

# Technical Assignment 2: Cost and Methods Analysis

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Construction Management Option  
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**Constitution Center**

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## CONSTRUCTION MANAGEMENT OPTION

# CONSTITUTION CENTER

## 400 7TH STREET SE, WASHINGTON, DC 20024



### BUILDING STATISTICS

- Size: 1,500,000-SF base building and 600,000-SF parking garage
- Number of Stories: Three-level underground parking garage, 10 stories + Pent House
- Occupancy Type: Class A Office Space
- Cost: \$246 Million GMP
- Construction Dates: July 2007 - November 2009
- Delivery Method: Design-Bid-Build
- LEED Gold Project



### MECHANICAL & ELECTRICAL

- Centralized Plant in the Penthouse Housing:
  - Two 800 h.p. Boilers
  - One 350 h.p. Boiler
  - Three 1200 ton Trane Chillers
  - Eight 30,000 CFM Trane Air Handlers
  - Eight 30,000 CFM Semco Energy Recovery Units
  - Four 1200 ton Cooling Towers utilizing 6,700 Active Chilled Beams
- Power distribution system of 13.8 kVA feed from four primary switchgear connected to Pepco feeders
- 10 secondary 4000A transformers within the garage and Pent House levels
- Two 1000 kilowatt generators are roof mounted to provide power back-up to the critical building systems during a power outage
- Two dedicated chiller/purifier drinking water systems that continuously circulate water throughout the building
- Custom made Chilled-Beam System from Germany

### PROJECT TEAM

- Owner/Developer: David Nassif Associates
- General Contractor: James G. Davis Construction Corporation
- Owners Representative: Kramer Consulting
- Architect: SmithGroup, Inc.
- MEP Engineer: SmithGroup, Inc.
- Civil Engineer: Wiles Mensch Corporation
- Structural Engineer: SK&A

### STRUCTURAL

- Precast panels found at all four corners of the building, which frame the spandrel glass
- Blast resistant curtainwall throughout at Streetscape and Courtyard, with floor two being the most resistant including an air barrier system
- Metal panel on the Pent House level to conceal the MEP equipment
- Blast protection in garage tenant space, entrance ramp, internal ramps, electrical rooms, telecom rooms, elevator shafts, egress stairs, and exposed columns
- Two-way waffle slab on all floors except the Pent House

### ARCHITECTURE

- Renovation of an existing building, originally constructed in 1976 and occupied by the Department of Transportation (DOT)
- 4 separate, but integrated quadrants that have their own elevator, stairs ways, bathrooms, electrical closets, communication closets
- One acre of courtyard that is a private, secure green space with fountain, seating areas, sculpture, and 32 Honey Locust Trees that are 11'-15' tall
- White Marble and Jerusalem Limestone are located around the first level of the building, creating a boarder for the spandrel glass located at the storefront entrances
- Built-up roofing system and metal panels used to conceal the MEP equipment on the Pent House level



RENDERINGS PROVIDED BY SMITHGROUP, INC. AND STUDIO CHRISTEN

## EXECUTIVE SUMMARY

Technical Assignment 2 deals with the cost and methods of construction on Constitution Center, which is a renovation of the Department of Transportation (DOT) building found between 6<sup>th</sup> and 7<sup>th</sup> Street and D and E Street in SW DC.

Information about the detailed project schedule is included and how the project was sequenced for the interior and exterior façade. Additionally, three site plans were developed for Constitution Center. They are for the demolition, superstructure and finishes phases of construction. One unique feature about these plans are that most of the information does not change from one phase to the next since DAVIS is utilizing the parking garage for storage and the offices are found on the second and third floors of the building.

A detailed system estimate is also included in this document. The curtain wall of Constitution Center was examined and an estimate was calculated. This estimate is within 2.2% of the actual estimate provided by DAVIS. Also, a general conditions estimate was calculated and it was determined that the project staff cost are 76% of the total general conditions. Furthermore, the general conditions only make up about 3% of the overall \$244,700,033 project cost.

Finally, this report is concluded with an overview of the PACE Roundtables which occurred on Thursday, October 16, 2008. In this particular section, one can find information about the mentoring program that is planned to be established in the Architectural Engineering Department. Additionally, information about the "LEED Evolution" seminar is evaluated and surprises about this session are noted. To finish, an outline of the two panel discussions are included.

Overall, this technical assignment will give an overview of the cost and methods of construction in order to build a 1.5 million square foot office building that has a total cost of \$244,700,033.



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## A. DETAILED PROJECT SCHEDULE

A detailed project schedule can be found in Appendix A. This schedule expands upon the project schedule summary which was a part of Technical Assignment 1. The detailed schedule reflects how the project was built. As one can see, the main phases of construction were to have the north quadrant completed first, followed by the east, then west, and ending with the south. The reason for this sequencing is to turn the northeast quadrant over to the ownership by May 1, 2009 in order to allow for tenant use as soon as possible. The NW is then turned over, followed by the southwest and finishing with the southeast. Additionally, the south will be turned over last in order for the auditorium to be constructed. The auditorium was an addendum to the project since the bid proposal did not occur till the summer July 2008. As one can tell, the auditorium is not included in the detailed project schedule since it is being treated as a separate project for Constitution Center.

Table 1 shows how the façade is sequenced. The schedule is broken down even more to show what specific tasks must occur in order for the entire north exterior and north courtyard façade to be completed. As one can tell, the erection of the actual curtainwall takes the longest, 91 days for the exterior and 26 days for the courtyard.

*Table 1: Summary of the Façade Sequence*

Task	Duration	Start	Finish
<b>Exterior Façade</b>	<b>366</b>	<b>10/1/2007</b>	<b>2/23/2009</b>
<b>North</b>	<b>328</b>	<b>10/1/2007</b>	<b>12/31/2008</b>
Fabrications for Slab Extensions	32	10/1/2007	11/13/2007
Demo & Shoring 2nd Floor at Blast Beams	10	11/6/2007	11/19/2007
Slab Extensions	1	12/17/2007	12/17/2007
Encase Perimeter Columns at Blast Beams	1	12/5/2007	12/5/2007
F,R&P Blast Beams	1	1/18/2008	1/18/2008
Fab Anchors & Plates for Curtianwall	1	1/21/2008	1/21/2008
Install Anchors & Plates for Curtainwall	1	3/12/2008	3/12/2008
Erect Curtainwall	91	2/22/2008	6/27/2008
Erect Metal Panels	20	7/28/2008	8/22/2008
Erect Exterior Storefont	17	11/12/2008	12/4/2008
Erect Exterior Stone	17	12/9/2008	12/31/2008
<b>East</b>	<b>311</b>	<b>10/1/2007</b>	<b>12/8/2008</b>
<b>West</b>	<b>266</b>	<b>1/22/2008</b>	<b>1/27/2009</b>
<b>South</b>	<b>272</b>	<b>2/8/2008</b>	<b>2/23/2009</b>
<b>NE Corner - Erect Precast</b>	<b>24</b>	<b>1/31/2008</b>	<b>3/4/2008</b>
<b>NW Corner - Erect Precast</b>	<b>21</b>	<b>4/23/2008</b>	<b>5/21/2008</b>
<b>SE Corner - Erect Precast</b>	<b>21</b>	<b>5/22/2008</b>	<b>6/19/2008</b>
<b>SW Corner - Erect Precast</b>	<b>21</b>	<b>6/20/2008</b>	<b>7/18/2008</b>
<b>Courtyard Façade</b>	<b>332</b>	<b>1/22/2008</b>	<b>4/29/2009</b>
<b>North</b>	<b>232</b>	<b>1/22/2008</b>	<b>12/10/2008</b>
Fab Anchors & Plates for Ctyd Curtainwall	25	1/22/2008	2/25/2008
Install Anchors & Plates for Curtainwall	21	4/11/2008	5/9/2008
Erect Structural Steel & Deck	16	5/12/2008	6/2/2008
Erect Curtainwall	26	8/26/2008	9/30/2008
Erect Metal Panels	1	10/13/2008	10/13/2008
Erect Storefront	12	11/25/2008	12/10/2008
<b>East</b>	<b>207</b>	<b>2/8/2008</b>	<b>11/24/2008</b>
<b>West</b>	<b>163</b>	<b>5/12/2008</b>	<b>12/24/2008</b>
<b>South</b>	<b>247</b>	<b>5/20/2008</b>	<b>4/29/2009</b>

The MEP rough-in, distribution, and finishes can be found in Table 2. This table shows how the northeast was sequenced in order to have the task completed on time. As one can tell, the hardening of the columns and the rough-in of the MEP in the garage takes the longest, therefore they play a very large role in the scheduling process. Finally, the finishes for

floors 2-10 take the longest in the sequence and DAVIS has a specific project manager dedicated to the finishes of the building.

*Table 2: Sequence of MEP Rough-ins & Finishes*

Task	Duration	Start	Finish
<b>MEP Rough-ins &amp; Finishes</b>	<b>511</b>	<b>9/26/2007</b>	<b>9/9/2009</b>
<b>P-3 Level</b>	<b>339</b>	<b>9/26/2007</b>	<b>1/12/2009</b>
<b>NE</b>	<b>275</b>	<b>9/26/2007</b>	<b>10/14/2008</b>
Construct Elevator Shaft Walls	10	9/26/2007	10/9/2007
Erect CMU Blast Walls	10	9/26/2007	10/9/2007
Hardening Concrete Walls	1	10/30/2007	10/30/2007
Hardening Columns	27	10/31/2007	12/6/2007
Rough-in MEP	22	10/31/2007	11/29/2007
Construct Raised Slabs	1	12/28/2007	12/28/2007
Install Garage Lighting	1	1/21/2008	1/21/2008
Finishes	10	10/1/2008	10/14/2008
<b>NW</b>	<b>190</b>	<b>2/26/2008</b>	<b>11/17/2008</b>
<b>SW</b>	<b>229</b>	<b>2/12/2008</b>	<b>12/26/2008</b>
<b>SE</b>	<b>329</b>	<b>10/10/2007</b>	<b>1/12/2009</b>
<b>P-2 Level</b>	<b>1</b>	<b>2/9/2009</b>	<b>2/9/2009</b>
<b>P-1 Level</b>	<b>366</b>	<b>10/29/2007</b>	<b>3/23/2009</b>
<b>Plaza Level</b>	<b>473</b>	<b>10/10/2007</b>	<b>7/31/2009</b>
<b>2nd Floor</b>	<b>285</b>	<b>10/24/2007</b>	<b>11/25/2008</b>
<b>NE</b>	<b>285</b>	<b>10/24/2007</b>	<b>11/25/2008</b>
Erect Steel Columns and Beams	3	10/24/2007	10/26/2007
Remove Expansion Joints	1	10/30/2007	10/30/2007
In Fill Slabs	2	10/29/2007	10/30/2007
Construct Shaft Walls	5	11/30/2007	12/6/2007
Rough-in MEP	15	11/30/2007	12/20/2007
Finishes	40	10/1/2008	11/25/2008
<b>3rd Floor</b>	<b>416</b>	<b>10/29/2007</b>	<b>6/1/2009</b>
<b>4th Floor</b>	<b>423</b>	<b>11/1/2007</b>	<b>6/15/2009</b>
<b>5th Floor</b>	<b>430</b>	<b>11/6/2007</b>	<b>6/29/2009</b>
<b>6th Floor</b>	<b>438</b>	<b>11/9/2007</b>	<b>7/14/2009</b>
<b>7th Floor</b>	<b>445</b>	<b>11/14/2007</b>	<b>7/28/2009</b>
<b>8th Floor</b>	<b>452</b>	<b>11/19/2007</b>	<b>8/11/2009</b>
<b>9th Floor</b>	<b>457</b>	<b>11/26/2007</b>	<b>8/25/2009</b>
<b>10th Floor</b>	<b>465</b>	<b>11/29/2007</b>	<b>9/9/2009</b>
<b>Penthouse / Roof</b>	<b>150</b>	<b>4/9/2008</b>	<b>11/4/2008</b>
<b>North</b>	<b>150</b>	<b>4/9/2008</b>	<b>11/4/2008</b>
Construct Raised Slab	20	4/9/2008	5/6/2008
Spray Fireproofing	1	5/13/2008	5/13/2008
Eqpt Pads & Curbs	1	5/20/2008	5/20/2008
Set Boilers	1	6/4/2008	6/4/2008
Set Major Mech Eqpt	1	6/18/2008	6/18/2008
Set Generators	10	6/5/2008	6/18/2008
Construct Shaft Walls	5	6/19/2008	6/25/2008
Set Major Elec Eqpt	11	6/26/2008	7/10/2008
Rough-in MEP	41	8/12/2008	10/7/2008
Final MEP Connections & Checkout	1	11/4/2008	11/4/2008
Finishes	20	10/8/2008	11/4/2008

## B. SITE LAYOUT PLANNING

There are three different site plans found in Appendix B. The first is for the demolition phase. One should take note that the only entrance available is the north entrance and that is where the majority of the dumpsters are found. The next site plan is during the superstructure phase of construction. Finally, the third site plan is during the finishes phases, where one will notice that much of the site work is already complete.

The temporary power was initially supplied to Constitution Center by Pepco. The locations of the transformers were in the existing main electrical room found on level P-3 of the parking garage. These transformers were utilized until temporary generators were brought onto site in August of 2008. The locations of the generators are currently on the P-2 level where the new main electrical room is found.

The offices of Constitution Center can be found on the south side of the second and third floors. DAVIS' office is located on the second floor; SmithGroup, David Nassif Associates, and Kramer Consulting are all on the third floor; and subcontractors can be found on both floors.

There are four tower cranes on the Constitution Center site. The tower cranes in the northeast and southwest corners are Peiner SK 415-20 Tower Cranes. They have a lifting capacity of 22,025lbs – 44,050lbs and have the option of 2-part line jib and a 4-part line jib. The tower cranes in the northwest and southeast corners Peiner SK 415-25 Tower Cranes. They have a lifting capacity of 27,600lbs-55,100lbs and have the option of 2-part line jib and 4-part line jib. For the majority of the project, the cranes utilized the 2-part line jib. The southeast tower crane had the 4-part line jib added in order to install the major mechanical equipment to the Pent House level. With this 4-part jib and having the trolley extended a total of 246'-1", it has the ability to carry 45,600lbs (please see Figure 1 for more information on the lifting capacities). The only area not covered by a tower crane is the very center of the courtyard. This area was designed to be completed landscaped, therefore a tower crane was not necessary.

*Figure 1: Lifting Capacities for the SK-425-25 Tower Crane with a 4-Part Line.*

Hook Radius (ft.) 12'-0" (min.)	AVAILABLE JIB LENGTHS IN FEET								
	L9	L8	L7	L6	L5	L4	L3	L2	L1
	246'-1"	229'-8"	213'-3"	196'-10"	180'-5"	164'-1"	147'-8"	131'-3"	114'-10"
52'-6"	45600	52100	55100	55100	55100	55100	55100	55100	55100
59'-1"	39500	45200	50500	55100	55100	55100	55100	55100	55100
65'-7"	34700	39800	44500	48600	51900	55100	55100	55100	55100
68'-11"	32600	37500	42000	45800	49000	51800	53400	55100	55100
75'-6"	29100	33500	37600	41100	44000	46500	47900	49000	49400
78'-9"	27600	31800	35700	39000	41800	44200	45600	46600	47000
82'-0"	26200	30200	34000	37200	39800	42100	43500	44400	44800
91'-10"	22700	26300	29600	32500	34800	36800	38000	38800	39200
101'-8"	19900	23100	26100	28700	30800	32600	33700	34400	34700
111'-7"	17500	20500	23200	25600	27400	29100	30100	30800	31100
114'-10"	16900	19700	22400	24600	26500	28100	29100	29700	

The location of the main entrance and exit to the site changed throughout the construction phases. During demolition and until July 2008, the main entrance was on the north side of the building. This access was both for the entrance to the parking garage and where deliveries were made. The north entrance, which is along D Street, has two-way traffic. This area would allow for only one-way; however during rush hours it would not be feasible to

have one-way traffic. After July 2008, the south entrance became the new access for both deliveries and parking. The south entrance is along E Street, which is also two-way traffic. This area is often shut down to one lane when large deliveries are made, therefore would allow for one-way traffic if necessary. The main reason for this change was because the L'Enfant Plaza metro entrance reopened in the north, and DAVIS felt it would be better to not have pedestrian traffic interacting with the construction traffic.

*Figure 2: Aerial view of Constitution Center showing the lanes of traffic around the building.*



Since Constitution Center is a renovation, there were no requirements for temporary excavation systems. However, when the curtain wall is installed using a crawler crane, shoring is added to the P-1 level of the parking garage since the garages have a larger footprint than the building.

There are several pieces of temporary equipment around the site. The material hoist was initially placed at the northeast corner of the building, and then in August 2008, it was moved to the southwest corner of the building. The personnel hoist was installed at the southeast corner of the building and will remain there for the duration of construction. Since there are two hoists, it was not necessary to have temporary elevators since they were critical renovation items. After the renovation of the loading docks, found on the east side of the building, they were open for limited construction use.

Since Constitution Center is striving for LEED Gold Certification, the site has a total of eight dumpsters; five belong to DAVIS, two trash, one metal, one block, and one wood while the other three are the responsibility of the subcontractors, ACECO, Brothers, and CRS. There are portable toilets found in multiple locations on the site. The majority are placed on the southeast corner of the building and at least one can be found on floors 2-10. Material storage sheds are not used on the Constitution Center site; however DAVIS has specific areas for storage, including the sidewalks and the three levels of the parking garage.

### C. DETAILED SYSTEMS ESTIMATE

Figure 3: Northeast interior curtain wall



As one can see by the schedule found in Appendix A, the exterior façade takes a large amount of time and coordination to install. Because of these two main reasons, a detailed estimate of the façade was performed. A typical bay is 30' by 30' long and there are 6 curtain wall panels per bay. This concludes that there are a total of 84 pieces per floor for the exterior and 54 pieces per floor for the interior. Please see Appendix C for the actual take off of each façade, note that only the west façade hand take-offs are included in this document. Table 3 shows how the square foot of the façade was calculated. The items in blue are the total exterior and interior façade square foot.

Table 3: Square Foot Calculations

Exterior Façade			
30' Bay	14 Bays	420'	
9 Floors	10'-4" Floor to Floor Height	93'	
420'	93'	39,060 S.F.	156,240 S.F.

Interior Façade			
30' Bay	9 Bays	270'	
9 Floors	10'-4" Floor to Floor Height	93'	
270'	93'	25,110 S.F.	100,440 S.F.

Tables 4 and 5 are taken from R.S. Means Building Construction Cost Data. It was determined that the average, double glazed curtain wall was the most similar to the façade of Constitution Center. The area highlighted in blue was utilized to calculate the square feet estimate. According to R.S. Means, the typical crew consists of two glaziers and two structural steel workers. Their daily labor costs are \$1238.40 for a typical 8 hour workday. With experience onsite during the summer of 2008, the exact same crew size was used.

Table 4: Glazed Curtain wall Cost Information<sup>1</sup>

08 44 13.10 Glazed Curtain Walls		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total
0010	Glazed Curtain Walls, aluminum, stock, including glazing	H-1			S.F.				
0020	Minimum	H-1	205	.156	S.F.	24	6.05		30.05
0050	Average, single glazed	H-1	195	.164	S.F.	31	6.35		37.35
0150	Average, double glazed	H-1	180	.178	S.F.	43.50	6.90		50.40
0200	Maximum	H-1	160	.200	S.F.	119	7.75		126.75

Table 5: Crew description<sup>2</sup> including hourly and daily wages

Crew H-1	Hr.	Daily
2 Glaziers	\$36.05	\$576.80
2 Strc. Steel Workers	\$41.35	\$661.60
<b>Total</b>		<b>\$1238.40</b>

<sup>1</sup> (R.S. Means Building Construction Cost Data)

<sup>2</sup> (R.S. Means Building Construction Cost Data)

Tables 6, 7, 8, and 9 are used to determine the productivity and labor costs of a typical double glazed curtain wall. Figure 5 provides a visual representation of how the curtain wall pieces are installed.

Table 6: Productivity Calculation

	Quantity	Daily Output	Duration
Exterior	156,240 S.F	180/crew day	868 Crew Days
Interior	100,440 S.F.	180/crew day	558 Crew Days

Table 7: Productivity Calculation

	Quantity	Productivity Rate	Duration
Exterior	156,240 S.F	0.178 Labor-Hours/S.F.	27810 Labor-Hours
Interior	100,440 S.F.	0.178 Labor-Hours/S.F.	17878 Labor-Hours

Table 8: Labor Calculation

	Labor-Hour Cost	Labor-Hour Unit	Labor
Façade	\$36.05	6.90	\$248.75

Table 9: Square Foot Curtain wall Cost

	Material	Labor	Total
Façade	\$43.50	\$248.75	\$292.25

From the calculations above, it was determined that the curtain wall for floors 2-10 cost \$292.25 per square foot without the equipment cost added. The subcontractor used a window washing trolley system in order to make the process more efficient. Therefore, since the total square foot of curtain wall is 256,680 the total cost is \$75,014,730. Using R.S. Means data, it is determined that the exterior curtain wall is \$45,661,140. From the Building Systems Cost apart of Technical Assignment One, it was determined that the exterior curtain wall is \$46,697,203 which is about a 2.2% difference. The reason for this difference is because the plaza level façade varies between curtain walls, doors, and stone, both were not calculated in this detailed estimate.

Figure 4: Street Side Laboratory Mock Up

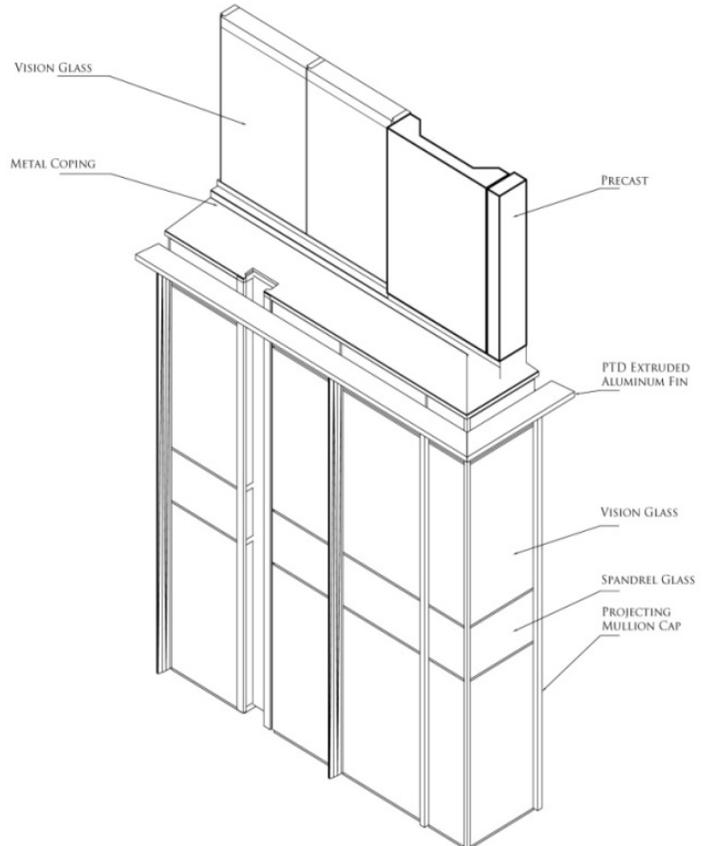


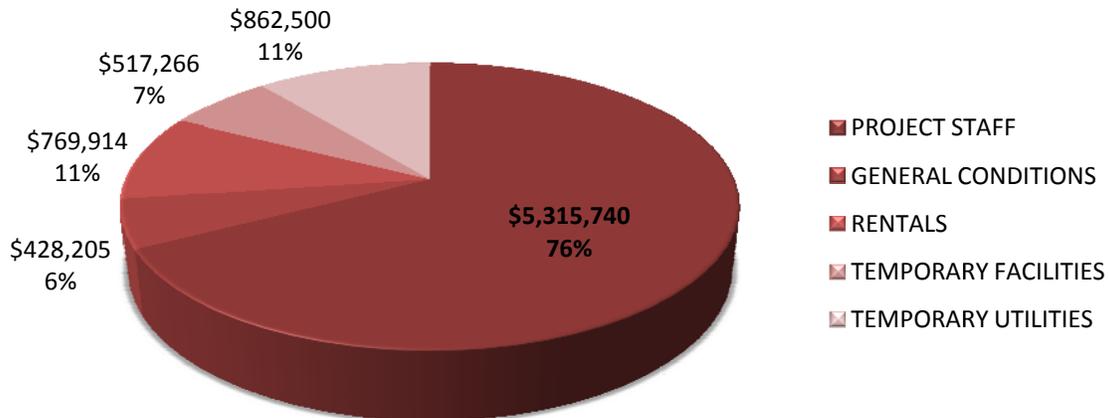
Figure 5: Photograph showing the installation of a curtain wall



#### D. GENERAL CONDITIONS ESTIMATE

The general conditions estimate for Constitution Center utilized both R.S. Means Construction Cost Data and the project team from Davis Construction. Figure 6 is a summary of the general conditions, the entire estimate breakdown can be found in Table 10. As one can see, the project staff is over 75% of the total general conditions costs.

Figure 6: Summary of General Conditions



The project staff was categorized into four separate areas: overall management, office management, field management, and miscellaneous. The costs for the overall management were estimated from R.S. Means<sup>3</sup> through interpolation since they were not included in the section. The majority of the office management was taken from R.S. Means. Since there was a minimum, average, and maximum, the minimum was used for the assistant project managers, the average was used for the project managers, and the maximum was used for the senior project manager. Additionally, the project administrator price was taken from the timekeeper. Finally, the schedule and reporting support and estimating expenses were given by DAVIS.

The field management prices were also taken from R.S. Means. Again, the minimum, average, and maximum were used for the superintendents. The senior layout engineer was found in R.S. Means and the safety officer was estimated based on the other given prices. Finally, the miscellaneous labor is included for the DAVIS personal that is onsite.

The temporary utility costs are split between both the General Conditions and the ownership. The electric was initially supplied by PEPCO for the first 13 months of construction. Then in August 2008, it was switched over to generators, which have the additional cost of fuel. It is estimated that they will have the generators till November 2009, however this date will more than likely change. The water is provided by the ownership; however it is through the existing building water meter.

Overall, the total project cost is \$244,700,033. The general conditions cost is only about 3% of the total cost which is close to the average of 5%.

<sup>3</sup> (R.S. Means Building Construction Cost Data)

Table 10: General Conditions Estimate

Description	Quantity	Unit	Price/Unit	Amount
<b>PROJECT STAFF</b>				
<b>OVERALL MANAGEMENT</b>				
Senior Vice President	156	Wks	\$2,200.00	\$343,200.00
Vice President	130	Wks	\$2,100.00	\$273,000.00
<b>OFFICE MANAGEMENT</b>				
Senior Project Manager	156	Wks	\$2,025.00	\$315,900.00
Project Managers	566	Wks	\$1,775.00	\$1,004,650.00
Assistant PM's/Project Coordinator	809	Wks	\$1,550.00	\$1,253,950.00
Project Administrator	147	Wks	\$970.00	\$142,590.00
Schedule & Reporting Support	110	Wks	\$500.00	\$55,000.00
Estimating Expenses	1200	Wks	\$50.00	\$60,000.00
<b>FIELD MANAGEMENT</b>				
Senior Superintendent	138	Wks	\$1,875.00	\$258,750.00
Senior Layout Engineer	108	Wks	\$1,250.00	\$135,000.00
Superintendent	506	Wks	\$1,650.00	\$834,900.00
Assistant Superintendent	165	Wks	\$1,500.00	\$247,500.00
Safety Officer	130	Wks	\$1,400.00	\$182,000.00
<b>MISCELLANEOUS</b>				
Miscellaneous Labor	182	Wks	\$1,150.00	\$209,300.00
				<b>\$5,315,740.00</b>
<b>GENERAL CONDITIONS</b>				
Expediting	138	Wks	\$60.00	\$8,280
Misc. reproduction	1	Ls	\$30,000	\$30,000
Photographs	29	Mos	\$475.00	\$13,775
Video Survey	1	Ls	\$10,000	\$10,000
Occupancy permit	1	Ls	\$1,000	\$1,000
Construction sign	1	Ls	\$2,500	\$2,500
Layout Engineers Supplies	108	Wks	\$50	\$5,400
Initial Scheduling costs	1	Ls	\$15,000	\$15,000
Final cleaning	2,100,000	Sf	\$0.15	\$315,000
Travel Expense	1	Ls	\$10,000	\$10,000
Miscellaneous items	138	Wks	\$125.00	\$17,250
				<b>\$428,205</b>
<b>RENTALS</b>				
Pickup truck (Superintendents)	778	Wks	\$296.00	\$230,288
Courier vehicle	126	Wks	\$56.40	\$7,106
Dump truck	322	Hrs	\$26.49	\$8,530
Industrial vacuum	10	Ls	\$350.00	\$3,500
Surveying instruments	25	Mos	\$500.00	\$12,500
Two way radios (3 total)	414	Wks	\$74.40	\$30,802
Gang box	32	Mos	\$72.00	\$2,304

Vehicles (For PE, PM's MEP, Safety)	851	Wks	\$296.00	\$251,896
Vehicle Allowance (Ass't. Sup't, PC)	58	Mos	\$300.00	\$17,400
Estimated Super, LE, Safety IT Costs	36,303	hrs	\$1.64	\$59,537
Estimated PM IT Costs	63,778	hrs	\$2.29	\$146,052
				<b>\$769,914</b>
<b>TEMPORARY FACILITIES</b>				
Field telephone / IT - hookup	1	Ls	\$15,000	\$15,000
- calls - 10 phones	30	Mos	\$1,000	\$30,000
Cell Phone costs - PM's, Supers, LE	100,080	hrs	\$0.58	\$58,046
Set up phone, internet, copiers	1	Ls	\$5,000	\$5,000
Monthly Phone Equipment Rental	26	Mos	\$500	\$13,000
Field Office expense	130	Wks	\$750	\$97,500
Temporary Partitions - Office	200	LF	\$20	\$4,000
Office furniture	25	Ea	\$1,000	\$25,000
Temporary Protection	1	Ls	\$50,000	\$50,000
Temporary Bldg. Access	3	Ea	\$5,000	\$15,000
Cleaning Service for Field Office/Baths	104	Wks	\$1,000	\$103,920
Copiers	26	Mos	\$2,000	\$52,000
Scanners / Color Printer	2	Ea	\$5,000	\$10,000
High Speed Internet / DSL	30	Mos	\$1,250	\$37,500
Network Equipment	26	Mos	\$50	\$1,300
				<b>\$517,266</b>
<b>TEMPORARY UTILITIES</b>				
Electric (PEPCO 7/1/07-8/1/08)	13	Mos	\$15,000	\$195,000
Electric (Generators Fuel 8/1/08-11/1/09)	15	Mos	\$34,500	\$517,500
Electric (Generators 8/1/08-11/1/09)	15	Mos	\$10,000	\$150,000
Water (Provided by ownership)				
				<b>\$862,500</b>
<b>Total</b>				<b>\$7,893,626</b>

## PACE Key Contacts

Name	Company
Corinne Ambler	Barton Malow Company
Mike Miller	Southland Industries
Jumanne Smith	Clark Construction Group
Aaron Bernett	Zelienople
Todd Vochinsky	Suffolk Construction
Bill Moyer	James G. Davis Construction Company
Steve Lee	Benchmark Construction Company Inc.
Colman Walker	The Haskell Company
Chuck	Truland Systems Corporation
John Bechtel	Office of Physical Plant
Mark Konchar	Balfour Beatty



## E. CRITICAL INDUSTRY ISSUES

The PACE Roundtable Meeting took place on Thursday, October 16, 2008 at the Penn Stater Conference Center Hotel. At the event, there were several workshops offered throughout the day. The first discussion was about the Mentoring Program that the Architectural Engineering Department Head, Dr. Anumba, would like to implement. One thing that surprised me about the program was that there were a variety of opinions from the students and professionals. One particular was that some felt this program should be kept separate from internship opportunities. Another was when the program would start, some felt that it should start second year, while other believed it would be more beneficial to begin when the students selected an option. An issue about this program that might affect me is that it was suggested for 5<sup>th</sup> years to also become a secondary mentor for second year students. One of the key contacts I gained from the Mentoring Program session is Corinne Ambler from the Barton Malow Company.

The break-out session that was most beneficial to Constitution Center was LEED Evolution. At this session, both the old LEED process and the new were discussed. One thing that surprised me the most about the session was that there were two professionals in the session that did not know much about LEED. This surprised me because they are from companies that do work in the Washington, DC area. The reason for my surprise is because "starting in 2010, all new and substantially improved commercial buildings of 50,000 sq ft or more both privately and publicly owned will have to fulfill or exceed LEED New Construction 2.2 or LEED Core and Shell 2.0 standards."<sup>4</sup> Therefore, because of this statement, I felt more industry members would be aware of LEED requirements. A topic from this session that might affect Constitution Center is that owners typically do not know the LEED rating system and force the general contractor to fulfill all of the requirements. However, for Constitution Center, the owner is very involved in the LEED process and I do not foresee this to be a problem. There are several industry members that I will be able to contact if I have any questions about topics discussed in LEED Evolution. Mike Miller from Southland Industries, Jumanne Smith from Clark Construction Group, Aaron Bernett from Zelienople, and Todd Vochinsky from Suffolk Construction were the most involved in the LEED Evolution discussion.

The final two sessions of the PACE Roundtable Meeting were panel discussions. The first panel was with industry members. The thing that surprised me the most about this panel was that they discussed the skills that their companies look for in

<sup>4</sup> (Bacon)

new hires. Some of the skills were knowledge, personalities, managing people, teams, leadership, motivational, organizational, and humanity skills. One thing taken from this panel that might affect Constitution Center is the managing people skills. There are 20+ people working for DAVIS at Constitution Center, so having “managing people skills” are very helpful. There are many key contacts I gained from this panel; two in particular are Bill Moyer from DAVIS and Chuck Tomasco from Truland Systems Corporation.

The second panel, comprised of students, was a discussion of Work-Life Balance. The thing that surprised me the most about this panel was that the industry members believed that we would be shocked by the number of hours we will spend at work. I feel that the number of hours spent at work will depend on the culture of the company I chose to work for and disagree with the statement that I “will not be able to handle the work.” One issue brought up at this panel that might affect Constitution Center was that some believe younger employees might get work shifted to them by employees that have children. This may affect Constitution Center because there are several people onsite that have children and there are also young employees. There are several key contacts from this panel discussion. The main people that asked questions were Andreas Phelps, a Graduate Student here at Penn State, and the industry members I named in the above sections.

As you can tell from Figure 7, Davis Construction provides its employees with a work-life balance opportunity of joining the Davis Ultimate Frisbee team. This opportunity was open to all full-time and interns during the summer of 2008. As I said before, it depends on the company culture and how they assist their employees with a work-life balance.

*Figure 7: Davis Construction's Work-Life Balance*



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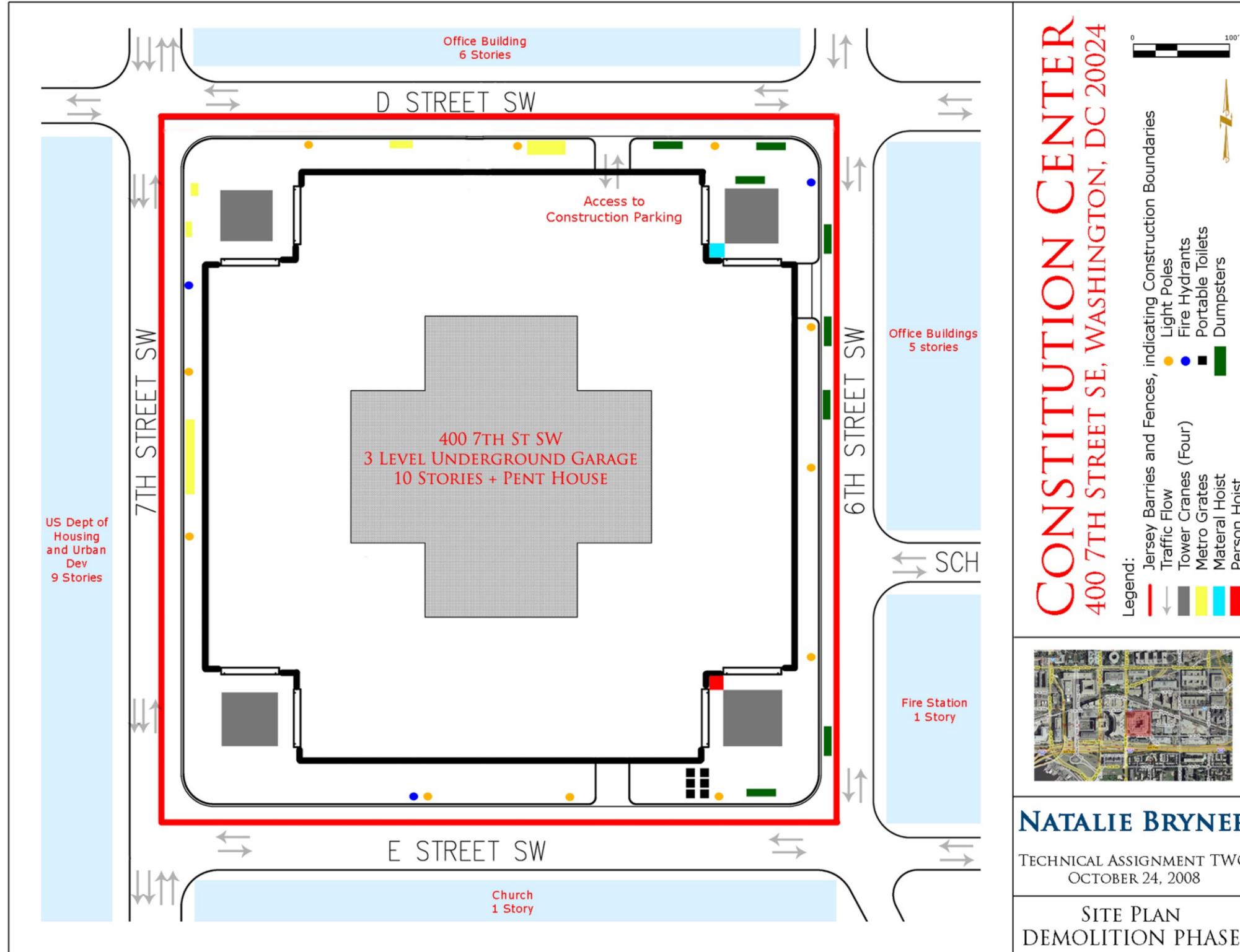
**APPENDIX A: DETAILED PROJECT SCHEDULE**

ID	Task Name	Start	Finish	October 11		May 1		November 21		June 11		January 1		July 21	
				10/22	1/28	5/6	8/12	11/18	2/24	6/1	9/7	12/14	3/22	6/28	10/4
1	<b>Pre-Construction</b>	Wed 11/1/06	Fri 10/31/08	[Gantt bar]											
2	<b>Mobilization</b>	Wed 11/1/06	Fri 6/29/07	[Gantt bar]											
3	Notice to Negotiate General Contract	Wed 11/1/06	Wed 11/1/06	[Gantt bar]											
4	Tenant Vacate Building	Wed 11/1/06	Fri 6/29/07	[Gantt bar]											
5	GC Prepare & Submit General Conditions & Fee	Wed 11/1/06	Thu 11/9/06	[Gantt bar]											
6	Develop Const Doct to 80%	Wed 11/1/06	Wed 1/31/07	[Gantt bar]											
7	Award GC	Fri 11/10/06	Fri 11/17/06	[Gantt bar]											
8	Prepare GMP Pricing	Thu 2/1/07	Fri 6/1/07	[Gantt bar]											
9	Negotiate & Accept GMP Pricing	Wed 3/7/07	Fri 6/1/07	[Gantt bar]											
10	Receive Demolition Permits (Demolition and Building)	Fri 6/1/07	Fri 6/1/07	[Gantt bar]											
11	Establish Field Offices / Mobilize on Site	Mon 6/4/07	Fri 6/29/07	[Gantt bar]											
12	<b>Critical Procurement</b>	Wed 11/1/06	Fri 10/31/08	[Gantt bar]											
13	<b>Curtainwall</b>	Wed 11/1/06	Fri 10/31/08	[Gantt bar]											
14	General	Mon 11/20/06	Fri 10/31/08	[Gantt bar]											
15	Exterior Façade - Mock-Up Dwgs and Submittals	Wed 11/1/06	Thu 6/28/07	[Gantt bar]											
16	Courtyard Façade - Mock-Up Dwgs and Submittals	Wed 11/1/06	Wed 7/4/07	[Gantt bar]											
17	Precast - Submittal, Fabrication & Delivery	Wed 4/18/07	Tue 1/29/08	[Gantt bar]											
18	Elevator - Submittal, Fabrication & Delivery	Wed 4/18/07	Thu 2/21/08	[Gantt bar]											
19	Blast Elements - Submittal, Fabrication & Delivery	Wed 4/18/07	Fri 10/12/07	[Gantt bar]											
20	Structural Steel - Submittal, Fabrication & Delivery	Wed 4/18/07	Tue 12/18/07	[Gantt bar]											
21	Mechanical - Submittal, Fabrication & Delivery	Wed 4/18/07	Thu 3/20/08	[Gantt bar]											
22	Electrical - Submittal, Fabrication & Delivery	Wed 4/18/07	Thu 3/20/08	[Gantt bar]											
23	<b>Demolition</b>	Mon 7/2/07	Fri 6/27/08	[Gantt bar]											
24	<b>General</b>	Mon 7/2/07	Fri 6/27/08	[Gantt bar]											
25	Notice to Proceed with Demolition	Mon 7/2/07	Mon 7/2/07	[Gantt bar]											
26	Metro D Street Access Closed	Tue 7/31/07	Fri 6/27/08	[Gantt bar]											
27	<b>Interior Demolition</b>	Tue 7/10/07	Mon 5/12/08	[Gantt bar]											
28	<b>North</b>	Tue 7/10/07	Fri 12/28/07	[Gantt bar]											
29	Asbestos / Lead Paint Abatement	Tue 7/10/07	Fri 12/28/07	[Gantt bar]											
30	Interior Demo	Tue 7/17/07	Tue 10/16/07	[Gantt bar]											
31	Demo for Shafts & Slab Openings	Tue 8/28/07	Fri 12/28/07	[Gantt bar]											
32	East	Tue 7/24/07	Mon 1/14/08	[Gantt bar]											
33	West	Wed 9/5/07	Mon 4/28/08	[Gantt bar]											
34	South	Mon 5/12/08	Mon 5/12/08	[Gantt bar]											
35	<b>Exterior Demolition &amp; Survey Existing</b>	Tue 7/17/07	Tue 6/10/08	[Gantt bar]											
36	<b>Exterior Façade</b>	Tue 7/31/07	Tue 6/10/08	[Gantt bar]											
37	<b>North</b>	Tue 7/31/07	Mon 1/21/08	[Gantt bar]											
38	Demo Roof Slab - NW Corner	Tue 7/31/07	Tue 8/21/07	[Gantt bar]											
39	Exterior Façade Demo - NW Corner	Wed 9/5/07	Wed 9/5/07	[Gantt bar]											
40	Exterior Façade Demo - North	Fri 11/30/07	Fri 11/30/07	[Gantt bar]											
41	Survey Exterior Façade - NW Corner	Thu 9/6/07	Thu 9/13/07	[Gantt bar]											
42	Demo at Slab Edge - North	Mon 10/8/07	Mon 1/21/08	[Gantt bar]											
43	Survey Exterior Façade - North	Mon 12/17/07	Mon 12/17/07	[Gantt bar]											
44	East	Tue 8/14/07	Thu 2/7/08	[Gantt bar]											
45	West	Mon 12/3/07	Tue 5/27/08	[Gantt bar]											
46	South	Tue 12/18/07	Tue 6/10/08	[Gantt bar]											
47	<b>Courtyard Façade</b>	Tue 10/23/07	Tue 6/10/08	[Gantt bar]											
48	<b>North</b>	Tue 10/23/07	Thu 2/7/08	[Gantt bar]											
49	Courtyard Façade Demo	Tue 10/23/07	Thu 1/3/08	[Gantt bar]											
50	Demo at Courtyard Slab Edge	Wed 11/21/07	Thu 2/7/08	[Gantt bar]											
51	Survey Courtyard Façade	Mon 1/21/08	Mon 1/21/08	[Gantt bar]											
52	East	Tue 11/6/07	Mon 2/25/08	[Gantt bar]											
53	West	Mon 2/18/08	Tue 5/27/08	[Gantt bar]											
54	South	Thu 3/6/08	Tue 6/10/08	[Gantt bar]											
55	<b>Penthouse / Roof</b>	Tue 7/17/07	Thu 3/27/08	[Gantt bar]											
56	<b>North</b>	Fri 9/14/07	Mon 2/25/08	[Gantt bar]											
57	Asbestos / Lead Paint Abatement	Fri 9/14/07	Fri 10/12/07	[Gantt bar]											
58	Demo	Tue 1/22/08	Mon 2/25/08	[Gantt bar]											
59	East	Tue 8/14/07	Fri 1/4/08	[Gantt bar]											
60	West	Mon 10/15/07	Thu 3/27/08	[Gantt bar]											
61	South	Tue 7/17/07	Mon 12/3/07	[Gantt bar]											
62	<b>Construction</b>	Wed 9/26/07	Mon 1/4/10	[Gantt bar]											
63	<b>Façade / Roof</b>	Mon 10/1/07	Wed 4/29/09	[Gantt bar]											
64	<b>Exterior Façade</b>	Mon 10/1/07	Mon 2/23/09	[Gantt bar]											
65	<b>North</b>	Mon 10/1/07	Wed 12/31/08	[Gantt bar]											

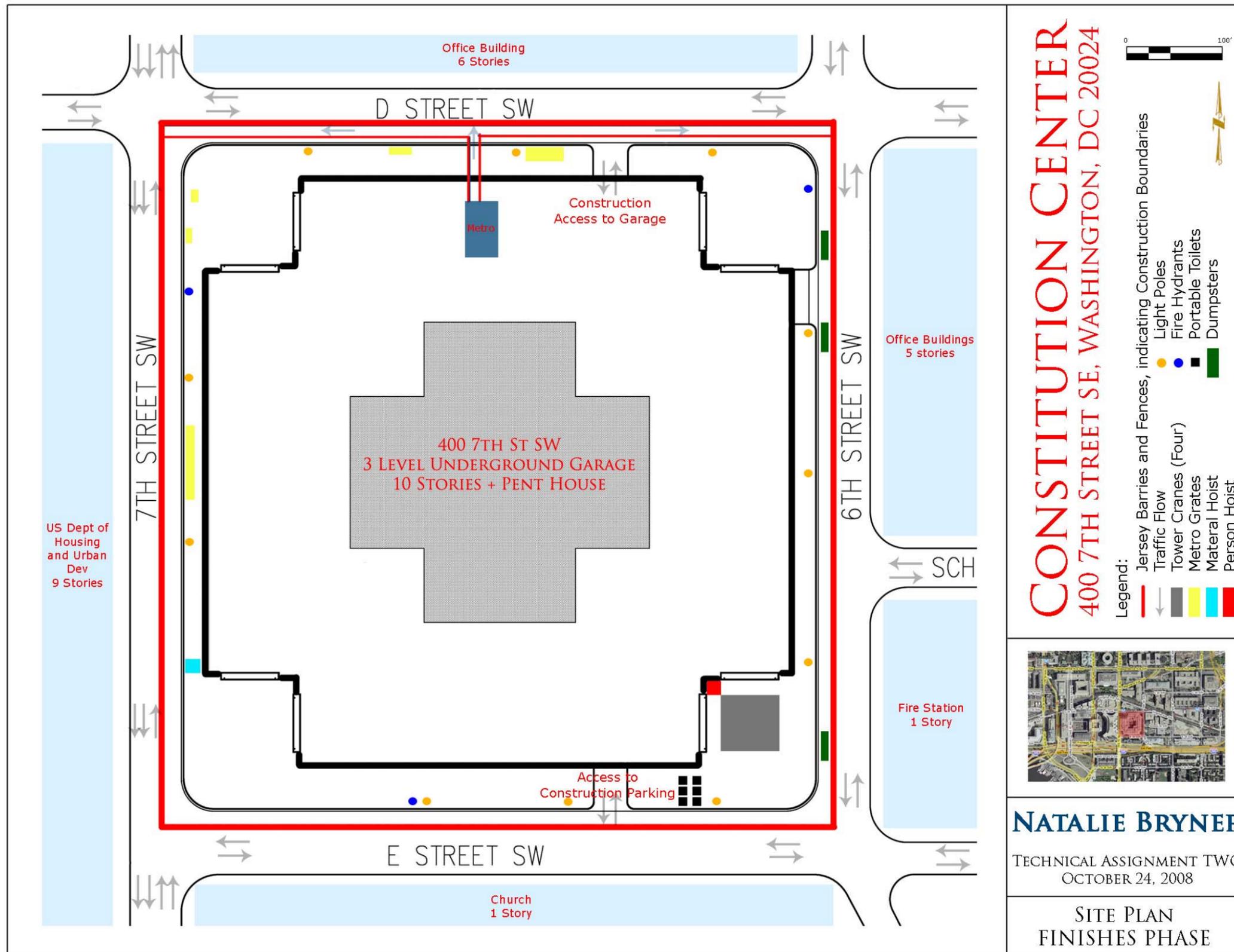
ID	Task Name	Start	Finish	October 11		May 1		November 21		June 11		January 1		July 21	
				10/22	1/28	5/6	8/12	11/18	2/24	6/1	9/7	12/14	3/22	6/28	10/4
66	Fabrications for Slab Extensions	Mon 10/1/07	Tue 11/13/07												
67	Demo & Shoring 2nd Floor at Blast Beams	Tue 11/6/07	Mon 11/19/07												
68	Slab Extensions	Mon 12/17/07	Mon 12/17/07												
69	Encase Perimeter Columns at Blast Beams	Wed 12/5/07	Wed 12/5/07												
70	F,R&P Blast Beams	Fri 1/18/08	Fri 1/18/08												
71	Fab Anchors & Plates for Curtianwall	Mon 1/21/08	Mon 1/21/08												
72	Install Anchors & Plates for Curtainwall	Wed 3/12/08	Wed 3/12/08												
73	Erect Curtainwall	Fri 2/22/08	Fri 6/27/08												
74	Erect Metal Panels	Mon 7/28/08	Fri 8/22/08												
75	Erect Exterior Storefont	Wed 11/12/08	Thu 12/4/08												
76	Erect Exterior Stone	Tue 12/9/08	Wed 12/31/08												
77	East	Mon 10/1/07	Mon 12/8/08												
78	West	Tue 1/22/08	Tue 1/27/09												
79	South	Fri 2/8/08	Mon 2/23/09												
80	NE Corner - Erect Precast	Thu 1/31/08	Tue 3/4/08												
81	NW Corner - Erect Precast	Wed 4/23/08	Wed 5/21/08												
82	SE Corner - Erect Precast	Thu 5/22/08	Thu 6/19/08												
83	SW Corner - Erect Precast	Fri 6/20/08	Fri 7/18/08												
84	<b>Courtyard Façade</b>	<b>Tue 1/22/08</b>	<b>Wed 4/29/09</b>												
85	<b>North</b>	<b>Tue 1/22/08</b>	<b>Wed 12/10/08</b>												
86	Fab Anchors & Plates for Ctyd Curtainwall	Tue 1/22/08	Mon 2/25/08												
87	Install Anchors & Plates for Curtainwall	Fri 4/11/08	Fri 5/9/08												
88	Erect Structural Steel & Deck	Mon 5/12/08	Mon 6/2/08												
89	Erect Curtainwall	Tue 8/26/08	Tue 9/30/08												
90	Erect Metal Panels	Mon 10/13/08	Mon 10/13/08												
91	Erect Storefront	Tue 11/25/08	Wed 12/10/08												
92	East	Fri 2/8/08	Mon 11/24/08												
93	West	Mon 5/12/08	Wed 12/24/08												
94	South	Tue 5/20/08	Wed 4/29/09												
95	<b>Penthouse / Roof</b>	<b>Tue 12/4/07</b>	<b>Fri 12/12/08</b>												
96	<b>North</b>	<b>Tue 2/26/08</b>	<b>Fri 8/1/08</b>												
97	In Fill Slabs & Curbs	Tue 2/26/08	Mon 3/10/08												
98	Erect Structural Steel & Deck	Tue 4/8/08	Tue 4/8/08												
99	Erect Exterior Wall Panels & Louvers	Wed 5/7/08	Wed 5/7/08												
100	Install PH Roofing	Thu 5/22/08	Thu 5/22/08												
101	Install Main Roofing	Mon 7/21/08	Fri 8/1/08												
102	East	Mon 1/7/08	Fri 7/18/08												
103	West	Fri 3/28/08	Mon 8/18/08												
104	South	Tue 12/4/07	Thu 7/3/08												
105	NE Quadrant Dry & Ready for DAVIS Tenant Fit-out	Wed 10/1/08	Wed 10/1/08												
106	NW Quadrant Dry & Ready for DAVIS Tenant Fit-out	Tue 11/4/08	Tue 11/4/08												
107	SW Quadrant Dry & Ready for DAVIS Tenant Fit-out	Fri 12/12/08	Fri 12/12/08												
108	SE Quadrant Dry & Ready for DAVIS Tenant Fit-out	Fri 12/12/08	Fri 12/12/08												
109	<b>MEP Risers</b>	<b>Wed 10/3/07</b>	<b>Mon 5/19/08</b>												
110	NE Risers	Wed 10/3/07	Mon 1/7/08												
111	NW Risers	Tue 2/5/08	Mon 5/5/08												
112	SW Risers	Tue 2/19/08	Mon 5/19/08												
113	SE Risers	Wed 10/17/07	Mon 1/21/08												
114	<b>MEP Rough-ins &amp; Finishes</b>	<b>Wed 9/26/07</b>	<b>Wed 9/9/09</b>												
115	<b>P-3 Level</b>	<b>Wed 9/26/07</b>	<b>Mon 1/12/09</b>												
116	<b>NE</b>	<b>Wed 9/26/07</b>	<b>Tue 10/14/08</b>												
117	Construct Elevator Shaft Walls	Wed 9/26/07	Tue 10/9/07												
118	Erect CMU Blast Walls	Wed 9/26/07	Tue 10/9/07												
119	Hardening Concrete Walls	Tue 10/30/07	Tue 10/30/07												
120	Hardening Columns	Wed 10/31/07	Thu 12/6/07												
121	Rough-in MEP	Wed 10/31/07	Thu 11/29/07												
122	Construct Raised Slabs	Fri 12/28/07	Fri 12/28/07												
123	Install Garage Lighting	Mon 1/21/08	Mon 1/21/08												
124	Finishes	Wed 10/1/08	Tue 10/14/08												
125	NW	Tue 2/26/08	Mon 11/17/08												
126	SW	Tue 2/12/08	Fri 12/26/08												
127	SE	Wed 10/10/07	Mon 1/12/09												
128	P-2 Level	Mon 2/9/09	Mon 2/9/09												
129	P-1 Level	Mon 10/29/07	Mon 3/23/09												
130	Plaza Level	Wed 10/10/07	Fri 7/31/09												

ID	Task Name	Start	Finish	October 11		May 1		November 21		June 11		January 1		July 21	
				10/22	1/28	5/6	8/12	11/18	2/24	6/1	9/7	12/14	3/22	6/28	10/4
131	<b>2nd Floor</b>	<b>Wed 10/24/07</b>	<b>Tue 11/25/08</b>												
132	<b>NE</b>	<b>Wed 10/24/07</b>	<b>Tue 11/25/08</b>												
133	Erect Steel Cols and Beams	Wed 10/24/07	Fri 10/26/07												
134	Remove Expansion Joints	Tue 10/30/07	Tue 10/30/07												
135	In Fill Slabs	Mon 10/29/07	Tue 10/30/07												
136	Construct Shaft Walls	Fri 11/30/07	Thu 12/6/07												
137	Rough-in MEP	Fri 11/30/07	Thu 12/20/07												
138	Finishes	Wed 10/1/08	Tue 11/25/08												
139	3rd Floor	Mon 10/29/07	Mon 6/1/09												
140	4th Floor	Thu 11/1/07	Mon 6/15/09												
141	5th Floor	Tue 11/6/07	Mon 6/29/09												
142	6th Floor	Fri 11/9/07	Tue 7/14/09												
143	7th Floor	Wed 11/14/07	Tue 7/28/09												
144	8th Floor	Mon 11/19/07	Tue 8/11/09												
145	9th Floor	Mon 11/26/07	Tue 8/25/09												
146	10th Floor	Thu 11/29/07	Wed 9/9/09												
147	<b>Penthouse / Roof</b>	<b>Wed 4/9/08</b>	<b>Tue 11/4/08</b>												
148	<b>North</b>	<b>Wed 4/9/08</b>	<b>Tue 11/4/08</b>												
149	Construct Raised Slab	Wed 4/9/08	Tue 5/6/08												
150	Spray Fireproofing	Tue 5/13/08	Tue 5/13/08												
151	Eqpt Pads & Curbs	Tue 5/20/08	Tue 5/20/08												
152	Set Boilers	Wed 6/4/08	Wed 6/4/08												
153	Set Major Mech Eqpt	Wed 6/18/08	Wed 6/18/08												
154	Set Generators	Thu 6/5/08	Wed 6/18/08												
155	Construct Shaft Walls	Thu 6/19/08	Wed 6/25/08												
156	Set Major Elec Eqpt	Thu 6/26/08	Thu 7/10/08												
157	Rough-in MEP	Tue 8/12/08	Tue 10/7/08												
158	Final MEP Connections & Checkout	Tue 11/4/08	Tue 11/4/08												
159	Finishes	Wed 10/8/08	Tue 11/4/08												
160	<b>Elevators</b>	<b>Fri 11/30/07</b>	<b>Thu 8/21/08</b>												
161	<b>NE</b>	<b>Fri 11/30/07</b>	<b>Thu 8/21/08</b>												
162	Install Shuttel Elevators #28, 29, 30 & Frieght Elevator #7	Fri 11/30/07	Thu 7/10/08												
163	Modernization of Elevators #8, 9, 10, 11, 12 & 31	Wed 3/5/08	Thu 8/21/08												
164	<b>Courtyard</b>	<b>Wed 10/1/08</b>	<b>Mon 2/9/09</b>												
165	<b>North</b>	<b>Wed 10/1/08</b>	<b>Mon 2/9/09</b>												
166	Demo Courtyard	Wed 10/1/08	Wed 10/22/08												
167	Waterproofing Courtyard	Thu 11/6/08	Thu 11/6/08												
168	Prep & Pour Concrete for Water Features	Tue 12/2/08	Tue 12/2/08												
169	Erect Courtyard Retaining Wall	Thu 12/4/08	Thu 12/18/08												
170	Install Granite at Water Features	Mon 1/5/09	Mon 1/5/09												
171	Place Fill and Soil	Thu 1/22/09	Thu 1/22/09												
172	Place Concrete Base & Pavers	Fri 1/30/09	Fri 1/30/09												
173	Install Landscaping	Mon 2/9/09	Mon 2/9/09												
174	<b>Sitework</b>	<b>Mon 12/1/08</b>	<b>Mon 2/23/09</b>												
175	<b>6th Street</b>	<b>Mon 12/1/08</b>	<b>Mon 2/23/09</b>												
176	Demo	Mon 12/1/08	Mon 12/15/08												
177	Install New Utilities to Bldg	Tue 12/23/08	Tue 12/23/08												
178	Waterproofing	Wed 12/31/08	Wed 12/31/08												
179	New Granite Curb & Brick Gutter	Fri 1/2/09	Mon 1/19/09												
180	Concrete Planters	Tue 1/20/09	Wed 2/4/09												
181	Prep & Pour New Sidewalks	Thu 2/5/09	Thu 2/5/09												
182	Install Bollards, Landscaping & Paving	Mon 2/23/09	Mon 2/23/09												
183	<b>Project Close-out</b>	<b>Mon 1/5/09</b>	<b>Mon 1/4/10</b>												
184	<b>NE Quadrant</b>	<b>Mon 1/5/09</b>	<b>Mon 6/1/09</b>												
185	Commissing	Mon 1/5/09	Fri 4/3/09												
186	Punchlist	Mon 3/9/09	Mon 6/1/09												
187	Final Inspection	Mon 4/6/09	Fri 5/1/09												
188	Substantial Completion	Fri 5/1/09	Fri 5/1/09												
189	NW Quadrant	Wed 3/4/09	Thu 7/30/09												
190	SW Quadrant	Mon 5/4/09	Wed 9/30/09												
191	SE Quadrant	Thu 7/2/09	Tue 12/1/09												
192	Final Completion / Project Close-out	Mon 11/2/09	Mon 1/4/10												

APPENDIX B: SITE LAYOUT PLANNING







**NATALIE BRYNER**

TECHNICAL ASSIGNMENT TWO  
 OCTOBER 24, 2008

SITE PLAN  
 FINISHES PHASE

**APPENDIX C: DETAILED SYSTEMS ESTIMATE**

		GL-2B	GL-2B (half)	GL-2BS	GL-2BS (half)	GL-2BS (half vert)	GL-4	GL-4 (half)	GL-4S	GL-4S (half)	GL-3	GL-3S	GL-6	GL-6 (half)	GL-6S	GL-6S (half)	GL-5	GL-5 (half)	GL-5S	GL-5S (half)	FP-2	PNL-1	PNL-1 (half)	Stone	Metal Panel	GL-13	GL-13 (half)	GL-13 (tall)	GL-13 (tall half)	GL-12 (tall)		
<b>West Exterior Façade</b>																																
<b>Bay A-B</b>	<b>Height</b>																															
Plaza-2	17'-6"	4	1	2																												
2-3	10'-4"						4	2	4	2	2	2																				
3-4	10'-4"						4	2	4	2	2	2																				
4-5	10'-4"												4	2	4	2	2			2												
5-6	10'-4"												4	2	4	2	2			2												
6-7	10'-4"												4	2	4	2	2			2												
7-8	10'-4"												4	2	4	2	2			2												
8-9	10'-4"												4	2			2			2			4	1								
9-10	10'-4"																4	1	4	1												
10-Roof	10'-4"																4	1	4	1												
<b>Bay B-C</b>	<b>Height</b>																															
Plaza-2	17'-6"	3	1	3	1	3																1	1									
2-3	10'-4"						1		1		3	3																				
3-4	10'-4"						1		1		3	3																				
4-5	10'-4"												1		1		3			3												
5-6	10'-4"												1		1		3			3												
6-7	10'-4"												1		1		3			3												
7-8	10'-4"												1		1		3			3												
8-9	10'-4"												1				3			3			1									
9-10	10'-4"																3	1	3	1												
10-Roof	10'-4"																3	1	3	1												
<b>Bay C-D</b>	<b>Height</b>																															
Plaza-2	17'-6"	2	4																			1	6									
2-3	10'-4"						6		6																							
3-4	10'-4"						6		6				6		6																	
4-5	10'-4"												6		6																	
5-6	10'-4"												6		6																	
6-7	10'-4"												6		6																	
7-8	10'-4"												6		6																	
8-9	10'-4"												6										6									
9-10	10'-4"																4	2	1													
10-Roof	10'-4"																4	2	1													
<b>Bay D-E</b>	<b>Height</b>																															
Plaza-2	17'-6"	2	4																			1	6									
2-3	10'-4"						6		6																							
3-4	10'-4"						6		6				6		6																	
4-5	10'-4"												6		6																	
5-6	10'-4"												6		6																	
6-7	10'-4"												6		6																	
7-8	10'-4"												6		6																	
8-9	10'-4"												6										6									
9-10	10'-4"																4	2	1													
10-Roof	10'-4"																4	2	1													
<b>Bay E-F</b>	<b>Height</b>																															
Plaza-2	17'-6"	2	4																			1	6									
2-3	10'-4"						6		6																							
3-4	10'-4"						6		6				6		6																	
4-5	10'-4"												6		6																	
5-6	10'-4"												6		6																	
6-7	10'-4"												6		6																	
7-8	10'-4"												6		6																	
8-9	10'-4"												6										6									





		GL-2B	GL-2B (half)	GL-2BS	GL-2BS (half)	GL-2BS (half vert)	GL-4	GL-4 (half)	GL-4S	GL-4S (half)	GL-3	GL-3S	GL-6	GL-6 (half)	GL-6S	GL-6S (half)	GL-5	GL-5 (half)	GL-5S	GL-5S (half)	FP-2	PNL-1	PNL-1 (half)	Stone	Metal Panel	GL-13	GL-13 (half)	GL-13 (tall)	GL-13 (tall half)	GL-12 (tall)		
<b>East Exterior Façade</b>																																
<b>Bay A-B</b>	<b>Height</b>																															
Plaza-2	17'-6"	4	1	2																												
2-3	10'-4"						4	2	4	2	2	2																				
3-4	10'-4"						4	2	4	2	2	2																				
4-5	10'-4"												4	2	4	2	2			2												
5-6	10'-4"												4	2	4	2	2			2												
6-7	10'-4"												4	2	4	2	2			2												
7-8	10'-4"												4	2	4	2	2			2												
8-9	10'-4"												4	2				2		2			4	1								
9-10	10'-4"																4	1	4	1												
10-Roof	10'-4"																4	1	4	1												
<b>Bay B-C</b>	<b>Height</b>																															
Plaza-2	17'-6"	3	1	3	1	3																1	1									
2-3	10'-4"						1		1		3	3																				
3-4	10'-4"						1		1		3	3																				
4-5	10'-4"												1		1		3			3												
5-6	10'-4"												1		1		3			3												
6-7	10'-4"												1		1		3			3												
7-8	10'-4"												1		1		3			3												
8-9	10'-4"												1				3			3			1									
9-10	10'-4"																3	1	3	1												
10-Roof	10'-4"																3	1	3	1												
<b>Bay C-D</b>	<b>Height</b>																															
Plaza-2	17'-6"	2	4																			1	6									
2-3	10'-4"						6		6																							
3-4	10'-4"						6		6				6		6																	
4-5	10'-4"												6		6																	
5-6	10'-4"												6		6																	
6-7	10'-4"												6		6																	
7-8	10'-4"												6		6																	
8-9	10'-4"												6										6									
9-10	10'-4"																4	2	1													
10-Roof	10'-4"																4	2	1													
<b>Bay D-E</b>	<b>Height</b>																															
Plaza-2	17'-6"	2	4																			1	6									
2-3	10'-4"						6		6																							
3-4	10'-4"						6		6				6		6																	
4-5	10'-4"												6		6																	
5-6	10'-4"												6		6																	
6-7	10'-4"												6		6																	
7-8	10'-4"												6		6																	
8-9	10'-4"												6										6									
9-10	10'-4"																4	2	1													
10-Roof	10'-4"																4	2	1													
<b>Bay E-F</b>	<b>Height</b>																															
Plaza-2	17'-6"	2	4																			1	6									
2-3	10'-4"						6		6																							
3-4	10'-4"						6		6				6		6																	
4-5	10'-4"												6		6																	
5-6	10'-4"												6		6																	
6-7	10'-4"												6		6																	
7-8	10'-4"												6		6																	
8-9	10'-4"												6										6									
9-10	10'-4"																4	2	1													
10-Roof	10'-4"																4	2	1													





		GL-2B	GL-2B (half)	GL-2BS	GL-2BS (half)	GL-2BS (half vert)	GL-4	GL-4 (half)	GL-4S	GL-4S (half)	GL-3	GL-3S	GL-6	GL-6 (half)	GL-6S	GL-6S (half)	GL-5	GL-5 (half)	GL-5S	GL-5S (half)	FP-2	PNL-1	PNL-1 (half)	Stone	Metal Panel	GL-13	GL-13 (half)	GL-13 (tall)	GL-13 (tall half)	GL-12 (tall)		
<b>North Exterior Façade</b>																																
<b>Bay 1-2</b>	<b>Height</b>																															
Plaza-2	17'-6"	4	1	2																												
2-3	10'-4"						4	2	4	2	2	2																				
3-4	10'-4"						4	2	4	2	2	2																				
4-5	10'-4"												4	2	4	2	2			2												
5-6	10'-4"												4	2	4	2	2			2												
6-7	10'-4"												4	2	4	2	2			2												
7-8	10'-4"												4	2	4	2	2			2												
8-9	10'-4"												4	2	4	2	2			2			4	1								
9-10	10'-4"																4	1	4	1												
10-Roof	10'-4"																4	1	4	1												
<b>Bay 2-3</b>	<b>Height</b>																															
Plaza-2	17'-6"	3	1	3	1	3																1	1									
2-3	10'-4"						1		1		3	3																				
3-4	10'-4"						1		1		3	3																				
4-5	10'-4"												1		1		3			3												
5-6	10'-4"												1		1		3			3												
6-7	10'-4"												1		1		3			3												
7-8	10'-4"												1		1		3			3												
8-9	10'-4"												1				3			3			1									
9-10	10'-4"																3	1	3	1												
10-Roof	10'-4"																3	1	3	1												
<b>Bay 3-4</b>	<b>Height</b>																															
Plaza-2	17'-6"	2	4																			1	6									
2-3	10'-4"						6		6																							
3-4	10'-4"						6		6				6		6																	
4-5	10'-4"												6		6																	
5-6	10'-4"												6		6																	
6-7	10'-4"												6		6																	
7-8	10'-4"												6		6																	
8-9	10'-4"												6										6									
9-10	10'-4"																4	2	1													
10-Roof	10'-4"																4	2	1													
<b>Bay 4-5</b>	<b>Height</b>																															
Plaza-2	17'-6"	2	4																			1	6									
2-3	10'-4"						6		6																							
3-4	10'-4"						6		6				6		6																	
4-5	10'-4"												6		6																	
5-6	10'-4"												6		6																	
6-7	10'-4"												6		6																	
7-8	10'-4"												6		6																	
8-9	10'-4"												6										6									
9-10	10'-4"																4	2	1													
10-Roof	10'-4"																4	2	1													
<b>Bay 5-6</b>	<b>Height</b>																															
Plaza-2	17'-6"	2	4																			1	6									
2-3	10'-4"						6		6																							
3-4	10'-4"						6		6				6		6																	
4-5	10'-4"												6		6																	
5-6	10'-4"												6		6																	
6-7	10'-4"												6		6																	
7-8	10'-4"												6		6																	
8-9	10'-4"												6										6									
9-10	10'-4"																4	2	1													
10-Roof	10'-4"																4	2	1													





		GL-2B	GL-2B (half)	GL-2BS	GL-2BS (half)	GL-2BS (half vert)	GL-4	GL-4 (half)	GL-4S	GL-4S (half)	GL-3	GL-3S	GL-6	GL-6 (half)	GL-6S	GL-6S (half)	GL-5	GL-5 (half)	GL-5S	GL-5S (half)	FP-2	PNL-1	PNL-1 (half)	Stone	Metal Panel	GL-13	GL-13 (half)	GL-13 (tall)	GL-13 (tall half)	GL-12 (tall)		
<b>South Exterior Façade</b>																																
<b>Bay 1-2</b>	<b>Height</b>																															
Plaza-2	17'-6"	4	1	2																												
2-3	10'-4"						4	2	4	2	2	2																				
3-4	10'-4"						4	2	4	2	2	2																				
4-5	10'-4"												4	2	4	2	2			2												
5-6	10'-4"												4	2	4	2	2			2												
6-7	10'-4"												4	2	4	2	2			2												
7-8	10'-4"												4	2	4	2	2			2												
8-9	10'-4"												4	2	4	2	2			2			4	1								
9-10	10'-4"																4	1	4	1												
10-Roof	10'-4"																4	1	4	1												
<b>Bay 2-3</b>	<b>Height</b>																															
Plaza-2	17'-6"	3	1	3	1	3																1	1									
2-3	10'-4"						1		1		3	3																				
3-4	10'-4"						1		1		3	3																				
4-5	10'-4"												1		1		3			3												
5-6	10'-4"												1		1		3			3												
6-7	10'-4"												1		1		3			3												
7-8	10'-4"												1		1		3			3												
8-9	10'-4"												1		1		3			3			1									
9-10	10'-4"																3	1	3	1												
10-Roof	10'-4"																3	1	3	1												
<b>Bay 3-4</b>	<b>Height</b>																															
Plaza-2	17'-6"	2	4																			1	6									
2-3	10'-4"						6		6																							
3-4	10'-4"						6		6				6		6																	
4-5	10'-4"												6		6																	
5-6	10'-4"												6		6																	
6-7	10'-4"												6		6																	
7-8	10'-4"												6		6																	
8-9	10'-4"												6		6								6									
9-10	10'-4"																4	2	1													
10-Roof	10'-4"																4	2	1													
<b>Bay 4-5</b>	<b>Height</b>																															
Plaza-2	17'-6"	2	4																			1	6									
2-3	10'-4"						6		6																							
3-4	10'-4"						6		6				6		6																	
4-5	10'-4"												6		6																	
5-6	10'-4"												6		6																	
6-7	10'-4"												6		6																	
7-8	10'-4"												6		6																	
8-9	10'-4"												6		6								6									
9-10	10'-4"																4	2	1													
10-Roof	10'-4"																4	2	1													
<b>Bay 5-6</b>	<b>Height</b>																															
Plaza-2	17'-6"	2	4																			1	6									
2-3	10'-4"						6		6																							
3-4	10'-4"						6		6				6		6																	
4-5	10'-4"												6		6																	
5-6	10'-4"												6		6																	
6-7	10'-4"												6		6																	
7-8	10'-4"												6		6																	
8-9	10'-4"												6		6								6									
9-10	10'-4"																4	2	1													
10-Roof	10'-4"																4	2	1													



