Technical Assignment 2

Cost and Schedule Analysis

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I Executive Summary

The following document is intended to provide an in-depth analysis of the cost and schedule for the Integrated Science Center project. The schedule and estimates were performed in more detail to see where the most time and money are spent. The intent is to look for possible proposal ideas or at least gain a better understanding of cost and scheduling techniques that can later be applied to my final thesis.

The schedule shows the phasing and sequencing of major activities for Phase I of the Integrated Science Center. Due to the schedule being limited to 200 activities, I chose to develop a detailed schedule for the ISC addition and a more general schedule for the Roger's Hall renovation. This prevented the repeating of major items and allowed me to include more trades for the ISC schedule. Key milestones are included throughout.

The site layout plans depict and describe three phases of construction – excavation, superstructure, and closeout. These plans help to visualize the changes in the site as construction progresses. The different equipment and layouts are discussed further in this section.

The detailed structural systems estimate was developed using R.S Means. It includes both the concrete foundation and steel superstructure. After performing a quantity take and using the unit prices found in R.S Means, the structural system estimate came out to be $1,831,139. A comparison of the R.S. Means estimate versus the actual structural system costs is included here.

R.S. Means was used again to calculate a general conditions estimate. This figure included staffing costs, temporary utilities, monthly fees, and other unit costs. Contingency, as well as overhead and profit, were not included in this estimate. The R.S. Means general estimate was $3,350,961 for Phases I and II of the Integrated Science Center.

The final section is a write up summarizing the topics and events during the PACE Roundtable meeting. This was a unique opportunity to mingle with professionals in the industry and discuss critical issues of today's business. I was able to develop relationships with represent ivies from multiple companies who might be able to advise me later in this thesis project.

II. Detailed Project Schedule

Appendix A *depicts a detailed schedule of the construction process and key milestones for the Integrated Science Center project. Due to the limit on the number of items, I chose to focus solely on the Phase I addition and go into greater detail of each trade sequence. Phase II is smaller and less complex than Phase I. A general schedule for Phase I is provided following the detailed schedule.*

Phase I

For the foundation and steel erection phases of the Integrated Science Center, the building was broken into two areas. The north end of the building is considered Area A and the south end is considered Area B. Foundation construction moved from the south end to the north. The structural system was erected in the same fashion. Floors one through four in Area B were followed by floors one through four in Area A. Figure 2.1 shows the area designations for the ISC building as well as the breakup of the project phases.

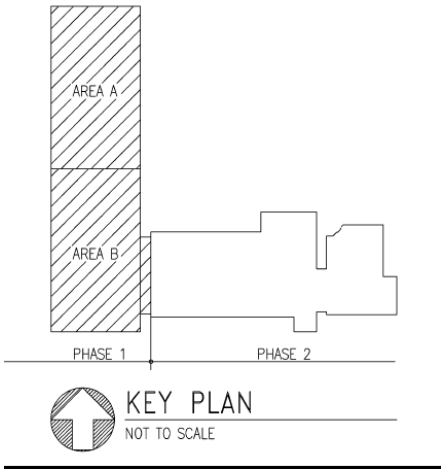


Figure 2.1 – ISC Area Designations

Once all the major systems were in, the finishes began. The finishes are sequenced by floor in the same south to north fashion as the previous systems. The contractors will complete their trade in the following order:

Metal Studs
MEP Rough-In
Gypsum Board
Ceiling Grid and Tiles
Floor Finishes (Carpet, VCT, Ceramic Tile, Epoxy, and Terrazzo)
Painting
Lighting Fixtures
Furniture

Phase II

After the new addition is complete, Gilbane will work with the college to transition people and equipment out of the existing building into their new home. Once vacant, the existing building will be gutted and renovated. The abatement of asbestos was required before demolition could take full swing. While construction on the first floor focused on underground utilities, ductwork and piping were started on the second floor. In most cases, trades started on the second floor and moved down to the first. The contractors will complete their trades in the same order listed above.

III. Site Layout Planning

Site plans for the following phases were developed to better visualize the changes in the site as construction progressed. Please refer to **Appendix B** for the excavation, superstructure, and closeout site plans for the College of William and Mary's Integrated Science Center.

Excavation Phase

The excavation plan depicts the site set up during the earliest construction phase of the new building. Excavation moved from the South end of the building to the North end (Area B to Area A). Once necessary, ramps were constructed at both ends. This provided more flexible access around the site in such a limited area. Most of the soil was removed by trucks at the both ends of the proposed building but a small soil storage area was located in the southwest corner.

Figure 3.1- Preparation for Excavation

Superstructure Phase

The site plan for the superstructure phase of the building shows the location of the crawler cranes, concrete pumps and pump trucks, material staging areas, and a material hoist. The site where the ISC addition is located was rather constricted. The structure is adjoining the existing Rogers Hall to the East and is in close proximity to Millington Hall to the West. Therefore, two crawler cranes were necessary to cover both ends of the building. Floors one through four were erected on in Area B followed by floors one through four in Area A. Steel layout areas were located on both the North and South ends of the building. Delivery and pump trucks had the same site access as the excavation site plan.

Figure 3.2 - Steel Erection Completion

Closeout Phase I and Startup Phase II

The final site plan, the Closeout of Phase I and Startup of Phase II, was set up much differently than the two previous phases. The fences were relocated to surround Rogers Hall, which is now the new focus of construction. The Integrated Science Center was partially opened for the 2008 summer school session. All temporary roads and walkways were removed and replaced with new sod. Construction deliveries are now made only from Landrum Rd to the northeast. A small part of the North wall was demolished so equipment had easier access and materials could be removed. Dumpsters were then conveniently located near the opening.

Safety is the number one priority for Gilbane. Each of the above site plans were designed with the intent to keep workers and pedestrians unharmed. During both the excavation and superstructure phases, a large number of deliveries were made to the site. A flag person was provided to help direct construction and pedestrian traffic. Overhead protection was provided near Millington Hall during the superstructure phase to protect individuals from any falling debris. Fences and signage were used in all phases of the project to keep people out of the site.

IV. Detailed Structural Systems Estimate

The superstructure of the Integrated Science Building was estimated using RS Means Facilities Construction Cost Data 2008. This was used because it breaks the building materials into basic components and provides a more accurate estimate. The take-off and calculation spreadsheets are located in ***Appendix C****.*

Assumptions:

- Use location factor for Newport News = 0.87
- Concrete CY calculations do not subtract out the volume for rebar
- Rebar was assumed to run the length of the wall, footing, or slab
- The 1st and 2nd floors were considered approximately the same. The 3rd and 4th floors were also roughly the same. Therefore, the estimates for the 1st and 3rd floors were each multiplied by 2.
- 2 use formwork was utilized
- Concrete strength = 3,500 psi throughout (normal and lightweight)
- For item sizes not covered in RS Means, the unit costs were interpolated for

Item	Unit Cost	Actual Cost	Estimated Cost	Difference
Concrete System	$103.00/CY	$890,756	$600,614	- $290,142
Steel System	$2,425.00/TON	$1,378,813	$1,230,525	- $148,288
Structural System Total		$2,269,569	$1,831,139	-$438,430

Table 4.1 – Structural System Cost Analysis

As shown in Table 4.2, the detailed structural systems estimates are rather comparable and vary only somewhat from the actual budget for the project. The actual cost and estimated cost difference for the concrete system is almost twice the difference between the two steel system costs. This is probably due to the fact that additional concrete slabs were needed in vibration intense and vibration sensitive areas. The elevator pit slabs and walls were also excluded from the estimated cost. The total structural system accounts for about 7% of the total project cost.

V. General Conditions Estimate

*Please refer to **Appendix D** for the detailed general conditions estimate.*

Assumptions:

- Location factor for Newport News = 0.87
- Project duration = 46.5 months or 200 weeks (May 15, 2005 – March 31, 2009)
- All Gilbane employees were on the job from the start - the team on this project was rather small to begin with so they took on various positions and shared responsibilities to cover all the start-up tasks
- Maximum commissioning – laboratories have more systems and controls than normal higher education buildings
- Minimum or average unit costs were selected for all other items

The unit costs for the general conditions estimate were taken from the first division of R.S. Means 2008. The general conditions for the Integrated Science Center came out to be around **$3,351,000**. Contingency, as well as overhead and profit, were not included in this figure. Table 5.1 below summarizes the breakdown of the general conditions for this project.

Item	Cost	% of GC
Staff	$1,109,250	33.1%
Temporary Utilities	$127,287	3.8%
Site Office & Expenses	$52,228	1.6%
Site Security & Protection	$42,533	1.3%
Fee, Insurance, Permits and Bonds	$1,419,394	42.3%
Commissioning	$277,225	8.3%
Miscellaneous	$323,044	9.6%
Total	$3,350,961	100%

Table 5.1 – General Conditions Estimate Breakdown

	General Conditions Estimate
Actual Budget	$4,286,057
RS Means	$3,350,961
Difference	-$935,096

Table 5.2 – General Conditions Estimate Comparison

As seen in Table 5.2, the estimate varied quite a bit from the actual general conditions budget. This could be contributed to the low project staff estimate for this project. The cost for employees can be difficult to estimate because it depends on the company. All the unit costs for the estimate were taken from R.S. Means rather than from Gilbane's data. The general conditions make up 9% of the total project cost.

VI. Critical Industry Issues

BREAK-OUT SESSION I: Mentorship Model

The first PACE mixer was a discussion on starting a mentorship program for future Architectural Engineering students. The proposed program consists of matching a student to an industry representative. We were asked to form small groups of both current students and company representatives to converse about benefits this program as well as ideas of how this will be facilitated and assessed.

Benefits

Our group consisted of Kristen Hlopick, a recent AE graduate of Buch Construction, my current class peer, Mike Webb, and myself. We felt this program would provide both benefits to the student and for the companies. It would allow students to become familiar with the industry by providing them with a source of contact for questions or information they might need. If started early enough, the program could provide young students with information about different career opportunities which in turn would help select an option. By having an industry contact, a student will practice interaction skills and learn to develop relationships. In some instances, potential internship opportunities could be available. The industry would also benefit from this program. It closes the generation gap by exposing the company with up to new ideas and concepts. This program would also be a way for companies to advertise their image to AE students as well as provide potential hires.

Program Organizational Details

There were a few questions regarding the program setup and organization. How would the department match the students with a company? After discussing several possibilities (random, rolling, assigned by faculty), we felt the best way to match a student with an industry representative would be to have each take a personality test and to match people with similar traits. This would require some effort but it is a fair and reasonable way to partner everyone up. How will this program be facilitated? Although calls and emails would be the most common source of communication, we felt it was necessary to have the pair meet face to face at least once during the course of the year. It is hard to develop a relationship with someone you are not familiar with or have never met. This could be achieved by holding AE events in order to bring students and industry members closer. How will this be assessed? Again many

possibilities were proposed but we felt that filling out a survey during the middle and at the end would be the most feasible. Feedback is necessary to evaluate the program but it has to be presented in a way that people would be willing to take part in it. A survey would be a convenient yet reliable way to assess this program.

Overall Thoughts
I was very surprised by the suggestion of this program. As beneficial as it sounds, I think it would difficult to get full participation from both the students and the full-time industry employees. The mixer was great opportunity to talk to a member in the business. Being a recent grade of Architectural Engineering herself, Kristen understood all we were going through with thesis, classes, and our current search for jobs. She provided us with little tips and pointers and told us we could contact her if we ever needed anything.

BREAK-OUT SESSION II: Technical Training Topics

This year, the PACE Advisory Board's technical topics for discussion included LEED evolution, BIM strategies, and the current energy and economic impacts on construction. Throughout the last year in the Architectural Engineering program, I have been exposed to several class discussions and guest lectures on the influences of LEED and BIM on a project. Although those topics spark an interest to me, I wanted to learn more about the effects of the current economy on construction. This was a great opportunity to expand my knowledge of current issues and get input from professionals in the industry. The following is a summary of the discussion led by Dr. Riley broken into different focuses.

Energy
Energy is a big topic in today's construction business. The cost of materials is highly dependent on the prices of oil. As oil prices rise, so do the prices to produce and transport materials, therefore; causing construction costs increase. During these critical times, there are many approaches that could help keep building costs down. Choosing local materials would cut transportation costs. Developing positive relationships with manufactures and getting early input from the subcontractors could cut significant time and money from the project. Commissioning is a critical process in construction. If started at the beginning of a project, system defects and inefficiencies could be caught and corrected early. Energy retrofits are also of interest today. Updating old or outdated assemblies could lead to reduced operating costs for the owner. Owners can be hesitant to look into these options because it is hard for them to pay more upfront even though it will save them later.

Power Systems
When considering possible cost saving possibilities, the electrical system tends to be overlooked by the mechanical system. Although, significant operating costs can be saved by addressing the electrical system as well. During the design phase, manufactures could be

contacted to provide information about lighting control, generator, and transformer options. Knowing what is offered can help develop a power saving system. Efficiently designed systems save money for a project. This could be achieved by changing the type of lighting system or the size of the conduit.

Economy

Even during this time of economic uncertainty, construction opportunities still exist. Federal work, data center, education, and healthcare are good markets to invest time into. Because of the loss of jobs and low demand for housing, the markets for condominiums and offices are not doing well. New construction has dropped but there is an increase in renovation and salvage work. Although the industry has been affected by the slow economy, there are work opportunities available.

Overall Thoughts

The experiences and participation of the professionals was critical for this discussion. They are the ones out in the industry dealing with the economic and energy crisis. I was surprised at how positive the company representatives were. Members insisted that there is work out there, that companies are still hiring, and that we should plan for recovery. This was very comforting to hear especially being a 5th year senior and the AE career fair coming up. I heard a few tips that stood out to me. Expand your horizons. We may receive fewer offers than in the past. This means we need to be flexible and open to new places and opportunities. Put your best foot forward. Companies are seeking good talent and are willing to invest in people. Acquire an interest in your career and take the time to become and expert.

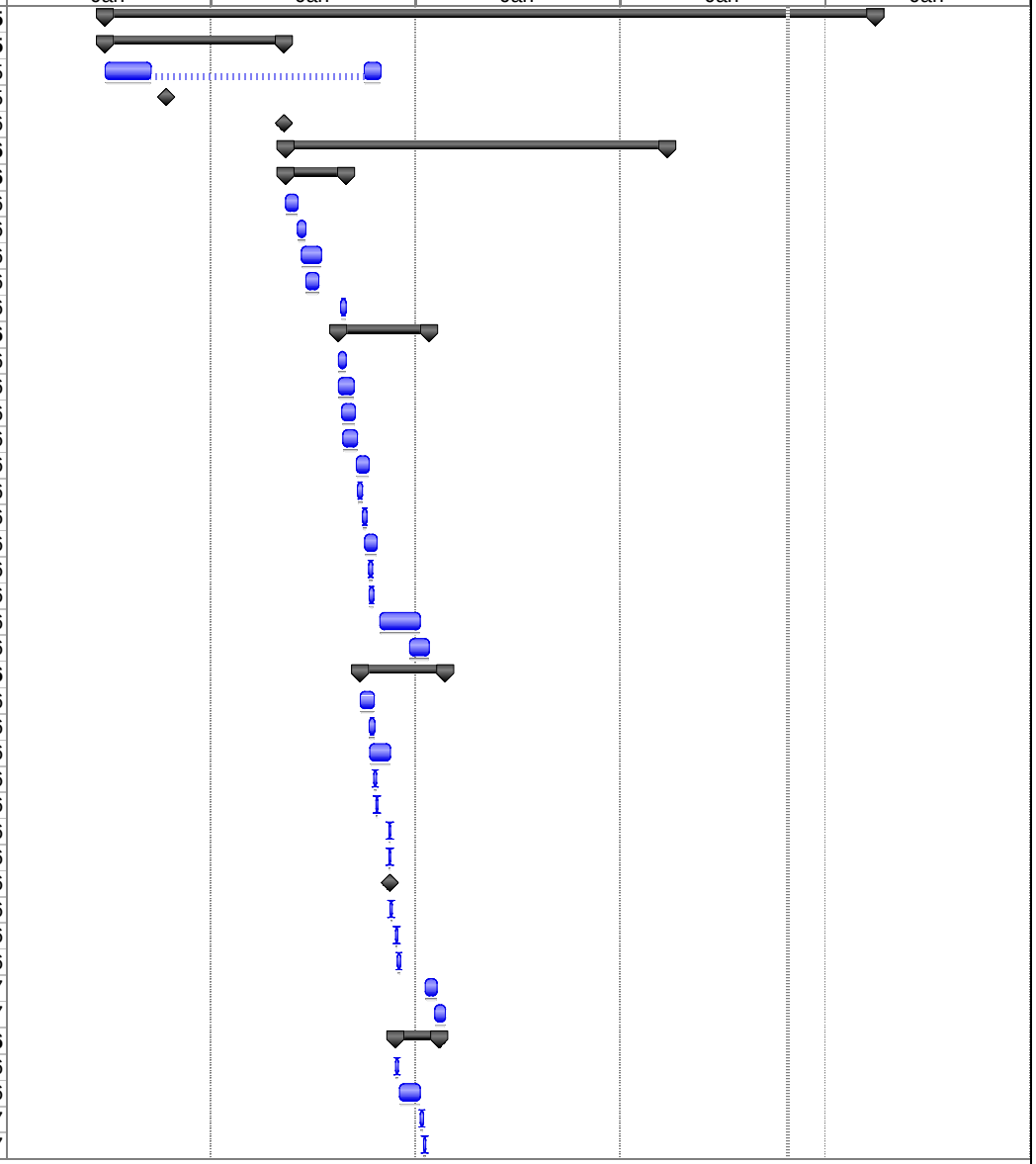
The issues I found most relevant to the Integrated Science Center include commissioning and choosing a more cost efficient system. Commissioning has been a major issue on this project. Poor tactics have pushed the schedule back over three months. Starting the commissioning process earlier could save time and additional costs to fix up the building systems. The mechanical and electrical systems for the ISC building are rather complex. I am interested in analyzing a portion on either of these systems, obtaining information on alternative options, and investigating if a different selection would have saved operating costs over time. Mr. Michael Grobaski from Gilbane Building Company is my primary contact to help advise me in these areas. I had previously met Mr. Grobaski this summer during my internship with Gilbane. His participation during a good portion of the discussion demonstrates his experience and knowledge in this area. I also spoke to Mr. Raj Vora of Southland Industries and Mr. Bill Moyer of Davis Construction who offered any assistance as I develop my ideas further.

Another subject that was brought up during the energy and economy discussion, which also happened to be the theme for the PACE Roundtable event, was the importance of investing in people. With the current economic and energy challenges, this is our most valuable asset in the building industry. The PACE Roundtable offered a unique opportunity to associate and develop relationships with current industry members. Participants willingly offered advice, encouragement, and support as we prepare for the upcoming job fair and the start of our careers.

APPENDIX

Appendix A - Detailed Project Schedule

ID	Task Name	Duration	Start
1	**Integrated Science Center Phases I & II**	**1 day**	**Mon 6/27/05**
2	**Preconstruction Phase**	**229 days**	**Mon 6/27/05**
3	Bid Packages Phases I & II	60 days	Mon 6/27/05
4	Award	0 days	Fri 10/14/05
5	Notice to Proceed	0 days	Fri 5/12/06
6	**PHASE I - INTEGRATED SCIENCE CENTER**	**487 days**	**Mon 5/15/06**
7	**Sitework, Shoring, Excavation**	**184 days**	**Mon 5/15/06**
8	Site Preparation and Site Utilities	16 days	Mon 5/15/06
9	Excav. Bldg. Area B	11 days	Mon 6/5/06
10	Perform Soil Nailing Area B	26 days	Mon 6/12/06
11	Excav. Bldg. Area A	17 days	Tue 6/20/06
12	Perform Soil Nailing Area A	8 days	Mon 8/21/06
13	**Foundations**	**116 days**	**Thu 8/17/06**
14	Foundation Wall Footings Area B	10 days	Thu 8/17/06
15	Place Rebar & Imbeds for Perim Walls A	20 days	Thu 8/17/06
16	Place Rebar & Imbeds for Perim Walls B	18 days	Wed 8/23/06
17	Foundation Walls Area B	18 days	Fri 8/25/06
18	Foundation Walls Area A	17 days	Mon 9/18/06
19	Interior Column Footings Area B	7 days	Wed 9/20/06
20	Interior Column Footings Area A	6 days	Fri 9/29/06
21	Foundation Wall Footings Area A	16 days	Tue 10/3/06
22	Place Elevator Pit Slabs Area B	5 days	Tue 10/10/06
23	Place Elevator Pit Slabs Area A	6 days	Wed 10/11/06
24	Install Understab Utilities Area B	52 days	Mon 10/30/06
25	Install Underslab Utilities Area A	25 days	Fri 12/22/06
26	**Structural Steel/Metal Deck**	**110 days**	**Mon 9/25/06**
27	Erect Structural Steel Area B	19 days	Mon 9/25/06
28	Lay Metal Deck Area B-1	8 days	Wed 10/11/06
29	Erect Structural Steel Area A	27 days	Thu 10/12/06
30	Lay Metal Deck Area B-2	3 days	Thu 10/19/06
31	Lay Metal Deck Area B-3	3 days	Mon 10/23/06
32	Lay Metal Deck Area B-4	3 days	Wed 11/15/06
33	Lay Metal Deck Area A-1	3 days	Wed 11/15/06
34	Structural Steel Top Out	0 days	Fri 11/17/06
35	Lay Metal Deck Area A-2	2 days	Fri 11/17/06
36	Lay Metal Deck Area A-3	4 days	Mon 11/27/06
37	Lay Metal Deck Area A-4	4 days	Thu 11/30/06
38	Install Stairs Area B	15 days	Fri 1/19/07
39	Install Stairs Area A	15 days	Mon 2/5/07
40	**Spray Fireproofing**	**56 days**	**Mon 11/27/06**
41	Spray Fireproofing Area B-1	5 days	Mon 11/27/06
42	Spray Fireproofing Area B-2	27 days	Mon 12/4/06
43	Spray Fireproofing Area B-3	4 days	Wed 1/10/07
44	Spray Fireproofing Area A-1	4 days	Tue 1/16/07



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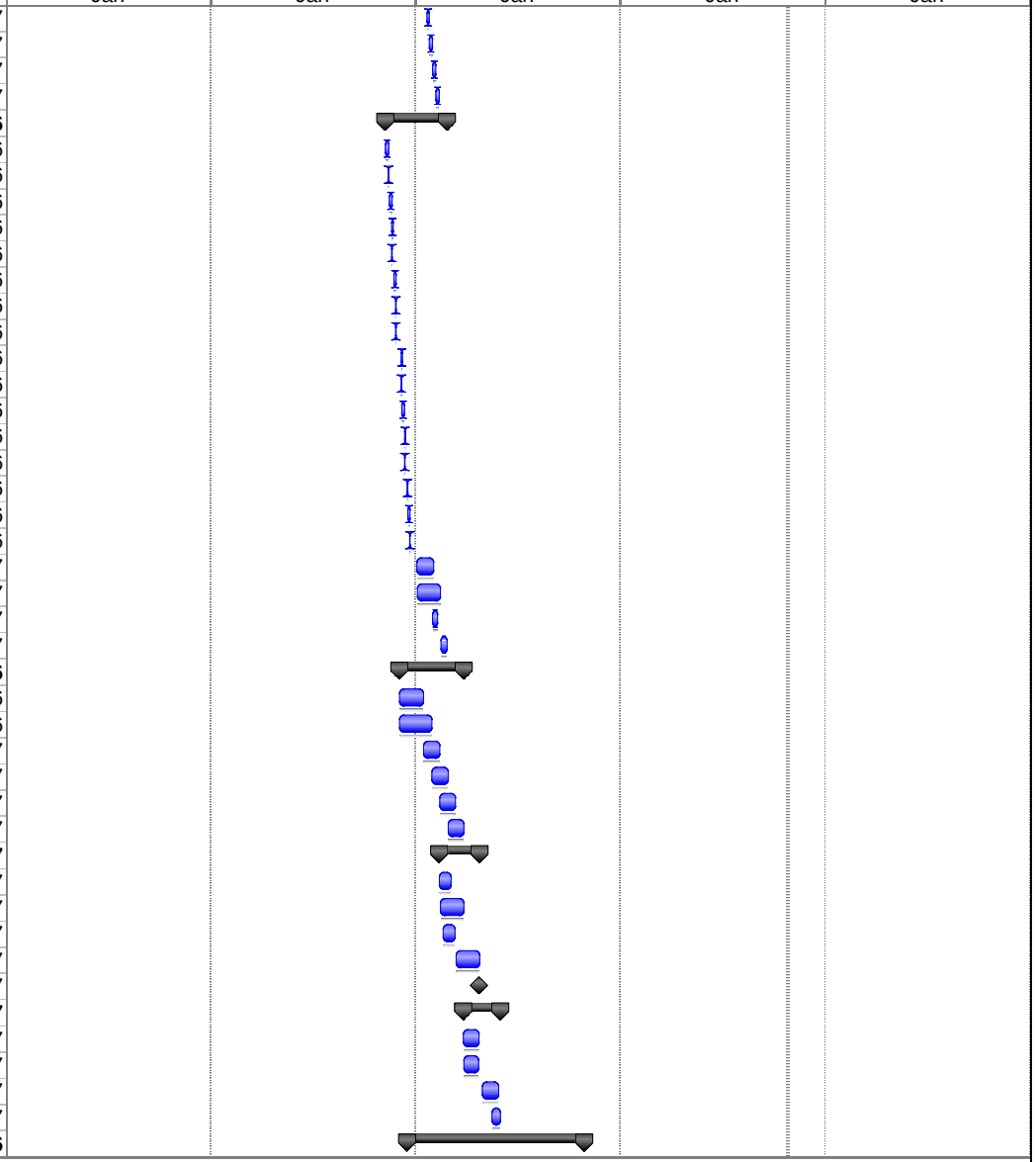
Date: Sat 10/25/08

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
Split
External Tasks
Project Summary
Group By Summary
Deadline

ID	Task Name	Duration	Start
45	Spray Fireproofing Area A-2	4 days	Mon 1/22/07
46	Spray Fireproofing Area A-3	4 days	Fri 1/26/07
47	Spray Fireproofing Area B-Ground	4 days	Thu 2/1/07
48	Spray Fireproofing Area A-Ground	4 days	Wed 2/7/07
49	**Concrete Work**	**78 days**	**Thu 11/9/06**
50	Place Wire Mesh/Block-outs Area B-1	4 days	Thu 11/9/06
51	Place Slab-on-Deck Area B-1	1 day	Tue 11/14/06
52	Place Wire Mesh/Block-outs Area B-2	3 days	Thu 11/16/06
53	Place Wire Mesh/Block-outs Area B-3	3 days	Mon 11/20/06
54	Place Slab-on-Deck Area B-2	1 day	Mon 11/20/06
55	Place Wire Mesh/Block-outs Area B-4	2 days	Fri 11/24/06
56	Place Slab-on-Deck Area B-3	1 day	Mon 11/27/06
57	Place Slab-on-Deck Area B-4	1 day	Mon 11/27/06
58	Place Wire Mesh/Block-outs Area A-1	2 days	Thu 12/7/06
59	Place Slab-on-Deck Area A-1	1 day	Thu 12/7/06
60	Place Wire Mesh/Block-outs Area A-2	3 days	Fri 12/8/06
61	Place Wire Mesh/Block-outs Area A-3	2 days	Wed 12/13/06
62	Place Slab-on-Deck Area A-2	1 day	Wed 12/13/06
63	Place Slab-on-Deck Area A-3	1 day	Mon 12/18/06
64	Place Wire Mesh/Block-outs Area A-4	4 days	Tue 12/19/06
65	Place Slab-on-Deck Area A-4	1 day	Fri 12/22/06
66	Backfill Foundation Walls Area B	22 days	Thu 1/4/07
67	Backfill Foundation Walls Area A	29 days	Fri 1/5/07
68	Place Slab-On-Grade Area B-Ground	7 days	Thu 2/1/07
69	Place Slab-On-Grade Area A-Ground	7 days	Fri 2/16/07
70	**Roofing**	**83 days**	**Mon 12/4/06**
71	Install Metal Deck Area B-Roof	31 days	Mon 12/4/06
72	Install Metal Deck Area A-Roof	42 days	Mon 12/4/06
73	Install Rigid Insulation and Cover Board B	21 days	Tue 1/16/07
74	Install Rigid Insulation and Cover Board A	21 days	Wed 1/31/07
75	Install Simulated Slate Roofing Area B	20 days	Wed 2/14/07
76	Install Simulated Slate Roofing Area A	20 days	Thu 3/1/07
77	**Masonry Work**	**52 days**	**Tue 2/13/07**
78	Erect Block Walls Area B-Ground	15 days	Tue 2/13/07
79	Lay Exterior Brick Area B	30 days	Thu 2/15/07
80	Erect Block Walls Area A-Ground	15 days	Tue 2/20/07
81	Lay Exterior Brick Area A	30 days	Thu 3/15/07
82	Enclosure	0 days	Wed 4/25/07
83	**Glass & Glazing**	**48 days**	**Wed 3/28/07**
84	Install Exterior Windows Area B	20 days	Wed 3/28/07
85	Install Curtainwall Storefront Area B	18 days	Thu 3/29/07
86	Install Exterior Windows Area A	21 days	Tue 5/1/07
87	Install Curtainwall Storefront Area A	11 days	Fri 5/18/07
88	**Drywall and Acoustical Ceilings**	**188 days**	**Mon 12/18/06**



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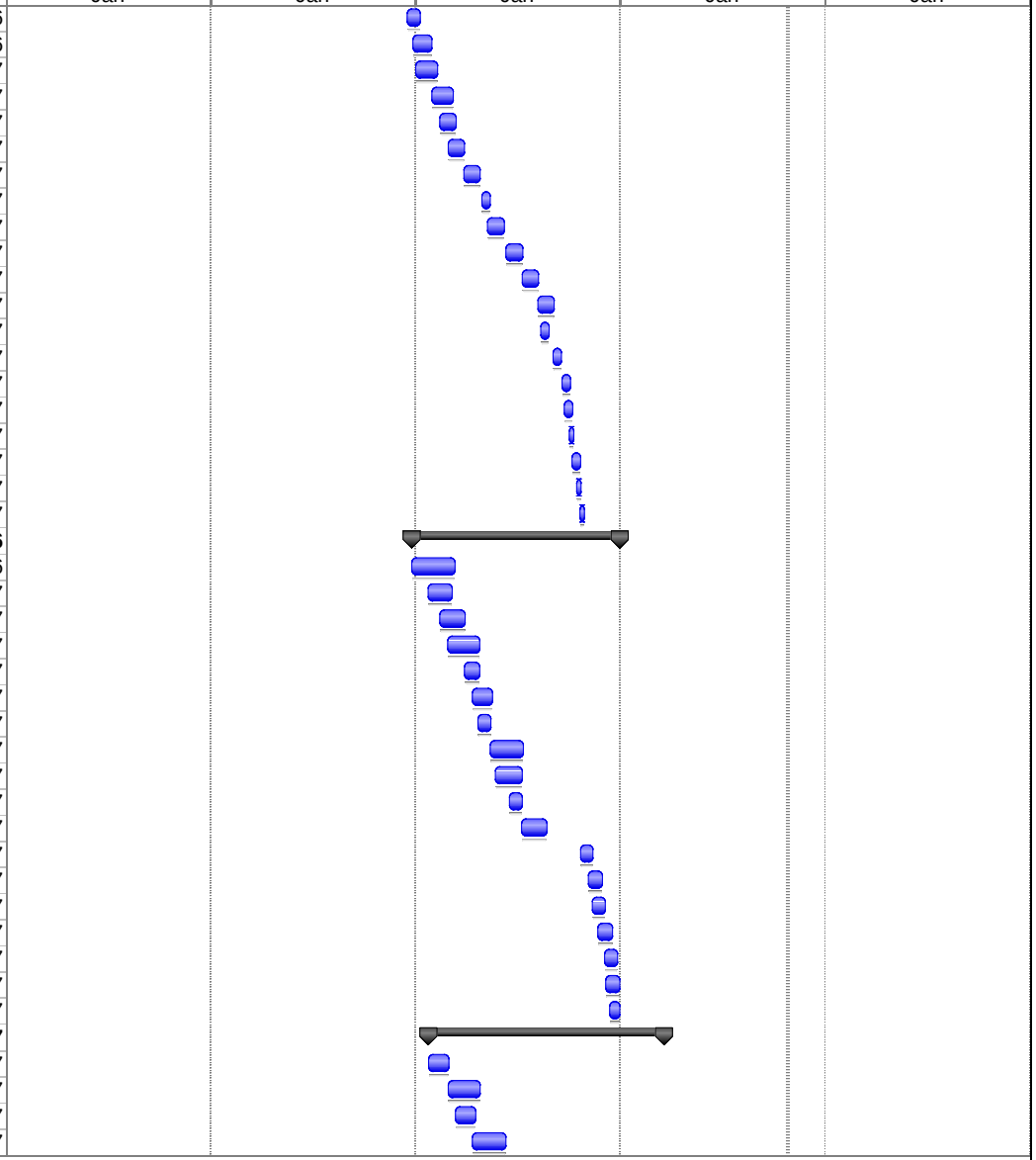
Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
Split
External Tasks
Project Summary
Group By Summary
Deadline

ID	Task Name	Duration	Start
89	Place Exterior Studs Area B	17 days	Mon 12/18/06
90	Place Exterior Studs Area A	24 days	Thu 12/28/06
91	Install Sheathing and Rigid Insulation B	29 days	Tue 1/2/07
92	Install Sheathing and Rigid Insulation A	28 days	Wed 1/31/07
93	Frame Partitions Floor 1	21 days	Wed 2/14/07
94	Frame Partitions Floor 2	21 days	Thu 3/1/07
95	Frame Partitions Floor 3	21 days	Thu 3/29/07
96	Frame Partitions Ground Floor	11 days	Mon 4/30/07
97	Drywall Close-in Walls Incl.Finish Floor 3	22 days	Thu 5/10/07
98	Drywall Close-in Walls Incl. Finish Ground	22 days	Tue 6/12/07
99	Drywall Close-in Walls Incl. Finish Floor 1	21 days	Wed 7/11/07
100	Drywall Close-in Walls Incl. Finish Floor 2	21 days	Wed 8/8/07
101	Install Ceiling Grid Ground Floor	11 days	Mon 8/13/07
102	Install Ceiling Grid Floor 1	11 days	Tue 9/4/07
103	Install Ceiling Grid Floor 2	11 days	Thu 9/20/07
104	Drop Ceiling Tiles Ground Floor	11 days	Mon 9/24/07
105	Drop Ceiling Tiles Floor 2	6 days	Wed 10/3/07
106	Install Ceiling Grid Floor 3	11 days	Mon 10/8/07
107	Drop Ceiling Tiles Floor 1	6 days	Tue 10/16/07
108	Drop Ceiling Tiles Floor 3	6 days	Mon 10/22/07
109	**Plumbing and HVAC**	**265 days**	**Tue 12/26/06**
110	Overhead Rough-In Piping Floor 1	55 days	Tue 12/26/06
111	Overhead Rough-In Duct Floor 1	31 days	Wed 1/24/07
112	Overhead Rough-In Duct Ground Floor	33 days	Wed 2/14/07
113	Overhead Rough-In Duct Floor 2	41 days	Wed 2/28/07
114	Overhead Rough-In Piping Ground Floor	19 days	Fri 3/30/07
115	Overhead Rough-In Piping Floor 2	26 days	Fri 4/13/07
116	In Wall Rough-In Piping Floor 1	17 days	Mon 4/23/07
117	In Wall Rough-In Piping Floor 2	43 days	Tue 5/15/07
118	Overhead Rough-In Piping Floor 3	34 days	Thu 5/24/07
119	Overhead Rough-In Piping Floor 3	17 days	Mon 6/18/07
120	In Wall Rough-In Floor 3	33 days	Tue 7/10/07
121	Diffusers, Registers, and Grilles Floor 1	16 days	Tue 10/23/07
122	Install Plumbing Fixtures Ground Floor	19 days	Tue 11/6/07
123	Diffusers, Registers, and Grilles Floor 2	17 days	Tue 11/13/07
124	Install Plumbing Fixtures Floor 1	18 days	Fri 11/23/07
125	Diffusers, Registers, and Grilles Floor 3	17 days	Wed 12/5/07
126	Install Plumbing Fixtures Floor 2	17 days	Fri 12/7/07
127	Install Plumbing Fixtures Floor 3	12 days	Fri 12/14/07
128	**Electrical**	**300 days**	**Thu 1/25/07**
129	Overhead Rough-In Electrical Floor 1	26 days	Thu 1/25/07
130	Overhead Rough-In Electrical Floor 2	41 days	Thu 3/1/07
131	In Wall Rough-In Floor 1	26 days	Wed 3/14/07
132	Overhead Rough-In Electrical Floor 3	42 days	Fri 4/13/07



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Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
Split
External Tasks
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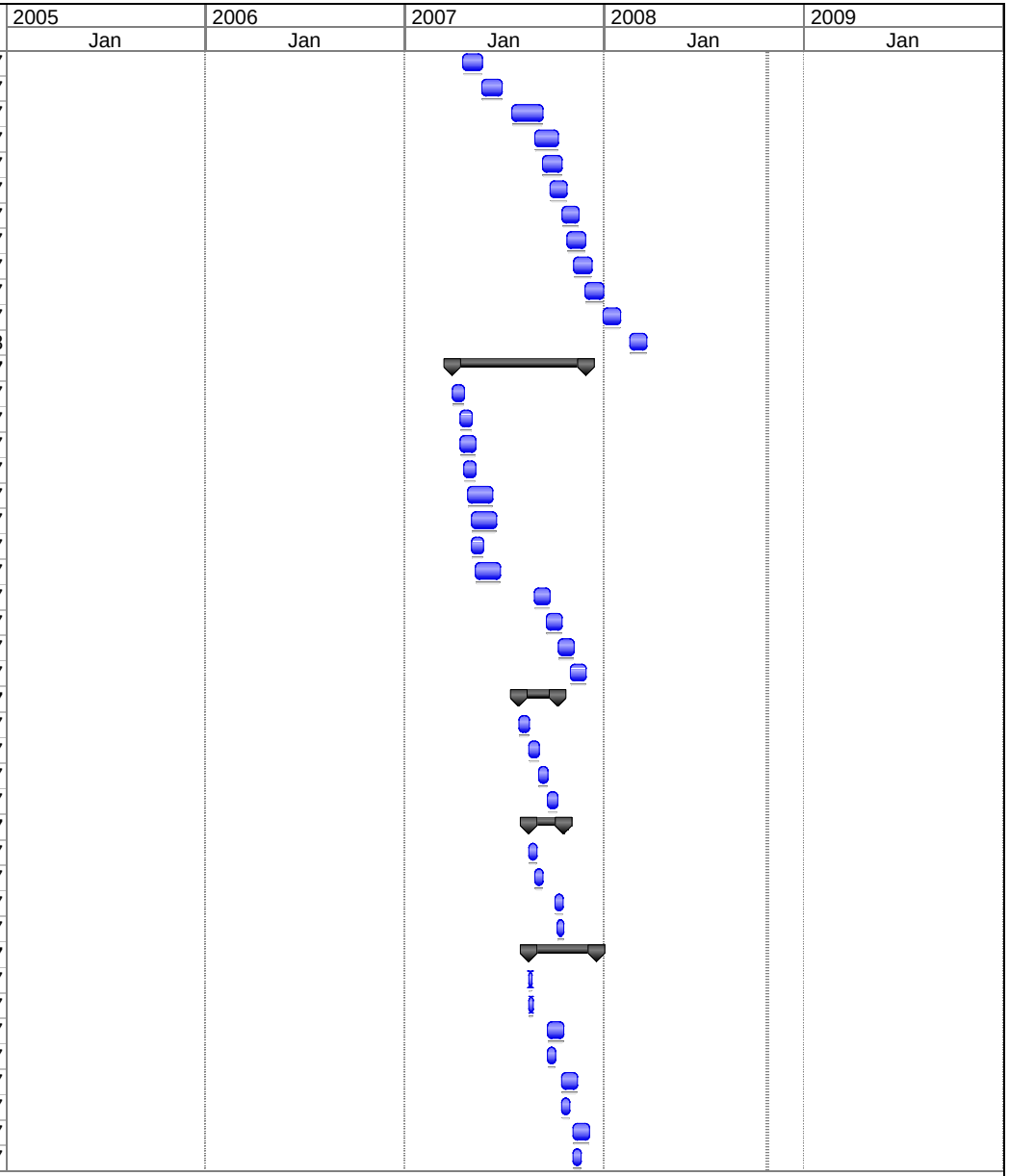
Group By Summary
Deadline

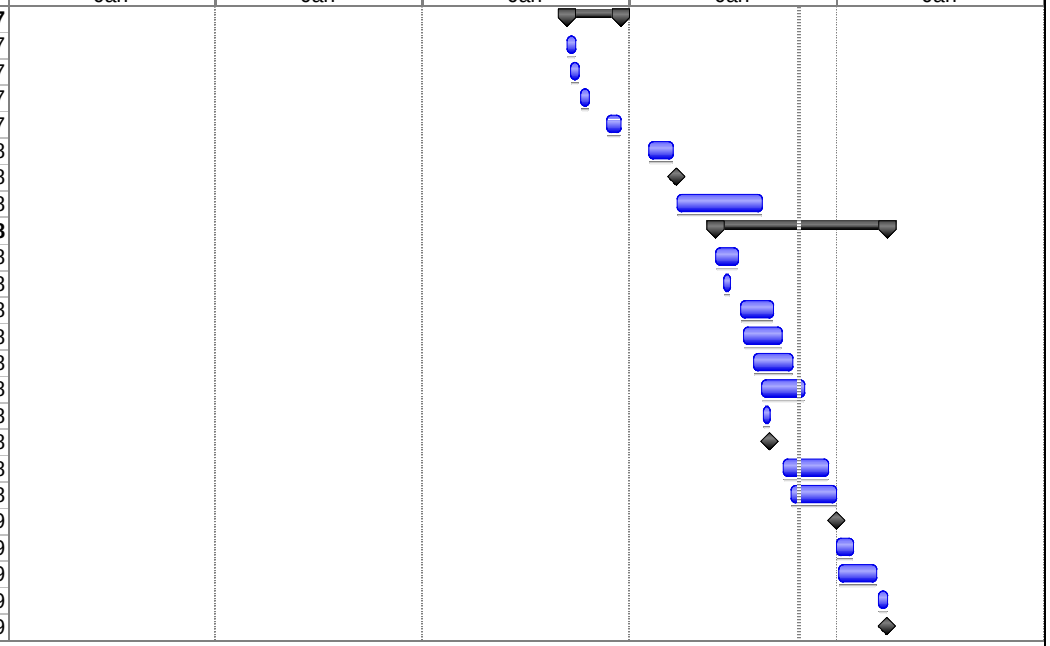
ID	Task Name	Duration	Start
133	In Wall Rough-In Floor 2	26 days	Wed 4/18/07
134	In Wall Rough-In Floor 3	27 days	Wed 5/23/07
135	Overhead Rough-In Elec. Ground Floor	41 days	Tue 7/17/07
136	Fire Alarm Rough-In Ground Floor	31 days	Tue 8/28/07
137	In Wall Rough-In Ground Floor	26 days	Tue 9/11/07
138	Fire Alarm Rough-In Floor 1	23 days	Tue 9/25/07
139	Fire Alarm Rough-In Floor 2	23 days	Wed 10/17/07
140	Install Light Fixtures Floor 1	24 days	Fri 10/26/07
141	Fire Alarm Rough-In Floor 3	24 days	Wed 11/7/07
142	Install Light Fixtures Floor 2	24 days	Wed 11/28/07
143	Install Light Fixtures Floor 3	24 days	Mon 12/31/07
144	Install Light Fixtures Ground Floor	23 days	Mon 2/18/08
145	**Fire Protection**	**137 days**	**Fri 3/30/07**
146	Install Sprinkler Mains Ground Floor	16 days	Fri 3/30/07
147	Install Sprinkler Mains Floor 1	16 days	Fri 4/13/07
148	Sprinkler Branch Lines Ground Floor	21 days	Fri 4/13/07
149	Install Sprinkler Mains Floor 2	16 days	Fri 4/20/07
150	Sprinkler Branch Lines Floor 1	32 days	Fri 4/27/07
151	Sprinkler Branch Lines Floor 2	32 days	Fri 5/4/07
152	Install Sprinkler Mains Floor 3	16 days	Fri 5/4/07
153	Sprinkler Branch Lines Floor 3	32 days	Fri 5/11/07
154	Drop Sprinkler Heads Ground Floor	21 days	Mon 8/27/07
155	Drop Sprinkler Heads Floor 1	21 days	Tue 9/18/07
156	Drop Sprinkler Heads Floor 2	21 days	Wed 10/10/07
157	Drop Sprinkler Heads Floor 3	21 days	Thu 11/1/07
158	**Painting**	**51 days**	**Mon 7/30/07**
159	Paint Ground Floor	15 days	Mon 7/30/07
160	Paint Floor 1	13 days	Fri 8/17/07
161	Paint Floor 2	13 days	Tue 9/4/07
162	Paint Floor 3	13 days	Thu 9/20/07
163	**Doors**	**46 days**	**Fri 8/17/07**
164	Hang Doors Ground Floor	11 days	Fri 8/17/07
165	Hang Doors Floor 1	11 days	Tue 8/28/07
166	Hang Doors Floor 2	11 days	Thu 10/4/07
167	Hang Doors Floor 3	10 days	Mon 10/8/07
168	**Hardware**	**88 days**	**Fri 8/17/07**
169	Install Lab Casework Ground Floor	4 days	Fri 8/17/07
170	Install Fumehoods Ground Floor	6 days	Fri 8/17/07
171	Install Lab Casework Floor 1	22 days	Thu 9/20/07
172	Install Fumehoods Floor 1	11 days	Thu 9/20/07
173	Install Lab Casework Floor 2	21 days	Tue 10/16/07
174	Install Fumehoods Floor 2	11 days	Tue 10/16/07
175	Install Lab Casework Floor 3	22 days	Tue 11/6/07
176	Install Fumehoods Floor 3	11 days	Tue 11/6/07



Project: Tech II Schedule.mpp
Date: Sat 10/25/08

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
Split
External Tasks
Project Summary
Group By Summary
Deadline

ID	Task Name	Duration	Start
177	**Flooring**	**67 days**	**Fri 9/14/07**
178	Install Carpet & VCT Ground Floor	11 days	Fri 9/14/07
179	Install Carpet & VCT Floor 2	11 days	Thu 9/20/07
180	Install Carpet & VCT Floor 3	11 days	Mon 10/8/07
181	Install Carpet & VCT Floor 1	17 days	Fri 11/23/07
182	Final Punchlist	31 days	Tue 2/5/08
183	Substantial Completion	0 days	Tue 3/25/08
184	Commissioning	108 days	Wed 3/26/08
185	**PHASE II - ROGERS HALL RENOVATION**	**217 days**	**Mon 6/2/08**
186	Demolition	30 days	Mon 6/2/08
187	Asbestos Abatement	10 days	Mon 6/16/08
188	MEP Floor 2	42 days	Wed 7/16/08
189	MEP Floor 1	50 days	Mon 7/21/08
190	Interior Partitions Floor 2	49 days	Fri 8/8/08
191	Interior Partitions Floor 1	54 days	Fri 8/22/08
192	Building Envelope	10 days	Mon 8/25/08
193	Enclosure	0 days	Fri 9/5/08
194	Interior Finishes Floor 2	58 days	Mon 9/29/08
195	Interior Finishes Floor 1	58 days	Mon 10/13/08
196	Substantial Completion	0 days	Thu 1/1/09
197	Demobilization	22 days	Thu 1/1/09
198	Commissioning	49 days	Mon 1/5/09
199	Final Punchlist	12 days	Mon 3/16/09
200	Final Completion/Occupancy	0 days	Tue 3/31/09



Project: Tech II Schedule.mpp
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Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
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External Tasks
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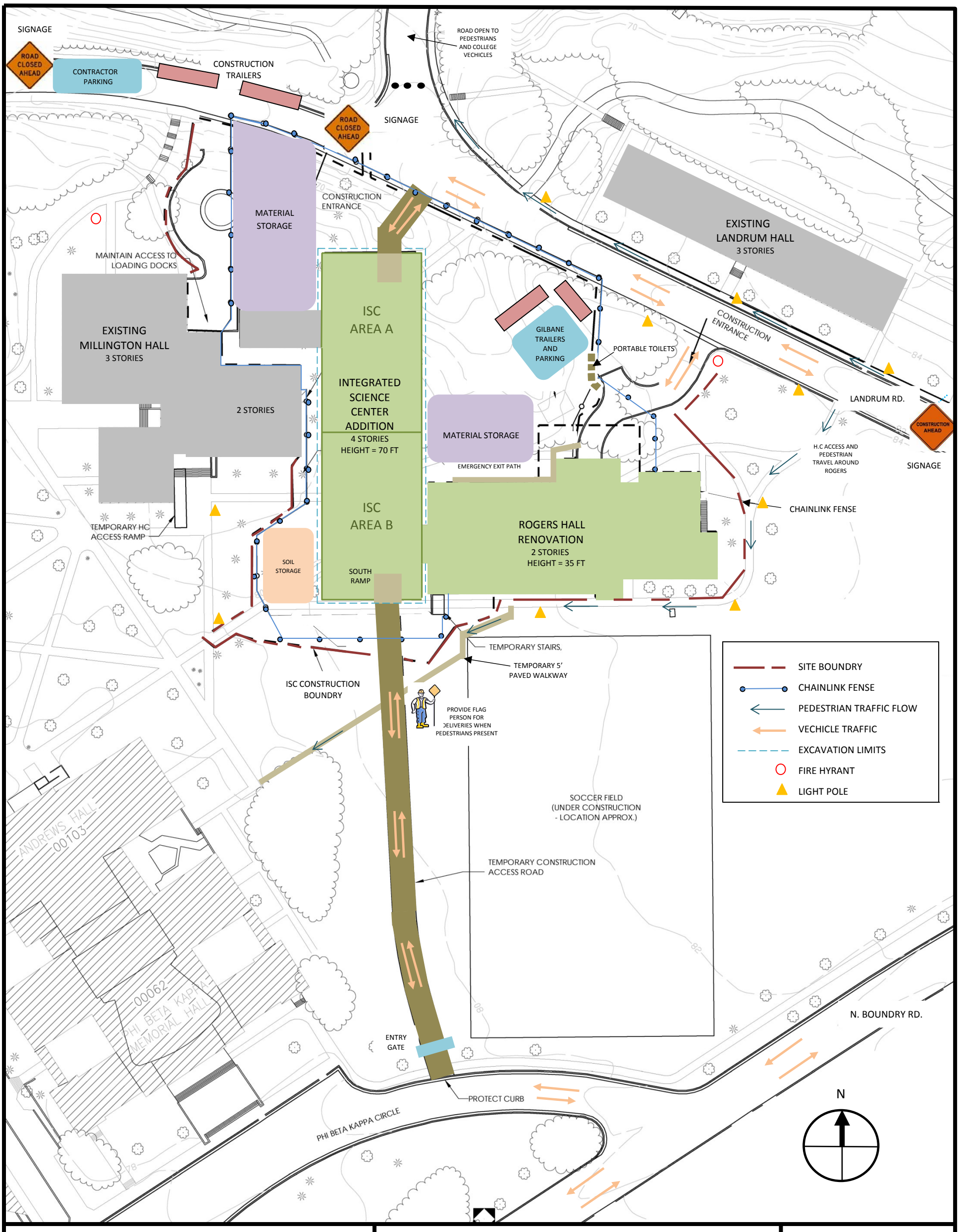
Appendix B – Site Layout Planning

SITE LAYOUT PLANNING – EXCAVATION PHASE

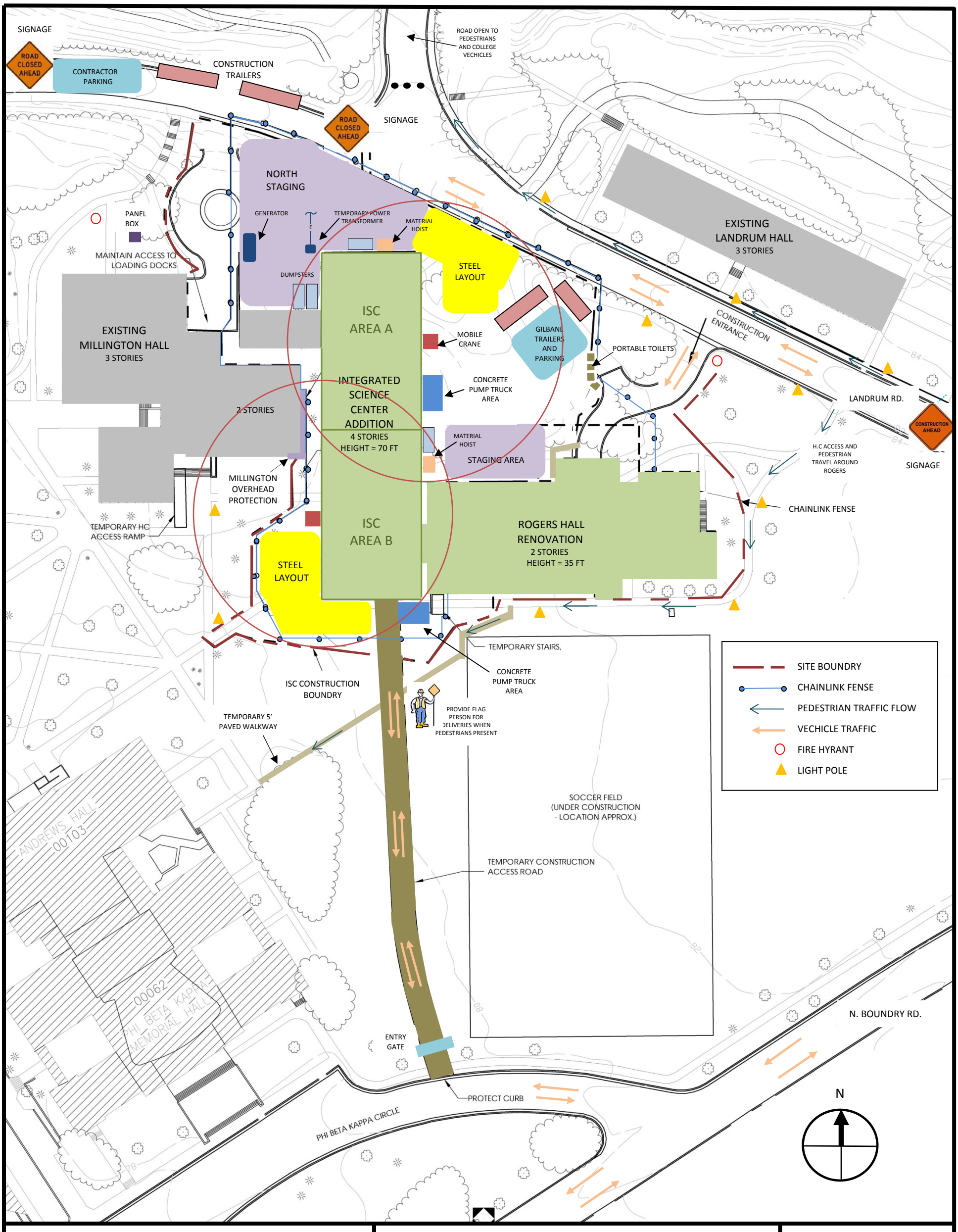


MEGHAN GRABER
THE PENNSYLVANIA STATE UNIVERSITY
TECHNICAL ASSIGNMENT 2
OCTOBER 24, 2008

THE COLLEGE OF WILLIAM AND MARY
INTEGRATED SCIENCE CENTER
WILLIAMSBURG, VIRGINIA

EXCAVATION SITE PLAN
C.01

SITE LAYOUT PLANNING – SUPERSTRUCTURE PHASE

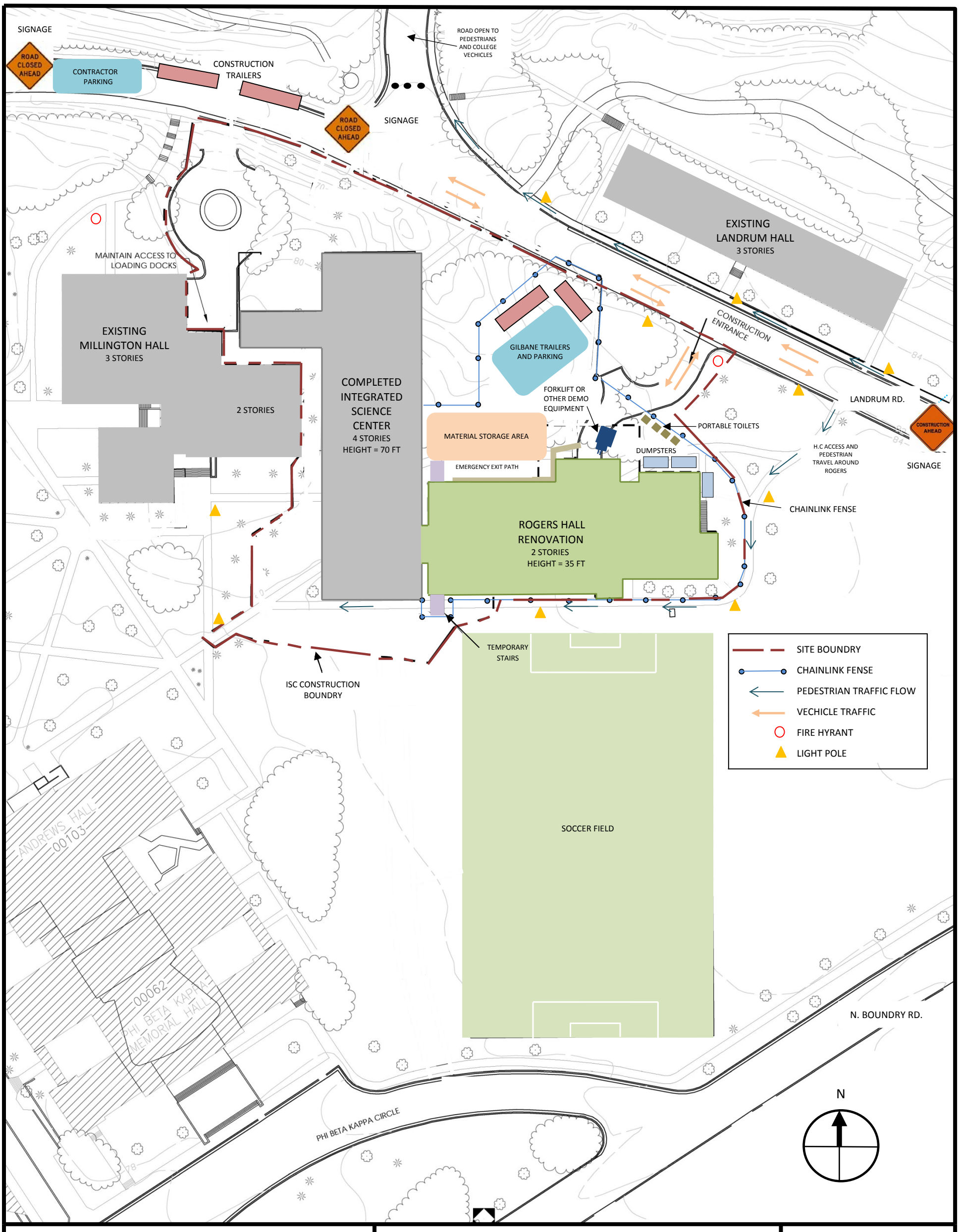


MEGHAN GRABER
THE PENNSYLVANIA STATE UNIVERSITY
TECHNICAL ASSIGNMENT 2
OCTOBER 24, 2008

THE COLLEGE OF WILLIAM AND MARY
INTEGRATED SCIENCE CENTER
WILLIAMSBURG, VIRGINIA

SUPERSTRUCTURE SITE PLAN
C.02

SITE LAYOUT PLANNING – CLOSEOUT PHASE



MEGHAN GRABER THE PENNSYLVANIA STATE UNIVERSITY TECHNICAL ASSIGNMENT 2 OCTOBER 24, 2008	THE COLLEGE OF WILLIAM AND MARY **INTEGRATED SCIENCE CENTER** WILLIAMSBURG, VIRGINIA	CLOSEOUT PHASE I & START-UP PHASE II SITE PLAN C.03

Appendix C - Detailed Structural Systems Estimate

Structural Steel Estimate										
Member Size	***Unit***	***Quanity***	***Length (L.F)***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equipment Cost***	***Equipment Cost***	***Total Item Cost***
Beams										
Wide Flange Shapes										
W 10x12	L.F	4	7'-0"	$14.28	$400	$3.78	$106	$2.52	$71	$576
W 10x12	L.F	8	9'-0"	$14.28	$1,028	$3.78	$272	$2.52	$181	$1,482
W 10x12	L.F	3	9'-4"	$14.28	$400	$3.78	$106	$2.52	$71	$576
W 10x12	L.F	12	14'-0"	$14.28	$2,399	$3.78	$635	$2.52	$423	$3,457
W 10x15	L.F	1	11'-0	$17.94	$197	$3.82	$42	$2.55	$28	$267
W 10x35	L.F	1	21'-0"	$42.39	$890	$4.08	$86	$2.73	$57	$1,033
W 12x14	L.F	4	6'-0"	$16.95	$407	$2.66	$64	$1.78	$43	$513
W 12x14	L.F	26	7'-0"	$16.95	$3,085	$2.66	$484	$1.78	$324	$3,893
W 12x14	L.F	4	7'-1"	$16.95	$480	$2.66	$75	$1.78	$51	$607
W 12x14	L.F	4	7'-2"	$16.95	$486	$2.66	$76	$1.78	$50	$613
W 12x14	L.F	23	8'-8"	$16.95	$3,379	$2.66	$530	$1.78	$355	$4,264
W 12x14	L.F	8	9'-0"	$16.95	$1,220	$2.66	$192	$1.78	$128	$1,540
W 12x14	L.F	18	9'-4"	$16.95	$2,848	$2.66	$447	$1.78	$299	$3,594
W 12x14	L.F	2	10'-2"	$16.95	$345	$2.66	$54	$1.78	$36	$435
W 12x14	L.F	5	11'-6"	$16.95	$975	$2.66	$153	$1.78	$102	$1,230
W 12x14	L.F	4	11'-8"	$16.95	$791	$2.66	$124	$1.78	$83	$998
W 12x14	L.F	3	13'-0"	$16.95	$661	$2.66	$104	$1.78	$69	$834
W 12x14	L.F	4	15'-11"	$16.95	$1,079	$2.66	$169	$1.78	$113	$1,362
W 12x14	L.F	4	17'-0"	$16.95	$1,153	$2.66	$181	$1.78	$121	$1,455
W 12x14	L.F	1	18'-1"	$16.95	$307	$2.66	$48	$1.78	$32	$387
W 12x14	L.F	12	20'-0"	$16.95	$4,068	$2.66	$638	$1.78	$427	$5,134
W 12x14	L.F	84	21'-0"	$16.95	$29,900	$2.66	$4,692	$1.78	$3,140	$37,732
W 12x16	L.F	2	10'-4"	$19.34	$400	$2.66	$55	$1.78	$37	$491
W 12x16	L.F	1	10'-8"	$19.34	$206	$2.66	$28	$1.78	$19	$254
W 12x16	L.F	1	11'-6"	$19.34	$222	$2.66	$31	$1.78	$20	$273
W 12x16	L.F	4	13'-0"	$19.34	$1,006	$2.66	$138	$1.78	$93	$1,237
W 12x16	L.F	16	13'-3"	$19.34	$4,100	$2.66	$564	$1.78	$377	$5,041
W 12x16	L.F	61	18'-0"	$19.34	$21,235	$2.66	$2,921	$1.78	$1,954	$26,110
W 12x16	L.F	14	18'-1"	$19.34	$4,896	$2.66	$673	$1.78	$451	$6,020
W 12x19	L.F	4	3'-0"	$22.92	$275	$2.66	$32	$1.78	$21	$328
W 12x19	L.F	2	4'-6"	$22.92	$206	$2.66	$24	$1.78	$16	$246
W 12x19	L.F	1	7'-0"	$22.92	$160	$2.66	$19	$1.78	$12	$192
W 12x19	L.F	6	8'-7"	$22.92	$1,180	$2.66	$137	$1.78	$92	$1,409
W 12x19	L.F	5	9'-0"	$22.92	$1,031	$2.66	$120	$1.78	$80	$1,231
W 12x19	L.F	2	9'-4"	$22.92	$428	$2.66	$50	$1.78	$33	$511
W 12x19	L.F	1	10'-1"	$22.92	$231	$2.66	$27	$1.78	$18	$276
W 12x19	L.F	12	10'-3"	$22.92	$2,819	$2.66	$327	$1.78	$219	$3,365
W 12x19	L.F	3	10'-4"	$22.92	$711	$2.66	$82	$1.78	$55	$848
W 12x19	L.F	2	10'-9"	$22.92	$493	$2.66	$57	$1.78	$38	$588
W 12x19	L.F	1	11'-9"	$22.92	$269	$2.66	$31	$1.78	$21	$321
W 12x19	L.F	1	12'-0"	$22.92	$275	$2.66	$32	$1.78	$21	$328
W 12x19	L.F	1	12'-5"	$22.92	$285	$2.66	$33	$1.78	$22	$340
W 12x19	L.F	1	12'-8"	$22.92	$290	$2.66	$34	$1.78	$23	$347
W 12x19	L.F	11	13'-3"	$22.92	$3,341	$2.66	$388	$1.78	$259	$3,988
W 12x19	L.F	1	13'-6"	$22.92	$309	$2.66	$36	$1.78	$24	$369
W 12x19	L.F	1	13'10"	$22.92	$317	$2.66	$37	$1.78	$25	$378

W 12x19	L.F	12	14'-0"	$22.92	$3,851	$2.66	$447	$1.78	$299	$4,596
W 12x19	L.F	1	14'-2"	$22.92	$325	$2.66	$38	$1.78	$25	$388
W 12x19	L.F	1	15'-10"	$22.92	$363	$2.66	$42	$1.78	$28	$433
W 12x19	L.F	30	18'-0"	$22.92	$12,377	$2.66	$1,436	$1.78	$961	$14,774
W 12x19	L.F	8	22'-3"	$22.92	$4,080	$2.66	$473	$1.78	$317	$4,870
W 12x22	L.F	8	9'-4"	$26.50	$1,979	$2.66	$199	$1.78	$133	$2,310
W 12x22	L.F	1	18'-0"	$26.50	$477	$2.66	$48	$1.78	$32	$557
W 12x26	L.F	26	11'-0"	$31.50	$9,009	$2.66	$761	$1.78	$509	$10,279
W 12x26	L.F	2	12'-8"	$31.50	$798	$2.66	$67	$1.78	$45	$910
W 12x26	L.F	4	14'-0"	$31.50	$1,764	$2.66	$149	$1.78	$100	$2,013
W 12x26	L.F	1	14'-2"	$31.50	$446	$2.66	$38	$1.78	$25	$509
W 12x26	L.F	41	18'-0"	$31.50	$23,247	$2.66	$1,963	$1.78	$1,314	$26,524
W 12x30	L.F	2	13'-3"	$36.33	$963	$2.75	$73	$1.84	$49	$1,084
W 14x22	L.F	1	8'-7"	$26.50	$227	$2.14	$18	$1.42	$12	$258
W 14x22	L.F	1	9'-0"	$26.50	$239	$2.14	$19	$1.42	$13	$271
W 14x22	L.F	1	10'-0"	$26.50	$265	$2.14	$21	$1.42	$14	$301
W 14x22	L.F	2	10'-4"	$26.50	$548	$2.14	$44	$1.42	$29	$621
W 14x22	L.F	3	10'-8"	$26.50	$848	$2.14	$68	$1.42	$45	$962
W 14x22	L.F	4	17'-1"	$26.50	$1,811	$2.14	$146	$1.42	$97	$2,054
W 14x22	L.F	13	18'-0"	$26.50	$6,201	$2.14	$501	$1.42	$332	$7,034
W 14x22	L.F	3	20'-10"	$26.50	$1,656	$2.14	$134	$1.42	$89	$1,879
W 14x22	L.F	16	21'-0"	$26.50	$8,904	$2.14	$719	$1.42	$477	$10,100
W 14x22	L.F	2	23'-1"	$26.50	$1,223	$2.14	$99	$1.42	$66	$1,388
W 14x22	L.F	37	23'-10"	$26.50	$23,369	$2.14	$1,887	$1.42	$1,252	$26,508
W 14x22	L.F	1	28'-5"	$26.50	$753	$2.14	$61	$1.42	$40	$854
W 14x22	L.F	1	31'-4"	$26.50	$830	$2.14	$67	$1.42	$44	$942
W 14x43	L.F	2	21'-3"	$51.88	$2,205	$2.93	$125	$1.96	$83	$2,413
W 16x26	L.F	2	10'-4"	$31.50	$651	$2.34	$48	$1.57	$32	$732
W 16x26	L.F	3	13'-7"	$31.50	$1,284	$2.34	$95	$1.57	$64	$1,443
W 16x26	L.F	3	14'-2"	$31.50	$1,339	$2.34	$99	$1.57	$67	$1,505
W 16x26	L.F	3	17'-1"	$31.50	$1,614	$2.34	$120	$1.57	$80	$1,815
W 16x26	L.F	1	18'-1"	$31.50	$570	$2.34	$42	$1.57	$28	$640
W 16x26	L.F	17	21'-0"	$31.50	$11,246	$2.34	$835	$1.57	$560	$12,641
W 16x26	L.F	3	21'-3"	$31.50	$2,008	$2.34	$149	$1.57	$100	$2,257
W 16x26	L.F	1	23'-11"	$31.50	$753	$2.34	$56	$1.57	$38	$847
W 16x26	L.F	7	26'-6"	$31.50	$5,843	$2.34	$434	$1.57	$291	$6,569
W 16x31	L.F	11	19'-2"	$37.50	$7,906	$2.60	$548	$1.74	$367	$8,821
W 16x31	L.F	6	23'-0"	$37.50	$5,175	$2.60	$359	$1.74	$240	$5,774
W 18x31	L.F	1	14'-8"	$37.70	$553	$3.53	$52	$1.77	$26	$631
W 18x35	L.F	1	15'-10"	$42.50	$673	$3.53	$56	$1.77	$28	$757
W 18x35	L.F	115	21'-0"	$42.50	$102,638	$3.53	$8,525	$1.77	$4,275	$115,437
W 18x35	L.F	12	21'-3"	$42.50	$10,838	$3.53	$900	$1.77	$451	$12,189
W 18x35	L.F	3	23'-11"	$42.50	$3,049	$3.53	$253	$1.77	$127	$3,430
W 18x35	L.F	305	28'-5"	$42.50	$368,351	$3.53	$30,595	$1.77	$15,341	$414,287
W 18x40	L.F	52	21'-0"	$48.50	$52,962	$3.53	$3,855	$1.77	$1,933	$58,750
W 18x40	L.F	5	21'-3"	$48.50	$5,153	$3.53	$375	$1.77	$188	$5,716
W 18x40	L.F	4	23'-11"	$48.50	$4,640	$3.53	$338	$1.77	$169	$5,147
W 18x40	L.F	2	25'-2"	$48.50	$2,441	$3.53	$178	$1.77	$89	$2,708
W 18x40	L.F	13	40'-0"	$48.50	$25,220	$3.53	$1,836	$1.77	$920	$27,976
W 18x46	L.F	2	21'-3"	$55.70	$2,367	$3.64	$155	$1.82	$77	$2,599
W 18x46	L.F	66	28'-5"	$55.70	$104,465	$3.64	$6,827	$1.82	$3,413	$114,706
W 18x50	L.F	1	18'-4"	$60.50	$1,109	$3.72	$68	$1.86	$34	$1,211

W 18x50	L.F	2	23'-10"	$60.50	$2,884	$3.72	$177	$1.86	$89	$3,150
W 18x50	L.F	3	28'-5"	$60.50	$5,158	$3.72	$317	$1.86	$159	$5,633
W 24x55	L.F	5	27'-0"	$66.50	$8,978	$3.06	$413	$1.53	$207	$9,597
W 24x62	L.F	2	27'-0"	$75.00	$4,050	$3.06	$165	$1.53	$83	$4,298
W 24x62	L.F	3	32'-0"	$75.00	$7,200	$3.06	$294	$1.53	$147	$7,641
W 24x72	L.F	1	32'-0"	$84.88	$2,716	$3.06	$98	$1.53	$49	$2,863
W 27x94	L.F	1	37'-7"	$114.00	$4,285	$2.85	$107	$1.43	$54	$4,445
W 30x116	L.F	2	37-7"	$140.00	$10,523	$2.93	$220	$1.46	$110	$10,853
Columns										
Wide Flange Shapes										
W 10 x 33	L.F	4	26'-0"	$39.89	$4,149	$2.21	$230	$1.48	$154	$4,532
W 10 x 33	L.F	4	36'-0"	$39.89	$5,744	$2.21	$318	$1.48	$213	$6,276
W 10 x 33	L.F	1	49'-0"	$39.89	$1,955	$2.21	$108	$1.48	$73	$2,135
W 10 x45	L.F	1	26'-0"	$54.50	$1,417	$2.27	$59	$1.52	$40	$1,516
W 10 x45	L.F	1	36'-0"	$54.50	$1,962	$2.27	$82	$1.52	$55	$2,098
W 12 x 53	L.F	2	26'-0"	$64.12	$3,334	$2.28	$119	$1.53	$80	$3,532
W 12 x 53	L.F	2	49'-0"	$64.12	$6,284	$2.28	$223	$1.53	$150	$6,657
W 12 x 65	L.F	5	26'-0"	$78.54	$10,210	$2.31	$300	$1.55	$202	$10,712
W 12 x 65	L.F	2	36'-0"	$78.54	$5,655	$2.31	$166	$1.55	$205	$6,026
W 12 x 65	L.F	36	41'-0"	$78.54	$115,925	$2.31	$3,410	$1.55	$2,288	$121,622
W 12 x 65	L.F	11	49'-0"	$78.54	$42,333	$2.31	$1,245	$1.55	$835	$44,414
W 12 x 72	L.F	28	36'-0"	$86.96	$87,656	$2.28	$2,298	$1.56	$1,572	$91,526
Steel Tube Shapes										
HSS 5 x 5 x 1/4	Ea.	2	12'-0"	$239.50	$479	$42.00	$84	$28.00	$56	$619
HSS 6 x 6 x 3/8	Ea.	2	12'-0"	$297.00	$594	$43.50	$87	$29.00	$58	$739
HSS 8 x 8 x 1/8	Ea.	3	14'-0"	$645.00	$1,935	$47.00	$141	$31.50	$95	$2,171
HSS 8 x 8 x 3/8	Ea.	2	14'-0"	$645.00	$1,290	$47.00	$94	$31.50	$63	$1,447
							Total Structural Steel Estimate			**$1,414,396**
							x Location Factor of 0.87			**$1,230,525**

Structural Concrete System Estimate											
Footings											
Item	***Size***	***Depth***	***Quantity***	***Total CY***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Normal Weight Concrete, 3500 PSI	4'-0" x 4'-0"	16"	5	3.95	$103.00	$407					$407
Normal Weight Concrete, 3500 PSI	7'-6" x 7'-6"	20"	18	62.50	$103.00	$6,438					$6,438
Normal Weight Concrete, 3500 PSI	7'-6" x 7'-6"	24"	24	100.00	$103.00	$10,300					$10,300
Normal Weight Concrete, 3500 PSI	8'-0" x 6'-0"	16"	4	9.48	$103.00	$977					$977
Normal Weight Concrete, 3500 PSI	8'-0" x 8'-0"	20"	17	67.16	$103.00	$6,918					$6,918
Normal Weight Concrete, 3500 PSI	8'-0" x 8'-0"	24"	1	4.74	$103.00	$488					$488
Normal Weight Concrete, 3500 PSI	10'-0" x 6'-0"	20"	1	4.74	$103.00	$488					$488
Item	***Size***	***Depth***	***Quantity***	***Total CY***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Placing Concrete Footings, pumped	4'-0" x 4'-0"	16"	5	3.95			$13.90	$55	$5.20	$21	$75
Placing Concrete Footings, pumped	7'-6" x 7'-6"	20"	18	62.50			$13.90	$869	$5.20	$325	$1,194
Placing Concrete Footings, pumped	7'-6" x 7'-6"	24"	24	100.00			$13.90	$1,390	$5.20	$520	$1,910
Placing Concrete Footings, pumped	8'-0" x 6'-0"	16"	4	9.48			$13.90	$132	$5.20	$49	$181
Placing Concrete Footings, pumped	8'-0" x 8'-0"	20"	17	67.16			$13.90	$934	$5.20	$349	$1,283
Placing Concrete Footings, pumped	8'-0" x 8'-0"	24"	1	4.74			$13.90	$66	$5.20	$25	$91
Placing Concrete Footings, pumped	10'-0" x 6'-0"	20"	1	4.74			$13.90	$66	$5.20	$25	$91
Item	***Size***	***Depth***	***Quantity***	***SFCA***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Forms in Place, plywood, 2 use	4'-0" x 4'-0"	16"	5	106.67	$1.46	$156	$3.34	$356			$512
Forms in Place, plywood, 2 use	7'-6" x 7'-6"	20"	18	900.00	$1.46	$1,314	$3.34	$3,006			$4,320
Forms in Place, plywood, 2 use	7'-6" x 7'-6"	24"	24	1440.00	$1.46	$2,102	$3.34	$4,810			$6,912
Forms in Place, plywood, 2 use	8'-0" x 6'-0"	16"	4	149.33	$1.46	$218	$3.34	$499			$717
Forms in Place, plywood, 2 use	8'-0" x 8'-0"	20"	17	906.67	$1.46	$1,324	$3.34	$3,028			$4,352
Forms in Place, plywood, 2 use	8'-0" x 8'-0"	24"	1	64.00	$1.46	$93	$3.34	$214			$307
Forms in Place, plywood, 2 use	10'-0" x 6'-0"	20"	1	53.33	$1.46	$78	$3.34	$178			$256
Item	***LBS/FT***	***Length***	***Quantity***	***LBS***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Footing # 6 Rebar, A615 Grade 60	1.502	4'-0"	20	120.16	$0.49	$59	$0.33	$40			$99
Footing # 6 Rebar, A615 Grade 60	1.502	6'-0"	42	378.50	$0.49	$185	$0.33	$125			$310
Footing # 6 Rebar, A615 Grade 60	1.502	7'-6"	108	1216.62	$0.49	$596	$0.33	$401			$998
Footing # 6 Rebar, A615 Grade 60	1.502	8'-0"	134	1610.14	$0.49	$789	$0.33	$531			$1,320

Footing # 6 Rebar, A615 Grade 60	1.502	10'-0"	10	150.20	$0.49	$74	$0.33	$50			$123
Footing # 7 Rebar, A615 Grade 60	2.044	7'-6"	144	2207.52	$0.49	$1,082	$0.33	$728			$1,810
Footing # 8 Rebar, A615 Grade 60	2.67	6'-0"	10	160.20	$0.49	$78	$0.19	$30			$109
Footing # 8 Rebar, A615 Grade 60	2.67	7'-6"	192	3844.80	$0.49	$1,884	$0.19	$731			$2,614
Footing # 8 Rebar, A615 Grade 60	2.67	8'-0"	180	3844.80	$0.49	$1,884	$0.19	$731			$2,614
Wall Footings											
Item	***Size***	***Depth***	***Length***	***CY***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Normal Weight Concrete, 3500 PSI	2'-6" x CONT.	12"	68'-0"	6.30	$103.00	$649					$649
Normal Weight Concrete, 3500 PSI	3'-0" x CONT.	14"	42'-0"	5.44	$103.00	$561					$561
Normal Weight Concrete, 3500 PSI	4'-0" x CONT.	14"	71'-8"	12.39	$103.00	$1,276					$1,276
Normal Weight Concrete, 3500 PSI	5'-0" x CONT.	14"	544'-10"	117.71	$103.00	$12,124					$12,124
Normal Weight Concrete, 3500 PSI	6'-0" x CONT.	16"	174'-6"	51.70	$103.00	$5,325					$5,325
Item	***Size***	***Depth***	***Length***	***CY***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Placing Concrete Footing Walls, pumped	2'-6" x CONT.	12"	68'-0"	6.30			$18.95	$119	$7.05	$44	$164
Placing Concrete Footing Walls, pumped	3'-0" x CONT.	14"	42'-0"	5.44			$18.15	$99	$6.78	$37	$136
Placing Concrete Footing Walls, pumped	4'-0" x CONT.	14"	71'-8"	12.39			$18.15	$225	$6.78	$84	$309
Placing Concrete Footing Walls, pumped	5'-0" x CONT.	14"	544'-10"	117.71			$18.15	$2,136	$6.78	$798	$2,935
Placing Concrete Footing Walls, pumped	6'-0" x CONT.	16"	174'-6"	51.70			$17.35	$897	$6.50	$336	$1,233
Item	***Size***	***Depth***	***Length***	***SFCA***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Continuous Wall Forms, plywood, 2 use	2'-6" x CONT.	12"	68'-0"	345.00	$2.89	$997	$2.63	$907			$1,904
Continuous Wall Forms, plywood, 2 use	3'-0" x CONT.	14"	42'-0"	259.00	$2.89	$749	$2.63	$681			$1,430
Continuous Wall Forms, plywood, 2 use	4'-0" x CONT.	14"	71'-8"	582.67	$2.89	$1,684	$2.63	$1,532			$3,216
Continuous Wall Forms, plywood, 2 use	5'-0" x CONT.	14"	544'-10"	5460.00	$2.89	$15,779	$2.63	$14,360			$30,139
Continuous Wall Forms, plywood, 2 use	6'-0" x CONT.	16"	174'-6"	481.33	$2.89	$1,391	$2.63	$1,266			$2,657
Item	***LBS/FT***	***Length***	***Quantity***	***LBS***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Wall #4 Rebar, A615 Grade 60	0.668	2'-5"	32	53.44	$0.49	$26	$0.23	$12			$38
Wall #4 Rebar, A615 Grade 60	0.668	3'-0"	40	80.16	$0.49	$39	$0.23	$18			$58

Wall #5 Rebar, A615 Grade 60	1.043	4'-0"	70	292.04	$0.49	$143	$0.23	$67			$210
Wall #5 Rebar, A615 Grade 60	1.043	5'-0"	725	3780.88	$0.49	$1,853	$0.23	$870			$2,722
Wall #5 Rebar, A615 Grade 60	1.043	6'-0"	115	719.67	$0.49	$353	$0.23	$166			$518
Wall #5 Rebar, A615 Grade 60	1.043	42'-0"	8	350.45	$0.49	$172	$0.23	$81			$252
Wall #5 Rebar, A615 Grade 60	1.043	68'-0"	6	425.54	$0.49	$209	$0.23	$98			$306
Wall #5 Rebar, A615 Grade 60	1.043	71'-8"	8	597.99	$0.49	$293	$0.23	$138			$431
Wall #5 Rebar, A615 Grade 60	1.043	544'-10"	10	5682.61	$0.49	$2,784	$0.23	$1,307			$4,091
Wall #6 Rebar, A615 Grade 60	1.502	174'-6"	12	3145.19	$0.49	$1,541	$0.23	$723			$2,265
Slab On Grade											
Item	***Area (SF)***	***Depth***	***Quantity***	***Total CY***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Normal Weight Concrete, 3500 PSI	23,411	6"	1	433.54	$103.00	$44,654					$44,654
Normal Weight Concrete, 3500 PSI	22,000	4"	1	271.60	$103.00	$27,975					$27,975
Item	***Area (SF)***	***Depth***	***Quantity***	***Total CY***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Placing Slab on Grade, pumped - Phase I	23,411	6"	-	433.54			$16.00	$6,937	$6.00	$2,601	$9,538
Placing Slab on Grade, pumped - Phase II	22,000	4"	-	271.60			$16.00	$4,346	$6.00	$1,630	$5,975
Item	***Area (SF)***	***Depth***	***Quantity***	***SFCA***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Curb forms, wood 6" to 12" high, 2 use	23,411	6"	-	448.50	$1.28	$574	$4.63	$2,077			$2,651
Curb forms, wood 6" to 12" high, 2 use	22,000	4"	-	222.56	$1.46	$325	$3.34	$743			$1,068
Item	***Area (SF)***	***Depth***	***Quantity***	***C.S.F***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
6 x 6 - W2.9 x W2.9 - Phase I	23,411	-	-	234.00	$20.00	$4,680	$23.50	$5,499			$10,179
6 x 6 - W1.4 x W1.4 - Phase II	22,000	-	-	220.00	$13.25	$2,915	$19.65	$4,323			$7,238
Elevated Slabs											
Item	***Area (SF)***	***Depth***	***Quantity***	***Total CY***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Lightweight Concrete 3,500 PSI -1st and 2nd Floors	23,400	5"	2	722.22	$103.00	$74,389					$74,389
Lightweight Concrete 3,500 PSI -3rd and 4th Floors	23,370	5"	2	721.30	$103.00	$74,294					$74,294
Item	***Area (SF)***	***Depth***	***Quantity***	***Total CY***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Placing Elevated Slab, pumped	23,400	5"	2	722.22			$14.90	$10,761	$5.55	$4,008	$14,769
Placing Elevated Slab, pumped	23,370	5"	2	721.30			$14.90	$10,747	$5.55	$4,003	$14,751
Item	***Area (SF)***	***Depth***	***Quantity***	***SFCA***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***

Curb forms, wood 6" to 12" high, 2 use	23,400	5"	2	753.00	$0.73	$550	$5.65	$4,254			$4,804
Curb forms, wood 6" to 12" high, 2 use	23,370	5"	2	740.00	$0.73	$540	$5.65	$4,181			$4,721
Item	***Area (SF)***	***Depth***	***Quantity***	***C.S.F***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
6 x 6 - W1.4 x W1.4 - 1st and 2nd Floors	23,400	-	2	468.00	$13.25	$6,201	$19.65	$9,196			$15,397
6 x 6 - W1.4 x W1.4 - 3rd and 4th Floors	23,370	-	2	467.40	$13.25	$6,193	$19.65	$9,184			$15,377
Item	***Area (SF)***	***Depth***	***Quantity***	***Total SF***	***Unit Mat'l Cost***	***Mat'l Cost***	***Unit Labor Cost***	***Labor Cost***	***Unit Equip. Cost***	***Equip. Cost***	***Total Item Cost***
Composite Decking, 2" deep, 22 Gauge	23,400	-	2	46,800.00	$1.53	$71,604	$0.36	$16,848	$0.03	$1,404	$89,856
Composite Decking, 2" deep, 22 Gauge	23,370	-	2	46,740.00	$1.53	$71,512	$0.36	$16,826	$0.03	$1,402	$89,741
Roof Decking, 1-1/2" deep, 22 Gauge	25,549	-	1	25,549.00	$1.61	$41,134	$0.31	$7,920	$0.03	$766	$49,821
							Total Structural Concrete Estimate				**$690,361**
							x Location Factor of 0.87				**$600,614**

Appendix D - Detailed General Conditions Estimate

General Conditions Estimate										
Div.	*Description*	*Unit*	*Quantity*	*Mat'l Unit Cost*	*Mat'l Cost*	*Labor Unit Cost*	*Labor Cost*	*Equipment Unit Cost*	*Equipment Cost*	*Total Cost*
01 11 31.20	**Construction Management Fees**									
0300	50,000,000 job, minimum	Project	2.50%							$1,062,166
01 31 13.20	**Field Personnel**									
0100	Field Engineer	Week	200			$1,125	$225,000			$225,000
0200	Project Manager, average	Week	200			$1,850	$370,000			$370,000
0250	Superintendent 1, average	Week	200			$1,700	$340,000			$340,000
0250	Superintendent 2, average	Week	200			$1,700	$340,000			$340,000
01 31 13.30	**Insurance**									
0020	Builders risk, standard, minimum	Job	0.24%							$101,968
01 31 13.90	**Performance Bond**									
0020	Performance bond for buildings, minimum	Job	0.60%							$254,920
01 32 13.50	**Scheduling**									
0650	Rule of thumb, CPM scheduling, large job ($50,000)	Job	0.03%							$12,746
01 41 26.50	**Permits**									
0020	Rule of thumb, most cities, minimum	Job	0.50%							$212,433
01 45 23.50	**Testing and Inspecting Services**									
0010	Testing and Inspecting Services for building costing $10,000,000, minimum	Project								$48,182
01 51 13.80	**Temporary Utilities**									
0100	Heat, incl. fuel and operation, per week, 12 hrs. per day	CSF Flr.	1,587.66	$10.35	$16,432	$3.15	$5,001			$21,433
0350	Lighting, incl. service lamps, wiring & outlets, minimum	CSF Flr.	1,587.66	$2.63	$4,176	$10.70	$16,988			$21,164
0400	Power for temp lighting only, per month, min/month 6.6 KWH	CSF Flr.	1,587.66							$1,191
0600	Power for job duration incl. elevator, ect. minimum	CSF Flr.	1,587.66							$74,620
1000	Toliet 1, portable	Month	46.5	$150	$6,975					$6,975
1000	Toliet 2, portable	Month	46.5	$150	$6,975					$6,975
1000	Toliet 3, portable	Month	46.5	$150	$6,975					$6,975
1000	Toliet 4, portable	Month	46.5	$150	$6,975					$6,975
01 52 13.20	**Office and Storage Space**									
0300	Trailer, furnished, no hookups, 32'x8' rent per month	Month	46.5	$241	$11,207					$11,207
0500	Trailer, furnished, no hookups, 50'x12' rent per month	Month	46.5	$375	$17,438					$17,438
01 52 13.40	**Field Office Expense**									
0100	Office equipment rental, average	Month	46.5	$150	$6,975					$6,975
0120	Office supplies, average	Month	46.5	$95	$4,418					$4,418
0140	Telephone bill; avg	Month	46.5	$210	$9,765					$9,765
0160	Lights & HVAC (trailer 1)	Month	46.5	$110	$5,115					$5,115
0160	Lights & HVAC (trailer 2)	Month	46.5	$110	$5,115					$5,115
01 54 16.50	**Weekly Forklift Crew**									
0100	All terrain forklift, 45' lift, 35' reach, 9000 lb capacity	Month	46.5			$1,500	$69,750	$2,175	$101,138	$170,888

01 55 23.50 Roadways and Sidewalks										
0050	Roads, gravel fill, no surfacing, 4" gravel depth	S.Y	1,656	$4.73	$7,833	$2.14	$3,544	$0.40	$662	$12,039
01 56 13.60 Tarpaulins and Barricades										
0600	Polyvinyl coated nylon, 14 oz. to 18 oz., minimum	S.F	45,000	$0.48	$21,600					$21,600
1000	Guardrail, wooden, 3' high, 1"x6", on 2"x6" posts	L.F	2,388	$1.09	$2,603	$3.05	$7,283			$9,886
01 56 26.50 Temporary Fencing and Protective Walkways										
0100	Rented chainlink, 6' high, over 1000' (1st 12 months)	L.F	1,500	$1.79	$2,685	$1.61	$2,415			$5,100
0100	Rented chainlink, 6' high, over 1000' (2nd 12 months)	L.F	1,500	$1.79	$2,685	$1.61	$2,415			$5,100
0100	Rented chainlink, 6' high, over 1000' (3rd 12 months)	L.F	1,500	$1.79	$2,685	$1.61	$2,415			$5,100
2300	Sidewalks, exterior plywood, 2 uses, 1/2" thick	S.F	1,000	$0.26	$260	$0.41	$410			$670
01 58 13.50 Signs										
0020	High intrensity reflectorized, no posts, buy	S.F	80	$17.90	$1,432					$1,432
01 74 13.20 Cleaning Up										
0020	After job completion, allow, minimum	Job	0.30%							$127,460
01 91 13.50 Commissioning										
0100	Performance verification, O&M, training, maximum	Project	0.75%							$318,650
									TOTAL PROJECT GENERAL CONDITIONS	**$3,851,679**
									x Location Factor of 0.87	**$3,350,961**