	10 days	Thu 10/20/11																		
30		Demo North Curtainwall	79 days	Tue 11/1/11																		
31		Level 13	7 days	Tue 11/1/11																		
32		Level 12	7 days	Thu 11/10/11																		
33		Level 11	7 days	Mon 11/21/11																		
34		Level 10	7 days	Wed 11/30/11																		
35		Level 9	7 days	Fri 12/9/11																		
36		Level 8	7 days	Tue 12/20/11																		
37		Level 7	7 days	Thu 12/29/11																		
38		Level 6	7 days	Mon 1/9/12																		
39		Level 5	7 days	Wed 1/18/12																		
40		Level 4	7 days	Fri 1/27/12																		
41		Level 3	9 days	Tue 2/7/12																		
42		Demo / Renovate West Toilet Stack	217 days	Tue 11/22/11																		
43		Renovate Level 3, 6, 8-10, 12, 13 Center	60 days	Mon 1/16/12																		
44		Install North Curtainwall	55 days	Mon 2/6/12																		
45		Level 13	5 days	Mon 2/6/12																		
46		Level 12	5 days	Mon 2/13/12																		
47		Level 11	5 days	Mon 2/20/12																		
48		Level 10	5 days	Mon 2/27/12																		
49		Level 9	5 days	Mon 3/5/12																		
50		Level 8	5 days	Mon 3/12/12																		
51		Level 7	5 days	Mon 3/19/12																		
52		Level 6	5 days	Mon 3/26/12																		
53		Level 5	5 days	Mon 4/2/12																		
54		Level 4	5 days	Mon 4/9/12																		
55		Level 3	5 days	Mon 4/16/12																		
56		Frame & Rough-In at Level 3-13 North	101 days	Mon 2/13/12																		
57		Panels & Louvers at North Elevation Level 14&15	46 days	Mon 4/9/12																		
58		Finishes Level 3-13 North	103 days	Mon 4/23/12																		

Project: Tech 2 Detailed Project S
Date: Mon 10/17/11

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

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					5/13	10/21	3/30	9/7	2/15	7/26	1/3	6/13	11/21	5/1	10/9	3/18	8/26	2/3	7/14	12/22	6/1		
59		Relocate Courts to North Side	10 days	Tue 6/12/12																			
60		Punchlist / Final Clean Phase 1A	30 days	Thu 9/13/12																			
61		Phase 1A Complete	0 days	Wed 10/24/12																			
62		Curtainwall at Hoist	15 days	Tue 10/8/13																			
63		Phase 0 - Mechanical Rooms	165 days	Tue 10/25/11																			
64		Temp AHU at Parking Deck	32 days	Tue 10/25/11																			
65		VAV/Light Fixture Replacement/Retrofit Level 1&2	94 days	Tue 10/25/11																			
66		Demo/Renovate Toilet Rooms Level 1	42 days	Tue 10/25/11																			
67		Level 14 MEP Renovation	84 days	Tue 11/22/11																			
68		Level 1 MEP Renovation	52 days	Thu 12/8/11																			
69		Level 1 HVAC & Plumbing Piping	30 days	Mon 2/20/12																			
70		Boiler and ATC Commissioned	15 days	Mon 3/19/12																			
71		Level 1 Finishes Restoration	30 days	Mon 4/2/12																			
72		Punchlist / Final Clean Level 1 & 2	21 days	Mon 5/14/12																			
73		Phase 1C - Exterior Work Levels 1 and 2	242 days	Tue 11/22/11																			
74		Roofing at Level 15	34 days	Tue 11/22/11																			
75		Entrance Canopy	26 days	Tue 6/12/12																			
76		Stone Veneer	15 days	Wed 7/18/12																			
77		Panels at North Soffit & 2nd Floor	21 days	Wed 8/8/12																			
78		Reglaze Level 1 North Windows	5 days	Thu 9/6/12																			
79		North Entry Doors & Revolver	15 days	Thu 9/6/12																			
80		Windows Level 2 North	5 days	Thu 9/13/12																			
81		Restore Finishes Level 2 North	10 days	Thu 9/20/12																			

Project: Tech 2 Detailed Project S
Date: Mon 10/17/11

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
Split		External Tasks		Inactive Summary		Manual Summary		Progress	
Milestone		External Milestone		Manual Task		Start-only			
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Technical Assignment 1

ID	Task Mode	Task Name	Duration	Start	1		November 1			October 1		September 1		August 1		July 1		June 1		May 1		April 1	
					5/13	10/21	3/30	9/7	2/15	7/26	1/3	6/13	11/21	5/1	10/9	3/18	8/26	2/3	7/14	12/22	6/1		
82		Punchlist / Final Clean Phase 1C	15 days	Thu 10/4/12																			
83		Phase 1C Complete	0 days	Wed 10/24/12																			
84		Phase 1B - MEP Work Levels 4 and 5	52 days	Tue 6/26/12																			
85		Demo / Renovate Level 4 & 5	31 days	Tue 6/26/12																			
86		Punchlist / Final Clean Phase 1B	21 days	Wed 8/8/12																			
87		Phase 1B Complete	0 days	Wed 9/5/12																			
88		Phase 2 - South Curtain Wall	312 days	Thu 10/25/12																			
89		Relocate Tenants Level 3-5, 7, 8 South	10 days	Thu 10/25/12																			
90		Dust Partition / Weather Wall Phase 2 Level 3-13	32 days	Thu 11/8/12																			
91		Demo South Curtainwall	78 days	Mon 12/3/12																			
92		Level 13	7 days	Mon 12/3/12																			
93		Level 12	7 days	Wed 12/12/12																			
94		Level 11	7 days	Fri 12/21/12																			
95		Level 10	7 days	Tue 1/1/13																			
96		Level 9	7 days	Thu 1/10/13																			
97		Level 8	7 days	Mon 1/21/13																			
98		Level 7	7 days	Wed 1/30/13																			
99		Level 6	7 days	Fri 2/8/13																			
100		Level 5	7 days	Tue 2/19/13																			
101		Level 4	7 days	Thu 2/28/13																			
102		Level 3	8 days	Mon 3/11/13																			
103		Demo / Renovate East Toilet Stack	214 days	Wed 12/26/12																			
104		Demo / Renovate Level 11 Phase 2 Center	21 days	Wed 12/26/12																			
105		Install South Curtainwall	61 days	Thu 3/7/13																			
106		Level 13	5 days	Thu 3/7/13																			
107		Level 12	5 days	Thu 3/14/13																			
108		Level 11	5 days	Thu 3/21/13																			
109		Level 10	5 days	Thu 3/28/13																			
110		Level 9	5 days	Thu 4/4/13																			

Project: Tech 2 Detailed Project S
Date: Mon 10/17/11

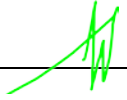
Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
Split		External Tasks		Inactive Summary		Manual Summary		Progress	
Milestone		External Milestone		Manual Task		Start-only			
Summary		Inactive Task		Duration-only		Finish-only			

Technical Assignment 1

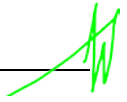
ID	Task Mode	Task Name	Duration	Start	1		November 1			October 1		September 1		August 1		July 1		June 1		May 1		April 1	
					5/13	10/21	3/30	9/7	2/15	7/26	1/3	6/13	11/21	5/1	10/9	3/18	8/26	2/3	7/14	12/22	6/1		
111		Level 8	6 days	Thu 4/11/13																	I		
112		Level 7	6 days	Fri 4/19/13																	I		
113		Level 6	6 days	Sat 4/27/13																	I		
114		Level 5	6 days	Mon 5/6/13																	I		
115		Level 4	6 days	Tue 5/14/13																	I		
116		Level 3	7 days	Wed 5/22/13																	I		
117		Frame & Rough-In South Level 3-13	61 days	Thu 3/14/13																			
118		Finishes Level 3-13 South	77 days	Fri 5/31/13																			
119		Sun Shades	46 days	Fri 5/31/13																			
120		Punchlist / Final Clean Phase 2	32 days	Tue 10/22/13																			
121		Phase 2 Complete	0 days	Wed 12/4/13																		12/4	
122		Furniture Move-In	22 days	Thu 12/5/13																			
123		Phase 3 - Lower Roof	176 days	Fri 5/31/13																			
124		Panels & Louvers South Elevation Level 14/15	51 days	Fri 5/31/13																			
125		Panels at Level 2 South Building Extension	41 days	Mon 8/12/13																			
126		Roofing at Level 3 South	21 days	Mon 8/12/13																			
127		Install Photovoltaics	40 days	Tue 9/10/13																			
128		Windows at Level 2 South	10 days	Tue 10/8/13																			
129		CMU Wall Reinforcing Level 2 South	20 days	Tue 10/8/13																			
130		South Canopies	54 days	Tue 10/22/13																			
131		Restore Finishes Level 2 South	15 days	Tue 11/5/13																			
132		Punchlist / Final Clean Phase 3	20 days	Mon 1/6/14																			
133		Phase 3 Complete	0 days	Fri 1/31/14																		1/31	

Project: Tech 2 Detailed Project S
Date: Mon 10/17/11

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



APPENDIX B – DETAILED CURTAIN WALL SYSTEM ESTIMATES



Quantity Takeoff Per Floor Per Side

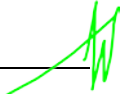
Item	Quantity	Unit	Extrapolated Total
HSS 8"x8"x3/8"	165	LF	3630
Unitized Curtain Wall	2333.33	SF	51333.3

RS Means

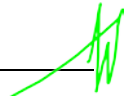
Line Item	Unit Rate	Unit	Quantity	Cost	Source
HSS 8"x8"x3/8"x25'	\$ 1,517.86	EA	154	\$ 233,750.00	05 12 23.17 4600
Glazed Curtain Walls	\$ 201.00	SF	51333.3	\$ 10,318,000.00	08 44 13.10 0200
Total Cost:				\$ 10,551,750.00	

Industry Cost Data

Line Item	Unit Rate	Unit	Quantity	Cost
Design Assist	\$ 1,200,000.00	LS	1	\$ 1,200,000.00
Demo Existing Curtain Wall	\$ 2.50	SF	51333.3	\$ 128,333.33
Tube Frame HSS	\$ 3,000.00	Ton	68.3	\$ 204,830.01
Curtain Wall	\$ 145.00	SF	51333.3	\$ 7,443,333.33
Powder Coat Exterior	\$ 1.66	SF	51333.3	\$ 85,213.33
Powder Coat Interior	\$ 0.62	SF	51333.3	\$ 31,826.67
Allowance for Design revisions	\$ 100,000.00	LS	1	\$ 100,000.00
Trim Detail at Slab Edge	\$ 14.40	LF	3850	\$ 55,440.00
Total Cost:				\$ 9,248,976.68



APPENDIX C – GENERAL CONDITIONS ESTIMATE



Project Supervision and Staffing

Line Item	Unit Rate	Unit	Quantity	Cost	Source
Vice President	\$ 5,000.00	Week	26	\$ 130,000.00	Assumption
Senior Project Manager	\$ 3,650.00	Week	130	\$ 474,500.00	01 31 13.20 0220
Superintendent	\$ 2,950.00	Week	130	\$ 383,500.00	01 31 13.20 0260
Superintendent	\$ 2,950.00	Week	130	\$ 383,500.00	01 31 13.20 0260
Project Engineer	\$ 1,950.00	Week	130	\$ 253,500.00	01 31 13.20 0120
Project Accountant	\$ 630.00	Week	130	\$ 81,900.00	01 31 13.20 0020
Site Labor	\$ 2,075.00	Week	130	\$ 269,750.00	01 31 13.20 0160
Subtotal				\$ 1,976,650.00	

Temporary Facilities & Safety

Line Item	Unit Rate	Unit	Quantity	Cost	Source
Field Office Trailer	\$ 315.00	Month	30	\$ 9,450.00	01 52 13.20 0450
Storage Trailer	\$ 103.00	Month	30	\$ 3,090.00	01 52 13.20 1350
Construction Site Fence	\$ 3,100.00	EA	1	\$ 3,100.00	Altered Actual Data
Personal Protective Equipment	\$ -				Assumption
Dumpster	\$ 695.00	Week	130	\$ 90,350.00	02 41 19.23 0725
Signage	\$ 29.50	SF	40	\$ 1,180.00	01 58 13.50 0020
Builder's Risk	\$ 132,600.00	EA	1	\$ 132,600.00	01 31 13.30 0020
Subtotal				\$ 239,770.00	

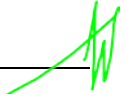
Temporary Utilities

Line Item	Unit Rate	Unit	Quantity	Cost	Source
Temporary Network Connection	\$ -				Assumption
Temporary Telephone Service	\$ -				Assumption
Temporary Power	\$ -				Assumption
Temporary Water	\$ -				Assumption
Temporary Toilets	\$ 177.00	Month	30	\$ 5,310.00	01 54 33.40 6410
Potable Water	\$ -				Assumption
Subtotal				\$ 5,310.00	

Contingency

Line Item	Unit Rate	Unit	Quantity	Cost	Source
Contingency for Cost of Work	\$ 1,100,000.00	EA	1	\$ 1,100,000.00	Altered Actual Data
Subtotal				\$ 1,100,000.00	

Total **\$ 3,321,730.00**



APPENDIX D – LEED SCORECARD



LEED 2009 for Existing Buildings: Operations & Maintenance

Government Office Center

19 October 2011

Project Checklist

10 9 7 Sustainable Sites Possible Points: 26

Y	?	N			
		4	Credit 1	LEED Certified Design and Construction	4
1			Credit 2	Building Exterior and Hardscape Management Plan	1
1			Credit 3	Integrated Pest Mgmt, Erosion Control, and Landscape Mgmt Plan	1
7	8		Credit 4	Alternative Commuting Transportation	3 to 15
		1	Credit 5	Site Development—Protect or Restore Open Habitat	1
		1	Credit 6	Stormwater Quantity Control	1
		1	Credit 7.1	Heat Island Reduction—Non-Roof	1
1			Credit 7.2	Heat Island Reduction—Roof	1
	1		Credit 8	Light Pollution Reduction	1

9 4 1 Water Efficiency Possible Points: 14

Y	?	N			
			Prereq 1	Minimum Indoor Plumbing Fixture and Fitting Efficiency	
2			Credit 1	Water Performance Measurement	1 to 2
5			Credit 2	Additional Indoor Plumbing Fixture and Fitting Efficiency	1 to 5
1	4		Credit 3	Water Efficient Landscaping	1 to 5
1		1	Credit 4	Cooling Tower Water Management	1 to 2

20 11 4 Energy and Atmosphere Possible Points: 35

Y	?	N			
			Prereq 1	Energy Efficiency Best Management Practices	
Y			Prereq 2	Minimum Energy Efficiency Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
10	8		Credit 1	Optimize Energy Efficiency Performance	1 to 18
2			Credit 2.1	Existing Building Commissioning—Investigation and Analysis	2
2			Credit 2.2	Existing Building Commissioning—Implementation	2
2			Credit 2.3	Existing Building Commissioning—Ongoing Commissioning	2
1			Credit 3.1	Performance Measurement—Building Automation System	1
1	1		Credit 3.2	Performance Measurement—System-Level Metering	1 to 2
1	2	3	Credit 4	On-site and Off-site Renewable Energy	1 to 6
1			Credit 5	Enhanced Refrigerant Management	1
		1	Credit 6	Emissions Reduction Reporting	1

7 2 1 Materials and Resources Possible Points: 10

Y	?	N			
			Prereq 1	Sustainable Purchasing Policy	
Y			Prereq 2	Solid Waste Management Policy	
1			Credit 1	Sustainable Purchasing—Ongoing Consumables	1
	1		Credit 2.1	Sustainable Purchasing—Electric-Powered Equipment	1
	1		Credit 2.2	Sustainable Purchasing—Furniture	1
1			Credit 3	Sustainable Purchasing—Facility Alterations and Additions	1
1			Credit 4	Sustainable Purchasing—Reduced Mercury in Lamps	1
		1	Credit 5	Sustainable Purchasing—Food	1

Materials and Resources, Continued

Y	?	N			
1			Credit 6	Solid Waste Management—Waste Stream Audit	1
1			Credit 7	Solid Waste Management—Ongoing Consumables	1
1			Credit 8	Solid Waste Management—Durable Goods	1
1			Credit 9	Solid Waste Management—Facility Alterations and Additions	1

12 3 Indoor Environmental Quality Possible Points: 15

Y	?	N			
			Prereq 1	Minimum IAQ Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
Y			Prereq 3	Green Cleaning Policy	
1			Credit 1.1	IAQ Best Mgmt Practices—IAQ Management Program	1
1			Credit 1.2	IAQ Best Mgmt Practices—Outdoor Air	1
	1		Credit 1.3	IAQ Best Mgmt Practices—Increased Ventilation	1
	1		Credit 1.4	IAQ Best Mgmt Practices—Reduce Particulates in Air Distribution	1
1			Credit 1.5	IAQ Mgmt Plan—IAQ Mgmt for Facility Alterations and Additions	1
1			Credit 2.1	Occupant Comfort—Occupant Survey	1
1			Credit 2.2	Controllability of Systems—Lighting	1
	1		Credit 2.3	Occupant Comfort—Thermal Comfort Monitoring	1
1			Credit 2.4	Daylight and Views	1
1			Credit 3.1	Green Cleaning—High Performance Cleaning Program	1
1			Credit 3.2	Green Cleaning—Custodial Effectiveness Assessment	1
1			Credit 3.3	Green Cleaning—Sustainable Cleaning Products, Materials Purchases	1
1			Credit 3.4	Green Cleaning—Sustainable Cleaning Equipment	1
1			Credit 3.5	Green Cleaning—Indoor Chemical and Pollutant Source Control	1
1			Credit 3.6	Green Cleaning—Indoor Integrated Pest Management	1

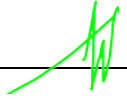
3 3 Innovation in Operations Possible Points: 6

Y	?	N			
1			Credit 1.1	Innovation in Operations: Specific Title	1
	1		Credit 1.2	Innovation in Operations: Specific Title	1
	1		Credit 1.3	Innovation in Operations: Specific Title	1
	1		Credit 1.4	Innovation in Operations: Specific Title	1
1			Credit 2	LEED Accredited Professional	1
1			Credit 3	Documenting Sustainable Building Cost Impacts	1

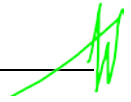
1 3 Regional Priority Credits Possible Points: 4

Y	?	N			
1			Credit 1.1	Regional Priority: Specific Credit	1
	1		Credit 1.2	Regional Priority: Specific Credit	1
	1		Credit 1.3	Regional Priority: Specific Credit	1
	1		Credit 1.4	Regional Priority: Specific Credit	1

62 35 13 Total Possible Points: 110



APPENDIX E – BUILDING INFORMATION MODELING USE EVALUATION GRAPHICS



BIM GOALS WORKSHEET

Priority (1-3)	Goal Description	Potential BIM Uses
1- Most Important	Value added objectives	
1	Ensure building's mechanical, electrical, and curtain wall systems are performing to specified design and sustainable standards	Building Systems Analysis
2	Improve constructability and safety of curtain wall demolition and installation	Construction System Design (Virtual Mock-up)
2	Reduce and eliminate field conflicts and improve on-site productivity	3D Coordination
3	Design visualization and improved collaboration between project stakeholders and BIM users	Design Authoring
3	Align scheduling and material quantities tracking	Sustainability (LEED) Evaluation
2	Optimize building performance by tracking energy use and indoor air quality for adherence to LEED standards	Sustainability (LEED) Evaluation
1	Plan phased occupancy requirements and improve owner and project participants' understanding of the phasing schedule	Phase Planning (4D Modeling)
3	Generate an accurate quantity take-off and cost estimate to provide cost effects of additions and modifications	Cost Estimation
1	Document existing building and site conditions to aid in renovation efforts	Existing Conditions Modeling

BIM USE ANALYSIS
Version 2.0

BIM Use*	Value to Project	Responsible Party	Value to Resp Party	Capability Rating			Additional Resources / Competencies Required to Implement	Notes	Proceed with Use
				Scale 1-3 (1 = Low)					
	High / Med / Low		High / Med / Low	Resources	Competency	Experience			YES / NO / MAYBE
Building Systems Analysis	HIGH	MEP Engineer	HIGH	3	3	3		Systems should perform as intended	YES
Construction System Design (Virtual Mock-up)	MED	Contractor	HIGH	3	3	3		High value for Contractor and Sub	YES
		Subcontractors	HIGH	1	2	2	None if Contractor creates model	building temp. weather wall	
3D Coordination (Construction)	MED	Contractor	HIGH	3	3	3		Contractor to facilitate Coord.	YES
		Subcontractors	HIGH	2	2	2	Coordination software required	Potential modeling learning curve	
Design Authoring	LOW	Architect	HIGH	3	3	3			YES
		MEP Engineer	HIGH	3	3	3			
		Structural Engineer	MED	3	3	3			
Sustainability (LEED) Evaluation	MED	Sustainability Cons.	HIGH	3	3	3	Accurate systems performance data		YES
		Architect	HIGH	2	3	3			
		MEP Engineer	HIGH	2	3	2	Accurate building loads		
Phase Planning (4D Modeling)	HIGH	Contractor	HIGH	3	3	3		High value to owner due to phasing complications	YES
								Use for Phasing & Construction	
Cost Estimation	LOW	Owner's Advisor	MED	2	3	3			YES
Existing Conditions Modeling	HIGH	Architect	HIGH	3	3	3			YES
		Owner's Advisor	MED	3	2	2			

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

