The Pennsylvania State University
5th Year Senior Thesis

Technical Assignment Two

Cost and Schedule Analysis

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Construction Management
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Unknown Data Center
Somewhere, USA
October 27, 2010

Executive Summary:

Technical assignment two focuses on key features of the Data Center. The area that is researched is the project schedule, site layout planning, a detailed structural estimate, and a general conditions estimate. In addition, the results of the sessions from the 2010 PACE roundtable are summarized.

The first area that was researched is the detailed project schedule associated with the Data Center. The schedule can be found starting on page 4 and in Appendix A. This project's schedule is very tight and there was no room for error. Coordination of mechanical and electrical trades was critical for this project. The project took roughly a year to construct. The conceptual documents for the Data Center were released in the beginning of August 2009. Turner quickly went to work with the submittal/award processes of trades. Once the primary trades of the project were awarded, construction quickly began. Construction began on September 21, 2009. The construction process was broken up into five sequences: existing building, structure, MEP coordination, MEP (includes rough-in and fit-out), and finishes. The closeout phase included all of the commissioning of the project. The Data Center hit a milestone on August 23, 2010 which represented that the project was substantially completed. Only the finial C of O inspection was left, the Data Center reached final completion on August 30, 2010.

The next area of focus for technical assignment two is the site layout plan. More details can be found on page five with plans located in Appendix B of this report. The site is located on a privately owned land and is not surrounded by neighboring buildings. Therefore, pedestrian and vehicular traffic was minimal. Being that the Data Center is an expansion onto an existing building, the owner granted Turner construction permission to use existing parking area for the site design. This allowed for less congestion near the project letting Turner use this parking space for trailer, dumpster and storage area. As well as parking for the foreman of all trades.

Next feature that was researched was a performed detailed structural estimate. This estimate includes both the structural steel frame and concrete takeoffs and cost. The total cost of these two systems came to be $976,289.57. The structural wide flange beams accounted for most of the cost. There was very little cast in place concrete on this job, so the calculations took little effort. More information on this feature can be located on page seven with the takeoff/cost in Appendix C.

Lastly, a calculated general conditions estimate was determined for the Data Center. More information can be located on page 9 and in Appendix D of this document. The general conditions calculated to be roughly $1,671,720. Key contributing factors included: the supervision/personnel and the insurance/bonds associated with the Data Center.

The report ends with a review of the 2010 PACE Roundtable. It focuses on critical issues regarding the construction industry. Proposed research topics were discussed at this event that could essentially aid the proposal process of the Data Center. Key contacts were made during this event and can be found in Table F.2 in the Critical Industry Issues section.

Table of Contents:

A. **Detailed Project Schedule:**

To get more familiar with the Data Center's schedule and construction process, the Schedule is broken up into three main phases: Preconstruction/Procurement, Construction, and Closeout. Table A.1 represents milestones that were important to the Data Center's successful schedule. Note that some milestones are not present in the detailed project schedule.

Milestones	Date
Conceptual Documents	03 AUG 09
Soils Report	03 AUG 09
Temp. Weather Tight	10 MAR 10
All Equip. Set on 1st Floor	09 APR 10
All Roof Top Equip. Set	24 MAR 10
Substantial Completion	23 AUG 10

*For Detailed Project Schedule see Appendix A.

The conceptual documents for Data Center were released by Sigma 7 in the beginning of August 2009. Due to the sensitivity of this project, the time frame in which it took to release these documents will be stated unknown. Due to the complex MEP systems on this project, review of all mechanical and electrical equipment also began immediately. Turner Construction quickly began the submittal/fabrication process early September for primary trades for the project. The trades included: concrete, structural steel and precast panel. The schedule for the Data Center is very tight; therefore coordination was a primary concern for this project. After Turner awarded the primary trades, September 15, 2009, mobilization for these trades took about a week and construction of the second Data Center Expansion was underway.

Construction began on September 21, 2009. To further understand the construction process, this phase is broken up into five sequences: existing building, structure, MEP coordination, MEP and finishes. Furthermore, the structure, MEP, and finishes were broken up into sub-sequences. These sub-sequences include site, upper/lower slab on grade and roof. This was done to provide simplicity to whoever is viewing the schedule. MEP sequence includes both rough-in and fit-out in the detailed schedule.

The structure sequence was not a primary concern for Turner. The only feature that makes the structure of the data center unique is the one story and 42 feet in height. A main concern for the structure could have been keeping the steel columns plumb, as well as keeping the steel erectors safe.

The MEP/MEP coordination was split up to show how complicated the mechanical, electrical, and plumbing components are in this building. The schedule shows that the MEP portion was the main focal point of this project.

Each sequence flow runs from west to east. Image A.1 represents the flow of construction for each phase.

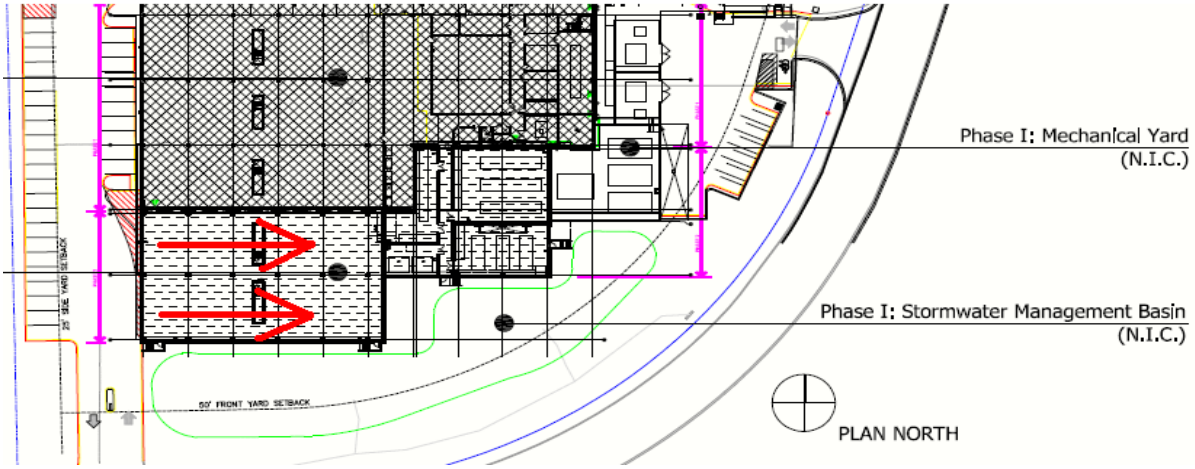


Image A.1Work Flow of construction

The closeout phase included all commissioning of the project. The entire Data Center construction was substantially completed on August 23, 2010. Finial C of O inspection was the next and last task to finish out the project. The project came to final completion on August 30, 2010.

B. Site Layout Planning:

When producing a site layout plan, the following key elements were established. The Data Center's site is located on privately owned land and is not surrounded by neighboring buildings. Turner used this element to their advantage to maximize the efficiency of the construction process. The project is an expansion on an existing structure. The owner granted Turner Construction permission to use valuable parking area. Turner used existing parking area for trailer area, storage of materials, temporary toilet, foreman parking, and dumpster area so that the congestion of the site was at a minimum.

To see details of the site layout plan, refer to Appendix B.

Superstructure Site Layout

The site plan represents the superstructure phases of construction associated with the Data Center. During this phase of the project, the site is congested the most out of any other phases of construction. The phases include: site excavation/foundation, steel erection, and precast panel enclosure. The crane represented on the site layout plan is a 250 ton all terrain crane that has a swing radius of roughly 200 feet. The crane is first positioned on the south side of the building and moves east to finish construction. The crane's swing radius can cover most of the building, therefore, the crane needed to move very little to complete the superstructure phase of this project. Deliveries including steel, precast panels and mechanical equipment can be picked up with this crane right at the construction delivery zone represent on the site layout plan. The second crane that is presented in the site layout plan is a 300 ton all terrain crane. The second crane is necessary to set the heavy loaded electrical backup generators that are located on the roof. The second crane does not mobilize onsite until all skeletal and shell construction is finished. This crane finishes all of the mechanical and electrical equipment that is located on the roof.

MEP/Interior Finishes Phase

The MEP/Interior finishes phase is represented with black arrows on the site layout plan. This phase runs west to east of the building. Whenever the superstructure of the building gets far enough ahead, the MEP/interior finish trades can proceed to work once the steel/concrete trades signoffs the building to the contractor. During this phase of construction, the majority of the materials are stored inside the building for less congestion within the site. Being that the Data Center was only a one story expansion, getting material into the building could be down with little effort or time.

Contractor Layout Critique

When analyzing Turner's site, a few discrepancies presented. The site layout plan provided by Turner shows only one way to gain access into the site. In Appendix B of this report, the access is the construction delivery zone. With all of the truck loads coming to this point to deliver materials, it may cause congestion which in turn may increase time and money as well as confusion between trades. Another criticism is that the contractor only created one site plan for all phases of construction. If another site plans were made specifying other phases of construction, it may better organize the different trades onsite.

C. Detailed Structural Systems Estimate:

A detailed structural estimate was performed to become more familiar with the Data Center. The takeoffs and estimate can be found in Appendix C of this report. The detailed estimate includes the structural steel and structural concrete with all accessories included. The Data Center was not designed with typical bays, therefore, each beam, column, footing, slab, etc. was counted and arranged orderly in a excel sheet. Note: No waste factors were used for the detailed structural estimate.

The detailed structural estimate is broken into concrete which includes formwork, reinforcing and cast in place concrete. Structural steel that includes: columns, beams, metal decking and shear studs. Table C.1 summarizes the cost and quantities for each CSI Masterformat divisions.

CSI Masterformat				
Component	**Unit Cost**	**Unit**	**Quantity:**	**Cost**
031100 - Concrete Formwork	$ 10.90	SFCA	292	$ 3,182.80
032100 - Concrete Reinforcing	$ 1,862.50	TON	8	$ 14,900.00
033050 Cast in Place Concrete	$ 157.86	CY	873.11	$137,829.54
032205 - Uncoated WWF	$ 66.72	C.S.F	398	$ 26,553.68
051223 - Steel Columns	$ 84.34	LF	1463	$123,384.55
051223 - Steel Beams	$ 114.54	LF	5426	$621,513.05
053113 - Decking	$ 2.24	SF	17,895	$ 40,078.35
05050 - Shear Studs	$ 2.19	EA	4,040	$ 8,847.60
			Total:	$976,289.57

Table C.1 Estimate Summary

To help visually see these costs, below in figure C.2 represents a percentage breakdown of the structural system costs.

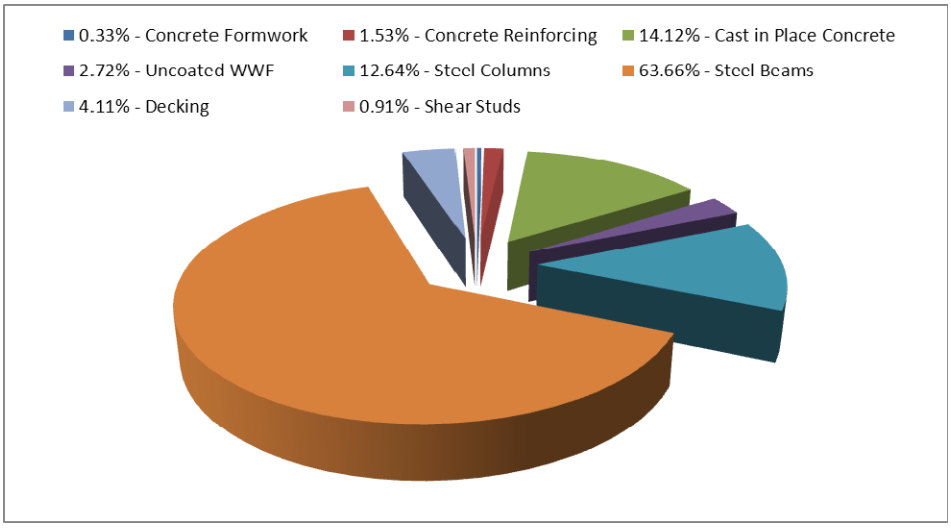


Figure C.2 Structural System Component Percentages

All of the cost data was located in RS Means Costworks online. These costs included material, labor, equipment and total overhead and profit. Any members that are idealized in the detailed structural steel estimate pricing chart indicates that RS Means did not have that member. To compensate for these missing members, it was necessary to use to next size up.
As stated before in technical assignment one, table C.1 shows the project cost summary to show cost comparisons from the detailed estimates and the total project, construction and building systems cost.

	Cost	Cost/SF
Construction:	$21 Million	$1,200.00
Total Project:	$33 Million	$1,890.00
Building System:	$12 Million	$688.00

Table C.1Project Cost Summary

Due to the sensitivity of this project, the actual prices for the structure of this building will remain unknown. However, RS Means provides a national average for the structure of any type of buildings. The structural system is roughly 14% of the construction cost. Using this data, RS Means gives a value of $2,940,000 for the structural systems. Table C.2 shows the actual (according to RS Means) versus the estimated cost.

	Total Cost	Cost/SF
Actual:	$2,940,000	$168.53
Estimated:	$976,289.57	$55.96

Table C.2 Actual vs. Estimated Structural Cost

The actual value versus the estimated value results in a 66.8% error.

There are many issues that brought about this error. As mentioned earlier, the actual prices of the building could not be released. Not having this information left out many values for the estimate. For example, there is roughly 100 rectangular structural steel supports to hold up mechanical and electrical systems on the roof. RS Means Costworks does not include any specialty prices in this nature. Having this information would have drove the estimate up. Below in Image C.1 represents the supports.

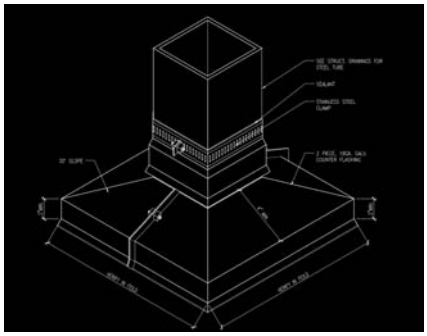


Image C.1 Dunnage roof support

D. General Conditions Estimate:

A general conditions estimate was calculated for the Data Center's site. Due to the sensitivity of this project, the actual general conditions cost was not released and will remain unknown. Detail for this estimate is available in Appendix D at the end of this report. The estimate is summarized in Table D.1. This table presents the cost for each line item associated with the Data Center.

General Condition Summary		
Item	**Cost ($)**	
Supervision and Personnel	603,330	
Construction Facilities and Equipment	38,450	
Temporary Utilities	153,100	
Miscellaneous Costs	27,640	
Insurance and Bonds	841,500	
	Total:	**$1,671,720**

Table D.1 General Condition Estimate Summary

The estimate was broken down into five main categories: Supervision and Personnel, Construction Facilities and Equipment, Temporary Utilities, Miscellaneous Cost and Insurance/Bonds. All prices that were used to calculate the general conditions estimate was obtained using RS Means Costworks.

The Supervision and Personnel category include the entire management staff and support teams for the project. For example, project executive, project managers, superintendents, and general labor. The Construction Facilities and Equipment category includes items that were needed onsite for construction. For example, office/storage trailers, survey, gang box, etc… The Temporary utilities include installation and consumption costs of power, water, and telecommunication services for the duration of the project. The Miscellaneous Cost category accounts for the site clean-up expenses as well as misc. field expenses associated with construction. The Insurance and Bonds category includes the bonds, permits, and insurance needed for the Data Center.

Show below in figure D.2 is a percentage breakdown to help visually see the general condition cost associated for the Data Center.

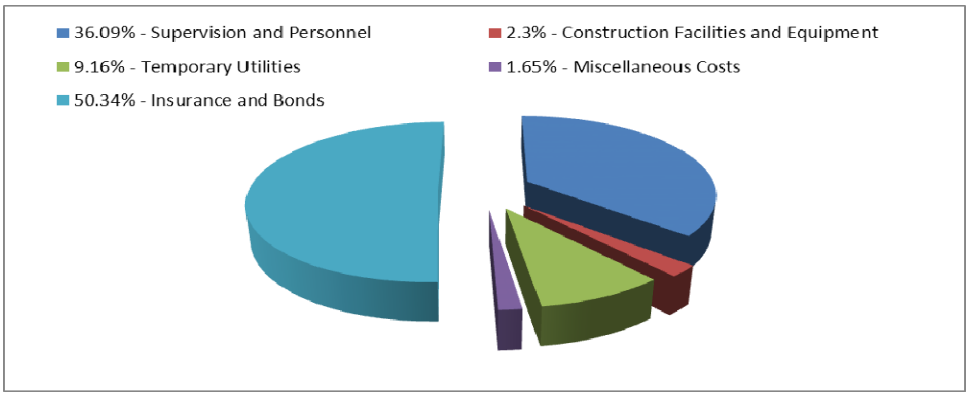


Figure D.2 – Percentage Breakdown of General Conditions

Similar to the detailed structure estimate, the general conditions estimate is inaccurate. Figure D.2 shows the Supervision and Personnel category only accounting for roughly 37% of the total general condition cost. It should be noted that the Supervision and Personnel does not include the cost of the estimator to complete a detailed estimate. In the same respect, without the cost breakdown of the actual general condition estimate from Turner, the duration of personnel is hard to determine. Any change orders may also effect the duration of key personnel as well. If these factors were known, it may drive up the calculated general conditions estimate to a more reasonable value.

The overall general conditions estimate was calculated at a value of $1,671,720. This value is a little under 8% of the total construction cost. It is stated that the general conditions cost should ultimately be around 15% of the construction cost which is approximately $3.15 million. This results in a percent error of 47%. This error can be rectified with reasons stated above.

F. Critical Industry Issues:

The 19th Annual PACE Roundtable was held at the Penn Stater Conference Center on October 28, 2010. The PACE Roundtable presented a variety of critical industry issues related to the construction industry. The theme of the roundtable this year was "Building a Collaboration Culture."

This event was broken up into four sessions: Break-outs 1&2, team collaboration, and a panel discussion.

Shown in Table F.1 are the different break-out sessions available to attend at the PACE Roundtable.

Break-Out Session Selection		
A. Sustainability/Green Building	**B. Technology Applications**	**C. Process Innovation**
Session 1A: Educating a future workforce for delivering high performance buildings	**Session 1B:** Transformation: What are the innovations that will transform our industry	**Session 1C:** IPD: Exploring the drivers behind highly integrated delivery of projects.
Session 2A: The Smart Grid: Energy impacts in the building industry	**Session 2B:** Carrying BIM to the field – new responsibilities, roles, & competencies	**Session 2C:** Operations & Maintenance process integration in new and retrofit projects

Table F.1 Different Break-Out Sessions

Each breakout topics were very interesting, the topics that were chosen to sit in on was the Technology Application. Session one was held by Dr. Messner. The session was an in depth conversation about ideals of the way we as future industrial leaders will essentially transform the construction industry with new innovations. Session two was held by Craig Dubler. In this session the group spoke about ways to integrate Building Information Modeling to the field of construction, also how to set up new roles and responsibilities in the field dealing with BIM.

Breakout session one was set up in an informal fashion. Those who had ideas would speak it. There were radical ideas, such as integrating robotics to the construction field, to ideas such as prefabricating materials to a new level. A specific topic that could be applied to the Data Center and definitely could benefit from this technology is the use of Latista. Latista is a basically a small personal computer that can be used by all participants of the construction process. Latista in the field can condense all project information, plans and drawings into a comfortably carried computer. Another key component of Latista is that it can tract down deliveries for all types of trades. Because the Data Center has complex mechanical and electrical systems, this project could apply this technology to track down all MEP deliveries. This could organize all the materials that are onsite and give Turner insight of what is needed next for the MEP rough-in or fit-out phases. Another topic that was discussed during this session, which could be applied to the Data Center, was pre-fabrication at a new level. Many participants at this session felt that prefabrication hit a plateau and we as leaders of this industry should look into how we could

prefabricate more components of buildings to speed up the construction process. For example, prefabrication of mechanical and electrical runways could be implemented off site then erected into place as one complete unit.

The second breakout session was similar to the first. This breakout session was an in depth conversation on applying BIM to the field. The main topic discussed in this session was a bit similar to the first. The topic was the use a tablet PC's to track materials. A few ideas arose when this topic was introduced. These ideas are listed below:

- Precast panel placement
- Steel placement
- Tracking items onsite
- Punch-list effective
- Tracking the work of the subcontractors
- Tracking the commissioning process

These are few of many ideas introduced during this session. As stated in the breakout 1 session paragraph above. The Data Center could apply this tablet PC technology to track materials. Breakout session two gave more descriptive information of what this technology is capable of. An example arose about the use of the tablet PC technology on a project. He explained by using barcodes to track pieces of precast the general contractor can know at any time all information pertaining to a specific precast panel. The Data Center is enclosed with architectural precast panels; the example given during this session can apply to this project.

Key contacts were introduced during the PACE seminar. Table F.2 shows there name, company and contact information. Most of these professionals sat/lectured in on the technology application breakout sessions. These key contacts can make of great use in the proposal process for the Data Center.

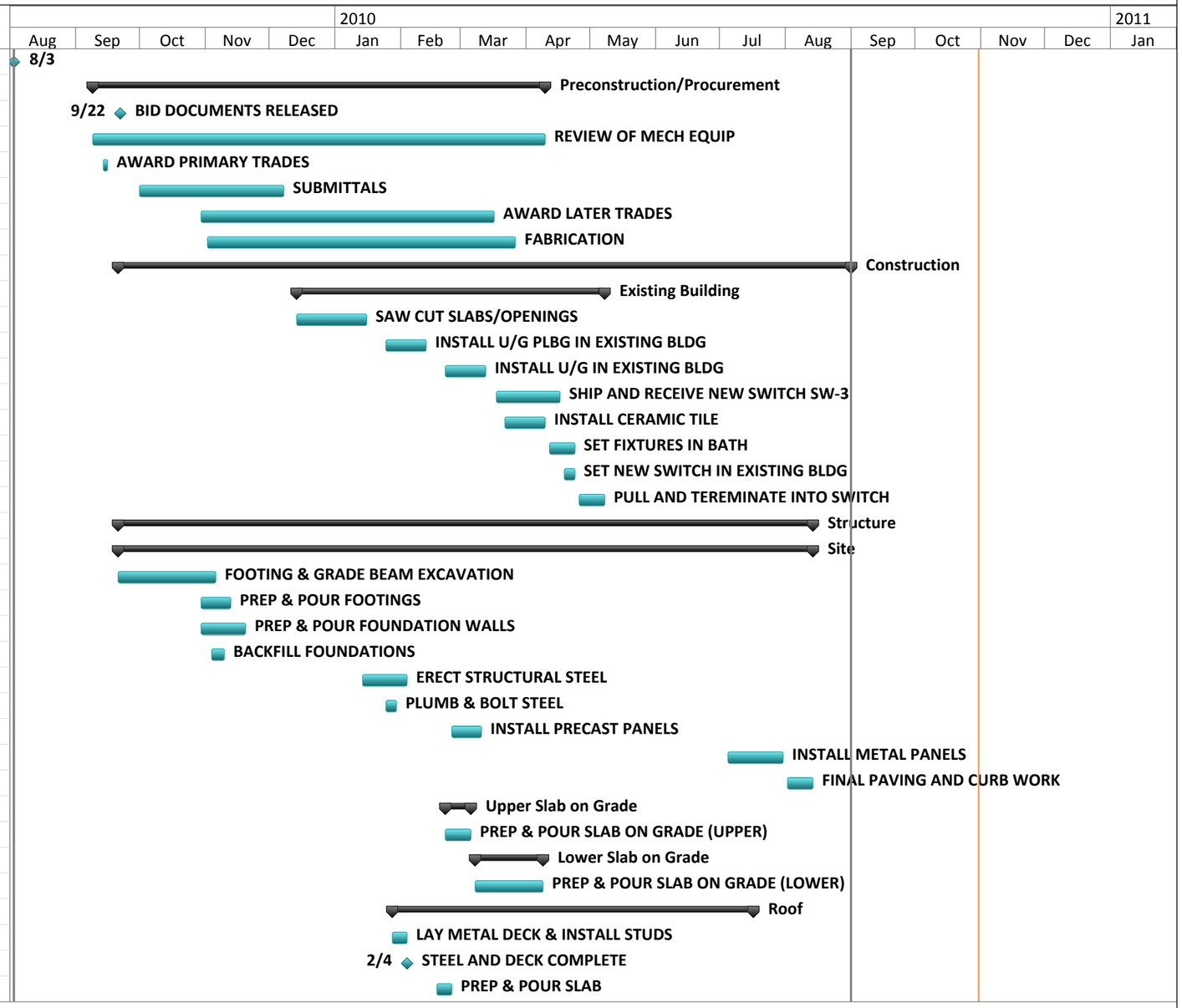
Key Contacts from PACE Seminar		
Name	**Company**	**Contact Info.**
Mr. Michael Barnhart	Forrester Construction Co.	mbarnhart@forresterconstruction.com
Dr. Chris Magent	Alexander Building Construction, LLC	chris.magent@alexanderbuilding.com
Mr. Jim Salvino	Clark Construction Group	james.salvino@clarkconstruction.com
Mr. John Bechtel	OPP (Office of the Physical Plant)	jrb115@psu.edu

Appendix A – Detailed Project Schedule:

*See Attached

Daniel Suter
Unknown Data Center
Somewhere, USA

ID	Task Name	Duration	Start	Finish
1	CONCEPTUAL DOCUMENTS	0 days	Mon 8/3/09	Mon 8/3/09
2	**Preconstruction/Procurement**	**153 days**	**Wed 9/9/09**	**Fri 4/9/10**
3	BID DOCUMENTS RELEASED	0 days	Tue 9/22/09	Tue 9/22/09
4	REVIEW OF MECH EQUIP	153 days	Wed 9/9/09	Fri 4/9/10
5	AWARD PRIMARY TRADES	2 days	Mon 9/14/09	Tue 9/15/09
6	SUBMITTALS	48 days	Thu 10/1/09	Mon 12/7/09
7	AWARD LATER TRADES	98 days	Fri 10/30/09	Tue 3/16/10
8	FABRICATION	105 days	Mon 11/2/09	Fri 3/26/10
9	**Construction**	**247 days**	**Mon 9/21/09**	**Tue 8/31/10**
10	**Existing Building**	**105 days**	**Mon 12/14/09**	**Fri 5/7/10**
11	SAW CUT SLABS/OPENINGS	25 days	Mon 12/14/09	Fri 1/15/10
12	INSTALL U/G PLBG IN EXISTING BLDG	15 days	Mon 1/25/10	Fri 2/12/10
13	INSTALL U/G IN EXISTING BLDG	15 days	Mon 2/22/10	Fri 3/12/10
14	SHIP AND RECEIVE NEW SWITCH SW-3	22 days	Thu 3/18/10	Fri 4/16/10
15	INSTALL CERAMIC TILE	15 days	Mon 3/22/10	Fri 4/9/10
16	SET FIXTURES IN BATH	10 days	Mon 4/12/10	Fri 4/23/10
17	SET NEW SWITCH IN EXISTING BLDG	5 days	Mon 4/19/10	Fri 4/23/10
18	PULL AND TEREMINATE INTO SWITCH	10 days	Mon 4/26/10	Fri 5/7/10
19	**Structure**	**235 days**	**Mon 9/21/09**	**Fri 8/13/10**
20	**Site**	**235 days**	**Mon 9/21/09**	**Fri 8/13/10**
21	FOOTING & GRADE BEAM EXCAVATION	34 days	Mon 9/21/09	Thu 11/5/09
22	PREP & POUR FOOTINGS	10 days	Fri 10/30/09	Thu 11/12/09
23	PREP & POUR FOUNDATION WALLS	15 days	Fri 10/30/09	Thu 11/19/09
24	BACKFILL FOUNDATIONS	4 days	Wed 11/4/09	Mon 11/9/09
25	ERECT STRUCTURAL STEEL	15 days	Thu 1/14/10	Wed 2/3/10
26	PLUMB & BOLT STEEL	5 days	Mon 1/25/10	Fri 1/29/10
27	INSTALL PRECAST PANELS	10 days	Thu 2/25/10	Wed 3/10/10
28	INSTALL METAL PANELS	20 days	Mon 7/5/10	Fri 7/30/10
29	FINAL PAVING AND CURB WORK	10 days	Mon 8/2/10	Fri 8/13/10
30	**Upper Slab on Grade**	**10 days**	**Mon 2/22/10**	**Fri 3/5/10**
31	PREP & POUR SLAB ON GRADE (UPPER)	10 days	Mon 2/22/10	Fri 3/5/10
32	**Lower Slab on Grade**	**24 days**	**Mon 3/8/10**	**Thu 4/8/10**
33	PREP & POUR SLAB ON GRADE (LOWER)	24 days	Mon 3/8/10	Thu 4/8/10
34	**Roof**	**122 days**	**Thu 1/28/10**	**Fri 7/16/10**
35	LAY METAL DECK & INSTALL STUDS	5 days	Thu 1/28/10	Wed 2/3/10
36	STEEL AND DECK COMPLETE	0 days	Thu 2/4/10	Thu 2/4/10
37	PREP & POUR SLAB	5 days	Thu 2/18/10	Wed 2/24/10



Project: Detailed project schedule
Date: Sun 10/31/10

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

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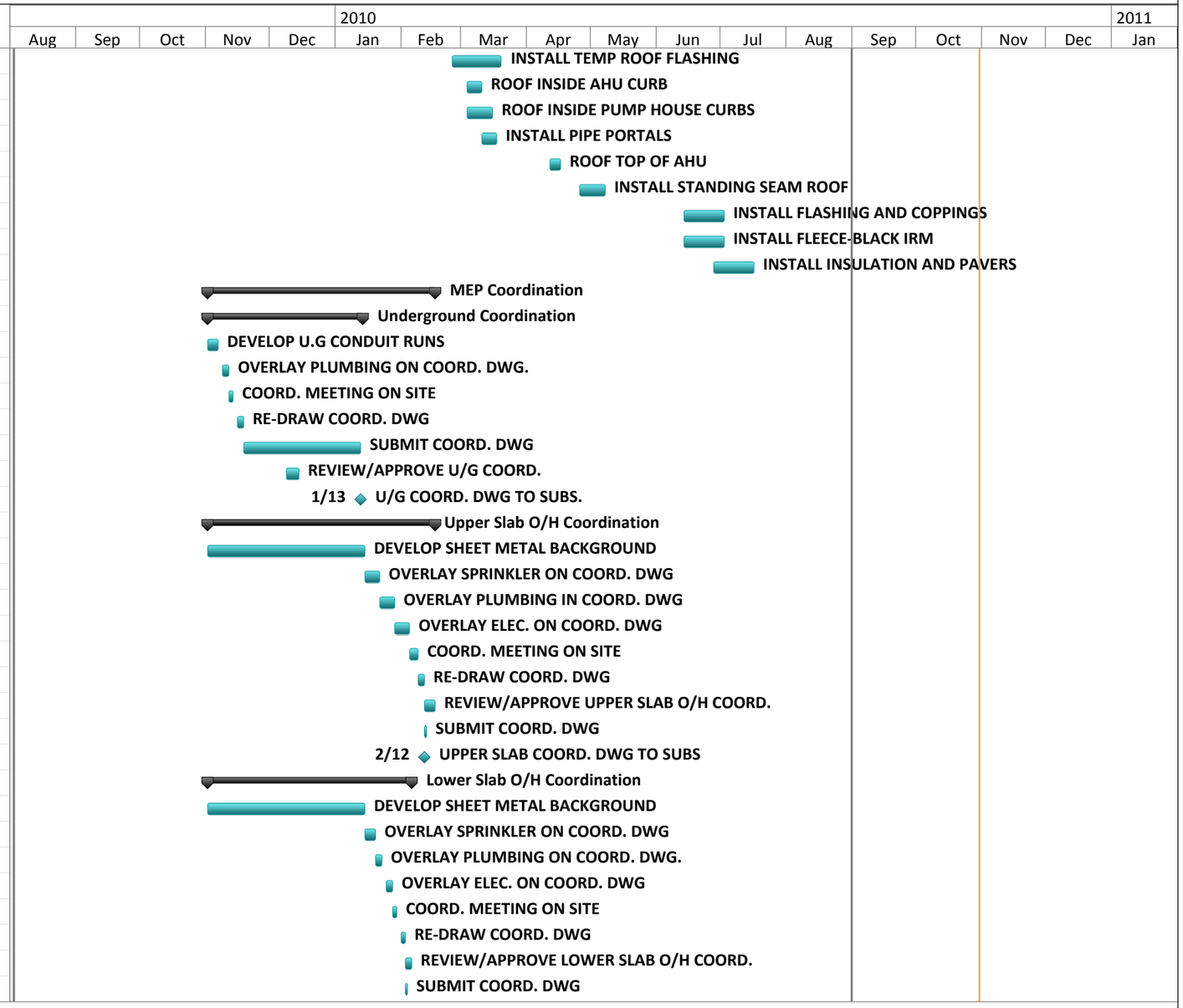
ID	Task Name	Duration	Start	Finish
38	INSTALL TEMP ROOF FLASHING	17 days	Thu 2/25/10	Fri 3/19/10
39	ROOF INSIDE AHU CURB	5 days	Thu 3/4/10	Wed 3/10/10
40	ROOF INSIDE PUMP HOUSE CURBS	8 days	Thu 3/4/10	Mon 3/15/10
41	INSTALL PIPE PORTALS	5 days	Thu 3/11/10	Wed 3/17/10
42	ROOF TOP OF AHU	5 days	Mon 4/12/10	Fri 4/16/10
43	INSTALL STANDING SEAM ROOF	10 days	Mon 4/26/10	Fri 5/7/10
44	INSTALL FLASHING AND COPPINGS	15 days	Mon 6/14/10	Fri 7/2/10
45	INSTALL FLEECE-BLACK IRM	15 days	Mon 6/14/10	Fri 7/2/10
46	INSTALL INSULATION AND PAVERS	15 days	Mon 6/28/10	Fri 7/16/10
47	**MEP Coordination**	**77 days**	**Mon 11/2/09**	**Tue 2/16/10**
48	**Underground Coordination**	**53 days**	**Mon 11/2/09**	**Wed 1/13/10**
49	DEVELOP U.G CONDUIT RUNS	5 days	Mon 11/2/09	Fri 11/6/09
50	OVERLAY PLUMBING ON COORD. DWG.	3 days	Mon 11/9/09	Wed 11/11/09
51	COORD. MEETING ON SITE	2 days	Thu 11/12/09	Fri 11/13/09
52	RE-DRAW COORD. DWG	3 days	Mon 11/16/09	Wed 11/18/09
53	SUBMIT COORD. DWG	39 days	Thu 11/19/09	Tue 1/12/10
54	REVIEW/APPROVE U/G COORD.	4 days	Wed 12/9/09	Mon 12/14/09
55	U/G COORD. DWG TO SUBS.	0 days	Wed 1/13/10	Wed 1/13/10
56	**Upper Slab O/H Coordination**	**77 days**	**Mon 11/2/09**	**Tue 2/16/10**
57	DEVELOP SHEET METAL BACKGROUND	54 days	Mon 11/2/09	Thu 1/14/10
58	OVERLAY SPRINKLER ON COORD. DWG	5 days	Fri 1/15/10	Thu 1/21/10
59	OVERLAY PLUMBING IN COORD. DWG	5 days	Fri 1/22/10	Thu 1/28/10
60	OVERLAY ELEC. ON COORD. DWG	5 days	Fri 1/29/10	Thu 2/4/10
61	COORD. MEETING ON SITE	2 days	Fri 2/5/10	Mon 2/8/10
62	RE-DRAW COORD. DWG	3 days	Tue 2/9/10	Thu 2/11/10
63	REVIEW/APPROVE UPPER SLAB O/H COORD.	3 days	Fri 2/12/10	Tue 2/16/10
64	SUBMIT COORD. DWG	1 day	Fri 2/12/10	Fri 2/12/10
65	UPPER SLAB COORD. DWG TO SUBS	0 days	Fri 2/12/10	Fri 2/12/10
66	**Lower Slab O/H Coordination**	**70 days**	**Mon 11/2/09**	**Fri 2/5/10**
67	DEVELOP SHEET METAL BACKGROUND	54 days	Mon 11/2/09	Thu 1/14/10
68	OVERLAY SPRINKLER ON COORD. DWG	3 days	Fri 1/15/10	Tue 1/19/10
69	OVERLAY PLUMBING ON COORD. DWG.	3 days	Wed 1/20/10	Fri 1/22/10
70	OVERLAY ELEC. ON COORD. DWG	3 days	Mon 1/25/10	Wed 1/27/10
71	COORD. MEETING ON SITE	2 days	Thu 1/28/10	Fri 1/29/10
72	RE-DRAW COORD. DWG	2 days	Mon 2/1/10	Tue 2/2/10
73	REVIEW/APPROVE LOWER SLAB O/H COORD.	3 days	Wed 2/3/10	Fri 2/5/10
74	SUBMIT COORD. DWG	1 day	Wed 2/3/10	Wed 2/3/10

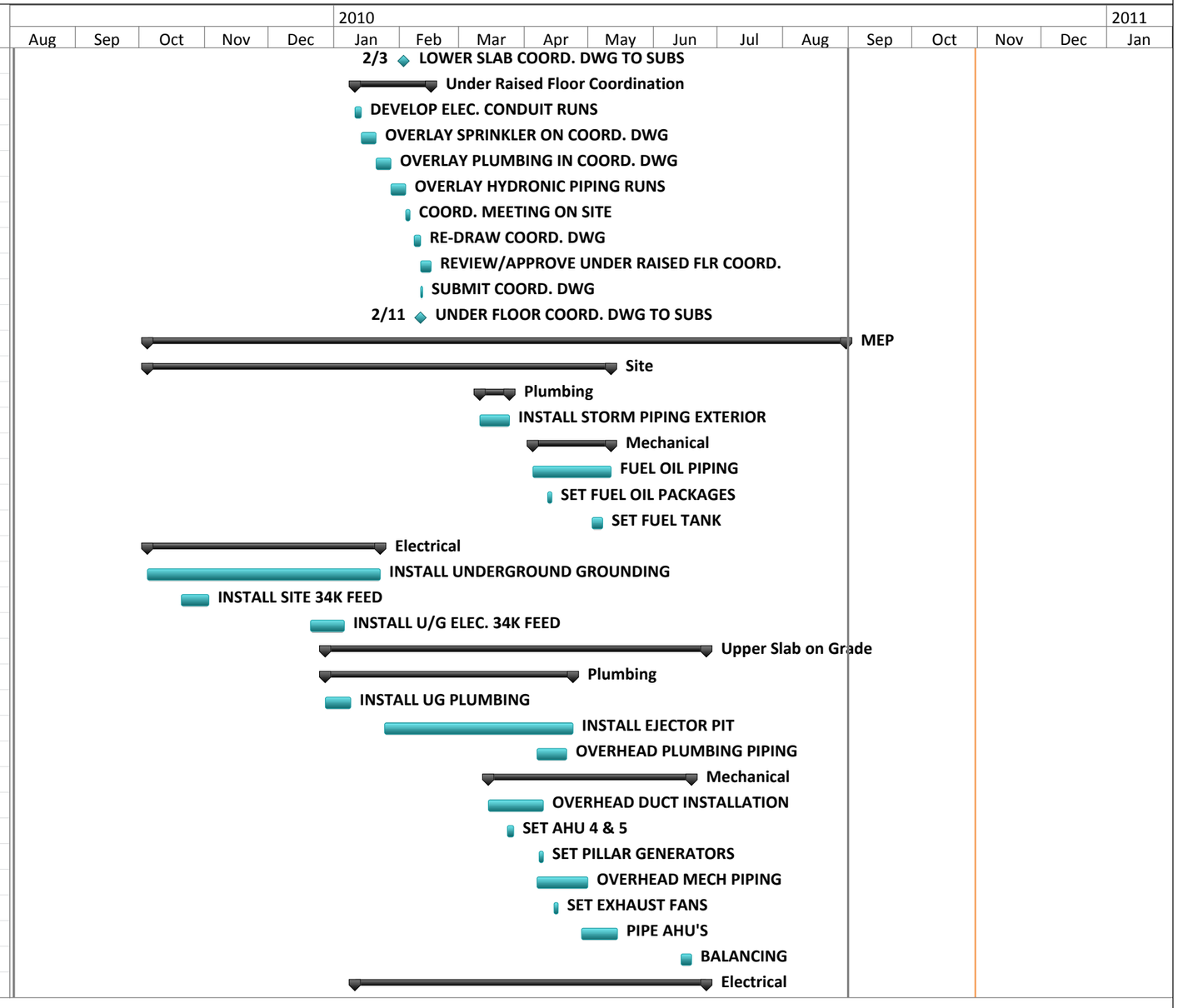


Project: Detailed project schedule
Date: Sun 10/31/10

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

Daniel Suter
Unknown Data Center
Somewhere, USA

ID	Task Name	Duration	Start	Finish
75	LOWER SLAB COORD. DWG TO SUBS	0 days	Wed 2/3/10	Wed 2/3/10
76	**Under Raised Floor Coordination**	**26 days**	**Mon 1/11/10**	**Mon 2/15/10**
77	DEVELOP ELEC. CONDUIT RUNS	3 days	Mon 1/11/10	Wed 1/13/10
78	OVERLAY SPRINKLER ON COORD. DWG	5 days	Thu 1/14/10	Wed 1/20/10
79	OVERLAY PLUMBING IN COORD. DWG	5 days	Thu 1/21/10	Wed 1/27/10
80	OVERLAY HYDRONIC PIPING RUNS	5 days	Thu 1/28/10	Wed 2/3/10
81	COORD. MEETING ON SITE	2 days	Thu 2/4/10	Fri 2/5/10
82	RE-DRAW COORD. DWG	3 days	Mon 2/8/10	Wed 2/10/10
83	REVIEW/APPROVE UNDER RAISED FLR COORD.	3 days	Thu 2/11/10	Mon 2/15/10
84	SUBMIT COORD. DWG	1 day	Thu 2/11/10	Thu 2/11/10
85	UNDER FLOOR COORD. DWG TO SUBS	0 days	Thu 2/11/10	Thu 2/11/10
86	**MEP**	**236 days**	**Mon 10/5/09**	**Mon 8/30/10**
87	**Site**	**157 days**	**Mon 10/5/09**	**Tue 5/11/10**
88	**Plumbing**	**10 days**	**Thu 3/11/10**	**Wed 3/24/10**
89	INSTALL STORM PIPING EXTERIOR	10 days	Thu 3/11/10	Wed 3/24/10
90	**Mechanical**	**27 days**	**Mon 4/5/10**	**Tue 5/11/10**
91	FUEL OIL PIPING	27 days	Mon 4/5/10	Tue 5/11/10
92	SET FUEL OIL PACKAGES	2 days	Mon 4/12/10	Tue 4/13/10
93	SET FUEL TANK	5 days	Mon 5/3/10	Fri 5/7/10
94	**Electrical**	**80 days**	**Mon 10/5/09**	**Fri 1/22/10**
95	INSTALL UNDERGROUND GROUNDING	80 days	Mon 10/5/09	Fri 1/22/10
96	INSTALL SITE 34K FEED	9 days	Wed 10/21/09	Mon 11/2/09
97	INSTALL U/G ELEC. 34K FEED	12 days	Mon 12/21/09	Tue 1/5/10
98	**Upper Slab on Grade**	**130 days**	**Mon 12/28/09**	**Fri 6/25/10**
99	**Plumbing**	**85 days**	**Mon 12/28/09**	**Fri 4/23/10**
100	INSTALL UG PLUMBING	10 days	Mon 12/28/09	Fri 1/8/10
101	INSTALL EJECTOR PIT	65 days	Mon 1/25/10	Fri 4/23/10
102	OVERHEAD PLUMBING PIPING	10 days	Wed 4/7/10	Tue 4/20/10
103	**Mechanical**	**70 days**	**Mon 3/15/10**	**Fri 6/18/10**
104	OVERHEAD DUCT INSTALLATION	20 days	Mon 3/15/10	Fri 4/9/10
105	SET AHU 4 & 5	3 days	Wed 3/24/10	Fri 3/26/10
106	SET PILLAR GENERATORS	2 days	Thu 4/8/10	Fri 4/9/10
107	OVERHEAD MECH PIPING	18 days	Wed 4/7/10	Fri 4/30/10
108	SET EXHAUST FANS	2 days	Thu 4/15/10	Fri 4/16/10
109	PIPE AHU'S	13 days	Wed 4/28/10	Fri 5/14/10
110	BALANCING	5 days	Mon 6/14/10	Fri 6/18/10
111	**Electrical**	**120 days**	**Mon 1/11/10**	**Fri 6/25/10**



Project: Detailed project schedule
Date: Sun 10/31/10

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

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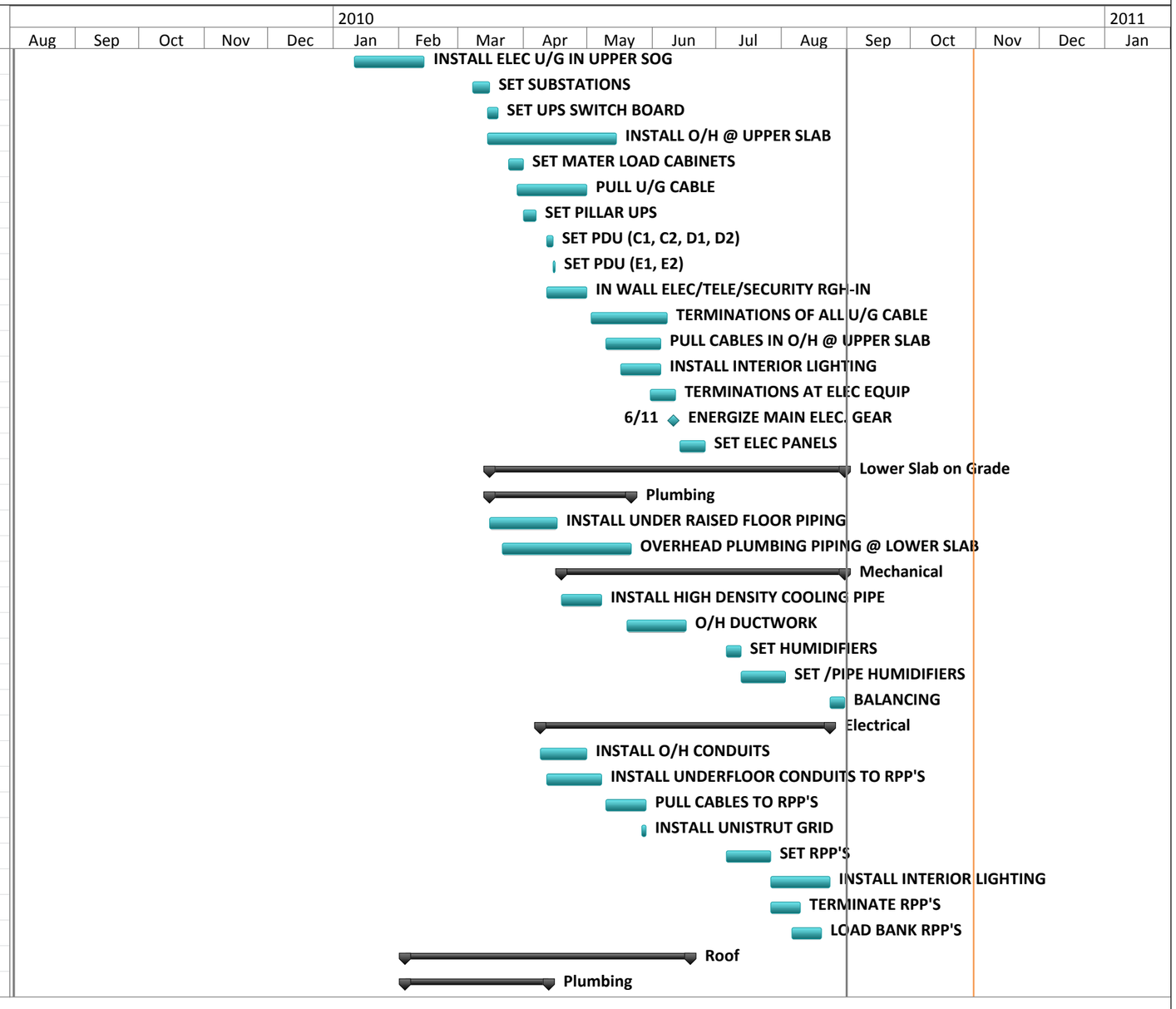
ID	Task Name	Duration	Start	Finish
112	INSTALL ELEC U/G IN UPPER SOG	25 days	Mon 1/11/10	Fri 2/12/10
113	SET SUBSTATIONS	6 days	Mon 3/8/10	Mon 3/15/10
114	SET UPS SWITCH BOARD	5 days	Mon 3/15/10	Fri 3/19/10
115	INSTALL O/H @ UPPER SLAB	45 days	Mon 3/15/10	Fri 5/14/10
116	SET MATER LOAD CABINETS	5 days	Thu 3/25/10	Wed 3/31/10
117	PULL U/G CABLE	25 days	Mon 3/29/10	Fri 4/30/10
118	SET PILLAR UPS	4 days	Thu 4/1/10	Tue 4/6/10
119	SET PDU (C1, C2, D1, D2)	3 days	Mon 4/12/10	Wed 4/14/10
120	SET PDU (E1, E2)	1 day	Thu 4/15/10	Thu 4/15/10
121	IN WALL ELEC/TELE/SECURITY RGH-IN	15 days	Mon 4/12/10	Fri 4/30/10
122	TERMINATIONS OF ALL U/G CABLE	26 days	Mon 5/3/10	Mon 6/7/10
123	PULL CABLES IN O/H @ UPPER SLAB	20 days	Mon 5/10/10	Fri 6/4/10
124	INSTALL INTERIOR LIGHTING	15 days	Mon 5/17/10	Fri 6/4/10
125	TERMINATIONS AT ELEC EQUIP	10 days	Mon 5/31/10	Fri 6/11/10
126	ENERGIZE MAIN ELEC. GEAR	0 days	Fri 6/11/10	Fri 6/11/10
127	SET ELEC PANELS	10 days	Mon 6/14/10	Fri 6/25/10
128	**Lower Slab on Grade**	**120 days**	**Tue 3/16/10**	**Mon 8/30/10**
129	**Plumbing**	**49 days**	**Tue 3/16/10**	**Fri 5/21/10**
130	INSTALL UNDER RAISED FLOOR PIPING	24 days	Tue 3/16/10	Fri 4/16/10
131	OVERHEAD PLUMBING PIPING @ LOWER SLAB	45 days	Mon 3/22/10	Fri 5/21/10
132	**Mechanical**	**96 days**	**Mon 4/19/10**	**Mon 8/30/10**
133	INSTALL HIGH DENSITY COOLING PIPE	15 days	Mon 4/19/10	Fri 5/7/10
134	O/H DUCTWORK	20 days	Thu 5/20/10	Wed 6/16/10
135	SET HUMIDIFIERS	5 days	Tue 7/6/10	Mon 7/12/10
136	SET /PIPE HUMIDIFIERS	15 days	Tue 7/13/10	Mon 8/2/10
137	BALANCING	5 days	Tue 8/24/10	Mon 8/30/10
138	**Electrical**	**97 days**	**Fri 4/9/10**	**Mon 8/23/10**
139	INSTALL O/H CONDUITS	16 days	Fri 4/9/10	Fri 4/30/10
140	INSTALL UNDERFLOOR CONDUITS TO RPP'S	20 days	Mon 4/12/10	Fri 5/7/10
141	PULL CABLES TO RPP'S	15 days	Mon 5/10/10	Fri 5/28/10
142	INSTALL UNISTRUT GRID	2 days	Thu 5/27/10	Fri 5/28/10
143	SET RPP'S	15 days	Tue 7/6/10	Mon 7/26/10
144	INSTALL INTERIOR LIGHTING	20 days	Tue 7/27/10	Mon 8/23/10
145	TERMINATE RPP'S	10 days	Tue 7/27/10	Mon 8/9/10
146	LOAD BANK RPP'S	10 days	Fri 8/6/10	Thu 8/19/10
147	**Roof**	**97 days**	**Thu 2/4/10**	**Fri 6/18/10**
148	**Plumbing**	**48 days**	**Thu 2/4/10**	**Mon 4/12/10**



Project: Detailed project schedule
Date: Sun 10/31/10

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Summary	Inactive Task	Duration-only	Finish-only	

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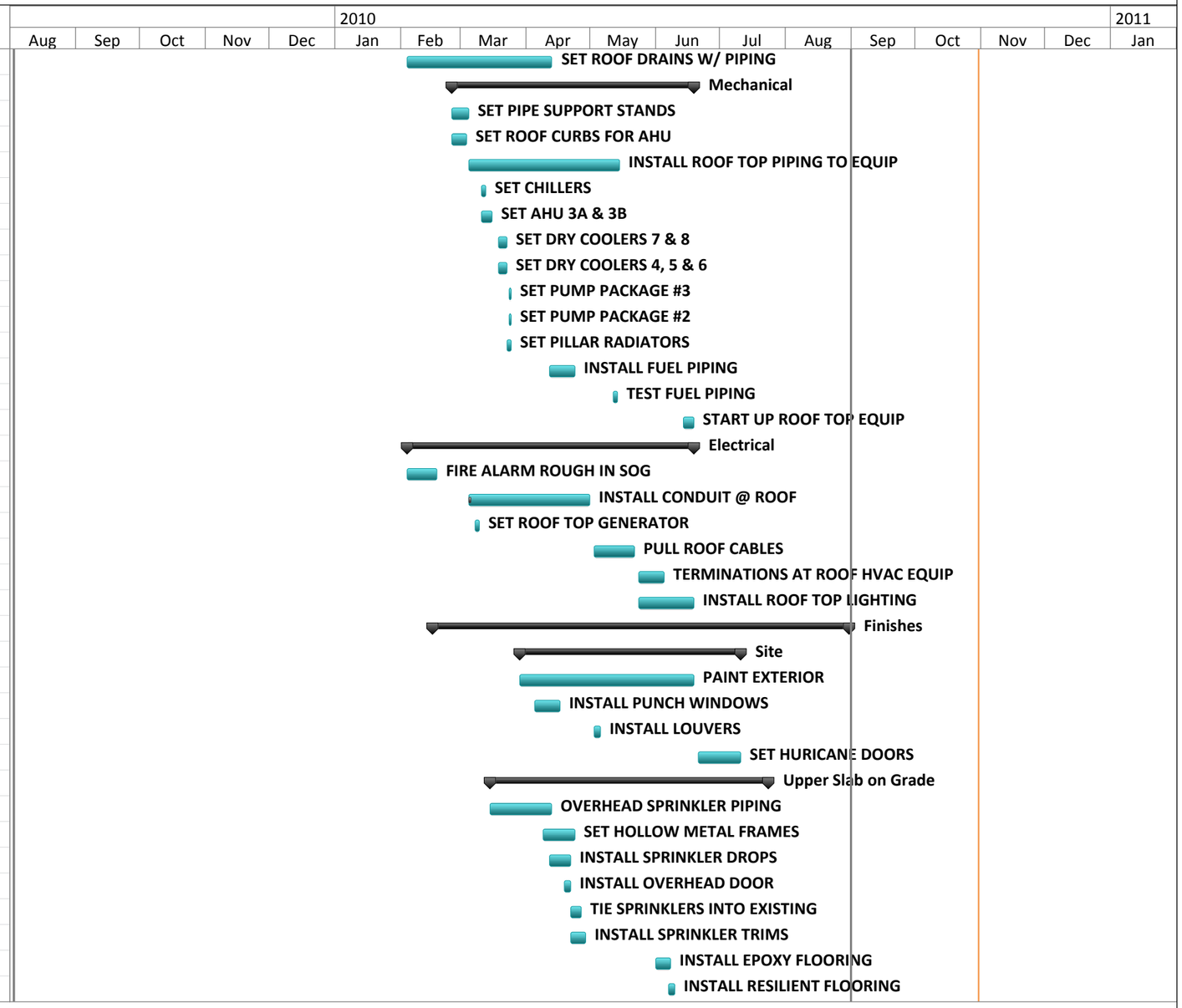
ID	Task Name	Duration	Start	Finish
149	SET ROOF DRAINS W/ PIPING	48 days	Thu 2/4/10	Mon 4/12/10
150	**Mechanical**	**82 days**	**Thu 2/25/10**	**Fri 6/18/10**
151	SET PIPE SUPPORT STANDS	6 days	Thu 2/25/10	Thu 3/4/10
152	SET ROOF CURBS FOR AHU	5 days	Thu 2/25/10	Wed 3/3/10
153	INSTALL ROOF TOP PIPING TO EQUIP	51 days	Fri 3/5/10	Fri 5/14/10
154	SET CHILLERS	2 days	Thu 3/11/10	Fri 3/12/10
155	SET AHU 3A & 3B	3 days	Thu 3/11/10	Mon 3/15/10
156	SET DRY COOLERS 7 & 8	2 days	Fri 3/19/10	Mon 3/22/10
157	SET DRY COOLERS 4, 5 & 6	2 days	Fri 3/19/10	Mon 3/22/10
158	SET PUMP PACKAGE #3	1 day	Wed 3/24/10	Wed 3/24/10
159	SET PUMP PACKAGE #2	1 day	Wed 3/24/10	Wed 3/24/10
160	SET PILLAR RADIATORS	2 days	Tue 3/23/10	Wed 3/24/10
161	INSTALL FUEL PIPING	10 days	Mon 4/12/10	Fri 4/23/10
162	TEST FUEL PIPING	2 days	Wed 5/12/10	Thu 5/13/10
163	START UP ROOF TOP EQUIP	5 days	Mon 6/14/10	Fri 6/18/10
164	**Electrical**	**97 days**	**Thu 2/4/10**	**Fri 6/18/10**
165	FIRE ALARM ROUGH IN SOG	10 days	Thu 2/4/10	Wed 2/17/10
166	INSTALL CONDUIT @ ROOF	41 days	Fri 3/5/10	Fri 4/30/10
167	SET ROOF TOP GENERATOR	2 days	Mon 3/8/10	Tue 3/9/10
168	PULL ROOF CABLES	15 days	Mon 5/3/10	Fri 5/21/10
169	TERMINATIONS AT ROOF HVAC EQUIP	10 days	Mon 5/24/10	Fri 6/4/10
170	INSTALL ROOF TOP LIGHTING	20 days	Mon 5/24/10	Fri 6/18/10
171	**Finishes**	**140 days**	**Tue 2/16/10**	**Mon 8/30/10**
172	**Site**	**75 days**	**Mon 3/29/10**	**Sat 7/10/10**
173	PAINT EXTERIOR	60 days	Mon 3/29/10	Fri 6/18/10
174	INSTALL PUNCH WINDOWS	10 days	Mon 4/5/10	Fri 4/16/10
175	INSTALL LOUVERS	3 days	Mon 5/3/10	Wed 5/5/10
176	SET HURICANE DOORS	16 days	Mon 6/21/10	Sat 7/10/10
177	**Upper Slab on Grade**	**95 days**	**Mon 3/15/10**	**Fri 7/23/10**
178	OVERHEAD SPRINKLER PIPING	21 days	Mon 3/15/10	Mon 4/12/10
179	SET HOLLOW METAL FRAMES	11 days	Fri 4/9/10	Fri 4/23/10
180	INSTALL SPRINKLER DROPS	8 days	Mon 4/12/10	Wed 4/21/10
181	INSTALL OVERHEAD DOOR	3 days	Mon 4/19/10	Wed 4/21/10
182	TIE SPRINKLERS INTO EXISTING	3 days	Thu 4/22/10	Mon 4/26/10
183	INSTALL SPRINKLER TRIMS	5 days	Thu 4/22/10	Wed 4/28/10
184	INSTALL EPOXY FLOORING	5 days	Tue 6/1/10	Mon 6/7/10
185	INSTALL RESILIENT FLOORING	3 days	Mon 6/7/10	Wed 6/9/10



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Date: Sun 10/31/10

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

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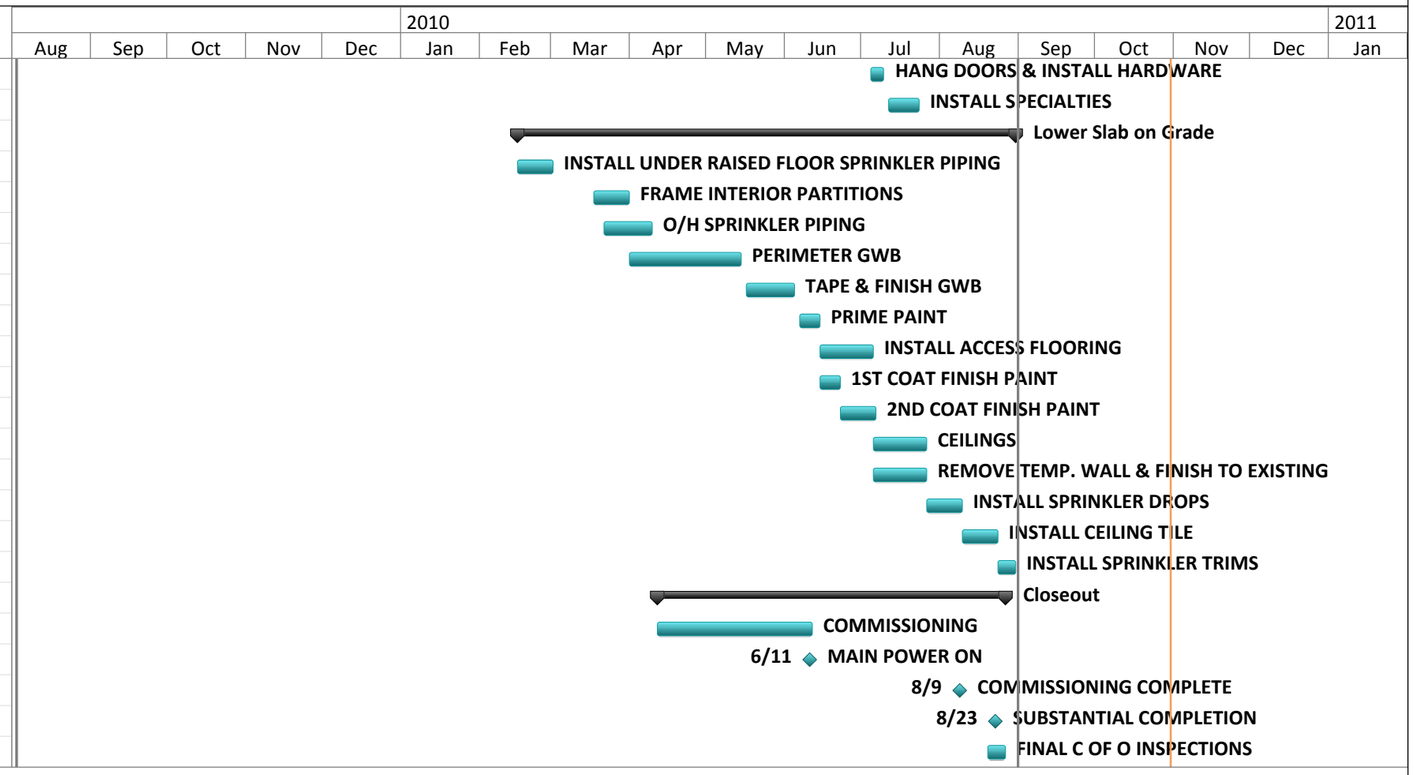
ID	Task Name	Duration	Start	Finish
186	HANG DOORS & INSTALL HARDWARE	5 days	Mon 7/5/10	Fri 7/9/10
187	INSTALL SPECIALTIES	10 days	Mon 7/12/10	Fri 7/23/10
188	**Lower Slab on Grade**	**140 days**	**Tue 2/16/10**	**Mon 8/30/10**
189	INSTALL UNDER RAISED FLOOR SPRINKLER PIPING	10 days	Tue 2/16/10	Mon 3/1/10
190	FRAME INTERIOR PARTITIONS	10 days	Thu 3/18/10	Wed 3/31/10
191	O/H SPRINKLER PIPING	15 days	Mon 3/22/10	Fri 4/9/10
192	PERIMETER GWB	32 days	Thu 4/1/10	Fri 5/14/10
193	TAPE & FINISH GWB	15 days	Mon 5/17/10	Fri 6/4/10
194	PRIME PAINT	6 days	Mon 6/7/10	Mon 6/14/10
195	INSTALL ACCESS FLOORING	15 days	Tue 6/15/10	Mon 7/5/10
196	1ST COAT FINISH PAINT	6 days	Tue 6/15/10	Tue 6/22/10
197	2ND COAT FINISH PAINT	10 days	Wed 6/23/10	Tue 7/6/10
198	CEILINGS	15 days	Tue 7/6/10	Mon 7/26/10
199	REMOVE TEMP. WALL & FINISH TO EXISTING	15 days	Tue 7/6/10	Mon 7/26/10
200	INSTALL SPRINKLER DROPS	10 days	Tue 7/27/10	Mon 8/9/10
201	INSTALL CEILING TILE	10 days	Tue 8/10/10	Mon 8/23/10
202	INSTALL SPRINKLER TRIMS	5 days	Tue 8/24/10	Mon 8/30/10
203	**Closeout**	**99 days**	**Mon 4/12/10**	**Thu 8/26/10**
204	COMMISSIONING	45 days	Mon 4/12/10	Fri 6/11/10
205	MAIN POWER ON	0 days	Fri 6/11/10	Fri 6/11/10
206	COMMISSIONING COMPLETE	0 days	Mon 8/9/10	Mon 8/9/10
207	SUBSTANTIAL COMPLETION	0 days	Mon 8/23/10	Mon 8/23/10
208	FINAL C OF O INSPECTIONS	5 days	Fri 8/20/10	Thu 8/26/10



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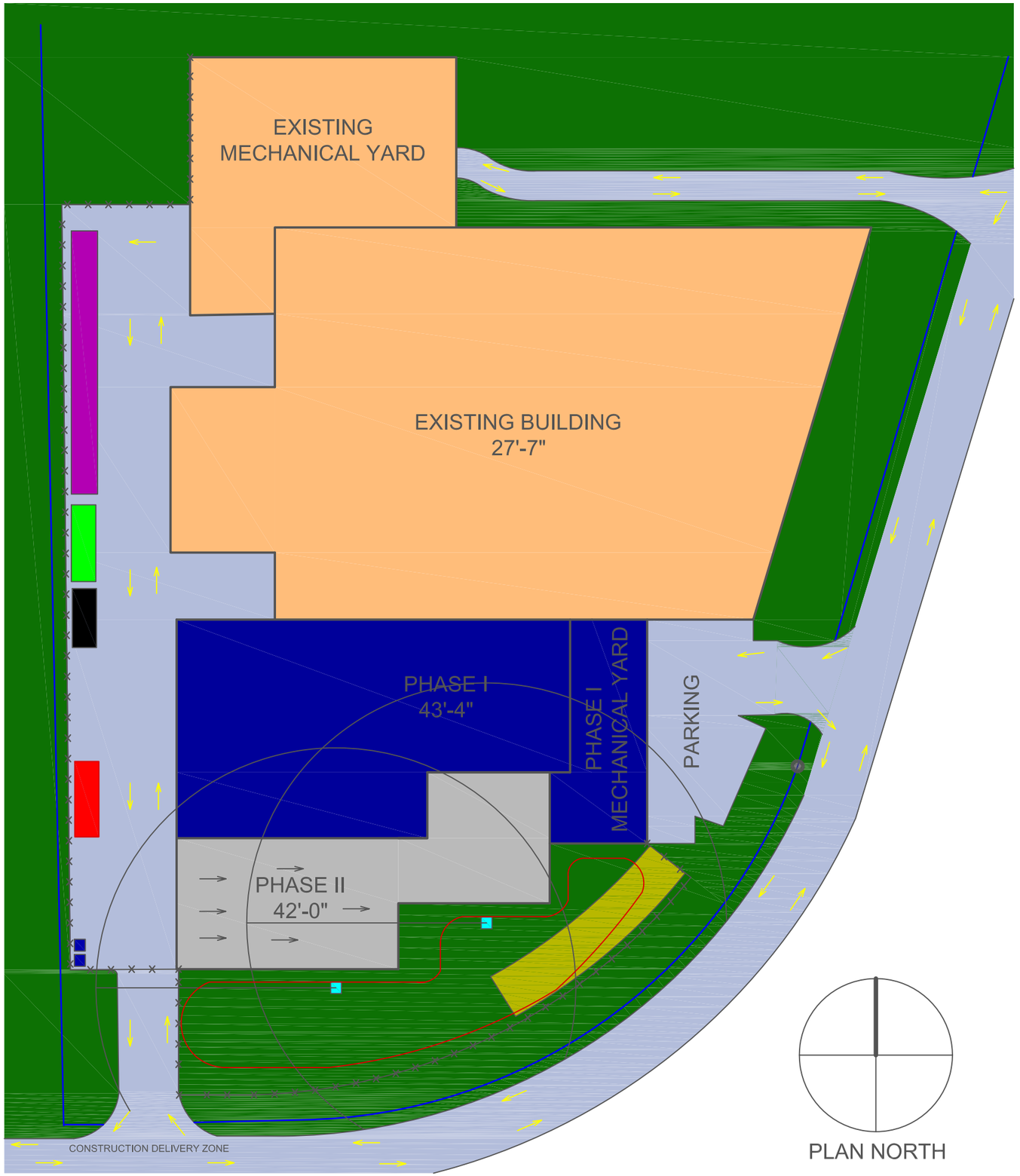
Appendix B – Site Layout Planning:

*See Attached



PLAN NORTH

LEGEND:

SYMBOLS:

FIRE HYDRANT----------
CONSTRUCTION TRAFFIC----------
CONSTRUCTION FENCE----------
WATER ----------
GAS ---------- EXISTING
STORM ----------
SANITARY---------- EXISTING
ELECTRIC ---------- EXISTING
DUMPSTER AREA----------
LAYDOWN AREA ----------
TRAILER AREA ----------
TEMP. TOILETS ----------
CRANE ----------
STORAGE SHED ----------
FOREMAN PARKING ----------

UNKNOWN DATA CENTER

SUPERSTRUCTURE PHASE PLAN

OCTOBER 5, 2010

DANIEL SUTER - CM

Appendix C – Detailed Structural System Estimate:

*See Attached

Structural Steel Estimate Take-off Chart

Beams:

ID	Type:	Unit:	Quantity:	Length (LF):
Roof	W24X55	LF	10	223
Roof	W30X108	LF	6	204
Roof	W30X90	LF	13	361.5
Roof	W21X50	LF	5	177
Roof	W30X99	LF	6	199
Roof	W30X173	LF	6	157
Roof	W30X191	LF	2	52.5
Roof	W14X22	LF	6	98
Roof	W21X44	LF	12	273
Roof	W12X14	LF	53	424
Roof	W30X148	LF	1	25
Roof	W12X26	LF	41	292
Roof	W24X68	LF	16	616
Roof	W30X132	LF	2	80
Roof	W40X249	LF	2	68
Roof	W16X26	LF	8	32
Roof	W18X40	LF	1	37
Roof	W18X35	LF	3	97
Roof	W12X19	LF	6	96
Roof	W30X124	LF	2	80
Roof	W24X76	LF	3	99
Roof	W27X84	LF	2	74
MEP	W8X18	LF	4	20
MEP	W24X55	LF	12	270
MEP	W12X14	LF	42	360
MEP	W12X26	LF	19	297
MEP	W14X38	LF	8	142
MEP	W14X43	LF	6	36
MEP	W18X50	LF	2	56
MEP	W18X86	LF	1	21
MEP	W18X130	LF	1	29
MEP	W24X76	LF	8	164
MEP	W12X16	LF	23	266
		Total:	332	

Columns:

ID	Type:	Unit:	Quantity:	Length (LF):
Roof	W12X50	LF	23	989
Roof	W12X87	LF	8	344
MEP	W10X45	LF	13	130
MEP	HSS 8"X4"	EA	3	

		Total:	47	
Metal Deck:				
ID	**Type:**	**Unit:**	**Area (SF):**	**Total:**
Roof	1-1/2" 16 GA	SF	17,445	17,895
MEP	1-1/2" 16 GA	SF	450	
Shear Studs:				
ID	**Type:**	**Unit:**	**Quantity:**	**Total:**
Roof	4" Shear Studs	EA	3,896	4,040
MEP	4" Shear Studs	EA	144	

Detailed Stuctural Steel Estimate Pricing

Description	Quanitity	Unit	Bare Material	Bare Labor	Bare Equipment	Bare Total	Total O & P	Total Cost
Columns								
Roof - W12X50	989	LF	$ 60.50	$ 2.27	1.52	$ 64.29	$ 72.09	$ 71,297.01
Roof - W12X87	344	LF	$ 105.00	$ 2.38	1.59	$ 108.97	$ 121.86	$ 41,919.84
MEP - W10X45	130	LF	$ 54.50	$ 2.27	1.52	$ 58.29	$ 65.59	$ 8,526.70
MEP - HSS 8"X4" - 14'	3	EA	$ 400.00	$ 43.50	29.00	$ 472.00	$ 547.00	$ 1,641.00
							TOTAL:	$ 123,384.55
Beams								
Roof - W24X55	223	LF	$ 66.50	$ 3.33	$ 1.58	$ 71.41	$ 80.44	$ 17,938.12
Roof - W30X108	204	LF	$ 131.00	$ 3.08	$ 1.46	$ 135.54	$ 150.86	$ 30,775.44
Roof - W30X90	361.5	LF	$ 120.00	$ 3.08	$ 1.46	$ 124.54	$ 138.86	$ 50,197.89
Roof - W21X50	177	LF	$ 60.50	$ 3.47	$ 1.65	$ 65.62	$ 74.26	$ 13,144.02
Roof - W30X99	199	LF	$ 120.00	$ 3.08	$ 1.46	$ 124.54	$ 138.86	$ 27,633.14
Roof - W30X173	157	LF	$ 209.00	$ 3.30	$ 1.57	$ 213.87	$ 237.37	$ 37,267.09
Roof - W30X191	52.5	LF	$ 231.00	$ 3.30	$ 1.57	$ 235.87	$ 261.37	$ 13,721.93
Roof - W14X22	98	LF	$ 43.00	$ 2.46	$ 1.76	$ 47.22	$ 53.14	$ 5,207.72
Roof - W21X44	273	LF	$ 53.00	$ 3.47	$ 1.65	$ 58.12	$ 66.26	$ 18,088.98
Roof - W12X14	424	LF	$ 43.00	$ 2.77	$ 1.98	$ 47.75	$ 53.92	$ 22,862.08
Roof - W30X148	25	LF	$ 179.00	$ 3.19	$ 1.51	$ 183.70	$ 204.11	$ 5,102.75
Roof - W12X26	292	LF	$ 31.50	$ 2.90	$ 1.83	$ 36.23	$ 41.42	$ 12,094.64
Roof - W24X68	616	LF	$ 82.50	$ 3.33	$ 1.58	$ 87.41	$ 97.94	$ 60,331.04
Roof - W30X132	80	LF	$ 160.00	$ 3.19	$ 1.51	$ 164.70	$ 183.11	$ 14,648.80
Roof - W40X249	68	LF	$ 365.00	$ 3.57	$ 1.69	$ 370.26	$ 407.96	$ 27,741.28
Roof - W16X26	32	LF	$ 31.50	$ 2.55	$ 1.61	$ 35.66	$ 40.59	$ 1,298.88
Roof - W18X40	37	LF	$ 48.50	$ 3.85	$ 1.83	$ 54.18	$ 61.61	$ 2,279.57
Roof - W18X35	97	LF	$ 42.53	$ 3.85	$ 1.83	$ 48.18	$ 55.11	$ 5,345.67
Roof - W12X19	96	LF	$ 31.50	$ 2.90	$ 1.83	$ 36.23	$ 41.42	$ 3,976.32
Roof - W30X124	80	LF	$ 160.00	$ 3.19	$ 1.51	$ 164.70	$ 183.11	$ 14,648.80
Roof - W24X76	99	LF	$ 92.00	$ 3.33	$ 1.58	$ 96.91	$ 108.44	$ 10,735.56
Roof - W27X84	74	LF	$ 102.00	$ 3.11	$ 1.47	$ 106.58	$ 118.92	$ 8,800.08
MEP -W8X18	20	LF	$ 25.50	$ 3.91	$ 2.61	$ 32.02	$ 37.62	$ 752.40
MEP -W24X55	270	LF	$ 66.50	$ 3.06	$ 1.53	$ 71.09	$ 80.03	$ 21,608.10
MEP -W12X14	360	LF	$ 16.95	$ 2.66	$ 1.78	$ 21.39	$ 25.21	$ 9,075.60
MEP -W12X26	297	LF	$ 31.50	$ 2.66	$ 1.78	$ 35.94	$ 41.06	$ 12,194.82
MEP -W14X38	142	LF	$ 52.00	$ 2.89	$ 1.93	$ 56.82	$ 64.13	$ 9,106.46
MEP -W14X43	36	LF	$ 52.00	$ 2.89	$ 1.93	$ 56.82	$ 64.13	$ 2,308.68

MEP -W18X50	56	LF	$ 60.50	$ 3.72	$ 1.86	$ 66.08	$ 75.05	$ 4,202.80
MEP -W18X86	21	LF	$ 104.00	$ 3.77	$ 1.89	$ 109.66	$ 122.68	$ 2,576.28
MEP -W18X130	29	LF	$ 128.00	$ 3.77	$ 1.89	$ 133.66	$ 149.68	$ 4,340.72
MEP -W24X76	164	LF	$ 92.00	$ 3.06	$ 1.53	$ 96.59	$ 108.03	$ 17,716.92
MEP -W12X16	266	LF	$ 26.50	$ 3.91	$ 2.61	$ 33.02	$ 39.12	$ 10,405.92
							TOTAL:	$ 621,513.05
Metal Deck								
Roof - 1 1/2" 16 GA	17,445	SF	$ 1.41	$ 0.35	0.03	$ 1.79	$ 2.21	$ 38,553.45
MEP - 1 1/2" 16 GA	690	SF	$ 1.41	$ 0.35	0.03	$ 1.79	$ 2.21	$ 1,524.90
							TOTAL:	$ 40,078.35
Shear Studs								
Roof - 4" Shear Studs	3,896	EA	$ 0.70	$ 0.81	0.39	$ 1.90	$ 2.19	$ 8,532.24
MEP - 4" Shear Studs	144	EA	$ 0.70	$ 0.81	0.39	$ 1.90	$ 2.19	$ 315.36
							TOTAL:	$ 8,847.60
							TOTAL ESTIMATE:	$ 793,823.55

Cast in Place Concrete Estimate Take-off Chart

Slab on Grade

Type:	Area (SF):	Thickness (ft)	Concrete (CY):	Rebar Type	Rebar Quantity	Rebar Total Weight (Lbs)
6" NW	10,800	0.500	200	(2) WWF*	21,600 SF	N/A
8" NW	6,645	0.670	164.80	#5	90@ 71' **	6709.5
		Totals:	365	216 - Total C.S.F		6709.5

Slab on Deck

Type:	Area (SF):	Thickness (ft)	Concrete (CY):	Rebar Type	C.S.F	TOTAL C.S.F:
6" LW	17,445	0.5	324	WWF***	174.45	178.95
5" LW	450	0.4	324	WWF***	4.5	

Footings

Length (FT)	Width (FT)	Depth (FT)	Quantity	Rebar Type	Rebar Quantity	Rebar Weight (lb/FT)	Concrete (CY)	Rebar Total Weight (Lbs)
8	8	1.83	1	#6	18	1.5	4.34	216
9	9	2.08	1	#6	22	1.5	6.24	297
10	10	2.17	12	#8	192	2.67	96.44	5126.4
11	11	2.42	1	#8	20	2.67	10.85	587.4
12	10	2.33	1	#8	21	2.67	10.36	608.8
16	8	2.5	2	#8/#5	8.0/8.0	2.67/1.05	23.7	683.52/134.4
						Totals #4-#7:	151.93	647.4
						Totals #8-#18:	N/A	6322.6

Isolation Pads

Length (FT)	Width (FT)	Height (FT)	Quantity	Rebar Type	Rebar Quantity	Concrete (CY)	Total C.S.F
33	6	0.5	3	N/A	N/A	11	N/A
18	6	0.5	3	N/A	N/A	6	N/A
10	9	0.5	2	N/A	N/A	3.33	N/A
18	4	0.5	1	WWF***	72 SF	1.33	0.72
38	5	0.5	1	WWF***	190 SF	3.52	1.9
					Totals:	25.18	2.62

Isolation Pads - Formwork Take-off

Length (FT)	Width (FT)	Height (FT)	Quantity	Units	Total
33	6	0.5	3	SFCA	117
18	6	0.5	3	SFCA	72
10	9	0.5	2	SFCA	38
18	4	0.5	1	SFCA	22
38	5	0.5	1	SFCA	43
				Total:	292

Cast in Place Concrete Estimate Pricing Chart

Description	Quanitity	Unit	Bare Material	Bare Labor	Bare Equipment	Bare Total	Total O & P	Total Cost
Rebar								
Footings - #4 - #7	1	Tons	$ 890.00	$ 655.00	-	$ 1,545.00	$ 2,050.00	$ 2,050.00
Footings - #8 - #18	3	Tons	$ 840.00	$ 380.00	-	$ 1,220.00	$ 1,550.00	$ 4,650.00
Slab on Grade	4	Tons	$ 890.00	$ 655.00	-	$ 1,545.00	$ 2,050.00	$ 8,200.00
Slab on Grade - WWF	216	C.S.F	$ 20.00	$ 23.50	-	$ 43.50	$ 61.00	$ 13,176.00
Isolation Pads	2.62	C.S.F	$ 29.00	$ 25.50	-	$ 54.50	$ 74.00	$ 193.88
Roof - Slab on Deck	174	C.S.F	$ 29.00	$ 25.50	-	$ 54.50	$ 74.00	$ 12,909.30
MEP - Slab on Deck	5	C.S.F	$ 20.00	$ 23.50	-	$ 43.50	$ 61.00	$ 274.50
							TOTAL:	$ 41,453.68
Concrete								
Footings	151.93	CY	$ 109.00	$ 13.00	$ 4.86	$ 17.86	$ 145.35	$ 22,083.03
Slab on Grade	365	CY	$ 109.00	$ 13.00	$ 4.86	$ 17.86	$ 145.35	$ 53,052.75
Isolation Pads	25.18	CY	$ 109.00	$ 13.00	$ 4.86	$ 17.86	$ 145.35	$ 3,659.91
Roof - Slab on Deck	324	CY	$ 153.00	$ 13.00	$ 4.86	$ 17.86	$ 178.35	$ 57,785.40
MEP - Slab on Deck	7	CY	$ 153.00	$ 13.00	$ 4.86	$ 17.86	$ 178.35	$ 1,248.45
							TOTAL:	$ 137,829.54
Formwork								
Isolation Pads	292	SFCA	$ 2.32	$ 5.40	-	$ 7.72	$ 10.90	$ 3,182.80
							TOTAL:	$ 3,182.80
							TOTAL ESTIMATE:	$ 182,466.02

Appendix D – General Conditions Estimate:

*See Attached

General Conditions Estimate

Supervision and Personnel

Item	Unit Rate	Unit	Quantity:	Cost
Project Executive	$ 1,600.00	Week	42	$ 67,200.00
MEP Project Manager	$ 2,100.00	Week	42	$ 88,200.00
Lead Project Manager	$ 2,100.00	Week	42	$ 88,200.00
MEP Superintendent	$ 1,950.00	Week	42	$ 81,900.00
General Superintendent	$ 1,950.00	Week	42	$ 81,900.00
Assistant Superintendent	$ 1,550.00	Week	42	$ 65,100.00
Assistant Engineer	$ 1,550.00	Week	42	$ 65,100.00
General Laborer	$ 1,200.00	Week	42	$ 50,400.00
Secretary	$ 365.00	Week	42	$ 15,330.00
			Sub-Total:	$ 603,330.00

Construction Facilities and Equipment

Field Office Trailer Set-up	$ 2,000.00	EA	1	$ 2,000.00
Field Office Trailer Rental	$ 1,000.00	Months	11	$ 11,000.00
Field Office Trailer Removal	$ 2,500.00	EA	1	$ 2,500.00
Construction Site Fence	$ 600.00	Months	11	$ 6,600.00
Storage Trailer	$ 150.00	Months	11	$ 1,650.00
Survey/Layout Equipment	$ 200.00	Months	2	$ 400.00
Gang Box	$ 55.00	Months	11	$ 605.00
Tools/Equipment	$ 650.00	Months	9	$ 5,850.00
Fire Extinguishers	$ 75.00	EA	10	$ 750.00
Computer/LAN Equipment	$ 2,500.00	Months	11	$ 27,500.00
Mobile Phones	$ 100.00	Months	11	$ 1,100.00
PPE	$ 100.00	Months	10	$ 1,000.00
Signage	$ 10.00	EA	50	$ 500.00
Dumpsters	$ 175.00	Months	10	$ 1,750.00
			Sub-Total:	$ 38,450.00

Temporary Utilities

Field Telephone Service	$ 100.00	Months	11	$ 1,100.00
Temp. Power Consumption	$ 12,000.00	Months	10	$ 120,000.00
Temp. Water Hook Up	$ 1,000.00	EA	1	$ 1,000.00
Temp. Water	$ 2,100.00	Months	10	$ 21,000.00
Temp. Lighting	$ 1,000.00	Months	10	$ 10,000.00
Portable Toilts	$ 350.00	Months	11	$ 3,850.00
			Sub-Total:	$ 153,100.00

Miscellaneous Costs

Clean-up Expenses	$ 490.00	Week	36	$ 17,640.00
Misc. Field Expenses	$ 1,000.00	Months	10	$ 10,000.00
			Sub-Total:	$ 27,640.00

Insurance and Bonds

Item	% of Contract	Building Cost	Cost
Bonds	1.00%	$ 33,000,000.00	$ 330,000.00
Permits	1.00%	$ 33,000,000.00	$ 330,000.00
Insurance	0.55%	$ 33,000,000.00	$ 181,500.00
		Sub-Total:	$ 841,500.00
		Total:	$ 1,671,720.00