Technical Report #2

David R. Riley

Friday, October 24th

Michael Webb – Construction Management

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Square 320 Project

1199 F Street NW Wash, DC

Michael Webb
Construction Management

Dr. David Riley
Faculty Consultant

The duality of this project, in both the renovation and new construction phases, can be clearly seen in the detailed project schedule. Organized into subcategories, the schedule outlines vital construction items and milestones. Any items that might have significant cost implications are specifically noted, such as construction and removal of the tower crane. While activity durations drive the schedule length, it is these individual milestones that tell the whole story. The project schedule spans a 31 month period in entirety but the construction duration only accounts for 27 of those months. In reference to the structural estimates discussed in this report, the durations of those activities include 111 days for the garage and 170 days for the tower. The project is scheduled for substantial completion on March 12, 2009 at which point a 90day punch list period begins.

Due to the very dense nature of Washington DC, the Square 320 site was very tight and had little room at all for extraneous machinery, materials, or equipment. In each of the three phases, excavation, superstructure, and finishes, outside the building boundaries the site only included the sidewalk and one lane of F street for additional space. All workers were required to take the METRO to and from work to each day. Considering a METRO stop was no farther than 2 blocks from the site, this was rather convenient and simple. Unlike most construction projects, DAVIS did not require the rental of a field office trailer. The field office changes locations as the work does, from the 2nd Floor of the B&W building during excavation to the ground floor of the tower as soon as they could transition over. The tight nature of the site only constrained production and made planning all the more important.

This portion of the report focused on the 12-story concrete tower and the 5-story parking garage beneath it. After reviewing the drawings, a list was compiled of the important structural elements on each of the floors and then the most repetitive items were focused on for the detailed estimate of the structure. Using a unit cost system for estimating the structure, dimensions were used to calculate volumes and square footages. Those values were organized by unit cost, material cost, equipment cost and labor cost. The final estimate came to a total of $6,263,751.83 with $2,733,566.57 accounting for the 5-story garage and $3,530,185.26 for the tower.

The general conditions estimate is fully encompassing and reflects the trends of construction in the DC Metro area over the years. A portion of this information comes from the historic data DAVIS uses in the estimation of their district projects. A local tax rate of 5.75% was applied to all items other than labor, reflective of the District's local tax rates. The DAVIS field office has different locations based on the construction phase, from the 2nd floor of the B&W building during excavation and superstructure to the ground floor of the tower during the finishing phase. For the first 19 months the project uses temporary utilities before transitioning to permanent power for the remaining 7 months. The final material and labor costs come to $935,334.85 and $1,607,617.80, respectively. A 55% multiplier is added to the labor costs to adjust for general insurance and employee fringe benefits equaling an additional $884,189.79. The final total for the general conditions estimate comes to $3,427,142.44.

At the PACE roundtable, Energy & Economy was a popular topic for discussion. Even prior to the dramatic plunge of the stock market, the volatility of certain goods drove the cost of materials in various directions. The discussions ranged from talks of how to pursue leading edge green supplies to energy efficient design to the growing markets of the industry despite the economic recession. Companies that are to survive this economic downturn will have to focus on expanding into Federal work, PPPs, Health Care, and Educational buildings because the demand for these specialties continues to grow. As future employees, the pressure will be on us to put our best foot forward and to be open to new opportunities in places we've never been. This year's roundtable was a huge success, very enlightening, and inspirational for those of us who are about to set forth into the field.

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Technical Assignment #2

Detailed Project Schedule

Duality of Construction

The initial observation that must be discussed is the apparent duality of this project. The Square 320 Project incorporates both the renovation and restoration of three historic buildings alongside the construction of a 12-story class-A concrete office tower on top of a 5-story parking garage. The project schedule is organized into two parallel portions, the first one dedicated to the detailed scheduling of the new concrete substructure and superstructure and the second portion dedicated to a simple inspection of the restoration and renovation work.

Construction Phasing & Subgrouping

The schedule also outlines a portion of vital construction dates. It is organized into subcategories each denoted by an important area of construction. For example, the portion of the schedule that focuses on the concrete tower has subcategories such as Tower – Above Grade Structure where individual activities are organized into a subcategory for ease of reviewing. Additionally, the detailed project schedule makes a point of outlining the majority of the vital construction milestones so that upon quick review of the schedule, someone can easily identify the important dates on the project and how those dates will be affected by delays.

Construction Milestones

The milestones reflect important events that effectively alter the general conditions, personnel on-site, or the completion of contracts if moved or delayed. Under further inspection you will discover that items such as the construction of the tower crane and eventual removal of it are address as they have significant cost implications. Additionally, points of interest may include watertight enclosure in the tower, watertight enclosure in the historic buildings, or the transition from temporary facilities to permanent power. When concerned with payment of subcontractors some of the dates for beginning finishes become important as well. For example, due to the high luxury nature of this office tower and the desired tenants, the start of lobby stonework and luxury finishes in the bathrooms becomes very important. While activity durations drive the schedule length, it is the individual milestones that tell the whole story.

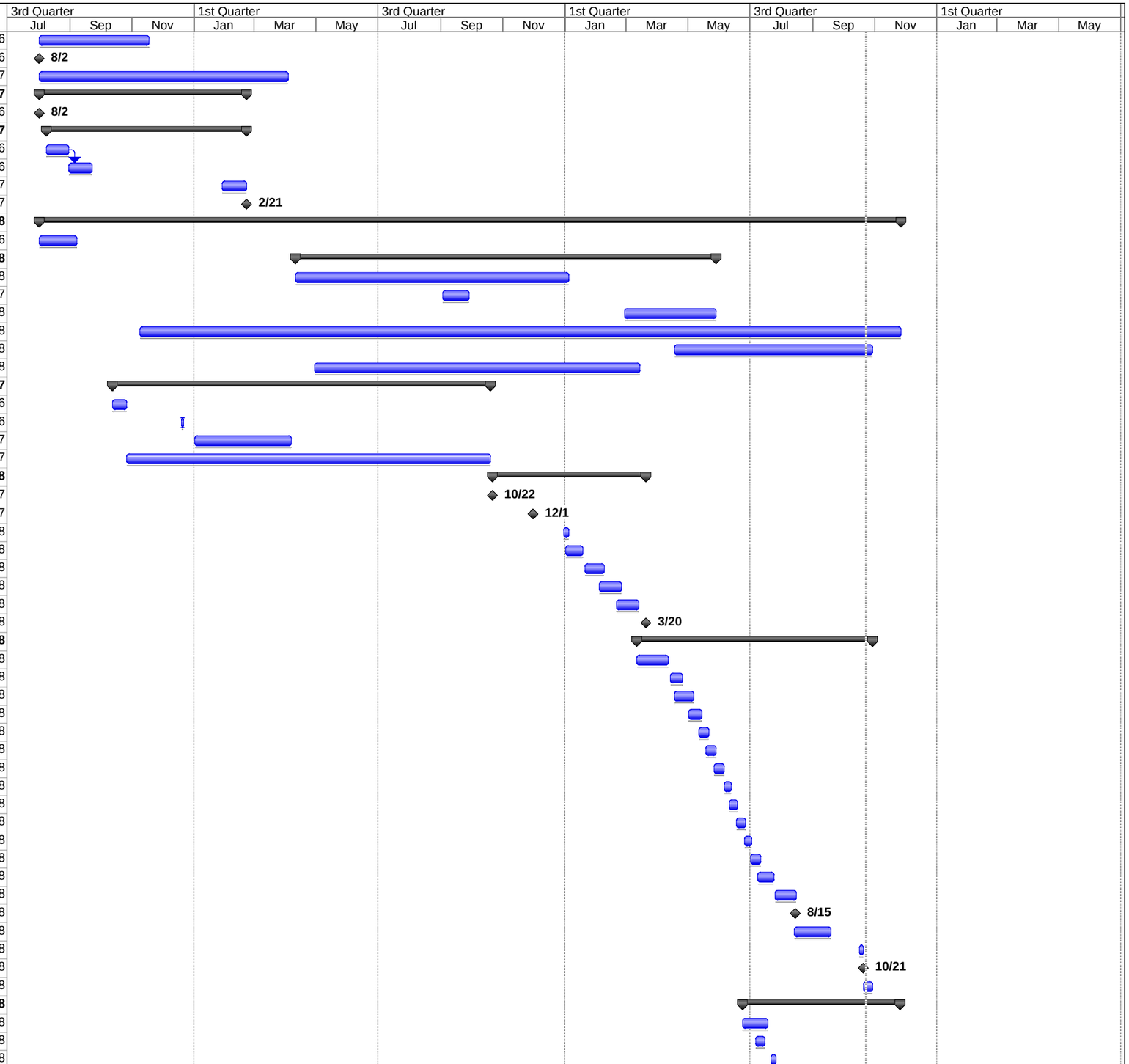
Tenant Fit-Out

Douglas Developers will not have the ability to phase the occupancy of their office space. DC law strictly rules that nobody can move in prior to a building inspected. However, while that might appear as a loss to the owner it enables each firm to fully customize their working spaces. It is for that reason that the Tenant improvements item was included. That represents the earliest date that the tenants' subcontractors are allowed to enter the site in order to begin the custom fit-out process of their rented space.

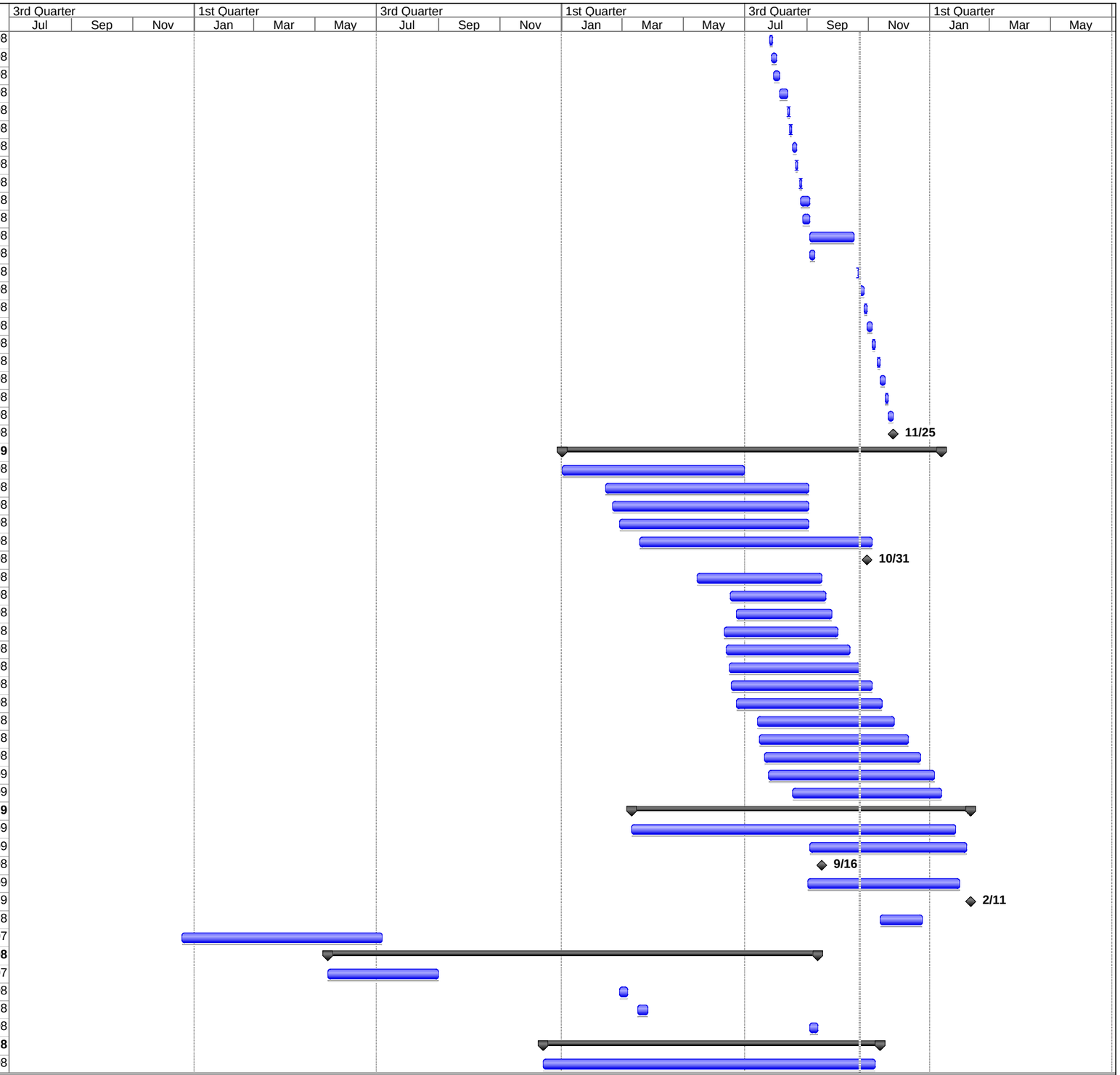
Project Closeout

Lastly, it is important to note the difference between substantial completion and final completion, especially in regards to how much time the contractor has for execution of the punch list between those two milestone dates. Substantial completion denotes when the building has been inspected, approved, and a permanent occupancy permit has been awarded. At this moment tenants can begin moving in, but there is still a 90 day period where DAVIS remains under contract and fully responsible for replacing, fixing, or repairing any items that are not up to the standards of the owner. Upon Final Completion, the contract is complete and DAVIS no longer holds any responsibility. At this point the project officially closes out and the DAVIS staff turns over the property to Doulas Development for full time management.

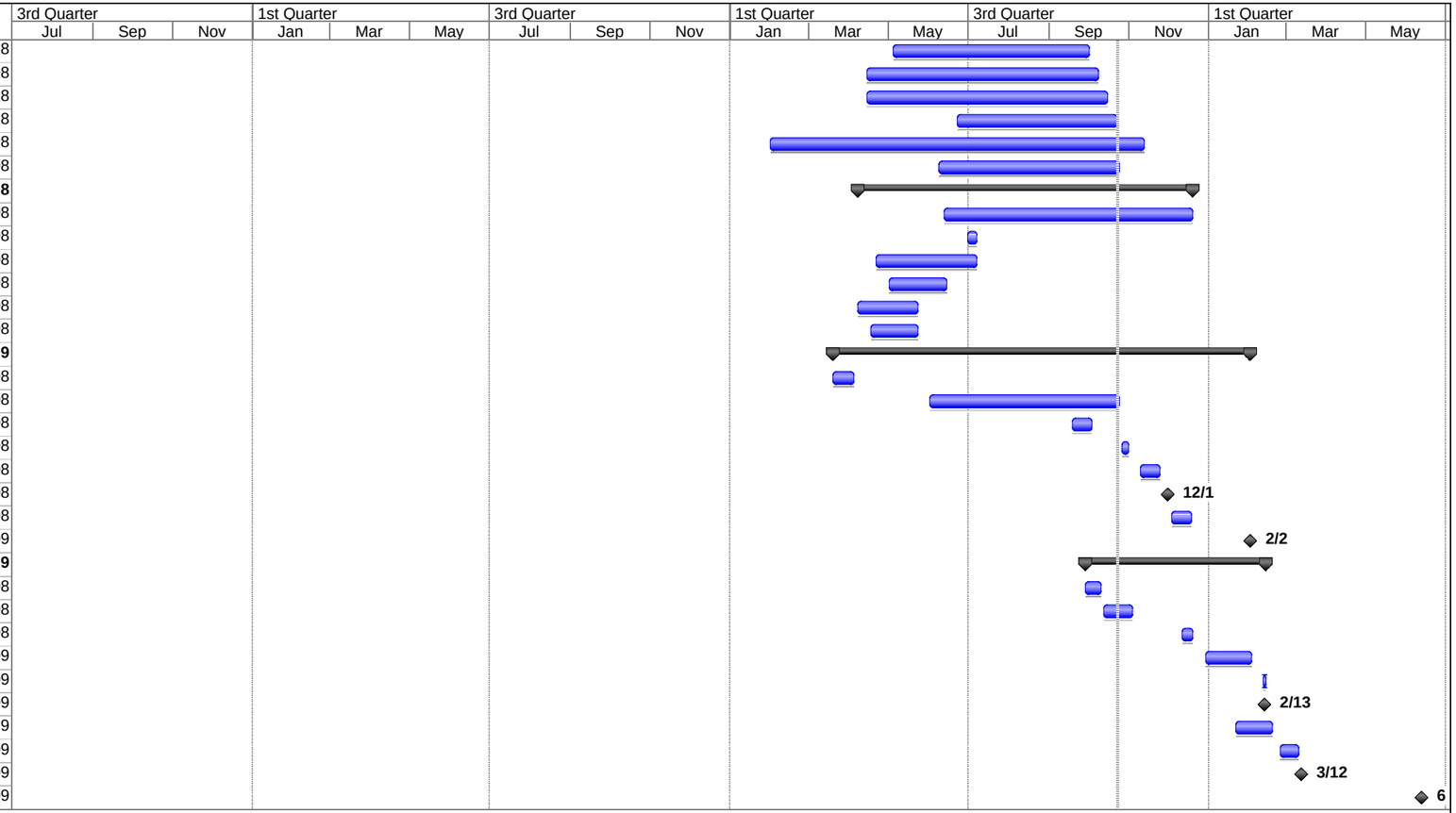
ID	Task Name	Duration	Start	Finish
1	Design Documents	78 days?	Wed 8/2/06	Fri 11/17/06
2	Limited Notice to Proceed Issued	0 days	Wed 8/2/06	Wed 8/2/06
3	Permit - Historic Façade Restoration	175 days?	Wed 8/2/06	Tue 4/3/07
4	**Site Demolition**	**146 days?**	**Wed 8/2/06**	**Wed 2/21/07**
5	Mobilize Demolition	0 days	Wed 8/2/06	Wed 8/2/06
6	**Start Demolition**	**141 days?**	**Wed 8/9/06**	**Wed 2/21/07**
7	Demo 1107-1109 F Street	16 days?	Wed 8/9/06	Wed 8/30/06
8	Demo Existing Buildings	17 days?	Thu 8/31/06	Fri 9/22/06
9	Demo Nordlinger Resr	18 days?	Mon 1/29/07	Wed 2/21/07
10	Conclude Demolition	0 days	Wed 2/21/07	Wed 2/21/07
11	**Procurement**	**612 days?**	**Wed 8/2/06**	**Wed 11/26/08**
12	Fabricate Rebar Caissons	27 days?	Wed 8/2/06	Thu 9/7/06
13	**Above Grade Structure**	**298 days?**	**Wed 4/11/07**	**Wed 5/28/08**
14	Fabricate Steel Columns B1 - Renovation	194 days?	Wed 4/11/07	Fri 1/4/08
15	Fabricate Inserts & Imbeds	20 days?	Mon 9/3/07	Fri 9/28/07
16	B&W Structural Steel Fabrication	65 days?	Fri 2/29/08	Wed 5/28/08
17	Building Façade & Roofing	541 days?	Thu 11/9/06	Wed 11/26/08
18	Interior Finishes	143 days?	Fri 4/18/08	Wed 10/29/08
19	Site Utilities	232 days?	Mon 4/30/07	Fri 3/14/08
20	**Tower - Excavate to Subgrade**	**266 days?**	**Fri 10/13/06**	**Fri 10/19/07**
21	Install Dewatering System	10 days?	Fri 10/13/06	Thu 10/26/06
22	Mobile For Sheeting & Excavation	2 days?	Wed 12/20/06	Thu 12/21/06
23	Drill Caissons	69 days?	Tue 1/2/07	Fri 4/6/07
24	Excavation	256 days?	Fri 10/27/06	Fri 10/19/07
25	**Tower - Below Grade Structure**	**111 days?**	**Mon 10/22/07**	**Thu 3/20/08**
26	**Begin Concrete Tower**	0 days	Mon 10/22/07	Mon 10/22/07
27	**Erect Tower Crane**	0 days	Sat 12/1/07	Sat 12/1/07
28	F/R/P Mat Slab - B4	5 days?	Mon 12/31/07	Fri 1/4/08
29	F/R/P Slab, Columns, & Walls - B4	13 days?	Wed 1/2/08	Fri 1/18/08
30	Slabs, Columns, Walls - B3	15 days?	Mon 1/21/08	Fri 2/8/08
31	Slabs, Columns, Walls - B2	16 days?	Mon 2/4/08	Mon 2/25/08
32	Slabs, Columns, Walls - B1	17 days?	Thu 2/21/08	Thu 3/13/08
33	**Garage Concrete Complete**	0 days	Thu 3/20/08	Thu 3/20/08
34	**Tower - Above Grade Structure**	**170 days?**	**Wed 3/12/08**	**Wed 10/29/08**
35	Slabs, Columns, Walls - Ground	23 days?	Wed 3/12/08	Fri 4/11/08
36	Slabs, Columns - 2nd Floor	10 days?	Mon 4/14/08	Fri 4/25/08
37	Slabs, Columns - 3rd Floor	13 days?	Fri 4/18/08	Tue 5/6/08
38	Slabs, Columns - 4th Floor	9 days?	Fri 5/2/08	Wed 5/14/08
39	Slabs, Columns - 5th Floor	8 days?	Mon 5/12/08	Wed 5/21/08
40	Slabs, Columns - 6th Floor	8 days?	Mon 5/19/08	Wed 5/28/08
41	Slabs, Columns - 7th Floor	8 days?	Tue 5/27/08	Thu 6/5/08
42	Slabs, Columns - 8th Floor	6 days?	Fri 6/6/08	Thu 6/12/08
43	Slabs, Columns - 9th Floor	7 days?	Wed 6/11/08	Wed 6/18/08
44	Slabs, Columns - 10th Floor	7 days?	Wed 6/18/08	Thu 6/26/08
45	Slabs, Columns - 11th Floor	5 days?	Thu 6/26/08	Wed 7/2/08
46	Slabs, Columns - 12th Floor	8 days?	Wed 7/2/08	Fri 7/11/08
47	Slabs, Columns - Main Roof	12 days?	Wed 7/9/08	Thu 7/24/08
48	Slabs, Columns - Penthouse	16 days?	Sat 7/26/08	Fri 8/15/08
49	**Superstructure Concrete Complete**	0 days	Fri 8/15/08	Fri 8/15/08
50	Erect Steel for Eyebrow Cornice	27 days?	Thu 8/14/08	Thu 9/18/08
51	Dismantle Tower Crane	2 days?	Fri 10/17/08	Mon 10/20/08
52	**Remove Tower Crane**	0 days	Tue 10/21/08	Tue 10/21/08
53	Pour Slab Openings	7 days?	Tue 10/21/08	Wed 10/29/08
54	**Tower - Façade & Roof**	**113 days?**	**Tue 6/24/08**	**Tue 11/25/08**
55	Erect Exterior CW - 3rd S	19 days?	Tue 6/24/08	Fri 7/18/08
56	Erect Exterior CW - 3rd W	7 days?	Mon 7/7/08	Tue 7/15/08
57	Erect Exterior CW - 4th S	5 days?	Tue 7/22/08	Sat 7/26/08



ID	Task Name	Duration	Start	Finish
58	Erect Exterior CW - 5th S	2 days?	Sat 7/26/08	Mon 7/28/08
59	Erect Exterior CW - 6th S	5 days?	Mon 7/28/08	Fri 8/1/08
60	Erect Exterior CW - 4th W	4 days?	Wed 7/30/08	Mon 8/4/08
61	Erect Exterior CW - 5th W	6 days?	Tue 8/5/08	Tue 8/12/08
62	Erect Exterior CW - 6th W	2 days?	Wed 8/13/08	Thu 8/14/08
63	Erect Exterior CW - 7th W	2 days?	Fri 8/15/08	Sat 8/16/08
64	Erect Exterior CW - 8th W	4 days?	Mon 8/18/08	Thu 8/21/08
65	Erect Exterior CW - 9th W	2 days?	Thu 8/21/08	Fri 8/22/08
66	Erect Exterior CW - 10th W	2 days?	Mon 8/25/08	Tue 8/26/08
67	Erect Exterior CW - 11th W	7 days?	Tue 8/26/08	Wed 9/3/08
68	Erect Exterior CW - 7th S	5 days?	Thu 8/28/08	Wed 9/3/08
69	Erect Exterior CW - 8th S	32 days?	Thu 9/4/08	Fri 10/17/08
70	Erect Exterior CW - 12th W	3 days?	Thu 9/4/08	Mon 9/8/08
71	Erect Exterior CW - 9th S	1 day?	Wed 10/22/08	Wed 10/22/08
72	Erect Exterior CW - 10th S	3 days?	Thu 10/23/08	Mon 10/27/08
73	Erect Exterior CW - 11th S	3 days?	Tue 10/28/08	Thu 10/30/08
74	Erect Exterior CW - 12th S	3 days?	Fri 10/31/08	Tue 11/4/08
75	Erect Exterior CW - 8th E	3 days?	Wed 11/5/08	Fri 11/7/08
76	Erect Exterior CW - 9th E	3 days?	Mon 11/10/08	Wed 11/12/08
77	Erect Exterior CW - 10th E	3 days?	Thu 11/13/08	Mon 11/17/08
78	Erect Exterior CW - 11th E	3 days?	Tue 11/18/08	Thu 11/20/08
79	Erect Exterior CW - 12th E	3 days?	Fri 11/21/08	Tue 11/25/08
80	**Tower Watertight**	0 days	Tue 11/25/08	Tue 11/25/08
81	**Tower - Rough-ins / Interior Framing**	**275 days?**	**Wed 1/2/08**	**Mon 1/12/09**
82	Rough-in : B5	132 days?	Wed 1/2/08	Mon 6/30/08
83	Rough-in : B4	149 days?	Thu 2/14/08	Tue 9/2/08
84	Rough-in : B3	144 days?	Thu 2/21/08	Tue 9/2/08
85	Rough-in : B2	139 days?	Thu 2/28/08	Tue 9/2/08
86	Rough-in : B1	169 days?	Wed 3/19/08	Tue 11/4/08
87	**Permanent Power**	0 days	Fri 10/31/08	Fri 10/31/08
88	Rough-in : Ground	92 days?	Thu 5/15/08	Mon 9/15/08
89	Rough-in : 2nd Floor	71 days?	Tue 6/17/08	Fri 9/19/08
90	Rough-in : 3rd Floor	71 days?	Mon 6/23/08	Thu 9/25/08
91	Rough-in : 4th Floor	84 days?	Wed 6/11/08	Wed 10/1/08
92	Rough-in : 5th Floor	90 days?	Fri 6/13/08	Mon 10/13/08
93	Rough-in : 6th Floor	96 days?	Mon 6/16/08	Thu 10/23/08
94	Rough-in : 7th Floor	102 days?	Wed 6/18/08	Tue 11/4/08
95	Rough-in : 8th Floor	107 days?	Mon 6/23/08	Fri 11/14/08
96	Rough-in : 9th floor	100 days?	Mon 7/14/08	Wed 11/26/08
97	Rough-in : 10th Floor	108 days?	Wed 7/16/08	Wed 12/10/08
98	Rough-in : 11th Floor	113 days?	Mon 7/21/08	Mon 12/22/08
99	Rough-in : 12th Floor	120 days?	Fri 7/25/08	Mon 1/5/09
100	Rough-in : Penthouse	107 days?	Mon 8/18/08	Mon 1/12/09
101	**Tower - Interior Finishes**	**246 days?**	**Tue 3/11/08**	**Wed 2/11/09**
102	Interior Finishes : Garage	235 days?	Tue 3/11/08	Mon 1/26/09
103	Interior Finishes : Tower	113 days?	Thu 9/4/08	Fri 2/6/09
104	**Begin Lobby Stonework**	0 days	Tue 9/16/08	Tue 9/16/08
105	Install Elevators	110 days?	Tue 9/2/08	Fri 1/30/09
106	**Lobby Finishes Complete**	0 days	Wed 2/11/09	Wed 2/11/09
107	Tower - Tenant Improvements	30 days	Thu 11/13/08	Wed 12/24/08
108	Renovation - Excavation & Sitework	143 days?	Wed 12/20/06	Fri 7/6/07
109	**Renovation - Below Grade Structure**	**355 days?**	**Mon 5/14/07**	**Thu 9/11/08**
110	Foundations: Corcoran & Nordlinger	80 days?	Mon 5/14/07	Fri 8/31/07
111	F/R/P New Ftg/Fndn Wall - Nordlinger	6 days?	Thu 2/28/08	Thu 3/6/08
112	Pour New B1 Slab - Corcoran&Nordlinger	8 days?	Mon 3/17/08	Wed 3/26/08
113	Pour New B1 Slab - B&W Bldg	6 days?	Thu 9/4/08	Thu 9/11/08
114	**Renovation - Above Grade Structure**	**244 days?**	**Fri 12/14/07**	**Wed 11/12/08**
115	Steel - Ground	241 days?	Fri 12/14/07	Fri 11/7/08



ID	Task Name	Duration	Start	Finish
116	Steel - 2nd Floor	112 days?	Mon 5/5/08	Wed 10/1/08
117	Steel - 3rd Floor	131 days?	Tue 4/15/08	Wed 10/8/08
118	Steel - 4th Floor	136 days?	Tue 4/15/08	Wed 10/15/08
119	Steel - 5th Floor	90 days?	Mon 6/23/08	Wed 10/22/08
120	Steel - 6th Floor	209 days?	Fri 2/1/08	Wed 11/12/08
121	Steel - Roof	103 days?	Mon 6/9/08	Fri 10/24/08
122	**Renovation - Interior Finishes**	**188 days?**	**Tue 4/8/08**	**Fri 12/19/08**
123	Interior Finishes - Ground	139 days?	Fri 6/13/08	Fri 12/19/08
124	Interior Finishes - 2nd Floor	5 days?	Tue 7/1/08	Mon 7/7/08
125	Interior Finishes - 3rd Floor	57 days?	Tue 4/22/08	Mon 7/7/08
126	Interior Finishes - 4th Floor	33 days?	Fri 5/2/08	Sat 6/14/08
127	Interior Finishes - 5th Floor	34 days?	Tue 4/8/08	Fri 5/23/08
128	Interior Finishes - 6th Floor	26 days?	Fri 4/18/08	Fri 5/23/08
129	**Renovation - Façade & Roof**	**232 days?**	**Thu 3/20/08**	**Mon 2/2/09**
130	Cornice Restoration	12 days?	Thu 3/20/08	Fri 4/4/08
131	Restoration Corcoran & Nordlinger	109 days?	Mon 6/2/08	Fri 10/24/08
132	Install Roof - B&W	11 days?	Fri 9/19/08	Fri 10/3/08
133	Install Roof - Corcoran	5 days?	Mon 10/27/08	Fri 10/31/08
134	Historic Façade - B&W Building	11 days?	Mon 11/10/08	Mon 11/24/08
135	Façade Renovation Complete	0 days	Mon 12/1/08	Mon 12/1/08
136	Install Roof - Nordlinger	11 days?	Thu 12/4/08	Thu 12/18/08
137	Historic Envelope Complete & Watertight	0 days	Mon 2/2/09	Mon 2/2/09
138	**Finish Sitework**	**101 days?**	**Mon 9/29/08**	**Fri 2/13/09**
139	Utility Tie-In : B&W	10 days?	Mon 9/29/08	Fri 10/10/08
140	Utility Tie-In : Tower	16 days?	Mon 10/13/08	Mon 11/3/08
141	Site Grading	6 days?	Fri 12/12/08	Fri 12/19/08
142	Pavers & Sidewalks	25 days?	Tue 12/30/08	Mon 2/2/09
143	Bus Shelter	2 days?	Thu 2/12/09	Fri 2/13/09
144	Sitework Complete	0 days	Fri 2/13/09	Fri 2/13/09
145	Test & Balance Complete	20 days?	Thu 1/22/09	Wed 2/18/09
146	Inspections	10 days?	Wed 2/25/09	Tue 3/10/09
147	Substantial Completion	0 days	Thu 3/12/09	Thu 3/12/09
148	Final Completion	0 days	Fri 6/12/09	Fri 6/12/09

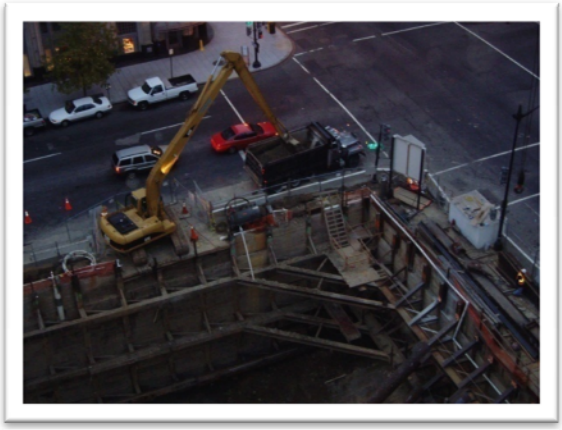


Site Layout Planning

Using the combination of the images and the site plans, the organization of the Square 320 project should be rather straightforward. With a tower crane stationed in between the two structures it provided to means to do all the heavy lifting necessary throughout each phase of construction.

Excavation

In these images and in the following site plans it is important to notice the placement of the ramp, where the excavators and dump trucks are required to position, and how the density of the downtown site affects the efficiency to which the work can be done. It is important to make the distinction that although this is not in the photograph, during the excavation phase of construction, the DAVIS field office was housed on the 2nd floor of the B&W building prior to the full demolition of the building. This decision was made to reduce the clutter on the site by not requiring a mobile trailer on site.



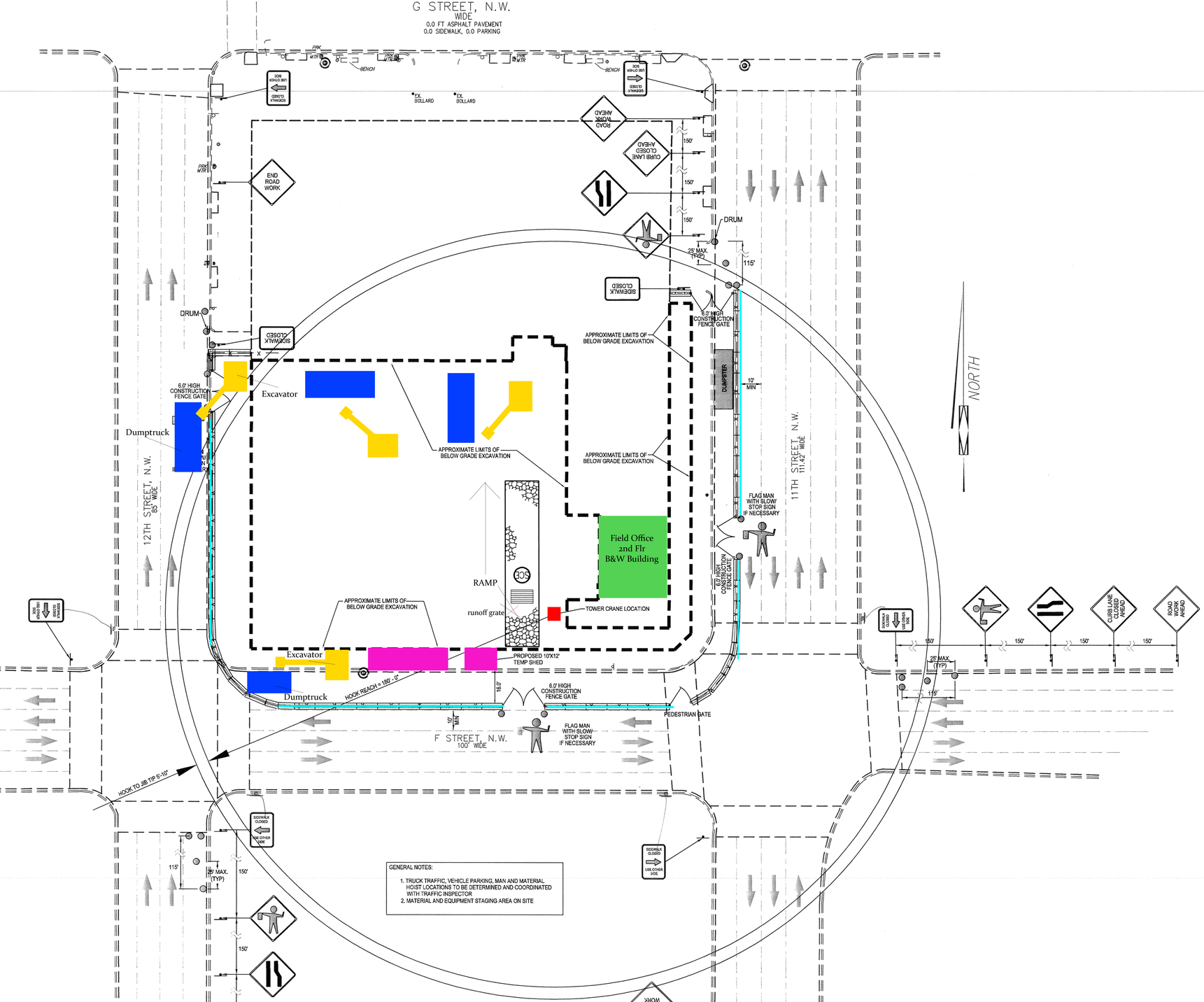
Superstructure

Similar to the excavation phase the concrete trucks and pump trucks had very little room to maneuver. At all times during construction hours, a flagman took station at the corner of 11th and F street as trucks were getting in station for their deliveries. Throughout the full duration of the project, one lane of west bound traffic on F street was closed, fenced in, and used for storage or deliveries. At this stage in the construction, as soon as the concrete reached the ground floor the field office transitioned from the B&W building to the ground floor of the tower organized just west of the central elevator and utilities core. Demolition had already begun in the historic buildings and their work was based out of a single mobile trailer stacked on top of two large storage compartments half way up the block on 11th.



Finishing Phases

As the finishing stages began, the installation of a complex trash chute system was installed along the north wall of the building with the chute leading to two large dumpster staged on the ground floor of the building in the loading dock located at the NW corner of the building. Additionally, a hoist system was installed on the South facade of the building nearly adjacent to the tower crane and continued to be heightened as more floors went up. If necessary, work on the renovation buildings was performed by use of a cherry picker as can be seen in the lower right picture below. This allowed the renovation work to not interfere with the hanging of the curtain wall and the enclosure of the building.

VICINITY MAP
NOT TO SCALE

= Tower Crane
= Fence
= Dumptrucks
= Excavators
= Storage Trailers
= Field Office

1199 F STREET
WASHINGTON, DC

Excavation Phase

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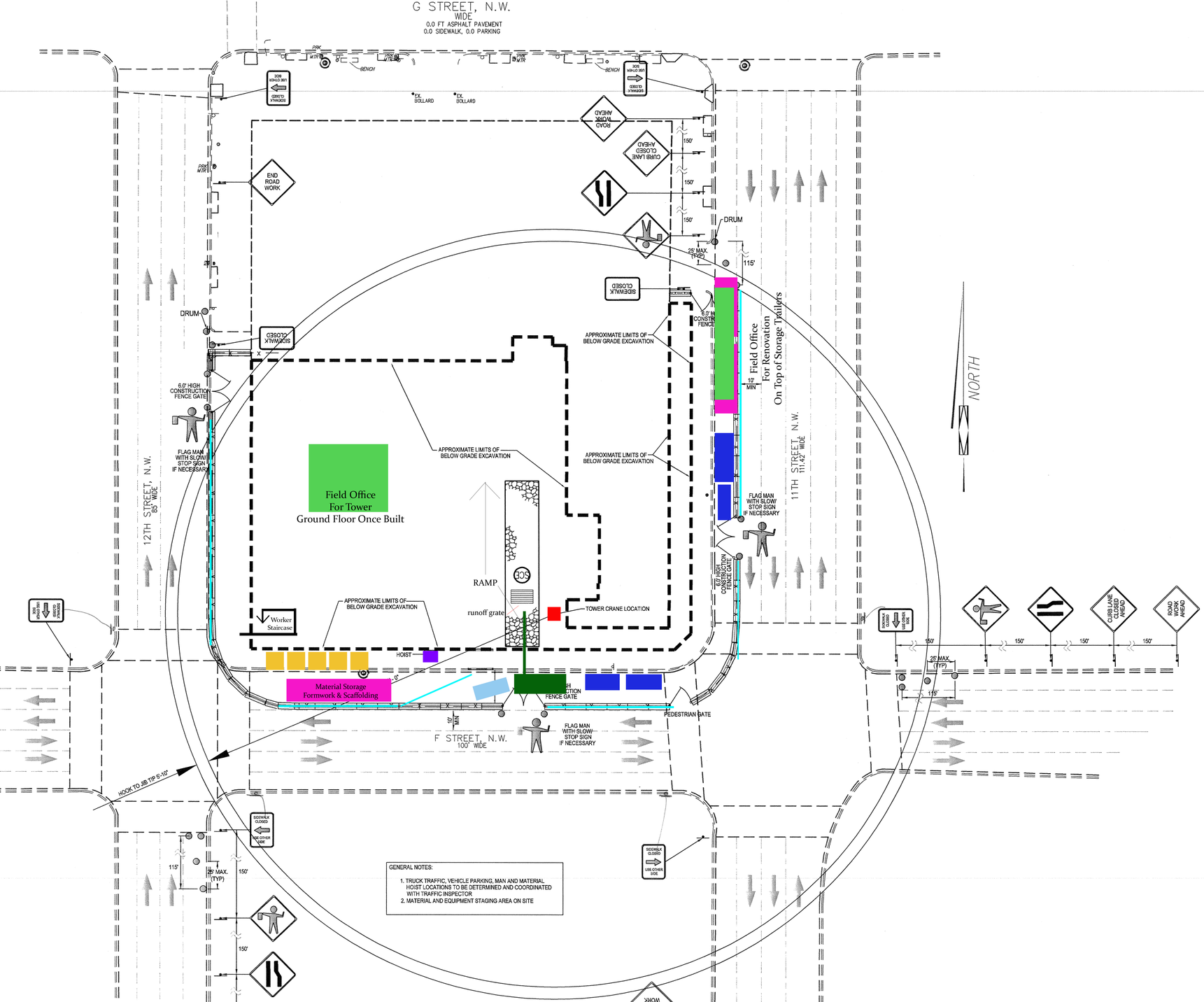
Square 320 - Traffic Control Plan



VICINITY MAP
NOT TO SCALE

- = Tower Crane
- = Fence
- = Dumpsters
- = Porta Johns
- = Storage Trailers
- = Field Office
- = Hoist
- = Pump Trucks
- = Concrete Trucks

1199 F STREET
WASHINGTON, DC

Superstructure Phase

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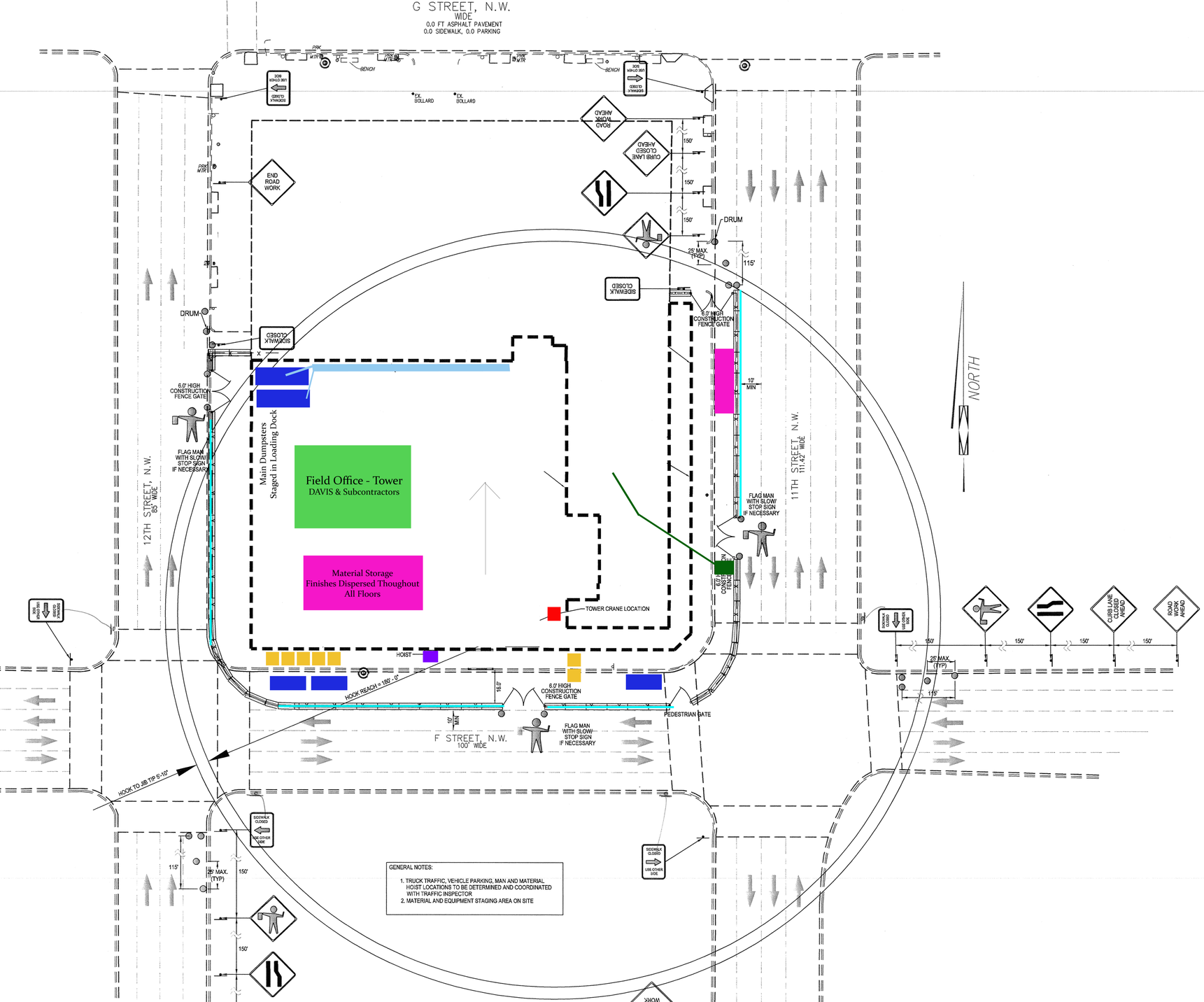
Square 320 - Traffic Control Plan



VICINITY MAP
NOT TO SCALE

- = Tower Crane
- = Fence
- = Dumpsters
- = Porta Johns
- = Storage Trailers
- = Field Office
- = Hoist
- = Cherry Picker
- = Trash Chutes

1199 F STREET
WASHINGTON, DC

Finishes Phase

Michael Webb - 24 October 2008
Square 320 - Traffic Control Plan

Detailed Structural Systems Estimate

In the renovation portion of the Square 320 project, the structural support system is very complex and inconsistent. For that reason this portion of the report will evaluate in detail the new construction of the 12-story concrete tower and the 5-story parking garage that supports it. Work performed on the renovation project is not transparent in the drawings/specs. While there are methods for uncovering more information about this aspect of the project, it is simply beyond the scope.

Method of Estimation

The structural systems estimate on this project is a hybrid between two methods, joining the use of a detailed floor take-off to calculate the entire building by using predetermined unit costs. The first task for this estimate was to determine which items from the plans would be important for estimation. After looking through the drawings, it became evident that an additional distinction needed to be made between the substructure and the super structure of the building. Due to the design differences between parking garage and office space, there were enough significant differences between the two systems that a decision was made to separate the two portions. After looking through each plan, a list was compiled of the important structural elements on each of the floors and then the most repetitive items were focused on for the detailed estimate of the structure.

Take-Offs

Once each item of the estimate was specified then dimensions were taken of each item. Based on the unit, totals were taken and multiplied by the number of floors the item appears on. At some points it was necessary to distinguish between various segments of slabs or different sized beams. All of the information is incorporated in the take–off sheets included. It is also important to mention that the units of take-off came directly from the units of the system estimate and how the information needed to be presented. Since the concrete take-off is in cubic yards, the dimensions were used to calculate cubic yards. For each of the varying concrete items, a unit cost was gathered from historical data that DAVIS uses for the estimation of their projects. In each of the cases covered in this estimate, the cost associated to the tonnage of steel reinforcing was included in the unit cost information.

Detailed Estimate

Following the take-off calculations, the reminder of the estimation purpose is very simple. Based on the dimensions and unit cost approximations, each take-off is compiled into an estimate sheet. The take-off value is then multiplied by the historical unit costs and a subtotal for each item is calculated. Included in this estimate will be the material cost, equipment cost and labor cost of each take-off item.

Estimate Comparison	***Detailed – TECH1***	***Project Cost Eval – TECH2***
12-Story Superstructure	*$3,530,185.26*	*$3,817,075*
5-Story Substructure	*$2,733,566.57*	*$4,242,504*
Total Estimate	*$6,263,751.83*	*$8,059,579*

Conclusion

The detailed estimate for the 12-story tower is remarkably close to the original project cost estimate from the earlier assignment. This suggests that the original cost evaluation, at least in regards to the superstructure, was very accurate. The detailed estimate for the parking structure was calculated to be significantly less than the original evaluation from the first technical assignment. The project cost evaluation data came from a detailed budget of the

building based on original design drawings. The significant difference in cost is most likely an issue of not having a large enough scope for this detailed estimate and not covering enough of the special elements of the garage. The estimate covered a very simple calculation of concrete volume based on square footage numbers but did go into detail to calculate each of the individuals of each floor nor did it account for the details of the elevator shaft, loading dock, or the ramping floors of the garage. Under more scrutiny the detailed estimate will likely grow in cost and get more accurate to the project cost data.

Detailed Structural Take-Off

CONCRETE

Category/Activity	Dimensions	Width	Length (feet)	Depth	Unit	Subtotal	Mulitplier	TOTAL TAKEOFF QUANTITY	
SUBSTRUCTURE									
42" Mat Foundation	148ft 9in x 157ft 3in	148.75	157.25	3.5	CY	3032.2		**3,032.16**	**CY**
8" Susp Slab w/ Drop Panels									
8" Suspended Slab	93ft 6in x 93ft 9in	93.5	93.75	-	SQFT	8765.6	5 flrs	43,828.13	
Drop Panels - 25/floor w/ 5 floors	10in x 10in x 8in	0.833	0.833	-	SQFT	0.6944	5 flrs @ 25 per flr	86.81	
								43,914.93	**SQFT**
10-1/2" Slab B1 level	85ft 8in x 102ft 3in	85.67	102.25	-	SQFT	8759.4		**8,759.42**	**SQFT**
8" Susp Slab to B1									
Section A	43ft 6in x 107ft 2in	43.5	107.1667	-	SQFT	4661.8		4,661.75	
Section B	148ft 9in x 63ft 6in	148.75	63.5	-	SQFT	9445.6		9,445.63	
								14,107.38	**SQFT**
15" Thickened Loading Dock	69ft 8in x 44ft	69.67	44	-	SQFT	3065.3		**3,065.33**	**SQFT**
Beams									
Type 1	12in x 60in	1.0	165.3	5.0	CY	22.95	5 flrs	114.76	
Type 2	12in x 24in	1.0	413.1	2.0	CY	7.65	5 flrs	38.25	
								153.00	**CY**
Columns									
Type 1 w/ 4#10	2ft x 2ft x 8ft 6in	2.0	8.5	2.0	CY	1.26	5 flrs @ 22 per flr	138.52	
Type 2 w 6#11	1ft 3in x 2ft 4in x 8ft 6in	1.3	8.5	2.0	CY	0.79	5 flrs @ 35 per flr	137.73	
								276.25	**CY**
	Wall Area								
16" Foundation Wall	475ft 6in x 8ft 6in	475.5	8.5	1.33	SQFT	4041.75		**4,041.75**	**SQFT**
14" Foundation Wall	660ft 8in x 8ft 6in	660.67	8.5	1.167	SQFT	5615.67		**5,615.67**	**SQFT**
12" Foundation Wall	1048ft 4in x 8ft 6in	1048.33	8.5	1.0	SQFT	8910.83		**8,910.83**	**SQFT**
	Days								
Tower Crane	111	-	-	22.2	Weeks			**23.0**	**Weeks**

Detailed Structural Take-Off

CONCRETE

Category/Activity	Dimensions	Width	Length (feet)	Depth	Unit	Subtotal	Mulitplier	TOTAL TAKEOFF QUANTITY	
SUPERSTRUCTURE									
9" Suspended Slab	127ft 9.5in x 130ft 6in	127.792	130.5	-	SQFT	16676.9	1 flrs	**16,676.86**	**SQFT**
7" Suspended Slab									
Section A	127ft 9.5in x 130ft 6in	127.792	130.5	-	SQFT	16676.9	11 flrs	183,445.42	
Section B	127ft 9.5in x 13ft	127.792	13.0	-	SQFT	1661.3	11 flrs	18,274.26	
								201,719.67	**SQFT**
Beams									
Type 1	12in x 60in	1.0	84.4	5.0	CY	11.73	11 flrs	129.0	
Type 2	12in x 24in	1.0	211.1	2.0	CY	3.91	11 flrs	43.0	
								172.0	**CY**
Columns									
Type 1 w/ 4#10	2ft x 2ft x 10ft 6in	2.0	10.67	2.0	CY	1.58	11 flrs @ 22 per flr	382.42	
Type 2 w 6#11	1ft 3in x 2ft 4in x 10ft 6in	1.3	10.67	2.0	CY	0.99	11 flrs @ 33 per flr	358.52	
								740.94	**CY**
Staircases	*steel w/ concrete top*	-	-	1	EACH	1.0	13 flrs @ 2 per flr	**26.0**	**EACH**
	Days								
Tower Crane	170	-	-	34	Weeks			**34.0**	**Weeks**

Michael Webb - Square 320 Project - 1199 F Street
Detailed Structural Estimate

CONCRETE			Material		Equiptment		Material Total	Labor Total
Category/Activity	Quantity	Unit	Rate	Cost	Rate	Cost	Cost	Cost
CONCRETE - Sub Grade								
42" Mat Foundation	3,033	CY	$240.00	$727,920.00				
8" Susp Slab w/ Drop Panels	43,915	SQFT	$11.75	$516,001.25				
10-1/2" Slab B1 level	8,760	SQFT	$14.00	$122,640.00				
8" Susp Slab to B1	14,108	SQFT	$11.75	$165,769.00				
15" Thickened Loading Dock	3,066	SQFT	$16.00	$49,056.00				
Beams	153	CY	$750.00	$114,750.00				
Columns	277	CY	$650.00	$180,050.00				
16" Foundation Wall	4,042	SQFT	$30.00	$121,260.00				
14" Foundation Wall	5,616	SQFT	$28.50	$160,056.00				
12" Foundation Wall	8,911	SQFT	$26.00	$231,686.00				
Tower Crane	23	Weeks			$9,000	$207,000		
Subtotal				$2,389,188.25				
Sales Tax	5.75	%		$137,378.32				
Total Sub Structure				$2,526,566.57		$207,000.00	$2,526,566.57	$207,000.00
CONCRETE - Superstructure								
9" Suspended Slab	16,677	SQFT	$11.25	$187,616.25				
7" Suspended Slab	201,720	SQFT	$10.50	$2,118,060.00				
Beams	172	CY	$725.00	$124,700.00				
Columns	741	CY	$650.00	$481,650.00				
Staircases	26	Each	$6,500.00	$169,000.00				
Tower Crane	34	Weeks			$8,000	$272,000		
Subtotal				$3,081,026.25				
Sales Tax	5.75	%		$177,159.01				
Total Superstructure				$3,258,185.26		$272,000.00	$3,258,185.26	$272,000.00
						SUBTOTAL	$5,784,751.83	$479,000.00
						TOTAL COST	**$6,263,751.83**	

1199 F Street - Square 320 - Tower

Updated Tower Estimate - CSI Masterformat

Assembly	% of Total	Cost per SF	Total Cost
A Substructure	**4.6%**	**$11.98**	**$2,733,566.57**
B. Shell			
B10 Superstructure	**23.5%**	**$15.47**	**$3,530,185.26**
B20 Exterior Enclosure	**12.8%**	**$21.89**	**$4,994,091.09**
B30 Roofing	**0.3%**	**$0.51**	**$117,049.01**
C. Interiors	**17.0%**	**$29.07**	**$6,632,777.23**
D. Services			
D10 Conveying	**4.7%**	**$8.04**	**$1,833,767.82**
D20 Plumbing	**1.3%**	**$2.22**	**$507,212.38**
D30 HVAC	**15.7%**	**$26.85**	**$6,125,564.86**
D40 Fire Protection	**4.1%**	**$7.01**	**$1,599,669.80**
D50 Electrical	**16.0%**	**$27.36**	**$6,242,613.87**
E. Equipment & Furnishings	**0.0%**	**$0.00**	**$0.00**
F Special Construction	**0.0%**	**$0.00**	***$0.00***
G. Building Sitework	**0.0%**	**$0.00**	***$0.00***
Additions			
Jobsite OH & GC's	**22** (Time (# months))	**$119,980.00** (Monthly Cost)	**$2,639,560.00**
Subtotal			**$36,956,057.90**
Contractors Fee		**25%**	**$9,239,014.47**
Designer's Fee		**6%**	**$2,217,363.47**
		Total Cost of Building	**$48,412,400**

General Conditions

Construction Milestones

The general conditions estimate is fully encompassing and reflects the trends of construction in the DC Metro area over the years. A portion of this information comes from the historic data DAVIS uses in the estimation of their district projects. For that reason specifically, a location factor or time multiplier was not included in this estimate; both are reflected implicitly in each of the calculated rates. Additionally, a local tax rate of 5.75% has been applied to all items not including labor, reflective of the District's local tax rates. A portion of the information has come from direct cost data from the project itself. The Square 320 project is well into its 21th month of a 26 month schedule therefore a lot of the calculations come from the actual costs associated with each item, labor rate, or activity.

Personnel

The estimation of the personnel is very straightforward and not subject to change over the course of the project. This information is based on the competitive rates of similar positions throughout the Northern Virginia area. The general conditions subtotal in the estimate is much more of a universal look at the requirements of similar sized construction projects. The items listed are not specifically reflective of the Square 320 project anymore than a standard construction project. The same can be said in reference to the rentals subdivision of the estimate as well.

On-Site Office

There is one item that is especially worth noticing, the on-site office space. The GC estimate has the office space noted as a rental trailer. In fact, during excavation and the early stages of superstructure, the DAVIS on-site office was located on the second floor of the B7W building. Additionally, there was an actual rental office trailer on top of storage containers on the East side of the B&W building, but in no more than 3 months it was removed as the offices moved onto the ground floor of the office tower. In addition, it is interesting to see that in place of an actual monthly public transportation (METRO) allowance; this estimate was calculated using a basic vehicle rate to allow for the estimate to have some independence from DAVIS and their specifics regarding the construction of this project.

Temporary Facilities

Lastly, the temporary utilities are included in the project estimate of the project and they specifically reflect the detailed project schedule. For example, when the schedule milestone Permanent Power is reached, the duration of the Temporary Utilities item on the GC estimate is fixed. It is for that reason that it stops at 19 months instead of carrying through to 26 months like the other temporary utilities.

Michael Webb - Square 320 Project - 1199 F Street

GENERAL CONDITIONS ESTIMATE			Material		Labor		Material Total	Labor Total
Category/Activity	Quantity	Unit	Rate	Cost	Rate	Cost	Cost	Cost
PERSONNEL								
Senior Project Superintendent	114	Weeks			$2,872	$327,408		
Superintendents	166	Weeks			$1,471	$244,186		
Layout Engineer	72	Weeks			$793	$57,096		
Secretary	117	Weeks			$222	$25,974		
Project Executive	114	Weeks			$807	$91,998		
Project Manager	228	Weeks			$1,750	$399,000		
Assisstant Project Manager	228	Weeks			$1,049	$239,172		
Scheduling	20	Weeks			$263	$5,260		
Estimating / Preconstruction	7	Weeks		$101,864	$4,654	$32,578		
MEP Coordinator	8	Weeks			$172	$1,376		
Cost Engineer	117	Weeks			$222	$25,974		
Total Personnel				$101,864		$1,450,022	$101,864	$1,450,022
GENERAL CONDITIONS								
Expediting	114	Weeks	$50	$5,700				
As Built Reproduction Costs	1	Item	$2,000	$2,000				
Photographs	26	Months	$250	$6,500				
Survey & Wall Check	3	Item	$3,000	$9,000				
Occupancy Permit	1	Item	$300	$300				
Temporary Protection	26	Months	$656	$17,050				
First Aid	26	Months	$58	$1,500				
Safety - Protection	26	Months	$277	$7,200				
Construction Sign	2	Item	$1,000	$2,000				
Layout Engineer Supplies	17	Months	$100	$1,700				
Final Cleaning	355,013	SQFT	$0.07	$24,850.91	$0.35	$125,921		
Miscellaneous Items	114	Weeks	$50	$5,700				
Courier Services	80	Weeks	$75	$6,028	$115	$9,200		
Subtotal				$89,528.91				
Sales Tax	5.75	%		$5,147.91				
Total General Conditions				$94,676.82		$135,121	$94,676.82	$135,121
Miscellaneous Labor	110	Weeks			$129	$14,190		$14,190
						Category 1 - TOTAL	$196,540.82	$1,599,333

GENERAL CONDITIONS ESTIMATE			Material		Labor		Material Total	Labor Total
Category/Activity	Quantity	Unit	Rate	Cost	Rate	Cost	Cost	Cost
RENTALS								
Pick-up Truck	280	Weeks	$300.00	$84,000.00				
Courier Vehicle	80	Hours	$7.49	$599.20				
Dump Truck	80	Hours	$28.00	$2,240.00				
Field Office Trailer	26	Months	$350.00	$9,100.00				
Storage/Change house Trailer	26	Months	$150.00	$3,900.00				
Surveying Instruments	7	Months	$161.77	$1,132.39				
2-Way Radios	352	Weeks	$24.80	$8,729.60				
Gang Box	26	Months	$72.00	$1,872.00				
Vehicle (Construction Executive)	34	Weeks	$300.00	$10,200.00				
Vehicle (Proj. Manager)	235	Weeks	$300.00	$70,500.00				
Pickup truck (Layout Engineer)	31	Weeks	$300.00	$9,300.00				
Cell Phone	34,380	Hours	$0.53	$18,221.40				
Computer/IT/Fax/Lan/Phone	35,316	Hours	$2.30	$81,226.80				
Copier/Fax	1	Item	$5,000.00	$5,000.00				
Subtotal				$306,021.39				
Sales Tax	5.75	%		$17,596.23				
Total Rentals				$323,617.62			$323,617.62	
TEMPORARY FACILITES								
Field Telephone Hookup	1	Item	$1,000	$1,000				
Temporary Water	26	Months	$106	$2,750				
Temporary Toilets	26	Months	$1,163	$30,245				
Temporary Electrical	19	Months	$12,717	$241,629				
Trash Disposal	26	Months	$3,610	$93,870				
Field Telephone Calls	26	Months	$250	$6,500				
Field Office Set-up	1	Item	$10,000	$10,000				
Field Office Expense	114	Weeks	$50	$5,700				
Subtotal				$391,694				
Sales Tax	5.75	%		$22,522				
Total Temporary Facilities				$414,216			$414,216	
Punch-List & Warranty	320	Hours	$3	$960	$25.89	$8,284.80	$960	$8,284.80
						Category 2 - TOTAL	$738,794.02	$8,284.80
						Category 1 - TOTAL	$196,540.82	$1,599,333
						Subtotal	$935,334.85	$1,607,617.80
Insurances & Employee Benefits	55	%						$884,189.79
Total General Conditions							$935,334.85	$2,491,807.59
						Grand Total General Conditions		$3,427,142.44

Critical Industry Issues

Energy & Economy

During the PACE roundtable, Energy and the Economy was a popular topic for discussion. Even prior to the dramatic plunge of the stock market, the volatility of certain goods drove the cost of materials in various directions. The biggest challenge came in guaranteeing material prices because in a week's time the trading value of petroleum might skyrocket sending the price of shingles through the roof. Even as the market heads into recession, as material prices fall the contractor appears to be making money off the difference between the estimated and actual cost of a material. There needs to be a way to negotiate prices in contracts and more importantly there needs to be more attention paid to upfront designs that will equate to more energy efficient buildings in operation. Life-cycle costing is a must as energy prices stay high. An interesting side effect is that renovation projects that redesign leaky HVAC systems are being more and more cost-effective. As the price of energy rises, this is causing the opening up of new markets in the construction industry at the same time as other industries suffer. Other ways of combating the rise of energy is the continual growth of both commissioning buildings and the development of their control systems. Commissioning has become a must in this modern day and as the public becomes more aware of their energy consumption they have a vested interest in lowering their consumption of these sources and this is done through advancement in controls design. HVAC control systems are now allowing for the scaling back of loads during different parts of the day and week.

Green Materials & Energy Efficient Systems

A lot of emphasis has been put on alternative materials and how designers can incorporate them from the beginning. Further learning needs to occur so the industry knows what green materials or finishes are new to the market. There needs to be an intentional effort put on not only designers but also contractors to focus on local materials. This is one more way to insulate your business and the project from the rising costs of transportation. Having the support of legislation would be very advantageous as well. For example, the state of California offers a 50% reimbursement for costs resulting from harnessing solar energy. That has turned into a 40% a year boom in the industry. And it doesn't even have to be in energy production; energy distribution is just as important and has been traditionally inefficient. The TP1 transformer standards have been a catalyst for getting rid of the electrical inefficiencies in current systems and this is noticed most as renovation projects included a redesign of the power distribution system and huge cost savings are seen almost immediately. In the lighting industry similar changes have been seen as the industry transitions from using high pressure sodium to florescent lights in high-bay designs. Research has even shown that changing the conductor size in your home can have drastic effects on energy savings. In the design of an electrical system, engineers traditionally struggle between material cost and future expansion. Code is only the minimum and if designers were to size every conductor one higher than the lower resistance would allow more energy to pass and therefore make the system more efficient. There is an increase in first cost but it can pay for itself in two years.

Economy

When the sub-prime bubble popped it took with it the ability of financial institutions to invest in future growth, both in the stock market and in real-estate and construction. Owners are having a difficult time being able to finance new projects creating a considerable dip in the growth of traditional construction but that allows for growth in the other areas. Work in pre-construction can grow considerably before the cash arrives. Work with developers can start now by buying up land while the market is depressed. For those developers will the capital to do today is a buyer's market. Recent days have seen a significant increase in renovation opportunities, not only for the energy reasons discussed above, but also because they offer minimal risk – the foundation and

general conditions are known. Certain projects experienced such financial trouble that they had to stop in a days notice. Now a project in the middle of development is on the market for cheap because the owner needs to get their assets out; this provides a developer with another reason to buy. Finally, since financially new construction has been slowed down there is a growing need to expand projects underway. For example, an IT company was forced to put on the breaks on a new data center but they needed to expand, so they worked to redesign and expand the project underway.

Good Markets

Traditionally, in times of a downward moving economy, retrofits become a huge part of the market. Owners and contractors alike appreciate when they can work to understand a project and then find a creative solution to implement and make an efficient building out of an energy sink. This work can be seen in projects where contractors are more involved in the pre-design rather than just being handed a set of drawings and forced to react. With proper planning and assessment early one the end goal is to find a solution that works to keep maintenance and energy use to a minimum.

Federal – With BRAC and the Army Corps of Engineers, there will always be work to be done. From Washington DC down to North Carolina government and military construction is relying more and more heavily on civilian construction. Especially with our country in the middle of military confrontations, the federal market will continue to grow and depend on the civilians for success.

Health Care – In this age, more and more of the baby boom generation are aging and requiring the help of medical professionals. The rate of medical assistance has seen its largest growth in recent years and hospitals all over the country are expanding. And when hospitals are growing old a huge push is in effect for new construction as an investment in future growth.

Public/Private/Partnership – In the area of higher education especially, there has been a consistent rise in the amount of PPPs each year. More often than not a private company will fund the construction of a project and then will turn around and lease it back to the state or local government. There are many universities nation-wide that are experiencing consistent growth and need more dorms but cannot afford to build them. That is where the private industry comes in, invests in the school, and takes advantage of the education system's need for space by selling or leasing it all back.

Education – Similar to the health care industry, there is a growing amount of poorly designed buildings dating back to the 1960s that are in dire need of renovation or replacement. The 1960's created a significant stock of energy inefficient buildings and as the energy prices rise they put an even larger stress on the local government and the need to start over grows.

Investing in People

As the industry slows and new projects dwindle, companies have the opportunity to pour back into their employees what they have been getting out over the years. Employers can make their workers experts and educate them in alternative areas or invest in promising business sectors. It is important to keep the work force consistent. Businesses must be careful not to look solely at the bottom line, they must see this period as one unlike any before and they must hone their skills. Company cultures must allow for employees to pick up new talents or get additional education. If some employees are looking for a market change then they should be counseled out of the industry. But companies must be looking long-term because future growth will definitely be stumped by a lack of hiring this year. The industry is experienced based so talent must be recruited, trained, and strengthened in order for them to be an asset to the industry.

What About the Students?

As we head out to the unknown there are a few things we as students can focus on to ensure success. We must be willing to set outside of our comfort zone and be willing to expand our

horizons. For some of us we need to go where the jobs are which might require moving to Dubai in Saudi Arabia while we are young and free of long-term responsibilities. And more than anything else we must put our best foot forward in all that we do. In this age, as the industry thins out there will be a lot of recently fired individuals not because they were ineffective but because their business could no longer support them. This will equate to a considerable rise in job competition but not from our traditional peers. We must be always looking for a niche and opportunity to shine and without doubt we will.

Conclusion

For a first experience ever at a PACE roundtable and an industry focused discussion I was extremely pleased with how the event turned out. I went into the day moderately closed off and disinterested in the field just because my personal situation prevents me from entering the industry for nearly a decade. But I was quickly won over by the long-term, far-ahead focused discussions addressing current events and their significant effect on the industry. I found each session to be very educational and I greatly appreciate the senior leadership from the industry and the wise, sage words they had to offer us.

I had the distinct privilege of making two very important networking connections during the two-day event both of which show great promise in helping me not only better understand my project but also hone in on a research topic for the spring semester. William Moyer, Executive Vice President of James G. Davis Construction Company, has offered me an opportunity to travel down to DC to not only visit the site, but to meet his son Tyler Moyer, Assistant Superintendent, and tour the company's headquarters in Rockville, MD. He was very supportive of my desire to study the interpersonal relationships and interactions between DAVIS employees to better understand the role emotional intelligence (EQ) plays in their organization and specifically on the Square 320 jobsite.

Mark Konchar, Vice President for Business Acquisition of Balfour Beatty Construction, has agreed to talk with me about the importance of interaction between employees and their managers in a way that can empower both sides and allow for the development of the younger person. Both gentlemen helped me to discover that not only is the Square 320 project a perfect example for researching the human element but that at this time in the industry, taking care of your people and making sure they know they are your first priority and working to develop and prepare them for what's ahead, is the most important thing a company can do. I am hoping that in the coming weeks and months I can learn a lot more in this area and gather enough of the knowledge base to offer a convincing thesis proposal at the end of the semester.

I honestly believe that by researching how the teaching of emotional intelligence can affect a jobsite and how mentorship can advance an organization I can prepare myself for my future. These research topics are very relevant to my future career as a naval officer and I am very inspired to learn locally and empower myself with the tools to lead real men and women in the military.