<u>Hice</u> Building



Katey Andaloro

Construction Management Final Report Dr. John Messner April 7, 2009

# Detailed Project Schedule

### General Schedule Summary

Notice to proceed for the project was given by the owner to the general contractor on August 14, 2006. After receipt of the notice to proceed, the general contractor began its mobilization of the site, and excavation and dewatering activities began in early September of 2006. The project required the excavating crew to remove soil at an approximate depth of forty-five feet below existing grade to reach the bottom of the project's foundation. Given limited site space and depth of the excavation to the mat foundation, a sheeting and shoring system with tie backs was used. As a result of the water table being approximately 25 feet above the bottom of the scheduled excavation and the soil content of the site having heavy clay content, installing the dewatering system prior to the beginning of excavation was critical to maintain the project's schedule. In August, 2008, work on the cast in place mat foundation system began. The forming and pour sequence for the mat foundation was broken into ten pours, proceeding from the south end of the site to north end of the site.

Once the foundation was complete, the concrete crews worked their way vertically towards the top of the building. The concrete operation reached original Ground Floor in January of 2008. Once above the Ground Floor, the concrete's reinforcement switched from mild steel reinforcement (rebar) to post tension cables. One of the most important factors in completing the post tension concrete floors was the time needed to cure the concrete to a proper strength, so that the cables could be stressed. Because of this factor, concrete pours were often scheduled around when its adjacent pour could be stressed. The structural engineer's project specifications required that shoring occupying four levels below to the floor being poured to ensure that the weight of the freshly poured concrete floors could be supported until the concrete of the floor obtained the specified strength. The completion of the above grade structured occurred in June of 2008.

Interior finishes in the bathrooms, main lobby, lower level lobby, and M Street lobby are to begin in March of 2008. The remaining tenant build out of the project will commence outside of BBC's contact with the owner.

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Washington, D.C

Construction Management

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Activity ID	Activity Name	Original Start Duration	Finish
OFFICE	BUILDING	819 21-Feb-06	21-Apr-09
Preco	nstruction	132 21-Feb-06	25-Aug-06
Const	truction	681 06-Sep-06	21-Apr-09
Exca	avation	252 05-Sep-06	29-Aug-07
Suba	structure	141 02-Jul-07	14-Jan-08
C	oncrete	141 02-Jul-07	14-Jan-08
	P3 Level - Garage	90 02-Jul-07	02-Nov-07
	P2 Level - Garage	54 27-Aug-07	08-Nov-07
	P1 Level - Garage	30 23-Oct-07	03-Dec-07
	Lower Level - Garage	45 12-Nov-07	14-Jan-08
	erstructure	195 12-Dec-07	09-Sep-08
	oncrete	186 12-Dec-07	27-Aug-08
St	ructural Steel	132 10-Mar-08	09-Sep-08
Exte	rior Facade & Roof	554 08-Mar-07	21-Apr-09
Core	• • • • • • • • • • • • • • • • • • •	335 07-Jan-08	17-Apr-09
A1	780 Core Work & Finishes	264 20-Mar-08*	24-Mar-09
M	echanical & Plumbing Rough In	277 07-Jan-08	27-Jan-09
B	ectrical Rough In	308 13-Feb-08	17-Apr-09
	rinkler Rough in	161 14-Jan-08	25-Aug-08
B	evalors	184 07-Jul-08	19-Mar-09
E FI	niahea	98 12-Nov-08	27-Mar-09
Fi	t Out Lobbles	218 22-May-08	23-Mar-09
81	tewark	136 10-Oct-08	17-Apr-09
C	ose Out	14 13-Mar-09	02-Apr-09

Figure 3: Schedule Summary

#### Schedule Overview

Provided on the next few pages are a more comprehensive project schedule than the previously submitted summary schedule. This construction schedule is mainly organized by trade and how the trades progress from one level in the office building to the next level. Formatting the activities in this manner clearly demonstrates the principles of the phrase, "parade of trades," thus allowing trade movements throughout the project to be legible. As shown the in the schedule, structural trades work throughout the building in a relatively straight linear fashion, as the MEP trades overlap level construction while still proceeding upward through the building. This sequencing method allows for the substantial completion of the building, the project to be fast-tracked, and to have separate core-shell and fit-out packages with more than 10 contracts. A caution in using this technique is the possibility of trade congestion in a given work area or level of the project. Thus continuous trade coordination between the mechanical, electrical, plumbing, and finishing trades is key in completing the project on time.

The schedule of the project also utilizes a schedule with accelerated activities. This helped to create a more efficient project, and to create a buffer zone for any site issues such as weather conditions, unforeseen site conditions, and issues with material delivery.

Due to the events of construction and the complexity of the project, many items were left out but the milestone dates and general durations are noted.

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#### Excavation

Notice to proceed for the project was given by the owner to the general contractor on August 14, 2006. After receipt of the notice to proceed, the general contractor began its mobilization of the site, and excavation and dewatering activities began in early September of 2006. Given limited site space and depth of the excavation to the mat foundation, a sheeting and shoring system with tie backs was used. As a result of the water table being approximately 25 feet above the bottom of the scheduled excavation and the soil content of the site having heavy clay content, installing the dewatering system prior to the beginning of excavation was critical to maintain the project's schedule.

#### Structural Concrete

One key phase to highlight is the concrete pour schedule for both the substructure, concrete with mild steel reinforcement (rebar), and the superstructure, post tension slabs. The 200 item constraint did not allow for highly detailed phasing, but a more detailed schedule of concrete production would look something like this:

F02490	W/P Foundation Walls P3 to P2 - Pour #8	0	0.0005007	0705007		WWD Foundation Wells DO to DO Do 200
		2	2 26SEP07	27SEP07	-44	W/P Foundation Walls P3 to P2 - Pour #8
S01690	F/R/P Foundation Walls P3 to P2 - Pour #8	3	3 28SEP07	02OCT07	-44	# F/R/P Foundation Walls P3 to P2 - Pour #8
P2 LEVEL G						
S01081	F/R/P Elevated Deck Level P2 - Pour #5	2	2 10OCT07	110CT07	-44	EF/R/P Elevated Deck Level P2 - Pour #5
P1 LEVEL G						
S00250	F/R/P Elevated Deck Level P1 - Pour #1	2	2 12OCT07	15OCT07	-44	F/R/P Elevated Deck Level P1 - Pour #1
S00340	F/R/P Elevated Deck Level P1 - Pour #2	2	2 16OCT07	17OGT07	-44	EF/R/P Elevated Deck Level P1 - Pour #2
S00550	F/R/P Elevated Deck Level P1 - Pour #3	2	2 18OGT07	19OCT07	-44	ZF/R/P Elevated Deck Level P1 - Pour #3
S00560	F/R/P Elevated Deck Level P1 - Pour #4	2	2 22OCT07	23OCT07	-44	EF/R/P Elevated Deck Level P1 - Pour #4
S01781	F/R/P Elevated Deck Level P1 - Pour #5	2	2 240CT07	25OCT07	-44	EF/R/P Elevated Deck Level P1 - Pour #5
S01791	F/R/P Elevated Deck Level P1 - Pour #6	2	2 26OCT07	29OCT07	-44	F/R/P Elevated Deck Level P1 - Pour #6
	/EL				1.4.4	
S00400	F/R/P Elevated Deck Lower Lvl - Pour #1	2	2 30OCT07	310CT07	-44	F/R/P Elevated Deck Lower Lvl - Pour #1
S00430	F/R/P Elevated Deck Lower Lvl - Pour #2	2	2 01NOV07	02NOV07	-44	F/R/P Elevated Deck Lower Lvl - Pour #2
S00580	F/R/P Elevated Deck Lower Lvl - Pour #3	2	2 05NOV07	06NOV07	-44	F/R/P Elevated Deck Lower Lvl - Pour #3
S00610	F/R/P Elevated Deck Lower Lvl - Pour #4	2	2 07NOV07	08NOV07	-44	F/R/P Elevated Deck Lower Lvl - Pour #4
S01981	F/R/P Elevated Deck Lower Lvl - Pour #5	2	2 09NOV07	12NOV07	-44	F/R/P Elevated Deck Lower Lvl - Pour #5
501991	F/R/P Elevated Deck Lower Lvl - Pour #6	2	2 13NOV07	14NOV07	-44	EF/R/P Elevated Deck Lower Lvl - Pour #6
LEVEL 01						the second state of the se
S00470	F/R/P Elevated Deck Ground Floor - Pour #1	3	3 15NOV07	19NOV07	-44	F/R/P Elevated Deck Ground Floor - Pour #1
S00510	F/R/P Elevated Deck Ground Floor - Pour #2	3	3 20NOV07	26NOV07	-44	F/R/P Elevated Deck Ground Floor - Pour #2
500640	Columns Ground to 02	8	8 11DEC07	20DEC07	-44	Columns Ground to 02
S00660	F/R/P Elevated Deck Ground Floor - Pour #3	3	3 27NOV07	29NOV07	-44	E/R/P Elevated Deck Ground Floor - Pour #3
500700	F/R/P Elevated Deck Ground Floor - Pour #4	3	3 30NOV07	04DEC07	-44	F/R/P Elevated Deck Ground Floor - Pour #4
S00701	F/B/P Elevated Deck Ground Floor - Pour #5	3	3 05DEC07	07DEC07	-44	F/R/P Elevated Deck Ground Floor - Pour #5

Figure 4: Example of Pour Sections

Each floor is broken into four (4) or seven (7) sections to keep the pours manageable, proceeding from the south end of the site to north end of the site. The project specifications require that at least one floor be fully formed or shored with a minimum of four (4) floors reshored at any time. Some of these activities occur simultaneously, which keeps the job moving along.

ffice Building

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### Core MEP & Interior Finishes

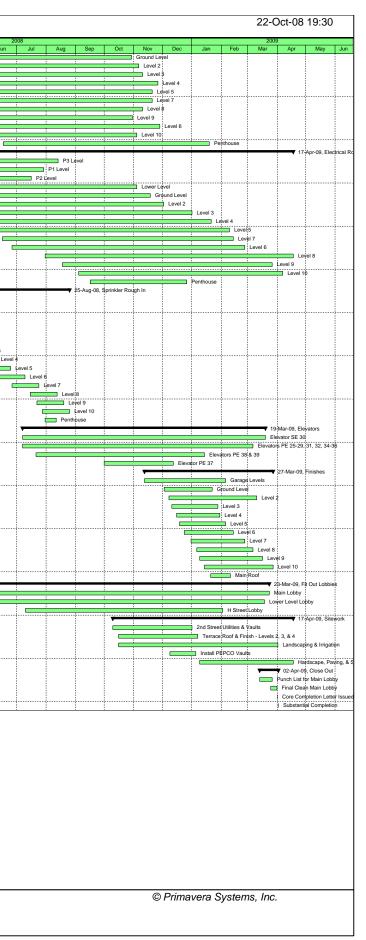
The main element in the finishing work on this project is the MEP work. The building is seeking LEED Silver certification, thus the mechanical and electrical equipment are very large and highly efficient. Procurement for these items took place as soon as the notice to proceed was given. Coordinating this work is one of the most important challenges in completing the building core.

Interior finishes in the bathrooms, main lobby, lower level lobby, and M Street lobby are to begin in March of 2008. The remaining tenant build out of the project will commence outside of BBC's contract with the owner.

Activity Name	Original Start Finish		2006							2007					2008					200	09
BUILDING	Duration         Jan           819         21-Feb-06         21-Apr-09	Feb Mar Apr	May Jun	Jul Aug Ser	p Oct	Nov Dec	Jan Feb	Mar Apr	May	Jun Jul Aug Sep	Oct	Nov Dec J	lan Feb Mar	Apr Ma	ay Jun Jul	Aug	Sep Oct Nov	Dec	Jan	Feb Mar	Apr 21-
Instruction	132 21-Feb-06 25-Aug-06			25-Aug-	-06, Preconstruction	n															
Design	121 21-Feb-06 10-Aug-06			Design																	
Purchasing Subs	32 12-Apr-06* 25-May-06		Purchasing \$ut	is																	
Permitting	47 30-May-06* 03-Aug-06	Ļ		Permitting															ļļ.		
Procurement	28 06-Jun-06* 14-Jul-06			Procurement																	
Notice to Proceed Mobilization	0 14-Aug-06* 14-Aug-06 10 14-Aug-06* 25-Aug-06			I Notice to Pro																	
ruction	681 06-Sep-06 21-Apr-09										-								<u> </u>		21-
ration	252 06-Sep-06 29-Aug-07									29-Aug-07	Excavation										
60 Excavation	252 06-Sep-06* 29-Aug-07									Excavation											
70 Sheeting & Shoring	196 06-Sep-06* 12-Jun-07						<u> </u>			Sheeting & Shoring											
80 Install Dewatering System	204 06-Sep-06* 22-Jun-07									Install Dewatering System									1		
ructure	111         02-Jul-07         03-Dec-07           111         02-Jul-07         03-Dec-07											▼ 03-Dec-07, Su ▼ 03-Dec-07, Co							4		
23 Level - Garage	111 02-Jul-07 03-Dec-07	·										03-Dec-07, Co									
A2480 F/R/P Mud Mat	30 02-Jul-07* 10-Aug-07									F/R/P Mud Mat		1							4		
A2490 Water Proofing Under Foundation Mat	36 26-Jul-07* 13-Sep-07									Wat		Jnder Foundation Mat							£ 1		
A2500 Install Mat Rebar	43 31-Jul-07* 27-Sep-07																		1		
A2510 Pour Foundation Mat	35 10-Aug-07* 27-Sep-07	L																			
A1150 F/R/P Foundation Walls	48 13-Aug-07* 17-Oct-07											R/P Foundation Walls R/P Foundation Columns									
A1170 F/R/P Foundation Columns A2520 F/R/P Wearing Slab	48 13-Aug-07* 17-Oct-07 24 01-Oct-07* 01-Nov-07											R/P Foundation Columns									
A2520 F/R/P Wearing Slab A1130 Erect Northern Tower Crane	1 02-Nov-07* 02-Nov-07											Erect Northern Tower Cran	e								1
A1140 Erect South Tower Crane	1 02-Nov-07 02-Nov-07										1	Erect South Tower Ctane									
2 Level - Garage	54 27-Aug-07 08-Nov-07						1			·····		08-Nov-07, P2 Level - Ga	arage	1					1		1
A1190 F/R/P Foundation Walls	39 27-Aug-07* 18-Oct-07											R/P Foundation Walls							. I		
A1200 F/R/P Foundation Columns	39 27-Aug-07* 18-Oct-07											R/P Foundation Columns									
A1180 F/R/P Floor Slab	37 19-Sep-07* 08-Nov-07											F/R/P Floor Slab 03-Dec-07, P1	Level - Garage								
1 Level - Garage A1210 F/R/P Floor Slab	30 23-Oct-07 03-Dec-07 19 23-Oct-07* 16-Nov-07						-+					F/R/P Floor Slab	Level - Oarage			-+					-+
A1210 F/R/P Floor Slab A1220 F/R/P Foundation Walls	23-00-07* 16-Nov-07 23 01-Nov-07* 03-Dec-07											F/R/P Floor Slat	ion Walls								
A1220 F/R/P Foundation Walls A1230 F/R/P Foundation Columns	23 01-Nov-07* 03-Dec-07										1	F/R/P Foundat		1							
structure	216 12-Nov-07 08-Sep-08										1						<ul> <li>08-Sep-08, Superstructure</li> </ul>				
ver Level - Garage	46 12-Nov-07 14-Jan-08										<u>.</u>		🔻 14-Jan-08, Lower Level - Ga	arage							
1240 F/R/P Floor Slab	32 12-Nov-07* 25-Dec-07											F/R/P									
1250         F/R/P Foundation Walls           1260         F/R/P Foundation Columns	33 29-Nov-07* 14-Jan-08												F/R/P Foundation Walls F/R/P Foundation Columns								
1260 F/R/P Foundation Columns	33 29-Nov-07* 14-Jan-08 186 12-Dec-07 27-Aug-08												F/R/P Foundation Columns			27	-Aug-08, Concrete		4 - E		
1270 Ground Level	35 12-Dec-07* 29-Jan-08												Ground Level			12/-	Aug-08, Concrete		1		
1280 Level 2	24 14-Jan-08* 14-Feb-08										÷	+	Level 2	+							
1290 Level 3	18 04-Feb-08* 27-Feb-08												Level 3								
1300 Level 4	17 19-Feb-08* 12-Mar-08												Leve								
1310 Level 5	16 03-Mar-08* 24-Mar-08										1								. 1		
1320 Level 6	15 17-Mar-08* 04-Apr-08	ļ									<b></b>			Level 6					l		
1330 Level 7	14 26-Mar-08* 14-Apr-08										1			Level 7							
1340 Level 8 1350 Level 9	16 08-Apr-08* 29-Apr-08 16 18-Apr-08* 09-May-08													Level							
1360 Level 10	19 01-May-08* 27-May-08														Level 10				, I		
1370 Main Roof	26 16-May-08* 20-Jun-08										1				Main Roof						
1380 Penthouse Roof	11 09-Jun-08* 23-Jun-08						1				1	1		1	Penthouse				1		1
1390 Remove South Tower Crane	1 27-Jun-08* 27-Jun-08										1					South Tower Crane					
1400 Infill Slab Openings at Southern Tower Crane	3 30-Jun-08* 02-Jul-08										1				Infill Sla		uthern Tower Crane				
A1410         Remove Northern Tower Crane           A1420         Infill Slab Openings at Northern Tower Crane	1 22-Aug-08* 22-Aug-08 3 25-Aug-08* 27-Aug-08										1						ove Northern Tower Crane ill Slab Openings at Northern T	ower Crope			
International Steel	131 10-Mar-08 08-Sep-08	+					-++-				÷	+++					<ul> <li>08-Sep-08, Structural Steel</li> </ul>		·		-++
1430 Set Blast Resistant Steel Columns Level 4	3 10-Mar-08* 12-Mar-08												Set I	Blast Resistant Steel	Columns Level 4				1 I		
1450 Set Blast Resistant Steel Columns Level 5	3 31-Mar-08* 02-Apr-08													Set Blast Resista	ant Steel Columns Level 5				1		
1460 Metal Deck Level 5	4 27-Jun-08* 02-Jul-08															Deck Level 5					
1470 Deck Studs & Edge Angles Level 5	5 03-Jul-08* 09-Jul-08										ļ					k Studs & Edge An					
1480 Place/Finish Level 5 SOD 1440 Columns & Beams Level 4 to Main Roof	4 10-Jul-08* 15-Jul-08 14 16-Jul-08* 04-Aug-08										1					lace/Finish Level 5	SOD Beams Level 4 to Main Roof				
1510 Place/Finish Level 6 SOD	14 16-Jul-08* 04-Aug-08 5 17-Jul-08* 23-Jul-08															Place/Finish Leve			, I		
1540 Place/Finish Level 7 SOD	5 24-Jul-08* 30-Jul-08															Place/Finish Le	evel 7 SOD		. I		
1570 Place/Finish Level 8 SOD	5 31-Jul-08* 06-Aug-08										<u>.</u>					Place/Finish			L		
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1500 Deck Studs & Edge Angles Level 6	4 05-Aug-08* 08-Aug-08																Is & Edge Angles Level 6				
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1520 Metal Deck Level 7 1530 Deck Studs & Edge Angles Level 7	4 08-Aug-08* 13-Aug-08 4 11-Aug-08* 14-Aug-08										1						uds & Edge Angles Level 7				1
1630 Place/Finish Level 10 SOD	4 13-Aug-08* 18-Aug-08										1	1		1		Place/F	Finish Level 10 SOD		·		11
1550 Metal Deck Level 8	4 14-Aug-08* 19-Aug-08										1			1		🔲 Metal I	Deck Level 8				
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1640 Metal Deck Main Roof	4 02-Sep-08* 05-Sep-08										1						Metal Deck Main Roof				
1650 Deck Studs & Edge Angles Main Roof	4 03-Sep-08* 08-Sep-08										]						Deck Studs & Edge Angles N	fain Roof	i		
or Facade & Roof	554 08-Mar-07 21-Apr-09																				21
70 Curtainwall Design and Engineering	171 08-Mar-07* 01-Nov-07 356 07-Jun-07* 16-Oct-08										:	Curtainwall Design and Eng	ineering					erformance Moc	ekune or + P	duction	
80 Curtainwall Performance Mockups and Production 90 Exterior Cladding System/Curtainwall	356 07-Jun-07* 16-Oct-08 230 03-Dec-07* 17-Oct-08										1			1 1	1	1 1		erformance Moci ding System/Cur		205001	1
10 Roof Installation	137 02-Sep-08* 11-Mar-09										1								: :	Roof	of Installation
20 Penthouse Framing & Ext. Metal Panels	65 16-Sep-08* 15-Dec-08						++				1	1		+				Pent	house Framin	g & Ext. Metal Panels	s
00 Substantially Watertight	0 20-Oct-08* 20-Oct-08										1			1			Substantial		ľ		
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80 Core Work & Finishes	264 20-Mar-08* 24-Mar-09										<b></b>		<b>_</b>				<u></u>				Core Work & F
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Actual Work																					

AP700       Ground Level       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O       O	A	Activity Name	Original Start Duration	Finish	lon	Eat	Mor	Anr	Mou	hus	2006	A	Sco	Oct	Nov Do-	lon	Eab	Mor	Arr	Mar	2007	4 Au-	San	0~	Neu	Dee		Ech	Mar A-	Mer
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A230       Lower Level Lobby       A211       284ay 08       18-Mar-08       18-Mar-08       18-Mar-08       18-Mar-08       18-Mar-08       18-Mar-08       18-Mar-08       18-Mar-08       18-Mar-08       0       18-Mar-08								1							1															
A230       H Street Lobby       148       10-04-069       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       (0-7-4)-07       <					1	1		1																						
tework         136         10-Oct-08         17-Apr-09           A2300         2nd Street Utilities 43, 84         60         10-Oct-08'         01-Anr-09           A2400         Frace Roof & Finish - Lewels 2, 3, 84         60         10-Oct-08'         01-Anr-09           A2410         Landscaping & Irrigation         120         16-Oct-08'         01-Apr-09           A2420         Install PEPO Vauits         20         09-Doc-08'         05-Anr-09           A2430         Hardscaping & Irrigation         10         1-Apr-09           A2430         Hardscape, Paving, & Street Lights         71         09-Jan-09'         7-Apr-09           A2440         Punch List or Main Lobby         10         13-Mar-09         22-Apr-09'         3-Mar-09           A2460         Crec Completion Letter Issued         0         0+Apr-09'         01-Apr-09'         0-Apr-09'         0-Apr-09'				-																						1				
A230       2nd Street Utilities & Vaults       60       10-00-08       10-10-09       70-10-09         A2400       Terrace Rood & Finish - Levels 2, 3, 4.4       60       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08       16-00-08					1	1				1	1	1					11		††-				1	1	1	1	1	1		
A240       Indecaping & Mirgation       120       16-0c-080       01-Apr-09         A240       Install FEPCO Vaults       20       09-Dec-080       05-dan-09         A2430       Hardscaping & Street Lights       71       09-Jan-090       77-Apr-09         058-07L       141       12-Man-09       02-Apr-091         A240       Punch List or Main Lobby       10       13-Man-09       26-Man-09         A240       Core Completion Letter Issued       0       01-Apr-09       01-Apr-09		2nd Street Utilities & Vaults			1	1		1																						
A240       Instal PEPC Valits       20       00-Dec.00       05-Jan-00       10-Jan-00						1																				1				
A2430     Hardscape, Paving, & Street Lights     71     09-Jan-09     17-Apr-09       Iose Out     14     13-Marc 09     26-Apr-09       A2440     Pinch List for Main Lobby     10     13-Marc 09       A2450     Find Clam Main Lobby     52-SMarc 09       A2460     Core Completion Letter Issued     0     0-Apr-09       A2470     Find Clam Main Lobby     0     0-Apr-09       A2480     Find Clam Main Lobby     0       A2490     Find Clam Main Lobby     0       A2400     Core Completion Letter Issued     0     0-Apr-09       A2400     Find Clam Main Lobby     0     0-Apr-09       A2400     Find Clam M						1		1		1																1	1			
Iose Out         14         13.Mar.09         02.Apr.09           A2440         Punch List for Main Lobby         10         13.Mar.09         26.Mar.09           A240         Final Clean Main Lobby         5         25.Mar.09         31.Mar.09           A2400         Core Completion Lebtr / ssued         0         01.4pr.09         01.4pr.09						ļ							ļ						ļļ.						ļ	ļ		ļ		
A2440         Punch List or Main Lobby         10         13 Marc 09         28 Marc 09           A2450         Final Clean Main Lobby         5         25 Marc 09         31 Marc 09           A2460         Corcompletion Letter Issued         0         01 - Apr-09         0		Hardscape, Paving, & Street Lights															1		I I									I T		
A2450         Final Clean Main Lobby         5         25-Mar-09         31-Mar-09           A2460         Core Completion Letter Issued         0         01-Apr-09         01-Apr-09																														
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Actual Work			Critical Re
Remaining Work	•	٠	Milestone



Office Building



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# **Project Estimate Summary**

	D4Cost 2002 Es	stimate		
Code	Division Name	%	Sq. Cost	Projected
00	Bidding Requirements	4.67	\$6.18	\$4,581,205.00
01	General Requirements	4.47	\$5.91	\$4,379,911.00
02	Site Work	4.73	\$6.26	\$4,637,096.00
03	Concrete	13.04	\$17.25	\$12,782,384.00
04	Masonry	2.56	\$3.38	\$2,506,310.00
05	Metals	6.68	\$8.83	\$6,544,552.00
06	Wood, Plastics, and Composites	0.49	\$0.65	\$481,758.00
07	Thermal and Moisture Protection	2.48	\$3.28	\$2,430,767.00
08	Openings	4.69	\$6.20	\$4,596,309.00
09	Finishes	5.92	\$7.82	\$5,799,472.00
10	Specialties	1.05	\$1.39	\$1,028,425.00
11	Equipment	0.21	\$0.28	\$210,652.00
12	Furnishings	1.06	\$1.40	\$1,036,175.00
13	Special Construction	0.19	\$0.25	\$182,922.00
14	Conveying Systems	1.66	\$2.19	\$1,626,478.00
15	Mechanical	10.83	\$14.33	\$10,617,964.00
16	Electrical	11.61	\$15.35	\$11,374,770.00
21	Fire Suppression	1.82	\$2.41	\$1,783,436.00
22	Plumbing	1.6	\$2.12	\$1,570,989.00
23	HVAC	5.99	\$7.92	\$5,872,991.00
26	Electrical	5.71	\$7.55	\$5,598,030.00
27	Communications	2.62	\$3.47	\$2,568,774.00
31	Earthwork	2.47	\$3.27	\$2,423,567.00
32	Exterior Improvements	2.43	\$3.21	\$2,378,540.00
33	Utilities	1.01	\$1.34	\$989,899.00
	Total Building Costs	100	\$132.22	\$98,003,372

Table 3: D4Cost 2002 EstimatePlease reference Appendix A for original D4Cost Data.

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Final Report Dr. John Messner Apríl 7, 2009

### R.S. Means 2008 Estimate

Please reference Appendix B for R.S. Means sources for square foot costs.

### Tables 4 & 5: Office Building Space - R.S. Means 2008 Estimate

10 Floors, 554,812 SF, 1,172 LF Perimeter, 12'-0" Floor Height Avg.

Exterior Wall	S.F. Area	250,000	554,812	300,000
Extend wan	L.F. Perimeter	640	1,006	700
Precast Concrete Panel	R/Conc. Frame	\$125.60	\$117.07	\$124.20
Pe	rimeter Adjustment	\$2.15	-\$0.29	\$1.75
Story	Height Adjustment	\$1.10	\$0.49	\$1.00

Square Footage Estimate	\$117.07
Perimeter Adjustment	-\$0.48
Story Height Adjustment	\$0.49
Adjusted Square Foot Cost	\$117.08

Table 6 & 7: Underground Parking Garage Space - R.S. Means 2008 Estimate4 Floors, 186,388 SF, 1,172 LF Perimeter, 12'-0" Floor Height Avg.

Exterior Wall	S.F. Area	150,000	186,388	175,000
	L.F. Perimeter	1,100	1,224	1,185
Precast Concrete Panel	R/Conc. Frame	\$62.35	\$61.40	\$61.70
Pe	rimeter Adjustment	\$0.75	\$0.46	\$0.55
Story	Height Adjustment	\$0.70	\$0.63	\$0.65

Square Footage Estimate	\$61.40
Perimeter Adjustment	-\$0.24
Story Height Adjustment	\$0.63
Adjusted Square Foot Cost	\$61.79

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Construction Management Final Report Dr. John Messner April 7, 2009

### Table 8: Total Cost - R.S. Means 2008 Estimate

	SQUARE FOOTAGE	COST/SF	TOTAL COST
Office Building Space	554,812	\$117.08	\$64,957,400
Underground Parking Garage Space	186,388	\$61.79	\$11,517,000
		Elevators	\$2,854,300
			\$79,328,700
R.S	S. Means Location Factor	(Washington, DC)	0.98
		Total Estimate	\$77,742,126

The D4Cost estimate and R.S. Means estimate proved to be roughly accurate. The D4Cost estimate wavered from the actual project cost by only -\$1,000,000 and the R.S. Means wavered from the actual building cost by +\$740,000.

However, comparing D4's individual system costs with project's actual individual systems cost shows that, though D4 can be use to estimate the total cost, it is not accurate in estimating the individual system costs. Therefore, D4 should only be used to get approximate estimate of the overall building cost and not for the individual systems cost. Overall the D4Cost estimate was still pretty accurate and shows how potentially useful the software package can be.

R.S. Means on the other hand should only be used to estimate the building cost. This method does not account for greater building areas then listed, LEED designs, or various other features of the building. R.S. Means also does not account for post tensioned concrete, which can increase the cost, as well as a very expensive curtain wall system.



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### **Detailed Structural Systems Estimate**

The Office Building utilizes a cast in place concrete structural system. The foundation is a 4'-6" thick, 5,000 psi normal weight concrete mat foundation that rests on a 4" mud mat. Below grade parking levels are 9" reinforced concrete flat slabs with 5-1/2" drop panels at select column locations. Floors above grade are 12" post-tensioned two-way slabs with 4-1/4" drop panels at all columns and around the slab perimeter. The top 9 floors including the roof slab are post tensioned concrete while the bottom 5 floors are cast in place reinforced concrete and the mat foundation.

Data was taken from the 2008 R.S. Means Construction Data manual which contains costs based on projects from 2007 and the latter part of 2006. Assumptions were made in order to simplify the detailed estimate. Slab thicknesses were considered uniform throughout each floor though there were areas with thicker or thinner slab depths. An overall average was utilized and considered uniform throughout. Waste factors were considered and are included in the take-offs. Crane usage was included in the equipment subcategory of the concrete placement estimates.

The structural systems summary sheet can be found on the following page. The estimated total after being adjusted for the location is **\$28,540,038**. The calculated value is slightly greater than the structural total detailed in Technical Assignment 1. This is due to the fact that the total in Technical Assignment 1 includes the pre-cast concrete while this estimate is only the pumped structural concrete. Overall this estimate is accurate based on the pervious cost analysis and this detailed estimate.

Please reference Appendix C for the Detailed Structural System Estimate Take-Offs

			Detailed	d Cost Analysis o	f the Structure				
Level	Description	Amount	Material Price	Material Cost	Labor Price	Labor Cost	Equipment Price	Equipment Cost	Total Cost
	Mat Foundation	550 Ton	\$935.00	\$514,250	\$430.00	\$236,500	\$30.35	\$16,693	\$767,443
	Composite Decking	21 Ton	\$935.00	\$19,635	\$430.00	\$9,030	\$30.35	\$637	\$29,302
	P2 Level	402 Ton	\$935.00	\$375,870	\$430.00	\$172,860	\$30.35	\$12,201	\$560,931
	P1 Level	402 Ton	\$935.00	\$375,870	\$430.00	\$172,860	\$30.35	\$12,201	\$560,931
	Lower Level	402 Ton	\$935.00	\$375,870	\$430.00	\$172,860	\$30.35	\$12,201	\$560,931
	Ground Level	402 Ton	\$935.00	\$375,870	\$430.00	\$172 <i>,</i> 860	\$30.35	\$12,201	\$560,931
	Level 2	25 Ton	\$935.00	\$23,375	\$430.00	\$10,750	\$30.35	\$759	\$34,884
	Level 3	25 Ton	\$935.00	\$23,375	\$430.00	\$10,750	\$30.35	\$759	\$34,884
	Level 4	25 Ton	\$935.00	\$23,375	\$430.00	\$10,750	\$30.35	\$759	\$34,884
Reinforcement	Level 5	25 Ton	\$935.00	\$23,375	\$430.00	\$10,750	\$30.35	\$759	\$34,884
	Level 6	25 Ton	\$935.00	\$23,375	\$430.00	\$10,750	\$30.35	\$759	\$34,884
	Level 7	25 Ton	\$935.00	\$23,375	\$430.00	\$10,750	\$30.35	\$759	\$34,884
	Level 8	25 Ton	\$935.00	\$23,375	\$430.00	\$10,750	\$30.35	\$759	\$34,884
	Level 9	25 Ton	\$935.00	\$23,375	\$430.00	\$10,750	\$30.35	\$759	\$34,884
	Level 10	25 Ton	\$935.00	\$23,375	\$430.00	\$10,750	\$30.35	\$759	\$34,884
	Roof	25 Ton	\$935.00	\$23,375	\$430.00	\$10,750	\$30.35	\$759	\$34 <i>,</i> 884
	Columns	505 Ton	\$935.00	\$472,175	\$430.00	\$430.00	\$30.35	\$15,327	\$487,932
	Shear Walls	166 Ton	\$935.00	\$155,210	\$430.00	\$71 <i>,</i> 380	\$30.35	\$5 <i>,</i> 038	\$231,628
	SUB-TOTAL	3100	\$935.00	\$2,898,500	\$430.00	\$430.00	\$30.35	\$94,085	\$2,993,015
	Composite Decking	352 CY	\$109.00	\$38,368	\$14.90	\$5,245	\$5.55	\$1,954	\$45,566
Cast in Place	Columns	1167 CY	\$109.00	\$18,203	\$34.00	\$5,678	\$16.95	\$2,831	\$26,712
	Slabs	32420 CY	\$109.00	\$3,533,780	\$18.20	\$590,044	\$9.15	\$296,643	\$4,420,467
Concrete	Shear WAlls	2732 CY	\$109.00	\$297,788	\$26.50	\$72,398	\$1,320.00	\$3,606,240	\$3,976,426
	SUB-TOTAL	35671	\$109.00	\$3,888,139	\$23.40	\$834,701	\$337.91	\$12,053,588	\$16,776,428
	Steel	334 Ton	\$2,300.00	\$768,200	\$380.00	\$126,920	\$132.00	\$44,088	\$939,208
Strucutal Steel	PT Cables	400000 LB	\$1.79	\$716,000	\$0.79	\$316,000	\$0.03	\$12,000	\$1,044,000
				•					
Location Factor:	TOTAL STRUCTURAL	ESTIMATE :	\$28,54	0,038		Total I	abor Cost:	\$2,232,	565
98%	Total Materia	l Cost:	\$8,270	0,839		Total Equ	ipment Cost:	\$4,057,	840

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Construction Management Final Report Dr. John Messner Apríl 7, 2009

# **General Conditions Estimate**

Table 9: Displays the Total Cost of Each Sub-Category

General Conditions Estimate		
Supervision Subtotal		\$2,448,785
Temporary Facilities Subtotal		\$173,474
Temporary Utilities Subtotal		\$80,529
Equipment Rental Subtotal		\$11,368
General Costs Subtotal		\$478,857
Location Factor	98.00%	\$59,866
COMPLETE TOTAL		\$3,053,152

Please reference Appendix D for the General Conditions Calculation Sheet.

The total duration of this project is 2.6 years, totaling 32 months of work. The general conditions estimate is divided into five sub-categories: supervision, temporary facilities, temporary utilities, equipment rental, and general cost. The unit costs and total costs calculated for this estimate were performed using R.S. Means 2008, ICE 2000 estimating software, and certain values from other projects similar in size and scope. Also of importance, there is no crane expense included in the general conditions. The crane is owned and operated by the concrete contractor and is included in their scope of work. The general conditions estimate does not include insurance, bonding, fee, contingency, or any project overhead expenses. These would be included in the general contractor's fee. A 5.75% sales tax was added to all materials purchased for general conditions. Lastly a location factor was included to adjust the total cost of general conditions.

The total value calculated was **\$3,053,152** a little more than 3% of the total contract value; this value is quite low compared to the original value.