

Renovation of an Office Building in Washington D.C.



Washington, D.C.

Technical Report #1

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RENOVATION OF AN OFFICE BUILDING IN D.C. WASHINGTON, D.C.

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Executive Summary

Within this technical report, one can find any information pertaining to the renovation of an Office Building in Washington, D.C. You will first find information about the project schedule and how it is broken into the major phases of construction. The provided schedule is broken into Design Phase, Demolition, Structure, Façade, Roof, Pavilion/Atrium Construction, MEP, Interiors and Finishes. Following the schedule summary, there is a breakdown of the major Building Systems and what is being installed in the new Office Building. Next, there is an evaluation of the cost of the project, followed by a site plan of existing conditions. A description of Washington, D.C.'s local building conditions is explained, along with information about the owner, General Services Administration (GSA). Finally, the project delivery system is defined followed by the staffing plans of the General Contractor and Construction Manager. The owner has requested that the various names of the contractors be withheld due to the confidentiality of the project.





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Project Schedule Summary

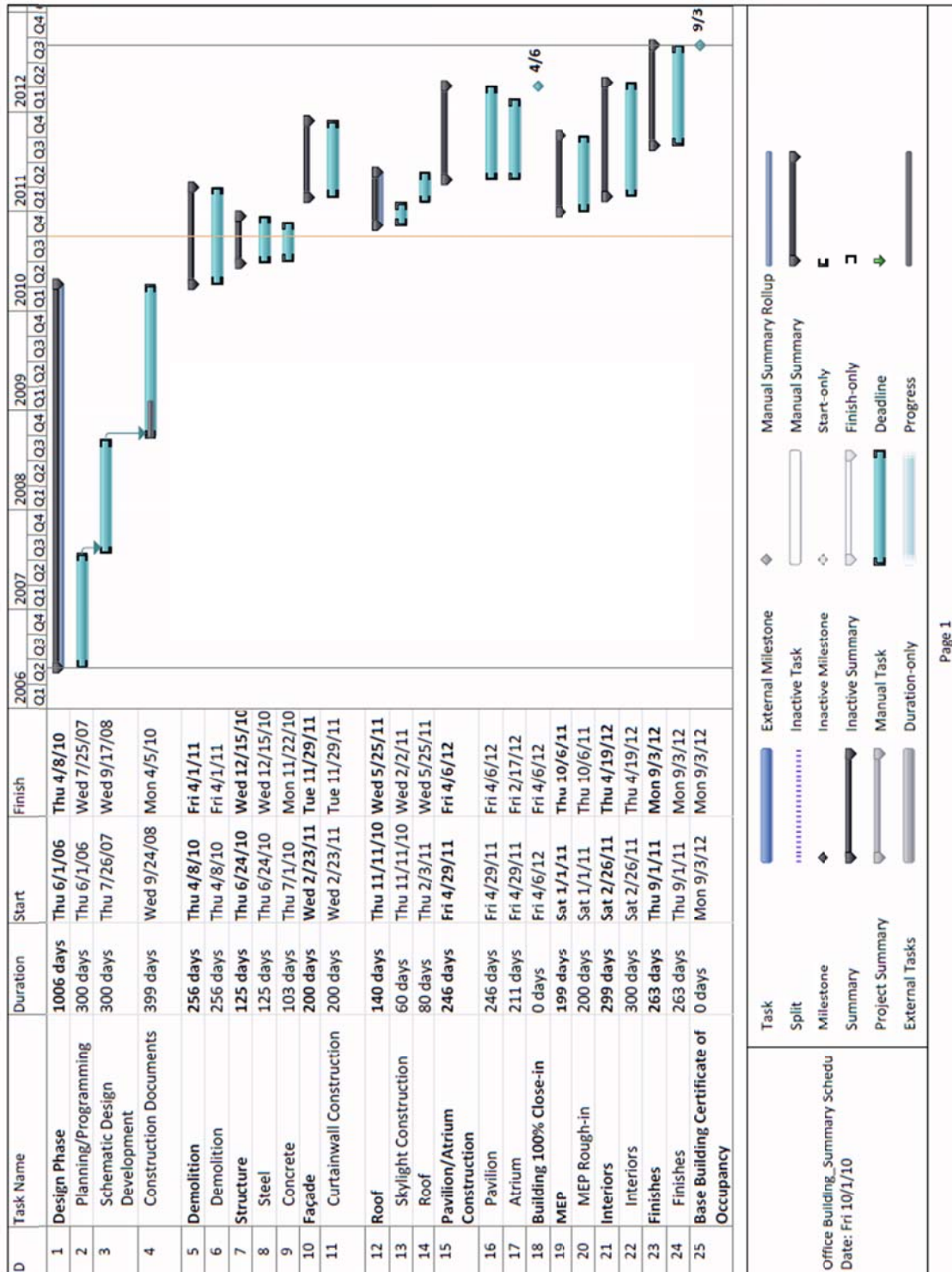
The following project summary schedule is based off of a number of schedules provided to me by the owner and the Construction Manager. The schedules provided to me did not include durations for every phase or activity, so some durations had to be estimated. I broke the Design Phase into Planning/Programming, Schematic Design Development, and Construction Documents and estimated their durations based on conversations with owner. I assumed that the Construction Documents would take the longest time based on how many design reviews they have to go through at GSA.

Demolition of the building takes a substantial amount of time due to the fact that so many hazardous materials needed to be removed. However, construction of the structure could begin in parts of the building where demolition was completed. Because it is a renovation of an existing building, the structure was not a huge part of the overall schedule. The curtain wall and façade are a large part of the schedule followed by the construction of the skylight and green roof. The construction of the Pavilion and Atrium also take up a large portion of the schedule. The building should reach 100% close in on April 6, 2012. The finishes will be completed after the building has been close in and MEP and Interiors are finishing up. The Office Building will receive its Base Building Certificate of Occupancy on September 3, 2012.



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Building Systems Summary

<u>Yes/No</u>	<u>Work Scope (if yes, address these questions/issues)</u>
Yes	<p>Demolition Requirements</p> <p>Demolition of the Office Building involved the removal of asbestos, lead based paint and dust, Polychlorinated biphenyls (PCB), mercury in the pipes and biological and radiological elements. PCB was found throughout the building in concrete slabs and ballasts in the lighting. The subcontractor is removing as much as possible, but in some cases it is more cost effective to trap and monitor the PCB rather than removing it. When that is the case, three coats of epoxy paint are applied to the concrete and the PCB is trapped. Another case where a hazardous material needs to be trapped is in the cooling tower. The steel that is holding the cooling tower up has lead on it and it is cheaper to trap and contain it than it is to remove it.</p>
Yes	<p>Structural Steel Frame</p> <p>New steel columns are being installed around the exterior of the building to support the curtain wall. New steel moment frame columns (W14x82) are being installed as well as new steel beams (W14x82) to support existing concrete edge beams.</p>
Yes	<p>Cast in Place Concrete</p> <p>The cast in place concrete included new concrete blast reinforcement and new concrete in fill slabs on existing slabs in the sub-basement and basement wherever the floor needed to be evened out. CIP Concrete also included new concrete in fill slab on metal deck on elevated floors and a concrete single span deck on top of new steel beams to help support the curtain wall.</p>
No	<p>Precast Concrete</p> <p>N/A</p>
Yes	<p>Mechanical System</p> <p>The mechanical rooms are located in the sub-basement and penthouse levels. The Office Building is undergoing a complete removal and replacement of all</p>



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	<p>MEP equipment with the exception of the chiller plant, which is located in the sub-basement. Two out of the four chillers in the plant were recently exchanged for new ones so they will remain while the two older chillers will be replaced. The chiller plant also serves the Ford Building which is located across the street from the Office Building. Air handling units and cooling towers are located in the penthouse of the Office Building.</p>
Yes	<p>Electrical System</p> <p>The Electrical room is located in the sub-basement of the building. All electrical equipment is being completely replaced. From the switchgear, the power is then distributed to the brand new transformers. There are eight transformers located in the sub-basement and four transformers located in the penthouse. There is an emergency generator in the penthouse to provide back-up power to the critical building systems during a power outage.</p>
Yes	<p>Masonry</p> <p>The only location of masonry in the Office Building is a CMU enclosure for a handicap lift in the loading dock.</p>
No	<p>Support of Excavation</p> <p>N/A</p>
Yes	<p>LEED Requirements</p> <p>GSA is adding a number of features to the Office Building to achieve a LEED Gold rating. Innovative environmental aspects of the project include a green roof, maximum use of natural light in the interior, storm water retention for landscape irrigation, energy saving Light Emitting Diodes (LEDs), smart building controls technology, and charging stations in the lower parking level for Electric Vehicles.</p>



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Project Cost Evaluation

The actual construction costs are based on a Schedule of Values report provided by the Construction Manager. The amounts are slightly altered and rounded for comparison purposes. All costs shown do not represent actual bid costs for the project.

Actual Costs:

General Costs		
	Cost	Per SF
Construction Cost	\$ 58,750,000	\$ 106.82
Total Cost	\$ 72,812,000	\$ 132.39

Building Systems Costs			
System	Cost	Per SF	% of CC
Cast-in-Place Concrete	\$ 2,000,000	\$3.64	3%
Metal Fabrications	\$ 4,300,000	\$7.82	6%
Glass and Glazing	\$ 7,900,000	\$14.36	11%
Mechanical and Plumbing	\$ 14,150,000	\$25.73	20%
Electrical	\$ 9,950,000	\$18.09	14%

The project cost of the Office Building was first evaluated by using the actual construction cost. Based on numbers provided by the owner, the construction cost was around \$58,750,000 or \$106.82/SF. Next the total cost was taken into consideration and it came out to be around \$72,812,000 or \$132.39/SF. Below the construction cost and total cost is a table that shows the major building systems costs and cost per square foot for each of the systems. After evaluation, it is determined that the mechanical and plumbing system is the most expensive, coming to a total of \$14,150,000.



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D4 Cost Estimate:

After calculating the building cost based on actual values, I used both D4 COST V9.5 and RS Means Cost Works to come up with a parametric estimate and square foot estimate, respectively. For the D4 Cost estimate, I selected the Ha-Lo Headquarters Office Building as the case study. This office building was a 7-story, 267,000 SF building with a total project cost of \$40,134,138. After selecting this case study, I adjusted the target date and location to September 2010 and Washington, D.C. and then adjusted the building size to 550,000 SF. The D4 estimate was about \$7,000,000 over. One reason for this source of error is because DD4 is calculating the cost of a new building while the Office Building in D.C. is a renovation of an existing building. The D4 estimate also accounts for a large amount of Cast-in-Place concrete when in fact most of the concrete in the Office Building is already in place. For a spreadsheet of the D4 Cost Estimate, see Appendix A.

RS Means Square Foot Cost Estimate:

I developed a square foot estimate by using RS Means Online (<http://www.meanscostworks.com>). I chose a 5-10 story office building with Limestone Panel Concrete Block Back-up with a reinforced concrete frame. There was no curtain wall option in RS Means so I chose the option that was closest to the Office Building. The RS Means estimate ended up being around \$7,000,000 over the actual estimate. A couple reasons for this discrepancy could be that there is no renovation option in RS Means and the parameters of the Office Building were outside of the ranges recommended by RS Means. For a spreadsheet of the RS Means Square Foot Cost Estimate, see Appendix B.



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Site Plan of Existing Conditions

**See APPENDIX C for the Existing Site Plan*



The Office Building in D.C. is located at 200 C Street SW in the heart of Washington, D.C. With uninterrupted views of the Capitol, FOB 8 is in a prime location for an office building. The office building is surrounded by other office buildings on its South, West and North sides and a major highway on its East side. Similar to the Office Building, all of the surrounding buildings are government buildings due to its close proximity to the Capitol. Across the street from the Office Building is the Metro-Federal Center SW Station. This station makes for a very pedestrian heavy area at the intersection of D Street and 3rd Street. The major highway located on the East side of the building, I-395, makes the Office Building very accessible when traveling from outside of the city. See APPENDIX C for the existing conditions site plan.



Local Conditions

The preferred method of construction in Washington, DC is the use of concrete. The reason for this method is because there is a height restriction in Washington, D.C. “In 1889, Congress passed the Heights of Building Act...but was amended in 1910 to the width of the adjacent street plus 20 feet.*” As a result, when Federal Office Building No. 8 was originally built in 1961, concrete beams and concrete columns were used to maximize the floor-to-floor height, staying within the height restriction.

At the Office Building, there is very limited room for construction parking. On-site parking is only available for the Construction Manager and the General Contractor. Even though there is very limited parking for workers on site, the Office Building project site is conveniently located across the street from the Metro-Federal SW Station. This method of transportation gives the workers an easy and inexpensive way to commute to the job site.

Since the Office Building is striving for LEED Gold Certification, the site has a number of recycling dumpsters to help achieve points for certification. The initial cost of the dumpsters is around \$500 and there is a tipping fee of about \$130 for each dumpster. Recycling dumpsters play a heavy role with the building earning LEED certification. As a result, Turner Construction has a project engineer who is responsible for tracking the percentage of waste being recycled. Currently, the site has is recycling 99% of all waste.

*(Grunwald)



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Client Information:



The Office Building is owned by the United States General Services Administration, or GSA. GSA is an independent agency of the United States government, established in 1949 to help manage and support the basic functioning of federal agencies. GSA is renovating the Office Building due to a change in function from lab space to a Class A office space.

The office building, built in the 1960s, was originally the central headquarters and lab space for the Federal Drug Administration. GSA felt that the Office Building would better serve as an office space rather than a lab space. The Office Building is located one block from the Capitol and is considered premium rental/office space. The unobstructed views of the Capitol make the Office Building everyone's ideal office.

GSA is most concerned with the needs of the tenants. They expect the Office Building to come in on time and on budget. The longer the project takes, the longer the tenants have to wait to occupy their space. GSA is also placing an emphasis green building and recycling. They are striving for LEED gold and want to do everything they can achieve this. If the project team is able to successfully meet these objectives by providing a high quality end product within budget and on time, GSA will be satisfied.

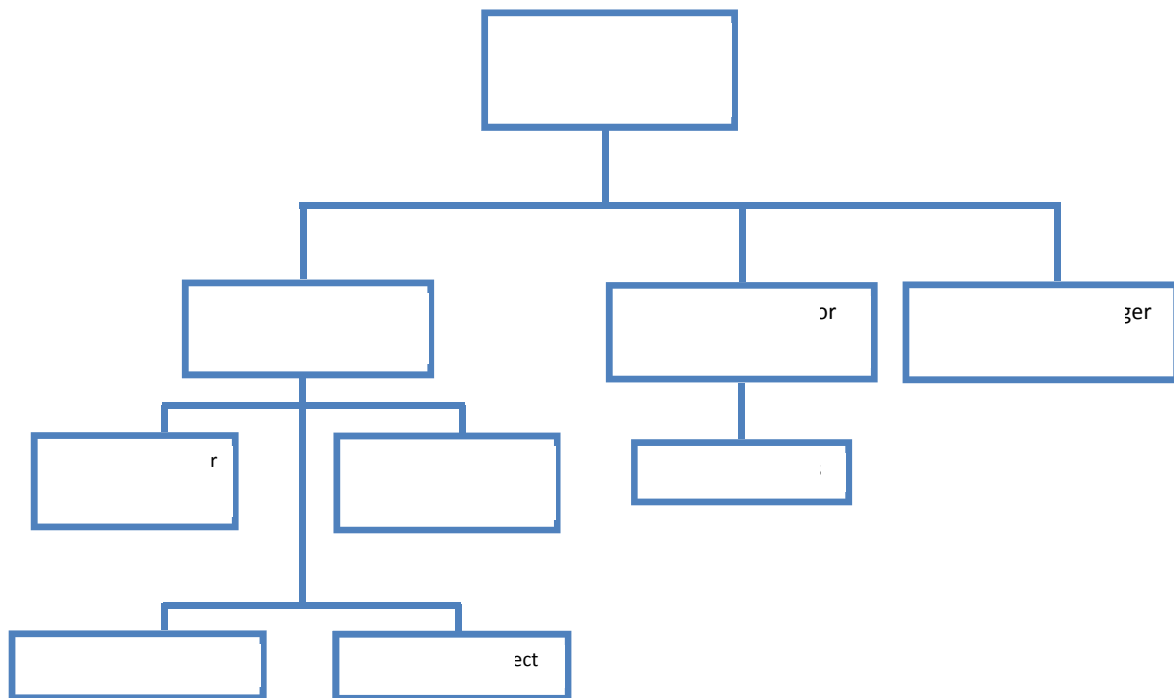


Project Delivery System:

The Office Building is being delivered as a design-bid-build project with a Construction Manager. GSA first hired an Architect to design the renovation and prepare a complete set of contract documents. Once the project plans and specifications were complete, GSA purchased them from the Architect.

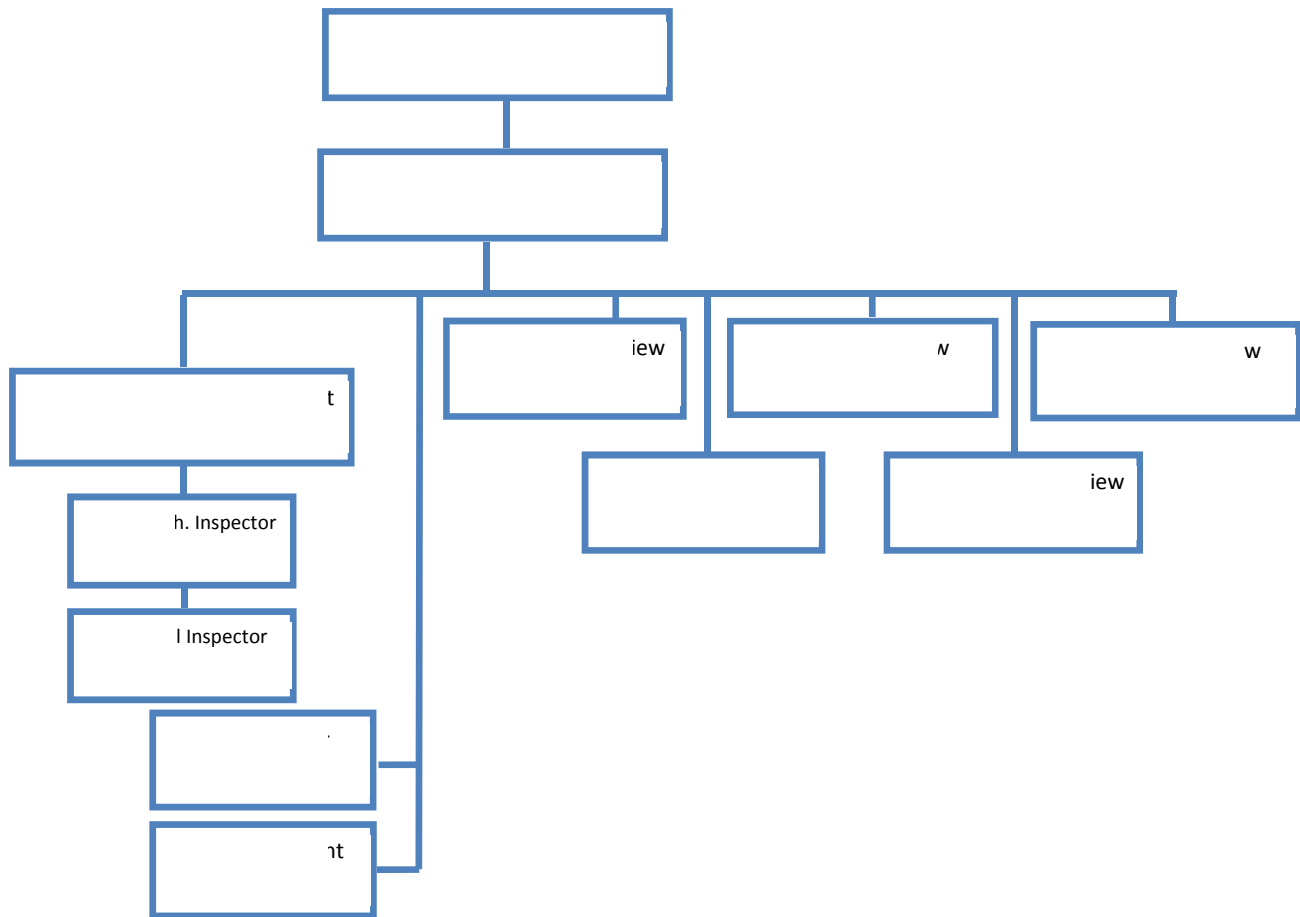
At the same time GSA hired the Architect, they hired a Construction Manager to help improve cost, schedule and quality control; improve constructability of the design; and improve field management. Once the design was complete, GSA brought on a General Contractor. The General Contractor is responsible to hire the subcontractors for every trade. The lowest bidder for each trade was awarded the contract.

Due to the confidentiality of this project, the owner has requested that generic names be used for all of the contractors and that the types of contract types are withheld.





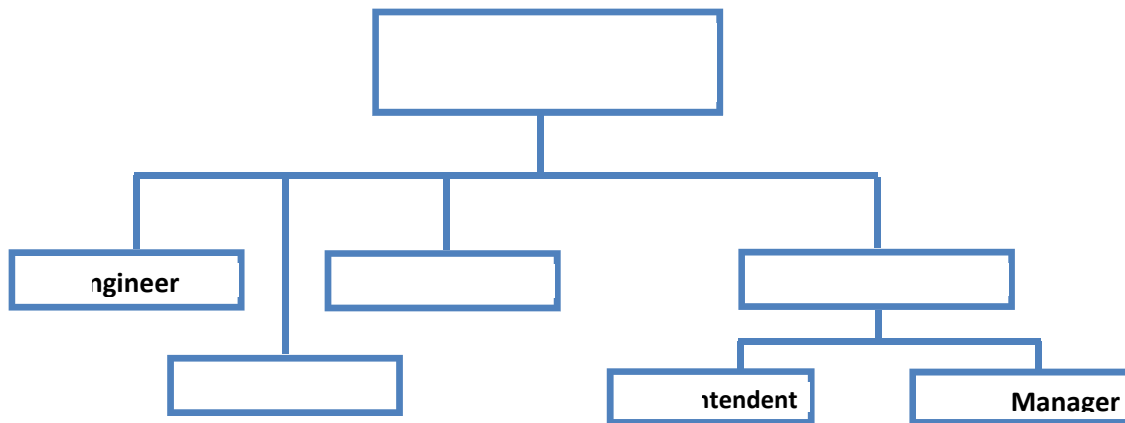
Staffing Plan – Construction Manager



The construction management staffing plan of the Office Building, as outlined in the organizational chart above, involves a number of different players that all play a key role. First, you have the Project Executive that oversees the entire project and reports directly to GSA. Underneath the Project Executive is the Senior Project Manager, who is on the job site every day and oversees the Superintendent and the part-time project support staff. The responsibilities of the major trades of the project are divided amongst the five sub-positions of the Project Manager. The Superintendent is also assigned Inspectors who help oversee the work directly in the field. There is also a Cost Engineer and Administrative Assistant on site to perform and maintain all bookkeeping and ensure that everything is running smoothly in the office.



Staffing Plan – General Contractor



The General Contractor staffing plan shown above lays out the relationships of people that are on site every day. First, you have the Project Manager on site that oversees everyone and makes sure that the project stays under budget and on schedule. Underneath the Project Manager is the General Superintendent. The General Superintendent oversees work being done in the field. The Superintendent and Safety Manager are there to help the General Superintendent in the field to ensure that work is completed in a timely and safe manner. Also underneath the Project Manager are the Engineer, Project Engineer and Support Administration. They are there to assist the Project Manager in day-to-day activities on the job site.



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Works Cited

Grunwald, Michael. "The Washington Post." 2 July 2006. Washingtonpost.com 1 October 2010
<http://www.washingtonpost.com/wp-dyn/content/article/2006/06/30/AR2006063001316.html>.



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Appendix A

D4 Cost Estimate



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Office Building in D.C.				
Building Size		550,000	Building Use:	Office
No. of Floors		6	Foundation:	CON
Building Height		90'	Ext. Walls:	CUR
1st Floor Height		12.5'	Int. Walls:	DRY
1st Floor Size		37,000	Roof Type:	MEM
			Floor Type:	CON
			Project Type:	NEW
Division		Percent	SF Cost	Amount
00	Procurement & Contracting Req.	2.08%	\$3.02	\$1,659,096
01	General Requirements	12.41%	\$18.03	\$9,917,603
02	Existing Conditions	3.12%	\$4.53	\$2,490,756
03	Concrete	18.83%	\$27.36	\$15,050,310
04	Masonry	1.73%	\$2.51	\$1,379,010
05	Metals	9.16%	\$13.31	\$7,321,398
06	Woods, Plastics & Composites	0.19%	\$0.28	\$154,908
07	Thermal & Moisture Protection	1.00%	\$1.45	\$798,335
08	Openings	20.77%	\$30.18	\$16,600,312
09	Finishes	1.38%	\$2.00	\$1,100,428
10	Specialties	3.21%	\$4.67	\$2,569,249
12	Furnishings	1.22%	\$1.78	\$978,353
14	Conveying Systems	4.23%	\$6.15	\$3,380,595
15	HVAC	13.15%	\$19.11	\$10,509,042
16	Electrical	7.54%	\$10.96	\$6,027,030
Total Project Costs			\$145.34	\$79,936,425



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Appendix B


RS Means Square Foot Cost Estimate



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Square Foot Cost Estimate Report

Estimate Name:	Office Building in DC	
Building Type:	Office, 5-10 Story with Precast Concrete Panel / Steel Frame	
Location:	WASHINGTON, DC	 <p>Costs are derived from a building model with basic components.</p> <p>Scope differences and market conditions can cause costs to vary significantly.</p> <p>Parameters are not within the ranges recommended by RSMeans.</p>
Story Count:	6	
Story Height (L.F.):	12.5	
Floor Area (S.F.):	550000	
Labor Type:	Union	
Basement Included:	No	
Data Release:	Year 2010 Quarter 3	
Cost Per Square Foot:	\$138.47	
Building Cost:	\$76,158,000	

		% of Total	Cost Per S.F.	Cost
A Substructure		2.10%	\$2.23	\$1,228,000
A1010	Standard Foundations		\$1.25	\$690,000
A1030	Slab on Grade		\$0.81	\$445,000
A2010	Basement Excavation		\$0.05	\$25,500
A2020	Basement Walls		\$0.12	\$67,500
B Shell		22.70%	\$23.71	\$13,039,000
B1010	Floor Construction		\$17.65	\$9,707,500
B1020	Roof Construction		\$0.91	\$501,500
B2010	Exterior Walls		\$3.49	\$1,920,000
B2020	Exterior Windows		\$0.70	\$383,500
B2030	Exterior Doors		\$0.23	\$129,000
B3010	Roof Coverings		\$0.72	\$397,500
C Interiors		21.50%	\$22.45	\$12,345,000
C1010	Partitions		\$1.53	\$840,000
C1020	Interior Doors		\$2.56	\$1,407,000
C1030	Fittings		\$0.70	\$384,500
C2010	Stair Construction		\$2.68	\$1,475,500
C3010	Wall Finishes		\$0.88	\$482,000
C3020	Floor Finishes		\$7.95	\$4,375,000
C3030	Ceiling Finishes		\$6.15	\$3,381,000
D Services		53.70%	\$56.12	\$30,865,500
D1010	Elevators and Lifts		\$15.91	\$8,749,500
D2010	Plumbing Fixtures		\$2.22	\$1,222,500



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D2020	Domestic Water Distribution		\$0.49	\$270,000
D2040	Rain Water Drainage		\$0.25	\$138,000
D3050	Terminal & Package Units		\$15.67	\$8,620,000
D4010	Sprinklers		\$2.71	\$1,490,000
D4020	Standpipes		\$0.62	\$343,000
D5010	Electrical Service/Distribution		\$0.27	\$146,500
D5020	Lighting and Branch Wiring		\$11.54	\$6,346,500
D5030	Communications and Security		\$5.36	\$2,950,000
D5090	Other Electrical Systems		\$1.07	\$589,500
E Equipment & Furnishings		0.00%	\$0.00	\$0
E1090	Other Equipment		\$0.00	\$0
F Special Construction		0.00%	\$0.00	\$0
G Building Sitework		0.00%	\$0.00	\$0
Total Building Cost			\$138.47	\$76,158,000



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Appendix C

Site Plan of Existing Conditions



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