STEM Building

Science **T**echnology **E**ngineering **M**athematics

Hagerstown Community College

Hagerstown, MD

Technical Assignment 2

Craig Owsiany

Construction Management

Adviser: Robert M. Leicht

October 27, 2010

Executive Summary

Technical Assignment 2 will investigate further into the STEM Building at Hagerstown Community College. It is comprised of five sections, each elaborating on the fine details of the project. These sections include:

- Detailed Project Schedule
- Site Layout Planning
- Detailed Structural Systems Estimate
- General Conditions Estimate
- Critical Idustry Issues.

Key activities and major concerns were discovered upon further investigation of the project schedule. The three critical activities during initial sitework will be the blasting necessary for site demo, the new water and gas line, and the building pad excavation. The key activities in the substructure will be completing the SOG for level one and level three, and the three stair shafts. Superstructure and slab on deck placements have little concerns and plan to run smoothly once started. The key milestone for interior rough-ins and finished is achieving conditioned air for each floor. The key activity for the electrical room will be energizing the main electrical gear**.** The mechanical room has two main concerns to worry about: setting major mechanical equipment and the start-up of HVAC pumps. Substantial completion is the main milestone for final completion to allow considerable time for move in before classes. Final completion, set for the day before the start of classes, is also a milestone.

Site layout plans have been produced for three different phases of the project: substructure, superstructure and enclosure. While the plans are similar in many ways (parking, contractor staging, sanitary facilities, etc.), they all have their differences. Substructure shows the flow from west to east of the concrete crane. Superstructure shows where the steel crane will sit as well as the steel shake out area. Crane stone access is also shown in the superstructure plan as this will be how the crane will climb the hill without damaging the landscape. A loading dock and scaffolding are shown on the enclosure plan as well as arrows that indicate the flow of work.

The detailed structural systems estimate and general conditions estimate are both similar representations of the actual estimates. While both generated estimates are lower than the actual, the detailed structural systems estimate differs by 6.8% and the general conditions estimate differs by 14%. Discrepancies for the detailed structural systems estimate were found in the concrete portion of the estimate. Errors in the general conditions estimate are most like to occur in the interpolation used to find the actual general conditions estimate. These inaccuracies will be explained further in their designated sections of this assignment.

The critical industry issues section of the assignment will elaborate on the topics discussed at the PACE Roundtable which was held on October 28, 2010. Each student attended two break-out sessions throughout the day. The first breakout session I attended was “IPD: Exploring the drivers behind highly integrated delivery of project” lead by Rob Leight. We started out by discussing the barriers and concerns of IPD, following with the opportunities that IPD can offer and finishing with potential thesis research topics. The second breakout session I attended was “Carrying BIM to the field-new responsibilities, roles, and competencies.” We started off the session with discussing the general interests of BIM, followed by the field uses and advantages, and finished with the disadvantages.

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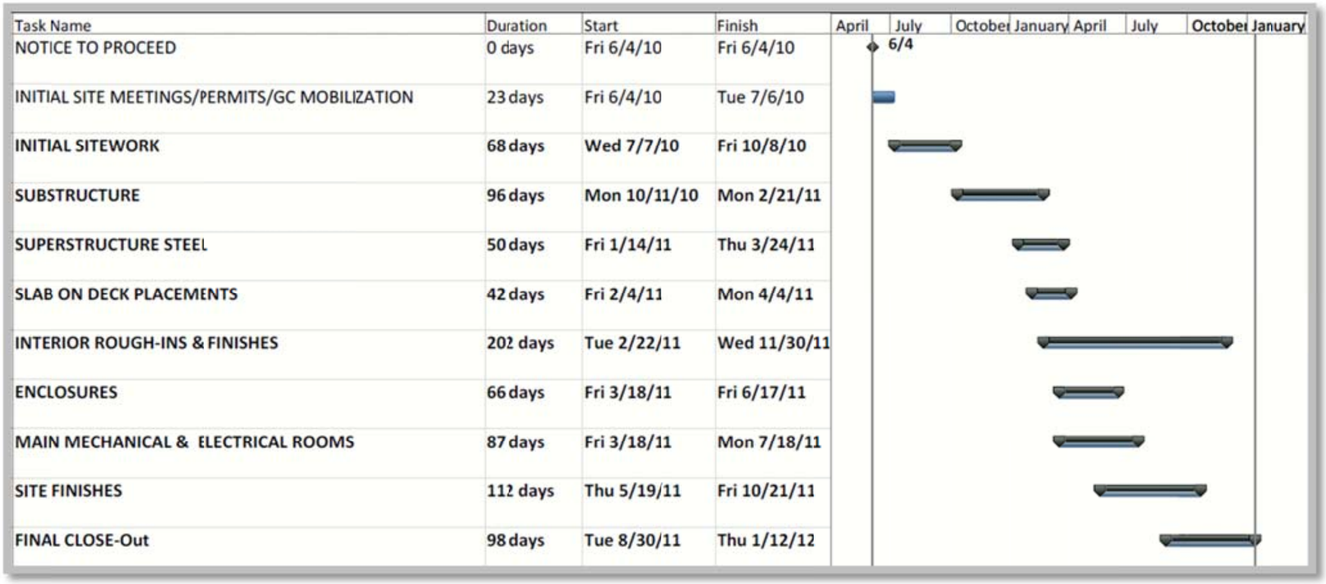
Detailed Project Schedule

(See Appendix A for Detailed Project Schedule)

The detailed project schedule shown below is divided into nine sections. They are as follows: initial sitework, substructure, superstructure steel, slab on deck placements, enclosures, main mechanical & electrical rooms, site finishes, interior rough-ins & finishes and final close-out (See Figure 1 below). The notice to proceed milestone and initial site meetings/GC mobilization activity are also included for reference. The design phase activity and procurement of GC activity have been left out of the detailed schedule because they bare no effect on the schedule once the notice to proceed has been given. They can be found in Tech 1 if needed.



Task Name	Duration	Start	Finish
NOTICE TO PROCEED	0 days	Fri 6/4/10	Fri 6/4/10
INITIAL SITE MEETINGS/PERMITS/GC MOBILIZATION	23 days	Fri 6/4/10	Tue 7/6/10
INITIAL SITEWORK	**68 days**	**Wed 7/7/10**	**Fri 10/8/10**
SUBSTRUCTURE	**96 days**	**Mon 10/11/10**	**Mon 2/21/11**
SUPERSTRUCTURE STEEL	**50 days**	**Fri 1/14/11**	**Thu 3/24/11**
SLAB ON DECK PLACEMENTS	**42 days**	**Fri 2/4/11**	**Mon 4/4/11**
INTERIOR ROUGH-INS & FINISHES	**202 days**	**Tue 2/22/11**	**Wed 11/30/11**
ENCLOSURES	**66 days**	**Fri 3/18/11**	**Fri 6/17/11**
MAIN MECHANICAL & ELECTRICAL ROOMS	**87 days**	**Fri 3/18/11**	**Mon 7/18/11**
SITE FINISHES	**112 days**	**Thu 5/19/11**	**Fri 10/21/11**
FINAL CLOSE-Out	**98 days**	**Tue 8/30/11**	**Thu 1/12/12**

Figure 1: Project Schedule

Initial Sitework

The initial sitework for the project will take place over three months. The three critical activities during this period will be the blasting necessary for site demo, the new water and gas line, and the building pad excavation.

Blasting is a must on this project due to the large masses of limestone rock upon which the building sits. Thus traditional excavation methods would render useless. Blasting is to take place from July 7, 2010 to August 12, 2010. It is very important that blasting commence and finish as scheduled due to the building being a higher educational facility. Therefore the optimal time to blast would be in the summer. This is when minimal students are on campus and will cause the least distraction. Also, blasting must finish before the fall semester starts at the beginning of September. If blasting were to take place while classes were in session, it would create an unsuitable learning environment.

Completing the new water line and gas line is critical because during this time, several walkways will be blocked. Pedestrian traffic relies heavily on these walkways to get to and from classes. It is imperative that the water line and gas line be installed by their scheduled date of September 1, 2010. This will allow time for patching to be completed before classes start.

Building pad excavation is the most critical out of the three. Without excavations down to subgrade after blasting is complete, none of the substructure can be started. Every extra day it takes to excavate to subgrade will add a day to the total schedule. This is also the activity that brings the most risk to the schedule. Implementing blasting has a big unknown of where competent rock will be found, which is necessary for the foundation. Once this activity is complete, there are few unknowns left in the project.

Substructure

It is important to note that the substructure cannot start until the initial sitework has been completed. This is due to blasting. All work must be halted and the site cleared at each and every blast for safety purposes. Working through a blast is unacceptable and a constant stop and go work environment will be costly and time consuming. This is the reasoning for the substructure to follow initial sitework in a linear fashion.

The STEM Building has a unique substructure because it is being constructed into the side of a hill. This causes mat foundations, spread footings, and strip footings to be at various elevations. Steps will be incorporated in the strip footings to accommodate for elevation changes. There will also be three slabs on grade each at a different elevation. With varying elevations brings challenges for scheduling. The SOGs for level one, two and three are shown below in Figure 2, Figure 3 and Figure 4 respectively.

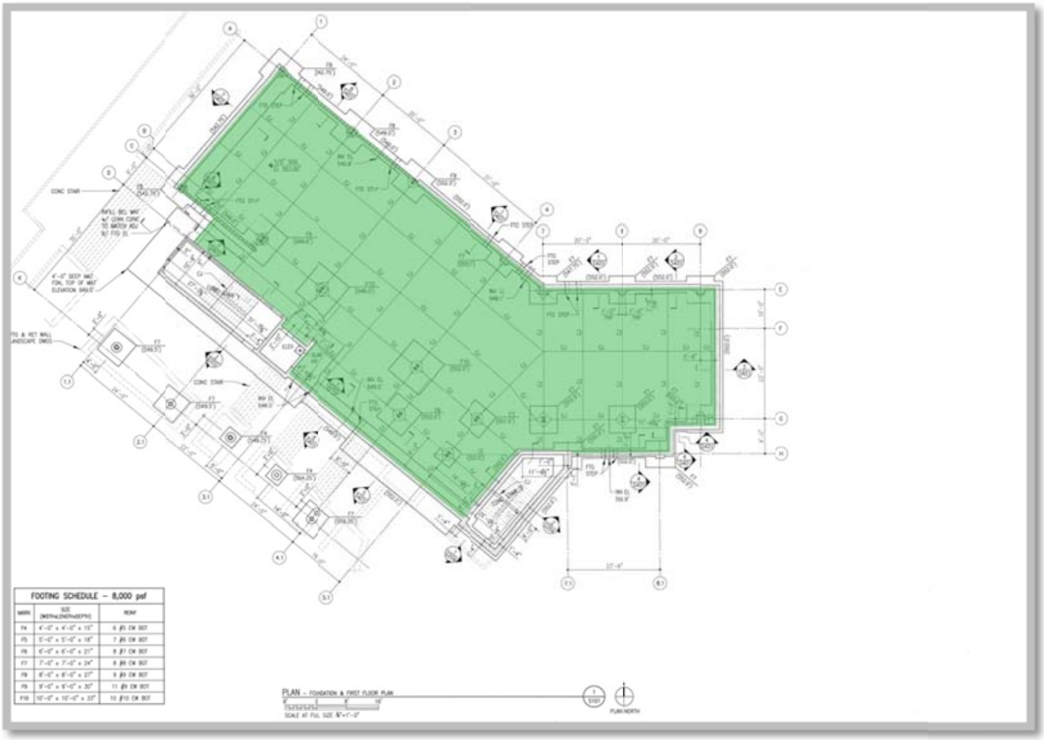


Figure 2: Level One SOG

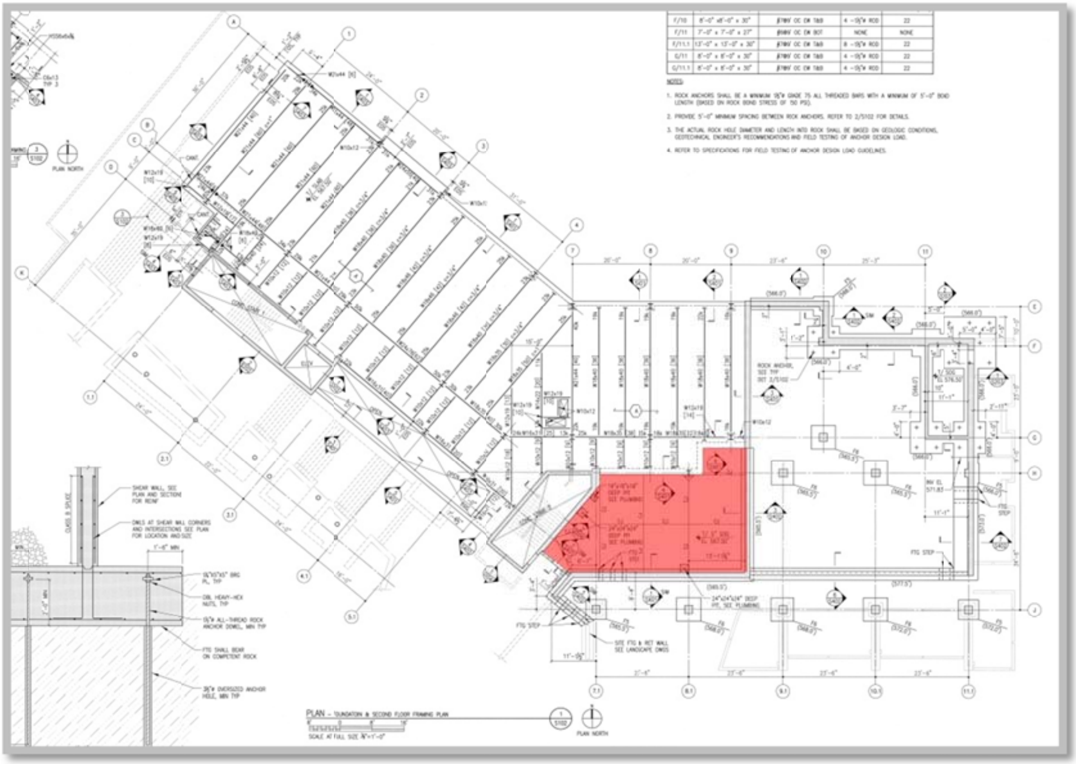


Figure 3: Level Two SOG

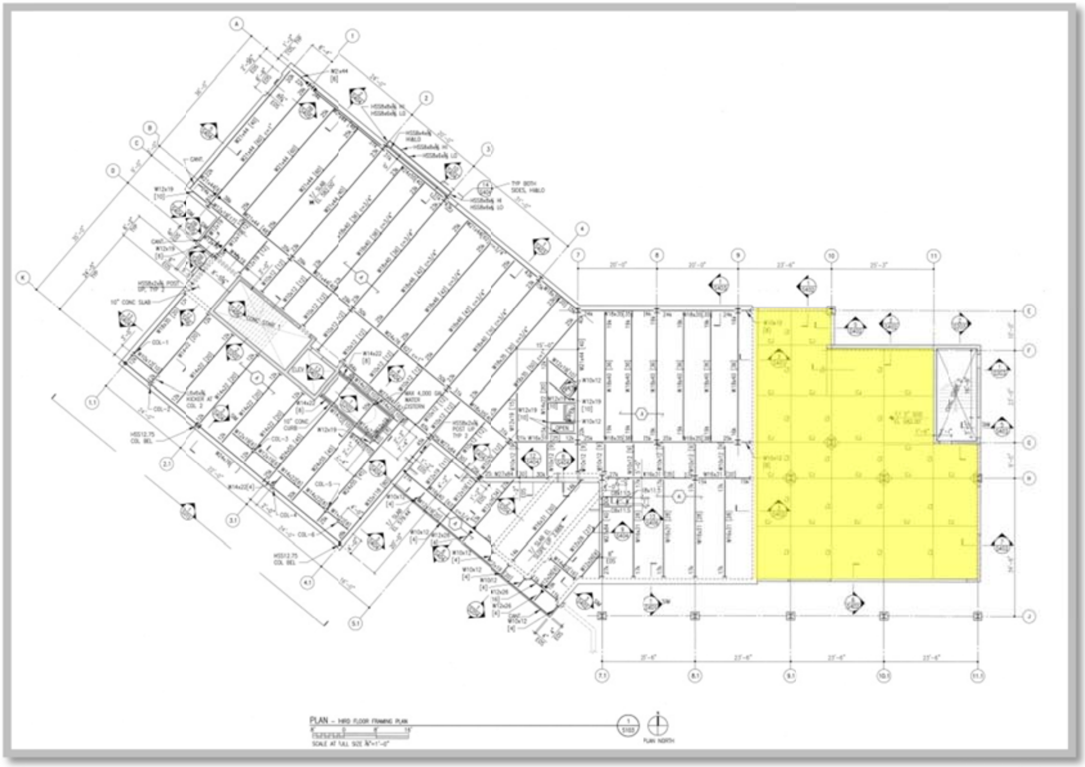


Figure 4: Level Three SOG

The key activities in the substructure will be completing the SOG for level one and level three, and the three stair shafts (Stair shafts shown below in Figure 5). The SOG for level one and stair shaft 1 & 3 will be completed first, followed by the SOG for level three and stair shaft 2. Of course, preceding activities include the FRP of footings, mat slabs and foundation walls. Level two SOG is not critical due to its size. It is small enough that the contractor has decided to excavate it to the same subgrade as level one and backfill to level two elevation when ready.

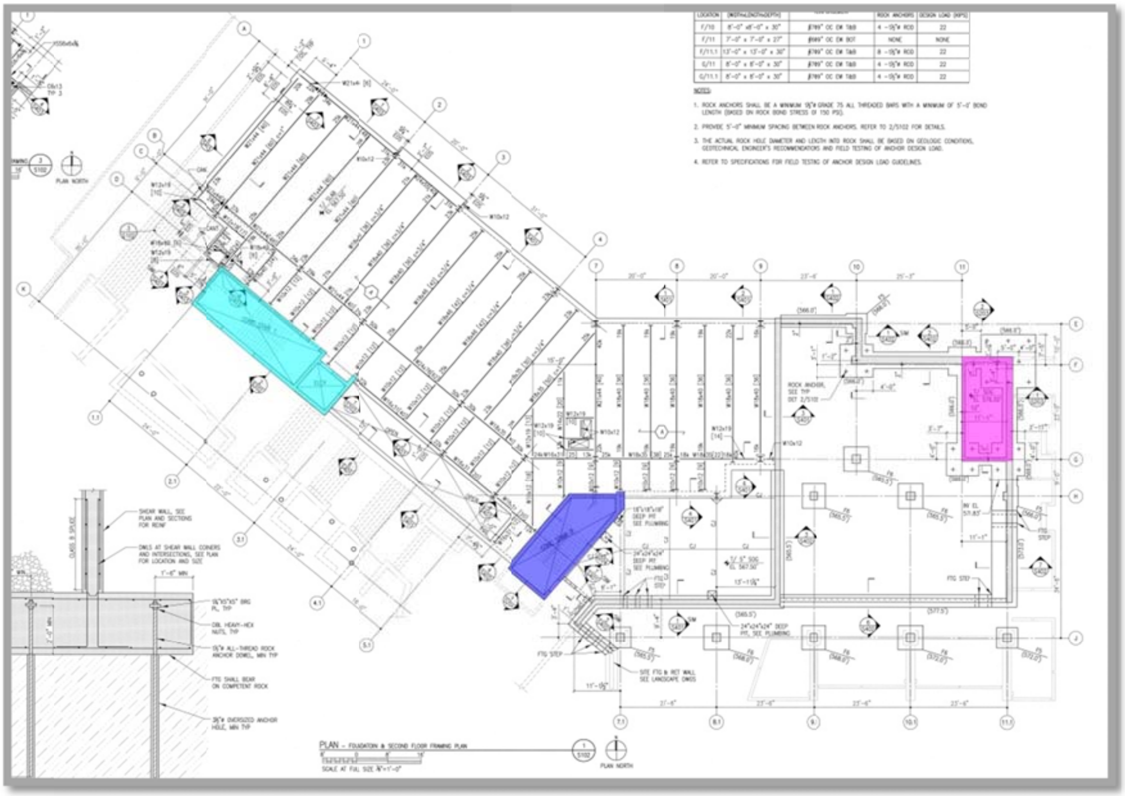


Figure 5: Stair Shafts & Elevator

Superstructure Steel

Most of the steel columns in the building spans two floors and acts as the driving factor for the sequencing. The fourth and fifth floors have been divided into east and west sections for sequencing purposes. Midway through substructure, columns and beams will begin being set from the first floor up to the third floor. Next the west side columns and beams will be set from the third floor up to the roof, followed by the east side in the same manner. The installation of decking will be discussed in the next section, “Slab on Deck Placements.”

Slab on Deck Placements

The actual installation of the decking is included in the superstructure portion of the schedule. It is being discussed here to relate it to following activities. The schedule for slab on decks is straight forward. Installation will follow immediately behind the start of superstructure steel. For example, steel is set from level one to level three, then decking is installed for level two and three. Steel is set from level three to the roof, then decking is installed for level four, level five and the roof. MEP deck prep follows the installation of the decking and once inspection is passed, concrete is poured. This activity generates little to no concern for construction.

Interior Rough-Ins & Finishes

Interior rough-ins and finishes by far has the longest duration. The schedule for each floor includes the same activities with slightly altered durations. This will be discussed in further detail shortly. Laying out interior walls kicks off the interior rough-ins and finishes on each floor. Layout begins once concrete is poured on the corresponding deck two floors above; this reduces safety risks such as falling objects and lessens material damages from precipitation.

MEP work takes up majority of the interior rough-ins and finishes duration. This leads to the changing durations to adjust for differing floor size and usage. For example, level one has much less MEP work than level four. This is because level one is much smaller and consists of basic classrooms and computer labs. Level four is much larger and consists of chemistry and physics classrooms, computer labs, and many offices making the MEP work for this floor more extensive.

The key milestone is achieving conditioned air for each floor. This is the date at which the HVAC systems of the building are functioning properly. Having conditioned are greatly reduces the risk of mold, and consequently reduces drywall rework if mold were to arise.

Enclosures

Typically enclosures would be discussed before interior rough-ins and finishes, but in this case, rough-ins and finishes begins a month before enclosure**.** This is due to activities that can be performed before the building is enclosed such as laying out interior walls, ductwork/mechanical mains, and fire protection mains. It is important to note that enclosing the building does relate back to certain interior rough-ins and finishes activities. The main activities which ideally trail building enclosure are hanging drywall, painting, flooring and testing/startup of VAVs for conditioned air.

Main Mechanical & Electrical Rooms

The key activity for the electrical room will be energizing the main electrical gear. At this point, workers can begin using power provided by the building and temporary power can start being removed from the building. Removing temporary power also provides a safer working environment. Removing extension cords for temporary power reduces the risk of electrocution and tripping.

The mechanical room has two main concerns to worry about: setting major mechanical equipment and the start-up of HVAC pumps. Major mechanical equipment must be set before the enclosure of the building is complete. If not, demo must be performed to provide an entrance. The start-up of the HVAC pumps is the next key activity. Relating back to the interior rough-ins and finishes, these pumps need to be in working order before conditioned air can be supplied.

Site Finishes

Site finishes for the STEM Building includes the metal panels and soffits, site hardscape and site landscaping. With the building being constructed into the side of a hill, there is a bit more hardscape and landscaping than a typical project of the same size. Despite the additional work, these activities provide little impact on the overall schedule.

Final Close-Out

The last section of the schedule will be the final close-out. It includes all the typical activities of a close-out schedule. Substantial completion and final completion are always milestones in any schedule. For this schedule, the dates are being driven by the start of school since the STEM Building is an educational facility. The substantial completion date has been set 42 days prior to beginning of classes. This allows ample time for the college to move in and get situated. Final completion is set for the day before the start of class.

Site Layout Planning

(See Appendix B for Site Plans)

Site plans have been developed for three phases of the STEM Building at Hagerstown Community College: substructure, superstructure and enclosure (See Appendix B). Many of the items shown on the site plan remain constant throughout the construction process. They include:

- Construction Entrance and Exits
- Contractor Staging
- Parking
- Building Stone Access
- Temporary Sanitary Facilities
- Temporary Power
- Dumpsters
- Silt Fence
- Safety Fence

There are two parking lots that run north and south located at the west of the site. The construction entrance is located in the middle of these lots with two exits at the north and south. Contractor staging, parking, dumpsters, temporary power, sanitary facilities and temporary power are all located in these lots. The safety fence, which also acts as the limits of construction, encompasses the entire site with three gates for entering and exiting. The silt fence follows the same pattern as the safety fence but does now encompass the parking lots. A silt fence is necessary on this project to control erosion from the hill which the STEM Building is being built into. The hill's elevation increases from west to east, causing runoff to travel west. This is why there is not a silt fence between the existing classroom and learning center. Lastly, there is an area for stone access to the building. This will allow workers and equipment to travel to and from their trailers and the building. For this reason, there will be no silt fence at this area, but the stone will act as the erosion control instead. As a side note, the drawings provided did not illustrate the new location of the fire hydrant, and therefore it was left off of the site plans.

Substructure Site Plan

The substructure site plan's only main difference from the others is the concrete crane. There will be one concrete crane use for the STEM Building. It will reside within the building footprint while placing concrete. The boom for the concrete crane is not large enough to span the entire building; therefore it will need to move throughout this phase. The contractor has selected to use a crawler crane for this reason. It will start by placing the concrete for level one, and then move east to place the concrete for level two and three.

Superstructure Site Plan

Steel crane, steel layout and crane stone access differs the superstructure site plan from the other phase site plans. A 150 ton crawler crane will be brought in to set the steel. Despite being a crawler crane, it will stay in one location while setting steel. The crane is positioned in an area that allows it to cover the footprint of the building. Steel layout will be located just west of the crane. This allows steel deliveries to back up to the building stone access area and be unloaded with short crane picks. Lastly, crane stone access has been added to the site plan. This is a sloping site in which some grading will need to be performed in order for the crane to access the site. In addition, the silt fence will need to be taken down on the day the crane arrives and 3-4 parking spots will need to be vacated on that day. The same will go for the day the crane leaves. The crane stone access will be removed during the site finishes phase.

Enclosure Site Plan

The enclosure site plan shows the scaffolding that will be used for installing the brick veneer and metal panels, as well as the flow of work. Scaffolding will work from the northwest corner of the building to the southeast corner, in both directions. Another alteration to this site plan includes the loading dock, which is simply part of the building stone access. If the materials or equipment being delivered are to enter to building immediately, they will be unloaded here. Otherwise, they will be unloaded at their trailer. Just like the crane stone access, the building stone access will be removed during the site finishes phase.

Detailed Structural Systems Estimate

(See Appendix C for Detailed Structural Systems Estimate)

The detailed structural systems estimate for the STEM Building was produced with the use of drawings, R.S. Means and discussions with the project team. It is divided into four subdivisions:

- Concrete
- Metals-Columns
- Metals-Beams
- Metals-Steel Decking

The sum of these subdivisions is shown below along with a 15% factor for connections, anchor bolts and base plates. A time factor was not applied because the project is being completed now and will finish in 12 months. Quantity takeoffs were performed with the use of the drawings and Microsoft Excel. They have not been included due to their length.

Detailed Structural Systems Estimate	
Concrete Total	$856,829.00
Columns Total	$258,406.87
Beam Total	$776,825.45
Steel Decking Total	$132,179.24
Detailed Structural Systems Subtotal	$2,024,240.56
Connections, Anchor Bolts, Base Plates	15%
Detailed Structural Systems Total	$2,327,876.64

The actual structural systems estimate was $2.5 M. The generated subtotal estimate came to $2 M. A 15% factor was added to this to cover connections, anchor bolts and base plates. The generated estimate comes to a total of just over $2.3 M. This is 6.8% less than the actual estimate. This is a fairly accurate estimate.

The concrete portion of the actual estimate would be the main area of discrepancies in the generated estimate. The actual estimate also includes the concrete for site work, stairs, sidewalk repairs and landings. These were not taken into account for the above estimate as they are not part of the structural system.

General Conditions Estimate

(See Appendix D for General Conditions Estimate)

The general conditions estimate was developed using the same process as the detailed structural systems estimate. Drawings, R.S. Means and discussions with the project team provided the necessary information for the estimate.

General Conditions Estimate	
Project Personnel Subtotal	$609,240.00
Field Office Support Subtotal	$60,973.00
Temp. Facilities/Fences/Controls Subtotal	$23,941.00
Temp. Utilities Subtotal	$25,559.60
Safety Subtotal	$20,000.00
Clean-Up Subtotal	$210,147.18
Travel Subtotal	$44,320.00
Small Tools Subtotal	$70,463.02
Quality Control Subtotal	$25,198.00
Permits Subtotal	$45,000.00
Commissioning Subtotal	$78,292.25
Total	$1,213,134.05

The actual general conditions estimate was $1.4 M and generated estimate was $1.2 M. This is a 14% difference. Overall this estimate is fairly accurate.

The actual general conditions estimate was lumped together with two small renovation projects. I used the cost of the STEM Building and renovation projects to interpolate for the general conditions of the STEM Building. This would be the most probable area of error in the estimates.

Critical Industry Issues

The first breakout session I attended was "IPD: Exploring the drivers behind highly integrated delivery of project" lead by Rob Leight. We started out by discussing the barriers and concerns of IPD, following with the opportunities that IPD can offer and finishing with potential thesis research topics.

The first concern brought up was the lack of case studies. We discussed that without case studies, few owners would be willing to be the "guinea pig" for IPD. Without case studies, we are unsure how of the legal precedents would be set up and who would assume risk in case a project failed. We spoke about multiparty agreements and whether or not they would hold up in court because it had never happened before. GMP vs "Target Process" was brought up in the discussion as well. Owners like to see what a project is going to cost them before they start signing contracts, but that is very difficult to do using IPD. An idea of a "Target Process" was discussed as an alternative in which there would not be a max price specified but a target cost. Much discussion occurred when talking about the change of culture that would occur with IPD. Generations have been using conventional methods for years and would be unwilling to change now. The idea that a new generation entering the work force would help implement IPD came to discussion. The next generation has the necessary schooling to start the transformation from conventional delivery methods to IPD as well as the technical knowledge. Lastly we spoke about how the current economy is having a negative effect on trying IPD.

Opportunities of IPD included BIM to drive integration and increased innovation by bringing engineers, general contractors and subcontractors into the design process earlier. Value engineering will also be more effective using IPD. An owner will be able to get a better quality building and an equal or lesser value by incorporating subs and engineer ideas. With an IPD delivery method, more materials will be able to be prefabricated because all parties involved are on the same page and won't have to worry about conflict in the field since they will be worked out beforehand. This will significantly cut down time on construction.

Many research topics were discussed in this session. Since IPD is still very new, there are many unknowns. Below are questions that one may try to answer with their thesis research.

- Are IPD projects more successful?
- How do you select and IPD team?
- How does IPD improve production?
- What are the added values of IPD?
- Does IPD make LEED easier to achieve?
- What happens if an IPD project goes to court?
- Compare IPD vs. traditional delivery methods

The second breakout session I attended was “Carrying BIM to the field-new responsibilities, roles, and competencies.” We started off the session with discussing the general interests of BIM, followed by the field uses and advantages, and finished with the disadvantages.

Interest in BIM:

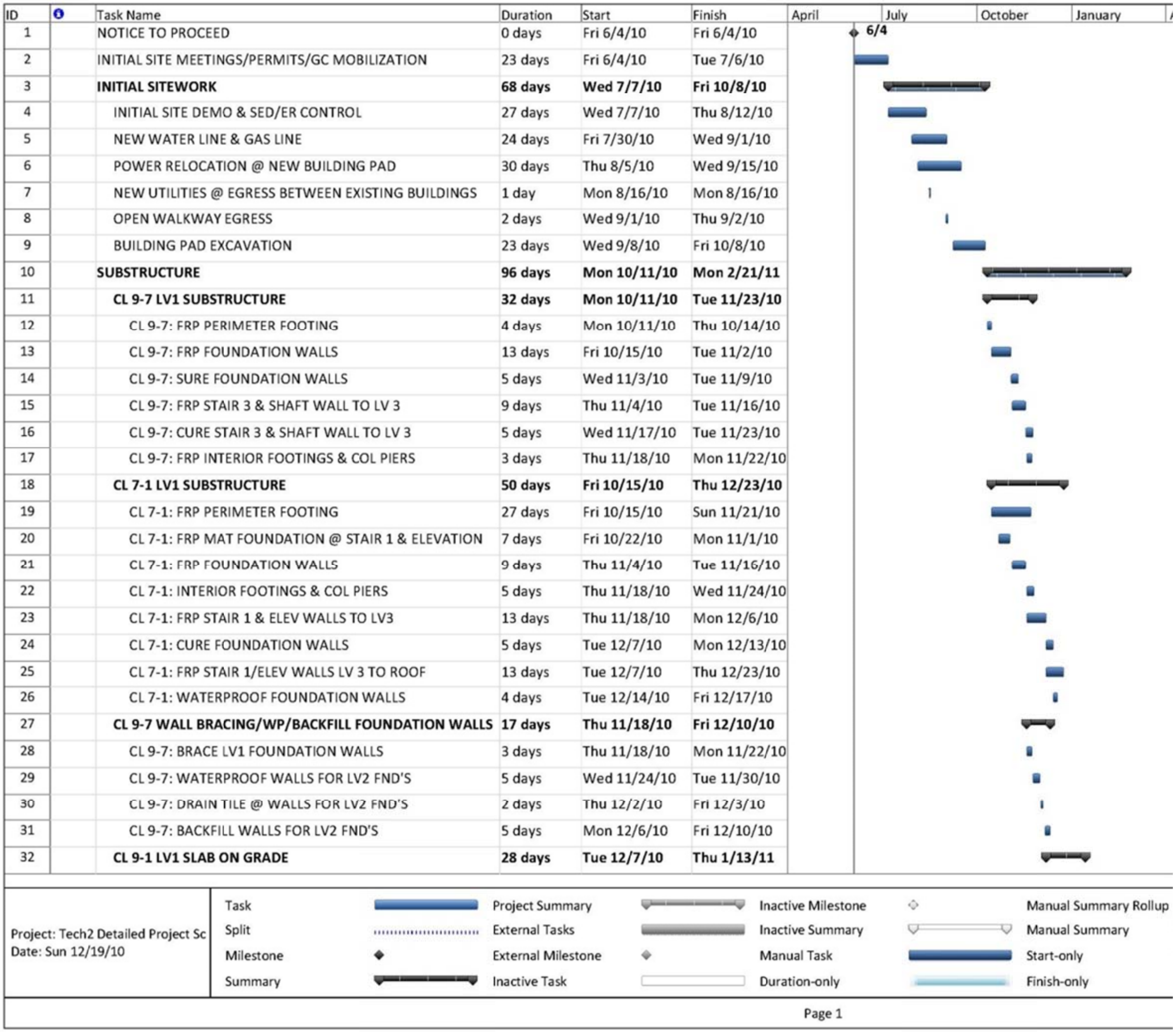
- Productivity
- BIM users
- Roadblocks
- Owner turnover
- Tools and processes to improve communication
- Education
- Examples

After going around the room to see what peoples interests were, we began the discussion of BIM advantages and uses. The first was that BIM could be used to help manage the field. Allowing everyone in the field to view the model ensures that everyone is looking at the same drawings. RFIs can also be linked to the model. The bonus of using tablets onsite offers a simple means of completing punchlists, product tracking via scanning and having information at your fingertips. We discussed that although the upfront cost for such technology is high, it is still less than the amount of money spent on paper.

Our discussion included little talk of the disadvantages of BIM but the biggest drawback was file size. With programs such as Revit and AutoCAD, an accurate and detailed model would have a large file size that would require super computers to handle. These computers come at a high price and many subcontractors are unable or unwilling to spend such money up front. Another challenge is that the programs used for BIM are quite complicated. Teaching these programs to project teams will cost additional time and money. The challenge discussed related to bandwidth limitations. In today’s world, majority of files are transferred over the internet. The problem is that the internet is only so fast. Even if the super computers required to open such BIM models are available, the amount of time needed to transfer these files is excessive. This topic ended our session.

Appendix A

Detailed Project Schedule



ID	Task Name	Duration	Start	Finish
1	NOTICE TO PROCEED	0 days	Fri 6/4/10	Fri 6/4/10
2	INITIAL SITE MEETINGS/PERMITS/GC MOBILIZATION	23 days	Fri 6/4/10	Tue 7/6/10
3	**INITIAL SITEWORK**	**68 days**	**Wed 7/7/10**	**Fri 10/8/10**
4	INITIAL SITE DEMO & SED/ER CONTROL	27 days	Wed 7/7/10	Thu 8/12/10
5	NEW WATER LINE & GAS LINE	24 days	Fri 7/30/10	Wed 9/1/10
6	POWER RELOCATION @ NEW BUILDING PAD	30 days	Thu 8/5/10	Wed 9/15/10
7	NEW UTILITIES @ EGRESS BETWEEN EXISTING BUILDINGS	1 day	Mon 8/16/10	Mon 8/16/10
8	OPEN WALKWAY EGRESS	2 days	Wed 9/1/10	Thu 9/2/10
9	BUILDING PAD EXCAVATION	23 days	Wed 9/8/10	Fri 10/8/10
10	**SUBSTRUCTURE**	**96 days**	**Mon 10/11/10**	**Mon 2/21/11**
11	**CL 9-7 LV1 SUBSTRUCTURE**	**32 days**	**Mon 10/11/10**	**Tue 11/23/10**
12	CL 9-7: FRP PERIMETER FOOTING	4 days	Mon 10/11/10	Thu 10/14/10
13	CL 9-7: FRP FOUNDATION WALLS	13 days	Fri 10/15/10	Tue 11/2/10
14	CL 9-7: SURE FOUNDATION WALLS	5 days	Wed 11/3/10	Tue 11/9/10
15	CL 9-7: FRP STAIR 3 & SHAFT WALL TO LV 3	9 days	Thu 11/4/10	Tue 11/16/10
16	CL 9-7: CURE STAIR 3 & SHAFT WALL TO LV 3	5 days	Wed 11/17/10	Tue 11/23/10
17	CL 9-7: FRP INTERIOR FOOTINGS & COL PIERS	3 days	Thu 11/18/10	Mon 11/22/10
18	**CL 7-1 LV1 SUBSTRUCTURE**	**50 days**	**Fri 10/15/10**	**Thu 12/23/10**
19	CL 7-1: FRP PERIMETER FOOTING	27 days	Fri 10/15/10	Sun 11/21/10
20	CL 7-1: FRP MAT FOUNDATION @ STAIR 1 & ELEVATION	7 days	Fri 10/22/10	Mon 11/1/10
21	CL 7-1: FRP FOUNDATION WALLS	9 days	Thu 11/4/10	Tue 11/16/10
22	CL 7-1: INTERIOR FOOTINGS & COL PIERS	5 days	Thu 11/18/10	Wed 11/24/10
23	CL 7-1: FRP STAIR 1 & ELEV WALLS TO LV3	13 days	Thu 11/18/10	Mon 12/6/10
24	CL 7-1: CURE FOUNDATION WALLS	5 days	Tue 12/7/10	Mon 12/13/10
25	CL 7-1: FRP STAIR 1/ELEV WALLS LV 3 TO ROOF	13 days	Tue 12/7/10	Thu 12/23/10
26	CL 7-1: WATERPROOF FOUNDATION WALLS	4 days	Tue 12/14/10	Fri 12/17/10
27	**CL 9-7 WALL BRACING/WP/BACKFILL FOUNDATION WALLS**	**17 days**	**Thu 11/18/10**	**Fri 12/10/10**
28	CL 9-7: BRACE LV1 FOUNDATION WALLS	3 days	Thu 11/18/10	Mon 11/22/10
29	CL 9-7: WATERPROOF WALLS FOR LV2 FND'S	5 days	Wed 11/24/10	Tue 11/30/10
30	CL 9-7: DRAIN TILE @ WALLS FOR LV2 FND'S	2 days	Thu 12/2/10	Fri 12/3/10
31	CL 9-7: BACKFILL WALLS FOR LV2 FND'S	5 days	Mon 12/6/10	Fri 12/10/10
32	**CL 9-1 LV1 SLAB ON GRADE**	**28 days**	**Tue 12/7/10**	**Thu 1/13/11**

Project: Tech2 Detailed Project Sc
Date: Sun 12/19/10

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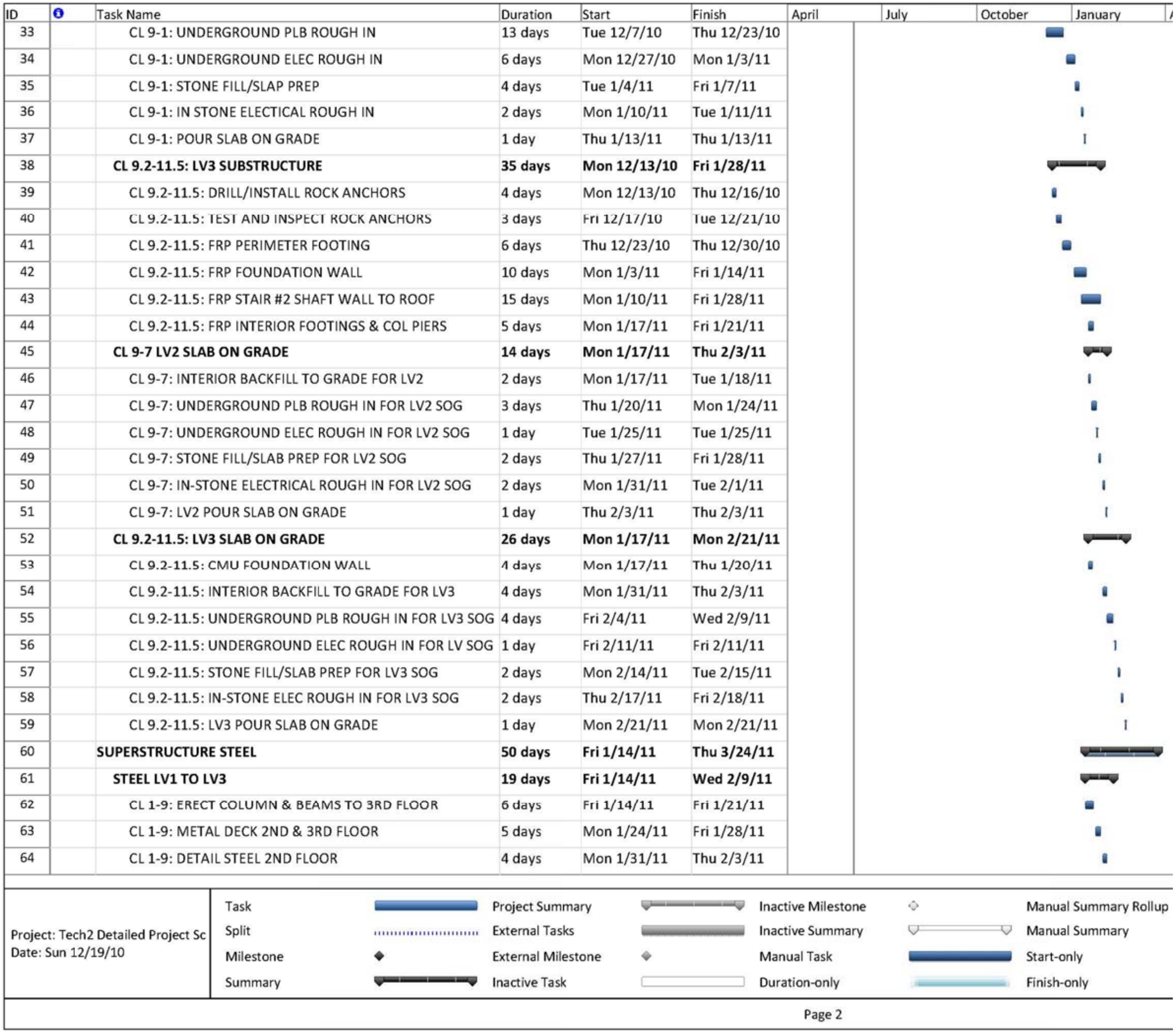

ID		Task Name	Duration	Start	Finish
33		CL 9-1: UNDERGROUND PLB ROUGH IN	13 days	Tue 12/7/10	Thu 12/23/10
34		CL 9-1: UNDERGROUND ELEC ROUGH IN	6 days	Mon 12/27/10	Mon 1/3/11
35		CL 9-1: STONE FILL/SLAP PREP	4 days	Tue 1/4/11	Fri 1/7/11
36		CL 9-1: IN STONE ELECTICAL ROUGH IN	2 days	Mon 1/10/11	Tue 1/11/11
37		CL 9-1: POUR SLAB ON GRADE	1 day	Thu 1/13/11	Thu 1/13/11
38		**CL 9.2-11.5: LV3 SUBSTRUCTURE**	**35 days**	**Mon 12/13/10**	**Fri 1/28/11**
39		CL 9.2-11.5: DRILL/INSTALL ROCK ANCHORS	4 days	Mon 12/13/10	Thu 12/16/10
40		CL 9.2-11.5: TEST AND INSPECT ROCK ANCHORS	3 days	Fri 12/17/10	Tue 12/21/10
41		CL 9.2-11.5: FRP PERIMETER FOOTING	6 days	Thu 12/23/10	Thu 12/30/10
42		CL 9.2-11.5: FRP FOUNDATION WALL	10 days	Mon 1/3/11	Fri 1/14/11
43		CL 9.2-11.5: FRP STAIR #2 SHAFT WALL TO ROOF	15 days	Mon 1/10/11	Fri 1/28/11
44		CL 9.2-11.5: FRP INTERIOR FOOTINGS & COL PIERS	5 days	Mon 1/17/11	Fri 1/21/11
45		**CL 9-7 LV2 SLAB ON GRADE**	**14 days**	**Mon 1/17/11**	**Thu 2/3/11**
46		CL 9-7: INTERIOR BACKFILL TO GRADE FOR LV2	2 days	Mon 1/17/11	Tue 1/18/11
47		CL 9-7: UNDERGROUND PLB ROUGH IN FOR LV2 SOG	3 days	Thu 1/20/11	Mon 1/24/11
48		CL 9-7: UNDERGROUND ELEC ROUGH IN FOR LV2 SOG	1 day	Tue 1/25/11	Tue 1/25/11
49		CL 9-7: STONE FILL/SLAB PREP FOR LV2 SOG	2 days	Thu 1/27/11	Fri 1/28/11
50		CL 9-7: IN-STONE ELECTRICAL ROUGH IN FOR LV2 SOG	2 days	Mon 1/31/11	Tue 2/1/11
51		CL 9-7: LV2 POUR SLAB ON GRADE	1 day	Thu 2/3/11	Thu 2/3/11
52		**CL 9.2-11.5: LV3 SLAB ON GRADE**	**26 days**	**Mon 1/17/11**	**Mon 2/21/11**
53		CL 9.2-11.5: CMU FOUNDATION WALL	4 days	Mon 1/17/11	Thu 1/20/11
54		CL 9.2-11.5: INTERIOR BACKFILL TO GRADE FOR LV3	4 days	Mon 1/31/11	Thu 2/3/11
55		CL 9.2-11.5: UNDERGROUND PLB ROUGH IN FOR LV3 SOG	4 days	Fri 2/4/11	Wed 2/9/11
56		CL 9.2-11.5: UNDERGROUND ELEC ROUGH IN FOR LV SOG	1 day	Fri 2/11/11	Fri 2/11/11
57		CL 9.2-11.5: STONE FILL/SLAB PREP FOR LV3 SOG	2 days	Mon 2/14/11	Tue 2/15/11
58		CL 9.2-11.5: IN-STONE ELEC ROUGH IN FOR LV3 SOG	2 days	Thu 2/17/11	Fri 2/18/11
59		CL 9.2-11.5: LV3 POUR SLAB ON GRADE	1 day	Mon 2/21/11	Mon 2/21/11
60		**SUPERSTRUCTURE STEEL**	**50 days**	**Fri 1/14/11**	**Thu 3/24/11**
61		**STEEL LV1 TO LV3**	**19 days**	**Fri 1/14/11**	**Wed 2/9/11**
62		CL 1-9: ERECT COLUMN & BEAMS TO 3RD FLOOR	6 days	Fri 1/14/11	Fri 1/21/11
63		CL 1-9: METAL DECK 2ND & 3RD FLOOR	5 days	Mon 1/24/11	Fri 1/28/11
64		CL 1-9: DETAIL STEEL 2ND FLOOR	4 days	Mon 1/31/11	Thu 2/3/11

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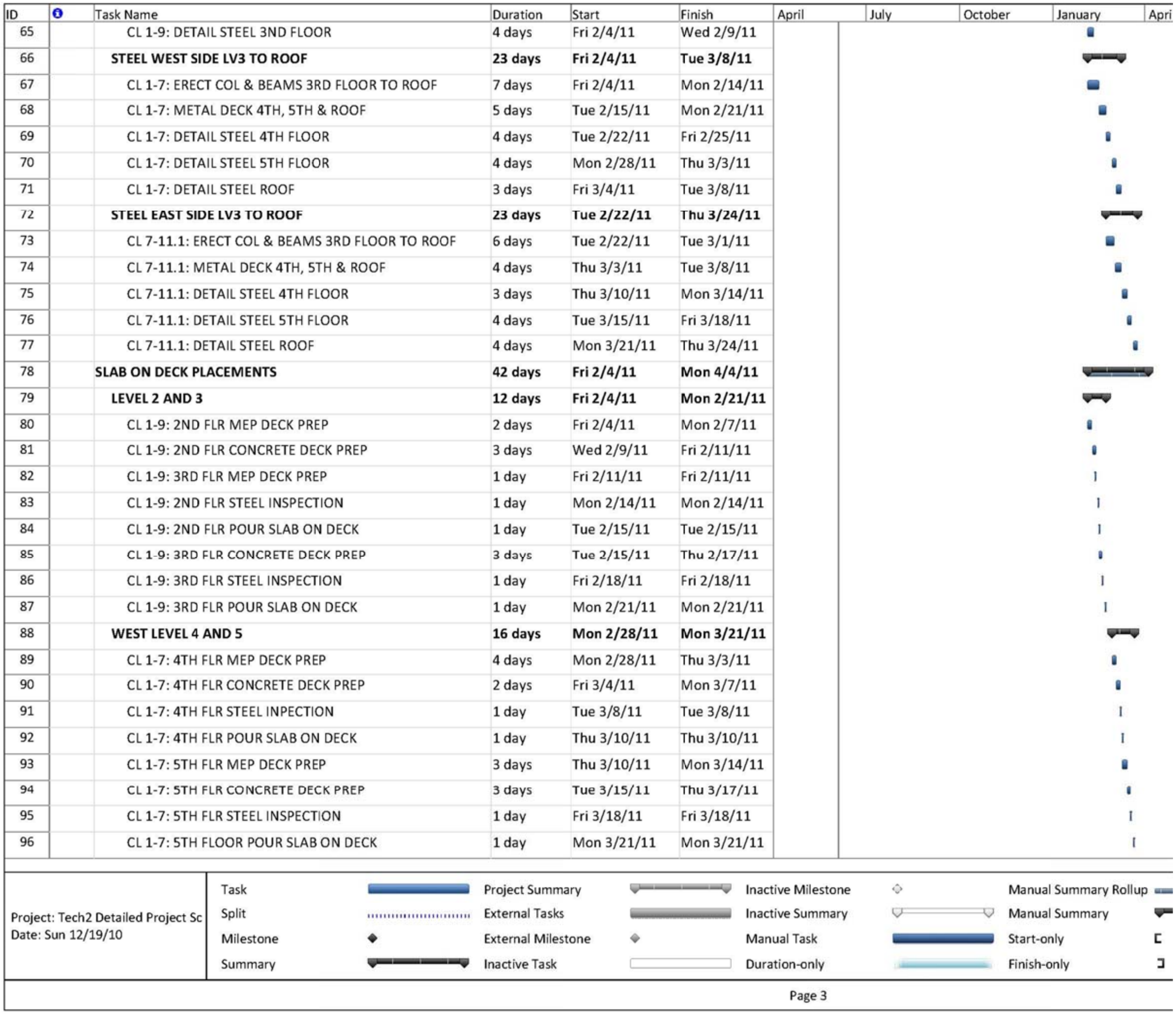

ID	ℹ	Task Name	Duration	Start	Finish
65		CL 1-9: DETAIL STEEL 3ND FLOOR	4 days	Fri 2/4/11	Wed 2/9/11
66		**STEEL WEST SIDE LV3 TO ROOF**	**23 days**	**Fri 2/4/11**	**Tue 3/8/11**
67		CL 1-7: ERECT COL & BEAMS 3RD FLOOR TO ROOF	7 days	Fri 2/4/11	Mon 2/14/11
68		CL 1-7: METAL DECK 4TH, 5TH & ROOF	5 days	Tue 2/15/11	Mon 2/21/11
69		CL 1-7: DETAIL STEEL 4TH FLOOR	4 days	Tue 2/22/11	Fri 2/25/11
70		CL 1-7: DETAIL STEEL 5TH FLOOR	4 days	Mon 2/28/11	Thu 3/3/11
71		CL 1-7: DETAIL STEEL ROOF	3 days	Fri 3/4/11	Tue 3/8/11
72		**STEEL EAST SIDE LV3 TO ROOF**	**23 days**	**Tue 2/22/11**	**Thu 3/24/11**
73		CL 7-11.1: ERECT COL & BEAMS 3RD FLOOR TO ROOF	6 days	Tue 2/22/11	Tue 3/1/11
74		CL 7-11.1: METAL DECK 4TH, 5TH & ROOF	4 days	Thu 3/3/11	Tue 3/8/11
75		CL 7-11.1: DETAIL STEEL 4TH FLOOR	3 days	Thu 3/10/11	Mon 3/14/11
76		CL 7-11.1: DETAIL STEEL 5TH FLOOR	4 days	Tue 3/15/11	Fri 3/18/11
77		CL 7-11.1: DETAIL STEEL ROOF	4 days	Mon 3/21/11	Thu 3/24/11
78		**SLAB ON DECK PLACEMENTS**	**42 days**	**Fri 2/4/11**	**Mon 4/4/11**
79		**LEVEL 2 AND 3**	**12 days**	**Fri 2/4/11**	**Mon 2/21/11**
80		CL 1-9: 2ND FLR MEP DECK PREP	2 days	Fri 2/4/11	Mon 2/7/11
81		CL 1-9: 2ND FLR CONCRETE DECK PREP	3 days	Wed 2/9/11	Fri 2/11/11
82		CL 1-9: 3RD FLR MEP DECK PREP	1 day	Fri 2/11/11	Fri 2/11/11
83		CL 1-9: 2ND FLR STEEL INSPECTION	1 day	Mon 2/14/11	Mon 2/14/11
84		CL 1-9: 2ND FLR POUR SLAB ON DECK	1 day	Tue 2/15/11	Tue 2/15/11
85		CL 1-9: 3RD FLR CONCRETE DECK PREP	3 days	Tue 2/15/11	Thu 2/17/11
86		CL 1-9: 3RD FLR STEEL INSPECTION	1 day	Fri 2/18/11	Fri 2/18/11
87		CL 1-9: 3RD FLR POUR SLAB ON DECK	1 day	Mon 2/21/11	Mon 2/21/11
88		**WEST LEVEL 4 AND 5**	**16 days**	**Mon 2/28/11**	**Mon 3/21/11**
89		CL 1-7: 4TH FLR MEP DECK PREP	4 days	Mon 2/28/11	Thu 3/3/11
90		CL 1-7: 4TH FLR CONCRETE DECK PREP	2 days	Fri 3/4/11	Mon 3/7/11
91		CL 1-7: 4TH FLR STEEL INPECTION	1 day	Tue 3/8/11	Tue 3/8/11
92		CL 1-7: 4TH FLR POUR SLAB ON DECK	1 day	Thu 3/10/11	Thu 3/10/11
93		CL 1-7: 5TH FLR MEP DECK PREP	3 days	Thu 3/10/11	Mon 3/14/11
94		CL 1-7: 5TH FLR CONCRETE DECK PREP	3 days	Tue 3/15/11	Thu 3/17/11
95		CL 1-7: 5TH FLR STEEL INSPECTION	1 day	Fri 3/18/11	Fri 3/18/11
96		CL 1-7: 5TH FLOOR POUR SLAB ON DECK	1 day	Mon 3/21/11	Mon 3/21/11

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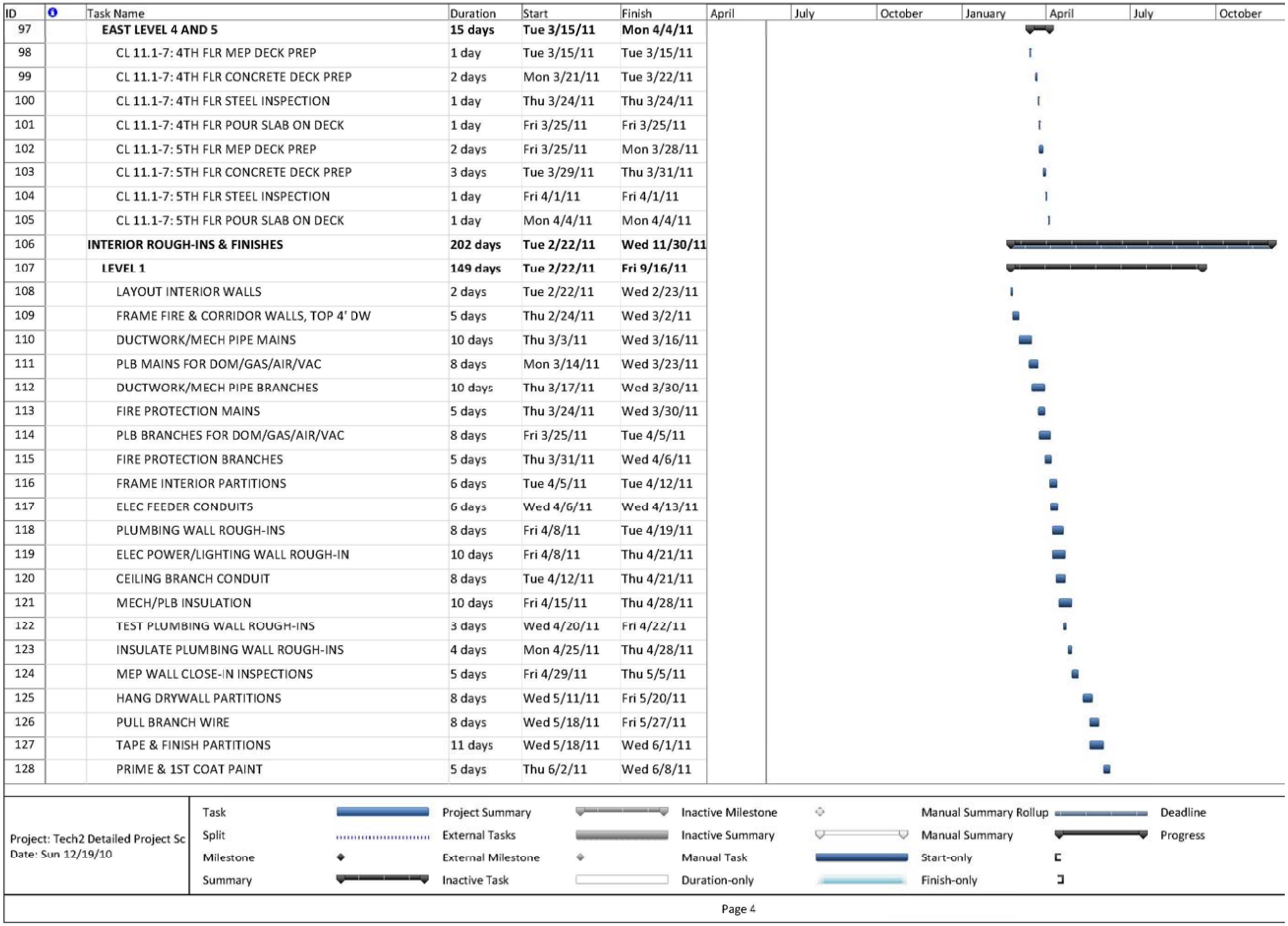

ID		Task Name	Duration	Start	Finish
97		**EAST LEVEL 4 AND 5**	**15 days**	**Tue 3/15/11**	**Mon 4/4/11**
98		CL 11.1-7: 4TH FLR MEP DECK PREP	1 day	Tue 3/15/11	Tue 3/15/11
99		CL 11.1-7: 4TH FLR CONCRETE DECK PREP	2 days	Mon 3/21/11	Tue 3/22/11
100		CL 11.1-7: 4TH FLR STEEL INSPECTION	1 day	Thu 3/24/11	Thu 3/24/11
101		CL 11.1-7: 4TH FLR POUR SLAB ON DECK	1 day	Fri 3/25/11	Fri 3/25/11
102		CL 11.1-7: 5TH FLR MEP DECK PREP	2 days	Fri 3/25/11	Mon 3/28/11
103		CL 11.1-7: 5TH FLR CONCRETE DECK PREP	3 days	Tue 3/29/11	Thu 3/31/11
104		CL 11.1-7: 5TH FLR STEEL INSPECTION	1 day	Fri 4/1/11	Fri 4/1/11
105		CL 11.1-7: 5TH FLR POUR SLAB ON DECK	1 day	Mon 4/4/11	Mon 4/4/11
106		**INTERIOR ROUGH-INS & FINISHES**	**202 days**	**Tue 2/22/11**	**Wed 11/30/11**
107		**LEVEL 1**	**149 days**	**Tue 2/22/11**	**Fri 9/16/11**
108		LAYOUT INTERIOR WALLS	2 days	Tue 2/22/11	Wed 2/23/11
109		FRAME FIRE & CORRIDOR WALLS, TOP 4' DW	5 days	Thu 2/24/11	Wed 3/2/11
110		DUCTWORK/MECH PIPE MAINS	10 days	Thu 3/3/11	Wed 3/16/11
111		PLB MAINS FOR DOM/GAS/AIR/VAC	8 days	Mon 3/14/11	Wed 3/23/11
112		DUCTWORK/MECH PIPE BRANCHES	10 days	Thu 3/17/11	Wed 3/30/11
113		FIRE PROTECTION MAINS	5 days	Thu 3/24/11	Wed 3/30/11
114		PLB BRANCHES FOR DOM/GAS/AIR/VAC	8 days	Fri 3/25/11	Tue 4/5/11
115		FIRE PROTECTION BRANCHES	5 days	Thu 3/31/11	Wed 4/6/11
116		FRAME INTERIOR PARTITIONS	6 days	Tue 4/5/11	Tue 4/12/11
117		ELEC FEEDER CONDUITS	6 days	Wed 4/6/11	Wed 4/13/11
118		PLUMBING WALL ROUGH-INS	8 days	Fri 4/8/11	Tue 4/19/11
119		ELEC POWER/LIGHTING WALL ROUGH-IN	10 days	Fri 4/8/11	Thu 4/21/11
120		CEILING BRANCH CONDUIT	8 days	Tue 4/12/11	Thu 4/21/11
121		MECH/PLB INSULATION	10 days	Fri 4/15/11	Thu 4/28/11
122		TEST PLUMBING WALL ROUGH-INS	3 days	Wed 4/20/11	Fri 4/22/11
123		INSULATE PLUMBING WALL ROUGH-INS	4 days	Mon 4/25/11	Thu 4/28/11
124		MEP WALL CLOSE-IN INSPECTIONS	5 days	Fri 4/29/11	Thu 5/5/11
125		HANG DRYWALL PARTITIONS	8 days	Wed 5/11/11	Fri 5/20/11
126		PULL BRANCH WIRE	8 days	Wed 5/18/11	Fri 5/27/11
127		TAPE & FINISH PARTITIONS	11 days	Wed 5/18/11	Wed 6/1/11
128		PRIME & 1ST COAT PAINT	5 days	Thu 6/2/11	Wed 6/8/11

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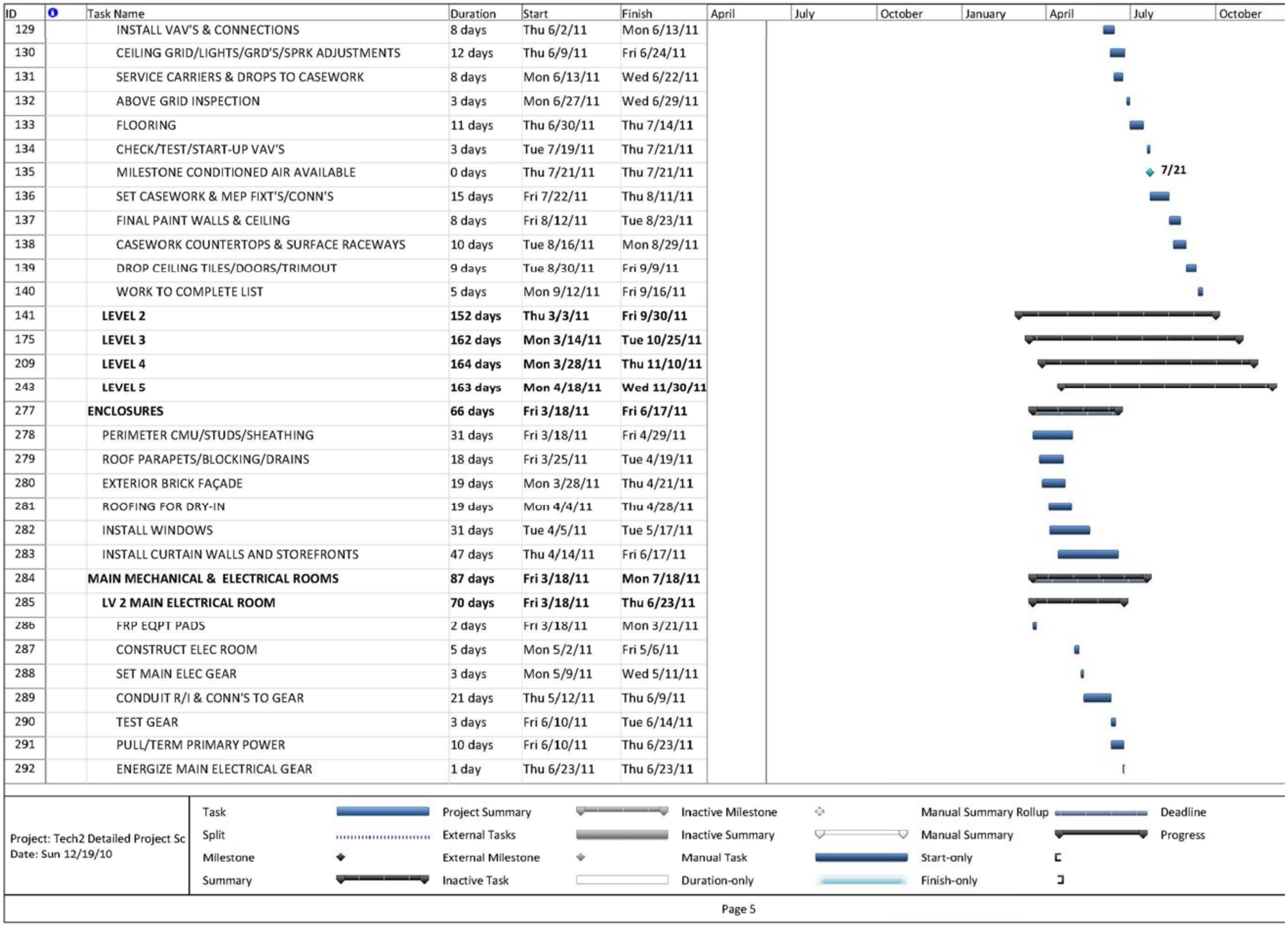

ID	ℹ	Task Name	Duration	Start	Finish
129		INSTALL VAV'S & CONNECTIONS	8 days	Thu 6/2/11	Mon 6/13/11
130		CEILING GRID/LIGHTS/GRD'S/SPRK ADJUSTMENTS	12 days	Thu 6/9/11	Fri 6/24/11
131		SERVICE CARRIERS & DROPS TO CASEWORK	8 days	Mon 6/13/11	Wed 6/22/11
132		ABOVE GRID INSPECTION	3 days	Mon 6/27/11	Wed 6/29/11
133		FLOORING	11 days	Thu 6/30/11	Thu 7/14/11
134		CHECK/TEST/START-UP VAV'S	3 days	Tue 7/19/11	Thu 7/21/11
135		MILESTONE CONDITIONED AIR AVAILABLE	0 days	Thu 7/21/11	Thu 7/21/11
136		SET CASEWORK & MEP FIXT'S/CONN'S	15 days	Fri 7/22/11	Thu 8/11/11
137		FINAL PAINT WALLS & CEILING	8 days	Fri 8/12/11	Tue 8/23/11
138		CASEWORK COUNTERTOPS & SURFACE RACEWAYS	10 days	Tue 8/16/11	Mon 8/29/11
139		DROP CEILING TILES/DOORS/TRIMOUT	9 days	Tue 8/30/11	Fri 9/9/11
140		WORK TO COMPLETE LIST	5 days	Mon 9/12/11	Fri 9/16/11
141		**LEVEL 2**	**152 days**	**Thu 3/3/11**	**Fri 9/30/11**
175		**LEVEL 3**	**162 days**	**Mon 3/14/11**	**Tue 10/25/11**
209		**LEVEL 4**	**164 days**	**Mon 3/28/11**	**Thu 11/10/11**
243		**LEVEL 5**	**163 days**	**Mon 4/18/11**	**Wed 11/30/11**
277		**ENCLOSURES**	**66 days**	**Fri 3/18/11**	**Fri 6/17/11**
278		PERIMETER CMU/STUDS/SHEATHING	31 days	Fri 3/18/11	Fri 4/29/11
279		ROOF PARAPETS/BLOCKING/DRAINS	18 days	Fri 3/25/11	Tue 4/19/11
280		EXTERIOR BRICK FAÇADE	19 days	Mon 3/28/11	Thu 4/21/11
281		ROOFING FOR DRY-IN	19 days	Mon 4/4/11	Thu 4/28/11
282		INSTALL WINDOWS	31 days	Tue 4/5/11	Tue 5/17/11
283		INSTALL CURTAIN WALLS AND STOREFRONTS	47 days	Thu 4/14/11	Fri 6/17/11
284		**MAIN MECHANICAL & ELECTRICAL ROOMS**	**87 days**	**Fri 3/18/11**	**Mon 7/18/11**
285		**LV 2 MAIN ELECTRICAL ROOM**	**70 days**	**Fri 3/18/11**	**Thu 6/23/11**
286		FRP EQPT PADS	2 days	Fri 3/18/11	Mon 3/21/11
287		CONSTRUCT ELEC ROOM	5 days	Mon 5/2/11	Fri 5/6/11
288		SET MAIN ELEC GEAR	3 days	Mon 5/9/11	Wed 5/11/11
289		CONDUIT R/I & CONN'S TO GEAR	21 days	Thu 5/12/11	Thu 6/9/11
290		TEST GEAR	3 days	Fri 6/10/11	Tue 6/14/11
291		PULL/TERM PRIMARY POWER	10 days	Fri 6/10/11	Thu 6/23/11
292		ENERGIZE MAIN ELECTRICAL GEAR	1 day	Thu 6/23/11	Thu 6/23/11

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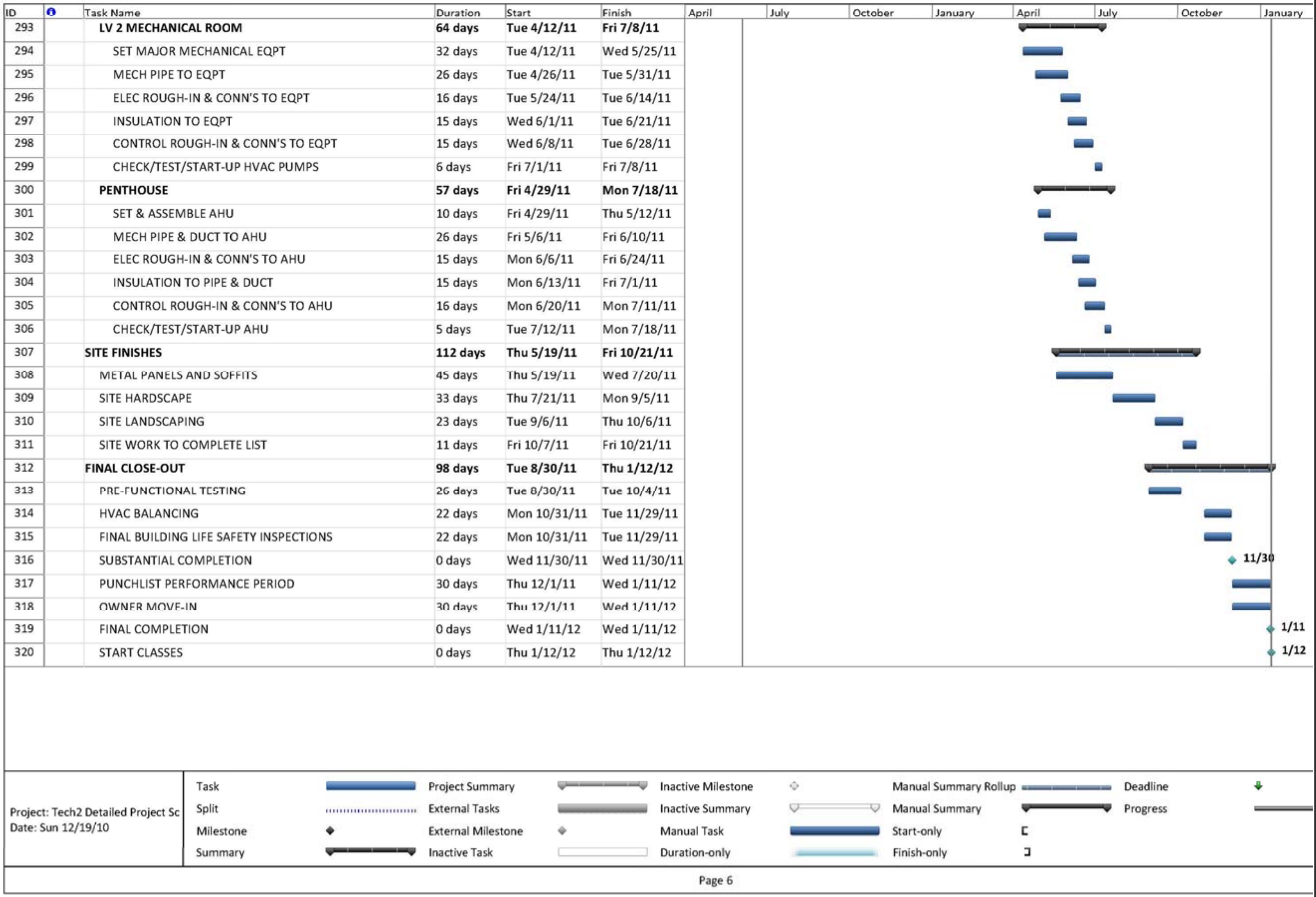

ID	Task Name	Duration	Start	Finish
293	**LV 2 MECHANICAL ROOM**	**64 days**	**Tue 4/12/11**	**Fri 7/8/11**
294	SET MAJOR MECHANICAL EQPT	32 days	Tue 4/12/11	Wed 5/25/11
295	MECH PIPE TO EQPT	26 days	Tue 4/26/11	Tue 5/31/11
296	ELEC ROUGH-IN & CONN'S TO EQPT	16 days	Tue 5/24/11	Tue 6/14/11
297	INSULATION TO EQPT	15 days	Wed 6/1/11	Tue 6/21/11
298	CONTROL ROUGH-IN & CONN'S TO EQPT	15 days	Wed 6/8/11	Tue 6/28/11
299	CHECK/TEST/START-UP HVAC PUMPS	6 days	Fri 7/1/11	Fri 7/8/11
300	**PENTHOUSE**	**57 days**	**Fri 4/29/11**	**Mon 7/18/11**
301	SET & ASSEMBLE AHU	10 days	Fri 4/29/11	Thu 5/12/11
302	MECH PIPE & DUCT TO AHU	26 days	Fri 5/6/11	Fri 6/10/11
303	ELEC ROUGH-IN & CONN'S TO AHU	15 days	Mon 6/6/11	Fri 6/24/11
304	INSULATION TO PIPE & DUCT	15 days	Mon 6/13/11	Fri 7/1/11
305	CONTROL ROUGH-IN & CONN'S TO AHU	16 days	Mon 6/20/11	Mon 7/11/11
306	CHECK/TEST/START-UP AHU	5 days	Tue 7/12/11	Mon 7/18/11
307	**SITE FINISHES**	**112 days**	**Thu 5/19/11**	**Fri 10/21/11**
308	METAL PANELS AND SOFFITS	45 days	Thu 5/19/11	Wed 7/20/11
309	SITE HARDSCAPE	33 days	Thu 7/21/11	Mon 9/5/11
310	SITE LANDSCAPING	23 days	Tue 9/6/11	Thu 10/6/11
311	SITE WORK TO COMPLETE LIST	11 days	Fri 10/7/11	Fri 10/21/11
312	**FINAL CLOSE-OUT**	**98 days**	**Tue 8/30/11**	**Thu 1/12/12**
313	PRE-FUNCTIONAL TESTING	26 days	Tue 8/30/11	Tue 10/4/11
314	HVAC BALANCING	22 days	Mon 10/31/11	Tue 11/29/11
315	FINAL BUILDING LIFE SAFETY INSPECTIONS	22 days	Mon 10/31/11	Tue 11/29/11
316	SUBSTANTIAL COMPLETION	0 days	Wed 11/30/11	Wed 11/30/11
317	PUNCHLIST PERFORMANCE PERIOD	30 days	Thu 12/1/11	Wed 1/11/12
318	OWNER MOVE-IN	30 days	Thu 12/1/11	Wed 1/11/12
319	FINAL COMPLETION	0 days	Wed 1/11/12	Wed 1/11/12
320	START CLASSES	0 days	Thu 1/12/12	Thu 1/12/12

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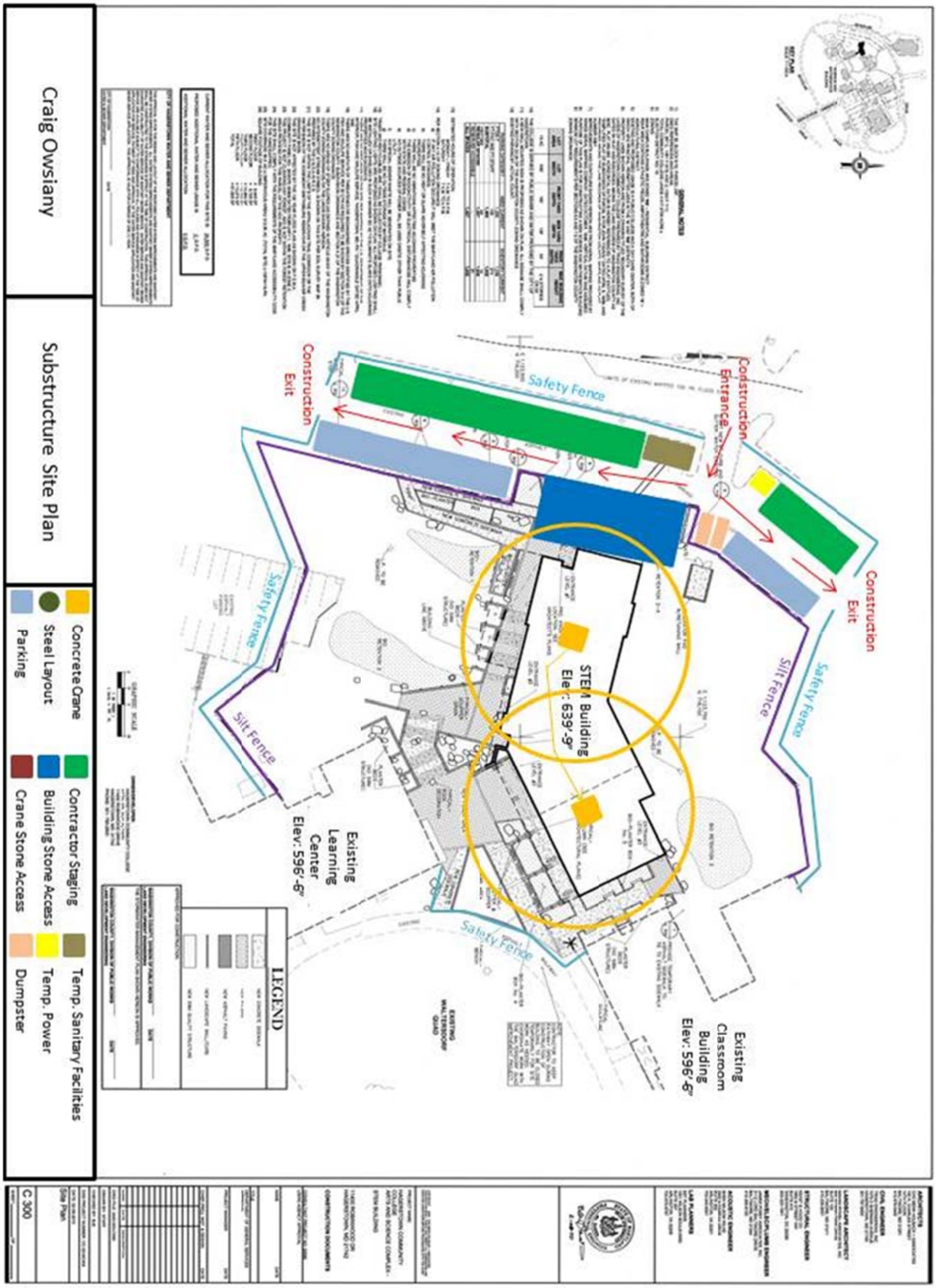
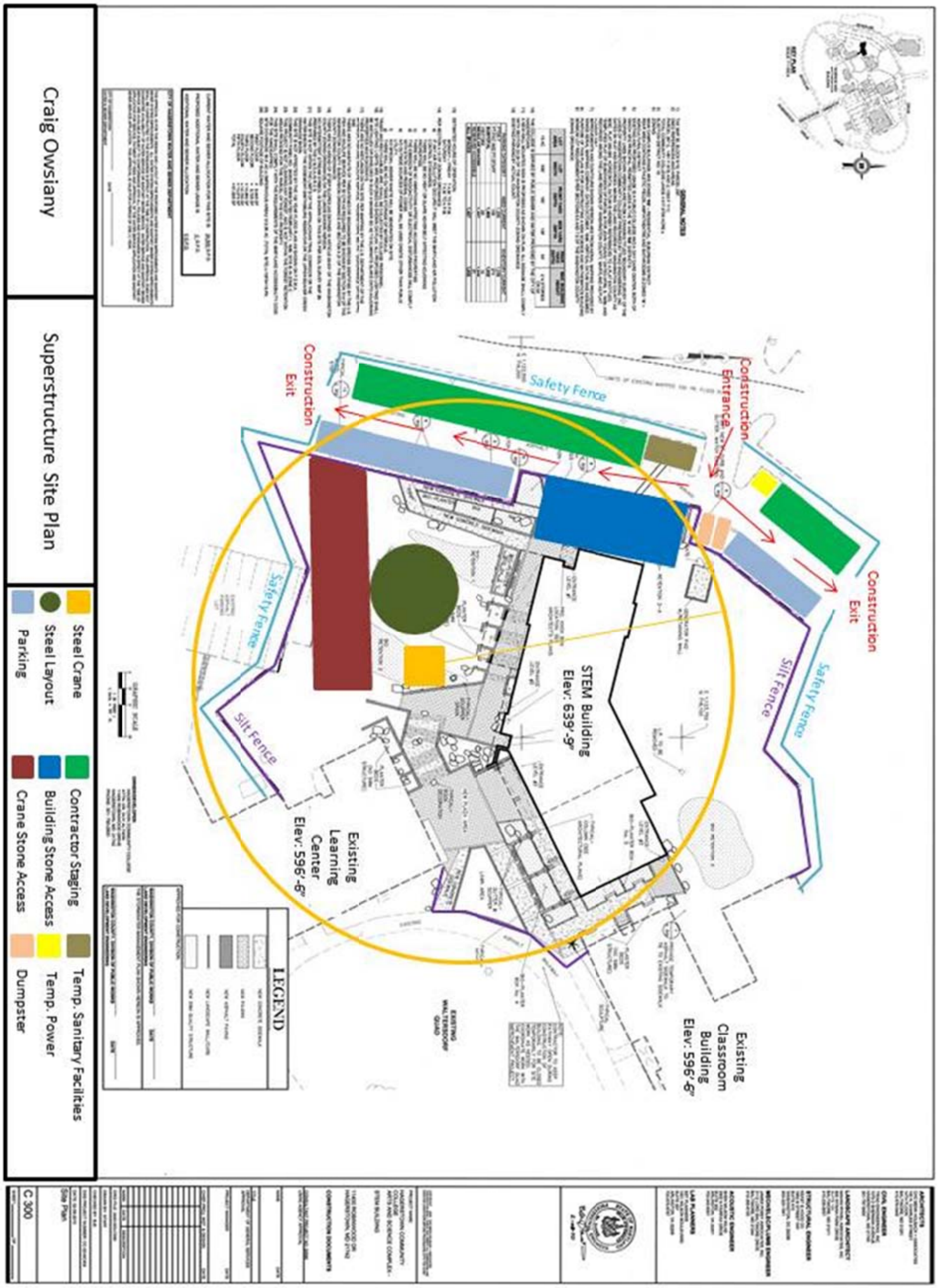
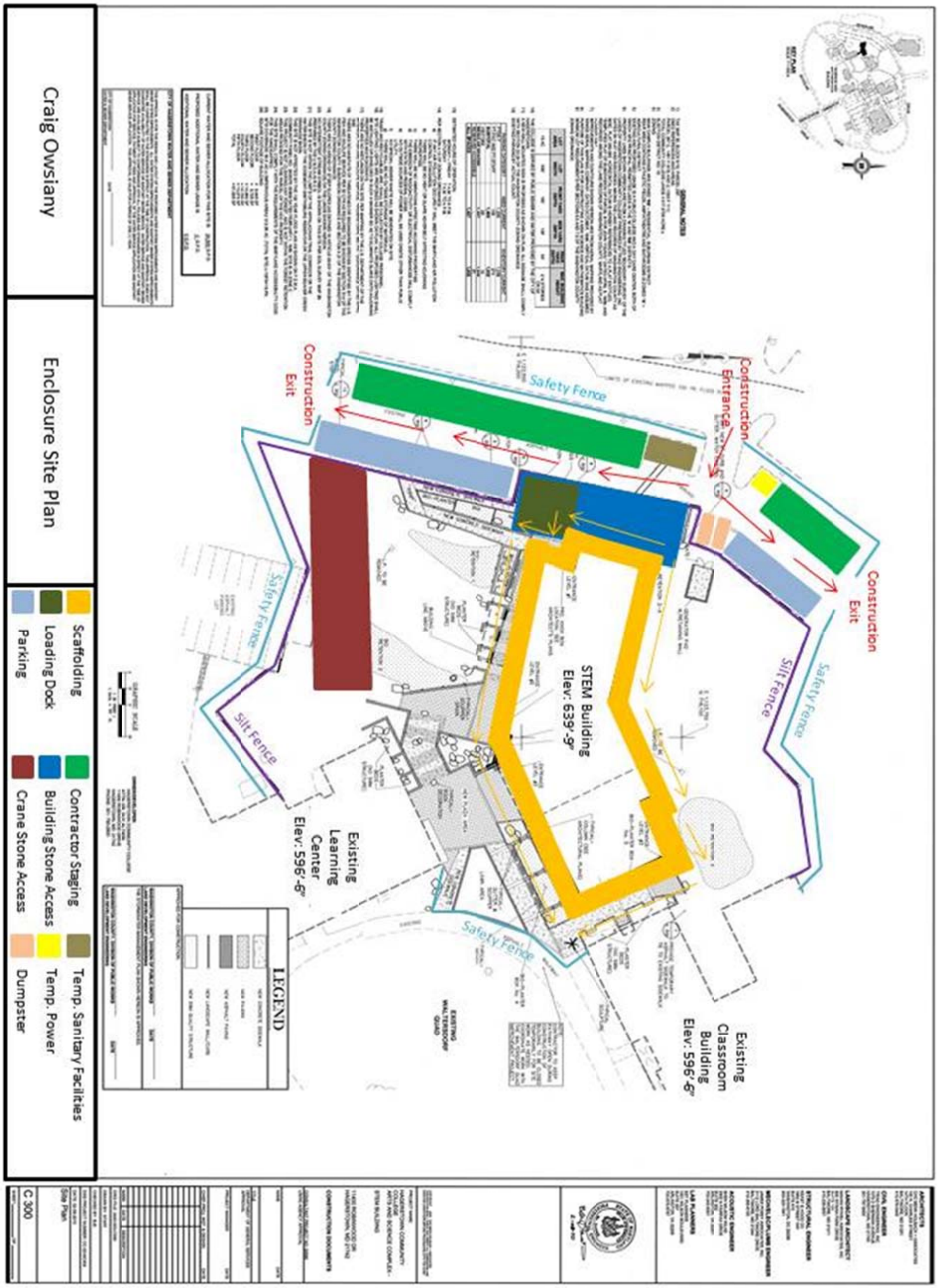
Appendix B

Site Layout Planning

(Substructure Plan, Superstructure Plan, Enclosure Plan)


Craig Owsiany
Substructure Site Plan
Concrete Crane
Steel Layout
Parking
Contractor Staging
Building Stone Access
Crane Stone Access
Temp. Sanitary Facilities
Temp. Power
Dumpster
Construction Entrance
Construction Exit
Construction Exit
Safety Fence
Safety Fence
Safety Fence
Safety Fence
Silt Fence
Silt Fence
STEM Building
Elev: 639'-9"
Existing Learning Center
Elev: 596'-6"
Existing Classroom Building
Elev: 596'-6"
LEGEND
GENERAL NOTES
KEY PLAN
C 300
Site Plan


Craig Owsiany
Superstructure Site Plan
Steel Crane
Steel Layout
Parking
Contractor Staging
Building Stone Access
Crane Stone Access
Temp. Sanitary Facilities
Temp. Power
Dumpster
Construction Entrance
Construction Exit
Construction Exit
Safety Fence
Safety Fence
Safety Fence
Silt Fence
Silt Fence
STEM Building
Elev: 639'-9"
Existing Learning Center
Elev: 596'-6"
Existing Classroom Building
Elev: 596'-6"
LEGEND
C 300
Site Plan


Craig Owsiany
Enclosure Site Plan
Scaffolding
Loading Dock
Parking
Contractor Staging
Building Stone Access
Crane Stone Access
Temp. Sanitary Facilities
Temp. Power
Dumpster
Construction Entrance
Construction Exit
Construction Exit
Safety Fence
Safety Fence
Safety Fence
Safety Fence
Silt Fence
Silt Fence
STEM Building
Elev: 639'-9"
Existing Learning Center
Elev: 596'-6"
Existing Classroom Building
Elev: 596'-6"
LEGEND
C 300
Site Plan

Appendix C

Detailed Structural Systems Estimate

Detailed Structural Systems Estimate

03 Concrete

Description	Unit	Material	Unit Price	Amount
4,000 psi LW	CY	1139	$153.45	$174,779.55
4,000 psi NW	CY	1866	$111.87	$208,749.42
WWF 6x6, W2.1xW2.1	CSF	718	$49.35	$35,433.30
Rebar #4	Tons	58.25	$1,648.06	$95,999.50
Rebar #5	Tons	157.1	$1,559.69	$245,027.30
Rebar #8	Tons	10.65	$1,231.54	$13,115.90
5/8" Wood Formwork	SF	71559	$1.17	$83,724.03
Concrete Total				$856,829.00

05 Metals-Columns

Description	Unit	Material	Unit Price	Amount
W8x48	LF	244	$63.32	$15,450.08
W12x50	LF	1166	$64.53	$75,241.98
W12x87	LF	956	$108.63	$103,850.28
W12x120	LF	268	$147.72	$39,588.96
HSS8.625x0.375, 14'	Each	5	$768.27	$3,841.35
HSS12.75x.5, 18'	Each	12	$1,391.96	$16,703.52
HSS8x8x0.375, 14'	Each	5	$746.14	$3,730.70
Columns Subtotal				$258,406.87

05 Metals-Beams				
Description	Unit	Material	Unit Price	Amount
W10x12	LF	1060	$23.92	$25,355.20
W12x22	LF	903	$32.79	$29,609.37
W12x26	LF	380	$37.21	$14,139.80
W14x26	LF	1207	$36.46	$44,007.22
W16x31	LF	927	$43.26	$40,102.02
W16x40	LF	359	$54.26	$19,479.34
W18x35	LF	1994	$49.43	$98,563.42
W18x40	LF	1346	$55.19	$74,285.74
W18x46	LF	684	$62.27	$42,592.68
W21x44	LF	1812	$59.23	$107,324.76
W24x55	LF	765	$71.76	$54,896.40
W24x76	LF	631	$96.54	$60,916.74
W27x84	LF	510	$105.77	$53,942.70
W30x99	LF	471	$123.42	$58,130.82
W33x118	LF	367	$145.72	$53,479.24
Beam Subtotal				$776,825.45

05 Metals-Steel Decking				
Description	Unit	Material	Unit Price	Amount
2" Deep, 20 Gauge, Composite	SF	61766	$2.14	$132,179.24
Steel Decking Subtotal				$132,179.24

Detailed Structural Systems Subtotal	$2,024,240.56

Appendix D

General Conditions Estimate

General Conditions Estimate

Project Personnel	Unit	Duration	Quantity	Unit Price	Amount
Project Executive	Week	16	1	$2,100.00	$33,600.00
Senior Project Manager	Week	78	1	$1,850.00	$144,300.00
Asst. Project Manager	Week	52	1	$1,600.00	$83,200.00
Senior Superintendent	Week	78	1	$1,700.00	$132,600.00
Asst. Superintendent	Week	52	1	$1,550.00	$80,600.00
Project Engineer	Week	78	1	$1,000.00	$78,000.00
Estimator	Week	78	1	$365.00	$28,470.00
Accounting	Week	78	1	$365.00	$28,470.00
Project Personnel Subtotal					$609,240.00

Field Office Support	Unit	Duration	Quantity	Unit Price	Amount
Office Trailer	Month	18	2	$375.00	$13,500.00
Field Office Light/HVAC	Month	18	2	$110.00	$3,960.00
Furniture	LS	1	1	$12,000.00	$12,000.00
Storage Boxes	Month	18	1	$73.50	$1,323.00
Postage/Delivery	LS	1	1	$5,000.00	$5,000.00
Office Equipment	Month	18	1	$150.00	$2,700.00
Office Supplies	Month	18	1	$95.00	$1,710.00
Telephone	Month	18	1	$210.00	$3,780.00
Printing	LS	1	1	$17,000.00	$17,000.00
Field Office Support Subtotal					$60,973.00

Temp. Facilities/Fences/Controls	Unit	Duration	Quantity	Unit Price	Amount
Temp. Toilet	Month	18	4	$168.00	$12,096.00
Temp. Fence	LF	1	1000	$3.58	$3,580.00
Silt Fence	LF	1	1000	$3.58	$3,580.00
Job Signage	SF	1	150	$17.90	$2,685.00
Drinking Water	LS	1	1	$2,000.00	$2,000.00
Temp. Facilities/Fences/Controls Subtotal					$23,941.00

Temp. Utilities	Unit	Duration	Quantity	Unit Price	Amount
Temp. Heat	CSF	1	628	$13.50	$8,478.00
Temp. Electric	CSF	1	628	$27.20	$17,081.60
Temp. Utilities Subtotal					$25,559.60

Safety	Unit	Duration	Quantity	Unit Price	Amount
Safety	LS	1	1	$20,000.00	$20,000.00
Safety Subtotal					$20,000.00

Clean-Up	Unit	Duration	Quantity	Unit Price	Amount
Periodic Clean-Up	MSF	13	65.38	$26.07	$22,157.94
Final Clean-Up	Job	1	$15,658,449	0.50%	$78,292.25
30 CY Dumpsters	Week	56	2	$900.00	$100,800.00
18" Diameter Trash Chutes	LF	1	140	$63.55	$8,897.00
Clean-Up Subtotal					$210,147.18

Travel	Unit	Duration	Quantity	Unit Price	Amount
Travel	LS	1	1	$10,000.00	$10,000.00
Fuel Costs	40 miles for 4 employees	390	160	$0.55	$34,320.00
Travel Subtotal					$44,320.00

Tools	Unit	Duration	Quantity	Unit Price	Amount
Small Tool	Job	1	$15,658,449	0.45%	$70,463.02
Small Tools Subtotal					$70,463.02

Quality Control	Unit	Duration	Quantity	Unit Price	Amount
Steel Buildings	Job	1	1	$14,818.00	$14,818.00
Concrete Testing	Each	30	1	$136.00	$4,080.00
Earthwork Inspection	Day	30	1	$210.00	$6,300.00
Quality Control Subtotal					$25,198.00

Permits	Unit	Duration	Quantity	Unit Price	Amount
Water and Sewer Permit	LS	1	1	$45,000.00	$45,000.00
Permits Subtotal					$45,000.00

Commissioning	Unit	Duration	Quantity	Unit Price	Amount
Commissioning	Job	1	$15,658,449	$0.50	$78,292.25
Commissioning Subtotal					$78,292.25

Subtotal	$1,213,134.05