

Technical Assignment One

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Maryland Public Health Laboratories

Construction Management

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Executive Summary

The Technical Assignment Two is intended to analyze a construction project execution and the several aspects that cause teams to strategically perform their work in order to efficiently complete a project. The report is focused on the examination of The Maryland Public Health Laboratories located in east Baltimore, MD and the construction process implemented. A comprehensive analysis of the building project provides information regarding how construction manager, Jacobs Engineering, and general contractor, Turner Construction, have established and executed plans to ensure that the project meets budget and schedule. The report is comprised of thorough research that is used to produce detailed schedules, costs estimates, BIM analyses, and constructability issue studies.

A detailed project schedule of The Maryland Public Health Laboratories provides sufficient information regarding the numerous tasks involved on site from the project start date, January 1, 2012, to the date of completion, April 19, 2014. An understanding how certain phases of construction overlap one another and individual work task are performed simultaneously in efforts to decrease project schedule is provided. Discoveries of how important schedules become when involved in projects as complex as laboratories were derived after extensive research.

In addition to a project schedule, detailed structural systems and general conditions estimates are provided to help establish the basis of the types of expenditures need to perform work on the project. The structural systems estimate analyzes the concrete structural system of the building, breaking it down into the copious amounts of material and labor it takes to build the design. After all have been taken into consideration a detailed structural estimate of \$11,006,921.40 was produced for the building. Costs of staff, site utilities and finical documents comprise of the general conditions estimate. This is an essential cost of construction that allows construction to continue throughout the durations. A general conditions cost estimate of \$7,103,281.79 was contributed to the project.

A BIM analyses was conducted to provide an explanation on how it was implemented on the Maryland Public Health Laboratories project. BIM is a tool that provides numerous benefits as it manages, coordinate, and facilitates aspects present throughout the planning phase to the operational phase of a building. Unfortunately, the teams didn't use BIM to its full potential on this project, but it has been implemented in areas such as, 3-D coordination, site utilization, and record modeling.

The last section of the report focuses on constructability issues faced by the project teams on site. Management has attended to these issues, but some have caused additional costs and schedule delays on the project. Descriptive summaries of four issues provide an understanding what problems can arise on any given project and how they are handled in an efficient manner.

It is important that project teams use tools at their disposal such a schedules, cost estimates and technology to form plans that can be successfully implemented in the field. Ultimately, this report provides a descriptive analysis on how tools and project execution have influenced the schedule and costs to construct The Maryland Public Health Laboratories.

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Detailed Project Schedule

On any given construction project there are several schedules that are the driving force of task progression and completion. These schedules are continuously revised to ensure accuracy, factoring any change in the construction process. A detailed project schedule contains the specific individual tasks performed throughout the duration of an entire project. These tasks define the steps to complete a larger portion of work, allowing other forms of work to begin or continue.

Another use for detailed schedules is to provide specific work sequencing of individual tasks. It can be easily noted whether certain tasks can work simultaneously without causing delays of other tasks being performed on site.

The Maryland Public Health Laboratories is currently run on a strict schedule that has been provided by Jacobs Engineering. The notice to proceed was issued for January 1, 2012 and the project completion date is set at April 19, 2014. Between these two dates are thousands of individual task necessary to complete the project. To simplify the many task of this schedule, it was sub-categorized into major components of the design/construction. This provided an idea of what tasks and assemblies are necessary to be complete d to successful complete certain construction phases. Jacobs also used their schedule to indicate the sequencing of work zones as project tasks are seen being performed from the west end of the building to the east end. This is one of several ways Jacobs ensured work progress efficiency as multiple tasks can be performed at once.

Schedule Description

The detailed project schedule developed has been divided into several key sub-categories that depict the major assemblies and phases consisted within the project. These categories include Site work, Foundations, Slab on Grade, Concrete Superstructure, Structural Steel, Stairs, MEP Risers, Building Envelope, Elevators, Interiors, Commissioning, and Close-Out. Each are important steps of the construction process and will continue to be further discussed. A detailed schedule is provided in *Appendix A* of the report.

Sitework

The sitework portion of the schedule pertains to the preparation period and excavation necessary to begin the construction of the building structure itself. Mobilization, soil testing and site demolition were a few of the first task performed on site. Excavation of the site began several months afterwards due to proceeding foundation tasks that were necessary to begin excavation intended for sitework. The few tasks that were included with sitework excavation were the excavation of the north retaining footing/wall and the installation of underground utilities around the building perimeter.

Foundation

The foundation phase of the schedule is one of the first phases experienced on site. The site is located in a confined, developed area and specific procedures of going about

excavation for foundations needed to be considered. This portion of the schedule depicts the excavation process necessary to place the foundation. Foundation construction was able to proceed, while excavation was continuing as work was sequenced from west to east. The tower crane construction concludes the end of this schedule as this phase approximately lasted for 4 weeks.

Slab on Grade

It was essential to place the slab on grade at a specific date if the construction was going to run along its intended critical path. The slab on grade allows for the superstructure to proceed. This section of the schedule lasts for approximately 2 months as underslab utility installation, preparation for pour, and SOG pour are the primary tasks performed within the scheduled dates.

Concrete Superstructure

The concrete superstructure is the part of the schedule when structural members are being constructed. As this is a concrete structural system, tasks being performed include installing reinforcing steel, MEP sleeves, pouring elevated slabs and columns, and curing the concrete. The schedule is broken down by floor as the schedule progress as the construction of floors move upwards. Because of the limited amount of line items allowed to create this schedule, it was difficult to indicate that this process also was performed from west to east. To conclude this portion of the schedule structural steel installation within the penthouse was also provided.

Stairs/MEP Risers

Construction of stairs and MEP risers are provided within the schedule. These sections have been divided into the locations they were installed or constructed.

Building Envelope

One of the most intricate systems of the building project and a large portion of the detail schedule is the building envelope. The envelope schedule has been divided into exterior framing, façade construction and roofing. The building envelope again divided by floor as each floor takes roughly 20 days to complete. Each façade scheduled duration as certain elevation contains a multitude of exterior systems or more complex exterior systems. Systems that are provided within this portion of the schedule include precast band, brick veneer, metal panel, curtain wall, and storefront installation. This is a major component of the detailed schedule as many tasks are performed to dry-in the building. The duration of this period is approximately 10 months.

Interiors

The longest experienced portion of the schedule is the interiors. This includes all MEP work performed amongst all floors of the building, floor construction tasks, and interior finishes of each floor. The schedule is divided by each floor. The penthouse is the most detailed of all floors because it contains major mechanical components. These components take several months to install, connect to mechanical distribution systems, and power.

Each floor is scheduled as such to show MEP rough-ins and trim-outs of both overhead mains and branches. Along, with performed tasks regarding MEP, interior construction and finishes of each floor are provided within the detailed schedule. Again, because of limited line items there wasn't the ability to show the sequencing of interior work from west to east. This is the largest portion of the detailed schedule as interior tasks last approximately a year and a half.

Commissioning & Close-out

The final section of the detailed schedule is commissioning & close-out. This is the phase dedicated to testing the systems within the building. It is used evaluate each system and note any problems a system might experience. This part of the schedule is broken down into its commissioning phase, endurance phase and followed by the final completion of the building.

The Maryland Public Health Laboratories project follows a stringent schedule lasting two years and 4 months. The scheduled provided in *Appendix A* narrows Jacobs provided schedule, representing in detail the major task performed at each phase of construction.

Detailed Structural Systems Estimate

To establish a detailed structural systems estimate for the Maryland Public Health Laboratories it is necessary to break down the entire structural system into its substructure and superstructure. Once broken down into the two sub-sections a detailed analysis of the systems and components can be used to formulate a cost estimate for the entire structural system. As this building is a concrete structural system many of the costs involve concrete, reinforcing steel, formwork, curing and other costs associated with concrete construction. **Appendix B** provides a detailed cost estimate of the structural system. It's important to note that all material & labor costs were provided by Jacob's from archived cost information. The cost data provided does not only give costs of materials, but assigns costs to specific tasks in order to construct the given structural component. This is often seen with site preparation for footings, reinforcing steel handling and loading costs, etc. Brief descriptions below indicate the components used in the take-offs used for each assembly.

Substructure

The substructure of the building consists of wall foundation, column foundation, an elevator pit, and basement wall construction. Concrete structural members located within the substructure consisted of cast in place 4000 psi walls that consist of #3 to #18 reinforcing steel, grade 60. Take-offs of Additional costs associated with the preparation & curing of the concrete used in the substructure was taken into account. This includes cost estimates for formwork (erecting, bracing, stripping and cleaning) for multiple uses, curing and the sprayed membrane. Figure 2-1 provides an image of the concrete, reinforcing steel and formwork that are being taken-off in this estimate.



Figure 2-1: Concrete Columns/Walls, Rebar & Forms

Another assembly prominent of the substructure is the slab on grade. Similar to the foundation columns and walls, 4000 psi cast in place concrete is used with reinforcing steel ranging from #3 to #8, grade 60. An added component in the estimated is the welded wire fabric used as tensile reinforcement within the slab.

Superstructure

The superstructure consists of all structural work above grade and consists of assemblies such as concrete columns, upper floor concrete construction, one way slabs, concrete beams and shear walls. These assemblies remain similar to the columns, walls, and SOG found in the substructure section. Cast in place concrete continues to be used at 4000 psi with ranging reinforcing steel from #3 to #8, 60 grade. Notable differences include reinforcing steel used with the construction of concrete beams and keyways placed on the top of concrete shear walls.

In addition to concrete as the predominant material used in the building’s structural system there is some structural steel within the design. Structural steel is noticed within the penthouse as galvanized structural tube framing is used to support the cooling tower and as mechanical framing. The structural steel didn’t provide a cost estimate total that was significant to stand alone as a section so it was grouped with the assemblies it was a component of.

Detailed Estimate Description/Evaluation

The previous descriptions provided an idea of the major materials that comprise of the detailed estimate. There are several others components that are further indicated in *Appendix B* that are necessary to complete an accurate detailed estimate of the system. After take-offs of all materials/procedures are conducted and costs estimates are established a total cost of each assembly could be calculated. Table 2-1 provides total costs estimates for each sub-assembly of both the substructure and superstructure.

Detailed Structural Systems Estimate Table	
Assemblies Name	Total Cost
Total Standard Foundations Cost	\$770,964.15
Total Special Foundations Cost	\$153,094.41
Total Slab on Grade Cost	\$244,978.61
Total Basement Wall Construction Cost	\$889,216.88
Total Building Floors Structure Costs	\$8,948,667.35
Total Detailed Structural Cost	\$11,006,921.40

Table 2-1 Detailed Structural System Estimate

It is also important to note the comparison of the detailed estimate with the actual cost of construction of this system. The actual costs of the building system can be calculated by given data in the systems budgets established by Jacobs and Turner. This cost is approximately \$11,832,200, very similar to the one estimated in the detail estimate. A comparison chart is provided below, Table 2-2. The detailed estimate is roughly 10% off

the budgeted value of the structural system. This could be due to miscellaneous steel costs neglected in the estimated or the inaccuracy of the take-offs due to area calculations. Several costs become adjusted due to the equipment, labor, or materials that are used that could also contribute to the difference in the estimate compared to the actual cost.

Comparison Chart: Actual Cost vs. Estimated Cost of the Building Structural System		
	Total Cost	Cost per SF
Actual Cost	\$11,832,200	\$52.59/SF
Detailed Estimate	\$11,006,921	\$48.92/SF
Percentage Off = approx. 10%		

Table 2-2 Actual vs. Estimated Cost Comparison

General Assumption made when creating the Detailed Estimate:

- Neglect misc. steel allowance
- Neglect mechanical pad allowance
- Exclude accessory materials for reinforcing steel in foundation wall
- Use indicated procedures for specific assembly in estimate. These are provided by Jacobs.
- Use materials that are associated with structural design, but are not necessarily structural components.

General Conditions Estimate

The General Conditions cost associated with a construction is an important cost that provides the essentials to successfully manage a project. These costs include project aspect such as faculty pay, insurance and bonding, cleaning, safety, temporary utilities, barrier/enclosures, etc. This tends to be a fairly large portion of a project estimate as these items are, in most cases, continuously used throughout the duration of a project.

In order to understand the expenses associated with the General Conditions on the Maryland Public Health Laboratories it is necessary to establish a cost chart. In *Appendix C* a General Conditions Cost chart is provided explaining the expenses allocated to individual necessities for the project. This chart is comprised of five categories that include Administration, Quality Requirement, Temporary Facilities, Project Closeout, and Permits, Insurance & Bonds costs. Figure 3-1 depicts the estimated cost percentage of each category of the total general conditions as a whole. Table 3-1 provides a cost estimate of each of these categories, as well as the total cost estimate of the general conditions required for this project.

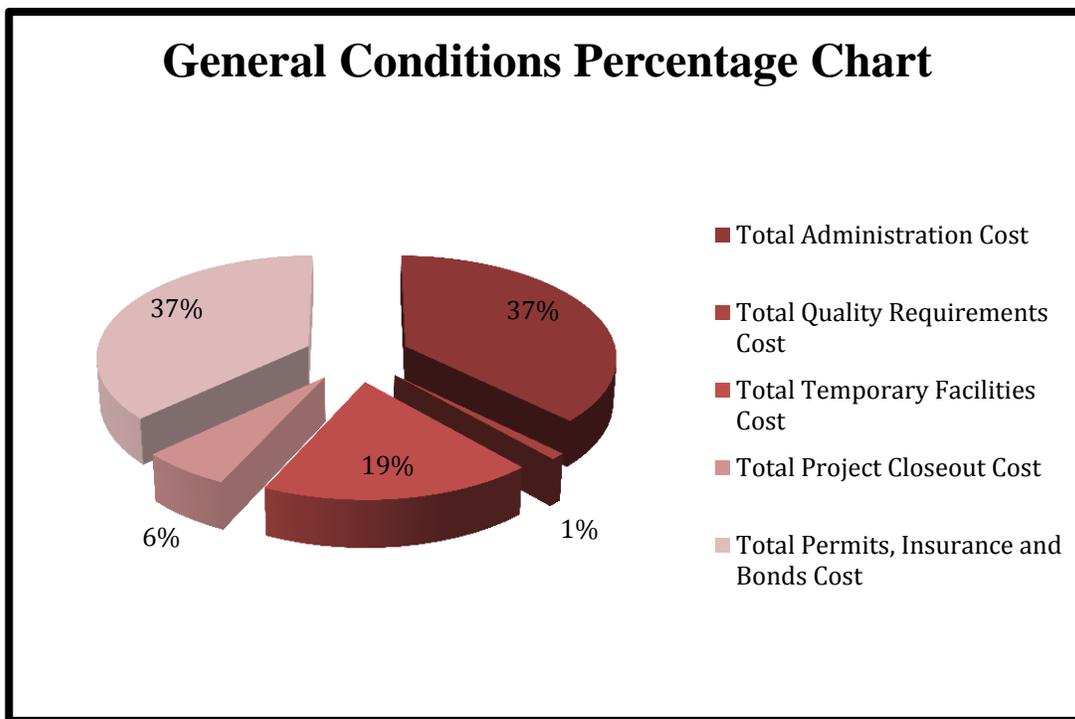


Table 3-1 General Conditions Percentage Chart

General Conditions Estimate Table	
Category Name	Total Cost
Total Administration Cost	\$2,650,874.27
Total Quality Requirements Cost	\$74,367.20
Total Temporary Facilities Cost	\$1,318,785.17
Total Project Closeout Cost	\$434,099.15
Total Permits, Insurance and Bonds Cost	\$2,625,156.00
General Conditions Cost Total	\$7,103,281.79

Table 3-1 General Conditions Estimate Table

Administration

Administrative costs are those associated with the pay of the staff present on site. Jacobs/Turner has indicated that they will provide an extensive staff with job roles consisting of clerk, project engineer, project executive, project manager, MEP coordinator, safety manger and more. The pay per week is provided within the chart regarding these position as well as schedule and scheduler costs. The costs of administration proved to be a bulk of the general conditions as it totaled to approximately \$2,650,874.27.

Quality Requirements

Typically on project sites progress photographs are taken to document the condition of the building and progression of construction. Also, many tests must be performed on the site and concrete to ensure safety and quality for the finished product. These costs are usually provided within the general conditions. Jacobs has indicated that these photographs, tests, and surveying crew are all costs that are all contained in general conditions. The quality requirements costs totaled to approximately \$74,367.20.

Temporary Facilities

A major cost associated with construction is that of temporary facilities. These are facilities, utilities, and equipment that won't remain on-site throughout the entire project or will be removed once the project is turned over to the owner.

Temporary facilities costs can be further divided into more specific groups such as temporary utilities, construction utilities, construction aids, temporary site access and parking, temporary barriers and enclosures, and project identification.

The temporary utilities on the project consist of costs regarding power, lighting, water, and heat temporarily provided to the site. Construction utilities are the costs of work spaces and storage for the on-site staff. This includes, office trailers and storage boxes, along with the telephone bills, lights, HVAC, and office equipment associated with the work facilities.

Construction Aids are miscellaneous equipment that is used on a day to day basis on site. This ranges from project cars to tower cranes. Fuel for machines, safety equipment, and scaffolding can also be found in the section.

Temporary site access and parking is the roadway and on-site parking that allows entry to the site. This is a necessary cost, as staff members must be allowed to enter the perimeter of the site to perform the task need to complete the project.

To ensure quality and safety on a project it's important to consider expenses that protect employee, pedestrians and the building itself. Temporary barriers and enclosures are those expenses that provide these aspects. Barricades, safety rails, fall protection, winter protection, protected pedestrian walkways and watchman are expenses that are located within this category.

Lastly, project identification is the cost associated with the production of signage. These signs are used heavily within the site to promote safety, hazard zones, specific details, etc. They are important and seen on most construction sites.

These five categories that comprise the temporary facilities portion of the general conditions estimate to roughly \$1,318,785.17 of the project.

Project Closeout

The project closeout category refers to the cleaning and maintained performed on site. It is necessary to keep a clean site after each day of work performed as it prevents safety hazards and assure project quality. Items that are indicated within this category would include dumpster, daily cleaning, and site staging costs. This totals to approximately \$434,099.15.

Permits, Insurance and Bond

It is necessary on all projects that specific permits, insurances and bonding is filed before construction proceeds. On the Maryland Public Health Laboratories there are several forms of these that were taken into account when establishing the estimate. General Liability Insurance, Builders Risk Insurance, and Performance/Payment Bonds are those aspects found within this category. This was another predominate expense placed within the general conditions, as it totaled to approximately \$2,626,156.

After performing a fairly detailed estimate of the cost of general conditions a total of approximately \$7,103,281.79 can be associated with the Maryland Public Health Laboratories project.

Building Information Modeling Use Evaluation

An innovative process that is being used amongst many building projects is the implementation of Building Information Modeling or BIM. BIM is used to promote efficiency from the planning stages of building design/construction to the turnover of a completed project for operational uses. It is a knowledge resource that is used by design professionals and construction teams to make decisions that will impact the efficiency of their work and the building as a whole.

It was decided by Turner Construction to involve BIM on the Maryland Public Health Laboratories project as construction tool. The owner, Maryland Department of Health and Mental Hygiene, did not request for BIM to be used prior to the project start. Turner has utilized BIM to coordinate the many MEP trades working on the project. Due to the complexity of the design it is beneficial to use tools like BIM to coordinate this type of work to prevent clashing of work performed by these trades. Many of these sub-contractors must contend for space and BIM helps navigate each design to prevent systems from clashing with one another. This was Turner's primary use for BIM. Figure 4-1 and Figure 4-2 represents the MEP coordination performed by BIM and how contractors and sub-contractors can use the information produced to prevent conflicts with their system designs.

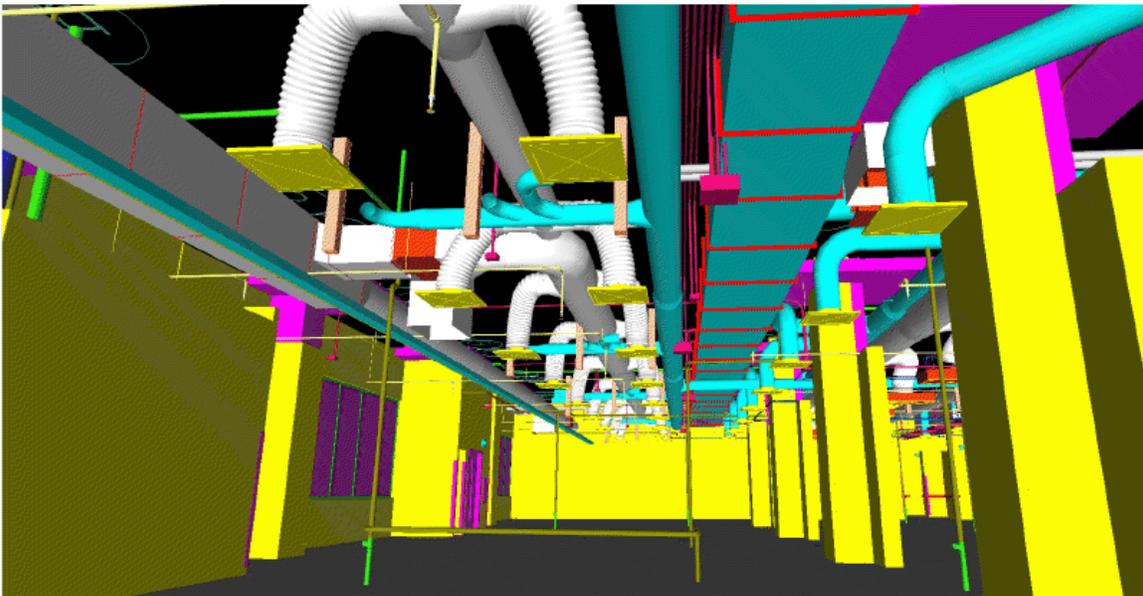


Figure 4-1 BIM Coordination Planning Work Space

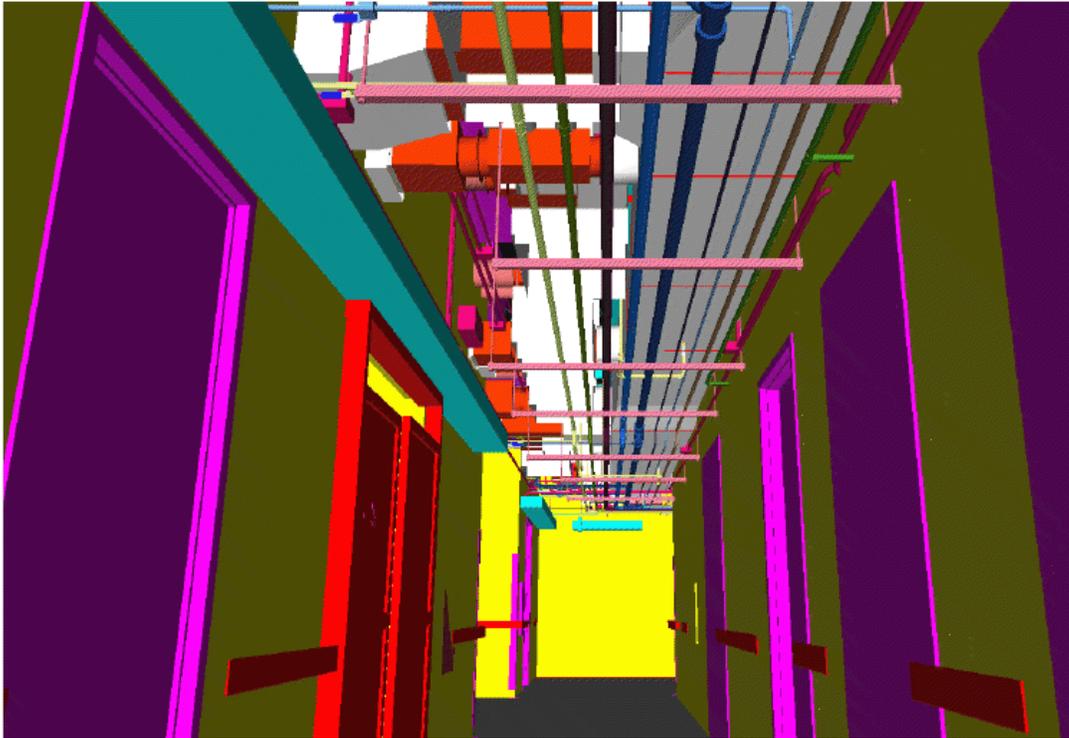


Figure 4-2 BIM Coordination Planning Hallway

BIM has also allowed Turner to schedule the installation of work. This provides an efficient means to the scheduling process as activities can be sequenced. The sequencing is detailed before BIM coordination is established. This allows the sequencing process to be modified after BIM has generated information regarding the coordination process. This allows contractors to understand the most efficient process of installation their specific systems and how to conduct their tasks to work simultaneously with the other contractors on site.

Site utilization planning was another use of BIM by Turner to manage subcontractors and their materials on site. Because of such a small area provided for construction it is necessary to establish a well thought out site layout plan for materials. BIM provides the 3-D modeling to efficiently utilize space to promote efficient access and use for subcontractor equipment and materials. This allows Turner and the subs to allocate specific space for subcontractors prior to material delivery and understand the duration the material will remain on site. This is a tool that also organizes the site for efficient use.

BIM is also utilized as tool to maintain recordable drawings. Turner has expressed the desire to keep a history of drawings within the model to depict project progression. These recordable drawings can be compared to one another to acknowledge certain areas of the design that have changed throughout the construction process. This will be beneficial in the future when establishing As-Built drawings.

Lastly, HDR originally designed the model for design purposes before transferring it over to Turner. HDR's intentions with the 3-D model were to provide the owner with a tool for visualization. Occasionally it's difficult for clients to imagine what their finished product is going to appear with design documents. This was an opportunity to establish an image for the owner's understanding, even though BIM wasn't requested in the beginning.

Appendix D provides several visual representations of the uses of BIM. A major BIM goals & objectives table represents the previous explained uses of BIM on the project. A checklist indicates the array of uses that BIM provides and which of these were utilized on the project. The last document provided is a Level 1 Process Map that navigates the reader through the several phases of the design/construction process and how BIM is implemented within each. In addition, the information exchanged is provided to give a brief example what documents are transferred into BIM at any given time of the process.

Constructability Challenges

Amongst all construction projects, project teams are eventually going to run into unforeseen issues that are dealt with as they occur. These tend to conflict with the baseline project schedule causing additional time to be tacked on to the expected duration of the project. Also, these issues create need for change orders, which create additional costs to the project budget. It is important that as these issues arise they are immediately attended to and a solution to the problem is formulated and implemented. This assures that there will be minimal consequences impacting project schedule and budget.

The Maryland Public Health Laboratories project has now been in progress for approximately 10 months and has faced several constructability challenges. These challenges have been faced by both Jacobs and Turner as both teams have used their expertise to create solutions to bypass these issues with minimal damages. The project is currently the superstructure phase as the concrete structure is being erected. Therefore, the problems that the teams had to face were associated mainly with preconstruction and the early phases of construction. The major challenges faced up to today include unexpectedly high water table, waterproofing detail confusion, inaccurate project drawings, and administrative issues.

Water Table/Dewatering

When planning to excavate a construction site it is always beneficial to note the water table associated with the land being dug up. Geological test are performed to gather this information and is passed along to the parties involved with the construction. On the Maryland Public Health Laboratories project Schnabel Engineering performed geological testing on the site and concluded that the water table was relatively low. The depth of the water table varied from around 10-25' below the current existing grade. This 15' gap caused difficulties when performing spread footer excavation. Figure 5-1 provides an image of water flooding area intended for spread footers.

Significant attention was dedicated to these areas that were experiencing flooding as the soil beneath spread footers are intended to withstand the distributed building load. As soils become saturated they weaken and these conditions aren't suitable for the structural design.

To absolve this problem dewatering pumps had to be used

on the project to evacuate the excess water to continue with construction. Dewatering lines ran throughout the excavation perimeter to dispose of the



Figure 15-1 Flooded Spread Footer Excavation

excess water. Figure 5-2 shows these lines running within the excavated site as well as a problematic area that also experienced flooding. Although measures were taken to treat



Figure 25-2 Dewatering Equipment

the flooding, the project experienced major schedule delays. The schedule has been pushed back approximately 2 months, due to the high water table, as well occasional rainfall.

Jacobs plans to absolve the delay by accelerating their schedule. To do so they plan on work overtime, weekend work, and hiring extra manpower to make up for the lost time that has occurred.

Waterproofing Uncertainties

When designing footings, slab on grades, or any components that is coming in contact with adjacent soils it is common to add waterproofing. This is used to protect structural and building components from becoming water damage as water enters these materials. Water damage can affect the overall strength of members as it begins to decompose the material.

During the construction of the foundation and slab on grade of the building there were some discrepancies experienced between what was depicted on the architectural drawings. After a couple spread footers had been already been place, Jacobs noticed that there hadn't been waterproofing placed along the footers. The sub-contractor involved with the foundation construction informed Jacobs that there wasn't any indication of waterproofing in the architectural drawings. Unfortunately, HDR's design depicts waterproofing, but very vaguely. It was misread by the sub-contractor resulting in the absence of the material on the first couple footers.

Jacobs and Turner were able to determine the severity of the problem by discussing the ramification of the lack of waterproofing of these footers. They determined that this will mostly likely not pose as a problem and could install enough waterproofing around the footers to provide sufficient protection against water.

Design Issues

As the project continues to progress, issue regarding design have become apparent. As stated above there were issues regarding the waterproofing and whether it was depicted in the design drawings. A major design issue that has evolved into a constructability issue was the plumbing design implemented on site. The plumbing subcontractor has experienced difficulties as they have misjudged drawing specifications and procured materials that did not match those provided within the plumbing drawings.

A major problem regarding the plumbing construction was that the subcontractor purchased and installed trap primers that weren't deep enough to exit the concrete slab poured. Trap primers are essentially P-traps that supply water to the trap on a schedule basis. They are used to capture waste and assure no contaminants entering the floor drains are able to exit through the waste line.

These traps aren't intended to be installed within the slab, but rather beneath the slab within the gravel below. This resulted in several change orders to obtain the necessary parts deep enough to penetrate and exit the slab. Additional costs were allocated to the project as well as added project duration. The plumbing sub-contractor was required to attend to the incorrectly installed trap-primers, which prevented previously scheduled work, of the plumbing sub-contractor, to be completed.

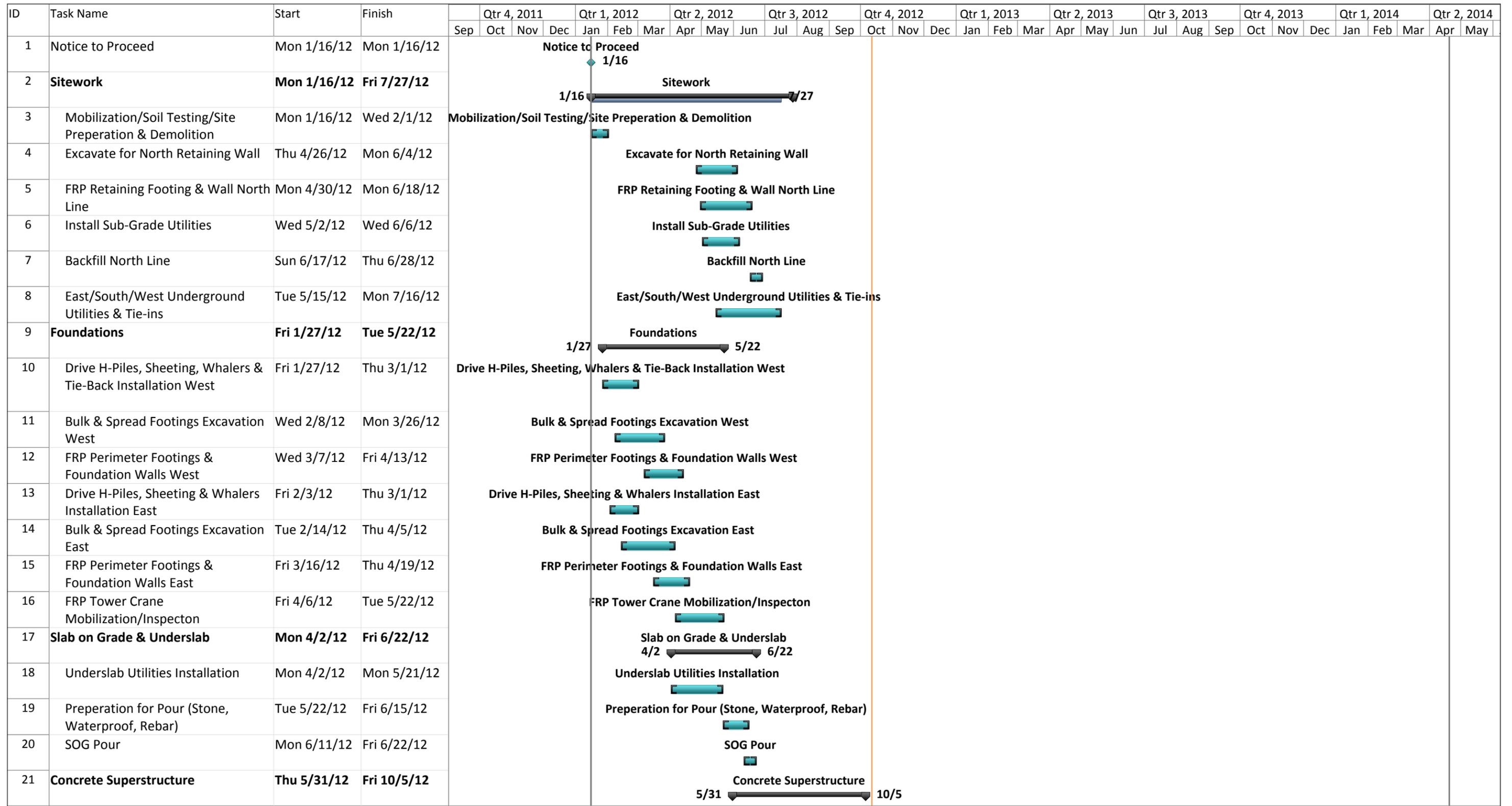
Administrative

The final major issue the construction teams have faced is the inclusion of Women Business Enterprises, Local Business Enterprises and Minority Business Enterprises working on the project. The minimum percentage of these enterprises required by the owner through the request for proposal was 25%. Currently on the project there is a 30% of these enterprises. This has posed as a problem as certain small companies have lacked the experience to perform specific tasks to the standards expected by Jacobs and Turner. Misinterpreting of information has occurred as well as inefficient construction procedures.

As these companies tend to be smaller in size they aren't as well equipped with the technologies or experience using them to collaborate with larger companies who have been involved for years. The inconsistency creates conflicts, which leads to the field during construction.

Another issue regarding these small enterprises is that during the submittal and procurement phase, competent companies must be neglected because of the requirement to meet the 25% WBE/LBE/MBE on site. Companies who have produced bids that were more acceptable for the project weren't awarded the project as smaller businesses took over their positions. This creates a larger total cost of construction for the project.

Appendix A- Detailed Project Schedule



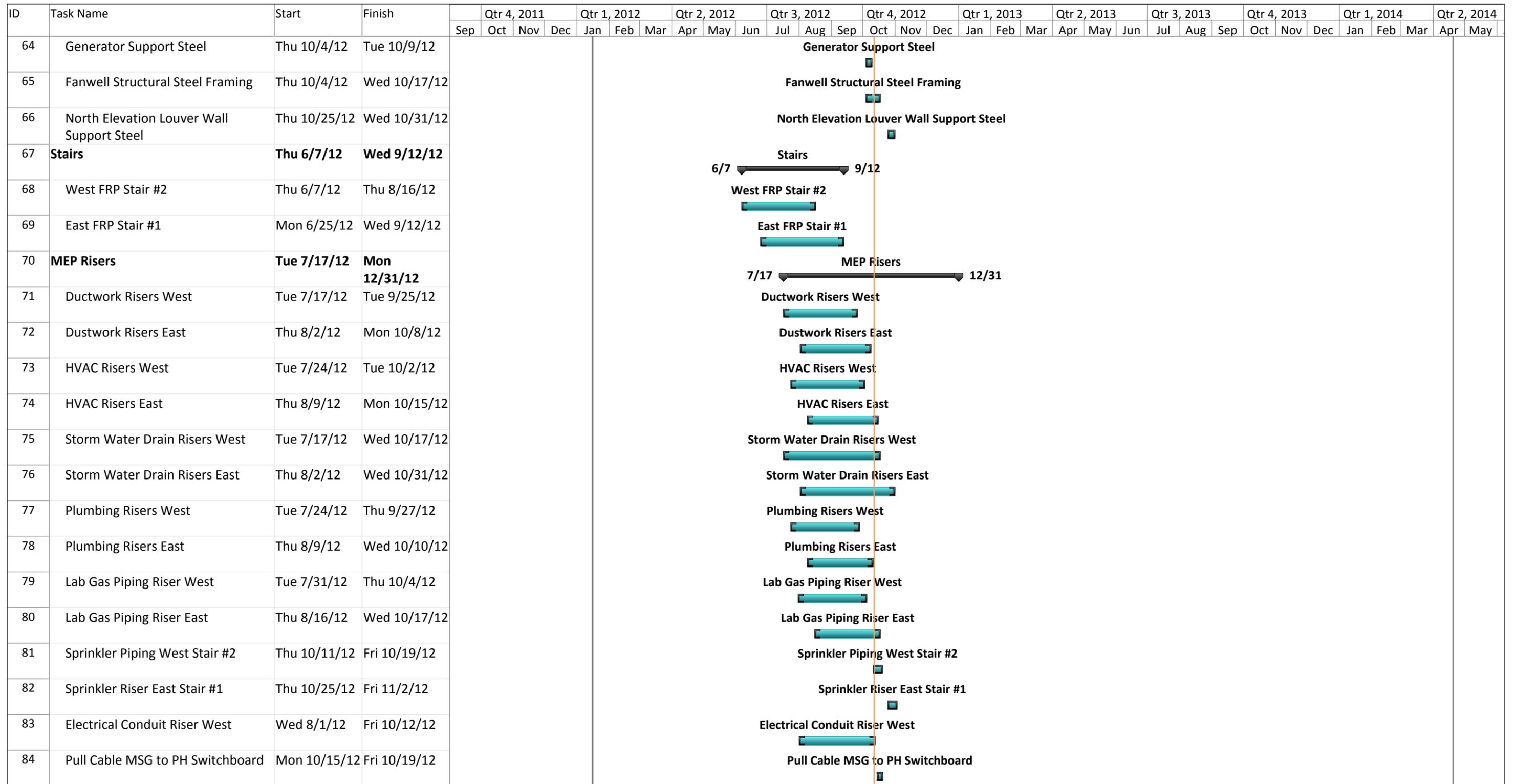
Project: Detailed Project Schedule Date: Fri 10/12/12	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Critical	
	Milestone		External Milestone		Manual Task		Start-only		Critical Split	
	Summary		Inactive Task		Duration-only		Finish-only		Progress	

ID	Task Name	Start	Finish	Qtr 4, 2011				Qtr 1, 2012			Qtr 2, 2012			Qtr 3, 2012			Qtr 4, 2012			Qtr 1, 2013			Qtr 2, 2013			Qtr 3, 2013			Qtr 4, 2013			Qtr 1, 2014			Qtr 2, 2014	
				Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
22	1st Floor Superstructure	Thu 5/31/12	Wed 7/25/12	<p style="text-align: center;">1st Floor Superstructure 5/31 7/25</p> <p style="text-align: center;">Install Steel Reinforcement 1st Floor </p> <p style="text-align: center;">Install MEP Sleeves 1st Floor </p> <p style="text-align: center;">Pour Elevated Slab 1st Floor </p> <p style="text-align: center;">FRP Columns 1st-2nd Floor </p> <p style="text-align: center;">FRP Shear Walls 1st-2nd Floor Column 11-16 </p> <p style="text-align: center;">Cure Slab 1st Floor </p> <p style="text-align: center;">2nd Floor Superstructure 6/14 8/7</p> <p style="text-align: center;">Install Steel Reinforcement 2nd Floor </p> <p style="text-align: center;">Install MEP Sleeves 2nd Floor </p> <p style="text-align: center;">Pour Elevated Slab 2nd Floor </p> <p style="text-align: center;">FRP Columns 2nd-3rd Floor </p> <p style="text-align: center;">FRP Shear Walls 2nd-3rd Floor </p> <p style="text-align: center;">Cure Slab 2nd Floor </p> <p style="text-align: center;">3rd Floor Superstructure 6/28 8/17</p> <p style="text-align: center;">Install Steel Reinforcement 3rd Floor </p> <p style="text-align: center;">Install MEP Sleeves 3rd Floor </p> <p style="text-align: center;">Pour Elevated Slab 3rd Floor </p> <p style="text-align: center;">FRP Columns 3rd-4th Floor </p> <p style="text-align: center;">FRP Shear Wall 3rd-4th Floor </p> <p style="text-align: center;">Cure Slab 3rd Floor </p>																																
23	Install Steel Reinforcement 1st Floor	Thu 5/31/12	Tue 6/26/12																																	
24	Install MEP Sleeves 1st Floor	Thu 6/7/12	Mon 6/25/12																																	
25	Pour Elevated Slab 1st Floor	Mon 6/11/12	Wed 6/27/12																																	
26	FRP Columns 1st-2nd Floor	Tue 6/19/12	Fri 6/29/12																																	
27	FRP Shear Walls 1st-2nd Floor Column 11-16	Thu 6/28/12	Fri 6/29/12																																	
28	Cure Slab 1st Floor	Tue 6/12/12	Wed 7/25/12																																	
29	2nd Floor Superstructure	Thu 6/14/12	Tue 8/7/12																																	
30	Install Steel Reinforcement 2nd Floor	Thu 6/14/12	Mon 7/9/12																																	
31	Install MEP Sleeves 2nd Floor	Tue 6/19/12	Fri 7/6/12																																	
32	Pour Elevated Slab 2nd Floor	Thu 6/21/12	Tue 7/10/12																																	
33	FRP Columns 2nd-3rd Floor	Fri 6/22/12	Thu 7/12/12																																	
34	FRP Shear Walls 2nd-3rd Floor	Fri 6/22/12	Thu 7/12/12																																	
35	Cure Slab 2nd Floor	Thu 6/28/12	Tue 8/7/12																																	
36	3rd Floor Superstructure	Thu 6/28/12	Fri 8/17/12																																	
37	Install Steel Reinforcement 3rd Floor	Thu 6/28/12	Thu 7/19/12																																	
38	Install MEP Sleeves 3rd Floor	Tue 7/3/12	Wed 7/18/12																																	
39	Pour Elevated Slab 3rd Floor	Fri 7/6/12	Fri 7/20/12																																	
40	FRP Columns 3rd-4th Floor	Mon 7/9/12	Tue 7/24/12																																	
41	FRP Shear Wall 3rd-4th Floor	Mon 7/9/12	Tue 7/24/12																																	
42	Cure Slab 3rd Floor	Sat 7/7/12	Fri 8/17/12																																	

Project: Detailed Project Schedule Date: Fri 10/12/12	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Critical	
	Milestone		External Milestone		Manual Task		Start-only		Critical Split	
	Summary		Inactive Task		Duration-only		Finish-only		Progress	

ID	Task Name	Start	Finish	Qtr 4, 2011				Qtr 1, 2012			Qtr 2, 2012			Qtr 3, 2012			Qtr 4, 2012			Qtr 1, 2013			Qtr 2, 2013			Qtr 3, 2013			Qtr 4, 2013			Qtr 1, 2014			Qtr 2, 2014	
				Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
43	4th Floor Superstructure	Thu 7/12/12	Thu 8/30/12	<p style="text-align: center;">4th Floor Superstructure 7/12 8/30</p>																																
44	Install Steel Reinforcement 4th Floor	Thu 7/12/12	Wed 8/1/12	<p style="text-align: center;">Install Steel Reinforcement 4th Floor </p>																																
45	Install MEP Sleeves 4th Floor	Tue 7/17/12	Tue 7/31/12	<p style="text-align: center;">Install MEP Sleeves 4th Floor </p>																																
46	Pour Elevated Slab 4th Floor	Thu 7/19/12	Thu 8/2/12	<p style="text-align: center;">Pour Elevated Slab 4th Floor </p>																																
47	FRP Columns 4th-5th Floor	Fri 7/20/12	Mon 8/6/12	<p style="text-align: center;">FRP Columns 4th-5th Floor </p>																																
48	FRP Shear Wall 4th-5th Floor	Fri 7/20/12	Mon 8/6/12	<p style="text-align: center;">FRP Shear Wall 4th-5th Floor </p>																																
49	Cure Slab 4th Floor	Fri 7/20/12	Thu 8/30/12	<p style="text-align: center;">Cure Slab 4th Floor </p>																																
50	5th Floor Superstructure	Wed 7/25/12	Sat 9/15/12	<p style="text-align: center;">5th Floor Superstructure 7/25 9/15</p>																																
51	Install Steel Reinforcement 5th Floor	Wed 7/25/12	Tue 8/14/12	<p style="text-align: center;">Install Steel Reinforcement 5th Floor </p>																																
52	Install MEP Sleeves 5th Floor	Mon 7/30/12	Mon 8/13/12	<p style="text-align: center;">Install MEP Sleeves 5th Floor </p>																																
53	Pour Elevated Slab 5th Floor	Wed 8/1/12	Wed 8/15/12	<p style="text-align: center;">Pour Elevated Slab 5th Floor </p>																																
54	FRP Columns 5th-PH Floor	Thu 8/2/12	Fri 8/17/12	<p style="text-align: center;">FRP Columns 5th-PH Floor </p>																																
55	FRP Shear Wall 5th-PH Floor	Thu 8/2/12	Fri 8/17/12	<p style="text-align: center;">FRP Shear Wall 5th-PH Floor </p>																																
56	Cure Slab 5th Floor	Thu 8/2/12	Sat 9/15/12	<p style="text-align: center;">Cure Slab 5th Floor </p>																																
57	Penthouse Superstructure	Tue 8/7/12	Fri 10/5/12	<p style="text-align: center;">Penthouse Superstructure 8/7 10/5</p>																																
58	Install Steel Reinforcement & MEP Sleeves PH	Tue 8/7/12	Thu 9/6/12	<p style="text-align: center;">Install Steel Reinforcement & MEP Sleeves PH </p>																																
59	Pour & Cure Elevated Slab PH	Tue 8/14/12	Fri 10/5/12	<p style="text-align: center;">Pour & Cure Elevated Slab PH </p>																																
60	FRP Columns & Shear Wall PH	Wed 8/15/12	Tue 9/11/12	<p style="text-align: center;">FRP Columns & Shear Wall PH </p>																																
61	Structure Complete	Wed 9/19/12	Wed 9/19/12	<p style="text-align: center;">Structure Complete ◆ 9/19</p>																																
62	Structural Steel	Thu 9/20/12	Wed 10/31/12	<p style="text-align: center;">Structural Steel 9/20 10/31</p>																																
63	Cooling Tower Structural Support	Thu 9/20/12	Tue 10/30/12	<p style="text-align: center;">Cooling Tower Structural Support </p>																																

Project: Detailed Project Schedule Date: Fri 10/12/12	Task		Project Summary		Inactive Milestone	◆	Manual Summary Rollup		Deadline	↓
	Split		External Tasks		Inactive Summary		Manual Summary		Critical	
	Milestone	◆	External Milestone	◆	Manual Task		Start-only		Critical Split	
	Summary		Inactive Task		Duration-only		Finish-only		Progress	



Project: Detailed Project Schedule Date: Fri 10/12/12	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Critical	
	Milestone		External Milestone		Manual Task		Start-only		Critical Split	
	Summary		Inactive Task		Duration-only		Finish-only		Progress	

ID	Task Name	Start	Finish	Qtr 4, 2011			Qtr 1, 2012			Qtr 2, 2012			Qtr 3, 2012			Qtr 4, 2012			Qtr 1, 2013			Qtr 2, 2013			Qtr 3, 2013			Qtr 4, 2013			Qtr 1, 2014			Qtr 2, 2014	
				Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
85	Bus Duct Riser West	Mon 10/29/12	Mon 12/10/12																																
86	Tele/Data Conduit Riser West	Mon 8/6/12	Fri 10/12/12																																
87	Tele/Data Conduit Riser East	Wed 8/22/12	Mon 10/29/12																																
88	Fiber Riser West	Mon 10/15/12	Tue 10/30/12																																
89	Fiber Riser East	Tue 10/30/12	Wed 11/14/12																																
90	Copper Cabling Riser West	Mon 10/15/12	Mon 11/26/12																																
91	Copper Cabling Riser East	Tue 10/30/12	Tue 12/11/12																																
92	Security Riser West	Tue 11/27/12	Wed 12/12/12																																
93	Security Risers East	Thu 12/13/12	Mon 12/31/12																																
94	Building Envelope	Fri 7/27/12	Sat 4/13/13																																
95	Exterior Framing 1st Floor	Fri 7/27/12	Fri 8/24/12																																
96	Exterior Framing 2nd Floor	Mon 8/13/12	Thu 9/6/12																																
97	Exterior Framing 3rd Floor	Fri 8/24/12	Wed 9/19/12																																
98	Exterior Framing 4th Floor	Fri 9/7/12	Mon 10/1/12																																
99	Exterior Framing 5th Floor	Wed 9/19/12	Thu 10/11/12																																
100	Exterior Framing Penthouse	Thu 10/11/12	Mon 11/5/12																																
101	West Façade	Fri 8/24/12	Thu 1/3/13																																
102	Precast Band Installation (incl. Waterproofing, Insulation, Misc. Steel)	Fri 8/24/12	Fri 9/7/12																																
103	Brick Veneer Installation (incl. Sheathing, Waterproofing, Wall Ties, Flashing, Insulation, etc.)	Mon 10/8/12	Thu 11/29/12																																
104	Metal Panel Installation (incl. Sheathing & Vapor Barrier)	Tue 10/23/12	Tue 12/18/12																																

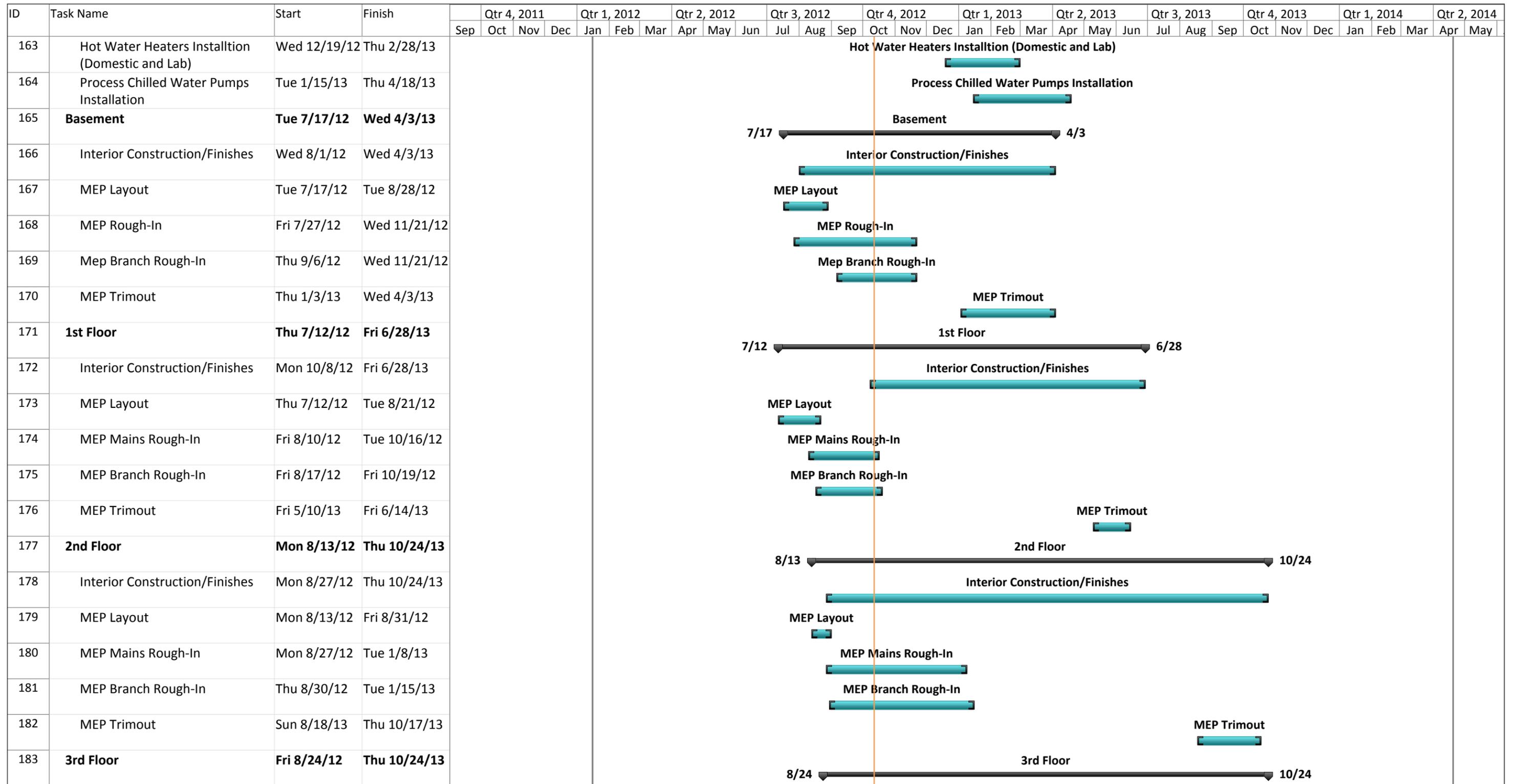
Project: Detailed Project Schedule Date: Fri 10/12/12	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Critical	
	Milestone		External Milestone		Manual Task		Start-only		Critical Split	
	Summary		Inactive Task		Duration-only		Finish-only		Progress	

ID	Task Name	Start	Finish	Qtr 4, 2011				Qtr 1, 2012			Qtr 2, 2012			Qtr 3, 2012			Qtr 4, 2012			Qtr 1, 2013			Qtr 2, 2013			Qtr 3, 2013			Qtr 4, 2013			Qtr 1, 2014			Qtr 2, 2014	
				Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
105	Curtain Wall Framing/Glazing	Wed 12/12/12	Wed 12/26/12	Curtain Wall Framing/Glazing																																
106	Storefront Framing/Glazing	Wed 12/12/12	Thu 1/3/13	Storefront Framing/Glazing																																
107	North Façade	Tue 8/28/12	Wed 1/30/13	North Façade 8/28 → 1/30 Precast Band Installation (incl. Waterproofing, Insulation, Misc. Steel) Brick Veneer Installation (incl. Sheathing, Waterproofing, Wall Ties, Flashing, Insulation, etc.)																																
108	Precast Band Installation (incl. Waterproofing, Insulation, Misc. Steel)	Tue 8/28/12	Mon 10/8/12																																	
109	Brick Veneer Installation (incl. Sheathing, Waterproofing, Wall Ties, Flashing, Insulation, etc.)	Mon 10/29/12	Wed 1/30/13																																	
110	South Façade	Mon 8/27/12	Fri 3/29/13	South Façade 8/27 → 3/29 Precast Band Installation (incl. Waterproofing, Insulation, Misc. Steel) Brick Veneer Installation (incl. Sheathing, Waterproofing, Wall Ties, Flashing, Insulation, etc.)																																
111	Precast Band Installation (incl. Waterproofing, Insulation, Misc. Steel)	Mon 8/27/12	Thu 9/20/12																																	
112	Brick Veneer Installation (incl. Sheathing, Waterproofing, Wall Ties, Flashing, Insulation, etc.)	Thu 10/25/12	Mon 12/3/12																																	
113	Curtain Wall Framing/Glazing	Mon 10/1/12	Wed 2/20/13	Curtain Wall Framing/Glazing																																
114	Metal Panel Installation (incl. Sheathing & Vapor Barrier)	Tue 11/6/12	Thu 2/28/13	Metal Panel Installation (incl. Sheathing & Vapor Barrier)																																
115	Storefront Framing/Glazing	Thu 12/27/12	Fri 3/29/13	Storefront Framing/Glazing																																
116	East Façade	Wed 9/12/12	Fri 3/29/13	East Façade 9/12 → 3/29 Precast Band Installation (incl. Waterproofing, Insulation, Misc. Steel) Brick Veneer Installation (incl. Sheathing, Waterproofing, Wall Ties, Flashing, Insulation, etc.)																																
117	Precast Band Installation (incl. Waterproofing, Insulation, Misc. Steel)	Wed 9/12/12	Fri 10/12/12																																	
118	Brick Veneer Installation (incl. Sheathing, Waterproofing, Wall Ties, Flashing, Insulation, etc.)	Thu 12/6/12	Fri 2/1/13																																	
119	Storefront Framing/Glazing	Mon 12/17/12	Fri 3/29/13	Storefront Framing/Glazing																																
120	Curtain Wall Framing/Glazing	Thu 1/24/13	Wed 3/27/13	Curtain Wall Framing/Glazing																																
121	Roof	Thu 10/4/12	Sat 4/13/13	Roof 10/4 → 4/13																																

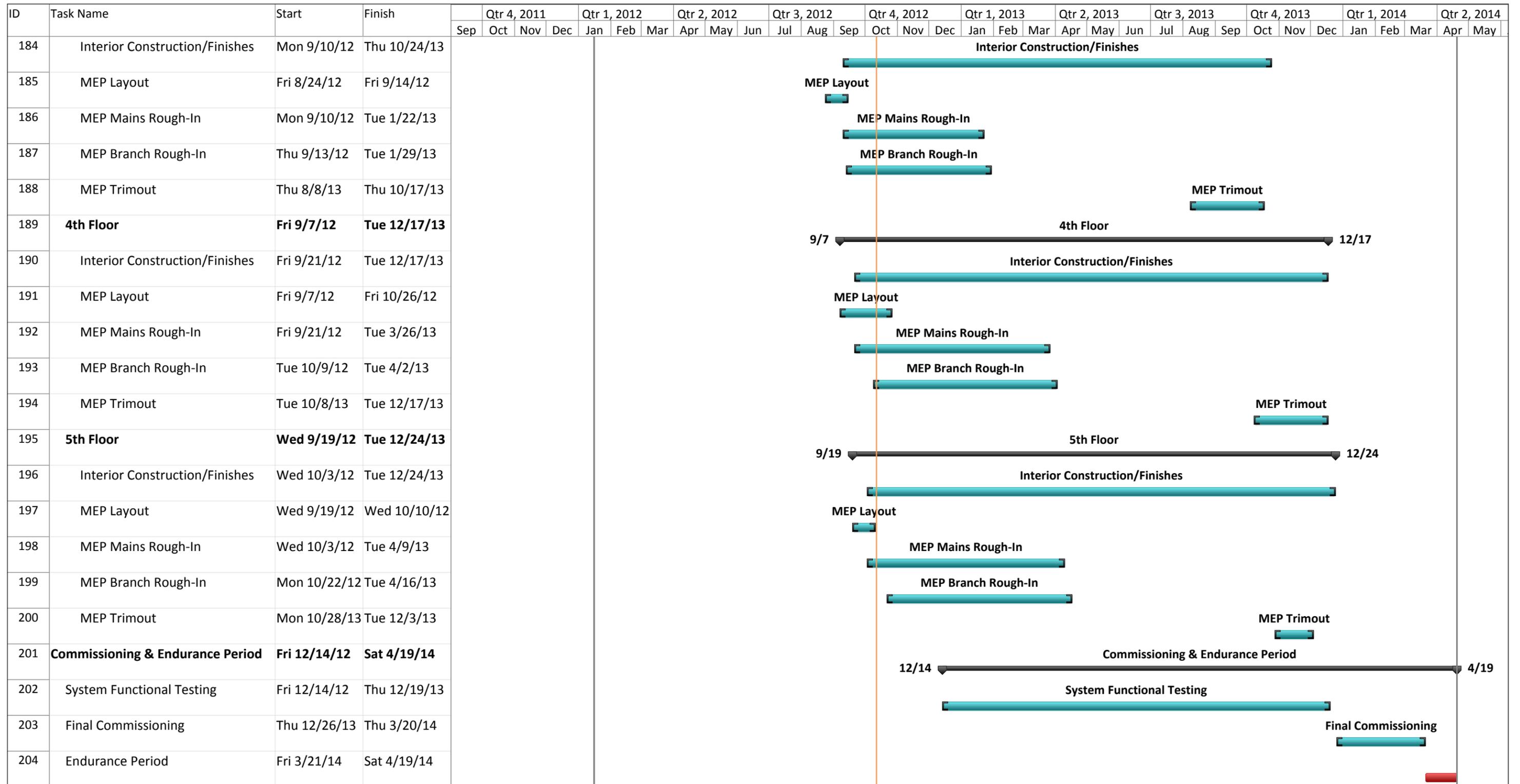
Project: Detailed Project Schedule Date: Fri 10/12/12	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
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	Milestone		External Milestone		Manual Task		Start-only		Critical Split	
	Summary		Inactive Task		Duration-only		Finish-only		Progress	

ID	Task Name	Start	Finish	Qtr 4, 2011				Qtr 1, 2012			Qtr 2, 2012			Qtr 3, 2012			Qtr 4, 2012			Qtr 1, 2013			Qtr 2, 2013			Qtr 3, 2013			Qtr 4, 2013			Qtr 1, 2014			Qtr 2, 2014	
				Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
143	Natural Gas/Fuel Oil Piping Rough-In	Tue 2/12/13	Mon 3/25/13	<p style="text-align: center;">Natural Gas/Fuel Oil Piping Rough-In</p> 																																
144	MEP Trimout	Fri 5/10/13	Mon 8/5/13	<p style="text-align: center;">MEP Trimout</p> 																																
145	Interior Construction and Finishes (Partition Walls, Flooring, Casework, Paint, etc.)	Thu 3/21/13	Tue 9/3/13	<p style="text-align: center;">Interior Construction and Finishes (Partition Walls, Flooring, Casework, Paint, etc.)</p> 																																
146	Cooling Tower Installation	Thu 10/18/12	Tue 4/23/13	<p style="text-align: center;">Cooling Tower Installation</p> 																																
147	Exhaust Fans Installation	Wed 11/7/12	Mon 3/18/13	<p style="text-align: center;">Exhaust Fans Installation</p> 																																
148	Boilers B1-3 Installation	Fri 12/7/12	Mon 2/4/13	<p style="text-align: center;">Boilers B1-3 Installation</p> 																																
149	Hot Water Boilers HB1-4 Installation	Fri 12/14/12	Thu 1/31/13	<p style="text-align: center;">Hot Water Boilers HB1-4 Installation</p> 																																
150	Deaerator & Blow Down Tank Installation	Mon 12/17/12	Wed 2/13/13	<p style="text-align: center;">Deaerator & Blow Down Tank Installation</p> 																																
151	AHU 1-5 Installation	Mon 12/31/12	Fri 3/8/13	<p style="text-align: center;">AHU 1-5 Installation</p> 																																
152	Chiller 1-3 Installation	Tue 1/8/13	Mon 4/8/13	<p style="text-align: center;">Chiller 1-3 Installation</p> 																																
153	Chilled Water Pumps 1-4 Installation	Fri 1/11/13	Mon 3/25/13	<p style="text-align: center;">Chilled Water Pumps 1-4 Installation</p> 																																
154	Chilled Hot Water Exchanger Installation	Mon 1/14/13	Mon 4/1/13	<p style="text-align: center;">Chilled Hot Water Exchanger Installation</p> 																																
155	Condenser Water Pump/Filter Installation	Mon 1/14/13	Wed 4/17/13	<p style="text-align: center;">Condenser Water Pump/Filter Installation</p> 																																
156	Switchboards/ATS DSHP, DMHP, SHP-1 Installation	Tue 3/5/13	Mon 4/15/13	<p style="text-align: center;">Switchboards/ATS DSHP, DMHP, SHP-1 Installation</p> 																																
157	Energize Normal Power	Mon 4/15/13	Mon 4/15/13	<p style="text-align: center;">Energize Normal Power</p> <p style="text-align: center;">◆ 4/15</p>																																
158	Switchgear Installation	Tue 3/5/13	Mon 5/20/13	<p style="text-align: center;">Switchgear Installation</p> 																																
159	ATS DEHP & DLHP Installation	Wed 3/6/13	Tue 5/28/13	<p style="text-align: center;">ATS DEHP & DLHP Installation</p> 																																
160	Backboxes/VFD's/UPS Installation	Tue 3/12/13	Tue 6/18/13	<p style="text-align: center;">Backboxes/VFD's/UPS Installation</p> 																																
161	Generator 1-2 Installation	Thu 11/1/12	Fri 6/28/13	<p style="text-align: center;">Generator 1-2 Installation</p> 																																
162	Hot Water Pumps 1-8 Installation	Tue 12/18/12	Thu 2/14/13	<p style="text-align: center;">Hot Water Pumps 1-8 Installation</p> 																																

Project: Detailed Project Schedule Date: Fri 10/12/12	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
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	Milestone		External Milestone		Manual Task		Start-only		Critical Split	
	Summary		Inactive Task		Duration-only		Finish-only		Progress	



Project: Detailed Project Schedule Date: Fri 10/12/12	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Critical	
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	Summary		Inactive Task		Duration-only		Finish-only		Progress	



Project: Detailed Project Schedule Date: Fri 10/12/12	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
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	Milestone		External Milestone		Manual Task		Start-only		Critical Split	
	Summary		Inactive Task		Duration-only		Finish-only		Progress	

Appendix B – Detailed Structural Systems Estimate

Detailed Structural Systems Estimate

SUBSTRUCTURE

Standard Foundations

Ref. #	Description	Takeoff Quantity	Unit	Labor Cost/Unit	Material Cost/Unit	Equipment Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Cost
<i>Wall Foundation</i>									
03-11-13.45	C.I.P. concrete forms, footing, continuous wall, plywood, 3 use, includes erecting, bracing, stripping and cleaning	1,670	sfca	3.12	2.64			\$5.76	\$9,619.20
03-11-13.45	C.I.P. concrete forms, footing, keyway, tapered wood, 2" x 6", 4 use, includes erecting, bracing, stripping and cleaning	900	lf	0.77	0.34			\$1.11	\$999.00
03-21-10.60	Reinforcing steel, in place, footings, #4 to #7, A615, grade 60	2	ton	937.70	863.56			\$1,801.26	\$3,602.52
03-21-10.60	Reinforcing steel, unload and sort, add to base	2	ton	33.34		8.65		\$41.99	\$83.98
03-21-10.60	Reinforcing steel, crane cost for handling, average	2	ton	36.24		9.40		\$45.64	\$91.28
03-31-05.35	Concrete, ready mix, regular weight, 4000 psi	99	cy		110.64			\$110.64	\$10,953.36
03-31-05.70	Structural concrete, placing, continuous footing, shallow, pumped, includes vibrating	99	cy	18.29		5.70		\$23.99	\$2,375.01
03-39-13.50	Curing, sprayed membrane curing compound	34	csf	6.82	5.00			\$11.82	\$401.88
31-22-16.10	Fine grading, fine grade for slab on grade, hand grading	316	sy	1.69		0.06		\$1.75	\$553.00
<i>Column Foundations</i>									
03-11-13.45	C.I.P. concrete forms, pile cap, square or rectangular, plywood, 3 use, includes erecting, bracing, stripping and cleaning	13,353	sfca	3.95	1.62			\$5.57	\$74,376.21
03-21-10.60	Reinforcing steel, in place, footings, #4 to #7, A615, grade 60	97	ton	937.70	863.56			\$1,801.26	\$174,722.22
03-21-10.60	Reinforcing steel, unload and sort, add to base	97	ton	33.34		8.65		\$41.99	\$4,073.03
03-21-10.60	Reinforcing steel, crane cost for handling, average	97	ton	36.24		9.40		\$45.64	\$4,427.08
03-31-05.35	Concrete, ready mix, regular weight, 4000 psi	2,297	cy		110.64			\$110.64	\$254,140.08
03-31-05.70	Structural concrete, placing, spread footing, pumped, over 5 C.Y., includes vibrating	2,297	cy	85.75		5.70		\$91.45	\$210,060.65
03-39-13.50	Curing, sprayed membrane curing compound	291	csf	6.82	5.00			\$11.82	\$3,439.62
31-22-16.10	Fine grading, fine grade for slab on grade, hand grading	2,094	sy	1.69		0.06		\$1.75	\$3,664.50
<i>Elevator Pit</i>									
03-11-13.45	C.I.P. concrete forms, footing, keyway, tapered wood, 2" x 6", 4 use, includes erecting, bracing, stripping and cleaning	51	lf	0.77	0.34			\$1.11	\$56.61
03-11-13.85	C.I.P. concrete forms, wall, job built, plywood, exterior, 8 to 16' high, 3 use, includes erecting, bracing, stripping and cleaning	507	sfca	6.01	1.47			\$7.48	\$3,792.36
03-15-13.50	Waterstop, PVC, dumbbell type, plain, 3/8" thick x 9" wide	51	lf	2.97	5.36			\$8.33	\$424.83
03-21-10.60	Reinforcing steel, in place, columns, #3 to #7, A615, grade 60	2	ton	1312.77	909.01			\$2,221.78	\$4,443.56
03-21-10.60	Reinforcing steel, unload and sort, add to base	2	ton	33.34		8.65		\$41.99	\$83.98
03-21-10.60	Reinforcing steel, crane cost for handling, average	2	ton	36.24		9.40		\$45.64	\$91.28
03-31-05.35	Concrete, ready mix, regular weight, 4000 psi	19	cy		110.64			\$110.64	\$2,102.16
03-31-05.70	Structural concrete, placing, foundation mat, with crane and bucket, over 20 C.Y., includes vibrating	9	cy	32.39		4.36		\$36.75	\$330.75
03-31-05.70	Structural concrete, placing, walls, with crane and bucket, 8" thick, includes vibrating	10	cy	38.87		16.34		\$55.21	\$552.10
03-35-29.60	Finishing: break ties & patch voids (walls, cols or beams)	507	sf	0.69	0.03			\$0.72	\$365.04
03-39-13.50	Curing, sprayed membrane curing compound	6	csf	6.82	5.00			\$11.82	\$70.92
07-13-53.10	Elastomeric Waterproofing, polyethylene and rubberized asphalt sheets, 1/8" thick	306	sf	1.30	0.56			\$1.86	\$569.16
07-21-13.10	Extruded polystyrene insulation, rigid, for walls, 25 PSI compressive strength, 2" thick, R10	306	sf	0.56	1.07			\$1.63	\$498.78
Total Standard Foundations Cost									\$770,964.15

Special Foundations

Ref. #	Description	Takeoff Quantity	Unit	Labor Cost/Unit	Material Cost/Unit	Equipment Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Cost
<i>Elevator Pit</i>									
03-11-13.25	C.I.P. concrete forms, column, square, plywood, includes erecting, bracing, stripping and cleaning	5,556	sfca	9.15	2.94			\$12.09	\$67,172.04

03-15-05.12	Chamfer strip, polyvinyl chloride, 3/4" wide with leg	2,662	lf	0.74	0.53			\$1.27	\$3,380.74
03-21-10.60	Reinforcing steel, in place, columns, #3 to #7, A615, grade 60	2	ton	1312.77	909.01			\$2,221.78	\$4,443.56
03-21-10.60	Reinforcing steel, in place, columns, #8 to #18, A615, grade 60	30	ton	856.16	909.01			\$1,765.17	\$52,955.10
03-21-10.60	Reinforcing steel, unload and sort, add to base	32	ton	33.34		8.65		\$41.99	\$1,343.68
03-21-10.60	Reinforcing steel, crane cost for handling, average	32	ton	36.24		9.40		\$45.64	\$1,460.48
03-31-05.35	Concrete, ready mix, regular weight, 4000 psi	117	cy		110.64			\$110.64	\$12,944.88
03-31-05.70	Structural concrete, placing, column, square or round, with crane and bucket, 18" thick, includes vibrating	117	cy	56.53		23.76		\$80.29	\$9,393.93
Total Special Foundations Cost									\$153,094.41
Slab on Grade									
Ref. #	Description	Takeoff Quantity	Unit	Labor Cost/Unit	Material Cost/Unit	Equipment Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Cost
<i>Standard Slab on Grade</i>									
03-11-13.65	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	500	sfca	3.58	0.66			\$4.24	\$2,120.00
03-15-05.25	Premolded, bituminous fiber, 1/2" x 5"	1,500	lf	1.29	1.13			\$2.42	\$3,630.00
03-15-05.25	Expansion joint, cork with resin binder, 1/2" x 5"	565	lf	1.21	4.22			\$5.43	\$3,067.95
03-15-05.25	Sawcut control joints, slab on grade	2,256	lf	0.44	0.55	0.26		\$1.25	\$2,820.00
03-21-10.60	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60	3	ton	856.16	863.56			\$1,719.72	\$5,159.16
03-21-10.60	Reinforcing steel, unload and sort, add to base	3	ton	33.34		8.65		\$41.99	\$125.97
03-21-10.60	Reinforcing steel, crane cost for handling, average	3	ton	36.24		9.40		\$45.64	\$136.92
03-22-05.50	Welded wire fabric, sheets, 6 x 6 - W2.1 x W2.1 (8 x 8) 30 lb. per C.S.F., A185	356	csf	31.76	25.22			\$56.98	\$20,284.88
03-30-53.40	Structural concrete, in place, slab on grade, 6" thick, includes finishing only	356	sf	1.16	3.34	0.01		\$4.51	\$1,605.56
03-30-53.40	Structural concrete, in place, slab on grade, 5" thick, includes finishing only	27,024	sf	1.01	2.79	0.01		\$3.81	\$102,961.44
03-35-29.35	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)	2,256	lf	1.37	0.18			\$1.55	\$3,496.80
03-39-13.50	Curing, sprayed membrane curing compound	310	csf	6.82	5.00			\$11.82	\$3,664.20
07-26-10.10	Building Paper, polyethylene vapor barrier, standard	341	sq	12.69	12.23			\$24.92	\$8,497.72
07-92-10.10	Caulking & Sealants, polysulfide compounds, in place, 1 or 2 component, 68 LF per gal, 3/4" x 3/8"	2,065	lf	3.11	0.82			\$3.93	\$8,115.45
31-22-16.10	Fine grading, fine grade for slab on grade, machine	3,441	sy	0.84		0.57		\$1.41	\$4,851.81
32-11-23.23	Base course drainage layers, aggregate base course for roadways and large paved areas, crushed stone base, compacted, crushed 1-1/2" stone base, 4" deep	3,441	sy	0.64	7.69	0.64		\$8.97	\$30,865.77
<i>Edge Thickening - Slab on Grade</i>									
03-21-10.60	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60	3	ton	856.16	863.56			\$1,719.72	\$5,159.16
03-21-10.60	Reinforcing steel, unload and sort, add to base	3	ton	33.34		8.65		\$41.99	\$125.97
03-21-10.60	Reinforcing steel, crane cost for handling, average	3	ton	36.24		9.40		\$45.64	\$136.92
03-31-05.35	Concrete, ready mix, regular weight, 4000 psi	21	cy		110.64			\$110.64	\$2,323.44
03-31-05.70	Structural concrete, placing, Edge Thickening - slab on grade	21	cy	86.37		30.63		\$117.00	\$2,457.00
31-23-16.16	Structural excavation for minor structures, bank measure, normal soil, to 2' deep, hand pits	21	bcy	81.31				\$81.31	\$1,707.51
<i>Framed Slab on Grade</i>									
03-21-10.60	Reinforcing steel, in place, elevated slabs, #4 to #7, A615, grade 60	9	ton	679.02	965.82			\$1,644.84	\$14,803.56
03-21-10.60	Reinforcing steel, unload and sort, add to base	9	ton	33.34		8.65		\$41.99	\$377.91
03-21-10.60	Reinforcing steel, crane cost for handling, average	9	ton	36.24		9.40		\$45.64	\$410.76
03-30-53.40	Structural concrete, in place, slab on grade, 8" thick, includes finishing only	2,123	sf	1.56	4.46	0.01		\$6.03	\$12,801.69
03-39-13.50	Curing, sprayed membrane curing compound	21	csf	6.82	5.00			\$11.82	\$248.22
07-26-10.10	Building Paper, polyethylene vapor barrier, standard	23	sq	12.69	12.23			\$24.92	\$573.16
31-22-16.10	Fine grading, fine grade for slab on grade, machine	236	sy	0.84		0.57		\$1.41	\$332.76

32-11-23.23	Base course drainage layers, aggregate base course for roadways and large paved areas, crushed stone base, compacted, crushed 1-1/2" stone base, 4" deep	236	sy	0.64	7.69	0.64			\$8.97	\$2,116.92
Total Slab on Grade Cost									\$244,978.61	
Basement Construction										
Ref. #	Description	Takeoff Quantity	Unit	Labor Cost/Unit	Material Cost/Unit	Equipment Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Cost	
<i>Basement Wall Construction</i>										
03-11-13.85	C.I.P. concrete forms, wall, bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	1,062	lf	8.46	4.41			\$12.87	\$13,667.94	
03-11-13.85	Keyway, top of wall, 4 use, tapered wood, 2" x 4"	964	lf	2.41	0.49			\$2.90	\$2,795.60	
03-11-13.85	C.I.P. concrete forms, wall, job built, plywood, exterior, 8 to 16' high, 3 use, includes erecting, bracing, stripping and cleaning	44,243	sfca	6.01	1.47			\$7.48	\$330,937.64	
03-15-13.50	Waterstop, PVC, dumbbell type, center bulb, 3/8" thick x 9" wide	3,298	lf	2.97	9.75			\$12.72	\$41,950.56	
03-15-13.50	Waterstop, fittings, rubber, flat, dumbbell or center bulb, flat cross, 3/8" thick x 9" wide	33	ea	12.86	66.05			\$78.91	\$2,604.03	
03-15-13.50	Waterstop, fittings, rubber, flat, dumbbell or center bulb, flat tee, 3/8" thick x 9" wide	92	ea	12.86	61.65			\$74.51	\$6,854.92	
03-21-10.60	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60	83	ton	701.17	863.56			\$1,564.73	\$129,872.59	
03-21-10.60	Reinforcing steel, unload and sort, add to base	83	ton	33.34			8.65	\$41.99	\$3,485.17	
03-21-10.60	Reinforcing steel, crane cost for handling, average	83	ton	36.24			9.40	\$45.64	\$3,788.12	
03-31-05.35	Concrete, ready mix, regular weight, 4000 psi	1,147	cy	24.95			7.78	\$32.73	\$37,541.31	
03-31-05.70	Structural concrete, placing, walls, pumped, 14" thick, includes vibrating	1,147	cy		110.64			\$110.64	\$126,904.08	
03-35-29.60	Finishing, break ties & patch voids, underside elevated decks	44,243	sf	0.69	0.03			\$0.72	\$31,854.96	
03-39-13.50	Curing, sprayed membrane curing compound	442	csf	6.82	5.00			\$11.82	\$5,224.44	
07-13-53.10	Elastomeric Waterproofing, neoprene sheets, plain, nylon reinforced, 120 mils thick	21,016	sf	1.43	3.62			\$5.05	\$106,130.80	
07-13-53.10	Elastomeric Waterproofing, polyethylene and rubberized asphalt sheets, asphaltic hardboard protection board, 1/4" thick	21,016	sf	1.59	0.58			\$2.17	\$45,604.72	
Total Basement Wall Construction Cost									\$889,216.88	
SUPERSTRUCTURE										
Building Floors Structural Construction										
Ref. #	Description	Takeoff Quantity	Unit	Labor Cost/Unit	Material Cost/Unit	Equipment Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Cost	
<i>Concrete Columns</i>										
03-11-13.25	C.I.P. concrete forms, column, oval, includes erecting, bracing, stripping and cleaning	78	sf	22.88	24.50			\$47.38	\$3,695.64	
03-11-13.25	C.I.P. concrete forms, column, square, plywood, 4 use, includes erecting, bracing, stripping and cleaning	100,286	sfca	6.23	0.96			\$7.19	\$721,056.34	
03-15-05.12	Chamfer strip, polyvinyl chloride, 3/4" wide with leg	46,899	lf	0.74	0.53			\$1.27	\$59,561.73	
03-21-10.60	Reinforcing steel, in place, columns, #3 to #7, A615, grade 60	26	ton	1312.77	909.01			\$2,221.78	\$57,766.28	
03-21-10.60	Reinforcing steel, in place, columns, #8 to #18, A615, grade 60	212	ton	856.16	909.01			\$1,765.17	\$374,216.04	
03-21-10.60	Reinforcing steel, unload and sort, add to base	238	ton	33.34			8.65	\$41.99	\$9,993.62	
03-21-10.60	Reinforcing steel, crane cost for handling, average	238	ton	36.24			9.40	\$45.64	\$10,862.32	
03-31-05.35	Concrete, ready mix, regular weight, 4000 psi	2,123	cy		110.64			\$110.64	\$234,888.72	
03-31-05.70	Structural concrete, placing, column, square or round, pumped, 18" thick, includes vibrating	2,123	cy	30.49			9.51	\$40.00	\$84,920.00	
<i>Upper Floor Construction</i>										
03-11-13.35	C.I.P. concrete forms, elevated slab, flat slab with drop panels, 15'20' high ceilings, 4 use, includes shoring, erecting, bracing, stripping and cleaning	198,428	sf	4.70	5.41			\$10.11	\$2,006,107.08	
03-11-13.35	C.I.P. concrete forms, elevated slab, edge forms, to 12" high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	21,217	lf	3.43	0.39			\$3.82	\$81,048.94	
03-21-10.60	Reinforcing steel, in place, elevated slabs, #4 to #7, A615, grade 60	629	ton	679.02	965.82			\$1,644.84	\$1,034,604.36	
03-21-10.60	Reinforcing steel, unload and sort, add to base	629	ton	33.34			8.65	\$41.99	\$26,411.71	
03-21-10.60	Reinforcing steel, crane cost for handling, average	629	ton	36.24			9.40	\$45.64	\$28,707.56	

03-31-05.35	Concrete, ready mix, regular weight, 4000 psi	6,916	cy		110.64			\$110.64	\$765,186.24
03-31-05.70	Placing conc, curbs/pads, elev slab, pumped	6,325	cy	19.60		6.11		\$25.71	\$162,615.75
03-31-05.70	Placing conc, flat slab drop heads, pump or bucket	591	cy	32.73		13.76		\$46.49	\$27,475.59
03-39-13.50	Curing, sprayed membrane curing compound	2,212	cy	6.82	5.00			\$11.82	\$26,145.84
One Way Slabs									
03-11-13.35	C.I.P. concrete forms, elevated slab, flat plate, plywood, to 15' high, 2 use, includes shoring, erecting, bracing, stripping and cleaning	24,030	sf	4.34	3.02			\$7.36	\$176,860.80
03-11-13.35	C.I.P. concrete forms, elevated slab, edge forms, to 12" high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	2,756	lf	3.43	0.39			\$3.82	\$10,527.92
03-21-10.60	Reinforcing steel, in place, elevated slabs, #4 to #7, A615, grade 60	57	ton	679.02	965.82			\$1,644.84	\$93,755.88
03-21-10.60	Reinforcing steel, unload and sort, add to base	57	ton	33.34		8.65		\$41.99	\$2,393.43
03-21-10.60	Reinforcing steel, crane cost for handling, average	57	ton	36.24		9.40		\$45.64	\$2,601.48
03-31-05.35	Concrete, ready mix, regular weight, 4000 psi	708	cy		110.64			\$110.64	\$78,333.12
03-31-05.70	Placing conc, curbs/pads, elev slab, pumped	708	cy	19.60		6.11		\$25.71	\$18,202.68
03-39-13.50	Curing, sprayed membrane curing compound	240	csf	6.82	5.00			\$11.82	\$2,836.80
Upper Floor Construction - Concrete Beams									
03-11-13.20	C.I.P. concrete forms, beams, bottom only, plywood, includes shoring, erecting, bracing, stripping and cleaning	19,757	stca	7.78	1.69			\$9.47	\$187,098.79
03-11-13.20	C.I.P. concrete forms, beams, sides only, vertical, plywood, includes shoring, erecting, bracing, stripping and cleaning	34,377	sfca	5.07	2.79			\$7.86	\$270,203.22
03-21-10.60	Reinforcing steel, in place, beams and girders, #3 to #7, A615, grade 60	201	ton	1230.72	909.01			\$2,139.73	\$430,085.73
03-21-10.60	Reinforcing steel, unload and sort, add to base	201	ton	33.34		8.65		\$41.99	\$8,439.99
03-21-10.60	Reinforcing steel, crane cost for handling, average	201	ton	36.24		9.40		\$45.64	\$9,173.64
03-31-05.35	Concrete, ready mix, regular weight, 4000 psi	1,028	ton		110.64			\$110.64	\$113,737.92
03-31-05.70	Structural concrete, placing, beam, small, elevated, pumped, includes vibrating	100	cy	45.73		14.26		\$59.99	\$5,999.00
03-31-05.70	Structural concrete, placing, beam, large, elevated, pumped, includes vibrating	928	cy	30.49		9.51		\$40.00	\$37,120.00
03-39-13.50	Curing, sprayed membrane curing compound	541	csf	6.82	5.00			\$11.82	\$6,394.62
Concrete Shear Wall									
03-11-13.85	Keyway, top of wall, 4 use, tapered wood, 2" x 4"	1,196	lf	2.41	0.49			\$2.90	\$3,468.40
03-11-13.85	C.I.P. concrete forms, wall, job built, plywood, exterior, 8 to 16' high, 3 use, includes erecting, bracing, stripping and cleaning	47,264	sfca	6.01	1.47			\$7.48	\$353,534.72
03-15-05.12	Chamfer strip, polyvinyl chloride, 3/4" wide with leg	2,800	lf	0.74	0.53			\$1.27	\$3,556.00
03-21-10.60	Reinforcing steel, in place, footings, #4 to #7, A615, grade 60	61	ton	937.70	863.56			\$1,801.26	\$109,876.86
03-21-10.60	Reinforcing steel, unload and sort, add to base	61	ton	33.34		8.65		\$41.99	\$2,561.39
03-21-10.60	Reinforcing steel, crane cost for handling, average	61	ton	36.24		9.40		\$45.64	\$2,784.04
03-31-05.35	Concrete, ready mix, regular weight, 4000 psi	875	cy		110.64			\$110.64	\$96,810.00
03-31-05.70	Structural concrete, placing, walls, pumped, 14" thick, includes vibrating	875	cy	24.95		7.78		\$32.73	\$28,638.75
03-35-29.60	Finishing: break ties & patch voids (walls, cols or beams)	47,264	sf	0.69	0.03			\$0.72	\$34,030.08
03-39-13.50	Curing, sprayed membrane curing compound	473	csf	6.82	5.00			\$11.82	\$5,590.86
Structural Support for Cooling Tower									
03-15-05.02	Anchor bolts, J-type, 1-1/2" diameter x 18" long, includes nut and washer	48	ea	17.54	22.77			\$40.31	\$1,934.88
03-30-53.40	Structural concrete, in place, Curb wall, 12" thick x 24' high, includes forms, reinforcing steel, and finishing	12	cy	404.05	294.00	62.12		\$760.17	\$9,122.04
03-62-13.50	Grout, non-shrink, for column and machine bases, non-metallic, 2" deep	24	sf	14.89	17.42			\$32.31	\$775.44
05-12-23.75	Chiller Support Framing Galvanised Steel	13	ton	1110.16	2695.00	503.64		\$4,308.80	\$56,014.40
Mechanical Support Framing									
05-12-23.17	Galvanized Structural tube Framing, cap & base plate, bolts	163	ton	2490.01	3430.00	244.69		\$6,164.70	\$1,004,846.10
05-53-21.50	Floor grating, steel, painted, 1-3/4" x 3/16" bearing bars @ 1-3/16" O.C., cross bars @ 2" O.C., over 300 S.F., field fabricated from panels	793	sf	10.35	39.20	3.00		\$52.55	\$41,672.15
Training Room Risers									
03-11-13.65	C.I.P. concrete forms	690	sfca	9.15	2.05			\$11.20	\$7,728.00

03-31-05.70	Structural concrete, placing	25	cy	42.22		13.16		\$55.38	\$1,384.50
03-31-05.70	Structural concrete, placing, by walking cart, add to placing costs	25	cy	11.47		1.94		\$13.41	\$335.25
03-35-29.30	Concrete finishing, hand trowel finish	657	sf	1.23				\$1.23	\$808.11
04-22-10.34	CMU Riser Walls	690	sf	6.00	5.20			\$11.20	\$7,728.00
05-31-13.50	Metal decking, steel, non-cellular, composite, galvanized, 2" D, 22 ga	657	sf	2.58	7.08	0.14		\$9.80	\$6,438.60
Total Building Floors Structural Construction Cost									\$8,948,667.35

Total Standard Foundations Cost	\$770,964.15
Total Special Foundations Cost	\$153,094.41
Total Slab on Grade Cost	\$244,978.61
Total Basement Wall Construction Cost	\$889,216.88
Total Building Floors Structural Construction Cost	\$8,948,667.35
Total Detailed Structural Cost Estimate	\$11,006,921.40

Appendix C – General Conditions Estimate

General Conditions Cost Estimate

General Requirements									
Administration									
Ref. #	Description	Takeoff Quantity	Unit	Labor Cost/Unit	Material Cost/Unit	Equipment Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Cost
<i>Project Management</i>									
01-31-13.20	Field Personnel, clerk	122	wk	1,500.00				\$1,500.00	\$183,000.00
01-31-13.20	Field Personnel, project engineer	122	wk	2,200.00				\$2,200.00	\$268,400.00
01-31-13.20	Field Personnel, project engineer	122	wk	2,000.00				\$2,000.00	\$244,000.00
01-31-13.20	Field Personnel, project engineer QA/QC & LEED	122	wk	1,875.00				\$1,875.00	\$228,750.00
01-31-13.20	Field Personnel, project executive	31	wk	4,375.01				\$4,375.01	\$135,625.31
01-31-13.20	Field Personnel, project manager	104	wk	4,000.00				\$4,000.00	\$416,000.00
01-31-13.20	Field Personnel, MEP coordinator	104	wk	2,749.99				\$2,749.99	\$285,998.96
01-31-13.20	Field Personnel, assistant superintendent	82	wk	3,000.00				\$3,000.00	\$246,000.00
01-31-13.20	Field Personnel, general superintendent	122	wk	3,750.00				\$3,750.00	\$457,500.00
01-31-13.20	Field Personnel, safety manger	61	wk	2,000.00				\$2,000.00	\$122,000.00
<i>Project Scheduling</i>									
01-32-12.50	Initial Schedule	1	day	9,600.00			2,000.00	\$11,600.00	\$11,600.00
01-32-12.50	Scheduler	26	mo				2,000.00	\$2,000.00	\$52,000.00
Total Administration Cost								\$2,650,874.27	
Quality Requirements									
Ref. #	Description	Takeoff Quantity	Unit	Labor Cost/Unit	Material Cost/Unit	Equipment Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Cost
<i>Quality Assurance and Control</i>									
01-32-33.50	Monthly Construction Photographs	28	mo		196.00			\$196.00	\$5,488.00
01-71-23.13	Surveying, site and building layout, 3 person crew	10	day	1422.13			75.79	\$1,497.92	\$14,979.20
<i>Testing and Inspections</i>									
01-45-23.50	Field Testing, for building	1	ls		53900.00			\$53,900.00	\$53,900.00
Total Quality Requirements Cost								\$74,367.20	
Temporary Facilities									
Ref. #	Description	Takeoff Quantity	Unit	Labor Cost/Unit	Material Cost/Unit	Equipment Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Cost
<i>Temporary Utilities</i>									
01-51-13.50	Generator during Sitework	4	mo				625.00	\$625.00	\$2,500.00
01-51-13.80	Temporary Heat	8	mo	1374.80	637.00			\$2,011.80	\$16,094.40
01-51-13.80	Temporary Power and Lighting	24	mo	753.43	735.00			\$1,488.43	\$35,722.32
01-51-13.80	Temporary Utilities, temporary construction water bill per month average	28	mo				250.00	\$250.00	\$7,000.00
<i>Construction Utilities</i>									
01-52-13.20	Office Trailer, furnished, rent per month, 32' x 8'	56	ea		318.17			\$318.17	\$17,817.52
01-52-13.20	Storage Boxes, rent per month, 20' x 8'	28	ea		108.22			\$108.22	\$3,030.16
01-52-13.40	Field Office Expense, office equipment rental, average	56	mo		169.24			\$169.24	\$9,477.44
01-52-13.40	Field Office Expense, office supplies, average	56	mo		107.19			\$107.19	\$6,002.64
01-52-13.40	Field Office Expense, telephone bill, average bill/month	56	mo		236.94			\$236.94	\$13,268.64
01-52-13.40	Field Office Expense, field office lights & HVAC	56	mo		124.11			\$124.11	\$6,950.16
<i>Construction Aids</i>									
01-54-09.60	Personal Protective Equipment	40	ea		247.09			\$247.09	\$9,883.60
01-54-09.60	Mobilize & Demobilize Tower Crane	2	ea	11520.56		13502.50		\$11,520.56	\$23,041.12
01-54-09.60	Crane crew, tower crane, 130' high, 106' jib, 6200 lb. capacity, monthly use	8	mo	11064.36		25935.64		\$37,000.00	\$296,000.00
01-54-09.60	Crane Base	1	ls				15000.00	\$15,000.00	\$15,000.00
01-54-23.70	Scaffolding, steel tubular, regular, bldg. ext., wall face, 6 to 12 stories	364	csf	222.62	24.50			\$247.12	\$89,951.68
01-54-33.40	Rent portable toilet chemical - 5ea	140	mo			501.27		\$501.27	\$70,177.80
01-54-33.40	Staff Car	28	mo			600.00		\$600.00	\$16,800.00
01-54-33.40	Staff Pickup	54	mo			900.00		\$900.00	\$48,600.00
01-54-33.40	Fuel & Insurance	28	mo			1200.00		\$1,200.00	\$33,600.00
01-54-33.60	Rent hoist & tower personnel, electric, 4000 lb., 100' at 300 FPM	6	mo			27020.40		\$27,020.40	\$162,122.40
<i>Temporary Site Access and Parking</i>									
01-55-23.50	Temporary, roads, gravel fill, 8" gravel depth	1,125	sy	3.61	10.66		0.51	\$14.78	\$16,627.50
<i>Temporary Barriers and Enclosures</i>									
01-56-13.90	Winter Protection, tarpaulins	6	mo	3540.33	1470.00			\$5,010.33	\$30,061.98
01-56-13.90	Winter Protection, snow removal	4	mo	7080.65	490.00	800.00		\$8,370.65	\$33,482.60
01-56-23.10	Barricades	1	ls	8850.81	6370.00			\$15,220.81	\$15,220.81
01-56-23.10	Safety Rail & Fall Protection	1	ls	22262.21	12483.04			\$34,745.25	\$34,745.25
01-56-29.50	Protect Interior Finishes	200,000	sf	0.20	0.05			\$0.25	\$50,000.00
01-56-29.50	Protected Pedestrian Walkways	1	ls	13357.33	6509.82			\$19,867.15	\$19,867.15
01-56-32.50	Watchman, security services, uniformed person, monthly basis	4,850	hr			48.00		\$48.00	\$232,800.00
<i>Project Identification</i>									
01-58-12.50	Project Signage	1	ea		2940.00			\$2,940.00	\$2,940.00
Total Temporary Facilities Cost								\$1,318,785.17	
Project Closeout									
Ref. #	Description	Takeoff Quantity	Unit	Labor Cost/Unit	Material Cost/Unit	Equipment Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Cost
<i>Cleaning</i>									
01-74-13.20	Cleaning Up, cleanup of floor area, continuous, per day, during construction	28	mo	9483.22	117.60		2.57	\$9,603.39	\$268,894.92
01-74-13.20	Cleaning Up, streetsweeping	12	mo				2000.00	\$2,000.00	\$24,000.00

01-74-13.20	Cleaning Up, cleanup of floor area, final by GC at end of job	231	msf	69.87	3.06		4.29	\$77.22	\$17,837.82
01-74-13.20	Dumpsters, per pull	112	ea		490.00			\$490.00	\$54,880.00
01-74-13.20	Cleaning Up, glazing, final clean	1	ls	5356.73	665.68	2464.00		\$8,486.41	\$8,486.41
01-74-13.20	Site staging & restoration	1	ls				60000.00	\$60,000.00	\$60,000.00
Total Project Closeout Cost									\$434,099.15
Permits, Insurance and Bonds									
Ref. #	Description	Takeoff Quantity	Unit	Labor Cost/Unit	Material Cost/Unit	Equipment Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Cost
<i>Permits, Insurance and Bonds</i>									
01-41-26.00	General Liability Insurance	1	ls				1508497.00	\$1,508,497.00	\$1,508,497.00
01-41-26.00	Builder Risk Insurance	1	ls				95950.00	\$95,950.00	\$95,950.00
01-41-26.00	Performance/Payment Bond	1	ls				1021709.00	\$1,021,709.00	\$1,021,709.00
Total Permits, Insurance and Bonds Cost									\$2,626,156.00

Total Administration Cost	\$2,650,874.27
Total Quality Requirements Cost	\$74,367.20
Total Temporary Facilities Cost	\$1,318,785.17
Total Project Closeout Cost	\$434,099.15
Total Permits, Insurance and Bonds Cost	\$2,625,156.00
General Conditions Cost Total	\$7,103,281.79

Appendix D – Building Information Modeling

BIM GOALS/Objectives

PRIORITY	Goal Description	Potential BIM Uses
(HIGH/MED/LOW)	Value added objectives	
HIGH	Increase Field Productivity	3D Coordination
HIGH	Eliminate Field Conflicts	3D Coordination
MED	Efficiently Utilize the Site for Layout Purposes	Site Utilization Planning
MED	Prefabrication to Increase Construction Efficiency	Digital Fabrication
LOW	Convey Design to Owner for Visualization Purposes	Design Authoring

BIM Uses Checklist

X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
	PROGRAMMING	X	DESIGN AUTHORING	X	SITE UTILIZATION PLANNING		BUILDING MAINTENANCE SCHEDULING
	SITE ANALYSIS		DESIGN REVIEWS		CONSTRUCTION SYSTEM DESIGN		BUILDING SYSTEM ANALYSIS
			3D COORDINATION	X	3D COORDINATION		ASSET MANAGEMENT
			STRUCTURAL ANALYSIS	X	DIGITAL FABRICATION		SPACE MANAGEMENT / TRACKING
			LIGHTING ANALYSIS		3D CONTROL AND PLANNING		DISASTER PLANNING
			ENERGY ANALYSIS	X	RECORD MODELING		RECORD MODELING
			MECHANICAL ANALYSIS				
			OTHER ENG. ANALYSIS				
			SUSTAINABILITY (LEED) EVALUATION				
			CODE VALIDATION				
	PHASE PLANNING		PHASE PLANNING		PHASE PLANNING		PHASE PLANNING
	(4D MODELING)		(4D MODELING)		(4D MODELING)		(4D MODELING)
	COST ESTIMATION		COST ESTIMATION		COST ESTIMATION		COST ESTIMATION
	EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING

Project Title

BIM USES

INFO EXCHANGE

