October 27th, 2010

TECHNICAL ASSIGNMENT TWO

PENN STATE SENIOR THESES

UNIVERSITY SCIENCES BUILDING

NORTHEASTERN U.S.

JUSTIN GREEN

CONSTRUCTION MANAGEMENT
ADVISOR: DR. RILEY

PENNSTATE

1855

Turner

TECHNICAL ASSIGNMENT TWO

Justin Green - CM

EXECUTIVE SUMMARY

Technical Assignment Two is intended to analyze the key features of the project that affect the project execution of the University Sciences Building. This project is a mixed use facility that will house both students and faculty of the university. It includes 39 research and teaching laboratories for bio-medical engineering, biology, chemistry, and fossil preparation. This 138,000 square foot building also houses 8 educational classrooms, a small auditorium seating 240 students, and a wing dedicated to both administrative and faculty support.

This report will contain a ***detailed project schedule*** that is more developed then the summary schedule developed in the first technical assignment. This schedule is comprised of two hundred line items that summarize the key construction tasks and their relationships on the project. Some of the larger challenges with construction will be discussed under the ***site layout*** portion of this technical report. Under this section, an in-depth analysis of site logistical planning during the building's superstructure phase will describe some of the reasoning behind where items were placed on the jobsite, and how they could possibly be re-arranged to allow for better efficiency in layout around the building perimeter.

Two estimates can be found in the later portion of the report. The first is a ***detail structural estimate*** that breaks down the costs of steel and concrete within the building. This estimate provided some difficulties because of the building's unique layout and the variety of structural systems implemented into the design. This building has a mix of precast filigree slabs, cast-in-place concrete, and structural steel. The second estimate is a ***general conditions estimate***. This estimate breaks down the general conditions costs into four major categories: Supervision & Personnel, Construction Facilities & Equipment, Temporary Utilities, and other Miscellaneous Costs. The largest of which is the cost of supervision & personnel, and the most difficult to accurately predict was the temporary utilities costs during construction. All unit rates were obtained from RS Means Building Construction and all quantities were scaled from the supplied contract drawings.

Lastly, this report contains a summary of ***critical industry issues*** discussed during the PACE Roundtable meeting. Items discussed include surprising facts learned, issues that might affect or be applied to this project, and key contacts obtained that can be used for future reference.

After analyzing the information within the report, site logistics is a critical feature and needs to be thoroughly thought out for any project with a limited amount of space for materials and equipment. Site logistics in a congested city has a direct impact on the phasing of exterior enclosures and other trades on site. These considerations can be shown on the detailed project schedule attached.

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DETAILED PROJECT SCHEDULE

See APPENDIX A for the Detailed Project Schedule

PRECONSTRUCTION / PROCUREMENT

The University Sciences Building was bid out in the traditional Design-Bid-Build fashion. This means that there was very little to no overlap between the design and construction phases of the project. It is because of this that Turner Construction is unaware of the specific details in the procurement and design of this facility. In comparison with other facilities of the same occupancy type and location, it was determined that the design phase of the project was in the vicinity of 1 year, or 260 work days.

Members of the construction team are also unaware of the exact time frame of when the design was put out to bid and when the team was awarded the project. Most construction projects have a typical contractor selection period of about a month and a half, resulting in the duration of 35 work days for the bid and award of the CM @ Risk.

Lastly, a major time commitment of any project startup is the permits and approvals needed to begin construction. When researching typical permit request and approval durations in the area, it was found that construction permits can take anywhere from 15 to 90 days depending on what type of permit is being requested. This is what you see in the final line item of the preconstruction phase *(Reference Appendix A)*.

CONSTRUCTION

For this technical report, the preconstruction and project completion dates did not change from the initial overview schedule generated in the first technical report. For this report, construction was broken up into five major subdivisions. These divisions are general, foundation/superstructure, enclosure/façade, MEP systems, and finishes. Within these divisions are minor subdivisions that break the building up into its different areas.

The major sequence of work on this project is such that construction starts on the first floor and raises one floor at a time in a clockwise rotation until the penthouse is reached *(see Figure 1)*. This however, is not the sequence pattern for every type of activity on the project.

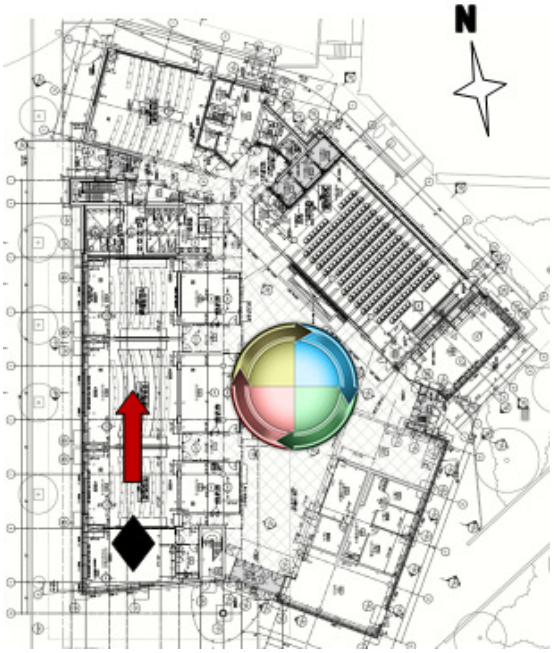


Figure 1: First Floor Layout Showing Sequence

CONSTRUCTION ACTIVITY BREAKDOWN

Foundation / Superstructure

The structure of the building is comprised of drilled caisson piers, pile caps, grade beams, shear walls, concrete/steel columns, and precast/cast-in-place concrete slabs. The masonry walls are under the enclosure/façade portion of the schedule because there are no load bearing walls in the University Sciences Building, making the CMU walls an architectural feature of the building instead of a means of support for the facility.

This grouping of activities is broken down by floor, starting at the basement level and proceeding to the roof of the penthouse floor.

One important thing to point out is that the slab on grade (SOG) was placed after the other building slabs because of the shoring required to support each floor above. You need four levels of shoring before you can start the SOG. Another reason that SOG's are typically skipped over and poured later on in the job is because of the time needed to wait for the ground floor to cure. This can hold up other activities within the building.

Enclosure / Façade

The enclosure is unique in that the sequencing of masonry wall proceeds from floor to floor, while the rest of the façade focuses on one face of the building at a time. More time was allocated to the masonry work on the first floor when compare to the other floors that have a similar quantity of CMU block. This may be because of the learning curve with any new activity, and possibly the assembly of scaffolding around the facility.

Another surprising fact about the sequencing of the façade is that it typically proceeds in a clockwise direction like the other building activities, but often skips the south-eastern façade of the building (the side facing the laydown area) and returns after the other faces have been completed. Perhaps this is due to limited space on that side of the University Sciences Building at the time of erection.

MEP Systems

The MEP systems consist of electrical, mechanical, plumbing, fire protection, and elevator work. Of these systems, the electrical, mechanical, and plumbing features of the building have been broken down into their core activities. These activities include rough-in, distribution, and final connections. The hardest of which to analyze was that of the mechanical systems within the building. This is because of the large air and ventilation requirements that are involved with the laboratory spaces, as well as the quantity of activities present in the current schedule.

Building Finishes

The building finishes were broken down into framing of interior partitions, hanging/taping/painting drywall, installation of ceiling grid, hanging of lighting fixtures, dropping ceiling tile, and flooring installation. Other key finishes to point out lie within the auditorium and atrium spaces within the University Sciences Building.

The atrium is unique because of its living wall system and the large quantity of scaffolding that will fill every square foot of the open space. The four floor atrium spaced will be completely filled with scaffolding in order to streamline the finishing of walls and railings around the perimeter of the space. The less you move scaffolding or other forms of equipment, more time can be spent actually performing the work and performing the work safely.

Summary of Key Milestones

MILESTONES	KEY CONSTRUCTION DATES
Notice to Proceed	8/25/2009
Ground Breaking	10/21/2009
Steel Top Out	7/20/2010
Enclosure	1/27/2011
Substantial Completion	6/30/2011

Figure 2: Summary of Key Project Milestones

SITE LAYOUT PLANNING

See APPENDIX B for a Site Plan of the Superstructure Logistics Plan

The site for the University Sciences Building is located in the heart of the University's campus. This means that vehicular and pedestrian traffic will be a major concern during all phases of the project. Whether it means blocking of street lanes or installing overhead protection, site safety has to be taken into serious consideration.

Being in a city has its advantages and disadvantages. One perk of this building's location is the easy access to nearby utility lines and highly skilled trades in the area. Some of the major disadvantages include limited space for site storage and material deliveries. This means that more thought has to be put into scheduling and material staging. Less space outside of the building also typically equates to more congestion within the building.

The Superstructure Phase Plan

The site logistics plan shown below *(and in larger detail in Appendix B)* of the superstructure phase of the project is very similar to all other phases of the project. Site access and laydown space along with trailer locations are identical throughout the entire duration of the project. The key feature shown in *figure 3* is that of the positioning of the tower crane. This type of crane was used because of the limited space around the perimeter of the University Sciences Building, as well as the convenience of having a large open space within the building to help avoid crane interference with building trades.

Contractor Layout Critique

This site is already extremely efficient, mostly because of the simplicity of its layout and the limited space to stage any materials or equipment outside of the building.

The positioning of the tower crane in the atrium makes sense because of its central location, the ease of access to all areas of the structure, and the limited disturbance to the work surrounding the tower (no holes left to patch after the floors are erected and crane is removed).

Two site entrances with two areas for material distribution help give the site flexibility and ease of access at all times.

The only space that could be rearranged or condensed is that of the northwestern corner of the site. It may have been better to arrange the concrete subcontractor's trailer next to the other trailers on site. Also, the mock-up panel has room to move either further backward or closer to the Turner job trailers. Moving these few items would allow for more space that could be used to store materials or equipment.

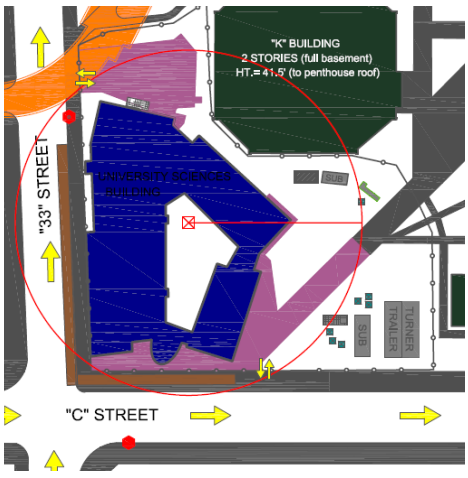


Figure 3: Superstructure Layout Plan

DETAILED STRUCTURAL SYSTEM ESTIMATE

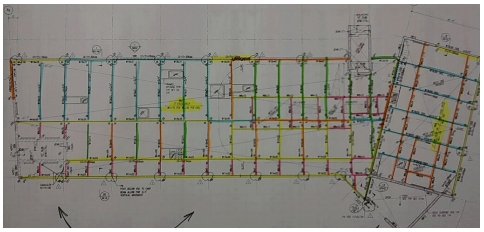
See APPENDIX C for the complete Structural System Estimate

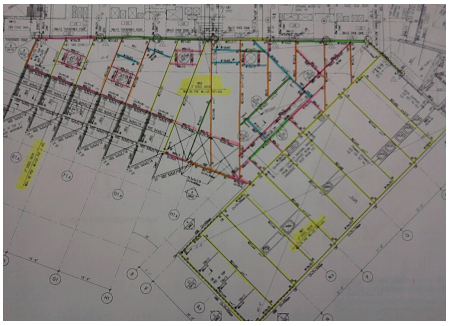
The superstructure for the University Sciences Building is composed of a variety of different steel and concrete systems. Steel for the building contains a variety of I-beams sizes, mainly located at the Penthouse levels, with some steel existing above the first floor auditorium *(shown on the highlighted plans in figures 4A and 4B).* The University Sciences Building's concrete floor system is composed of a thin precast layer (filigree slab) that supports a voided cast-in-place concrete slab on top.

This detailed structural estimate *(located in Appendix C)* is a good representation of the actual system costs for concrete and steel within the building.

Some of the major factors that can affect cost are as follows:

- Quality
- Productivity
- Size of Project
- Location
- Overtime





Figures 4A & 4B: Highlighted plans used in Steel Takeoff

The factor that most affects this estimate is productivity because of the use of precast panels on the project. These filigree slabs can drastically reduce the time of placing concrete and completing the structure. Filigree slabs replace the need for formwork, thereby reducing the time between concrete placements. This is why the estimated concrete values are a little higher than the actual cost of the system *(see figure 5 below)*, because of the labor savings not accounted for by the RS Means values utilized in the estimate.

Steel costs were found to be almost exactly the same as the actual cost of construction. The accuracy of this estimate can be contributed to the detailed breakdown of each and every structural steel member within the building (with the exception of tube steel supporting the atrium skylights).

MAJOR STRUCTURAL SYSTEMS				
SYSTEM	**ACTUAL COST**	**COST PER SF**	**ESTIMATED COST**	**COST PER SF**
Concrete	$ 5,800,000	$ 42.03	$ 6,927,426	$ 50.20
Steel	$ 800,000	$ 5.80	$ 797,602	$ 5.78

Figure 5: Structural Comparison Actual vs. Estimated

These pie charts shown in *figure 6* represent the breakdown of costs for each type of structural system. Actual dollar amounts can be found in *Appendix C*.

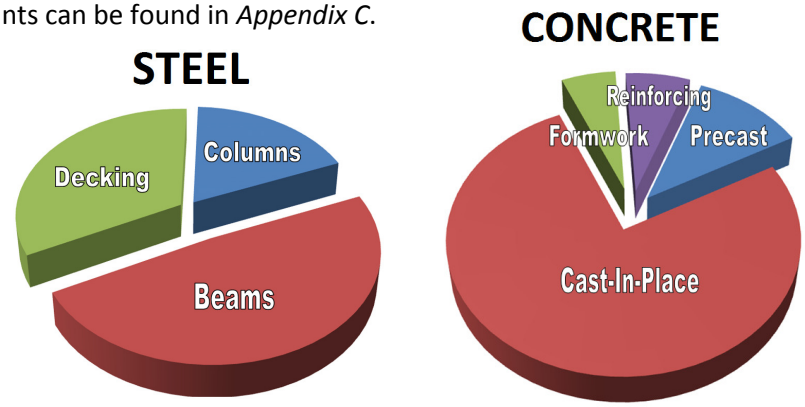


Figure 6: Cost Percentage Breakdowns for Steel & Concrete Systems

Items that the detailed estimate does not include are:

Concrete finishing/curing, bulk heads, expansion/saw cut joints, block outs, masonry CMU, metal wall studs, miscellaneous steel, or percentages for material waste.

All of the unit pricing in this detailed estimate came from RS Means Building Construction 2011. These values were used to determine all material, labor, and equipment costs for the structural system of the University Sciences Building. A location factor was applied at the end of the estimate to accurately adjust the average costs that RS Means supplies to better fit the city that this building is currently being constructed.

Other assumptions and findings can be found at the end of the estimate, located in *Appendix C*. Floor areas were determined using the scaled CAD drawings shown below in *figure 7*.

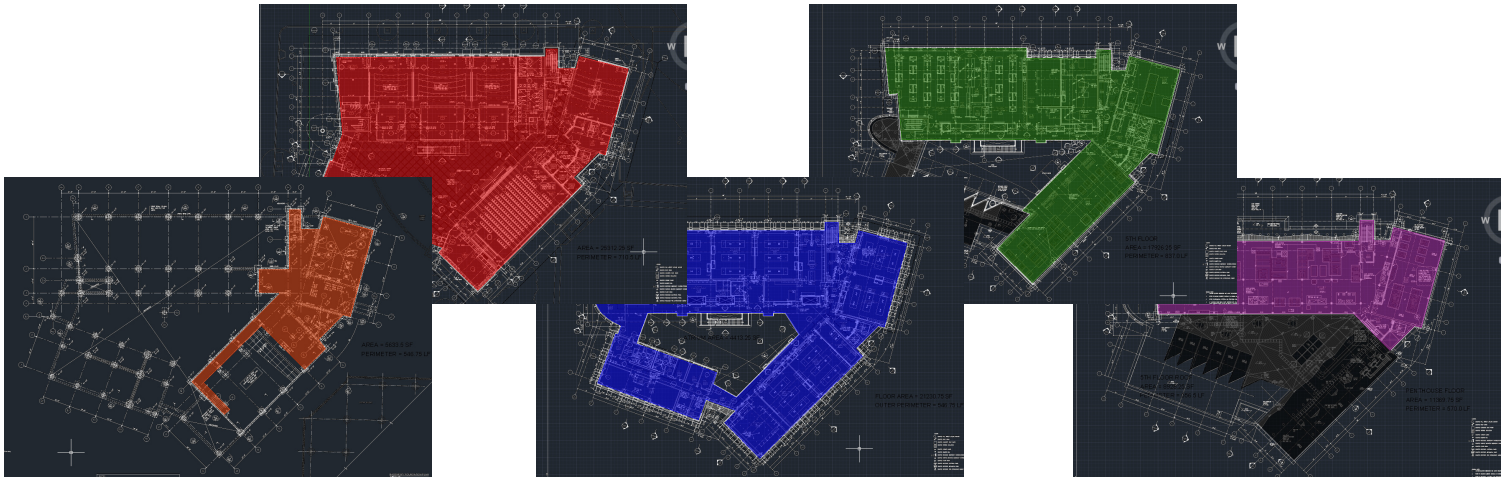


Figure 7: Floor Areas Found in CAD for Quantity Take-offs

GENERAL CONDITIONS ESTIMATE

See APPENDIX D for the complete Structural System Estimate

The estimate, summarized in *figures 8 and 9,* shows the cost breakdown for the general conditions of the University Sciences Building project. All values are an approximation based upon RS Means figures, and do not reflect the actual amounts incurred by Turner construction.

The estimate was broken down into four separate categories: Supervision and Personnel, Construction Facilities and Equipment, Temporary Utilities, and other Miscellaneous Costs. All figures are based on a project duration of 22 months, and a bulk construction period of 20 months.

Supervision and Personnel includes all staffing and project administration for the project. This cost was found to be the largest of the four categories considered, and will be the case for most projects constructed in the United States.

Construction Facilities and Equipment incorporates items such as field office trailer set-up & removal, construction fencing & pedestrian protection, storage, tools & equipment, personal protective equipment, etc.

Temporary Utilities are the most difficult of the four categories to accurately predict without knowing the exact extent and durations for the use of things such as temporary power, water, phone, toilets, etc. on the project.

Miscellaneous Costs account for items such as commissioning, document reproduction, permits, bonding, insurance, travel expenses, etc. These costs account for the second largest contribution to the general conditions estimate. This is true in large part because of the cost of commissioning, permits, bonding, and insurance on the job. Each of these categories is determined by RS Means as a percentage of the overall cost of the project. So the larger the project, the higher the miscellaneous costs incurred.

GENERAL CONDITIONS SUMMARY

Description	Cost/Month	Cost
Supervision and Personnel	$ 68,611	$ 1,509,450
Construction Facilities and Equipment	$ 7,325	$ 161,150
Temporary Utilities	$ 2,350	$ 51,700
Miscellanesous Costs	$ 56,578	$ 1,244,720
TOTAL		$ 2,967,020

Figure 8: General Conditions Breakdown by Category.

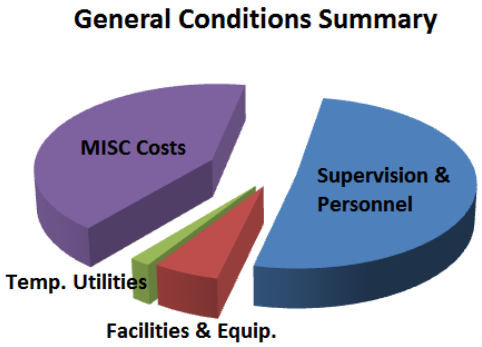


Figure 9: General Conditions by percentage.

CRITICAL INDUSTRY ISSUES – PACE ROUNDTABLE SUMMARY

PACE Roundtable is an event in which both industry professionals and students meet in a relaxed discussion of critical issues present in the construction industry. This year's PACE event was the 19th annual meeting of the minds held on the 27th and 28th of October, 2010. Events included an introductory dinner on the 27th and a series of group discussions the following day. Discussions involved two group sessions, a team building activity, and a group discussion surrounding the difficulty in finding a job in a poor economy.

1st Group Session - Industry Transformations:

This breakout session touched on some of the issues surrounding technology and some of the benefits that can accompany them. Topics included using robots in the field for layout and control, different uses of MEP prefabrication, using Latista software for commissioning/close-out applications, and training/simplification of BIM for project individuals.

One of the more interesting implementations of virtual modeling involves the use of gaming engines to simulate how a building space will look and how its occupants will utilize the space for its intended purpose. You can set tasks for an individual to complete and get instant feedback about how the space will interact.

Building Information Modeling (BIM) was a hot topic of discussion in this first group session. Questions were raised about the various types of training available for BIM, and who should be receiving that training. Will the field/craft embrace BIM? How do we take a complex BIM model and reduce it/simplify it for owners/maintenance personnel on the project? How do individual BIM uses tie together and have a synergistic impact? What is the long term plan/perspective of where BIM will be 10-20 years down the road?

2nd Group Session - Smart Grid Technology:

With natural forms of energy generation increasing, knowledge about the smart grid also needs to increase. Five important categories relating to the smart grid include:

- Power Generation/Distribution
- Advanced Metering (Real Time Feedback)
- Cyber Security
- Distributed Energy Generation
- Energy Efficiency & Controls

Of these categories, power generation/distribution, distributed energy generation, and energy efficiency & controls were said to have the largest impact on buildings.

Power Generation/Distribution

- Power Purchase Agreements - Innovative solar array agreements where people will pay to install photovoltaic panels on roofs and sell the electricity back to the owner at a lower rate.

- Building Integration - The weaving of technology into the building systems. Examples include the mounting of wind turbines to a parapet on a roof or using window systems that have PV cells already incorporated within the glazing.

Distributed Energy Generation

- Solar, Wind, and Geothermal systems are a few of the natural sources of energy that can be used to power either some or all parts of a building.

Energy Efficiency & Controls

- Choose When To Use Energy - Avoid using energy during peak load hours. A simple example that can be followed by all is running your laundry/dishwashing machines at night when power is the cheapest.

- Avoid Vampire/Phantom Loads - Things like cell phone chargers and computers that are plugged into your wall still draw power even when they are completely turned off. Phantom loads for a backup transformer in a building can also be very significant.

- Controls - Money can be saved if each occupant can have control over the temperature in their space. By keeping employees comfortable, better production levels can be reached and only the energy that is needed is supplied to the space, nothing more. Another thing that was mentioned was that it would be easy for solar energy to be used for occupant lighting because LED's use DC power and solar panels generate DC power.

- Load Leveling - One method of limiting the use of energy during peak load hours of the day is through load leveling. This method of energy savings used power and energy at night and releases/uses it throughout the day. Examples include making ice at night and melting it throughout the day for cooling of the building, or charging batteries at night and using them throughout the day as another means of supplying power to various building systems.

Team Building Exercise:

This exercise took place after the morning sessions and involved multiple sets of two teams competing against each other with collaboration and negotiation to build roads and score points. The amount of points earned was based on how many roads a team completed along with their corresponding lengths. The team that scored the most points had convinced the other team to forfeit all of their territories so that the opposing team could maximize the amount of roads that it could construct. The winning side agreed to split the winnings 50/50 in order to score the most points within the entire room, thereby winning the competition.

The thing to take away from this exercise was the need to find a good balance between collaboration & negotiation, and avoid having too much of one or the other.

Finding a Job in a Poor Economy:

The day ended with a discussion of job availability in the industry. A student panel was selected to answer questions and provide topics for discussion/debate.

Things to take away from the discussion and advice given from industry professionals were as follows:

- Be prepared for the interview.
- Focus on a few companies and stay in constant contact with them.
- Be optimistic. Companies are still hiring and Penn State students are at an advantage.
- Take advantage of any and all opportunities. You may not always get your first choice.
- Be flexible, and be prepared to move around a lot early on in your career.

Surprising Thoughts:

BIM is the latest and greatest trend in the industry. New technologies and new methods of construction are helping the construction process by eliminating some of the risk that comes with difficult jobs/owners.

Cyber security is going to be a pretty serious issue in the years to come. Hackers can see when power levels are low, which informs them that people aren't home. They can also disable entire security systems at the click of a button.

Issues That May Be Applied On This Project:

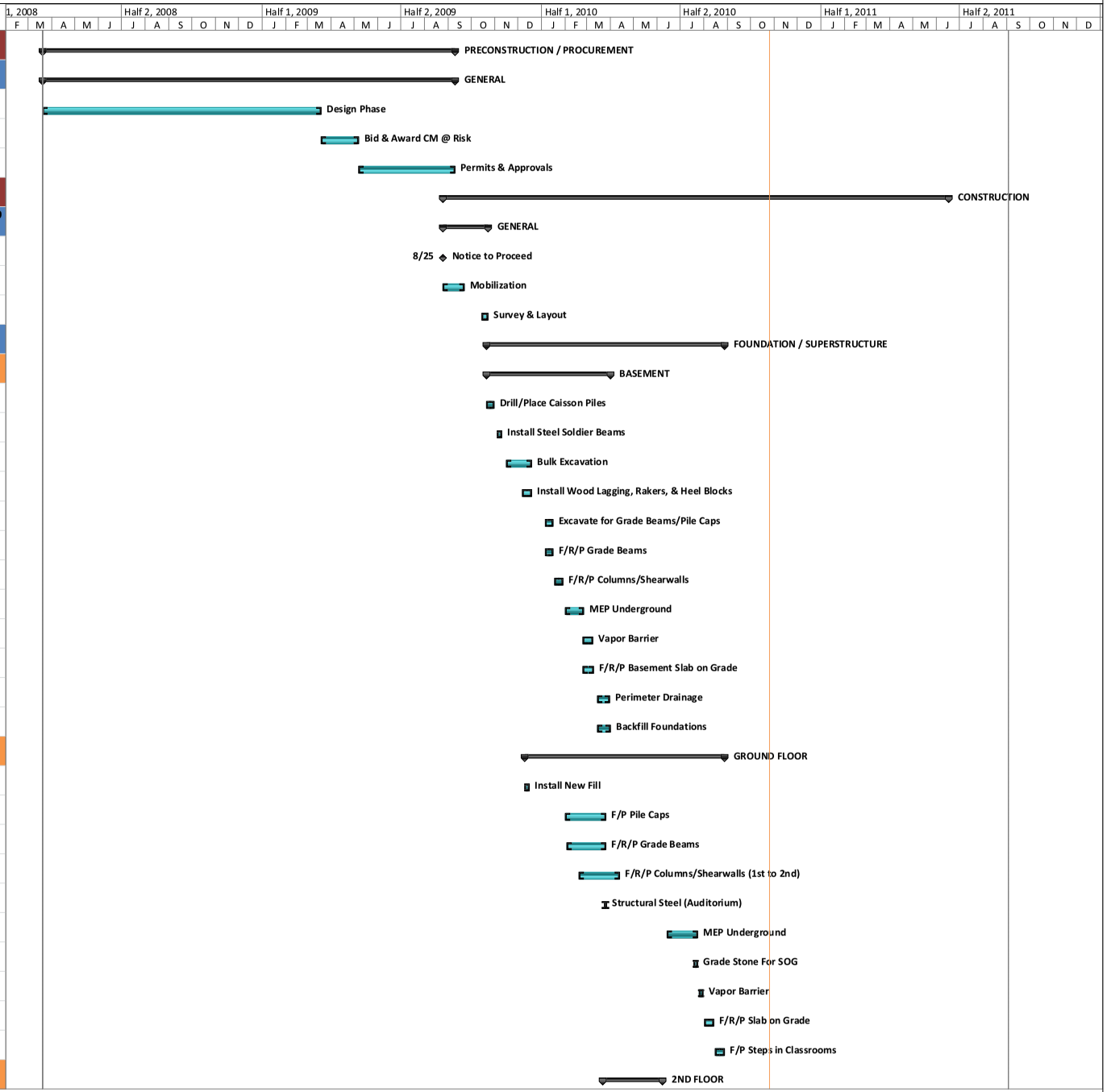
Some of the things that can be studied and applied to the University Sciences Building include the use and implementation of BIM, and the affects it can have on the project. Others include the implementation of PV panels and solar heating to reduce some of the operating costs of the building.

Key Contacts:

All industry professionals were very knowledgeable and had a lot of information to contribute in the discussions throughout the event. Individuals that could be helpful in pursuing research for the University Sciences Building include Stan Carlat with Hensel Phelps Construction, Bill Moyer with James G. Davis Construction, John Bechtel with PSU Office of Physical Plant, Chuck Tomasco with Truland Systems Corporation, and a few other individuals from the breakout sessions.

APPENDIX A - Detailed Project Schedule

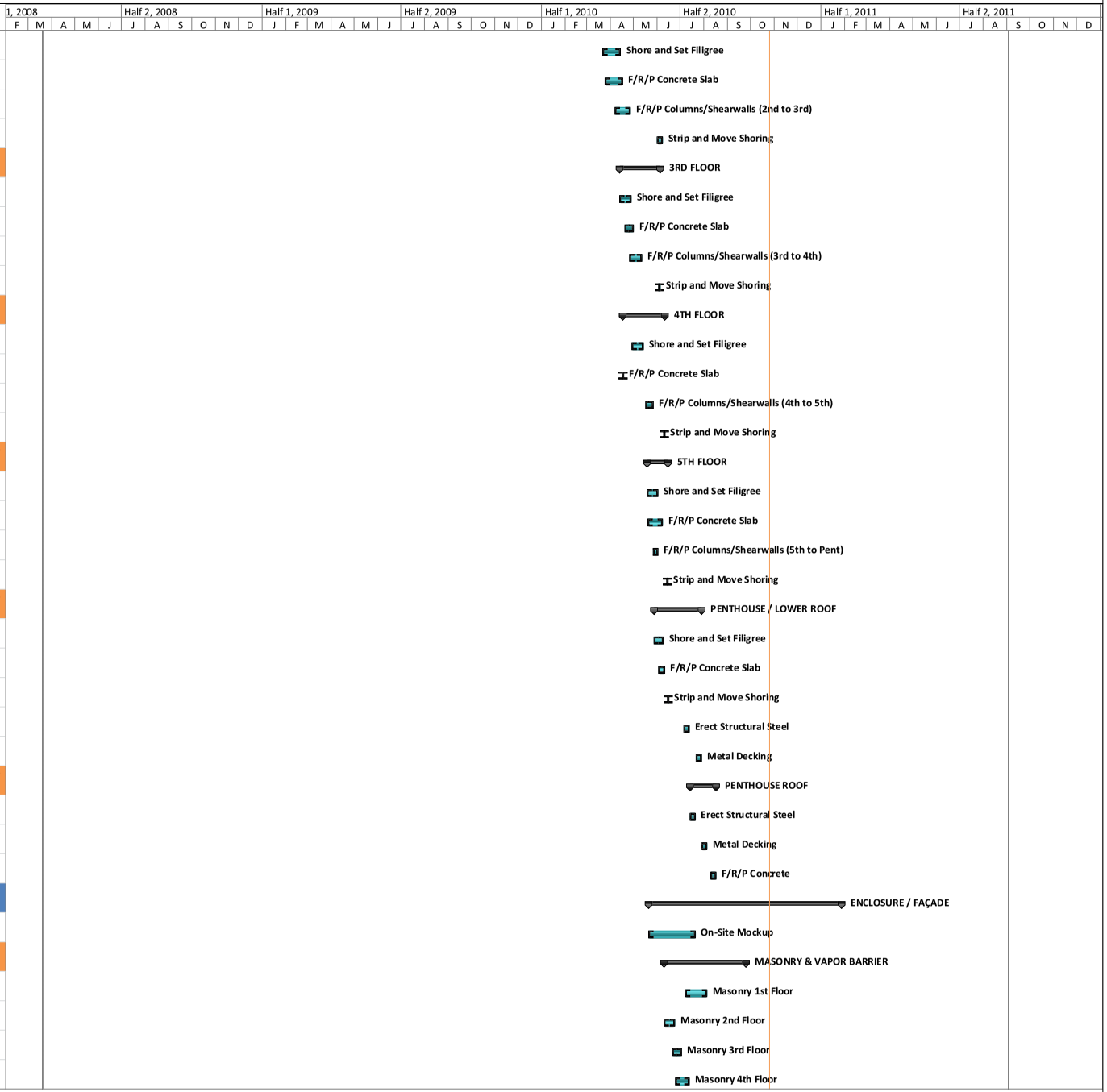
ID	Task Name	Duration	Start	Finish
1	**PRECONSTRUCTION / PROCUREMENT**	**385 days**	**Thu 3/20/08**	**Wed 9/9/09**
2	**GENERAL**	**385 days**	**Thu 3/20/08**	**Wed 9/9/09**
3	Design Phase	260 days	Thu 3/20/08	Wed 3/18/09
4	Bid & Award CM @ Risk	35 days	Thu 3/19/09	Wed 5/6/09
5	Permits & Approvals	90 days	Thu 5/7/09	Wed 9/9/09
6	**CONSTRUCTION**	**473 days?**	**Tue 8/25/09**	**Thu 6/16/11**
7	**GENERAL**	**43 days**	**Tue 8/25/09**	**Thu 10/22/09**
8	Notice to Proceed	0 days	Tue 8/25/09	Tue 8/25/09
9	Mobilization	20 days	Tue 8/25/09	Mon 9/21/09
10	Survey & Layout	6 days	Thu 10/15/09	Thu 10/22/09
11	**FOUNDATION / SUPERSTRUCTURE**	**223 days**	**Wed 10/21/09**	**Fri 8/27/10**
12	**BASEMENT**	116 days	Wed 10/21/09	Wed 3/31/10
13	Drill/Place Caisson Piles	8 days	Wed 10/21/09	Fri 10/30/09
14	Install Steel Soldier Beams	4 days	Wed 11/4/09	Mon 11/9/09
15	Bulk Excavation	25 days	Mon 11/16/09	Fri 12/18/09
16	Install Wood Lagging, Rakers, & Heel Blocks	10 days	Mon 12/7/09	Fri 12/18/09
17	Excavate for Grade Beams/Pile Caps	8 days	Wed 1/6/10	Fri 1/15/10
18	F/R/P Grade Beams	8 days	Wed 1/6/10	Fri 1/15/10
19	F/R/P Columns/Shearwalls	9 days	Mon 1/18/10	Thu 1/28/10
20	MEP Underground	18 days	Mon 2/1/10	Wed 2/24/10
21	Vapor Barrier	9 days	Wed 2/24/10	Mon 3/8/10
22	F/R/P Basement Slab on Grade	10 days	Wed 2/24/10	Tue 3/9/10
23	Perimeter Drainage	12 days	Mon 3/15/10	Tue 3/30/10
24	Backfill Foundations	13 days	Mon 3/15/10	Wed 3/31/10
25	**GROUND FLOOR**	187 days	Thu 12/10/09	Fri 8/27/10
26	Install New Fill	4 days	Thu 12/10/09	Tue 12/15/09
27	F/P Pile Caps	39 days	Mon 2/1/10	Thu 3/25/10
28	F/R/P Grade Beams	37 days	Wed 2/3/10	Thu 3/25/10
29	F/R/P Columns/Shearwalls (1st to 2nd)	37 days	Fri 2/19/10	Mon 4/12/10
30	Structural Steel (Auditorium)	3 days	Wed 3/24/10	Fri 3/26/10
31	MEP Underground	30 days	Mon 6/14/10	Fri 7/23/10
32	Grade Stone For SOG	5 days	Mon 7/19/10	Fri 7/23/10
33	Vapor Barrier	5 days	Mon 7/26/10	Fri 7/30/10
34	F/R/P Slab on Grade	10 days	Mon 8/2/10	Fri 8/13/10
35	F/P Steps in Classrooms	10 days	Mon 8/16/10	Fri 8/27/10
36	**2ND FLOOR**	**56 days**	**Mon 3/22/10**	**Mon 6/7/10**



Project: Detailed Project Schedul
Date: 10/27/2010

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Start-only | Finish-only | Deadline | Progress

ID	Task Name	Duration	Start	Finish
37	Shore and Set Filigree	17 days	Mon 3/22/10	Tue 4/13/10
38	F/R/P Concrete Slab	17 days	Thu 3/25/10	Fri 4/16/10
39	F/R/P Columns/Shearwalls (2nd to 3rd)	14 days	Wed 4/7/10	Mon 4/26/10
40	Strip and Move Shoring	5 days	Tue 6/1/10	Mon 6/7/10
41	**3RD FLOOR**	**39 days**	**Tue 4/13/10**	**Fri 6/4/10**
42	Shore and Set Filigree	11 days	Tue 4/13/10	Tue 4/27/10
43	F/R/P Concrete Slab	9 days	Tue 4/20/10	Fri 4/30/10
44	F/R/P Columns/Shearwalls (3rd to 4th)	12 days	Mon 4/26/10	Tue 5/11/10
45	Strip and Move Shoring	2 days	Thu 6/3/10	Fri 6/4/10
46	**4TH FLOOR**	**39 days**	**Sat 4/17/10**	**Thu 6/10/10**
47	Shore and Set Filigree	11 days	Thu 4/29/10	Thu 5/13/10
48	F/R/P Concrete Slab	1 day	Sat 4/17/10	Sat 4/17/10
49	F/R/P Columns/Shearwalls (4th to 5th)	8 days	Mon 5/17/10	Wed 5/26/10
50	Strip and Move Shoring	1 day	Thu 6/10/10	Thu 6/10/10
51	**5TH FLOOR**	**19 days**	**Wed 5/19/10**	**Mon 6/14/10**
52	Shore and Set Filigree	10 days	Wed 5/19/10	Tue 6/1/10
53	F/R/P Concrete Slab	13 days	Thu 5/20/10	Mon 6/7/10
54	F/R/P Columns/Shearwalls (5th to Pent)	4 days	Thu 5/27/10	Tue 6/1/10
55	Strip and Move Shoring	1 day	Mon 6/14/10	Mon 6/14/10
56	**PENTHOUSE / LOWER ROOF**	**44 days**	**Fri 5/28/10**	**Wed 7/28/10**
57	Shore and Set Filigree	8 days	Fri 5/28/10	Tue 6/8/10
58	F/R/P Concrete Slab	6 days	Thu 6/3/10	Thu 6/10/10
59	Strip and Move Shoring	1 day	Tue 6/15/10	Tue 6/15/10
60	Erect Structural Steel	5 days	Tue 7/6/10	Mon 7/12/10
61	Metal Decking	5 days	Thu 7/22/10	Wed 7/28/10
62	**PENTHOUSE ROOF**	**24 days**	**Wed 7/14/10**	**Mon 8/16/10**
63	Erect Structural Steel	5 days	Wed 7/14/10	Tue 7/20/10
64	Metal Decking	5 days	Thu 7/29/10	Wed 8/4/10
65	F/R/P Concrete	5 days	Tue 8/10/10	Mon 8/16/10
66	**ENCLOSURE / FAÇADE**	**180 days**	**Fri 5/21/10**	**Thu 1/27/11**
67	On-Site Mockup	43 days	Fri 5/21/10	Tue 7/20/10
68	**MASONRY & VAPOR BARRIER**	**77 days**	**Thu 6/10/10**	**Fri 9/24/10**
69	Masonry 1st Floor	20 days	Thu 7/8/10	Wed 8/4/10
70	Masonry 2nd Floor	10 days	Thu 6/10/10	Wed 6/23/10
71	Masonry 3rd Floor	10 days	Mon 6/21/10	Fri 7/2/10
72	Masonry 4th Floor	12 days	Fri 6/25/10	Mon 7/12/10



Project: Detailed Project Schedul
Date: 10/27/2010

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Start-only | Finish-only | Deadline | Progress

ID	Task Name	Duration	Start	Finish
73	Masonry 5th Floor	12 days	Thu 7/1/10	Fri 7/16/10
74	Vapor Barrier Facing "33" Street	10 days	Mon 7/19/10	Fri 7/30/10
75	Vapor Barrier Facing "K" Building	10 days	Mon 8/9/10	Fri 8/20/10
76	Vapor Barrier Facing "C" Street	10 days	Mon 8/30/10	Fri 9/10/10
77	Vapor Barrier Facing "S" Building	10 days	Mon 9/13/10	Fri 9/24/10
78	**CURTAINWALL & WINDOWS**	**114 days**	**Mon 7/12/10**	**Thu 12/16/10**
79	Unitized - Fin - Facing "C" Street	17 days	Mon 7/12/10	Tue 8/3/10
80	Unitized - Fin - Facing "33" Street	18 days	Wed 7/14/10	Fri 8/6/10
81	Unitized - Fin - Facing "K" Building	5 days	Wed 7/21/10	Tue 7/27/10
82	Unitized - Fin - Facing "S" Building	3 days	Wed 8/4/10	Fri 8/6/10
83	Stick - Louvers - Facing "33" Street	14 days	Tue 7/27/10	Fri 8/13/10
84	Stick - Louvers - Facing "C" Street	28 days	Tue 9/14/10	Thu 10/21/10
85	Misc. - Louvers	10 days	Mon 8/30/10	Fri 9/10/10
86	Misc. - Panel Frames	5 days	Mon 9/13/10	Fri 9/17/10
87	Unitized - Panels/Windows - "33" Street	8 days	Wed 8/11/10	Fri 8/20/10
88	Unitized - Panels/Windows - "K" Building	8 days	Fri 8/13/10	Tue 8/24/10
89	Unitized - Panels/Windows - "C" Street	3 days	Mon 8/16/10	Wed 8/18/10
90	Unitized - Panels/Windows - "S" Building	5 days	Wed 8/18/10	Tue 8/24/10
91	Stick - Facing "33" Street	29 days	Wed 8/4/10	Mon 9/13/10
92	Stick - Facing "S" Building	9 days	Thu 9/16/10	Tue 9/28/10
93	Stick - Facing "C" Street	11 days	Wed 9/22/10	Wed 10/6/10
94	Stick - Rotunda	21 days	Thu 11/18/10	Thu 12/16/10
95	Stick - Atrium Skylight	38 days	Fri 10/1/10	Tue 11/23/10
96	Skylight	3 days	Mon 9/20/10	Wed 9/22/10
97	**STONE & METAL EXTERIOR PANELS**	**129 days**	**Mon 8/2/10**	**Thu 1/27/11**
98	Framing and Girts - Facing "33" Street	20 days	Mon 8/23/10	Fri 9/17/10
99	Framing and Girts - Facing "C" Street	15 days	Mon 9/13/10	Fri 10/1/10
100	Framing and Girts - Facing "K" Building	19 days	Mon 9/20/10	Thu 10/14/10
101	Framing and Girts - Facing "S" Building	22 days	Mon 9/27/10	Tue 10/26/10
102	Exterior Insulation - Facing "33" Street	17 days	Mon 9/6/10	Tue 9/28/10
103	Exterior Insulation - Facing "K" Building	16 days	Mon 10/4/10	Mon 10/25/10
104	Exterior Insulation - Facing "C" Street	12 days	Tue 10/26/10	Wed 11/10/10
105	Exterior Insulation - Facing "S" Building	19 days	Thu 11/11/10	Tue 12/7/10
106	Stone Panels - Facing "33" Street	17 days	Tue 10/26/10	Wed 11/17/10
107	Stone Panels - Facing "K" Building	16 days	Thu 11/18/10	Thu 12/9/10
108	Stone Panels - Facing "C" Street	15 days	Fri 12/10/10	Thu 12/30/10

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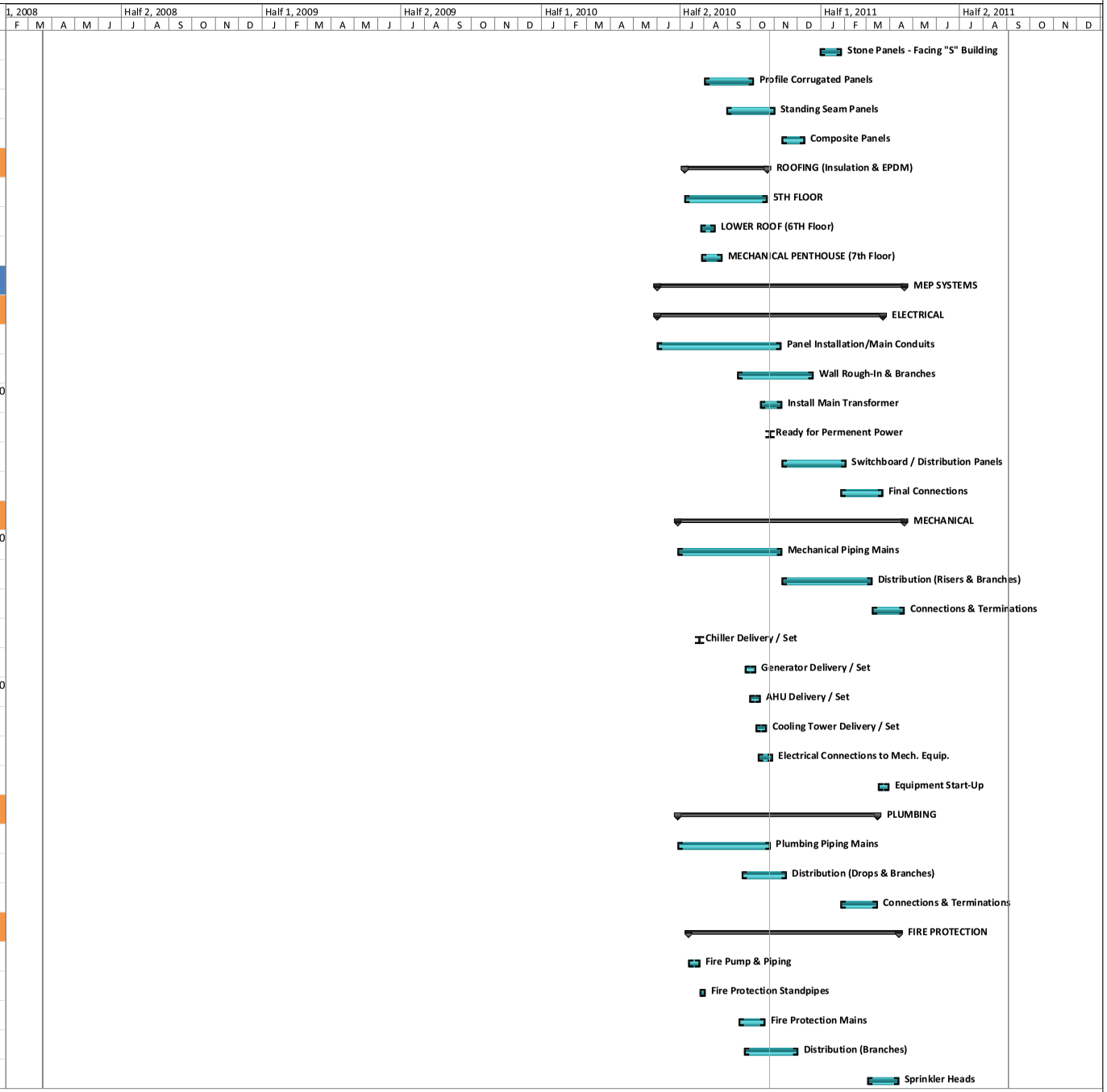
Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Start-only | Finish-only | Deadline | Progress

ID	Task Name	Duration	Start	Finish
109	Stone Panels - Facing "S" Building	20 days	Fri 12/31/10	Thu 1/27/11
110	Profile Corrugated Panels	46 days	Mon 8/2/10	Mon 10/4/10
111	Standing Seam Panels	45 days	Tue 8/31/10	Mon 11/1/10
112	Composite Panels	22 days	Thu 11/11/10	Fri 12/10/10
113	**ROOFING (Insulation & EPDM)**	**78 days**	**Wed 7/7/10**	**Fri 10/22/10**
114	5TH FLOOR	78 days	Wed 7/7/10	Fri 10/22/10
115	LOWER ROOF (6TH Floor)	14 days	Wed 7/28/10	Sun 8/15/10
116	MECHANICAL PENTHOUSE (7th Floor)	19 days	Thu 7/29/10	Tue 8/24/10
117	**MEP SYSTEMS**	**231 days**	**Tue 6/1/10**	**Tue 4/19/11**
118	**ELECTRICAL**	**211 days**	**Tue 6/1/10**	**Tue 3/22/11**
119	Panel Installation/Main Conduits	116 days	Tue 6/1/10	Tue 11/9/10
120	Wall Rough-In & Branches	71 days	Tue 9/14/10	Tue 12/21/10
121	Install Main Transformer	20 days	Thu 10/14/10	Wed 11/10/10
122	Ready for Permenent Power	1 day	Tue 10/26/10	Tue 10/26/10
123	Switchboard / Distribution Panels	60 days	Thu 11/11/10	Wed 2/2/11
124	Final Connections	39 days	Thu 1/27/11	Tue 3/22/11
125	**MECHANICAL**	**212 days**	**Mon 6/28/10**	**Tue 4/19/11**
126	Mechanical Piping Mains	98 days	Mon 6/28/10	Wed 11/10/10
127	Distribution (Risers & Branches)	84 days	Thu 11/11/10	Tue 3/8/11
128	Connections & Terminations	30 days	Wed 3/9/11	Tue 4/19/11
129	Chiller Delivery / Set	1 day	Mon 7/26/10	Mon 7/26/10
130	Generator Delivery / Set	10 days	Fri 9/24/10	Thu 10/7/10
131	AHU Delivery / Set	10 days	Thu 9/30/10	Wed 10/13/10
132	Cooling Tower Delivery / Set	10 days	Fri 10/8/10	Thu 10/21/10
133	Electrical Connections to Mech. Equip.	15 days	Mon 10/11/10	Fri 10/29/10
134	Equipment Start-Up	10 days	Thu 3/17/11	Wed 3/30/11
135	**PLUMBING**	**187 days**	**Mon 6/28/10**	**Tue 3/15/11**
136	Plumbing Piping Mains	87 days	Mon 6/28/10	Tue 10/26/10
137	Distribution (Drops & Branches)	42 days	Mon 9/20/10	Tue 11/16/10
138	Connections & Terminations	34 days	Thu 1/27/11	Tue 3/15/11
139	**FIRE PROTECTION**	**197 days**	**Mon 7/12/10**	**Tue 4/12/11**
140	Fire Pump & Piping	11 days	Mon 7/12/10	Mon 7/26/10
141	Fire Protection Standpipes	5 days	Tue 7/27/10	Mon 8/2/10
142	Fire Protection Mains	24 days	Thu 9/16/10	Tue 10/19/10
143	Distribution (Branches)	50 days	Thu 9/23/10	Wed 12/1/10
144	Sprinkler Heads	29 days	Thu 3/3/11	Tue 4/12/11



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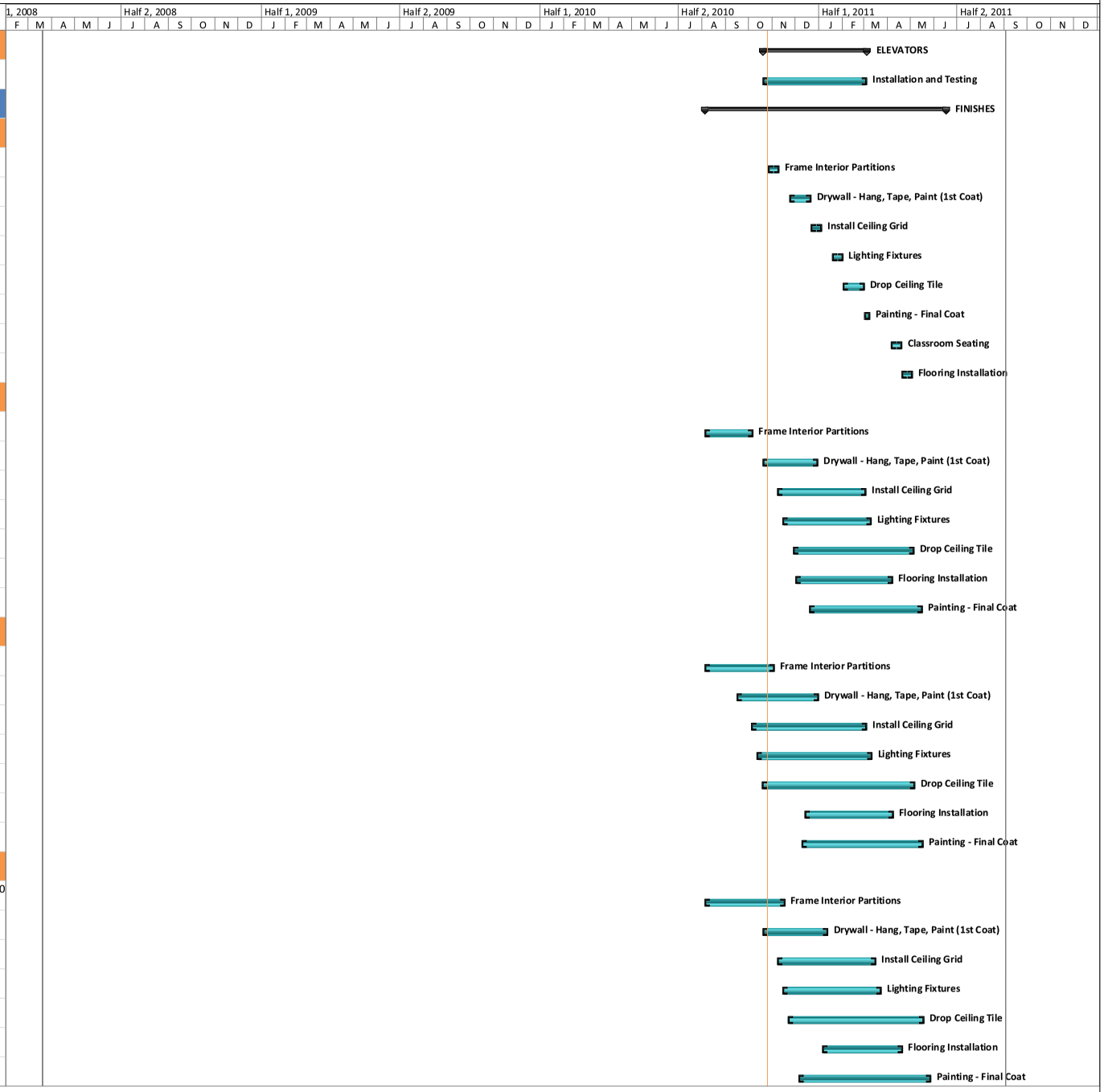
Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Start-only | Finish-only | Deadline | Progress

ID	Task Name	Duration	Start	Finish
145	**ELEVATORS**	**98 days**	**Wed 10/20/10**	**Fri 3/4/11**
146	Installation and Testing	98 days	Wed 10/20/10	Fri 3/4/11
147	**FINISHES**	**226 days?**	**Thu 8/5/10**	**Thu 6/16/11**
148	**GROUND FLOOR**			
149	Frame Interior Partitions	10 days	Wed 10/27/10	Tue 11/9/10
150	Drywall - Hang, Tape, Paint (1st Coat)	20 days	Wed 11/24/10	Tue 12/21/10
151	Install Ceiling Grid	10 days	Wed 12/22/10	Tue 1/4/11
152	Lighting Fixtures	10 days	Wed 1/19/11	Tue 2/1/11
153	Drop Ceiling Tile	20 days	Wed 2/2/11	Tue 3/1/11
154	Painting - Final Coat	5 days	Wed 3/2/11	Tue 3/8/11
155	Classroom Seating	10 days	Wed 4/6/11	Tue 4/19/11
156	Flooring Installation	10 days	Wed 4/20/11	Tue 5/3/11
157	**2ND FLOOR**			
158	Frame Interior Partitions	45 days	Thu 8/5/10	Wed 10/6/10
159	Drywall - Hang, Tape, Paint (1st Coat)	52 days	Wed 10/20/10	Thu 12/30/10
160	Install Ceiling Grid	84 days	Mon 11/8/10	Thu 3/3/11
161	Lighting Fixtures	84 days	Mon 11/15/10	Thu 3/10/11
162	Drop Ceiling Tile	114 days	Mon 11/29/10	Thu 5/5/11
163	Flooring Installation	91 days	Thu 12/2/10	Thu 4/7/11
164	Painting - Final Coat	106 days	Mon 12/20/10	Mon 5/16/11
165	**3RD FLOOR**			
166	Frame Interior Partitions	65 days	Thu 8/5/10	Wed 11/3/10
167	Drywall - Hang, Tape, Paint (1st Coat)	77 days	Thu 9/16/10	Fri 12/31/10
168	Install Ceiling Grid	109 days	Tue 10/5/10	Fri 3/4/11
169	Lighting Fixtures	109 days	Tue 10/12/10	Fri 3/11/11
170	Drop Ceiling Tile	144 days	Tue 10/19/10	Fri 5/6/11
171	Flooring Installation	84 days	Tue 12/14/10	Fri 4/8/11
172	Painting - Final Coat	113 days	Fri 12/10/10	Tue 5/17/11
173	**4TH FLOOR**			
174	Frame Interior Partitions	75 days	Thu 8/5/10	Wed 11/17/10
175	Drywall - Hang, Tape, Paint (1st Coat)	61 days	Wed 10/20/10	Wed 1/12/11
176	Install Ceiling Grid	93 days	Mon 11/8/10	Wed 3/16/11
177	Lighting Fixtures	93 days	Mon 11/15/10	Wed 3/23/11
178	Drop Ceiling Tile	128 days	Mon 11/22/10	Wed 5/18/11
179	Flooring Installation	75 days	Thu 1/6/11	Wed 4/20/11
180	Painting - Final Coat	125 days	Mon 12/6/10	Fri 5/27/11



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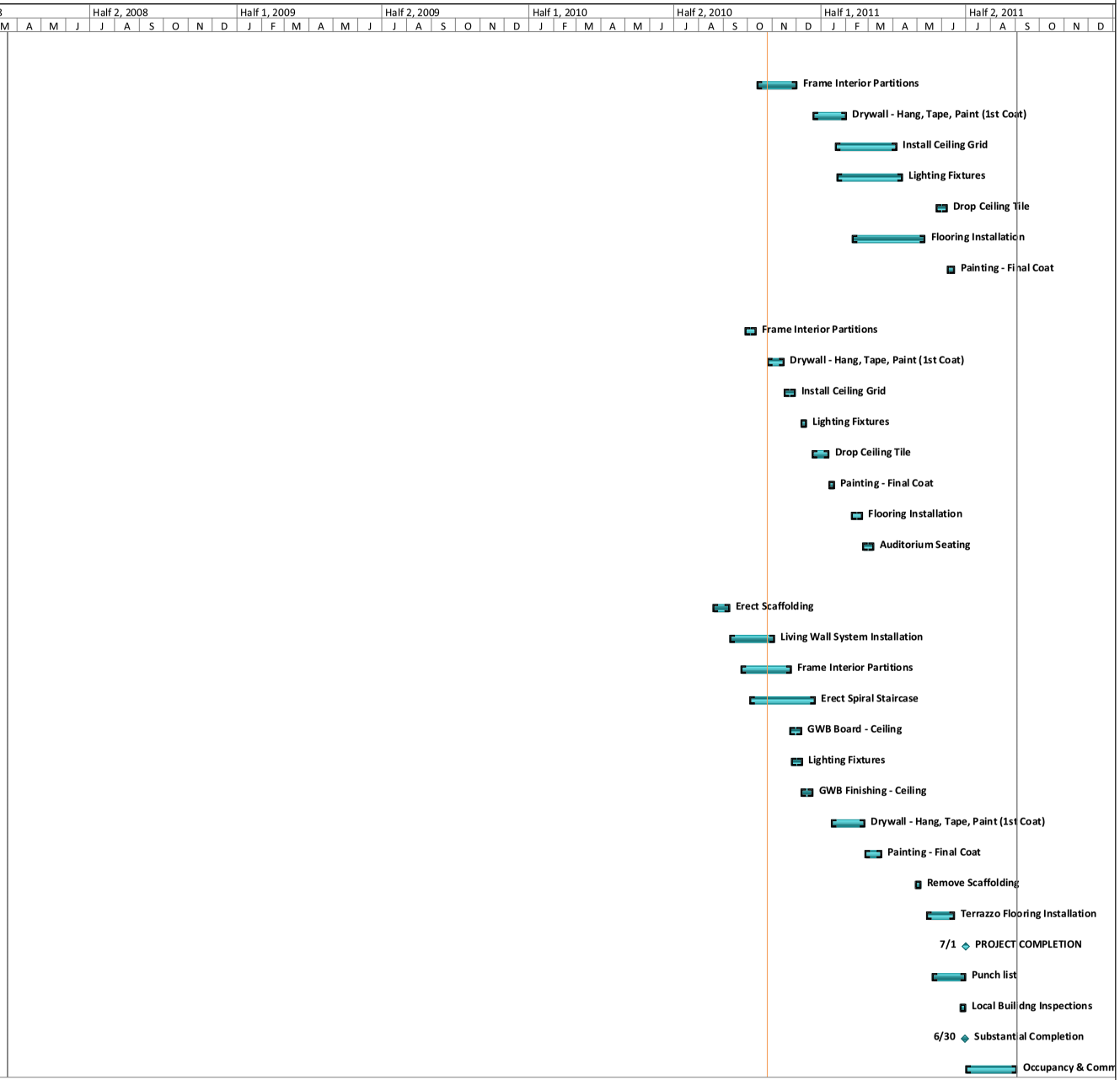
Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Start-only | Finish-only | Deadline | Progress

ID	Task Name	Duration	Start	Finish
181	**5TH FLOOR**			
182	Frame Interior Partitions	36 days	Wed 10/13/10	Wed 12/1/10
183	Drywall - Hang, Tape, Paint (1st Coat)	30 days	Wed 12/22/10	Tue 2/1/11
184	Install Ceiling Grid	55 days	Wed 1/19/11	Tue 4/5/11
185	Lighting Fixtures	58 days	Fri 1/21/11	Tue 4/12/11
186	Drop Ceiling Tile	10 days	Wed 5/25/11	Tue 6/7/11
187	Flooring Installation	65 days	Wed 2/9/11	Tue 5/10/11
188	Painting - Final Coat	7 days	Wed 6/8/11	Thu 6/16/11
189	**AUDITORIUM**			
190	Frame Interior Partitions	10 days	Tue 9/28/10	Mon 10/11/10
191	Drywall - Hang, Tape, Paint (1st Coat)	15 days	Tue 10/26/10	Mon 11/15/10
192	Install Ceiling Grid	10 days	Tue 11/16/10	Mon 11/29/10
193	Lighting Fixtures	5 days	Tue 12/7/10	Mon 12/13/10
194	Drop Ceiling Tile	15 days	Tue 12/21/10	Mon 1/10/11
195	Painting - Final Coat	5 days	Tue 1/11/11	Mon 1/17/11
196	Flooring Installation	10 days	Tue 2/8/11	Mon 2/21/11
197	Auditorium Seating	10 days	Tue 2/22/11	Mon 3/7/11
198	**ATRIUM**			
199	Erect Scaffolding	15 days	Thu 8/19/10	Wed 9/8/10
200	Living Wall System Installation	40 days	Thu 9/9/10	Wed 11/3/10
201	Frame Interior Partitions	45 days	Thu 9/23/10	Wed 11/24/10
202	Erect Spiral Staircase	60 days	Mon 10/4/10	Fri 12/24/10
203	GWB Board - Ceiling	11 days	Tue 11/23/10	Tue 12/7/10
204	Lighting Fixtures	10 days	Thu 11/25/10	Wed 12/8/10
205	GWB Finishing - Ceiling	11 days	Tue 12/7/10	Tue 12/21/10
206	Drywall - Hang, Tape, Paint (1st Coat)	30 days	Fri 1/14/11	Thu 2/24/11
207	Painting - Final Coat	15 days	Fri 2/25/11	Thu 3/17/11
208	Remove Scaffolding	5 days	Fri 4/29/11	Thu 5/5/11
209	Terrazzo Flooring Installation	25 days	Fri 5/13/11	Thu 6/16/11
210	**PROJECT COMPLETION**	**0 days**	**Fri 7/1/11**	**Fri 7/1/11**
211	Punch list	30 days	Fri 5/20/11	Thu 6/30/11
212	Local Builidng Inspections	5 days	Fri 6/24/11	Thu 6/30/11
213	Substantial Completion	0 days	Thu 6/30/11	Thu 6/30/11
214	Occupancy & Commissioning	46 days	Fri 7/1/11	Fri 9/2/11



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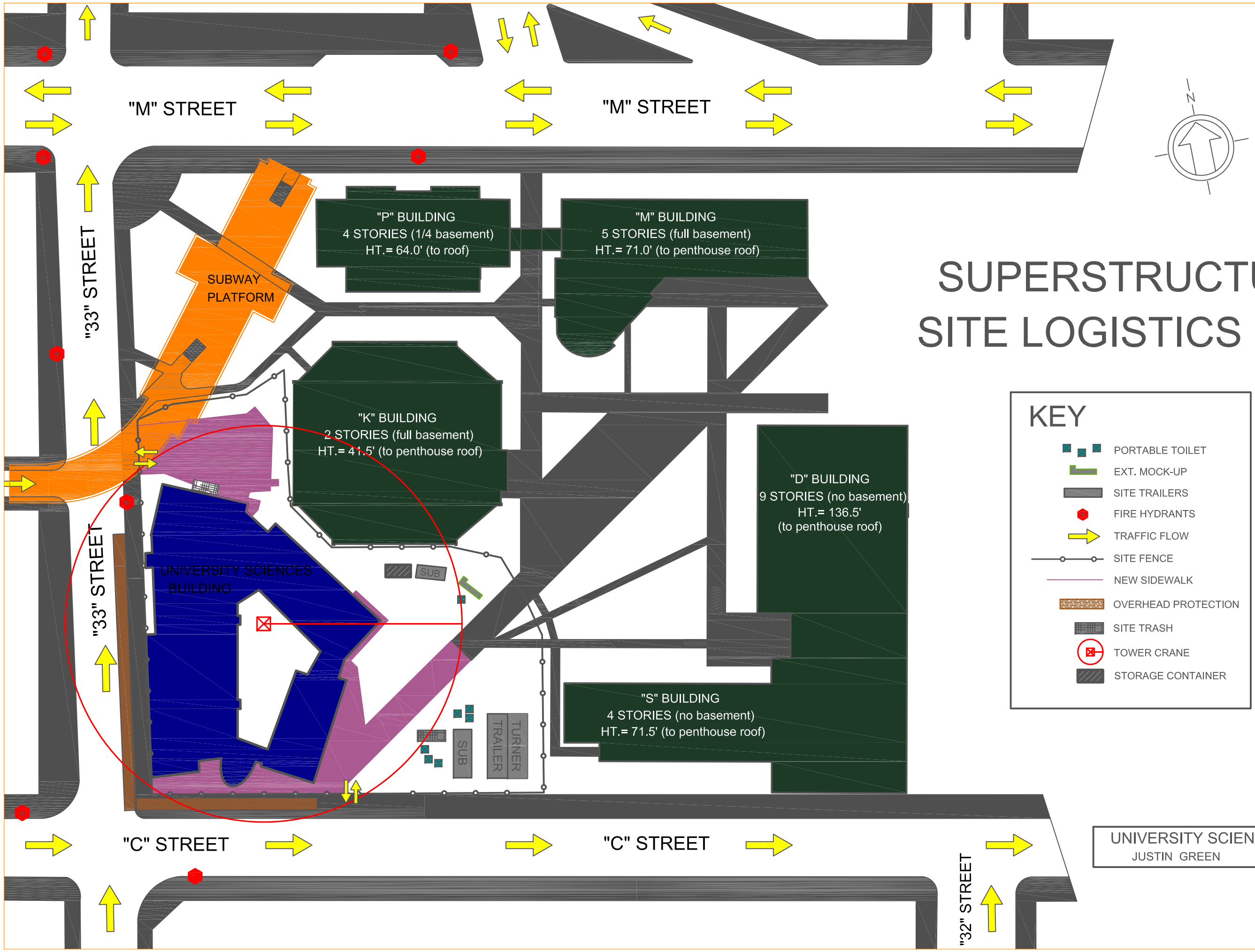
Task	Summary	External Milestone	Inactive Summary	Manual Summary Rollup	Deadline				
Split	Project Summary	Inactive Task	Manual Task	Start-only	Progress				
Milestone	External Tasks	Inactive Milestone	Duration-only	Finish-only					

APPENDIX B - Site Logistics Plan of Superstructure



SUPERSTRUCTURE SITE LOGISTICS PLAN

KEY

- PORTABLE TOILET
- EXT. MOCK-UP
- SITE TRAILERS
- FIRE HYDRANTS
- TRAFFIC FLOW
- SITE FENCE
- NEW SIDEWALK
- OVERHEAD PROTECTION
- SITE TRASH
- TOWER CRANE
- STORAGE CONTAINER

UNIVERSITY SCIENCES BUILDING
JUSTIN GREEN 10 / 27 / 2010

APPENDIX C - Detailed Structural Takeoff with RS Means Data

DETAILED STRUCTURAL SYSTEMS ESTIMATE SUMMARY

TYPE	DESCRIPTION	QUANTITY	UNIT	MATERIAL UNIT RATE	MATERIAL COST	LABOR UNIT RATE	LABOR COST	EQUIPMENT UNIT RATE	EQUIPMENT COST	TOTAL COST
Structural Steel										
Steel Column (28)	W8x40 - 22'6"	630.000	LF	59.50	$ 37,485.00	4.82	$ 3,036.60	2.95	$ 1,858.50	$ 42,380.10
Steel Column (17)	W8x48 - 22'6"	382.500	LF	59.50	$ 22,758.75	4.82	$ 1,843.65	2.95	$ 1,128.38	$ 25,730.78
Steel Column (7)	W8x48 - 29'9"	208.250	LF	59.50	$ 12,390.88	4.82	$ 1,003.77	2.95	$ 614.34	$ 14,008.98
Steel Column (1)	W8x67 - 29'9"	29.750	LF	59.50	$ 1,770.13	4.82	$ 143.40	2.95	$ 87.76	$ 2,001.28
Steel Column (1)	W12x65 - 22'6"	22.500	LF	59.50	$ 1,338.75	4.82	$ 108.45	2.95	$ 66.38	$ 1,513.58
Steel Beam (8)	Auditorium - W10x26 - 15'0"	120.000	LF	32.00	$ 3,840.00	4.42	$ 530.40	2.70	$ 324.00	$ 4,694.40
Steel Beam (8)	Auditorium - W12x26 - 40'0"	320.000	LF	32.00	$ 10,240.00	3.01	$ 963.20	1.84	$ 588.80	$ 11,792.00
Steel Beam (2)	Auditorium - W24x103 - 44'0"	88.000	LF	129.00	$ 11,352.00	3.65	$ 321.20	1.65	$ 145.20	$ 11,818.40
Steel Beam (7)	5th FL - W18x35 - 21'0"	147.000	LF	43.50	$ 6,394.50	3.99	$ 586.53	1.80	$ 264.60	$ 7,245.63
Steel Beam (3)	5th FL - W18x40 - 21'0"	63.000	LF	49.50	$ 3,118.50	3.99	$ 251.37	1.80	$ 113.40	$ 3,483.27
Steel Beam (7)	5th FL - W21x44 - 36'6"	255.500	LF	54.50	$ 13,924.75	3.60	$ 919.80	1.63	$ 416.47	$ 15,261.02
Steel Beam (1)	5th FL - W21x48 - 21'0"	21.000	LF	62.00	$ 1,302.00	3.60	$ 75.60	1.63	$ 34.23	$ 1,411.83
Steel Beam (1)	5th FL - W21x50 - 36'6"	36.500	LF	62.00	$ 2,263.00	3.60	$ 131.40	1.63	$ 59.50	$ 2,453.90
Steel Beam (1)	5th FL - W21x62 - 36'6"	36.500	LF	76.50	$ 2,792.25	3.70	$ 135.05	1.67	$ 60.96	$ 2,988.26
Steel Beam (1)	5th FL - W21x68 - 36'6"	36.500	LF	84.00	$ 3,066.00	3.70	$ 135.05	1.67	$ 60.96	$ 3,262.01
Steel Beam	Atrium - W8x10 - 322'	322	LF	12.40	$ 3,992.80	4.42	$ 1,423.24	2.70	$ 869.40	$ 6,285.44
Steel Beam	Atrium - W8x15 - 9'	9	LF	18.55	$ 166.95	4.42	$ 39.78	2.70	$ 24.30	$ 231.03
Steel Beam	Atrium - W8x35 - 59'	59	LF	43.50	$ 2,566.50	4.82	$ 284.38	2.95	$ 174.05	$ 3,024.93
Steel Beam	Atrium - W10x12 - 21'	12	LF	14.85	$ 178.20	4.42	$ 53.04	2.70	$ 32.40	$ 263.64
Steel Beam	Atrium - W12x14 - 47'	47	LF	19.80	$ 930.60	3.01	$ 141.47	1.84	$ 86.48	$ 1,158.55
Steel Beam	Atrium - W12x152 - 11'	11	LF	108.00	$ 1,188.00	4.14	$ 45.54	2.53	$ 27.83	$ 1,261.37
Steel Beam	Atrium - W14x22 - 117'	117	LF	32.00	$ 3,744.00	2.68	$ 313.56	1.64	$ 191.88	$ 4,249.44
Steel Beam	Atrium - W18x35 - 47'	47	LF	43.50	$ 2,044.50	3.99	$ 187.53	1.80	$ 84.60	$ 2,316.63
Steel Beam	Atrium - W18x40 - 31'	31	LF	49.50	$ 1,534.50	3.99	$ 123.69	1.80	$ 55.80	$ 1,713.99
Steel Beam	Atrium - W18x65 - 40'	40	LF	80.50	$ 3,220.00	4.26	$ 170.40	1.92	$ 76.80	$ 3,467.20
Steel Beam	Atrium - W21x44 - 23'	23	LF	54.50	$ 1,253.50	3.60	$ 82.80	1.63	$ 37.49	$ 1,373.79
Steel Beam	Atrium - W21x48 - 17'	17	LF	62.00	$ 1,054.00	3.60	$ 61.20	1.63	$ 27.71	$ 1,142.91
Steel Beam	Atrium - W21x93 - 43'	43	LF	115.00	$ 4,945.00	3.83	$ 164.69	1.73	$ 74.39	$ 5,184.08
Steel Beam	Atrium - W21x101 - 110'	110	LF	125.00	$ 13,750.00	3.83	$ 421.30	1.73	$ 190.30	$ 14,361.60
Steel Beam	Atrium - W21x111 - 20'	20	LF	151.00	$ 3,020.00	3.83	$ 76.60	1.73	$ 34.60	$ 3,131.20
Steel Beam	Atrium - W21x166 - 150'	150	LF	151.00	$ 22,650.00	3.83	$ 574.50	1.73	$ 259.50	$ 23,484.00
Steel Beam	Pent - W8x10 - 253'	253	LF	12.40	$ 3,137.20	4.42	$ 1,118.26	2.70	$ 683.10	$ 4,938.56
Steel Beam	Pent - W8x15 - 84'	84	LF	18.55	$ 1,558.20	4.42	$ 371.28	2.70	$ 226.80	$ 2,156.28
Steel Beam	Pent - W8x24 - 165'	165	LF	29.50	$ 4,867.50	4.82	$ 795.30	2.95	$ 486.75	$ 6,149.55
Steel Beam	Pent - W10x12 - 12'	12	LF	14.85	$ 178.20	4.42	$ 53.04	2.70	$ 32.40	$ 263.64
Steel Beam	Pent - W10x15 - 96'	96	LF	18.55	$ 1,780.80	4.42	$ 424.32	2.70	$ 259.20	$ 2,464.32
Steel Beam	Pent - W12x14 - 68'	68	LF	19.80	$ 1,346.40	3.01	$ 204.68	1.84	$ 125.12	$ 1,676.20
Steel Beam	Pent - W12x16 - 24'	24	LF	19.80	$ 475.20	3.01	$ 72.24	1.84	$ 44.16	$ 591.60
Steel Beam	Pent - W14x22 - 252'	252	LF	32.00	$ 8,064.00	2.68	$ 675.36	1.64	$ 413.28	$ 9,152.64
Steel Beam	Pent - W14x30 - 38'	38	LF	37.00	$ 1,406.00	2.95	$ 112.10	1.80	$ 68.40	$ 1,586.50
Steel Beam	Pent - W14x38 - 14'	14	LF	42.00	$ 588.00	3.27	$ 45.78	2.00	$ 28.00	$ 661.78
Steel Beam	Pent - W16x26 - 115'	115	LF	32.00	$ 3,680.00	2.65	$ 304.75	1.62	$ 186.30	$ 4,171.05
Steel Beam	Pent - W16x31 - 293'	293	LF	38.50	$ 11,280.50	2.95	$ 864.35	1.80	$ 527.40	$ 12,672.25
Steel Beam	Pent - W18x35 -226'	226	LF	43.50	$ 9,831.00	3.99	$ 901.74	1.80	$ 406.80	$ 11,139.54
Steel Beam	Pent - W18x40 - 195'	195	LF	49.50	$ 9,652.50	3.99	$ 778.05	1.80	$ 351.00	$ 10,781.55
Steel Beam	Pent - W18x46 - 148'	148	LF	57.00	$ 8,436.00	3.99	$ 590.52	1.80	$ 266.40	$ 9,292.92

Steel Beam	Pent - W18x50 - 21'	21	LF	62.00	$ 1,302.00	4.20	$ 88.20	1.90	$ 39.90	$ 1,430.10
Steel Beam	Pent - W18x55 - 42'	42	LF	68.00	$ 2,856.00	4.20	$ 176.40	1.90	$ 79.80	$ 3,112.20
Steel Beam	Pent - W21x44 - 17'	17	LF	54.50	$ 926.50	3.60	$ 61.20	1.63	$ 27.71	$ 1,015.41
Steel Beam	Pent - W24x84 - 19'	19	LF	103.00	$ 1,957.00	3.83	$ 72.77	1.73	$ 32.87	$ 2,062.64
Steel Beam	Pent Roof - W10x30 - 120'	120	LF	41.00	$ 4,920.00	4.82	$ 578.40	2.95	$ 354.00	$ 5,852.40
Steel Beam	Pent Roof - W10x33 - 54'	54	LF	41.00	$ 2,214.00	4.82	$ 260.28	2.95	$ 159.30	$ 2,633.58
* Doesn't include Steel at Skylights										
	Totals:				**$ 280,732**		**$ 22,898**		**$ 12,870**	**$ 316,500**

TYPE	DESCRIPTION	QUANTITY	UNIT	MATERIAL UNIT RATE	MATERIAL COST	LABOR UNIT RATE	LABOR COST	EQUIPMENT UNIT RATE	EQUIPMENT COST	TOTAL COST
Precast Filigree Slabs										
Precast	2nd FL - 2.25" typ. Filigree Slab	21230.75	SF	7.25	$ 153,922.94	1.30	$ 27,599.98	0.42	$ 8,916.92	$ 190,439.83
Precast	3rd FL - 2.25" typ. Filigree Slab	21230.75	SF	7.25	$ 153,922.94	1.30	$ 27,599.98	0.42	$ 8,916.92	$ 190,439.83
Precast	4th FL - 2.25" typ. Filigree Slab	21230.75	SF	7.25	$ 153,922.94	1.30	$ 27,599.98	0.42	$ 8,916.92	$ 190,439.83
Precast	5th FL - 2.25" typ. Filigree Slab	17926.25	SF	7.25	$ 129,965.31	1.30	$ 23,304.13	0.42	$ 7,529.03	$ 160,798.46
Precast	Pent. - 2.25" typ. Filigree Slab	11369.75	SF	7.25	$ 82,430.69	1.30	$ 14,780.68	0.42	$ 4,775.30	$ 101,986.66
Totals:					**$ 674,165**		**$ 120,885**		**$ 39,055**	**$ 834,105**

TYPE	DESCRIPTION	QUANTITY	UNIT	MATERIAL UNIT RATE	MATERIAL COST	LABOR UNIT RATE	LABOR COST	EQUIPMENT UNIT RATE	EQUIPMENT COST	TOTAL COST
Cast-In-Place Concrete										
Caisson (20)	36" (3'-0") diamater cassion	70.7	CY	111.00	$ 7,842.15	12.25	$ 865.46	0.33	$ 23.31	$ 8,730.93
Caisson (21)	42" (3'-6") diamater cassion	101.0	CY	111.00	$ 11,207.74	12.25	$ 1,236.89	0.33	$ 33.32	$ 12,477.95
Caisson (22)	48" (4'-0") diamater cassion	138.2	CY	111.00	$ 15,335.76	12.25	$ 1,692.46	0.33	$ 45.59	$ 17,073.81
Caisson (15)	54" (4'-6") diamater cassion	119.2	CY	111.00	$ 13,233.63	12.25	$ 1,460.47	0.33	$ 39.34	$ 14,733.44
Caisson (5)	60" (5'-0") diamater cassion	49.1	CY	111.00	$ 5,445.94	12.25	$ 601.02	0.33	$ 16.19	$ 6,063.14
Pile Cap (13)	42"x 42"x 40" pile cap	19.7	CY	111.00	$ 2,182.29	19.10	$ 375.51	0.52	$ 10.22	$ 2,568.03
Pile Cap (17)	48"x 48"x 40" pile cap	33.6	CY	111.00	$ 3,727.37	19.10	$ 641.38	0.52	$ 17.46	$ 4,386.21
Pile Cap (19)	54"x 54"x 40" pile cap	47.5	CY	111.00	$ 5,272.45	19.10	$ 907.24	0.52	$ 24.70	$ 6,204.39
Pile Cap (3)	56"x 56"x 40" pile cap	8.1	CY	111.00	$ 895.43	19.10	$ 154.08	0.52	$ 4.19	$ 1,053.70
Pile Cap (15)	58"x 58"x 40" pile cap	43.3	CY	111.00	$ 4,801.30	19.10	$ 826.17	0.52	$ 22.49	$ 5,649.96
Pile Cap (5)	60"x 60"x 40" pile cap	15.4	CY	111.00	$ 1,712.95	19.10	$ 294.75	0.52	$ 8.02	$ 2,015.72
Pile Cap (2)	66"x 66"x 40" pile cap	7.5	CY	111.00	$ 829.07	19.10	$ 142.66	0.52	$ 3.88	$ 975.61
Pile Cap (9)	82"x 42"x 40" pile cap	26.6	CY	111.00	$ 2,949.68	19.10	$ 507.56	0.52	$ 13.82	$ 3,471.05
Grade Beam	Grade Beams (~ 1,450 LF)	214.8	CY	111.00	$ 23,838.48	11.45	$ 2,459.01	0.31	$ 66.58	$ 26,364.07
Foundation Wall (379 LF)	Concrete Wall - 11'8" x 1'0" section	163.8	CY	106.00	$ 17,359.14	29.50	$ 4,831.08	14.20	$ 2,325.47	$ 24,515.69
Column (5)	Base to Ground - 10"x 24"	3.6	CY	111.00	$ 399.69	67.00	$ 241.26	32.00	$ 115.23	$ 756.18
Column (2)	Base to Ground - 16"x 34"	3.3	CY	111.00	$ 362.39	48.50	$ 158.34	48.50	$ 158.34	$ 679.07
Column (6)	Base to Ground - 16"x 36"	10.4	CY	111.00	$ 1,151.11	38.00	$ 394.08	18.50	$ 191.85	$ 1,737.04
Column (2)	Base to Ground - 24"x 24"	2.1	CY	111.00	$ 238.44	39.00	$ 83.78	19.50	$ 41.89	$ 364.11
Column (1)	Base to Ground - 24" diameter	1.4	CY	111.00	$ 150.60	38.00	$ 51.56	18.25	$ 24.76	$ 226.92
Column (1)	Base to Ground - 28" diameter	1.8	CY	111.00	$ 204.99	27.00	$ 49.86	12.75	$ 23.55	$ 278.40
Column (4)	Base to 2nd - 28"x 40"	30.9	CY	111.00	$ 3,432.01	27.00	$ 834.81	12.75	$ 394.22	$ 4,661.04
Column (15)	1st to 2nd - 24" diameter	26.5	CY	111.00	$ 2,936.77	38.00	$ 1,005.38	18.25	$ 482.85	$ 4,425.00
Column (3)	1st to 2nd - 28" diameter	7.2	CY	111.00	$ 799.46	27.00	$ 194.46	12.75	$ 91.83	$ 1,085.75

Column (2)	1st to 5th - 16"x 36"	16.9	CY	111.00	$ 1,880.15	38.00	$ 643.65	18.50	$ 313.36	$ 2,837.16
Column (1)	1st to 5th - 24" diameter	6.6	CY	111.00	$ 737.96	38.00	$ 252.63	18.25	$ 121.33	$ 1,111.92
Column (8)	1st to Penthouse - 16"x 34"	80.3	CY	111.00	$ 8,914.72	48.50	$ 3,895.17	48.50	$ 3,895.17	$ 16,705.05
Column (10)	1st to Penthouse - 16"x 36"	106.3	CY	111.00	$ 11,798.89	38.00	$ 4,039.26	18.50	$ 1,966.48	$ 17,804.63
Column (5)	1st to Penthouse - 24" diameter	41.7	CY	111.00	$ 4,631.06	38.00	$ 1,585.41	18.25	$ 761.41	$ 6,977.89
Column (1)	2nd to 3rd - 30"x 36"	3.9	CY	111.00	$ 431.67	27.00	$ 105.00	12.75	$ 49.58	$ 586.25
Column (9)	2nd to 5th - 16"x 34"	52.9	CY	111.00	$ 5,870.67	48.50	$ 2,565.11	48.50	$ 2,565.11	$ 11,000.89
Column (10)	2nd to 5th - 16"x 36"	62.2	CY	111.00	$ 6,906.67	38.00	$ 2,364.44	18.50	$ 1,151.11	$ 10,422.22
Column (1)	2nd to Penthouse - 16"x 36"	8.4	CY	111.00	$ 930.48	39.00	$ 326.93	19.50	$ 163.46	$ 1,420.87
Column (1)	3rd to Penthouse - 16"x 34"	6.0	CY	111.00	$ 661.36	48.50	$ 288.97	48.50	$ 288.97	$ 1,239.30
Shear Wall (97 LF)	From 1st to 5th - 57' 2" High	5545.2	CY	106.00	$ 587,787.70	29.50	$ 163,582.43	14.20	$ 78,741.37	$ 830,111.50
Shear Wall (87 LF)	From 1st to Pent. Roof - 94' 3"	8199.8	CY	106.00	$ 869,173.50	29.50	$ 241,892.63	14.20	$ 116,436.45	$ 1,227,502.58
Shear Wall (66 LF)	From Base to Pent. - 83' 5"	5505.5	CY	106.00	$ 583,583.02	29.50	$ 162,412.26	14.20	$ 78,178.10	$ 824,173.38
Shear Wall (139 LF)	From Base to Pent. Roof - 105' 11"	14722.4	CY	106.00	$ 1,560,576.66	29.50	$ 434,311.43	14.20	$ 209,058.38	$ 2,203,946.47
Beam (770 LF)	2nd FL Slab (Cross Sect. = 2.25 SF)	64.2	CY	106.00	$ 6,801.67	41.00	$ 2,630.83	19.65	$ 1,260.88	$ 10,693.38
Beam (770 LF)	3rd FL Slab (Cross Sect. = 2.25 SF)	64.2	CY	106.00	$ 6,801.67	41.00	$ 2,630.83	19.65	$ 1,260.88	$ 10,693.38
Beam (770 LF)	4th FL Slab (Cross Sect. = 2.25 SF)	64.2	CY	106.00	$ 6,801.67	41.00	$ 2,630.83	19.65	$ 1,260.88	$ 10,693.38
Beam (785 LF)	5th FL Slab (Cross Sect. = 4.92 SF)	143.0	CY	106.00	$ 15,162.71	41.00	$ 5,864.82	19.65	$ 2,810.82	$ 23,838.36
Beam (585 LF)	Pent FL Slab (Cross Sect. = 5.58 SF)	120.9	CY	106.00	$ 12,815.40	41.00	$ 4,956.90	19.65	$ 2,375.69	$ 20,147.99
Slab (5634 SF)	Base Floor Slab	86.9	CY	106.00	$ 9,216.11	15.60	$ 1,356.33	0.42	$ 36.52	$ 10,608.96
Slab (20899 SF)	1st Floor Slab	322.5	CY	106.00	$ 34,186.64	15.60	$ 5,031.24	0.42	$ 135.46	$ 39,353.33
Slab (4413.25 SF)	1st Floor Atrium	81.7	CY	106.00	$ 8,663.05	24.50	$ 2,002.31	11.60	$ 948.03	$ 11,613.39
Slab (21231 SF)	2nd Floor Slab	276.4	CY	106.00	$ 29,301.33	24.50	$ 6,772.48	11.60	$ 3,206.56	$ 39,280.36
Slab (21231 SF)	3rd Floor Slab	276.4	CY	106.00	$ 29,301.33	24.50	$ 6,772.48	11.60	$ 3,206.56	$ 39,280.36
Slab (21231 SF)	4th Floor Slab	276.4	CY	106.00	$ 29,301.33	24.50	$ 6,772.48	11.60	$ 3,206.56	$ 39,280.36
Slab (17926 SF)	5th Floor Slab	233.4	CY	106.00	$ 24,740.03	24.50	$ 5,718.21	11.60	$ 2,707.40	$ 33,165.65
Slab (11369 SF)	Pent Floor Slab	148.0	CY	106.00	$ 15,690.58	24.50	$ 3,626.60	11.60	$ 1,717.08	$ 21,034.26
Totals:					**$ 3,998,977**		**$ 1,095,041**		**$ 522,003**	**$ 5,616,020**

TYPE	DESCRIPTION	QUANTITY	UNIT	MATERIAL UNIT RATE	MATERIAL COST	LABOR UNIT RATE	LABOR COST	EQUIPMENT UNIT RATE	EQUIPMENT COST	TOTAL COST
Reinforcing Steel										
Caisson (20)	36" (3'-0") diamater cassion	0.3742	Tons	810.00	$ 303.07	430.00	$ 160.89	0.00	$ -	$ 463.95
Caisson (21)	42" (3'-6") diamater cassion	0.3824	Tons	810.00	$ 309.78	430.00	$ 164.45	0.00	$ -	$ 474.24
Caisson (22)	48" (4'-0") diamater cassion	0.4989	Tons	810.00	$ 404.09	430.00	$ 214.52	0.00	$ -	$ 618.61
Caisson (15)	54" (4'-6") diamater cassion	0.5072	Tons	810.00	$ 410.81	430.00	$ 218.08	0.00	$ -	$ 628.89
Caisson (5)	60" (5'-0") diamater cassion	0.6236	Tons	810.00	$ 505.11	430.00	$ 268.15	0.00	$ -	$ 773.26
Pile Cap (13)	42"x 42"x 40" pile cap rebar	0.7831	Tons	810.00	$ 634.35	430.00	$ 336.75	0.00	$ -	$ 971.10
Pile Cap (17)	48"x 48"x 40" pile cap rebar	1.1704	Tons	810.00	$ 948.04	430.00	$ 503.28	0.00	$ -	$ 1,451.32
Pile Cap (19)	54"x 54"x 40" pile cap rebar	1.4716	Tons	810.00	$ 1,192.02	430.00	$ 632.80	0.00	$ -	$ 1,824.82
Pile Cap (3)	56"x 56"x 40" pile cap rebar	0.2410	Tons	810.00	$ 195.18	430.00	$ 103.62	0.00	$ -	$ 298.80
Pile Cap (15)	58"x 58"x 40" pile cap rebar	1.2479	Tons	810.00	$ 1,010.77	430.00	$ 536.58	0.00	$ -	$ 1,547.36
Pile Cap (5)	60"x 60"x 40" pile cap rebar	0.4303	Tons	810.00	$ 348.54	430.00	$ 185.03	0.00	$ -	$ 533.57
Pile Cap (2)	66"x 66"x 40" pile cap rebar	0.1893	Tons	810.00	$ 153.36	430.00	$ 81.41	0.00	$ -	$ 234.77
Pile Cap (9)	82"x 42"x 40" pile cap rebar	0.8004	Tons	810.00	$ 648.29	430.00	$ 344.15	0.00	$ -	$ 992.44
Grade Beam	Grade Beams - Epoxy Coated	16.4252	Tons	900.00	$ 14,782.70	970.00	$ 15,932.47	0.00	$ -	$ 30,715.17
Grade Beam	Additional cost for Epoxy Coating	16.4252	Tons	350.00	$ 5,748.83	0.00	$ -	0.00	$ -	$ 5,748.83

Foundation Wall (379 LF)	Vertical (Inside Face) Rebar	7.0431	Tons	855.00	$ 6,021.85	385.00	$ 2,711.59	0.00	$ -	$ 8,733.44
Foundation Wall (379 LF)	Vertical (Outside Face) Rebar	1.5285	Tons	855.00	$ 1,306.87	515.00	$ 787.18	0.00	$ -	$ 2,094.05
Foundation Wall (379 LF)	Horizontal Rebar	3.0570	Tons	855.00	$ 2,613.74	515.00	$ 1,574.36	0.00	$ -	$ 4,188.09
Column	Column - 10"x 24"	0.4217	Tons	900.00	$ 379.50	700.00	$ 295.17	0.00	$ -	$ 674.66
Column	Column - 16"x 34"	21.8577	Tons	900.00	$ 19,671.94	700.00	$ 15,300.39	0.00	$ -	$ 34,972.33
Column	Column - 16"x 36"	26.0720	Tons	900.00	$ 23,464.78	700.00	$ 18,250.38	0.00	$ -	$ 41,715.16
Column	Column - 24"x 24"	0.3872	Tons	900.00	$ 348.49	700.00	$ 271.05	0.00	$ -	$ 619.53
Column	Column - 28"x 40"	3.2711	Tons	900.00	$ 2,943.97	700.00	$ 2,289.75	0.00	$ -	$ 5,233.72
Column	Column - 30"x 36"	0.3131	Tons	900.00	$ 281.79	700.00	$ 219.17	0.00	$ -	$ 500.95
Column	Column - 24" diameter	8.3706	Tons	900.00	$ 7,533.50	700.00	$ 5,859.39	0.00	$ -	$ 13,392.89
Column	Column - 28" diameter	0.7509	Tons	900.00	$ 675.78	700.00	$ 525.61	0.00	$ -	$ 1,201.39
Shear Wall (97 LF)	1st to 5th - 57' 2" High	7.7115	Tons	855.00	$ 6,593.31	515.00	$ 3,971.41	0.00	$ -	$ 10,564.73
Shear Wall (87 LF)	1st to Pent. Roof - 94' 3"	11.4031	Tons	855.00	$ 9,749.67	515.00	$ 5,872.61	0.00	$ -	$ 15,622.27
Shear Wall (66 LF)	Base to Pent. - 83' 5"	7.6563	Tons	855.00	$ 6,546.15	515.00	$ 3,943.00	0.00	$ -	$ 10,489.15
Shear Wall (139 LF)	Base to Pent. Roof - 105' 11"	20.4740	Tons	855.00	$ 17,505.25	515.00	$ 10,544.10	0.00	$ -	$ 28,049.35
Beam - Rebar	Concrete Beam - Horiz	1.9191	Tons	900.00	$ 1,727.19	970.00	$ 1,861.53	0.00	$ -	$ 3,588.72
Beam - Rebar	Concrete Beam - Long (top)	43.792	Tons	900.00	$ 39,412.80	575.00	$ 25,180.40	0.00	$ -	$ 64,593.20
Beam - Rebar	Concrete Beam - Long (bot)	13.8184	Tons	900.00	$ 12,436.56	970.00	$ 13,403.85	0.00	$ -	$ 25,840.41
Slab - Rebar	Concrete Slabs - SOG's	16.1665	Tons	855.00	$ 13,822.36	675.00	$ 10,912.39	0.00	$ -	$ 24,734.75
Slab - WWF (31,000 SF)	6x6 W4.0 x W4.0 WWF - SOG only	310	CSF	29.50	$ 9,145.00	28.50	$ 8,835.00	0.00	$ -	$ 17,980.00
Slab - WWF (93,000 SF)	6x6 W2.0 x W2.0 WWF - Elev. Slabs	930	CSF	18.90	$ 17,577.00	25.00	$ 23,250.00	0.00	$ -	$ 40,827.00
Totals:					**$ 227,352**		**$ 175,540**		**$ -**	**$ 402,893**

TYPE	DESCRIPTION	QUANTITY	UNIT	MATERIAL UNIT RATE	MATERIAL COST	LABOR UNIT RATE	LABOR COST	EQUIPMENT UNIT RATE	EQUIPMENT COST	TOTAL COST
Concrete Formwork										
Pile Cap (13)	42"x 42"x 40" pile cap rebar	606.7	SF	0.76	$ 461.07	3.42	$ 2,074.80	0.00	$ -	$ 2,535.87
Pile Cap (17)	48"x 48"x 40" pile cap rebar	906.7	SF	0.76	$ 689.07	3.42	$ 3,100.80	0.00	$ -	$ 3,789.87
Pile Cap (19)	54"x 54"x 40" pile cap rebar	1140.0	SF	0.76	$ 866.40	3.42	$ 3,898.80	0.00	$ -	$ 4,765.20
Pile Cap (3)	56"x 56"x 40" pile cap rebar	186.7	SF	0.76	$ 141.87	3.42	$ 638.40	0.00	$ -	$ 780.27
Pile Cap (15)	58"x 58"x 40" pile cap rebar	966.7	SF	0.76	$ 734.67	3.42	$ 3,306.00	0.00	$ -	$ 4,040.67
Pile Cap (5)	60"x 60"x 40" pile cap rebar	333.3	SF	0.76	$ 253.33	3.42	$ 1,140.00	0.00	$ -	$ 1,393.33
Pile Cap (2)	66"x 66"x 40" pile cap rebar	146.7	SF	0.76	$ 111.47	3.42	$ 501.60	0.00	$ -	$ 613.07
Pile Cap (9)	82"x 42"x 40" pile cap rebar	620.0	SF	0.76	$ 471.20	3.42	$ 2,120.40	0.00	$ -	$ 2,591.60
Grade Beam (1,450 LF)	Grade Beam	8700.0	SF	1.30	$ 11,310.00	3.47	$ 30,189.00	0.00	$ -	$ 41,499.00
Foundation Wall (379 LF)	Concrete Wall - 11'8" x 1'0" section	8843.3	SF	0.63	$ 5,571.30	5.10	$ 45,101.01	0.00	$ -	$ 50,672.31
Column	Column - 10"x 24"	330.4	SF	0.71	$ 234.56	5.80	$ 1,916.13	0.00	$ -	$ 2,150.69
Column	Column - 16"x 34"	8482.5	SF	0.71	$ 6,022.58	5.55	$ 47,077.88	0.00	$ -	$ 53,100.45
Column	Column - 16"x 36"	11946.1	SF	0.71	$ 8,481.75	5.55	$ 66,301.04	0.00	$ -	$ 74,782.79
Column	Column - 24"x 24"	232.0	SF	0.79	$ 183.28	5.50	$ 1,276.00	0.00	$ -	$ 1,459.28
Column	Column - 28"x 40"	1216.1	SF	1.01	$ 1,228.23	5.70	$ 6,931.58	0.00	$ -	$ 8,159.81
Column	Column - 30"x 36"	154.0	SF	1.01	$ 155.54	5.70	$ 877.80	0.00	$ -	$ 1,033.34
Column	Column - 24" diameter	655.1	LF	8.40	$ 5,502.84	10.05	$ 6,583.76	0.00	$ -	$ 12,086.60

Column	Column - 28" diameter	57.2	LF	11.40	$ 652.08	10.45	$ 597.74	0.00	$ -	$ 1,249.82
Shear Wall (97 LF)	1st to 5th - 57' 2" High	5545.2	SF	0.63	$ 3,493.46	5.10	$ 28,280.35	0.00	$ -	$ 31,773.81
Shear Wall (87 LF)	1st to Pent. Roof - 94' 3"	8199.8	SF	0.63	$ 5,165.84	5.10	$ 41,818.73	0.00	$ -	$ 46,984.57
Shear Wall (66 LF)	Base to Pent. - 83' 5"	5505.5	SF	0.63	$ 3,468.47	5.10	$ 28,078.05	0.00	$ -	$ 31,546.52
Shear Wall (139 LF)	Base to Pent. Roof - 105' 11"	14722.4	SF	0.63	$ 9,275.12	5.10	$ 75,084.33	0.00	$ -	$ 84,359.45
Slab	Basement Floor - Edge Forms	546.8	LF	0.27	$ 147.62	2.18	$ 1,191.92	0.00	$ -	$ 1,339.54
Slab	1st Floor - Edge Forms	710.5	LF	0.27	$ 191.84	2.18	$ 1,548.89	0.00	$ -	$ 1,740.73
Slab	2nd Floor - Edge Forms	1066.5	LF	0.17	$ 181.31	2.62	$ 2,794.23	0.00	$ -	$ 2,975.54
Slab	3rd Floor - Edge Forms	1066.5	LF	0.17	$ 181.31	2.62	$ 2,794.23	0.00	$ -	$ 2,975.54
Slab	4th Floor - Edge Forms	1066.5	LF	0.17	$ 181.31	2.62	$ 2,794.23	0.00	$ -	$ 2,975.54
Slab	5th Floor - Edge Forms	837.0	LF	0.17	$ 142.29	2.62	$ 2,192.94	0.00	$ -	$ 2,335.23
Slab	Penthouse Floor - Edge Forms	570.0	LF	0.17	$ 96.90	2.62	$ 1,493.40	0.00	$ -	$ 1,590.30
* Doesn't include Polystyrene Void Block Outs										
Totals:					**$ 65,597**		**$ 411,704**		**$ -**	**$ 477,301**

TYPE	DESCRIPTION	QUANTITY	UNIT	MATERIAL UNIT RATE	MATERIAL COST	LABOR UNIT RATE	LABOR COST	EQUIPMENT UNIT RATE	EQUIPMENT COST	TOTAL COST
Metal Decking										
1.5" Steel Deck	Auditorium (WD=60 & WL=100)	3375	SF	1.92	$ 6,480.00	0.43	$ 1,451.25	0.03	$ 101.25	$ 8,032.50
3" Steel Deck	Atrium (WD=30 psf & WL=25 psf)	4413	SF	2.35	$ 10,370.55	0.46	$ 2,029.98	0.03	$ 132.39	$ 12,532.92
3" Steel Deck	Roof (WD=70 psf & WL=25 psf)	8928	SF	2.35	$ 20,980.80	0.46	$ 4,106.88	0.03	$ 267.84	$ 25,355.52
3" Steel Deck	Penthouse Roof (WD=70-165 psf & WL=35-125 psf)	11369	SF	2.35	$ 26,717.15	0.46	$ 5,229.74	0.03	$ 341.07	$ 32,287.96
Totals:					**$ 64,549**		**$ 12,818**		**$ 843**	**$ 78,209**

SUBTOTAL	**$5,311,371**	**$1,838,886**	**$574,770**	**$7,725,028**
LOCATION MULTIPLIERS	**0.997**	**1.322**	**1.143**	

STRUCTURAL SYSTEMS GRAND TOTAL $8,383,407

TOTAL MATERIAL BREAKDOWN = **$5,295,437**
TOTAL LABOR BREAKDOWN = **$2,431,008**
TOTAL EQUIPMENT BREAKDOWN = **$656,962**

TOTAL CONCRETE (w/out Location Mult.) = **$6,927,426**
TOTAL STEEL (w/out Location Mult.) = **$797,602**

ASSUMPTIONS / FINDINGS

Estimated π to be 3.14.

CAISSONS

Caissons have a minimum length of 13'6", and that's what I used for length.

GRADE BEAMS

Determined average width and depths of grade beams to be 16" x 36" based on the range of values found in the beam schedule.
Determined average stirrup spacing w/in grade beams to be 15" and an average length of 8.667 LF based on the range of values found in the beam schedule.
Determined average horizontal spacing of rebar in grade beams to be 6" totaling 7 bars on each face of the grade beam based on the range of values found in the beam schedule.
Determined average size of horizontal rebar to be #6 size rebar (most were either #5 or #7) based on the range of values found in the beam schedule.

FOUNDATION WALLS

Typical vertical (Inside Face) reinforcing is #8@10".
Typical vertical (Outside Face) reinforcing is #5@18".
Typical horizontal reinforcing is #5@18".

CONCRETE COLUMNS

Typical horizontal reinforcement is #4 rebar @ 12" spacing (found in the caisson and column schedule).
Typical average vertical reinforcement is #8 rebar (very few cases have # 10 rebar, so assumed #8 for all cases).

SHEAR WALLS

All shear walls are 12" thick according to the framing plans given.

CONCRETE BEAMS

Typical concrete beams are 96" x 18" (includes slab thickness) on Floors 2-4.
Typical concrete beams are 96" x 26" (includes slab thickness) on the 5th Floor.
Typical concrete beams are 96" x 28" (includes slab thickness) on the Penthouse Floor.
Determined the cross-sectional area of the typical 96" x 18" voided concrete beam with precast to contain 2.25 SF of concrete (this excludes concrete considered in slab quantity).
Determined the cross-sectional area of the typical 96" x 26" voided concrete beam with precast to contain 4.92 SF of concrete (this excludes concrete considered in slab quantity).
Determined the cross-sectional area of the typical 96" x 28" voided concrete beam with precast to contain 5.58 SF of concrete (this excludes concrete considered in slab quantity).

PRECAST SLABS

SF of Filigree Slab is roughly the same as the total SF of slab area for each floor.
Precast slabs include rebar in their material cost.

SLABS

The majority of slabs (excluding SOG's) are 8" and 10" voided slabs with a 12" thickened edge at the perimeter of the building (36" from the edge of slab).
Assumed a 9" voided slab everywhere to simplify calculations and to account for the extra concrete at thickened slab locations.
SOG thickness for the Auditorium, Offices, and Classrooms is 5" thick.
SOG thickness for the Atrium is 6" thick.
Determined the ratio of CY of concrete to SF of slab surface area to be 0.01302 CY/SF for a typical 9" Voided Slab
Basement Area = 5,633.5 SF
1st Floor Area = 25,312.25 SF (Includes Arium Area)
2nd Floor Area = 21,230.75 SF
3rd Floor Area = 21,230.75 SF
4th Floor Area = 21,230.75 SF
5th Floor Area = 17,926.25 SF
Penthouse Floor Area = 11,369.75 SF
Atrium Floor Area = 4,413.25 SF

CONCRETE FORMWORK

Assumed multiple uses of various types of formwork.

STEEL REINFORCING

6x6 - W2.0 x W2.0 WWF throughout all elevated slabs (totaling 93,000 SF).
6x6 - W4.0 x W4.0 WWF throughout all Slab On Grade concrete (totaling 31,000 SF).
SOG's have a typical reinforcing of #5 rebar spaced @12" o.c. (one way).
Concrete beams have typical longitudinal rebar with 7#9 bar on top and 5#6 bar on the bottom.
Concrete beams have typical horizontal rebar of #5@12" spaning an average of 16'0".

REINFORCING STEEL CALCULATIONS:

36" Caisson	Vertical Reinforcement	18 #8 x 13.5' =	243.0	LF	0.3244	Tons	
	Stirrups	#5 @ 16" =	95.4	LF	0.0498	Tons	
42" Caisson	Vertical Reinforcement	18 #8 x 13.5' =	243.0	LF	0.3244	Tons	
	Stirrups	#5 @ 16" =	111.3	LF	0.0580	Tons	
48" Caisson	Vertical Reinforcement	24 #8 x 13.5' =	324.0	LF	0.4325	Tons	
	Stirrups	#5 @ 16" =	127.2	LF	0.0663	Tons	
54" Caisson	Vertical Reinforcement	24 #8 x 13.5' =	324.0	LF	0.4325	Tons	
	Stirrups	#5 @ 16" =	143.1	LF	0.0746	Tons	
60" Caisson	Vertical Reinforcement	30 #8 x 13.5' =	405.0	LF	0.5407	Tons	
	Stirrups	#5 @ 16" =	159.0	LF	0.0829	Tons	
42"x 42"x 40" pile cap (13)	NS-EW Reinforcement	2 x 4 #10 =	364.0	LF	0.7831	Tons	
48"x 48"x 40" pile cap (17)	NS-EW Reinforcement	2 x 4 #10 =	544.0	LF	1.1704	Tons	
54"x 54"x 40" pile cap (19)	NS-EW Reinforcement	2 x 4 #10 =	684.0	LF	1.4716	Tons	
56"x 56"x 40" pile cap (3)	NS-EW Reinforcement	2 x 4 #10 =	112.0	LF	0.2410	Tons	
58"x 58"x 40" pile cap (15)	NS-EW Reinforcement	2 x 4 #10 =	580.0	LF	1.2479	Tons	
60"x 60"x 40" pile cap (5)	NS-EW Reinforcement	2 x 4 #10 =	200.0	LF	0.4303	Tons	
66"x 66"x 40" pile cap (2)	NS-EW Reinforcement	2 x 4 #10 =	88.0	LF	0.1893	Tons	
82"x 42"x 40" pile cap (9)	NS-EW Reinforcement	2 x 4 #10 =	372.0	LF	0.8004	Tons	
Grade Beams (1,450 LF)	Stirrups	#4 @ 1.25' =	10053.4	LF	3.3578	Tons	* Epoxy Coated
	Horizontal Reinforcement	#6 @ 0.5' =	17400.0	LF	13.0674	Tons	* Epoxy Coated
Foundation Wall (379 LF)	Vertical (Inside Face) Rebar	#8@10" =	5275.7	LF	7.0431	Tons	
Foundation Wall (379 LF)	Vertical (Outside Face) Rebar	#5@18" =	2930.9	LF	1.5285	Tons	
Foundation Wall (379 LF)	Horizontal Rebar	#5@18" =	5861.9	LF	3.0570	Tons	

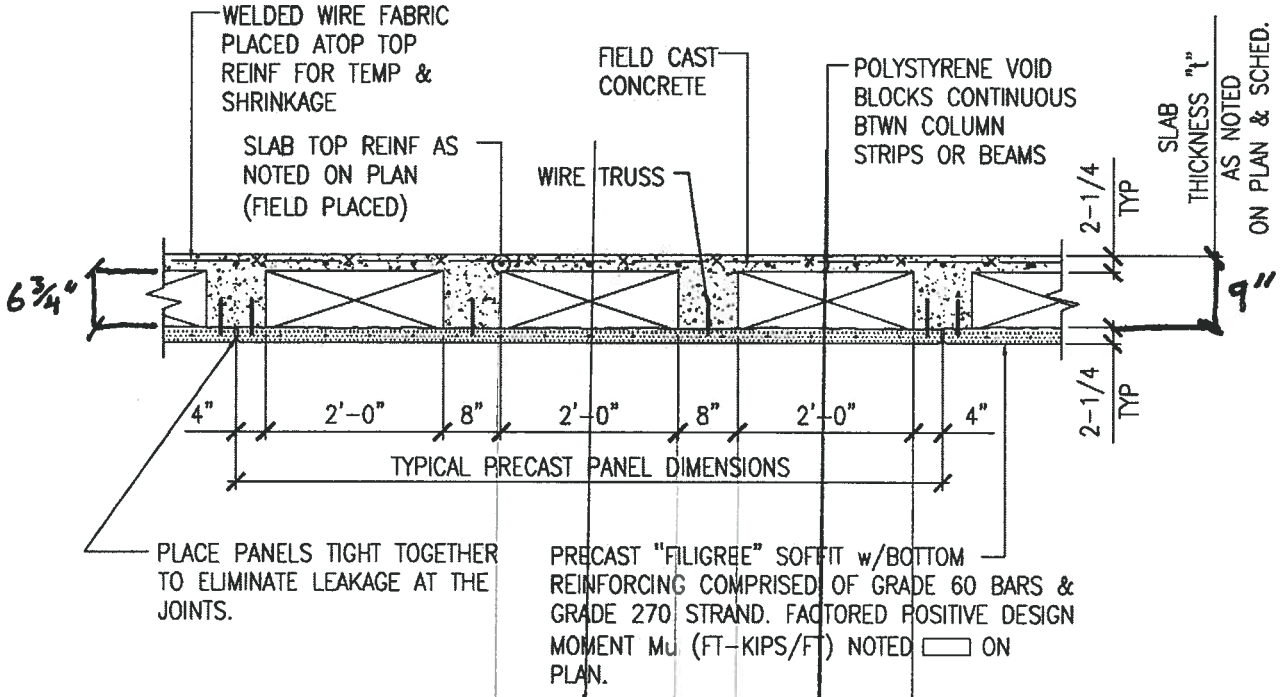
Column - 10"x 24"	58.3 LF	Vertical Reinforcement	4 - #8	233.2	LF	0.3113	Tons	
		Stirrups	#4 @ 12"	330.4	LF	0.1103	Tons	
Column - 16"x 34"	1017.9 LF	Vertical Reinforcement	14 - #8	14250.6	LF	19.0246	Tons	
		Stirrups	#4 @ 12"	8482.5	LF	2.8332	Tons	
Column - 16"x 36"	1378.4 LF	Vertical Reinforcement	12 - #8	16540.8	LF	22.0820	Tons	
		Stirrups	#4 @ 12"	11946.1	LF	3.9900	Tons	
Column - 24"x 24"	29.0 LF	Vertical Reinforcement	8 - #8	232.0	LF	0.3097	Tons	
		Stirrups	#4 @ 12"	232.0	LF	0.0775	Tons	
Column - 28"x 40"	107.3 LF	Vertical Reinforcement	20 - #8	2146.0	LF	2.8649	Tons	
		Stirrups	#4 @ 12"	1216.1	LF	0.4062	Tons	
Column - 30"x 36"	14.0 LF	Vertical Reinforcement	14 - #8	196.0	LF	0.2617	Tons	
		Stirrups	#4 @ 12"	154.0	LF	0.0514	Tons	
Column - 24" diameter	655.1 LF	Vertical Reinforcement	8 - #8	5240.8	LF	6.9965	Tons	
		Stirrups	#4 @ 12"	4114.0	LF	1.3741	Tons	
Column - 28" diameter	57.2 LF	Vertical Reinforcement	8 - #8	457.6	LF	0.6109	Tons	
		Stirrups	#4 @ 12"	419.1	LF	0.1400	Tons	

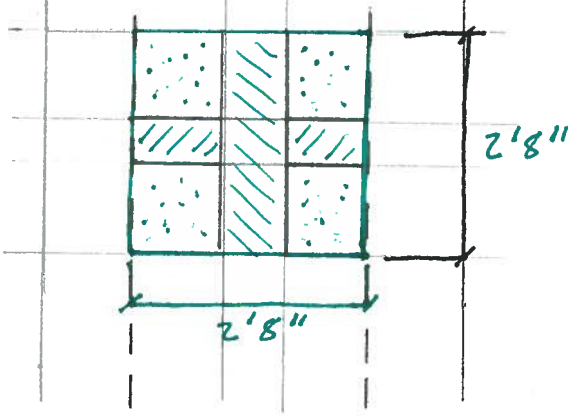
Shear Wall (97 LF)	1st to 5th - 57' 2" High	Vertical / Horizontal Reinforcement	2 x #5 @ 18"	14787.1	LF	7.7115	Tons
Shear Wall (87 LF)	1st to Pent. Roof - 94' 3"	Vertical / Horizontal Reinforcement	2 x #5 @ 18"	21866.0	LF	11.4031	Tons
Shear Wall (66 LF)	Base to Pent. - 83' 5"	Vertical / Horizontal Reinforcement	2 x #5 @ 18"	14681.3	LF	7.6563	Tons
Shear Wall (139 LF)	Base to Pent. Roof - 105' 11"	Vertical / Horizontal Reinforcement	2 x #5 @ 18"	39259.8	LF	20.4740	Tons

Concrete Slabs - SOG's	31,000 SF	#5@12"	31000.0	LF	16.1665	Tons
Concrete Beam - Horiz	3680 LF	#5@12"	3680.0	LF	1.9191	Tons
Concrete Beam - Long	3680 LF	T - 7#9	25760.0	LF	43.7920	Tons
Concrete Beam - Long	3680 LF	B - 5#6	18400.0	LF	13.8184	Tons

Size	Wt. in Lbs./Ft.
#4	0.67
#5	1.04
#6	1.50
#8	2.67
#9	3.40
#10	4.30

TYPICAL VOIDED SLAB SECTION





2'8" x 2'8" =
7.111 SQ. FT.

Middle = 2'8" x 8" x 6 3/4" = 0.037037 CY

Middle = 2' x 8" x 6 3/4" = 0.027778 CY

Top of Voids = 4 x 1' x 1' x 2 1/4" = 0.027778 CY

Σ = 0.092593 CY

Ratio:

$$\frac{0.092593\ CY}{7.111\ SF} = \boxed{0.01302\ CY/SF\ of\ Slab}$$

Profit = 10%

	03 11 13.20 Forms In Place, Beams and Girders		Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
3150	4 use		C-2	430	.112	SFCA	.79	4.68		5.47	8.05
3500	Bottoms only, to 30" wide, job-built plywood, 1 use			230	.209		3.42	8.75		12.17	17.20
3550	2 use			265	.181		1.91	7.60		9.51	13.75
3600	3 use			280	.171		1.37	7.20		8.57	12.55
3650	4 use			290	.166		1.11	6.95		8.06	11.85
4000	Sides only, vertical, 36" high, job-built plywood, 1 use			335	.143		3.46	6		9.46	13
4050	2 use			405	.119		1.91	4.97		6.88	9.70
4100	3 use			430	.112		1.39	4.68		6.07	8.70
4150	4 use			445	.108		1.13	4.52		5.65	8.20
4500	Sloped sides, 36" high, 1 use			305	.157		3.41	6.60		10.01	13.85
4550	2 use			370	.130		1.90	5.45		7.35	10.45
4600	3 use			405	.119		1.36	4.97		6.33	9.10
4650	4 use			425	.113		1.11	4.74		5.85	8.45
5000	Upstanding beams, 36" high, 1 use			225	.213		4.14	8.95		13.09	18.25
5050	2 use			255	.188		2.30	7.90		10.20	14.65
5100	3 use			275	.175		1.67	7.30		8.97	13.10
5150	4 use			280	.171		1.36	7.20		8.56	12.55
	03 11 13.25 Forms In Place, Columns										
0010	**FORMS IN PLACE, COLUMNS**	R031113-40									
0500	Round fiberglass, 4 use per mo., rent, 12" diameter		C-1	160	.200	L.F.	8.15	8.20		16.35	21.50
0550	16" diameter	R031113-60		150	.213		9.70	8.70		18.40	24
0600	18" diameter			140	.229		10.85	9.35		20.20	26.50
0650	24" diameter			135	.237		13.50	9.70		23.20	29.50
0700	28" diameter			130	.246		15.10	10.05		25.15	32
0800	30" diameter			125	.256		15.75	10.45		26.20	33.50
0850	36" diameter			120	.267		21	10.90		31.90	39.50
1500	Round fiber tube, recycled paper, 1 use, 8" diameter	G		155	.206		1.42	8.45		9.87	14.50
1550	10" diameter	G		155	.206		1.97	8.45		10.42	15.10
1600	12" diameter	G		150	.213		2.30	8.70		11	15.95
1650	14" diameter	G		145	.221		3.33	9		12.33	17.50
1700	16" diameter	G		140	.229		4.06	9.35		13.41	18.80
1720	18" diameter	G		140	.229		4.75	9.35		14.10	19.60
1750	20" diameter	G		135	.237		6.55	9.70		16.25	22
1800	24" diameter	G		130	.246		8.40	10.05		18.45	24.50
1850	30" diameter	G		125	.256		11.40	10.45		21.85	28.50
1900	36" diameter	G		115	.278		15.05	11.40		26.45	34
1950	42" diameter	G		100	.320		38	13.10		51.10	61.50
2000	48" diameter	G		85	.376		44	15.40		59.40	72
2200	For seamless type, add						15%				
3000	Round, steel, 4 use per mo., rent, regular duty, 14" diameter	G	C-1	145	.221	L.F.	15.15	9		24.15	30.50
3050	16" diameter	G		125	.256		15.50	10.45		25.95	33
3100	Heavy duty, 20" diameter	G		105	.305		17	12.45		29.45	38
3150	24" diameter	G		85	.376		18.65	15.40		34.05	44
3200	30" diameter	G		70	.457		21.50	18.70		40.20	52
3250	36" diameter	G		60	.533		23	22		45	59
3300	48" diameter	G		50	.640		68	26		94	115
3350	60" diameter	G		45	.711		42	29		71	90.50
4500	For second and succeeding months, deduct						50%				
5000	Job-built plywood, 8" x 8" columns, 1 use		C-1	165	.194	SFCA	2.31	7.95		10.26	14.70
5050	2 use			195	.164		1.32	6.70		8.02	11.75
5100	3 use			210	.152		.92	6.25		7.17	10.55
5150	4 use			215	.149		.76	6.10		6.86	10.20

655 LF
57 LF

			Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
03 11 13.25 Forms In Place, Columns											
5500	12" x 12" columns, 1 use		C-1	180	.178	SFCA	2.19	7.25		9.44	13.55
5550	2 use			210	.152		1.20	6.25		7.45	10.85
5600	3 use			220	.145		.87	5.95		6.82	10.05
5650	4 use			225	.142		.71	5.80		6.51	9.70
6000	16" x 16" columns, 1 use			185	.173		2.17	7.05		9.22	13.25
6050	2 use			215	.149		1.16	6.10		7.26	10.65
6100	3 use			230	.139		.87	5.70		6.57	9.65
6150	4 use			235	.136		.71	5.55		6.26	9.35
6500	24" x 24" columns, 1 use			190	.168		2.43	6.90		9.33	13.20
6550	2 use			216	.148		1.33	6.05		7.38	10.75
6600	3 use			230	.139		.97	5.70		6.67	9.75
6650	4 use			238	.134		.79	5.50		6.29	9.30
7000	36" x 36" columns, 1 use			200	.160		1.77	6.55		8.32	12
7050	2 use			230	.139		1.01	5.70		6.71	9.80
7100	3 use			245	.131		.71	5.35		6.06	9
7150	4 use			250	.128		.58	5.25		5.83	8.70
7400	Steel framed plywood, based on 50 uses of purchased										
7420	forms, and 4 uses of bracing lumber										
7500	8" x 8" column		C-1	340	.094	SFCA	1.81	3.85		5.66	7.90
7550	10" x 10"			350	.091		1.58	3.74		5.32	7.50
7600	12" x 12"			370	.086		1.35	3.54		4.89	6.90
7650	16" x 16"			400	.080		1.05	3.27		4.32	6.15
7700	20" x 20"			420	.076		.93	3.11		4.04	5.80
7750	24" x 24"			440	.073		.67	2.97		3.64	5.30
7755	30" x 30"			440	.073		.86	2.97		3.83	5.50
7760	36" x 36"			460	.070		.75	2.84		3.59	5.20
03 11 13.30 Forms In Place, Culvert											
0010	**FORMS IN PLACE, CULVERT**	R031113-40									
0015	5' to 8' square or rectangular, 1 use		C-1	170	.188	SFCA	3.10	7.70		10.80	15.20
0050	2 use	R031113-60		180	.178		1.83	7.25		9.08	13.15
0100	3 use			190	.168		1.40	6.90		8.30	12.10
0150	4 use			200	.160		1.19	6.55		7.74	11.35
03 11 13.35 Forms In Place, Elevated Slabs											
0010	**FORMS IN PLACE, ELEVATED SLABS**	R031113-40									
1000	Flat plate, job-built plywood, to 15' high, 1 use	R031113-60	C-2	470	.102	S.F.	3.16	4.28		7.44	10.05
1050	2 use			520	.092		1.74	3.87		5.61	7.85
1100	3 use			545	.088		1.26	3.69		4.95	7.05
1150	4 use			560	.086		1.03	3.59		4.62	6.65
1500	15' to 20' high ceilings, 4 use			495	.097		1.03	4.07		5.10	7.40
1600	21' to 35' high ceilings, 4 use			450	.107		1.29	4.47		5.76	8.25
2000	Flat slab, drop panels, job-built plywood, to 15' high, 1 use			449	.107		3.59	4.48		8.07	10.85
2050	2 use			509	.094		1.97	3.95		5.92	8.20
2100	3 use			532	.090		1.43	3.78		5.21	7.40
2150	4 use			544	.088		1.17	3.70		4.87	7
2250	15' to 20' high ceilings, 4 use			480	.100		2.08	4.19		6.27	8.75
2350	20' to 35' high ceilings, 4 use			435	.110		2.34	4.63		6.97	9.70
3000	Floor slab hung from steel beams, 1 use			485	.099		1.99	4.15		6.14	8.55
3050	2 use			535	.090		1.54	3.76		5.30	7.45
3100	3 use			550	.087		1.40	3.66		5.06	7.15
3150	4 use			565	.085		1.32	3.56		4.88	6.90
3500	Floor slab, with 1-way joist pans, 1 use			415	.116		5.35	4.85		10.20	13.35
3550	2 use			445	.108		3.73	4.52		8.25	11.05

			Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
03 11 13.35 Forms In Place, Elevated Slabs											
3600	3 use		C-2	475	.101	S.F.	3.19	4.24		7.43	10
3650	4 use			500	.096		2.92	4.03		6.95	9.40
4500	With 2-way waffle domes, 1 use			405	.119		5.50	4.97		10.47	13.65
4520	2 use			450	.107		3.86	4.47		8.33	11.10
4530	3 use			460	.104		3.32	4.38		7.70	10.35
4550	4 use			470	.102		3.05	4.28		7.33	9.90
5000	Box out for slab openings, over 16" deep, 1 use			190	.253	SFCA	3.51	10.60		14.11	20
5050	2 use			240	.200	"	1.93	8.40		10.33	14.95
5500	Shallow slab box outs, to 10 S.F.			42	1.143	Ea.	9.65	48		57.65	84
5550	Over 10 S.F. (use perimeter)			600	.080	L.F.	1.29	3.35		4.64	6.55
6000	Bulkhead forms for slab, with keyway, 1 use, 2 piece			500	.096		1.67	4.03		5.70	8.05
6100	3 piece (see also edge forms)			460	.104		1.80	4.38		6.18	8.70
6200	Slab bulkhead form, 4-1/2" high, exp metal, w/keyway & stakes	G	C-1	1200	.027		1.64	1.09		2.73	3.47
6210	5-1/2" high	G		1100	.029		1.90	1.19		3.09	3.91
6215	7-1/2" high	G		960	.033		2.31	1.36		3.67	4.63
6220	9-1/2" high	G		840	.038		2.40	1.56		3.96	5.05
6500	Curb forms, wood, 6" to 12" high, on elevated slabs, 1 use			180	.178	SFCA	1.34	7.25		8.59	12.65
6550	2 use			205	.156		.74	6.40		7.14	10.60
6600	3 use			220	.145		.54	5.95		6.49	9.70
6650	4 use			225	.142		.44	5.80		6.24	9.40
7000	Edge forms to 6" high, on elevated slab, 4 use			500	.064	L.F.	.17	2.62		2.79	4.20
7500	Depressed area forms to 12" high, 4 use			300	.107		.78	4.36		5.14	7.55
7550	12" to 24" high, 4 use			175	.183		1.06	7.50		8.56	12.60
8000	Perimeter deck and rail for elevated slabs, straight			90	.356		9.70	14.55		24.25	33
8050	Curved			65	.492		13.35	20		33.35	45.50
8500	Void forms, round fiber, 3" diameter	G		450	.071		.99	2.91		3.90	5.55
8550	4" diameter	G		425	.075		1.46	3.08		4.54	6.35
8600	6" diameter	G		400	.080		2.28	3.27		5.55	7.50
8650	8" diameter	G		375	.085		3.90	3.49		7.39	9.65
8700	10" diameter	G		350	.091		2.52	3.74		6.26	8.50
8750	12" diameter	G		300	.107		3.20	4.36		7.56	10.20
03 11 13.40 Forms In Place, Equipment Foundations											
0010	**FORMS IN PLACE, EQUIPMENT FOUNDATIONS**	R031113-40									
0020	1 use		C-2	160	.300	SFCA	2.66	12.60		15.26	22
0050	2 use	R031113-60		190	.253		1.47	10.60		12.07	17.85
0100	3 use			200	.240		1.07	10.05		11.12	16.60
0150	4 use			205	.234		.87	9.80		10.67	16
03 11 13.45 Forms In Place, Footings											
0010	**FORMS IN PLACE, FOOTINGS**	R031113-40									
0020	Continuous wall, plywood, 1 use		C-1	375	.085	SFCA	5	3.49		8.49	10.85
0050	2 use	R031113-60		440	.073		2.76	2.97		5.73	7.60
0100	3 use			470	.068		2	2.78		4.78	6.45
0150	4 use			485	.066		1.63	2.70		4.33	5.95
0500	Dowel supports for footings or beams, 1 use			500	.064	L.F.	.74	2.62		3.36	4.83
1000	Integral starter wall, to 4" high, 1 use			400	.080		.79	3.27		4.06	5.85
1500	Keyway, 4 use, tapered wood, 2" x 4"		1 Carp	530	.015		.18	.65		.83	1.20
1550	2" x 6"			500	.016		.26	.69		.95	1.35
2000	Tapered plastic			530	.015		.45	.65		1.10	1.50
2250	For keyway hung from supports, add			150	.053		.74	2.30		3.04	4.34
3000	Pile cap, square or rectangular, job-built plywood, 1 use		C-1	290	.110	SFCA	2.33	4.51		6.84	9.45
3050	2 use			346	.092		1.28	3.78		5.06	7.20
3100	3 use			371	.086		.93	3.53		4.46	6.40

	03 11 13.45 Forms In Place, Footings		Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
3150	4 use		C-1	383	.084	SFCA	.76	3.42		4.18	6.10
4000	Triangular or hexagonal, 1 use			225	.142		2.72	5.80		8.52	11.90
4050	2 use			280	.114		1.50	4.67		6.17	8.80
4100	3 use			305	.105		1.09	4.29		5.38	7.80
4150	4 use			315	.102		.88	4.15		5.03	7.30
5000	Spread footings, job-built lumber, 1 use			305	.105		1.79	4.29		6.08	8.55
5050	2 use			371	.086		1	3.53		4.53	6.50
5100	3 use			401	.080		.72	3.26		3.98	5.80
5150	4 use			414	.077		.58	3.16		3.74	5.50
6000	Supports for dowels, plinths or templates, 2' x 2' footing			25	1.280	Ea.	4.92	52.50		57.42	86
6050	4' x 4' footing			22	1.455		9.85	59.50		69.35	102
6100	8' x 8' footing			20	1.600		19.70	65.50		85.20	122
6150	12' x 12' footing			17	1.882		24	77		101	144
7000	Plinths, job-built plywood, 1 use			250	.128	SFCA	2.49	5.25		7.74	10.80
7100	4 use			270	.119	"	.82	4.85		5.67	8.35
	03 11 13.47 Forms In Place, Gas Station Forms										
0010	**FORMS IN PLACE, GAS STATION FORMS**										
0050	Curb fascia, with template, 12 ga. steel, left in place, 9" high	G	1 Carp	50	.160	L.F.	11.80	6.90		18.70	23.50
1000	Sign or light bases, 18" diameter, 9" high	G		9	.889	Ea.	74.50	38.50		113	140
1050	30" diameter, 13" high	G		8	1		118	43		161	196
2000	Island forms, 10' long, 9" high, 3'- 6" wide	G	C-1	10	3.200		330	131		461	565
2050	4' wide	G		9	3.556		340	145		485	600
2500	20' long, 9" high, 4' wide	G		6	5.333		545	218		763	935
2550	5' wide	G		5	6.400		570	262		832	1,025
	03 11 13.50 Forms In Place, Grade Beam										
0010	**FORMS IN PLACE, GRADE BEAM**	R031113-40									
0020	Job-built plywood, 1 use		C-2	530	.091	SFCA	2.37	3.80		6.17	8.45
0050	2 use	R031113-60		580	.083		1.30	3.47		4.77	6.75
0100	3 use			600	.080		.95	3.35		4.30	6.20
0150	4 use			605	.079		.77	3.33		4.10	5.95
	03 11 13.55 Forms In Place, Mat Foundation										
0010	**FORMS IN PLACE, MAT FOUNDATION**	R031113-40									
0020	Job-built plywood, 1 use		C-2	290	.166	SFCA	2.44	6.95		9.39	13.35
0050	2 use	R031113-60		310	.155		.99	6.50		7.49	11.05
0100	3 use			330	.145		.65	6.10		6.75	10.05
0120	4 use			350	.137		.58	5.75		6.33	9.45
	03 11 13.65 Forms In Place, Slab On Grade										
0010	**FORMS IN PLACE, SLAB ON GRADE**	R031113-40									
1000	Bulkhead forms w/keyway, wood, 6" high, 1 use		C-1	510	.063	L.F.	.86	2.57		3.43	4.88
1050	2 uses	R031113-60		400	.080		.47	3.27		3.74	5.50
1100	4 uses			350	.091		.28	3.74		4.02	6.05
1400	Bulkhead form for slab, 4-1/2" high, exp metal, incl keyway & stakes	G		1200	.027		1.64	1.09		2.73	3.47
1410	5-1/2" high	G		1100	.029		1.90	1.19		3.09	3.91
1420	7-1/2" high	G		960	.033		2.31	1.36		3.67	4.63
1430	9-1/2" high	G		840	.038		2.40	1.56		3.96	5.05
2000	Curb forms, wood, 6" to 12" high, on grade, 1 use			215	.149	SFCA	1.80	6.10		7.90	11.35
2050	2 use			250	.128		1	5.25		6.25	9.15
2100	3 use			265	.121		.72	4.94		5.66	8.35
2150	4 use			275	.116		.58	4.76		5.34	7.95
3000	Edge forms, wood, 4 use, on grade, to 6" high			600	.053	L.F.	.27	2.18		2.45	3.64
3050	7" to 12" high			435	.074	SFCA	.59	3.01		3.60	5.25
3500	For depressed slabs, 4 use, to 12" high			300	.107	L.F.	.60	4.36		4.96	7.35

	03 11 13.65 Forms In Place, Slab On Grade		Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
3550	To 24" high		C-1	175	.183	L.F.	.79	7.50		8.29	12.30
4000	For slab blockouts, to 12" high, 1 use			200	.160		.63	6.55		7.18	10.75
4050	To 24" high, 1 use			120	.267		.80	10.90		11.70	17.60
4100	Plastic (extruded), to 6" high, multiple use, on grade			800	.040		7.90	1.64		9.54	11.20
5000	Screed, 24 ga. metal key joint, see Section 03 15 05.25										
5020	Wood, incl. wood stakes, 1" x 3"		C-1	900	.036	L.F.	.68	1.45		2.13	2.98
5050	2" x 4"			900	.036	"	.67	1.45		2.12	2.97
6000	Trench forms in floor, wood, 1 use			160	.200	SFCA	1.55	8.20		9.75	14.25
6050	2 use			175	.183		.85	7.50		8.35	12.40
6100	3 use			180	.178		.62	7.25		7.87	11.85
6150	4 use			185	.173		.50	7.05		7.55	11.40
8760	Void form, corrugated fiberboard, 4" x 12", 4' long	G		3000	.011	S.F.	2.39	.44		2.83	3.29
8770	6" x 12", 4' long			3000	.011		2.81	.44		3.25	3.76
8780	1/4" thick hardboard protective cover for void form		2 Carp	1500	.011		.57	.46		1.03	1.33
	03 11 13.85 Forms In Place, Walls										
0010	**FORMS IN PLACE, WALLS**	R031113-10									
0100	Box out for wall openings, to 16" thick, to 10 S.F.		C-2	24	2	Ea.	23	84		107	154
0150	Over 10 S.F. (use perimeter)	R031113-40	"	280	.171	L.F.	1.94	7.20		9.14	13.20
0250	Brick shelf, 4" w, odd to wall forms, use wall area obv shelf										
0260	1 use	R031113-60	C-2	240	.200	SFCA	2.06	8.40		10.46	15.10
0300	2 use			275	.175		1.13	7.30		8.43	12.50
0350	4 use			300	.160		.82	6.70		7.52	11.20
0500	Bulkhead, wood with keyway, 1 use, 2 piece			265	.181	L.F.	1.69	7.60		9.29	13.50
0600	Bulkhead forms with keyway, 1 piece expanded metal, 8" wall	G	C-1	1000	.032		2.31	1.31		3.62	4.55
0610	10" wall	G		800	.040		2.40	1.64		4.04	5.15
0620	12" wall	G		525	.061		2.88	2.49		5.37	7
0700	Buttress, to 8' high, 1 use		C-2	350	.137	SFCA	2.89	5.75		8.64	12
0750	2 use			430	.112		1.59	4.68		6.27	8.95
0800	3 use			460	.104		1.16	4.38		5.54	8
0850	4 use			480	.100		.96	4.19		5.15	7.50
1000	Corbel or haunch, to 12" wide, add to wall forms, 1 use			150	.320	L.F.	1.91	13.40		15.31	22.50
1050	2 use			170	.282		1.05	11.85		12.90	19.30
1100	3 use			175	.274		.76	11.50		12.26	18.50
1150	4 use			180	.267		.62	11.20		11.82	17.85
2000	Wall, job-built plywood, to 8' high, 1 use			370	.130	SFCA	2.17	5.45		7.62	10.75
2050	2 use			435	.110		1.38	4.63		6.01	8.60
2100	3 use			495	.097		1.01	4.07		5.08	7.35
2150	4 use			505	.095		.82	3.99		4.81	7
2400	Over 8' to 16' high, 1 use			280	.171		2.38	7.20		9.58	13.65
2450	2 use			345	.139		1.08	5.85		6.93	10.15
2500	3 use			375	.128		.77	5.35		6.12	9.10
2550	4 use			395	.122		.63	5.10		5.73	8.50
2700	Over 16' high, 1 use			235	.204		2.18	8.55		10.73	15.55
2750	2 use			290	.166		1.20	6.95		8.15	11.95
2800	3 use			315	.152		.87	6.40		7.27	10.75
2850	4 use			330	.145		.71	6.10		6.81	10.15
4000	Radial, smooth curved, job-built plywood, 1 use			245	.196		2.16	8.20		10.36	15
4050	2 use			300	.160		1.19	6.70		7.89	11.60
4100	3 use			325	.148		.86	6.20		7.06	10.45
4150	4 use			335	.143		.70	6		6.70	9.95
4200	Below grade, job-built plywood, 1 use			225	.213		2.25	8.95		11.20	16.20
4210	2 use			225	.213		1.24	8.95		10.19	15.05

03 21 Reinforcing Steel

03 21 05 – Reinforcing Steel Accessories

03 21 05.75 Splicing Reinforcing Bars

			Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0810	#10 bars	G	C-5	40	1.400	Ea.	41	66	18.70	125.70	170
0900	#11 bars	G		32	1.750		49	82.50	23.50	155	210
0920	#14 bars	G		24	2.333		79.50	110	31	220.50	295
1000	Sleeve type w/ferrous filler, for critical structures, #6 bars	G	C-25	72	.444		41	16.80		57.80	72.50
1210	#7 bars	G		64	.500		42	18.90		60.90	76.50
1220	#8 bars	G		56	.571		44	21.50		65.50	83.50
1230	#9 bars	G	C-5	48	1.167		45	55	15.60	115.60	154
1240	#10 bars	G		40	1.400		48	66	18.70	132.70	178
1250	#11 bars	G		32	1.750		58	82.50	23.50	164	220
1260	#14 bars	G		24	2.333		73	110	31	214	288
1270	#18 bars	G		16	3.500		106	165	47	318	430
2000	Weldable half coupler, taper threaded, #4 bars	G	E-16	120	.133		7.10	6.60	.91	14.61	20.50
2100	#5 bars	G		112	.143		8.40	7.10	.97	16.47	23
2200	#6 bars	G		104	.154		13.35	7.60	1.05	22	29.50
2300	#7 bars	G		96	.167		15.50	8.25	1.14	24.89	33
2400	#8 bars	G		88	.182		16.15	9	1.24	26.39	35
2500	#9 bars	G		80	.200		17.80	9.90	1.36	29.06	38.50
2600	#10 bars	G		72	.222		18.20	11	1.51	30.71	41
2700	#11 bars	G		64	.250		19.45	12.40	1.70	33.55	45.50
2800	#14 bars	G		56	.286		22.50	14.15	1.95	38.60	51.50
2900	#18 bars	G		48	.333		36.50	16.50	2.27	55.27	71.50

03 21 10 – Uncoated Reinforcing Steel

03 21 10.60 Reinforcing In Place

0015	**REINFORCING IN PLACE**, 50-60 ton lots, A615 Grade 60 R032110-10										
0020	Includes labor, but not material cost, to install accessories										
0030	Made from recycled materials	G									
0100	Beams & Girders, #3 to #7	G	4 Rodm	1.60	20	Ton	900	970		1,870	2,550
0150	#8 to #18 R032110-20	G		2.70	11.852		900	575		1,475	1,900
0200	Columns, #3 to #7	G		1.50	21.333		900	1,025		1,925	2,650
0250	#8 to #18	G		2.30	13.913		900	675		1,575	2,075
0300	Spirals, hot rolled, 8" to 15" diameter	G		2.20	14.545		1,400	705		2,105	2,675
0320	15" to 24" diameter R032110-40	G		2.20	14.545		1,350	705		2,055	2,600
0330	24" to 36" diameter	G		2.30	13.913		1,275	675		1,950	2,475
0340	36" to 48" diameter R032110-50	G		2.40	13.333		1,225	645		1,870	2,350
0360	48" to 64" diameter	G		2.50	12.800		1,350	620		1,970	2,475
0380	64" to 84" diameter R032110-70	G		2.60	12.308		1,400	595		1,995	2,500
0390	84" to 96" diameter	G		2.70	11.852		1,475	575		2,050	2,550
0400	Elevated slabs, #4 to #7 R032110-80	G		2.90	11.034		955	535		1,490	1,900
0500	Footings, #4 to #7	G		2.10	15.238		855	740		1,595	2,125
0550	#8 to #18 Pile Caps, Caissons	G		3.60	8.889		810	430		1,240	1,575
0600	Slab on grade, #3 to #7	G		2.30	13.913		855	675		1,530	2,025
0700	Walls, #3 to #7	G		3	10.667		855	515		1,370	1,775
0750	#8 to #18	G		4	8		855	385		1,240	1,550
0900	For other than 50 – 60 ton lots										
1000	Under 10 ton job, #3 to #7, add					Ton	25%	10%			
1010	#8 to #18, add						20%	10%			
1050	10 – 50 ton job, #3 to #7, add						10%				
1060	#8 to #18, add						5%				
1100	60 – 100 ton job, #3 to #7, deduct						5%				
1110	#8 to #18, deduct						10%				
1150	Over 100 ton job, #3 to #7, deduct						10%				
1160	#8 to #18, deduct						15%				

03 22 Welded Wire Fabric Reinforcing

03 22 05 – Uncoated Welded Wire Fabric

03 22 05.50 Welded Wire Fabric

			Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**WELDED WIRE FABRIC** ASTM A185	R032205-30									
0030	Made from recycled materials	G									
0050	Sheets										
0100	6 x 6 - W1.4 x W1.4 (10 x 10) 21 lb. per C.S.F.	G	2 Rodm	35	.457	C.S.F.	12.50	22		34.50	49.50
0200	6 x 6 - W2.1 x W2.1 (8 x 8) 30 lb. per C.S.F.	G		31	.516		18.90	25		43.90	61
0300	6 x 6 - W2.9 x W2.9 (6 x 6) 42 lb. per C.S.F.	G		29	.552		21.50	26.50		48	66
0400	6 x 6 - W4 x W4 (4 x 4) 58 lb. per C.S.F.	G		27	.593		29.50	28.50		58	78.50
0500	4 x 4 - W1.4 x W1.4 (10 x 10) 31 lb. per C.S.F.	G		31	.516		17.90	25		42.90	59.50
0600	4 x 4 - W2.1 x W2.1 (8 x 8) 44 lb. per C.S.F.	G		29	.552		22.50	26.50		49	67
0650	4 x 4 - W2.9 x W2.9 (6 x 6) 61 lb. per C.S.F.	G		27	.593		36	28.50		64.50	85.50
0700	4 x 4 - W4 x W4 (4 x 4) 85 lb. per C.S.F.	G		25	.640		45	31		76	99
0750	Rolls										
0800	2 x 2 - #14 galv., 21 lb./C.S.F., beam & column wrap	G	2 Rodm	6.50	2.462	C.S.F.	44	119		163	239
0900	2 x 2 - #12 galv. for gunite reinforcing	G	"	6.50	2.462	"	65	119		184	262

03 23 Stressing Tendons

03 23 05 – Prestressing Tendons

03 23 05.50 Prestressing Steel

			Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**PRESTRESSING STEEL**	R034136-90									
0100	Grouted strand, post-tensioned in field, 50' span, 100 kip	G	C-3	1200	.053	Lb.	2.28	2.38	.09	4.75	6.35
0150	300 kip	G		2700	.024		1.04	1.06	.04	2.14	2.85
0300	100' span, 100 kip	G		1700	.038		2.29	1.68	.06	4.03	5.20
0350	300 kip	G		3200	.020		1.98	.89	.03	2.90	3.62
0500	200' span, 100 kip	G		2700	.024		2.28	1.06	.04	3.38	4.21
0550	300 kip	G		3500	.018		1.98	.81	.03	2.82	3.48
0800	Grouted bars, 50' span, 42 kip	G		2600	.025		.91	1.10	.04	2.05	2.77
0850	143 kip	G		3200	.020		.88	.89	.03	1.80	2.40
1000	75' span, 42 kip	G		3200	.020		.93	.89	.03	1.85	2.46
1050	143 kip	G		4200	.015		.78	.68	.03	1.49	1.96
1200	Ungrouted strand, 50' span, 100 kip	G	C-4	1275	.025		.62	1.23	.02	1.87	2.67
1250	300 kip	G		1475	.022		.62	1.06	.02	1.70	2.40
1400	100' span, 100 kip	G		1500	.021		.62	1.04	.02	1.68	2.37
1450	300 kip	G		1650	.019		.62	.95	.02	1.59	2.22
1600	200' span, 100 kip	G		1500	.021		.62	1.04	.02	1.68	2.37
1650	300 kip	G		1700	.019		.62	.92	.02	1.56	2.17
1800	Ungrouted bars, 50' span, 42 kip	G		1400	.023		.45	1.12	.02	1.59	2.31
1850	143 kip	G		1700	.019		.45	.92	.02	1.39	1.99
2000	75' span, 42 kip	G		1800	.018		.45	.87	.02	1.34	1.91
2050	143 kip	G		2200	.015		.45	.71	.01	1.17	1.65
2220	Ungrouted single strand, 100' slab, 25 kip	G		1200	.027		.62	1.30	.02	1.94	2.79
2250	35 kip	G		1475	.022		.62	1.06	.02	1.70	2.40
3000	Slabs on grade, 0.5-inch diam. non-bonded strands, HDPE sheathed,										
3050	attached dead-end anchors, loose stressing-end anchors										
3100	25' x 30' slab, strands @ 36" O.C., placing		2 Rodm	2940	.005	S.F.	.59	.26		.85	1.07
3105	Stressing		C-4A	3750	.004			.21	.01	.22	.34
3110	42" O.C., placing		2 Rodm	3200	.005		.52	.24		.76	.96
3115	Stressing		C-4A	4040	.004			.19	.01	.20	.32
3120	48" O.C., placing		2 Rodm	3510	.005		.46	.22		.68	.85
3125	Stressing		C-4A	4390	.004			.18	.01	.19	.29
3150	25' x 40' slab, strands @ 36" O.C., placing		2 Rodm	3370	.005		.57	.23		.80	1
3155	Stressing		C-4A	4360	.004			.18	.01	.19	.29

03 30 Cast-In-Place Concrete

03 30 53 – Miscellaneous Cast-In-Place Concrete

	03 30 53.40 Concrete In Place	Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
5500	Lightweight, ready mix, including screed finish only,									
5510	not including forms or reinforcing									
5550	1:4 (2500 psi) for structural roof decks	C-14B	260	.800	C.Y.	136	34.50	2.94	173.44	205
5600	1:6 (3000 psi) for ground slab with radiant heat	C-14F	92	.783		133	30.50	.25	163.75	192
5650	1:3:2 (2000 psi) with sand aggregate, roof deck	C-14B	260	.800		133	34.50	2.94	170.44	202
5700	Ground slab (2000 psi)	C-14F	107	.673		133	26	.22	159.22	185
5900	Pile caps (3000 psi), incl. forms and reinf., sq. or rect., under 10 C.Y.	C-14C	54.14	2.069		154	85.50	.43	239.93	300
5950	Over 10 C.Y.		75	1.493		147	61.50	.31	208.81	256
6000	Triangular or hexagonal, under 10 C.Y.		53	2.113		118	87.50	.44	205.94	264
6050	Over 10 C.Y.		85	1.318		132	54.50	.28	186.78	229
6200	Retaining walls (3000 psi), gravity, 4' high see Section 32 32	C-14D	66.20	3.021		136	130	11.55	277.55	360
6250	10' high		125	1.600		129	68.50	6.10	203.60	254
6300	Cantilever, level backfill loading, 8' high		70	2.857		148	122	10.90	280.90	365
6350	16' high		91	2.198		141	94	8.40	243.40	310
6800	Stairs (3500 psi), not including safety treads, free standing, 3'-6" wide	C-14H	83	.578	LF Nose	5	24.50	.28	29.78	43.50
6850	Cast on ground		125	.384	"	4.28	16.30	.18	20.76	30
7000	Stair landings, free standing		200	.240	S.F.	4.03	10.20	.12	14.35	20
7050	Cast on ground		475	.101	"	3.29	4.29	.05	7.63	10.25

03 31 Structural Concrete

03 31 05 – Normal Weight Structural Concrete

03 31 05.30 Concrete, Field Mix

0010	**CONCRETE, FIELD MIX**	R033105-65								
0015	FOB forms 2250 psi				C.Y.	85			85	93.50
0020	3000 psi				"	92			92	101

03 31 05.35 Normal Weight Concrete, Ready Mix

0010	**NORMAL WEIGHT CONCRETE, READY MIX**, delivered	R033105-10								
0012	Includes local aggregate, sand, Portland cement, and water									
0015	Excludes all additives and treatments	R033105-20								
0020	2000 psi				C.Y.	91.50			91.50	101
0100	2500 psi	R033105-30				94			94	103
0150	3000 psi					99			99	109
0200	3500 psi	R033105-40				99.50			99.50	110
0300	4000 psi					103			103	113
0350	4500 psi	R033105-50				106			106	116
0400	5000 psi					111			111	122
0411	6000 psi					127			127	139
0412	8000 psi					206			206	227
0413	10,000 psi					293			293	320
0414	12,000 psi					355			355	390
1000	For high early strength cement, add					10%				
1010	For structural lightweight with regular sand, add					25%				
1300	For winter concrete (hot water), add					4.25			4.25	4.68
1400	For hot weather concrete (ice), add					9.35			9.35	10.25
1410	For mid-range water reducer, add					4.13			4.13	4.54
1420	For high-range water reducer/superplasticizer, add					6.35			6.35	6.95
1430	For retarder, add					2.71			2.71	2.98
1440	For non-Chloride accelerator, add					4.83			4.83	5.30
1450	For Chloride accelerator, per 1%, add					3.28			3.28	3.61
1460	For fiber reinforcing, synthetic (1 lb./C.Y.), add					6.65			6.65	7.30
1500	For Saturday delivery, add					8.85			8.85	9.70

03 31 05.35 Normal Weight Concrete, Ready Mix	Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
1510 For truck holding/waiting time past 1st hour per load, add				Hr.	87.50			87.50	96.50
1520 For short load (less than 4 C.Y.), add per load				Ea.	112			112	124
2000 For all lightweight aggregate, add				C.Y.	45%				
03 31 05.70 Placing Concrete									
0010 **PLACING CONCRETE** R033105-70									
0020 Includes labor and equipment to place, strike off and consolidate									
0050 Beams, elevated, small beams, pumped	C-20	60	1.067	C.Y.		39	13.10	52.10	74
0100 With crane and bucket	C-7	45	1.600			59.50	28.50	88	121
0200 Large beams, pumped	C-20	90	.711			26	8.75	34.75	49
0250 With crane and bucket	C-7	65	1.108			41	19.65	60.65	84
0400 Columns, square or round, 12" thick, pumped	C-20	60	1.067			39	13.10	52.10	74
0450 With crane and bucket	C-7	40	1.800		12"	67	32	99	136
0600 18" thick, pumped	C-20	90	.711			26	8.75	34.75	49
0650 With crane and bucket	C-7	55	1.309		18"	48.50	23	71.50	99
0800 24" thick, pumped	C-20	92	.696			25.50	8.55	34.05	48.50
0850 With crane and bucket	C-7	70	1.029		24"	38	18.25	56.25	78
1000 36" thick, pumped	C-20	140	.457			16.80	5.60	22.40	31.50
1050 With crane and bucket	C-7	100	.720		36"	27	12.75	39.75	54.50
1400 Elevated slabs, less than 6" thick, pumped	C-20	140	.457			16.80	5.60	22.40	31.50
1450 With crane and bucket	C-7	95	.758			28	13.45	41.45	57.50
1500 6" to 10" thick, pumped	C-20	160	.400			14.70	4.92	19.62	28
1550 With crane and bucket	C-7	110	.655			24.50	11.60	36.10	50
1600 Slabs over 10" thick, pumped	C-20	180	.356			13.10	4.37	17.47	24.50
1650 With crane and bucket	C-7	130	.554			20.50	9.85	30.35	42
1900 Footings, continuous, shallow, direct chute	C-6	120	.400			14.30	.39	14.69	22
1950 Pumped	C-20	150	.427			15.70	5.25	20.95	30
2000 With crane and bucket	C-7	90	.800			29.50	14.20	43.70	60.50
2100 Footings, continuous, deep, direct chute Caissons	C-6	140	.343			12.25	.33	12.58	19
2150 Pumped	C-20	160	.400			14.70	4.92	19.62	28
2200 With crane and bucket	C-7	110	.655			24.50	11.60	36.10	50
2400 Footings, spread, under 1 C.Y., direct chute	C-6	55	.873			31	.85	31.85	48.50
2450 Pumped	C-20	65	.985			36	12.10	48.10	68.50
2500 With crane and bucket	C-7	45	1.600			59.50	28.50	88	121
2600 Over 5 C.Y., direct chute	C-6	120	.400			14.30	.39	14.69	22
2650 Pumped	C-20	150	.427			15.70	5.25	20.95	30
2700 With crane and bucket	C-7	100	.720			27	12.75	39.75	54.50
2900 Foundation mats, over 20 C.Y., direct chute	C-6	350	.137			4.91	.13	5.04	7.60
2950 Pumped	C-20	400	.160			5.90	1.97	7.87	11.10
3000 With crane and bucket	C-7	300	.240			8.90	4.26	13.16	18.20
3200 Grade beams, direct chute	C-6	150	.320			11.45	.31	11.76	17.75
3250 Pumped	C-20	180	.356			13.10	4.37	17.47	24.50
3300 With crane and bucket	C-7	120	.600			22.50	10.65	33.15	45.50
3500 High rise, for more than 5 stories, pumped, add per story	C-20	2100	.030			1.12	.37	1.49	2.11
3510 With crane and bucket, add per story	C-7	2100	.034			1.27	.61	1.88	2.60
3700 Pile caps, under 5 C.Y., direct chute	C-6	90	.533			19.10	.52	19.62	29.50
3750 Pumped	C-20	110	.582			21.50	7.15	28.65	40.50
3800 With crane and bucket	C-7	80	.900			33.50	15.95	49.45	68
3850 Pile cap, 5 C.Y. to 10 C.Y., direct chute	C-6	175	.274			9.80	.27	10.07	15.20
3900 Pumped	C-20	200	.320			11.75	3.94	15.69	22
3950 With crane and bucket	C-7	150	.480			17.85	8.50	26.35	36.50
4000 Over 10 C.Y., direct chute	C-6	215	.223			8	.22	8.22	12.40
4050 Pumped	C-20	240	.267			9.80	3.28	13.08	18.50

03 31 Structural Concrete

03 31 05 – Normal Weight Structural Concrete

	03 31 05.70 Placing Concrete	Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
4100	With crane and bucket	C-7	185	.389	C.Y.		14.45	6.90	21.35	29.50
4300	Slab on grade, up to 6" thick, direct chute	C-6	110	.436			15.60	.42	16.02	24
4350	Pumped	C-20	130	.492			18.10	6.05	24.15	34
4400	With crane and bucket	C-7	110	.655			24.50	11.60	36.10	50
4600	Over 6" thick, direct chute	C-6	165	.291			10.40	.28	10.68	16.10
4650	Pumped	C-20	185	.346			12.75	4.26	17.01	24
4700	With crane and bucket	C-7	145	.497			18.45	8.80	27.25	37.50
4900	Walls, 8" thick, direct chute	C-6	90	.533			19.10	.52	19.62	29.50
4950	Pumped	C-20	100	.640			23.50	7.85	31.35	44
5000	With crane and bucket	C-7	80	.900			33.50	15.95	49.45	68
5050	12" thick, direct chute	C-6	100	.480			17.15	.47	17.62	26.50
5100	Pumped	C-20	110	.582			21.50	7.15	28.65	40.50
5200	With crane and bucket	C-7	90	.800			29.50	14.20	43.70	60.50
5300	15" thick, direct chute	C-6	105	.457			16.35	.44	16.79	25.50
5350	Pumped	C-20	120	.533			19.60	6.55	26.15	37
5400	With crane and bucket	C-7	95	.758			28	13.45	41.45	57.50
5600	Wheeled concrete dumping, add to placing costs above									
5610	Walking cart, 50' haul, add	C-18	32	.281	C.Y.		9.70	1.72	11.42	16.80
5620	150' haul, add		24	.375			12.95	2.29	15.24	22.50
5700	250' haul, add		18	.500			17.30	3.06	20.36	30
5800	Riding cart, 50' haul, add	C-19	80	.113			3.89	1.15	5.04	7.20
5810	150' haul, add		60	.150			5.20	1.53	6.73	9.65
5900	250' haul, add		45	.200			6.90	2.04	8.94	12.85

03 35 Concrete Finishing

03 35 29 – Tooled Concrete Finishing

	03 35 29.30 Finishing Floors									
0010	**FINISHING FLOORS**									
0012	Finishing requires that concrete first be placed, struck off & consolidated									
0015	Basic finishing for various unspecified flatwork									
0100	Bull float only	C-10	4000	.006	S.F.		.23		.23	.34
0125	Bull float & manual float		2000	.012			.46		.46	.69
0150	Bull float, manual float, & broom finish, w/edging & joints		1850	.013			.50		.50	.74
0200	Bull float, manual float & manual steel trowel		1265	.019			.73		.73	1.09
0210	For specified Random Access Floors in ACI Classes 1, 2, 3 and 4 to achieve									
0215	Composite Overall Floor Flatness and Levelness values up to F35/F25									
0250	Bull float, machine float & machine trowel (walk-behind)	C-10C	1715	.014	S.F.		.54	.02	.56	.82
0300	Power screed, bull float, machine float & trowel (walk-behind)	C-10D	2400	.010			.39	.04	.43	.62
0350	Power screed, bull float, machine float & trowel (ride-on)	C-10E	4000	.006			.23	.06	.29	.40
0352	For specified Random Access Floors in ACI Classes 5, 6, 7 and 8 to achieve									
0354	Composite Overall Floor Flatness and Levelness values up to F50/F50									
0356	Add for two-dimensional restraightening after power float	C-10	6000	.004	S.F.		.15		.15	.23
0358	For specified Random or Defined Access Floors in ACI Class 9 to achieve									
0360	Composite Overall Floor Flatness and Levelness values up to F100/F100									
0362	Add for two-dimensional restraightening after bull float & power float	C-10	3000	.008	S.F.		.31		.31	.46
0364	For specified Superflat Defined Access Floors in ACI Class 9 to achieve									
0366	Minimum Floor Flatness and Levelness values of F100/F100									
0368	Add for 2-dim'l restraightening after bull float, power float, power trowel	C-10	2000	.012	S.F.		.46		.46	.69
0400	Integral topping and finish, using 1:1:2 mix, 3/16" thick	C-10B	1000	.040		.10	1.48	.23	1.81	2.58
0450	1/2" thick		950	.042		.27	1.56	.24	2.07	2.89
0500	3/4" thick		850	.047		.41	1.74	.27	2.42	3.36

05 12 23.75 Structural Steel Members			Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0020	Shop fab'd for 100-ton, 1-2 story project, bolted connections										
0100	W 6 x 9	G	E-2	600	.093	L.F.	11.15	4.42	2.70	18.27	22.50
0120	x 15	G		600	.093		18.55	4.42	2.70	25.67	31
0140	x 20	G		600	.093		25	4.42	2.70	32.12	37.50
0300	W 8 x 10	G		600	.093		12.40	4.42	2.70	19.52	24
0320	x 15	G		600	.093		18.55	4.42	2.70	25.67	31
0350	x 21	G		600	.093		26	4.42	2.70	33.12	39
0360	x 24	G		550	.102		29.50	4.82	2.95	37.27	44
0370	x 28	G		550	.102		34.50	4.82	2.95	42.27	49.50
0500	x 31	G		550	.102		38.50	4.82	2.95	46.27	53.50
0520	x 35	G		550	.102		43.50	4.82	2.95	51.27	59
0540	x 48	G		550	.102		59.50	4.82	2.95	67.27	77
0600	W 10 x 12	G		600	.093		14.85	4.42	2.70	21.97	27
0620	x 15	G		600	.093		18.55	4.42	2.70	25.67	31
0700	x 22	G		600	.093		27	4.42	2.70	34.12	40.50
0720	x 26	G		600	.093		32	4.42	2.70	39.12	46
0740	x 33	G		550	.102		41	4.82	2.95	48.77	56.50
0900	x 49	G		550	.102		60.50	4.82	2.95	68.27	78
1100	W 12 x 16	G		880	.064		19.80	3.01	1.84	24.65	29
1300	x 22	G		880	.064		27	3.01	1.84	31.85	37
1500	x 26	G		880	.064		32	3.01	1.84	36.85	42.50
1520	x 35	G		810	.069		43.50	3.27	2	48.77	55.50
1560	x 50	G		750	.075		62	3.54	2.16	67.70	76.50
1580	x 58	G		750	.075		72	3.54	2.16	77.70	87.50
1700	x 72	G		640	.088		89	4.14	2.53	95.67	108
1740	x 87	G		640	.088		108	4.14	2.53	114.67	128
1900	W 14 x 26	G		990	.057		32	2.68	1.64	36.32	42
2100	x 30	G		900	.062		37	2.95	1.80	41.75	48
2300	x 34	G		810	.069		42	3.27	2	47.27	54.50
2320	x 43	G		810	.069		53	3.27	2	58.27	66.50
2340	x 53	G		800	.070		65.50	3.32	2.03	70.85	80
2360	x 74	G		760	.074		91.50	3.49	2.13	97.12	109
2380	x 90	G		740	.076		111	3.58	2.19	116.77	131
2500	x 120	G		720	.078		149	3.68	2.25	154.93	172
2700	W 16 x 26	G		1000	.056		32	2.65	1.62	36.27	42
2900	x 31	G		900	.062		38.50	2.95	1.80	43.25	49
3100	x 40	G		800	.070		49.50	3.32	2.03	54.85	62.50
3120	x 50	G		800	.070		62	3.32	2.03	67.35	76
3140	x 67	G		760	.074		83	3.49	2.13	88.62	99.50
3300	W 18 x 35	G	E-5	960	.083		43.50	3.99	1.80	49.29	56.50
3500	x 40	G		960	.083		49.50	3.99	1.80	55.29	63.50
3520	x 46	G		960	.083		57	3.99	1.80	62.79	71.50
3700	x 50	G		912	.088		62	4.20	1.90	68.10	77.50
3900	x 55	G		912	.088		68	4.20	1.90	74.10	84.50
3920	x 65	G		900	.089		80.50	4.26	1.92	86.68	98
3940	x 76	G		900	.089		94	4.26	1.92	100.18	112
3960	x 86	G		900	.089		106	4.26	1.92	112.18	126
3980	x 106	G		900	.089		131	4.26	1.92	137.18	153
4100	W 21 x 44	G		1064	.075		54.50	3.60	1.63	59.73	68
4300	x 50	G		1064	.075		62	3.60	1.63	67.23	76
4500	x 62	G		1036	.077		76.50	3.70	1.67	81.87	92.50
4700	x 68	G		1036	.077		84	3.70	1.67	89.37	101
4720	x 83	G		1000	.080		103	3.83	1.73	108.56	122

	05 12 23.75 Structural Steel Members		Crew	Daily Output	Labor-Hours	Unit	2011 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
4740	x 93	G	E-5	1000	.080	L.F.	115	3.83	1.73	120.56	136
4760	x 101	G		1000	.080		125	3.83	1.73	130.56	146
4780	x 122	G		1000	.080		151	3.83	1.73	156.56	175
4900	W 24 x 55	G		1110	.072		68	3.45	1.56	73.01	82.50
5100	x 62	G		1110	.072		76.50	3.45	1.56	81.51	92
5300	x 68	G		1110	.072		84	3.45	1.56	89.01	100
5500	x 76	G		1110	.072		94	3.45	1.56	99.01	111
5700	x 84	G		1080	.074		104	3.55	1.60	109.15	122
5720	x 94	G		1080	.074		116	3.55	1.60	121.15	136
5740	x 104	G		1050	.076		129	3.65	1.65	134.30	150
5760	x 117	G		1050	.076		145	3.65	1.65	150.30	167
5780	x 146	G		1050	.076		181	3.65	1.65	186.30	207
5800	W 27 x 84	G		1190	.067		104	3.22	1.45	108.67	121
5900	x 94	G		1190	.067		116	3.22	1.45	120.67	135
5920	x 114	G		1150	.070		141	3.33	1.51	145.84	162
5940	x 146	G		1150	.070		181	3.33	1.51	185.84	206
5960	x 161	G		1150	.070		199	3.33	1.51	203.84	226
6100	W 30 x 99	G		1200	.067		123	3.19	1.44	127.63	142
6300	x 108	G		1200	.067		134	3.19	1.44	138.63	154
6500	x 116	G		1160	.069		144	3.31	1.49	148.80	165
6520	x 132	G		1160	.069		163	3.31	1.49	167.80	187
6540	x 148	G		1160	.069		183	3.31	1.49	187.80	208
6560	x 173	G		1120	.071		214	3.42	1.55	218.97	244
6580	x 191	G		1120	.071		236	3.42	1.55	240.97	268
6700	W 33 x 118	G		1176	.068		146	3.26	1.47	150.73	168
6900	x 130	G		1134	.071		161	3.38	1.53	165.91	184
7100	x 141	G		1134	.071		174	3.38	1.53	178.91	199
7120	x 169	G		1100	.073		209	3.49	1.57	214.06	238
7140	x 201	G		1100	.073		249	3.49	1.57	254.06	282
7300	W 36 x 135	G		1170	.068		167	3.28	1.48	171.76	191
7500	x 150	G		1170	.068		186	3.28	1.48	190.76	211
7600	x 170	G		1150	.070		210	3.33	1.51	214.84	238
7700	x 194	G		1125	.071		240	3.41	1.54	244.95	272
7900	x 231	G		1125	.071		286	3.41	1.54	290.95	325
7920	x 262	G		1035	.077		325	3.70	1.67	330.37	365
8100	x 302	G		1035	.077		375	3.70	1.67	380.37	420
8490	For projects 75 to 99 tons, add						10%				
8492	50 to 74 tons, add						20%				
8494	25 to 49 tons, add						30%	10%			
8496	10 to 24 tons, add						50%	25%			
8498	2 to 9 tons, add						75%	50%			
8499	Less than 2 tons, add						100%	100%			

	05 12 23.77 Structural Steel Projects										
0010	**STRUCTURAL STEEL PROJECTS** R050516-30										
0015	Made from recycled materials	G									
0020	Shop fab'd for 100-ton, 1-2 story project, bolted connections										
0200	Apartments, nursing homes, etc., 1 to 2 stories R050523-10	G	E-5	10.30	7.767	Ton	2,250	370	168	2,788	3,300
0300	3 to 6 stories	G	"	10.10	7.921		2,300	380	171	2,851	3,375
0400	7 to 15 stories R051223-10	G	E-6	14.20	9.014		2,350	430	133	2,913	3,475
0500	Over 15 stories	G	"	13.90	9.209		2,425	440	136	3,001	3,575
0700	Offices, hospitals, etc., steel bearing, 1 to 2 stories R051223-20	G	E-5	10.30	7.767		2,250	370	168	2,788	3,300
0800	3 to 6 stories	G	E-6	14.40	8.889		2,300	425	131	2,856	3,400

APPENDIX D - General Conditions Estimate Breakdown

GENERAL CONDITIONS ESTIMATE

All figures were obtained from RS Means Building Construction Data 2011

Project Duration = 22 Months
Bulk Construction = 20 Months

SUPERVISION AND PERSONNEL

Description	Quantity	Unit	Unit Rate	Cost
Vice President	95	WEEK	$ 2,500	$ 237,500
Project Executive	95	WEEK	$ 2,200	$ 209,000
Project Superintendent	95	WEEK	$ 1,925	$ 182,875
Assistant Superintendent	95	WEEK	$ 1,800	$ 171,000
Field Engineer	95	WEEK	$ 1,265	$ 120,175
Project Manager	95	WEEK	$ 2,075	$ 197,125
Project Engineer	95	WEEK	$ 1,800	$ 171,000
Office Engineer	95	WEEK	$ 1,265	$ 120,175
Project Administrator	22	MONTH	$ 800	$ 17,600
Safety Coordinator	95	WEEK	$ 175	$ 16,625
Project Scheduler	95	WEEK	$ 225	$ 21,375
Estimating Expenses	1	LS	$ 45,000	$ 45,000
TOTAL				**$ 1,509,450**

CONSTRUCTION FACILITIES AND EQUIPMENT

Description	Quantity	Unit	Unit Rate	Cost
Field Office Trailer Set-up	1	LS	$ 2,000	$ 2,000
Field Office Trailer Rental	22	MONTH	$ 425	$ 9,350
Field Office Trailer Removal	1	LS	$ 2,500	$ 2,500
Construction Site Fence	20	MONTH	$ 600	$ 12,000
Sidewalk Overhead Protection	1	LS	$ 1,250	$ 1,250
Storage Trailer	15	MONTH	$ 140	$ 2,100
Gang Box	20	MONTH	$ 55	$ 1,100
Tools/Equipment	20	MONTH	$ 650	$ 13,000
Fire Extinguishers	20	MONTH	$ 275	$ 5,500
Copier/Fax/Printer	22	MONTH	$ 400	$ 8,800
Computer/LAN Equipment	22	MONTH	$ 2,400	$ 52,800
Mobile Phones	22	MONTH	$ 325	$ 7,150
Personal Protective Equipment	20	MONTH	$ 250	$ 5,000
Signage	1	LS	$ 2,600	$ 2,600
Dumpsters	20	MONTH	$ 1,800	$ 36,000
TOTAL				**$ 161,150**

TEMPORARY UTILITIES

Description	Quantity	Unit	Unit Rate	Cost
Field IT/Network Set-up	1	LS	$ 4,250	$ 4,250
Temporary Power Installation	1	LS	$ 15,000	$ 15,000
Temporary Power Consumption	20	MONTH	$ 750	$ 15,000
Temporary Water/Sanitary Supply	1	LS	$ 1,500	$ 1,500
Temporary Toilets	22	MONTH	$ 550	$ 12,100
Potable Water	22	MONTH	$ 175	$ 3,850
TOTAL				**$ 51,700**

MISCELLANEOUS COSTS

Description	Quantity	Unit	Unit Rate	Cost
Progress Photographs	20	MONTH	$ 350	$ 7,000
Document Reproduction	1	LS	$ 25,000	$ 25,000
Travel Expenses (Staff Vehicles)	20	MONTH	$ 3,500	$ 70,000
Delivery/Shipping Expenses	20	MONTH	$ 300	$ 6,000
Clean-up Expenses	20	MONTH	$ 2,000	$ 40,000
Misc. Field Expenses	20	MONTH	$ 1,000	$ 20,000
Office Supplies	20	MONTH	$ 86	$ 1,720
QC and Commissioning (0.5%)	1	LS	$ 250,000	$ 250,000
Permits (0.75%)	1	LS	$ 375,000	$ 375,000
Insurance (0.3%)	1	LS	$ 150,000	$ 150,000
Bonds (0.6%)	1	LS	$ 300,000	$ 300,000
TOTAL				**$ 1,244,720**

GENERAL CONDITIONS SUMMARY

Description	Cost/Month	Cost
Supervision and Personnel	$ 68,611	$ 1,509,450
Construction Facilities and Equipment	$ 7,325	$ 161,150
Temporary Utilities	$ 2,350	$ 51,700
Miscellanesous Costs	$ 56,578	$ 1,244,720
TOTAL		**$ 2,967,020**