Office Building

Washington, Dc

Katey Andaloro

Construction Management

Project Information:

Building Name: Office Building
Location: Washington, DC
Occupancy types: B1 - Business; Commercial Office Building
Size: 529,000 SF, 10 stories
Dates of Construction: August 2006 - April 2009
Base Building Cost: $99,000,000
Project Delivery Method:
Design-Bid-Build

Project Team:

Construction Manager:
Balfour Beatty Construction

Architecture:

- State-of-the-art technology
- Three paver terraces
- Three levels of parking
- Well-located core services
- Flexibility to meet the needs of small, medium, and large space users
- LEED Silver certified
- Direct access to MACR Train Service, Virginia Railway Express trains, Amtrak, Metrobus and Washington's Metrorail
- Offer tenants high visibility, access to natural light and air, and spectacular views of Washington, DC

Structural:

- 4'-6" Reinforced Mat slab with a "false slab" underneath to aid in water proofing
- 12" Post-tensioned Concrete Floors
- Building Envelope features a glass curtain wall system with granite stone panels on three elevations
- Thermoplastic single-ply roofing membranes (TPO)
- 9" thick two-way reinforced concrete slabs on the underground and ground levels

Electrical:

- 4000A at 480/277V 3 phase
- (3) 4 Wire Switchboards
- Transformers provide step down voltage from 480/277 to 120/208 volt power for panels on every level of the each riser
- 750Kw, 208/120V back-up generator will provide power to all emergency systems
- Fluorescent lighting throughout the building

Mechanical:

- (4) Chillers with a capacity of 500 tons, located on the P3 Level
- (4) Cooling Towers located on the Roof
- (30) Air-Handling Units service the building with CFM values ranging from 4000 to 23400
- VAV fan powered terminal units with electric heat serve multiple ducts

Office Building

Washington, D.C

Katey Andaloro

Construction Management

Dr. John Messner

Technical Assignment #II

October 24, 2008

Office Building

Washington, D.C

Katey Andaloro
Construction Management
Technical Assignment #II
Dr. John Messner
October 24, 2009

Table of Contents

Office Building

Washington, D.C

Katey Andaloro
Construction Management
Technical Assignment #II
Dr. John Messner
October 24, 2009

Executive Summary

The intention of Technical Assignment #2 is to analyze more transcendent features of the project and how they will affect the project's outcome. This report contains a detailed schedule analysis, a site planning analysis of the superstructure phase, a detailed structural systems estimate, a general conditions estimate, and critical industry issues.

The detailed schedule is mainly organized by trade and building level and it also highlights the structural phase and MEP phases of construction because they are the most critical for completing the project on time. Minimal interior work is included into the schedule due to the Office Building being a core and shell building.

The next item that was looked into was a site layout plan for the superstructure of the building. The site layout shows the location of cranes as well as the concrete trucks that will be needed to place the concrete for the superstructure of the project, since the majority of the structural element consists of cast in place concrete.

A detailed structural systems estimate was created to evaluate the cost of the below grade reinforcement concrete, post tension concrete, and the steel structure systems for this project. One of each floor type was chosen to estimate because the interior bay sizes were very different; the only congruity was vertically through the types of floor systems. The structural estimate totaled $- which is relatively accurate.

The general conditions estimate shows the various general conditions project and staffing costs for the duration of the project. Each cost in the general conditions was categorized by supervision, temporary facilities, temporary utilities, equipment rental, and general cost.

Lastly, on Thursday, October 16, 2008, I attended the 17th Annual PACE (The Partnership for Achieving Construction Excellence) Roundtable Meeting, which allows students and industry practitioners to discuss openly key issues that affect the industry world today. These key issues can be utilized by aiding in the selection a possible future thesis research topic.

.

Detailed Project Schedule

Activity ID	Activity Name	Original Duration	Start	Finish
OFFICE BUILDING		819	21-Feb-06	21-Apr-09
Preconstruction		132	21-Feb-06	25-Aug-06
Construction		681	06-Sep-06	21-Apr-09
Excavation		252	06-Sep-06	29-Aug-07
Substructure		141	02-Jul-07	14-Jan-08
Concrete		141	02-Jul-07	14-Jan-08
P3 Level - Garage		90	02-Jul-07	02-Nov-07
P2 Level - Garage		54	27-Aug-07	08-Nov-07
P1 Level - Garage		30	23-Oct-07	03-Dec-07
Lower Level - Garage		46	12-Nov-07	14-Jan-08
Superstructure		195	12-Dec-07	09-Sep-08
Concrete		186	12-Dec-07	27-Aug-08
Structural Steel		132	10-Mar-08	09-Sep-08
Exterior Facade & Roof		554	08-Mar-07	21-Apr-09
Core		335	07-Jan-08	17-Apr-09
A1780	Core Work & Finishes	264	20-Mar-08*	24-Mar-09
Mechanical & Plumbing Rough In		277	07-Jan-08	27-Jan-09
Electrical Rough In		308	13-Feb-08	17-Apr-09
Sprinkler Rough In		161	14-Jan-08	25-Aug-08
Elevators		184	07-Jul-08	19-Mar-09
Finishes		98	12-Nov-08	27-Mar-09
Fit Out Lobbies		218	22-May-08	23-Mar-09
Sitework		136	10-Oct-08	17-Apr-09
Close Out		14	13-Mar-09	02-Apr-09

Figure 1: Schedule Summary

Overview

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

The schedule of the project also utilizes both a compressed schedule and a schedule with accelerated activities. This helps creates better efficiency on the project, and creates a buffer zone for any site issues such as weather conditions, unforeseen site conditions, and issues with material delivery.

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

Excavation

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

Structural Concrete

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

STRUCTURE							
P3 LEVEL GARAGE							
F02490	W/P Foundation Walls P3 to P2 - Pour #8	2	2	26SEP07	27SEP07	-44	W/P Foundation Walls P3 to P2 - Pour #8
S01690	F/R/P Foundation Walls P3 to P2 - Pour #8	3	3	28SEP07	02OCT07	-44	F/R/P Foundation Walls P3 to P2 - Pour #8
P2 LEVEL GARAGE							
S01081	F/R/P Elevated Deck Level P2 - Pour #5	2	2	10OCT07	11OCT07	-44	F/R/P Elevated Deck Level P2 - Pour #5
P1 LEVEL GARAGE							
S00250	F/R/P Elevated Deck Level P1 - Pour #1	2	2	12OCT07	15OCT07	-44	F/R/P Elevated Deck Level P1 - Pour #1
S00340	F/R/P Elevated Deck Level P1 - Pour #2	2	2	16OCT07	17OCT07	-44	F/R/P Elevated Deck Level P1 - Pour #2
S00550	F/R/P Elevated Deck Level P1 - Pour #3	2	2	18OCT07	19OCT07	-44	F/R/P Elevated Deck Level P1 - Pour #3
S00560	F/R/P Elevated Deck Level P1 - Pour #4	2	2	22OCT07	23OCT07	-44	F/R/P Elevated Deck Level P1 - Pour #4
S01781	F/R/P Elevated Deck Level P1 - Pour #5	2	2	24OCT07	25OCT07	-44	F/R/P Elevated Deck Level P1 - Pour #5
S01791	F/R/P Elevated Deck Level P1 - Pour #6	2	2	26OCT07	29OCT07	-44	F/R/P Elevated Deck Level P1 - Pour #6
LOWER LEVEL							
S00400	F/R/P Elevated Deck Lower Lvl - Pour #1	2	2	30OCT07	31OCT07	-44	F/R/P Elevated Deck Lower Lvl - Pour #1
S00430	F/R/P Elevated Deck Lower Lvl - Pour #2	2	2	01NOV07	02NOV07	-44	F/R/P Elevated Deck Lower Lvl - Pour #2
S00580	F/R/P Elevated Deck Lower Lvl - Pour #3	2	2	05NOV07	06NOV07	-44	F/R/P Elevated Deck Lower Lvl - Pour #3
S00610	F/R/P Elevated Deck Lower Lvl - Pour #4	2	2	07NOV07	08NOV07	-44	F/R/P Elevated Deck Lower Lvl - Pour #4
S01981	F/R/P Elevated Deck Lower Lvl - Pour #5	2	2	09NOV07	12NOV07	-44	F/R/P Elevated Deck Lower Lvl - Pour #5
S01991	F/R/P Elevated Deck Lower Lvl - Pour #6	2	2	13NOV07	14NOV07	-44	F/R/P Elevated Deck Lower Lvl - Pour #6
LEVEL 01							
S00470	F/R/P Elevated Deck Ground Floor - Pour #1	3	3	15NOV07	19NOV07	-44	F/R/P Elevated Deck Ground Floor - Pour #1
S00510	F/R/P Elevated Deck Ground Floor - Pour #2	3	3	20NOV07	26NOV07	-44	F/R/P Elevated Deck Ground Floor - Pour #2
S00640	Columns Ground to 02	8	8	11DEC07	20DEC07	-44	Columns Ground to 02
S00660	F/R/P Elevated Deck Ground Floor - Pour #3	3	3	27NOV07	29NOV07	-44	F/R/P Elevated Deck Ground Floor - Pour #3
S00700	F/R/P Elevated Deck Ground Floor - Pour #4	3	3	30NOV07	04DEC07	-44	F/R/P Elevated Deck Ground Floor - Pour #4
S00701	F/R/P Elevated Deck Ground Floor - Pour #5	3	3	05DEC07	07DEC07	-44	F/R/P Elevated Deck Ground Floor - Pour #5

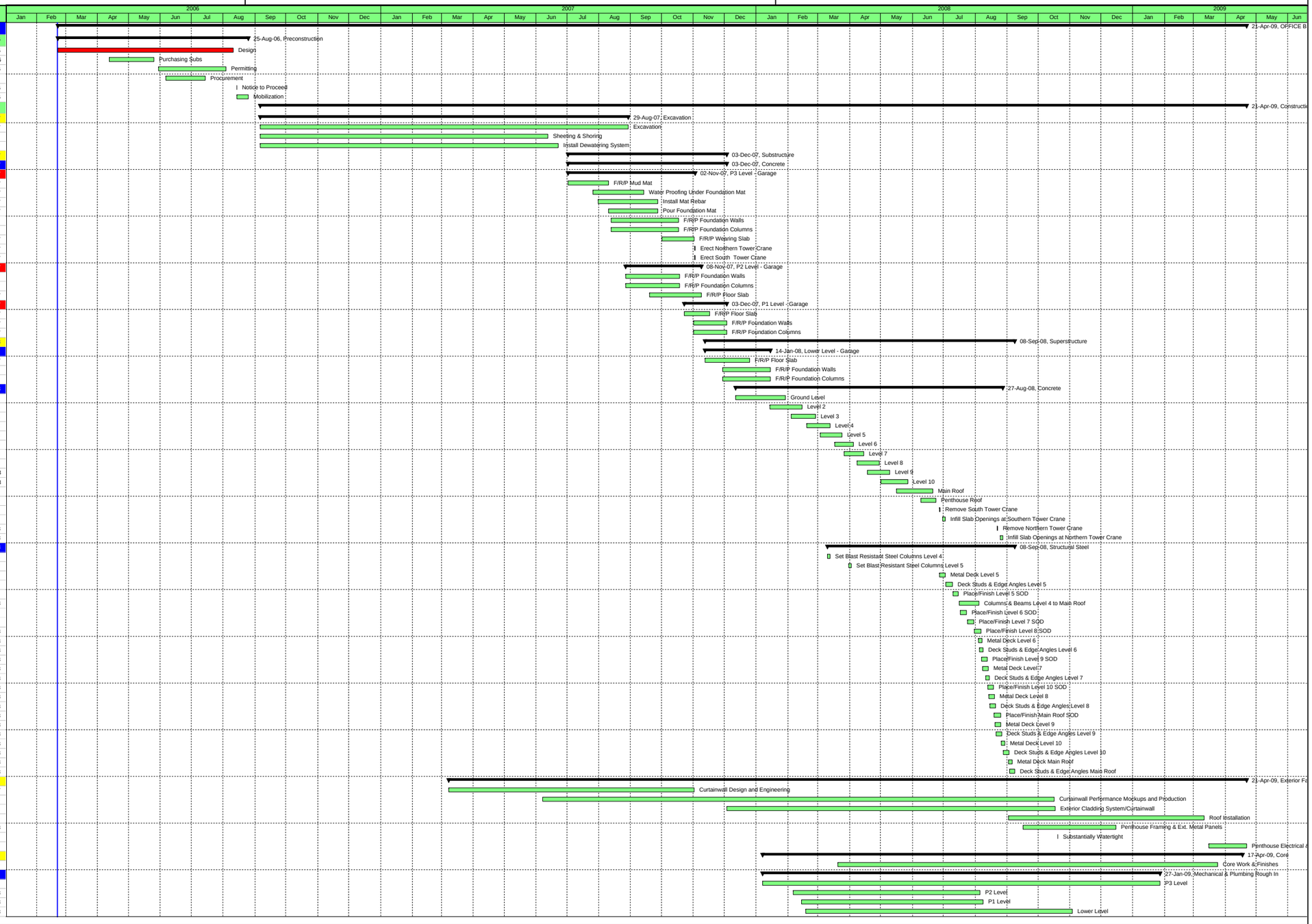
Figure 2: Example of Pour Sections

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

Core MEP & Interior Finishes

The main element in the finishing work on this project is the MEP work. The building is seeking LEED Silver certification, thus the mechanical and electrical equipment are very large and highly efficient. Procurement for these items took place as soon as the notice to proceed was given. Coordinating this work is one of the most important challenges in completing the building core.
Interior finishes in the bathrooms, main lobby, lower level lobby, and M Street lobby are to begin in March of 2008. The remaining tenant build out of the project will commence outside of BBC's contract with the owner.

Activity ID	Activity Name	Original Duration	Start	Finish
OFFICE BUILDING		819	21-Feb-06	21-Apr-09
Preconstruction		132	21-Feb-06	25-Aug-06
A1000	Design	121	21-Feb-06	10-Aug-06
A1010	Purchasing Subs	32	12-Apr-06*	25-May-06
A1030	Permitting	47	30-May-06*	03-Aug-06
A1020	Procurement	28	06-Jun-06*	14-Jul-06
A1040	Notice to Proceed	0	14-Aug-06*	14-Aug-06
A1050	Mobilization	10	14-Aug-06*	25-Aug-06
Construction		681	06-Sep-06	21-Apr-09
Excavation		252	06-Sep-06	29-Aug-07
A1060	Excavation	252	06-Sep-06*	29-Aug-07
A1070	Sheeting & Shoring	196	06-Sep-06*	12-Jun-07
A1080	Install Dewatering System	204	06-Sep-06*	22-Jun-07
Substructure		111	02-Jul-07	03-Dec-07
Concrete		111	02-Jul-07	03-Dec-07
P3 Level - Garage		90	02-Jul-07	02-Nov-07
A2480	F/R/P Mud Mat	30	02-Jul-07*	10-Aug-07
A2490	Water Proofing Under Foundation Mat	36	26-Jul-07*	13-Sep-07
A2500	Install Mat Rebar	43	31-Jul-07*	27-Sep-07
A2510	Pour Foundation Mat	35	10-Aug-07*	27-Sep-07
A1150	F/R/P Foundation Walls	48	13-Aug-07*	17-Oct-07
A1170	F/R/P Foundation Columns	48	13-Aug-07*	17-Oct-07
A2520	F/R/P Wearing Slab	24	01-Oct-07*	01-Nov-07
A1130	Erect Northern Tower Crane	1	02-Nov-07*	02-Nov-07
A1140	Erect South Tower Crane	1	02-Nov-07*	02-Nov-07
P2 Level - Garage		54	27-Aug-07	08-Nov-07
A1190	F/R/P Foundation Walls	39	27-Aug-07*	18-Oct-07
A1200	F/R/P Foundation Columns	39	27-Aug-07*	18-Oct-07
A1180	F/R/P Floor Slab	37	19-Sep-07*	08-Nov-07
P1 Level - Garage		30	23-Oct-07	03-Dec-07
A1210	F/R/P Floor Slab	19	23-Oct-07*	16-Nov-07
A1220	F/R/P Foundation Walls	23	01-Nov-07*	03-Dec-07
A1230	F/R/P Foundation Columns	23	01-Nov-07*	03-Dec-07
Superstructure		216	12-Nov-07	08-Sep-08
Lower Level - Garage		46	12-Nov-07	14-Jan-08
A1240	F/R/P Floor Slab	32	12-Nov-07*	25-Dec-07
A1250	F/R/P Foundation Walls	33	29-Nov-07*	14-Jan-08
A1260	F/R/P Foundation Columns	33	29-Nov-07*	14-Jan-08
Concrete		186	12-Dec-07	27-Aug-08
A1270	Ground Level	35	12-Dec-07*	29-Jan-08
A1280	Level 2	24	14-Jan-08*	14-Feb-08
A1290	Level 3	18	04-Feb-08*	27-Feb-08
A1300	Level 4	17	19-Feb-08*	12-Mar-08
A1310	Level 5	16	03-Mar-08*	24-Mar-08
A1320	Level 6	15	17-Mar-08*	04-Apr-08
A1330	Level 7	14	26-Mar-08*	14-Apr-08
A1340	Level 8	16	08-Apr-08*	29-Apr-08
A1350	Level 9	16	18-Apr-08*	09-May-08
A1360	Level 10	19	01-May-08*	27-May-08
A1370	Main Roof	26	16-May-08*	20-Jun-08
A1380	Penthouse Roof	11	09-Jun-08*	23-Jun-08
A1390	Remove South Tower Crane	1	27-Jun-08*	27-Jun-08
A1400	Infill Slab Openings at Southern Tower Crane	3	30-Jun-08*	02-Jul-08
A1410	Remove Northern Tower Crane	1	22-Aug-08*	22-Aug-08
A1420	Infill Slab Openings at Northern Tower Crane	3	25-Aug-08*	27-Aug-08
Structural Steel		131	10-Mar-08	08-Sep-08
A1430	Set Blast Resistant Steel Columns Level 4	3	10-Mar-08*	12-Mar-08
A1450	Set Blast Resistant Steel Columns Level 5	3	31-Mar-08*	02-Apr-08
A1460	Metal Deck Level 5	4	27-Jun-08*	02-Jul-08
A1470	Deck Studs & Edge Angles Level 5	5	03-Jul-08*	09-Jul-08
A1480	Place/Finish Level 5 SOD	4	10-Jul-08*	15-Jul-08
A1440	Columns & Beams Level 4 to Main Roof	14	16-Jul-08*	04-Aug-08
A1510	Place/Finish Level 6 SOD	5	17-Jul-08*	23-Jul-08
A1540	Place/Finish Level 7 SOD	5	24-Jul-08*	30-Jul-08
A1570	Place/Finish Level 8 SOD	5	31-Jul-08*	06-Aug-08
A1490	Metal Deck Level 6	4	04-Aug-08*	07-Aug-08
A1500	Deck Studs & Edge Angles Level 6	4	05-Aug-08*	08-Aug-08
A1600	Place/Finish Level 9 SOD	4	07-Aug-08*	12-Aug-08
A1520	Metal Deck Level 7	4	08-Aug-08*	13-Aug-08
A1530	Deck Studs & Edge Angles Level 7	4	11-Aug-08*	14-Aug-08
A1630	Place/Finish Level 10 SOD	4	13-Aug-08*	18-Aug-08
A1550	Metal Deck Level 8	4	14-Aug-08*	19-Aug-08
A1560	Deck Studs & Edge Angles Level 8	4	15-Aug-08*	20-Aug-08
A1660	Place/Finish Main Roof SOD	5	19-Aug-08*	25-Aug-08
A1580	Metal Deck Level 9	4	20-Aug-08*	25-Aug-08
A1590	Deck Studs & Edge Angles Level 9	4	21-Aug-08*	26-Aug-08
A1610	Metal Deck Level 10	4	26-Aug-08*	29-Aug-08
A1620	Deck Studs & Edge Angles Level 10	4	28-Aug-08*	02-Sep-08
A1640	Metal Deck Main Roof	4	02-Sep-08*	05-Sep-08
A1650	Deck Studs & Edge Angles Main Roof	4	03-Sep-08*	08-Sep-08
Exterior Facade & Roof		554	08-Mar-07	21-Apr-09
A1670	Curtainwall Design and Engineering	171	08-Mar-07*	01-Nov-07
A1680	Curtainwall Performance Mockups and Production	356	07-Jun-07*	16-Oct-08
A1690	Exterior Cladding System/Curtainwall	230	03-Dec-07*	17-Oct-08
A1710	Roof Installation	137	02-Sep-08*	11-Mar-09
A1720	Penthouse Framing & Ext. Metal Panels	65	16-Sep-08*	15-Dec-08
A1700	Substantially Watertight	0	20-Oct-08*	20-Oct-08
A1730	Penthouse Electrical & Finishes	27	16-Mar-09*	21-Apr-09
Core		335	07-Jan-08	17-Apr-09
A1780	Core Work & Finishes	264	20-Mar-08*	24-Mar-09
Mechanical & Plumbing Rough In		277	07-Jan-08	27-Jan-09
A1740	P3 Level	277	07-Jan-08*	27-Jan-09
A1750	P2 Level	130	06-Feb-08*	05-Aug-08
A1760	P1 Level	127	14-Feb-08*	08-Aug-08
A1770	Lower Level	186	18-Feb-08*	03-Nov-08



Actual Work | Remaining Work | Critical Remaining Work | Milestone | Summary

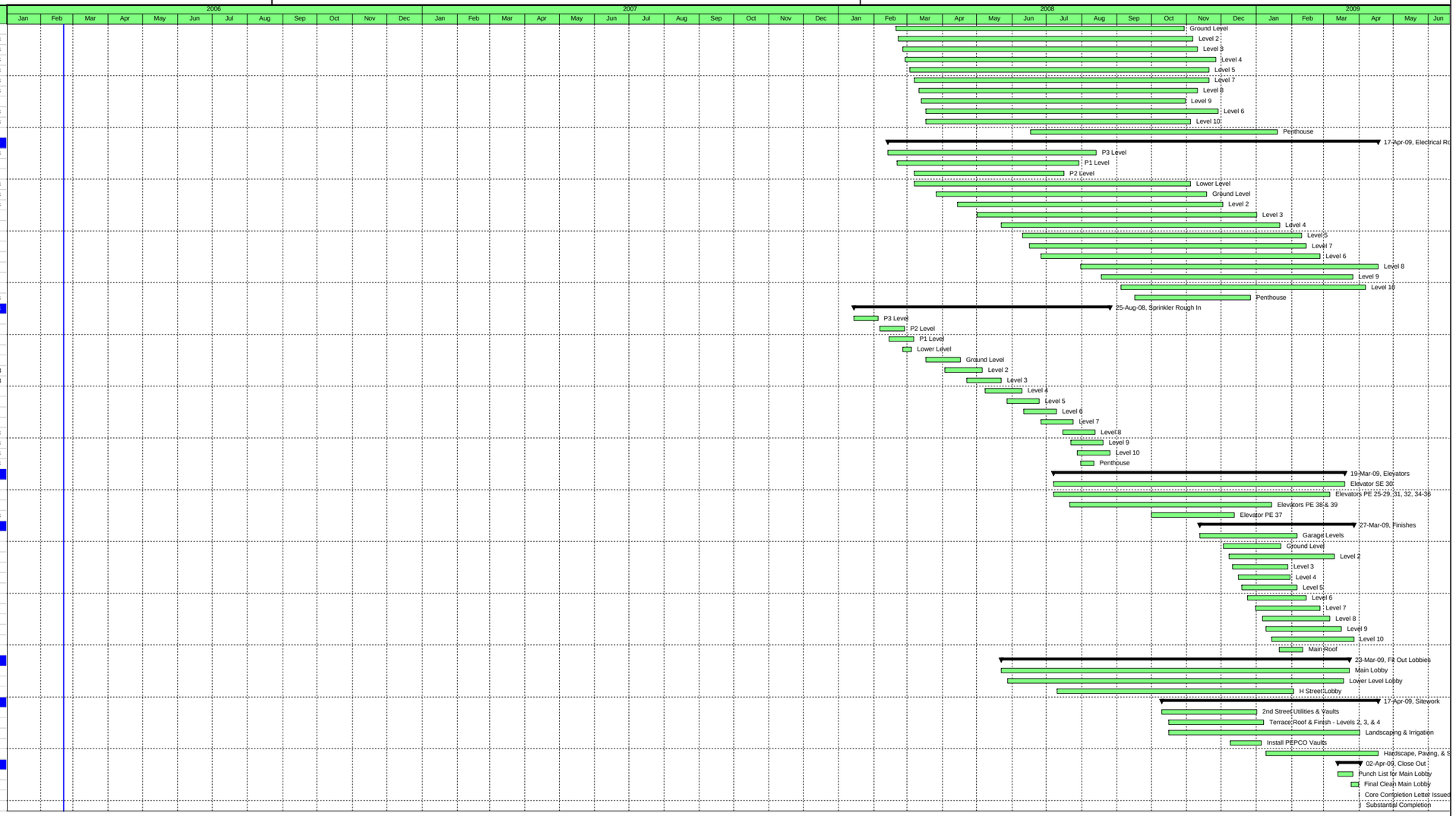
Katey Andaloro

Office Building - Washington, DC

Technical Assignment II - Detailed Schedule

22-Oct-08 19:30

Activity ID	Activity Name	Original Duration	Start	Finish
A1790	Ground Level	181	20-Feb-08*	29-Oct-08
A1800	Level 2	185	22-Feb-08*	06-Nov-08
A1810	Level 3	185	26-Feb-08*	10-Nov-08
A1820	Level 4	195	28-Feb-08*	26-Nov-08
A1830	Level 5	189	03-Mar-08*	20-Nov-08
A1850	Level 7	185	07-Mar-08*	20-Nov-08
A1860	Level 8	175	11-Mar-08*	10-Nov-08
A1870	Level 9	166	13-Mar-08*	30-Oct-08
A1840	Level 6	185	17-Mar-08*	28-Nov-08
A1880	Level 10	167	17-Mar-08*	04-Nov-08
A1890	Penthouse	155	17-Jun-08*	19-Jan-09
Electrical Rough In		308	13-Feb-08	17-Apr-09
A1900	P3 Level	131	13-Feb-08*	13-Aug-08
A1920	P1 Level	114	21-Feb-08*	29-Jul-08
A1910	P2 Level	94	07-Mar-08*	16-Jul-08
A1930	Lower Level	173	07-Mar-08*	04-Nov-08
A1940	Ground Level	170	26-Mar-08*	18-Nov-08
A1950	Level 2	167	14-Apr-08*	02-Dec-08
A1960	Level 3	176	01-May-08*	01-Jan-09
A1970	Level 4	175	22-May-08*	21-Jan-09
A1980	Level 5	175	10-Jun-08*	09-Feb-09
A2000	Level 7	175	16-Jun-08*	13-Feb-09
A1990	Level 6	175	26-Jun-08*	25-Feb-09
A2010	Level 8	187	31-Jul-08*	17-Apr-09
A2020	Level 9	159	18-Aug-08*	26-Mar-09
A2030	Level 10	153	04-Sep-08*	06-Apr-09
A2040	Penthouse	74	16-Sep-08*	26-Dec-08
Sprinkler Rough In		161	14-Jan-08	25-Aug-08
A2050	P3 Level	16	14-Jan-08*	04-Feb-08
A2060	P2 Level	16	06-Feb-08*	27-Feb-08
A2070	P1 Level	16	14-Feb-08*	06-Mar-08
A2080	Lower Level	6	26-Feb-08*	04-Mar-08
A2090	Ground Level	23	17-Mar-08*	16-Apr-08
A2100	Level 2	23	03-Apr-08*	05-May-08
A2110	Level 3	23	22-Apr-08*	22-May-08
A2120	Level 4	23	08-May-08*	09-Jun-08
A2130	Level 5	21	27-May-08*	24-Jun-08
A2140	Level 6	21	11-Jun-08*	09-Jul-08
A2150	Level 7	21	26-Jun-08*	24-Jul-08
A2160	Level 8	21	15-Jul-08*	12-Aug-08
A2170	Level 9	21	22-Jul-08*	19-Aug-08
A2180	Level 10	21	28-Jul-08*	25-Aug-08
A2190	Penthouse	8	31-Jul-08*	11-Aug-08
Elevators		184	07-Jul-08	19-Mar-09
A2200	Elevator SE 30	184	07-Jul-08*	19-Mar-09
A2210	Elevators PE 25-29, 31, 32, 34-36	175	07-Jul-08*	06-Mar-09
A2220	Elevators PE 38 & 39	128	21-Jul-08*	14-Jan-09
A2230	Elevator PE 37	53	01-Oct-08*	12-Dec-08
Finishes		98	12-Nov-08	27-Mar-09
A2240	Garage Levels	62	12-Nov-08*	05-Feb-09
A2250	Ground Level	37	03-Dec-08*	22-Jan-09
A2260	Level 2	67	08-Dec-08*	10-Mar-09
A2270	Level 3	35	11-Dec-08*	28-Jan-09
A2280	Level 4	34	16-Dec-08*	30-Jan-09
A2290	Level 5	35	19-Dec-08*	05-Feb-09
A2300	Level 6	38	24-Dec-08*	13-Feb-09
A2310	Level 7	41	31-Dec-08*	25-Feb-09
A2320	Level 8	44	06-Jan-09*	06-Mar-09
A2330	Level 9	47	09-Jan-09*	16-Mar-09
A2340	Level 10	53	14-Jan-09*	27-Mar-09
A2350	Main Roof	15	21-Jan-09*	10-Feb-09
Fit Out Lobbies		218	22-May-08	23-Mar-09
A2360	Main Lobby	218	22-May-08*	23-Mar-09
A2370	Lower Level Lobby	211	28-May-08*	18-Mar-09
A2380	H Street Lobby	148	10-Jul-08*	02-Feb-09
Sitework		136	10-Oct-08	17-Apr-09
A2390	2nd Street Utilities & Vaults	60	10-Oct-08*	01-Jan-09
A2400	Terrace Roof & Finish - Levels 2, 3, & 4	60	16-Oct-08*	07-Jan-09
A2410	Landscaping & Irrigation	120	16-Oct-08*	01-Apr-09
A2420	Install PEPCO Vaults	20	09-Dec-08*	05-Jan-09
A2430	Hardscape, Paving, & Street Lights	71	09-Jan-09*	17-Apr-09
Close Out		14	13-Mar-09	02-Apr-09
A2440	Punch List for Main Lobby	10	13-Mar-09*	26-Mar-09
A2450	Final Clean Main Lobby	5	25-Mar-09*	31-Mar-09
A2460	Core Completion Letter Issued	0	01-Apr-09*	01-Apr-09
A2470	Substantial Completion	0	02-Apr-09*	02-Apr-09



Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

Katey Andaloro

Office Building - Washington, DC

Site Layout Planning

Utilized Project Site Layout Plan

The following two (2) site plans depict the superstructure phase of the project, which extends from September 2006 through to September 2008. This phase best illustrates the relationship between the size of the site and its limitation with available space, considering space in Washington, DC is already limited enough. Thus, space on the project site needs to be very well planned in order to use it effectively.

As evidenced in site plan B, there are two (2) tower cranes onsite. Both tower cranes used on the job site are Peiner SK-415 Tower Cranes. The South Tower Crane has a jib height of 224'-5", weighs about 20 ton, and has a maximum hook radius of 180'-5". The North Tower Crane Tower has a jib height of 203'-5", weighs about 20 ton, and has a maximum hook radius of 213'-5". It is advised in the construction documents that neither tower crane's swing is allowed to come within 25 feet of the WMATA Metro track that is closest to the building footprint; this is mandated by the city of Washington, DC in an attempt to prevent a major accident should anything fall from the crane or the crane topple over. Even though both tower cranes are owned, operated, and primarily utilized by the concrete contractor; a contract was signed by the concrete contractor that allows other trades to employ the benefits of the tower cranes while the concrete workers are not using them.

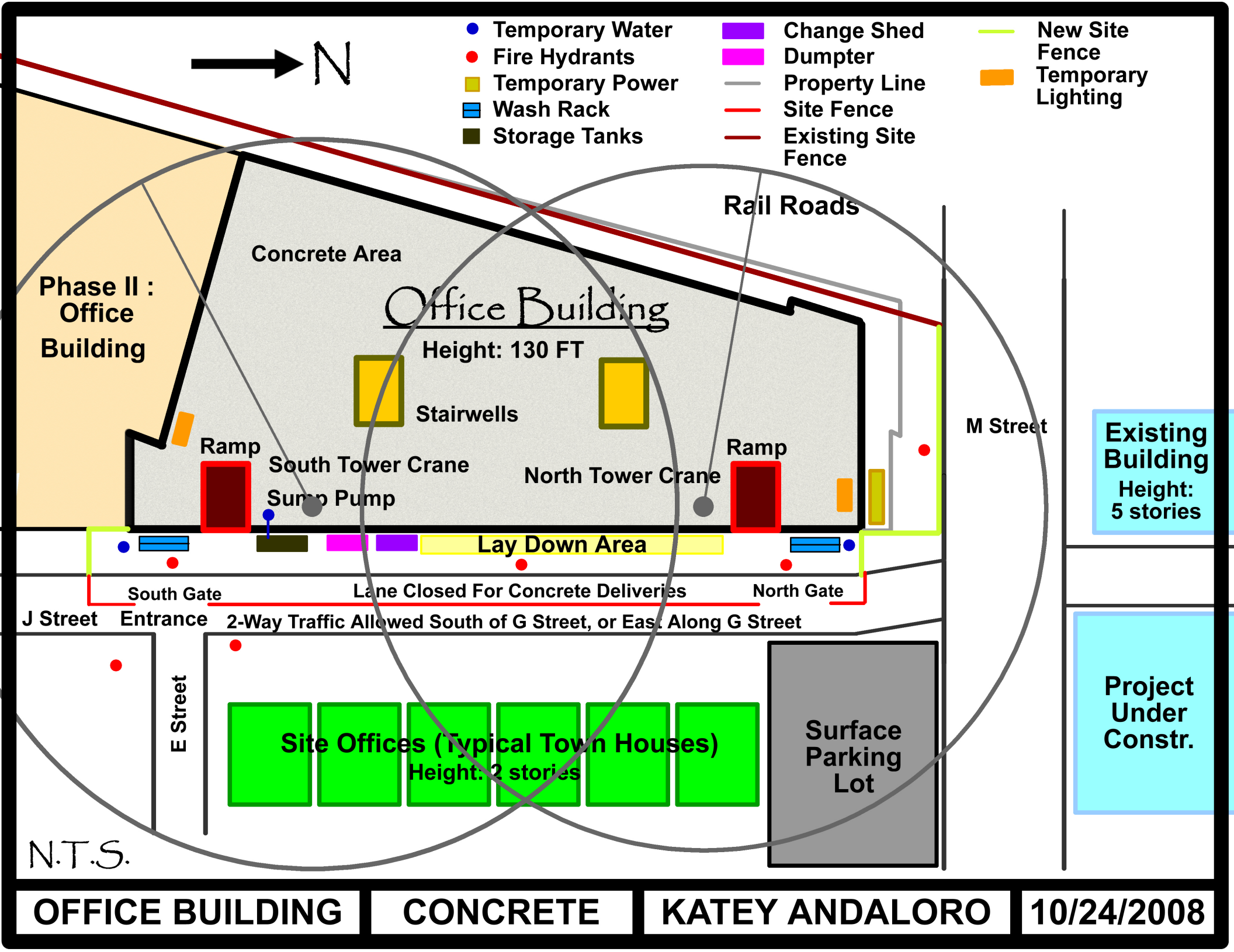
Gates are positioned at two locations around the site; one at the south end and the other at the north end of the building. Concrete/material deliveries will enter the south gate either from E Street or directly northbound from J Street, and will exit through the north gate. Thus allowing trucks to continue through the site and avoid turning around. Their unloading location will depend on which tower crane to which they will be supplying concrete/materials. Another concern about building in Washington, DC is that deliveries may arrive late due to the area. Hence establishing an appropriate time for delivery, i.e. after the rush hour or before rush hour, will increase the efficiency of the project.

After completing the concrete structure of the building, the south tower crane will be removed. The north town crane will then finish erecting the steel structure located above the M Street Ramp before being removed as well. In deconstructing both tower cranes, concrete will be needed to finish and fill the slabs where the foundations for the towers cranes were once present. If both cranes were located on J Street, then all concrete work would be done all at once and they would not have to deal with filling the holes later.

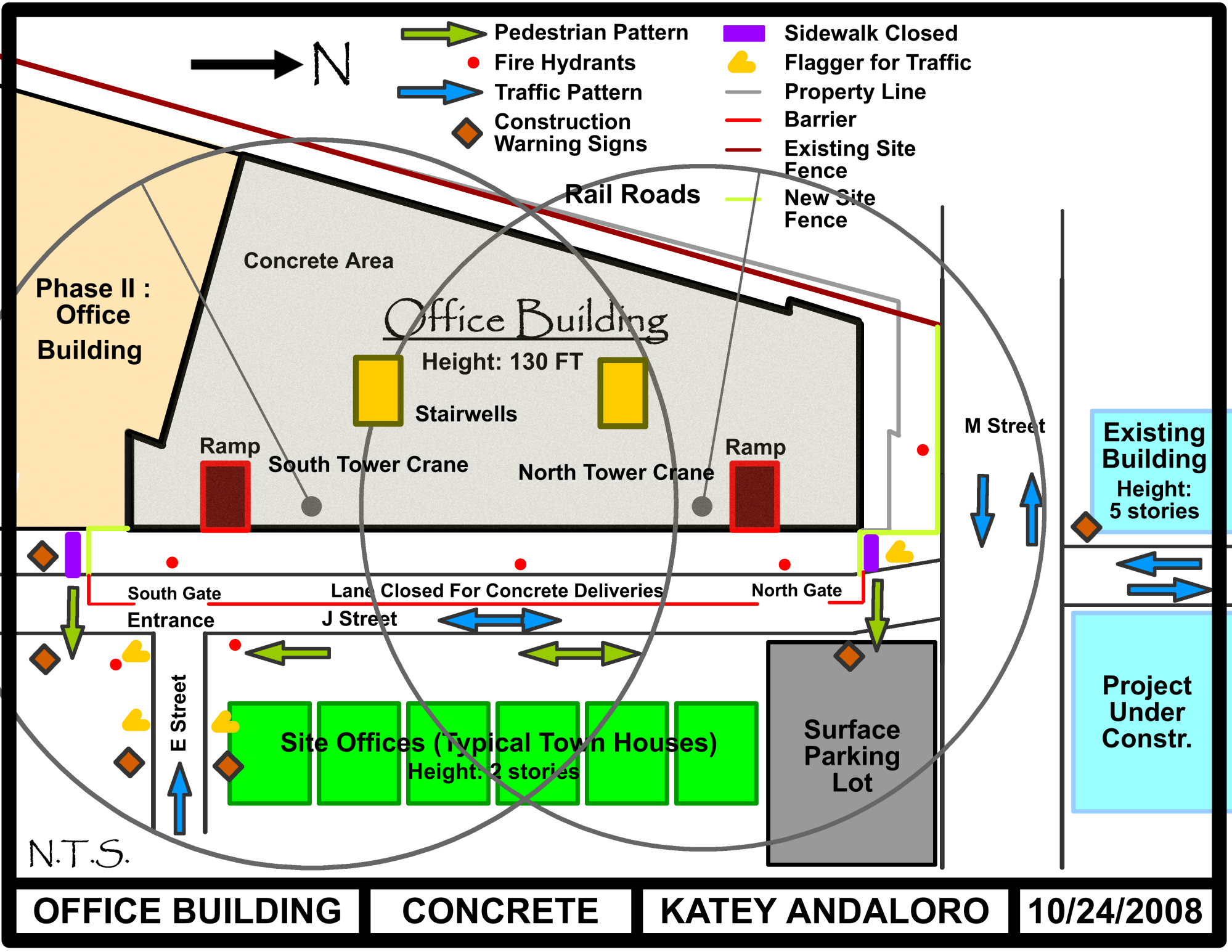
The logistics of the site plan have remained constant throughout the project. Trash chutes are located along the driving path so that dump trucks can pick and go. Parking for this project is still scarce, thus parking for the project team is located directly behind the townhouses and parking for the laborers is represented as Surface Parking as shown on the Site Plans. In the beginning of construction, the site offices were located in the town houses directly across J Street. After the topping out celebration in June of 2008, the site offices were moved inside of the building and relocated to the P1 and Lower Levels. These site plans also show neighboring buildings, temporary utilities, and construction boundaries.

Site Layout Plan Critique

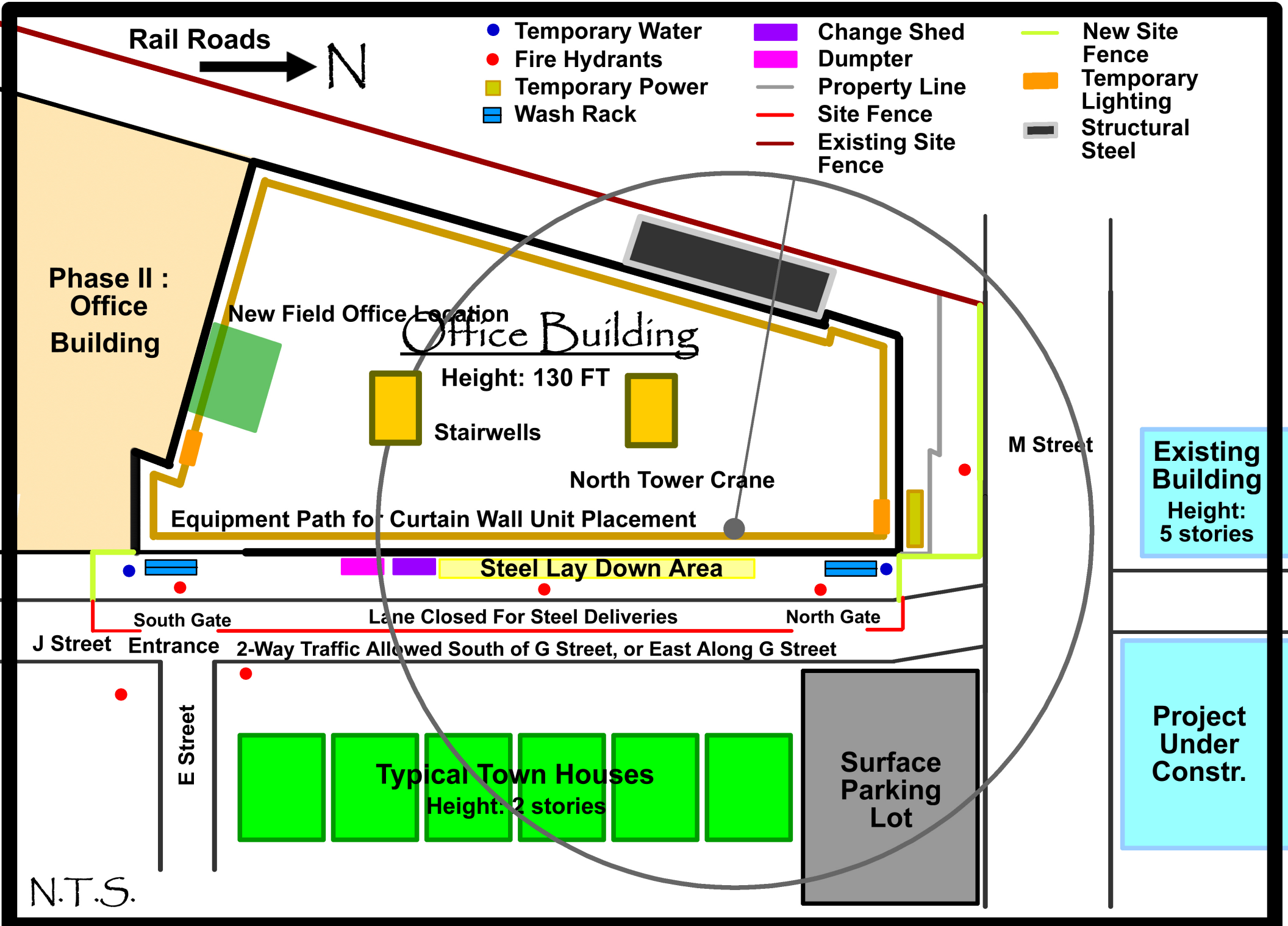
Given the location, space availability, and general surroundings of the office building, the site layout plan explained above is the best course of action to be taken in a project of this caliber.



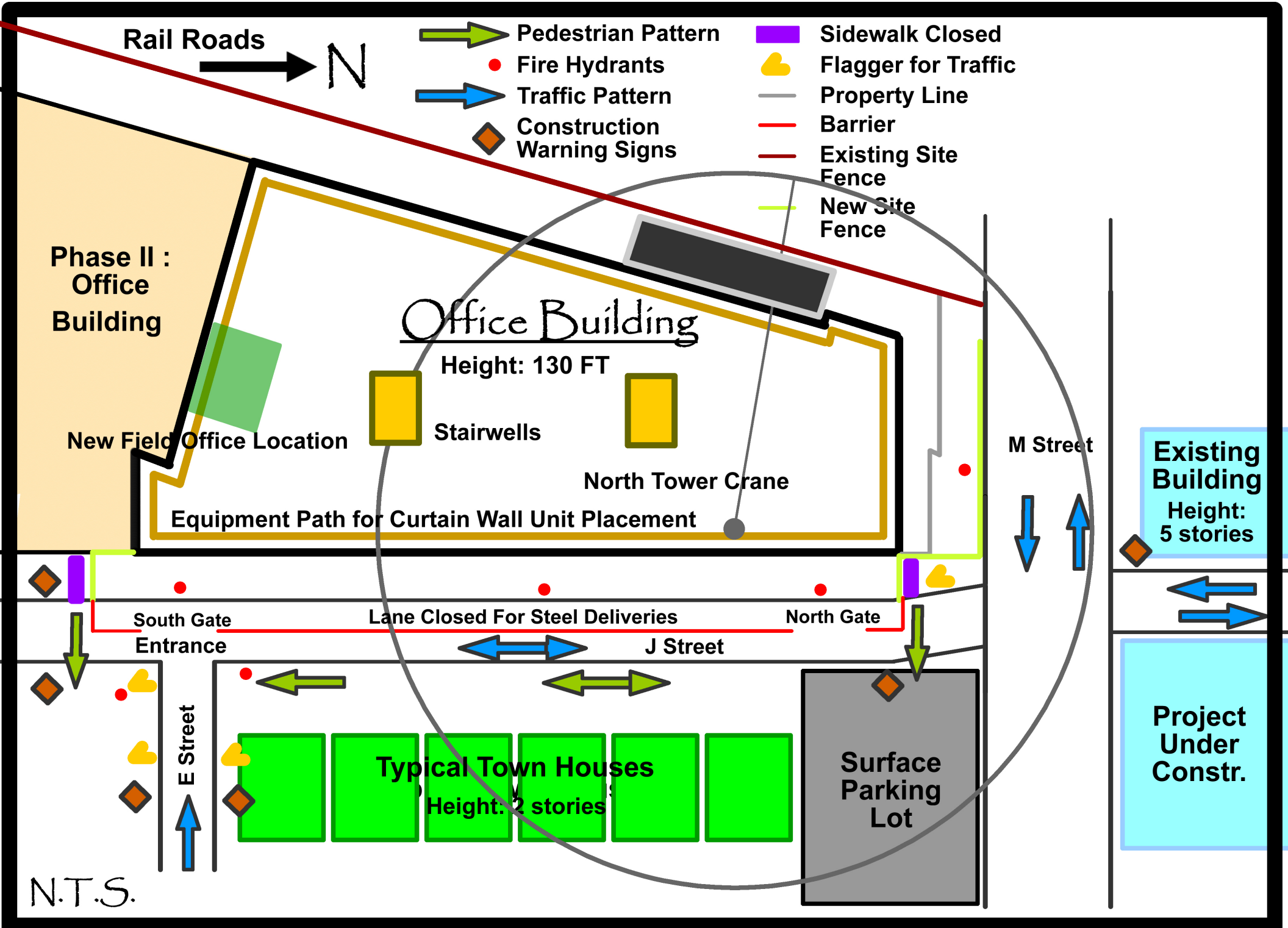
OFFICE BUILDING	CONCRETE	KATEY ANDALORO	10/24/2008



OFFICE BUILDING	CONCRETE	KATEY ANDALORO	10/24/2008



OFFICE BUILDING	STRUCTURE	KATEY ANDALORO	10/24/2008



OFFICE BUILDING	STRUCTURE	KATEY ANDALORO	10/24/2008

Detailed Structural Systems Estimate

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

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

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

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

Detailed Cost Analysis of the Structure									
Level	**Description**	**Amount**	**Material Price**	**Material Cost**	**Labor Price**	**Labor Cost**	**Equipment Price**	**Equipment Cost**	**Total Cost**
Reinforcement	Mat Foundation	550 Ton	$935.00	$514,250	$430.00	$236,500	$30.35	$16,693	$767,443
	Composite Decking	21 Ton	$935.00	$19,635	$430.00	$9,030	$30.35	$637	$29,302
	P2 Level	402 Ton	$935.00	$375,870	$430.00	$172,860	$30.35	$12,201	$560,931
	P1 Level	402 Ton	$935.00	$375,870	$430.00	$172,860	$30.35	$12,201	$560,931
	Lower Level	402 Ton	$935.00	$375,870	$430.00	$172,860	$30.35	$12,201	$560,931
	Ground Level	402 Ton	$935.00	$375,870	$430.00	$172,860	$30.35	$12,201	$560,931
	Level 2	25 Ton	$935.00	$23,375	$430.00	$10,750	$30.35	$759	$34,884
	Level 3	25 Ton	$935.00	$23,375	$430.00	$10,750	$30.35	$759	$34,884
	Level 4	25 Ton	$935.00	$23,375	$430.00	$10,750	$30.35	$759	$34,884
	Level 5	25 Ton	$935.00	$23,375	$430.00	$10,750	$30.35	$759	$34,884
	Level 6	25 Ton	$935.00	$23,375	$430.00	$10,750	$30.35	$759	$34,884
	Level 7	25 Ton	$935.00	$23,375	$430.00	$10,750	$30.35	$759	$34,884
	Level 8	25 Ton	$935.00	$23,375	$430.00	$10,750	$30.35	$759	$34,884
	Level 9	25 Ton	$935.00	$23,375	$430.00	$10,750	$30.35	$759	$34,884
	Level 10	25 Ton	$935.00	$23,375	$430.00	$10,750	$30.35	$759	$34,884
	Roof	25 Ton	$935.00	$23,375	$430.00	$10,750	$30.35	$759	$34,884
	Columns	505 Ton	$935.00	$472,175	$430.00	$430.00	$30.35	$15,327	$487,932
	Shear Walls	166 Ton	$935.00	$155,210	$430.00	$71,380	$30.35	$5,038	$231,628
	SUB-TOTAL	3100	$935.00	$2,898,500	$430.00	$430.00	$30.35	$94,085	$2,993,015
Cast in Place Concrete	Composite Decking	352 CY	$109.00	$38,368	$14.90	$5,245	$5.55	$1,954	$45,566
	Columns	1167 CY	$109.00	$18,203	$34.00	$5,678	$16.95	$2,831	$26,712
	Slabs	32420 CY	$109.00	$3,533,780	$18.20	$590,044	$9.15	$296,643	$4,420,467
	Shear WAlls	2732 CY	$109.00	$297,788	$26.50	$72,398	$1,320.00	$3,606,240	$3,976,426
	SUB-TOTAL	35671	$109.00	$3,888,139	$23.40	$834,701	$337.91	$12,053,588	$16,776,428
Strucutal Steel	Steel	334 Ton	$2,300.00	$768,200	$380.00	$126,920	$132.00	$44,088	$939,208
	PT Cables	400000 LB	$1.79	$716,000	$0.79	$316,000	$0.03	$12,000	$1,044,000
Location Factor: 98%	**TOTAL STRUCTURAL ESTIMATE :**		**$28,540,038**			**Total Labor Cost:**		**$2,232,565**	
	Total Material Cost:		**$8,270,839**			**Total Equipment Cost:**		**$4,057,840**	

General Conditions Estimate

Table 1: Displays the Total Cost of Each Sub-Category

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

Please reference Appendix for the General Conditions Calculation Sheet.

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

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

Critical Industry Issues – PACE Roundtable Meeting

On Thursday, October 16, 2008 I attended the 17th Annual PACE (The Partnership for Achieving Construction Excellence) Roundtable Meeting, which allows students and industry practitioners to openly discuss key topic selected by the advisory board. This year the theme was "Investing in People". Below is a brief summary of each session followed by my observations and opinions about information that was gathered from each session.

Break-out Session I – Mixer

The mission for this break-out session was to create a working model of a mentorship program between Industry Practitioners and Architectural Engineering (AE) students at Penn State. It began by pairing a single industry member with two to three students. My partners were Mark Konchar from Balfour Beatty Construction and Larry Warner a 5th year AE student. Our group arrived at several conclusions.

Conclusions:

- Program should be offered separately from classes, so as not to pressure communication between the two parties
- Mentor should be unbiased and not use the program as a recruiting tool
- Upon arriving at the beginning of your 5th year in AE, students should have a secondary mentor that has just graduated from the program recently (within the last year or two)
- Faculty advisers should arrange match between student and industry member, because faculty advisers have a better experience with each individual

I was impressed with how many industry members strongly agree that this program should not be used as a recruiting tool, but more so as a relationship between to an industry member and a future industry member. There were mixed responses to faculty advisers pairing up industry members and students. Several people claimed random selection would be a better, so as to increase communication skills. Personally I feel either one works, because you are still getting to know someone you have never met or talked to before. All-in-all, this program would be rewarding for both parties. The students would gain industry wisdom and a "big brother/sister" figure in the business world, while the industry member would stay in contact and be updated with developments in the AE Department along with a good sense of fulfillment in giving back to their fellow AE's.

Break-Out Session II – Technical Training Topics

Out of the three technical topics provided, I attended the lecture on "Energy & Economy" presented by Dr. Riley. This session discussed how energy affects the cost of materials and how this change creates a demand for more efficient equipment in buildings. The topic proceeded further in to an example of how manufactures are beginning to improve their power systems, such as lighting controls or transformers. Also, discussed in this session was how our economy will handle in today's market and what to expect in the near future.

There was really nothing that shocked me or grabbed my direct attention about this session. These are issues I have known about for a while. Yes, the economy is going for a down turn, thus increase in materials is expected along with a solution in trying to fix this increase. Because of the down turn in the economy, projects such as renovations will become more predominate in the construction market. This also mean a decrease in private sponsored projects, but an increase in public, along with companies searching to "salvaging" another projects.

Break-Outs Session III – Industry Panel

In this session six (6) industry members are selected to sit on a panel and answer questions from students.

The six industry members were:

- Mr. John Bechtel – Office of the Physical Plant (OPP)
- Dr. Mark Konchar – Baflour Beatty Construction (BBC)
- Mr. Steve Lee – Benchmark Construction Company Inc.
- Mr. Bill Moyer – James G. Davis Construction Corporation
- Coleman Walker – Haskell Construction
- Chuck Tomasco – Trueland Industries

Question topics ranged from how different types of skills are important to teams, uses of different project delivery methods, information management, and the advantages of collaboration contracts. A topic that caught my attention was developing people into evolving roles in the company. I was amazed at how each industry member explained how they will teach new hires behavior and leadership skills in order to "groom" them for a certain type of role or position inside the company. Even going as far as matching that individual up with a mentor to guide them down the correct path throughout their career in the company.

Break-out Session IV – Student Panel

For this last discussion six random students were selected to sit on a board and explain, using their own experiences, how students deal with the challenges of work-life balance. The question presented to the board ranged from how one keeps themselves organized, what motivates a person to excel as an individual, and perceptions of job challenges.

I really can't say I was amazed with the different answers that each of my fellow classman's gave. Not only has each of us partaken in very different activities throughout our lives, but we differ in the way that each of us lives our lives. However, we easily migrant back to one another in the pursuit of a common goal, whether it is completing a project, comparing previous industry experiences, or passing thesis.

Industry Issues That Apply to My Project

Since my project began as a non-LEED rated design, but was later changed, by owner's request, to a LEED Silver rating, because LEED certified buildings were becoming the future in construction, I feel the owner should have been educated more before and during the building's design, so as to incorporate new and innovative green design that will truly make the project a sustainable building and not just LEED certified.

Appendix A

Detailed Structural System Estimate Take-Offs

Table 2: Mat Foundation Take-Off for Rebar

Mat Foundation Take-Off : Rebar						
No. of Bars (#)	**Bar No. (#)**	**Length of Bar (FT)**	**LBS/FT**	**Subtotal (LBS)**	**Multiplier**	**Total (LBS)**
20	10	30	4.303	2,582	1	2,582
20	10	19	4.303	1,635	45	73,581
20	10	31	4.303	2,668	6	16,007
12	10	30	4.303	1,549	2	3,098
12	10	19	4.303	981	32	31,395
12	10	31	4.303	1,601	4	6,403
8	10	19	4.303	654	6	3,924
18	10	19	4.303	1,472	12	17,660
12	10	25	4.303	1,291	1	1,291
12	10	15	4.303	775	35	27,109
12	10	33	4.303	1,704	1	1,704
93	10	23	4.303	9,204	1	9,204
31	10	29	4.303	3,868	1	3,868
40	10	34	4.303	5,852	2	11,704
40	10	28	4.303	4,819	2	9,639
214	10	24	4.303	22,100	2	44,200
40	10	42	4.303	7,229	1	7,229
56	10	40	4.303	9,639	1	9,639
54	10	30	4.303	6,971	1	6,971
578	10	42	4.303	104,460	1	104,460
432	10	48	4.303	89,227	1	89,227
507	10	52	4.303	113,444	1	113,444
70	10	380	4.303	114,460	1	114,460
110	10	75	4.303	35,500	1	35,500
100	10	83	4.303	35,715	1	35,715
31	10	320	4.303	42,686	1	42,686
427	10	24	4.303	44,097	1	44,097
62	10	180	4.303	48,021	1	48,021
240	10	47	4.303	48,538	1	48,538
114	10	86	4.303	42,187	1	42,187
114	10	86	4.303	42,187	1	42,187
				Subtotal (LBS)		1,047,729
				Waste Factor (5%)		1.05
				TOTAL (LBS)		**1,100,115**
				TOTAL (TON)		**550**

Table 3: Composite Decking Take-Off for Rebar

Composite Decking : Rebar				
No. of Bars (#)	**Bar No. (#)**	**Length of Bar (FT)**	**LBS/FT**	**Total (LBS)**
220	6	37	1.5025	12,230.35
74	6	108	1.5025	12,007.98
148	6	37	1.5025	8,227.69
74	6	68	1.5025	7,560.58
Subtotal (LBS)				40,027
Waste Factor (5%)				1.05
Total (LBS)				**42,028**
Total (TON)				**21**

Table 4: Typical 2nd thru Roof Take-Off for Rebar

Typical 2nd - Roof Take-0ff: Rebar						
No. of Bars (#)	**Bar No. (#)**	**Length of Bar (FT)**	**LBS/FT**	**Subtotal (LBS)**	**Multiplier**	**Total (LBS)**
17	6	20	1.5025	511	15	7,663
22	6	20	1.5025	661	17	11,239
11	6	20	1.5025	331	20	6,611
10	6	20	1.5025	301	10	3,005
9	6	20	1.5025	270	23	6,220
15	6	20	1.5025	451	10	4,508
9	6	10	1.5025	135	9	1,217
14	6	12	1.5025	252		0
20	6	12	1.5025	361	3	1,082
16	6	15	1.5025	361	2	721
21	6	15	1.5025	473	2	947
12	6	15	1.5025	270	4	1,082
17	6	15	1.5025	383	3	1,149
18	6	15	1.5025	406	5	2,028
Subtotal (LBS)						47,471
Waste Factor (5%)						1.05
Total (LBS)						**49,845**
Total (TON)						**25**

Table 5: Column Take-Off for Rebar

Column Take-Off : Rebar							
Column	**No. of Bars (#)**	**Bar No. (#)**	**Height of Bar (FT)**	**LBS/FT**	**Subtotal (LBS)**	**Multiplier**	**Total (LBS)**
C1	98	4	10	0.67	655	18	11,784
	12	11	57	5.31	3,639	18	65,505
	8	11	73	5.31	3,113	18	56,042
C2	284	4	10	0.67	1,903	16	30,445
	12	11	142	5.31	9,053	16	144,854
C3	34	4	10	0.67	228	19	4,328
	8	11	33	5.31	1,403	19	26,650
	16	11	12	5.31	1,041	19	19,786
C4	284	4	10	0.67	1,897	1	1,897
	12	11	57	5.31	3,634	1	3,634
	8	11	85	5.31	3,613	1	3,613
C5	126	4	10	0.67	844	14	11,819
	12	11	58	5.31	3,698	14	51,770
	8	11	110	5.31	4,654	14	65,159
C6	45	4	10	0.67	301	1	301
	12	11	15	5.31	924	1	924
	8	11	45	5.31	1,923	1	1,923
C7	107	4	10	0.67	717	2	1,434
	12	11	57	5.31	3,634	2	7,268
	8	11	85	5.31	3,613	2	7,226
C8	126	4	10	0.67	842	14	11,784
	12	11	53	5.31	3,347	14	46,861
	8	11	72	5.31	3,039	14	42,547
C9	126	4	10	0.67	844	2	1,688
	12	11	53	5.31	3,347	2	6,694
	8	11	72	5.31	3,039	2	6,078
C10	126	4	10	0.67	842	8	6,733
	12	11	76	5.31	4,842	8	38,738
	8	11	110	5.31	4,654	8	37,234
C11	107	4	10	0.67	717	5	3,585
	12	11	85	5.31	5,419	5	27,096
	8	11	47	5.31	1,998	5	9,988
C12	98	4	10	0.67	655	4	2,619
	16	11	12	5.31	999	4	3,995
	12	11	45	5.31	2,885	4	11,540

	8	11	73	5.31	3,113	4	12,454
C13	98	4	10	0.67	657	1	657
	12	11	24	5.31	1,498	1	1,498
	8	11	107	5.31	4,537	1	4,537
C14	98	4	10	0.67	655	1	655
	16	11	12	5.31	999	1	999
	8	11	119	5.31	5,037	1	5,037
C15	98	4	10	0.67	657	1	657
	16	11	12	5.31	999	1	999
	8	11	119	5.31	5,037	1	5,037
C16	63	4	10	0.67	421	3	1,263
	16	11	12	5.31	999	3	2,997
	8	11	72	5.31	3,039	3	9,117
C17	54	4	10	0.67	362	2	724
	16	11	12	5.31	999	2	1,998
	8	11	60	5.31	2,540	2	5,079
C18	45	4	10	0.67	301	2	601
	12	11	15	5.31	924	2	1,849
	8	11	45	5.31	1,923	2	3,847
C19	34	4	10	0.67	228	10	2,278
	16	11	12	5.31	1,041	10	10,413
	8	11	23	5.31	978	10	9,776
C20	34	4	10	0.67	227	8	1,817
	12	11	12	5.31	781	8	6,248
	8	11	23	5.31	978	8	7,821
C21	33	4	10	0.67	221	4	884
	12	11	10	5.31	653	4	2,614
	8	11	13	5.31	542	4	2,168
C22	33	4	12	0.67	265	5	1,323
	10	11	23	5.31	1,222	5	6,110
C23	118	4	10	0.67	788	1	788
	12	11	158	5.31	10,042	1	10,042
C24	126	4	10	0.67	842	1	842
	12	11	38	5.31	2,423	1	2,423
	8	11	72	5.31	3,039	1	3,039
	20	11	35	5.31	3,746	1	3,746

Table 6: Structural Steel Take-Off for Rebar

Structural Steel Take-Off					
Level	**Steel Member**	**No. of Steel (#)**	**Length of Steel (FT)**	**No. of Shear Studs**	**Total (LBS)**
5th	W16X57	20	400	280	22800
	W16X26	4	80	56	2080
	W24x131	3	208	116	27248
	W12X22	4	32	24	704
	W24x76	2	28	28	2128
	W24x44	1	37	30	1628
	W24X103	2	74	96	7622
	W24X162	4	148	152	23976
6th	W16X57	22	440	308	25080
	W8X31	16	244	390	7564
	W12X22	2	16	12	352
	W21X68	4	56	56	3808
	W21X44	4	100	100	4400
	W21X132	7	262	332	34584
	W24X103	1	37	46	3811
	W24X162	1	37	46	5994
	W21X182	2	30	34	5460
	W21X57	1	2	3	114
	W16X26	1	20	32	520
	W21X50	1	38	1	1900
	W18X35	1	37	30	1295
7th	W8X31	19	308	486	9548
	W12X22	2	16	12	352
	W16X57	20	400	280	22800
	W21X68	4	56	56	3808
	W21X44	5	100	100	4400

	W21X132	8	296	384	39072
	W21X57	2	22	23	1254
	W21X182	2	34	34	6188
	W21X50	1	38	1	1900
	W18X35	1	37	30	1,295
8th	W8X31	19	308	486	9,548
	W12X22	2	16	12	352
	W16X57	20	400	280	22,800
	W21X68	4	56	56	3,808
	W21X44	5	100	100	4,400
	W21X132	8	296	384	39,072
	W21X57	2	22	23	1,254
	W21X182	2	34	34	6,188
	W21X50	1	38	1	1,900
	W18X35	1	37	30	1,295
9th	W8X31	19	308	486	9,548
	W12X22	2	16	12	352
	W16X57	20	400	280	22,800
	W21X68	4	56	56	3,808
	W21X44	5	100	100	4,400
	W21X132	8	296	384	39,072
	W21X57	2	22	23	1,254
	W21X182	2	34	34	6,188
	W21X50	1	38	1	1,900
	W18X35	1	37	30	1,295
10th	W8X31	19	308	486	9,548
	W12X22	2	16	12	352
	W16X57	20	400	280	22,800
	W21X68	4	56	56	3,808
	W21X44	5	100	100	4,400
	W21X132	8	296	384	39,072
	W21X57	2	22	23	1,254

	W21X182	2	34	34	6,188
	W21X50	1	38	1	1,900
	W18X35	1	37	30	1,295
Roof	W8X31	19	308	486	9,548
	W12X22	2	16	12	352
	W16X57	20	400	280	22,800
	W21X68	4	56	56	3,808
	W21X44	5	100	100	4,400
	W21X132	8	296	384	39,072
	W21X57	2	22	23	1,254
	W21X182	2	34	34	6,188
	W21X50	1	38	1	1,900
	W18X35	1	37	30	1,295

Total Shear Studs	9,202
Subtotal (LBS)	636,153
Waste Factor (5%)	1.05
Total (LBS)	**667,961**
Total (TON)	**334**

Table 7: Shear Wall Take-Off for Rebar

Shear Wall Take-Off : Rebar					
Wall	**No. of Bars (#)**	**Bar No. (#)**	**Length of Bar (FT)**	**LBS/FT**	**Total (LBS)**
1	180	4	40	0.67	4810
	80	8	23	2.67	4913
	80	9	27	3.40	7276
	40	6	130	1.50	7780
2	180	4	40	0.67	4810
	80	8	23	2.67	4913
	80	9	27	3.40	7276
	40	6	130	1.50	7780
3	180	4	40	0.67	4810
	80	8	35	2.67	7529
	80	11	62	5.31	26140
	80	6	48	1.50	5768
	40	6	35	1.50	2073
4	180	4	28	0.67	3367
	56	6	97	1.50	8138
	28	6	83	1.50	3470
5	180	4	28	0.67	3367
	56	6	97	1.50	8138
	28	6	83	1.50	3470
6	180	4	40	0.67	4810
	80	8	35	2.67	7529
	80	9	62	3.40	16742
	40	6	83	1.50	4987
7	168	4	40	0.67	4489
	80	8	35	2.67	7529
	80	9	62	3.40	16728
	40	6	71	1.50	4251
8	168	4	40	0.67	4489
	80	8	35	2.67	7529
	80	9	62	3.40	16728
	40	6	71	1.50	4251

9	180	4	20	0.67	2405
	40	8	35	2.67	3765
	40	9	97	3.40	13158
	20	6	47	1.50	1419
10	180	4	18	0.67	2164
	36	8	35	2.67	3388
	36	9	97	3.40	11842
	18	6	47	1.50	1277
11	180	4	20	0.67	2405
	40	8	35	2.67	3765
	40	9	97	3.40	13158
	20	6	47	1.50	1419
12	180	4	18	0.67	2164
	36	8	35	2.67	3388
	36	9	97	3.40	11842
	18	6	47	1.50	1277
13	95	4	28	0.67	1777
	56	6	85	1.50	7150
14	60	4	12	0.67	481
	12	7	50	0.67	399
15	72	4	16	0.67	770
	16	7	62	1.50	1478
Subtotal (LBS)					316779
Waste Factor (5%)					1.05
Total (LBS)					**332618**
Total (TON)					**166**

Table 8: Typical P2 thru Ground Level Take-Off for Rebar

Typical P2 - Ground Level Take-Off : Rebar						
No. of Bars (#)	**Bar No. (#)**	**Length of Bar (FT)**	**LBS/FT**	**Subtotal (LBS)**	**Multiplier**	**Total (LBS)**
8	6	9	1.5025	108	2	216
16	6	9	1.5025	216	3	649
14	6	15	1.5025	316	6	1893
16	6	32	1.5025	769	1	769
16	6	19	1.5025	457	2	914
12	4	12	0.668	96	1	96
8	6	16	1.5025	192	18	3462
16	6	16	1.5025	385	25	9616
8	6	16	1.5025	192	10	1923
12	6	19	1.5025	343	3	1028
21	6	34	1.5025	1073	1	1073
12	6	11	1.5025	198	1	198
10	6	35	1.5025	526	1	526
12	6	21	1.5025	379	1	379
16	6	20	1.5025	481	1	481
6	4	6	0.668	24	6	144
11	4	6	0.668	44	27	1190
24	6	2	1.5025	72	1	72
8	6	20	1.5025	240	1	240
6	6	14	1.5025	126	13	1641
24	6	18	1.5025	649	1	649
21	6	35	1.5025	1104	1	1104
16	6	28	1.5025	673	1	673
23	6	23	1.5025	795	2	1590
12	6	14	1.5025	252	30	7573
23	6	30	1.5025	1037	1	1037
25	6	20	1.5025	751	1	751
25	6	16	1.5025	601	3	1803
13	6	15	1.5025	293	22	6446
16	6	17	1.5025	409	8	3269
6	6	8	1.5025	72	2	144
14	6	18	1.5025	379	1	379

31	6	8	1.5025	373	1	373
16	6	8	1.5025	192	1	192
25	6	18	1.5025	676	3	2028
31	6	23	1.5025	1071	1	1071
16	6	23	1.5025	553	1	553
11	4	12	0.668	88	7	617
6	6	34	1.5025	307	3	920
12	6	34	1.5025	613	2	1226
6	6	28	1.5025	252	1	252
25	6	21	1.5025	789	10	7888
16	6	36	1.5025	865	1	865
12	4	6	0.668	48	1	48
25	6	35	1.5025	1315	3	3944
16	6	33	1.5025	793	1	793
25	6	12	1.5025	451	1	451
24	6	30	1.5025	1082	1	1082
8	6	37	1.5025	445	1	445
25	6	34	1.5025	1277	1	1277
8	4	11	0.668	59	3	176
6	6	25	1.5025	225	1	225
9	6	18	1.5025	243	1	243
11	6	25	1.5025	413	1	413
16	6	18	1.5025	433	3	1298
11	4	16	0.668	118	1	118
25	6	30	1.5025	1127	1	1127
16	6	36	1.5025	865	2	1731
8	6	24	1.5025	288	1	288
14	6	35	1.5025	736	1	736
18	6	24	1.5025	649	2	1298
18	6	27	1.5025	730	3	2191
25	6	41	1.5025	1540	1	1540
25	6	40	1.5025	1503	2	3005
24	6	9	1.5025	325	2	649
25	6	8	1.5025	301	32	9616
57	4	42	0.668	1599	6	9595
50	4	48	0.668	1603	12	19238
456	4	52	0.668	15840	1	15840
62	4	380	0.668	15738	35	550833

99	4	75	0.668	4960	1	4960
90	4	83	0.668	4990	1	4990
28	4	320	0.668	5985	1	5985
384	4	24	0.668	6156	2	12313
56	4	180	0.668	6733	2	13467
216	4	47	0.668	6782	2	13563
103	4	86	0.668	5917	1	5917
103	4	86	0.668	5917	1	5917
4	5	9	1.043	38	1	38
16	5	16	1.043	267	1	267
22	4	16	0.668	235	1	235
1	5	9	1.043	9	1	9
4	5	7	1.043	29	1	29
2	6	19	1.5025	57	1	57
1	6	32	1.5025	48	1	48
2	4	12	0.668	16	1	16
33	4	6	0.668	132	1	132
4	4	7	0.668	19	1	19
1	6	7	1.5025	11	1	11
2	6	9	1.5025	27	1	27
2	6	40	1.5025	120	1	120
8	6	21	1.5025	252	1	252
34	4	14	0.668	318	1	318
1	5	35	1.043	37	1	37
1	5	36	1.043	38	1	38
3	5	18	1.043	56	1	56
2	4	34	0.668	45	1	45
1	6	20	1.5025	30	1	30
22	5	15	1.043	344	1	344
1	5	20	1.043	21	1	21
4	6	11	1.5025	66	1	66
4	6	23	1.5025	138	1	138
2	6	36	1.5025	108	1	108
7	5	17	1.043	124	1	124
2	6	8	1.5025	24	1	24
1	4	25	0.668	17	1	17
1	6	25	1.5025	38	1	38
4	4	8	0.668	21	1	21

8	4	12	0.668	64	1	64
2	4	18	0.668	24	1	24
2	5	33	1.043	69	1	69
1	6	12	1.5025	18	1	18
3	6	18	1.5025	81	1	81
1	4	36	0.668	24	1	24
1	6	38	1.5025	57	1	57
1	6	34	1.5025	51	1	51
1	6	41	1.5025	62	1	62
2	4	11	0.668	15	1	15
1	4	10	0.668	7	1	7
1	4	35	0.668	23	1	23
1	6	16	1.5025	24	1	24
1	5	24	1.043	25	1	25
			Subtotal (LBS)			766,458
			Waste Factor (5%)			1.05
			Total (LBS)			804,780
			Total (TON)			402

Table 9: Shear Wall Take-Off for Concrete

Concrete Shear Wall Take-Off					
Wall	**Length (FT)**	**Thickness (FT)**	**Height (FT)**	**Volume (CF)**	**Volume (CY)**
1	40	1	179.25	7170	266
2	40	1	179.25	7170	266
3	40	1	179.25	7170	266
4	28	1	179.25	5019	186
5	28	1	179.25	5019	186
6	40	1	179.25	7170	266
7	40	1	167.5	6700	248
8	40	1	167.5	6700	248
9	20	1	179.25	3585	133
10	18	1	179.25	3227	120
11	20	1	179.25	3585	133
12	18	1	179.25	3227	120
13	28	1	95	2660	99
14	12	1	59.75	717	27
15	16	1	71.5	1144	42
Subtotal (CY)					2,602
Waste Factor (5%)					1.05
Total (CY)					2,732

Table 10: Concrete Slab Take-Off for Concrete

Concrete Slab Take-Off					
Level	**Width (FT)**	**Length (FT)**	**Thickness (FT)**	**Volume (CF)**	**Volume (CY)**
5th	37	108	0.35	1399	52
6th	37	70	0.35	907	34
	37	88	0.21	684	25
7th	37	156	0.21	1212	45
8th	37	156	0.21	1212	45
9th	37	156	0.21	1212	45
10th	37	156	0.21	1212	45
Roof	37	156	0.21	1212	45
Subtotal (CY)					335
Waste Factor (5%)					1.05
Total (CY)					352

Table 11: Concrete Columns Take-Off for Concrete

Concrete Column Take-Off					
Column	**Length (FT)**	**Width (FT)**	**Height (FT)**	**Volume (CF)**	**Volume (CY)**
C1	24	24	130.33	576	21
C2	24	24	130.33	576	21
C3	24	24	35.25	576	21
C4	24	24	132	576	21
C5	24	24	157.5	576	21
C6	24	24	49.75	576	21
C7	24	24	132	576	21
C8	27	2	157.5	54	2
C9	27	24	157.5	648	24
C10	27	24	157.5	648	24
C11	24	24	132	576	21
C12	24	24	120.25	576	21
C13	24	24	120.25	576	21
C14	24	24	120.25	576	21
C15	24	24	120.25	576	21
C16	24	24	73.25	576	21
C17	24	24	61.5	576	21
C18	24	24	49.75	576	21
C19	24	24	35.25	576	21
C20	24	24	35.25	576	21
C21	24	24	23	576	21
C22	24	36	23	864	32
C23	24	24	157.6	576	21
C24	24	24	157.6	576	21
C27	24	24	23	576	21
C28	12	18	35.5	216	8
C29	24	24	2.75	576	21
C30	24	24	35.5	576	21
C31	40	40	35.25	1600	59
C32	24	24	35.25	576	21
C33	24	24	73.25	576	21
C34	40	40	35.25	1600	59

C35	40	72	35.25	2880	107
C36	52	48	35.25	2496	92
C37	72	48	35.25	3456	128
C38	24	24	23	576	21
C39	24	24	73.25	576	21
Subtotal (CY)					1,112
Waste Factor (5%)					1.05
Total (CY)					1,167

Table 11: Concrete Columns Take-Off for Concrete

Concrete Slab Take-Off				
Level	**Area (FT^2)**	**Thickness (FT)**	**Volume (CF)**	**Volume (CY)**
P3	46597	4.5	209687	7766
	46597	0.5	23299	863
P2	46597	0.75	34948	1294
P1	46597	0.75	34948	1294
Lower	46597	0.75	34948	1294
Ground	46597	0.75	34948	1294
2nd	48616	1	48616	1801
3rd	49602	1	49602	1837
4th	46801	1	46801	1733
5th	51622	1	51622	1912
6th	53585	1	53585	1985
7th	53867	1	53867	1995
8th	45411	1	45411	1682
9th	32696	1	32696	1211
10th	32969	1	32969	1221
Roof	32969	1	32969	1221
Penthouse	12750	1	12750	472
Subtotal (CY)				30,876
Waste Factor (5%)				1.05
Total (CY)				32,420

Appendix B

General Conditions Estimate

Table 12: General Conditions Estimate

General Conditions Estimate					
Activity	**Qty.**	**Unit**	**Rate**	**Cost**	**Total Cost**
Supervision					
Senior Project Manager	131	WK	$2,100	$275,100	
Assistant Project Manager	131	WK	$1,850	$242,350	
Senior Project Engineer	393	WK	$1,125	$442,125	
Project Engineer	262	WK	$865	$226,630	
MEP Coordinator	131	WK	$1,300	$170,300	
Superintendent	131	WK	$2,100	$275,100	
Assistant Superintendent	70	WK	$1,600	$112,000	
Field Engineer	131	WK	$1,300	$170,300	
Instumant Man	131	WK	$865	$113,315	
Rodman	131	WK	$865	$113,315	
Safety Manager		LS	$10,000	$10,000	
Office Manager	131	WK	$750	$98,250	
Supervision Subtotal					**$2,248,785**
Temporary Facilities					
Jobsite Office	24	MO	$2,500	$60,000	
Telephone/Fax	30	MO	$850	$25,500	
Cell Phone Usage	30	MO	$85	$2,550	
Temporary Toilets	30	MO	$625	$18,750	
Office Equipment	30	MO	$1,000	$30,000	
Office Supplies	30	MO	$610	$18,300	
Field Office Set-Up	1	LS	$9,200	$9,200	
Sales Tax (Materials)	5.75%			$9,447	
Temporary Facilities Subtotal					**$173,747**
Temporary Utilities					
Electric	30	MO	$1,950	$58,500	
Water	1	LS	$5,600	$4,600	
Ethernet	30	MO	$435	$13,050	
Sales Tax (Materials)	5.75%			$4,379	
Temporary Utilities Subtotal					**$80,529**

Equipment Rental					
Storage Trailer	30	MO	$110	$3,300	
Surveying Instruments	1	LS	$7,450	$7,450	
Sales Tax (Materials)	5.75%			$618	
Equipment Rental Subtotal					**$11,368**
General Costs					
Fees for Public Parking	240	WK	$100	$24,000	
Photographs	30	MO	$150	$4,500	
Small Tools	30	MO	$360	$10,800	
Permits				$25,000	
Blue Prints	30	MO	$340	$10,200	
Temporary Fencing	450	LF	$22	$9,900	
Drug Testing	1	LS	$300	$300	
Construction Sign	30	MO	$27	$810	
Temporary Building Enclosures	1	LF	$17,500	$17,500	
Temporary Waterproofing	1	LF	$3,750	$3,750	
Performance Bond		LS	$18,530	$18,530	
Builder's Risk Insurance			$25,000	$25,000	
Jersey Barriers	30	WK	$60	$1,800	
Fire Extinguishers	1	LS	$5,400	$5,400	
Security	30	MO	$1,350	$40,500	
Trash Disposal	30	MO	$7,500	$225,000	
First Aid Kits & Supplies	1	EA	$175	$175	
Protection & Life Saving Equipment	30	MO	$1,375	$41,250	
Potable Water	30	MO	$95	$2,850	
Miscellaneous Items	30	MO	$275	$8,250	
Sales Tax (Materials)	5.75%			$27,342	
General Costs Subtotal					**$478,857**
Location Factor	98.00%				**$59,866**
COMPLETE TOTAL					**$3,053,152**