2013

INTRAMURAL BUILDING ADDITION AND RENOVATION-PHASE I

Gonzalo Lay
The Pennsylvania State University
Department of Architectural Engineering
Construction Option

AE 481 W – FALL 2013
Faculty Advisor: Ray Sowers
TECHNICAL REPORT II

EXECUTIVE SUMMARY

This report provides a thorough analysis of the project's detailed schedule, structural concrete and steel estimate and a MEP Assemblies estimate, general conditions estimate, LEED evaluation, and site logistics. The $26.1 million GMP contract for Mortenson includes two bid packages and is expected to be delivered over a 13 month period, with substantial completion in February 2014.

The detailed schedule illustrates the durations and sequencing of work in depth for the project. The schedule focuses on the design, construction, and closeout phase of the project in detail. Activities were grouped in each category under the phases to have a concise, detailed schedule with work sequencing. Building site logistics were developed to help understand the flow of traffic and work within the construction site in certain stages of the construction.

To get a better understanding of the project structural and MEP systems, a detailed structural estimate and an assemblies MEP estimate were performed. The building is comprised of structural steel framing with cast in place concrete slabs and metal roof decking. The calculated values for the structural concrete and steel were $499,525.50 and $966,892.73 respectively; compared to the actual costs, $939,943 and $1,372,105. These values are within reason, due to the cost data used and the lack of overhead and profit on these line items. The MEP assemblies estimate accounted the HVAC, Plumbing, Fire Protection and Electrical systems. The total cost of the estimate was $5,792,825 compared to the actual MEP costs $7,130,774.

The general conditions estimate helps understand what costs are associated with project. The total cost was estimated to be $1,593,340, approximately 8% of the buildings GMP contract value. Furthermore, constructability challenges were analyzed and explained. These challenges include the soil modifications, selective material demolition, and partial occupancy. In addition LEED evaluation was performed, utilizing the Pennsylvania State University implementation of sustainable elements. The building is projected to achieve a LEED Silver Rating with 50 out of the 110 possible points.

TABLE OF CONTENTS

Detailed Project Schedule

The project summary schedule presented in Technical Report I marked the main milestones and durations of activities for the Intramural Building Addition and Renovation. To further study the project, a detailed project schedule has been developed, emphasizing the trades and the phasing of construction activities. The schedule is mainly broken down into three main sections, including the design, construction and closeout of the project. The construction phase is detailed with site work, substructure, superstructure, building enclosure, MEP and interiors, and exterior finishes.

To better represent the understanding of the project schedule, Table 1 below shows an overview of the major durations and dates of the project.

Table 1 – Project Duration and Milestone Overview

Activity	Duration (d)	Start	Finish
Design	294	12-Jan-12	8-Mar-13
Construction	247	31-Jan-13	17-Jan-14
NTP	0	31-Jan-13	31-Jan-13
Site Work	164	12-Feb-13	2-Oct-13
Substructure	120	28-Feb-13	16-Aug-13
Steel Erection Start	0	20-May-13	20-May-13
Superstructure	102	20-May-13	11-Oct-13
Building Enclosure	99	10-Jul-13	26-Nov-13
Building Watertight	0	26-Nov-13	26-Nov-13
MEP & Interiors	135	10-Jul-13	17-Jan-14
Exterior Finishes	16	5-Dec-13	27-Dec-13
Closeout	87	11-Oct-13	12-Feb-14
Costumer Move-In	0	12-Feb-14	12-Feb-14

Start/Finish Dates & Durations are taken from detailed project schedule. Reference to Appendix A

The schedule created consists of 200 line items. This schedule is a modified shortened version to the original schedule with grouping of related activities. The project schedule begins on January 16, 2012 with the initiation of the schematic design. Mortenson originally broke down the schedule by general construction activities which follow a rational building pattern. In order to keep the schedule low in line items, the schedule was broken down into main trades, floors and sections. Since the project consists of both a renovation and addition, the sequencing of construction activities is phased. Construction is phased from project West to East and from North to South. This phasing can be seen in Figure 1.

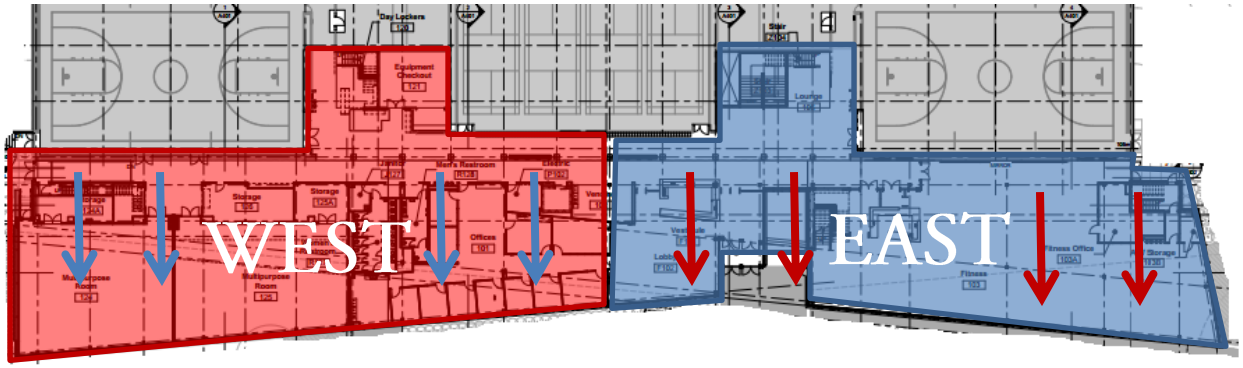


Figure 1: Intramural Building Addition Scheduling Sequencing

Design

This section of the schedule focuses on the preparation of construction documents and the breaking down of bids for procurement of the project. Moody Nolan, the design architect of the Intramural Building, presented their schematic design for the project the beginning of January, 2012. Once Penn State provided input to the design presented, the search for Constructor Manager started. MA Mortenson was awarded the project on March 16, 2012. Working with the architects and engineers, the first set of construction documents was presented in June, 2012. This led to the development of the project's design estimate, and the main breakdown of bids packages. The first package consisted of the first half of the building, such as the HVAC and Plumbing, structural and concrete systems. By September, the first bid package was sent out to contractors, and November the second package was sent. By late November, the first bid package was completely awarded. While the second bid package was awarded by March, 2013. The acquisition of permits and the given notice to proceed authorized the construction to begin on February 1st, 2013.

Construction

Site Work

After Mortenson was presented with the notice to proceed for Phase I, the contractors made their way to the site, setting up their trailers, signage and fencing. Their first step into breaking ground for the new addition of the Intramural Building was the demolition and clearing of the existing hardscape: 2500 square feet of stairs which led into the old entrance of the IM building. Once the demolition clears the site, mass excavation can occur, as well as the layout for the new building. The vast open excavated site allows for the improvement of the existing subsurface voids and displacement of the existing natural soils to prevent future building settlement. With proper measures and waiting, the grouting placed to better the soil's performance sets in place and the building's foundation can initiate.

Substructure

The building's foundation work started the beginning of April and extended till late June. The soil modification was successful enough to begin the necessary installation of foundation. This system included strip and spread footings, which expand across the building footprint, as well as a retaining foundation wall along the new addition's basement. Once footings are installed, the placing of electrical, plumbing and

draining systems under the building slabs can begin. This is critical activity, even though the new addition is completely independent from the existing building, the utilities branch of from the existing systems. Since the basement of the new addition does not expand across the whole footprint of the building, the retaining wall system acts as the center of the substructure. It acts as the main predecessor of the slab on grade pours.

Superstructure

The building's superstructure consists of steel erection and elevated slabs. After the SOGs are completed and the footings columns are in place, the steel erection can begin. The erection follows a clockwise pattern within the four phases. The first phase starts in the Western mid-section of the building, and moves West (2), while returning to the Eastern mid-section (3), moving East (4) to complete the erection. In each phase, both the main and mezzanine level columns, beams, connections and metal deck are erected, which averages a duration of 15 days. Once each steel phase is completed, the pouring of slabs on metal deck can occur. Each floor section averages 5 days for the concrete elevated slabs to be formed and poured, following a west to east flow. The completion of the pours concludes the major structural concrete and steel elements of the project.

Building Enclosure

The enclosure consists of prefabricated metal panels, face brick, curtain wall with glazing and polyethylene roof systems. The roofing installation is one of the most important events for this building. On time completion of the roof will prevent delays of slab pours. This activity takes place before the pour of elevated metal deck slabs, together with the erection of steel. Upon completion of the pours and roofing, metal stud framing along the building footprint can begin, keeping the flow of work from west to east. The installation of the face brick façade cannot begin until the exterior metal stud framing is completed. Prefabricated metal panels are installed as the brick façade is constructed; due to a lower square footage of MWPs, their erection is finished before the brick façade. Following the brick façade, the building's curtain wall on the west end towards the east end will begin construction. Upon the final installation of the curtain wall, the exterior shell of the building is complete, making the building watertight.

MEP, Interiors & Finishes

After the completion of the structure, the interior rough in of partition framing and the different MEP systems occurs. This intensive process takes up 135 days of the schedule. The rough in follows the same sequence flow, tackling floors from west to east. The reason behind the long duration is not only the complexity of the addition, but the challenges faced with the renovation in the existing building. The demolition and replacement of selective MEP equipment adds to the duration of the project. In the schedule, it is visible that most of the work overlaps, showing the continuous flow of work between trades to complete the project successfully on time. Upon completion of the respective system rough-in, the finishes can be installed to make the product complete. Activities in this part of the schedule include, but are not limited to, installation of sprinkler heads, lights, ceiling tiles, diffusers, and flooring.

Exterior Finishes

The building's exterior finishes come in as the rough-in process for the MEP and interior systems approaches completion. Improving the landscape around the construction, cleaning up and installing ornamental metals

are typical activities in this section. The main purpose of this section is to show the preparation of turnover to the owner.

Closeout

When the building comes to completion, each and every aspect of the building needs to be revised and closed out with each subcontractor for quality and performance assurance. System testing for electrical, mechanical and plumbing occurs throughout this period, as well as building inspection. Once punch-lists are checked and closed, the owner can now make use of the facility; projected February, 2014.

Detailed Structural Systems Estimate

This section entails a detailed structural estimate of the entire Intramural Building Addition and Renovation. It was recommended to select a typical bay for an estimate in detail, but the irregularity of the building footprint made it difficult to select one. For starters, the renovation portion of the building barely had structural changes. The new addition consisted of floors with different, oddly shaped areas, which made it difficult to extrapolate. For a better understanding of the building, a full system detailed estimate was performed. The systems included spread footings, strip footings, retaining walls, wide flange columns and beams, hollow structural steel columns and beams. Costs from RSMeans CostWorks have been combined with the quantities to find the overall cost of the structural system. Autodesk Quantity Takeoffs was used to obtain quantify and measure structural line items from the structural drawings. The total cost for the Structural Steel and Concrete is $1,466,418. Major sections of the estimate are discussed below.

***See Appendix B-1 for the Detailed Structural System Estimate**

Foundation

This section of the estimate included elements seen in both concrete and reinforcing steel. There are 7 types of spread footings, composed of 2500 psi normal weight concrete. Rebar runs full length in both directions at the bottom of the footing. The strip footings are 24”x12” and run along the building footprint. The estimated cost determined for the spread and strip footings, including concrete pour costs and reinforcement, came out to be $67,672.89.

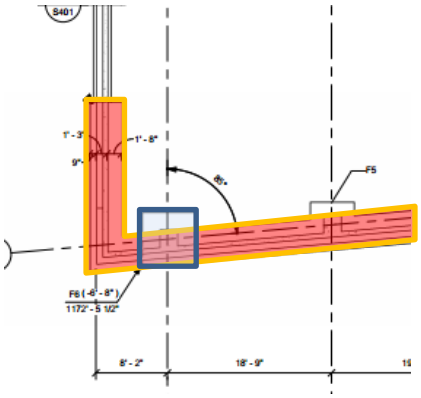


Figure 2 – Spread and Strip Footings

Retaining Wall

There is only one type of retaining wall found on this project and is located around the new addition’s basement construction. This retaining wall averages 15’ in height and is reinforced with rebar sizes #5 through #7, which sits on top of 24”x12” strip footers. The estimated cost determined for the retaining wall, including concrete pour costs and reinforcement, was $148,255.

Formwork

The project consists of over 1000 CY of concrete, and formwork is required for the majority of these pours. The spread footings use typical job built formwork, and have assumed to be 2 uses each. In addition, the slab on grade and the elevated slabs also require formwork, and are assumed to be 2 uses each also. The total estimated cost for formwork was $133,878

Slab on Grade / Slab on Metal Deck / Roof Decking

The slabs on grade are poured only under the basement, and on the main level on the west and east end. The SOG are 5” thick, 3000 psi normal weight concrete, reinforced with 6x6 welded wire fabrics. The slab on metal deck system consists of 2 ½ inches of normal weight concrete on a 3 inch deep galvanized composite

metal floor deck. The structural roof consists of 3 inch steel roof deck and covers about 21,000 SF. The total estimated cost for these systems together is of $275,316.

Structural Steel

The entire steel system, including beams and columns, totaled 210 tons of steel. The structural steel was erected by a telescopic crawler crane and an aerial lift to weld in place connectors. There are various sizes of columns and beams that can be seen in the takeoff in Appendix B-1. The total estimated cost for the structural steel is $790,230.

Assemblies Mechanical, Electrical & Plumbing Estimate

The assemblies estimate for the MEP systems included key items of each of the different systems. The plumbing, electrical, mechanical and fire suppression systems were analyzed for this estimate. Using RSMeans CostWorks, the assemblies estimate totaled $5,940,000. Table 2 shows the difference between the estimated system costs and the actual costs.

Table 2 – Assemblies Estimate Summary

Assemblies Estimate Summary		
System	Estimated Cost	Actual Cost
Mechanical & Plumbing	$ 3,006,415.79	$ 4,414,175.00
Electrical	$ 2,109,236.56	$ 2,251,927.00
Fire Suppression	$ 677,172.65	$ 464,672.00
Total	$ 5,792,825.00	$ 7,130,774.00

Estimated costs are taken from Assemblies Estimate. Reference to Appendix B-2

When breaking the costs down into each category, the electrical package is the closest in the estimate. The majority of the equipment was included in the construction documents and line items were available in the CostWorks data books. The fire suppression system ended up being higher than the actual costs. The unfamiliarity with this kind of system may be the reason of why the estimate is over. This estimate also considers the installation of fire suppression in both the addition and the renovation. The renovation consists of the selective demolition of the existing fire suppression systems. The mechanical and plumbing costs were tied together in the bid package. Most of the mechanical equipment was accounted for in the estimate, but on the plumbing side the equipment was unavailable in the data books. These inaccuracies can also be accounted for through system limitations and specialty fixtures. The generic data provided by CostWorks limits the application to specific systems, such as the chilled water and steam equipment. The total difference between actual and estimated costs of the MEP systems is 18.76%.

The issue with the comparison is mainly dividing what is part of the renovation and the addition. Mortenson sent out bid packages that tackled the MEP systems for Phase I, rather than dividing the costs of the renovation and addition. Under a renovation, costs tend to be higher because of the risks associated with damaging the existing systems. In renovation in which some of the existing systems are to remain, like Phase I, contractors raise their prices to cover for any unforeseen conditions. This will be seen in more detail in the constructability concerns section.

Site Layout Planning

Excavation Phase

The excavation phase is the first phase of the addition project. The main objective is to excavate and to remove substantial amount of soil from the site in an organized manner to ensure a continuous flow of work. Before this stage, the fencing around the site should be erected to prevent any unwanted appearances on the site. Contractor trailers should also be mobilized by this time and removed upon completion of the project. The main gate on University Drive will be used for dump trucks to enter and leave the site. The alternate gate along the temporary access road will also be used for dump trucks to only enter the site. The main gate will also be used for material deliveries. Dump trucks will drive down a ramp into the excavation (yellow), load up the soil, and exit up the same ramp. Front end loaders will clear the grub and top soil to facilitate the excavation process. Along the excavation, orange safety fencing will be placed on the sides of the excavation to provide alert and ensure safety of workers. The excavators will excavate the soil in a clockwise rotation along the respective phase. Heavy equipment will park in the south eastern part of the site.

Soil Modification Phase

Once the excavation is completed, it is time to improve the soil. The geotechnical report recommended the use of Limited Mobility Displacement Grouting to prevent the possible settlement and improve the subsurface voids. A vibratory drill with a continuous grout injection pipe is vibrated into the soil with the vibratory hammer. Concrete washout is located by the eastern side of the new addition building footprint.

Substructure Phase

After the excavation is complete, the spread footings can be excavated, formed and poured. The first stage is to pour the spread footings in the basement area. The concrete truck will be located in the area of the pour. Concrete trucks come in and out of the excavation the same way the dump trucks in the excavation phase. After spread footings are poured, the strip footings can be poured in a similar fashion. The retaining wall is formed and poured in a counter clockwise fashion. Starting in the West end and working along the perimeter of the retaining wall. Materials delivery will enters and exit the main gate. In the south-east corner of the site, the storage of reinforcement bars is located. These are moved by a forklift from the storage area to the building footprint. Concrete and formwork materials are located along the eastern side of the existing building.

Superstructure Phase

The set-up for the superstructure is similar to that of the substructure. An extra stage is added because of the sizing of the crawler crane. Steel is to be delivered to the main material storage next to the east side of the existing building. The steel is the transported to a steel specific laydown area to ease the erection of the superstructure. Steel is hoisted by the crane, and erected in place. Since most of the connections are made in the field, a telescopic boom is used to raise the steel connectors and make the field welds.

***See Appendix C for Site Layout Planning**

General Conditions Estimate

Detailed below is the general conditions estimate for the Intramural Building Addition and Renovation. Using the data from the RSMeans CostWorks database, the overall cost of the estimated General Conditions is $1,593,340.57 (Appendix D). This estimate is composed of project management, field office, field operations, insurance and water management.

The following table represents each category and the respective percentages of the General Conditions estimate. In addition, Figure 3 portrays a graphical representation of those percentages.

Table 3 – General Conditions Costs Comparison

Category	Project Cost	Percentage of GC
Project Management Team	$ 758,700.00	47.62%
Field Office	$ 75,235.25	4.72%
Field Operations	$ 28,420.00	1.78%
Insurance	$ 639,455.32	40.13%
Waste Management	$ 91,530.00	5.74%
Total	**$ 1,593,340.57**	**100%**

More information of the costs available in Appendix D

The project management costs include the Mortenson employees directly associated with the project. The roles are taken directly from the staffing plan elaborated in Technical Report I. Each individual in the project team is assumed to perform their work throughout the entire duration of the project (13 months). RS Means CostWorks provides general weekly salaries, and not every position is listed; thus some of the salaries are estimated.

The office-field section of the General Conditions estimate entails the costs associated with the renting of trailers, and anything associated with. The items accounted for are trailer expenses, telephone services, and office equipment and supplies. These items are also assumed to last the whole duration of the project.

The insurance section of the General Conditions estimate involves the builder's risk, liability and performance bond. These items are typically a percentage based off the project's contract cost ($19,8M). Please refer to Appendix C for the details of these costs.

The field operations section of the General Conditions estimate includes some of the necessities for the site which usually last the whole duration of the project. These necessities include, but are not limited to, temporary bathrooms, site signage, temporary power and water supply.

The last section of the General Conditions estimate is the waste management for the project. This primarily focuses on the clean-up of the site and the usage of dumpsters. Since the project undergoes demolition for a major part of the construction, dumpsters are a necessity to keep the site clean and organized.

***See Appendix D for the General Conditions Estimate**

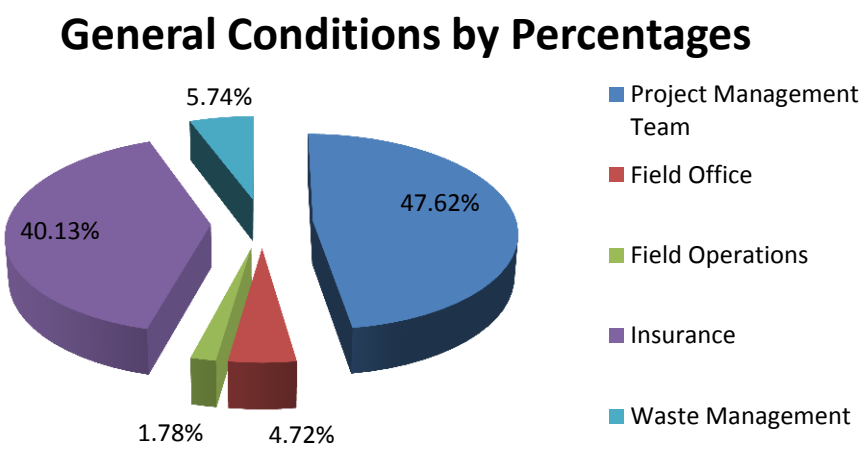


Figure 3 – General Conditions Breakdown

Constructability Challenges

There are three main constructability challenges that have affected the project team throughout the construction of the Intramural Building. Every construction is unique, and projects tend to encounter problems along the progress which drags down the pace of the construction. These constructability challenges are the modification of soil, the dealing with occupants, and replacement dilemma in a renovation.

For the construction of any new building, geotechnical reports are vital documents for the project team. A geotechnical report basically provides the project team with an understanding of what is located below the footprint of the building to erect. Prepared by a geotechnical specialist, several boring tests are performed in the soil and specific characteristics are identified. For this particular project, the test borings showed voids or cavities in close proximity to the proposed building foundation. This identified a sinkhole potential flaw in the soil and the construction of the project would not be able to start until the soil was improved.

Figure 4
LMD Grouting in action – Courtesy of Mortenson

Limited Mobility Displacement (LMD) grouting was recommended by the geotechnical engineer. This is the process of extending hollow stem drilling equipment into the voids within the bedrock, followed by the injection of grout to fill voids and displace poor quality bedrock. This process takes time, and conflicted with one of the project's main objective: on time delivery of the project. Two injections of grout needed to be place at the location of each column, as well as a maximum spacing of 10 feet along the building walls. The challenge associated with this soil modification, is the adaptation of the project schedule after completion of the activity. A delayed start in the construction of a building will set back the whole project.

The renovation of the existing building entails the improvements of the Mechanical, Electrical, Plumbing and Fire Protection systems. The existing systems have equipment which will be replaced and some diagnosed to remain. The challenge arises when the specific trade contractor decides what remains and what gets demo-ed. Is it worth it to keep equipment from the 70s, even though it seems in good conditions? The project team was presented the idea to replace completely the mechanical ductwork instead of selectively demo-ing it. The risk associated with this decision is the actual projected lifetime of the ductwork to remain. The solution was to diagnose the ductwork and define if necessary to remove or remain.

The Intramural Building Phase I project consists of both an addition and the renovation of the existing facility. Since the IM Building is a school facility which holds curricular classes (Health & Physical Activities) for students, the University claimed the possibility of performing the renovation under partial building occupancy. The project team agreed to perform the renovation of the existing building, while pedestrians

utilized the facility on a daily basis. The challenge for the construction and project team is to perform the renovation, while maintaining the building clean, undisturbed and safe.

The project team prepared a work flow for the renovation to accommodate for the owner's requests. The renovation starts in the northwest end of the existing building, moving its way east and finally southward. Most of the offices in the existing building are located along the south wall, adjacent to the construction of the new addition. Surrounded by construction, noise disturbance is unpreventable.

A recent conflict with the occupants is the shutdown of the main level bathrooms. The offices are located in the basement level, but all of the sport courts are located in the main level of the existing building. Since the renovations consist of MEP improvements, the shutdown of the main level bathrooms was required, as seen in Figure. This forced the building occupants to cluster in the basement level for the usage of restrooms.

Figure 5 – Restroom Shutdown

Another concern with the project is the student curiosity. Construction Projects around campus tend to be an obstacle for students that tend to be hurdled. Students are intrigued and interested by projects around campus and tend to walk onto site for observation. The installation of the blue mesh around the project site fence is the hint and warning to students for a construction site. Proper signage is helpful to prevent unwanted visits to the site.

LEED Evaluation

The Intramural Building Addition and Renovation is looking for a LEED Silver certification. As the sustainability movement spreads across Universities, the Pennsylvania State University is not wasting time in having their second fitness facility under a LEED rating. The project plans to reduce the building operating cost as well as reducing the carbon footprint in the University's green campus. The goals of the project team are to incorporate day-lighting to reduce the usage of electricity and use recycled local materials to minimize material waste and transportation associated pollution and consumption.

The Pennsylvania State University prioritizes the implementation of sustainable elements in the design of new and existing facilities, in accordance with the United States Green Building Council's LEED guide. The University focuses in the following criteria to yield an energy-efficient, healthy and comfortable facility on campus: energy and resource conservation, prevention of environmental degradation, people's health, and cost of ownership. Under the criterion, there are mandatory and of significant importance LEED credits that the University requires for the construction of projects. Table 5 illustrates the most important credits new construction at Penn State needs to comply to obtain LEED accreditation (33 points). See Appendix F for an expanded version, with project specific inclusions.

Analysis

Since the University already requires certain points to be accounted for when pursuing LEED accreditation, it's a no brainer to chase after more points to increase the chances of obtaining a higher certification. As shown in table ( ) below, the project team worked a plan to achieve a LEED scoreboard of 54 points with 19 potential points.

Table 4 – LEED 2009 Project Checklist

LEED 2009 for New Construction and Major Renovation - Checklist				
Y	?	N	Category	Possible Points
16	2	5	Sustainable Sites	26
5	0	5	Water Efficiency	10
6	6	23	Energy and Atmosphere	35
10	3	1	Materials and Resources	14
12	3	0	Indoor Environmental Quality	15
4	2	0	Innovation and Design Process	6
1	3	0	Regional Priority Credits	4
54	**19**	**34**	**TOTAL CREDITS**	**110**
Summary - LEED Silver: 50 to 59 pts. LEED Gold 60-79 pts.				

LEED totals taken from 2009 Checklist, Appendix F

Table 5 – PSU Basic LEED Requirements

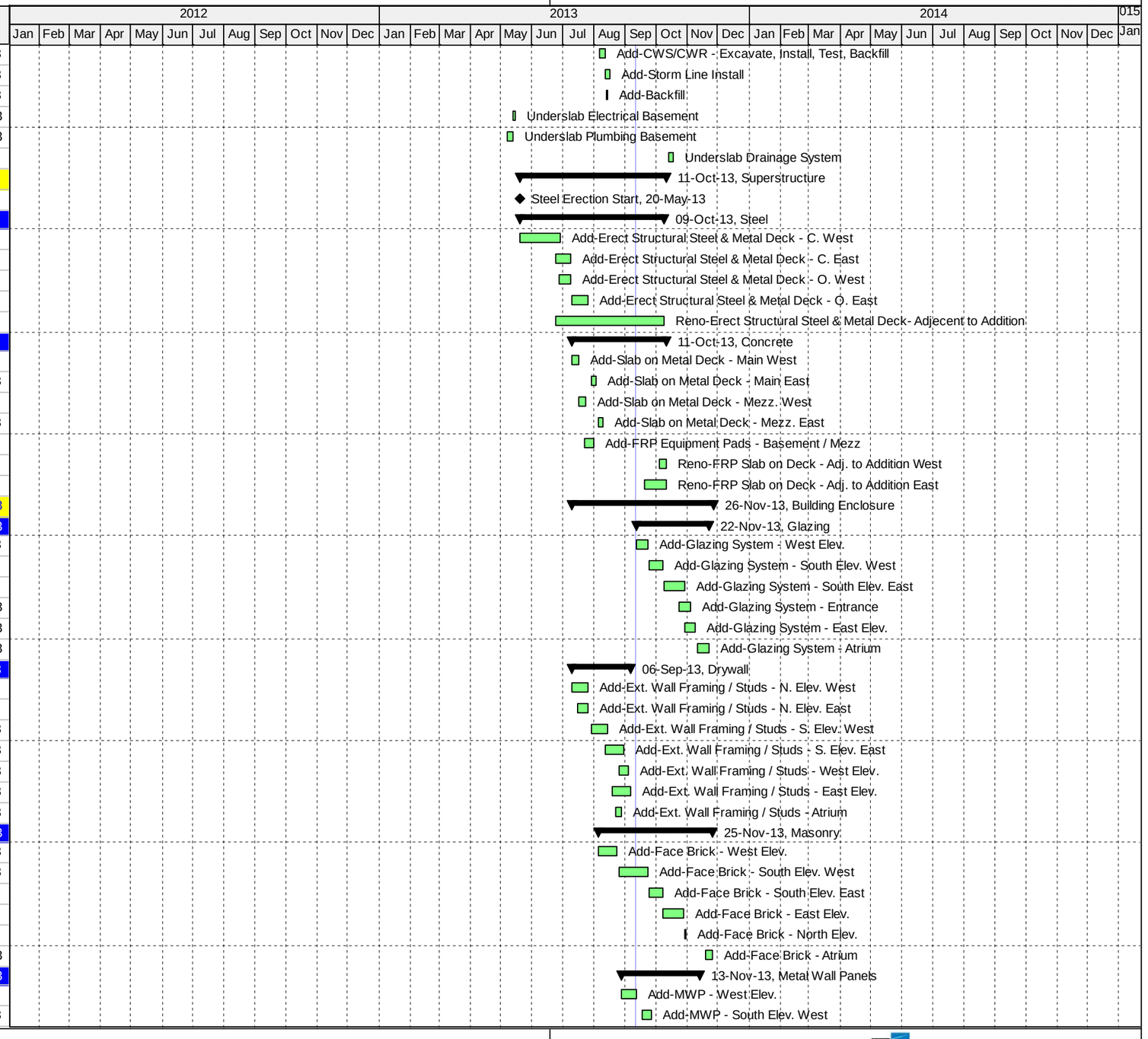
Credit Number	Credit Name	Classification	Points
Sustainable Sites			
4.2	Alt. Transportation: Bicycle Storage & Changing Rooms	Significant	1
5.2	Site Development: Maximize Open Space	Significant	1
6.1	Storm Water Design: Quantity Control	Mandatory	1
6.2	Storm Water Design: Quantity Control	Significant	1
7.2	Heat Island Effect: Roof	Significant	1
Energy and Atmosphere			
3.0	Enhanced Commissioning	Mandatory	2
4.0	Enhanced Refrigerant Management	Mandatory	2
6.0	Green Power	Mandatory	2
Materials and Resources			
2.1	Construction Waste Management: Divert 50-75% from Disposal	Mandatory	2
4.0	Recycled Content: 10-20%	Mandatory	2
5.1	Regional Materials: 10-20%	Mandatory	2
7.0	Certified Wood	Mandatory	1
Indoor Environmental Quality			
1.0	Outdoor Air Delivery Monitoring	Mandatory	1
3.1	Construction IAQ Management Plan: During Construction	Mandatory	1
3.2	Construction IAQ Management Plan: Before Occupancy	Mandatory	1
4.1	Low-Emitting Materials: Adhesives and Sealants	Mandatory	1
4.2	Low-Emitting Materials: Paints and Coatings	Mandatory	1
4.3	Low-Emitting Materials: Carpet Systems	Mandatory	1
4.4	Low-Emitting Materials: Composite Wood & Agrifiber Products	Mandatory	1
5.0	Indoor Chemical Pollutant Source Control	Mandatory	1
6.1	Controllability of Systems: Lighting	Mandatory	1
6.2	Controllability of Systems: Thermal Comfort	Significant	1
7.1	Thermal Comfort: Design	Significant	1
7.2	Thermal Comfort: Verification	Mandatory	1
8.1	Daylight and Views: Daylight	Significant	1
Innovation and Design Process			
1.0	Innovation in Design	Significant	1
2.0	LEED Accredited Professional	Mandatory	1
Total Minimum Points Under Criteria			**33**

APPENDIX A

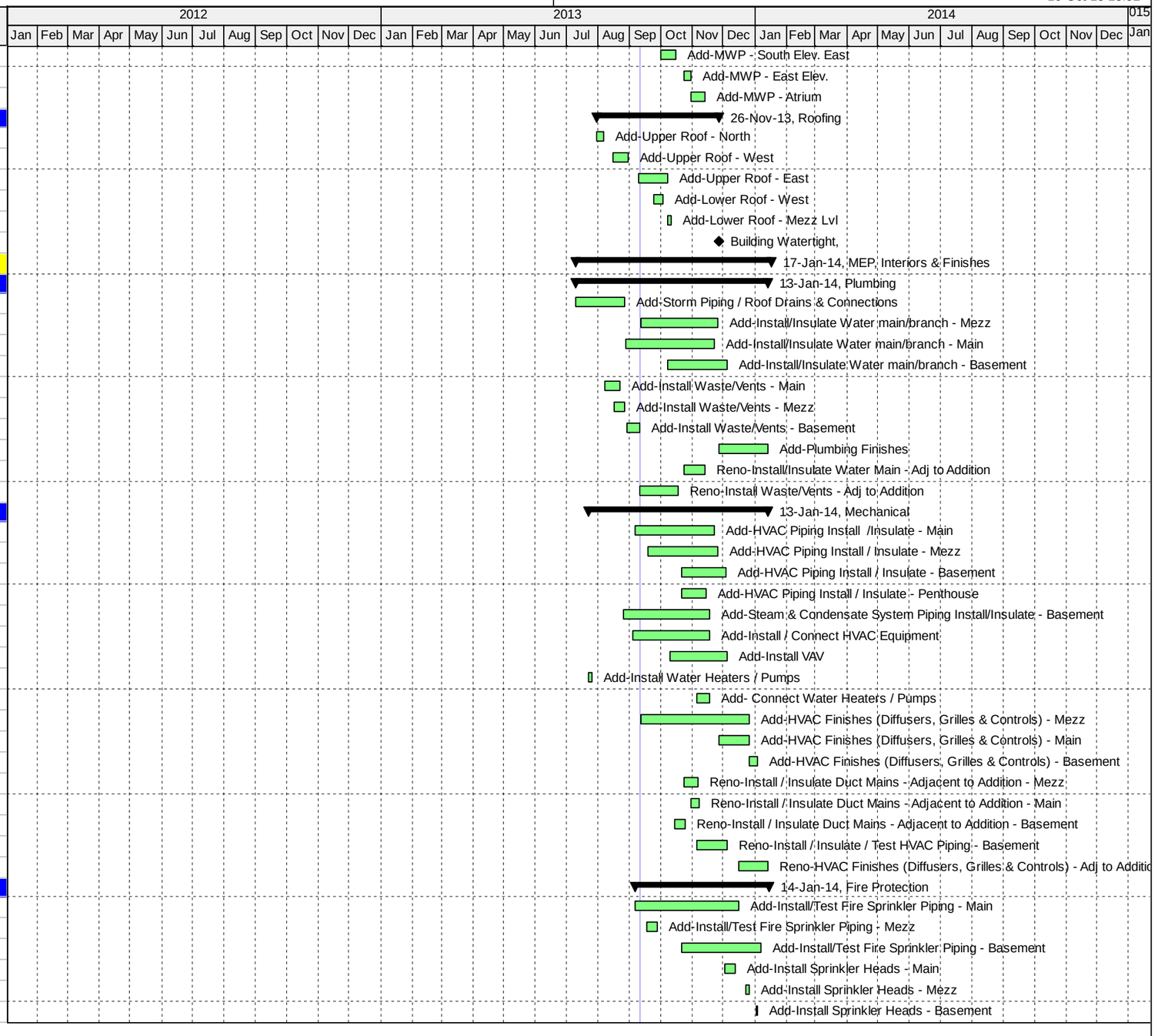
DETAILED PROJECT SCHEDULE

Activity Name	Original Duration	Start	Finish
Intramural Building Addition and Renovation	532	16-Jan-12	12-Feb-14
Design	294	16-Jan-12	08-Mar-13
Design	266	16-Jan-12	29-Jan-13
Bid & Award Contracts	125	12-Sep-12	08-Mar-13
Construction	247	31-Jan-13	17-Jan-14
Notice to Proceed	0	31-Jan-13	
Mobilization	3	04-Feb-13	06-Feb-13
Trailer Set Up	4	08-Feb-13	13-Feb-13
Site Fencing	3	05-Feb-13	07-Feb-13
Site Work	164	12-Feb-13	02-Oct-13
Site Demolition	164	12-Feb-13	02-Oct-13
Add-Demo Hardscape West	2	12-Feb-13	13-Feb-13
Add-Demo Hardscape East	1	14-Feb-13	14-Feb-13
Add-Site Clearing & Grubbing West	2	13-Feb-13	14-Feb-13
Add-Site Clearing & Grubbing East	11	14-Feb-13	28-Feb-13
Reno-Asbestos Abatement - Adjacent to Addition	15	08-Jul-13	26-Jul-13
Reno-Interior Demo - Adjacent to Addition	53	19-Jul-13	02-Oct-13
Reno-Exterior Wall / SOG Demo - Adjacent to Addition	35	13-Aug-13	01-Oct-13
Excavation	12	14-Feb-13	01-Mar-13
Add-Mass Excavation Basement	9	14-Feb-13	26-Feb-13
Add-Mass Excavation - Layout	3	27-Feb-13	01-Mar-13
Soil Modification	38	04-Mar-13	24-Apr-13
Add-Limited Mobility Displacement Grouting-Basement	19	04-Mar-13	28-Mar-13
Add-Limited Mobility Displacement Grouting - West	13	27-Mar-13	12-Apr-13
Add-Limited Mobility Displacement Grouting - East	14	05-Apr-13	24-Apr-13
Substructure	91	01-Apr-13	07-Aug-13
Concrete	91	01-Apr-13	07-Aug-13
Add-Excavate / FRP / Backfill Spread F- Basement	24	03-Apr-13	06-May-13
Add-Excavate / FRP / Backfill Spread F- West	13	23-Apr-13	09-May-13
Add-Excavate / FRP / Backfill Spread F- East	17	22-May-13	14-Jun-13
Add-Excavate / FRP / Backfill Strip F- Basement	20	01-Apr-13	26-Apr-13
Add-Excavate / FRP / Backfill Strip F- West	19	15-Apr-13	09-May-13
Add-Excavate / FRP / Backfill Strip F- East	27	08-May-13	14-Jun-13
Add-FRP Foundation Wall - Basement	17	08-Apr-13	30-Apr-13
Add-FRP Foundation Wall - West	8	01-May-13	10-May-13
Add-FRP Foundation Wall - East	22	15-May-13	14-Jun-13
Add-Foundation Waterproofing - Basement	13	23-Apr-13	09-May-13
Add-Foundation Waterproofing - West	9	07-May-13	17-May-13
Add-Foundation Waterproofing - East	16	30-May-13	20-Jun-13
Add-Slab on Grade - FRP Basement	6	10-Jul-13	17-Jul-13
Add-Slab on Grade - FRP Main Level West	2	18-Jul-13	19-Jul-13
Add-Slab on Grade - FRP Main Level East	2	06-Aug-13	07-Aug-13
Underground Utility	164	28-Feb-13	18-Oct-13
Add-Excavate Water and Steam Line	6	28-Feb-13	07-Mar-13
Add-Telecom Ductbank	17	13-Jun-13	08-Jul-13
Add-Steam Tunnel - Excavate, Pour, WP, Backfill	11	16-Jul-13	30-Jul-13

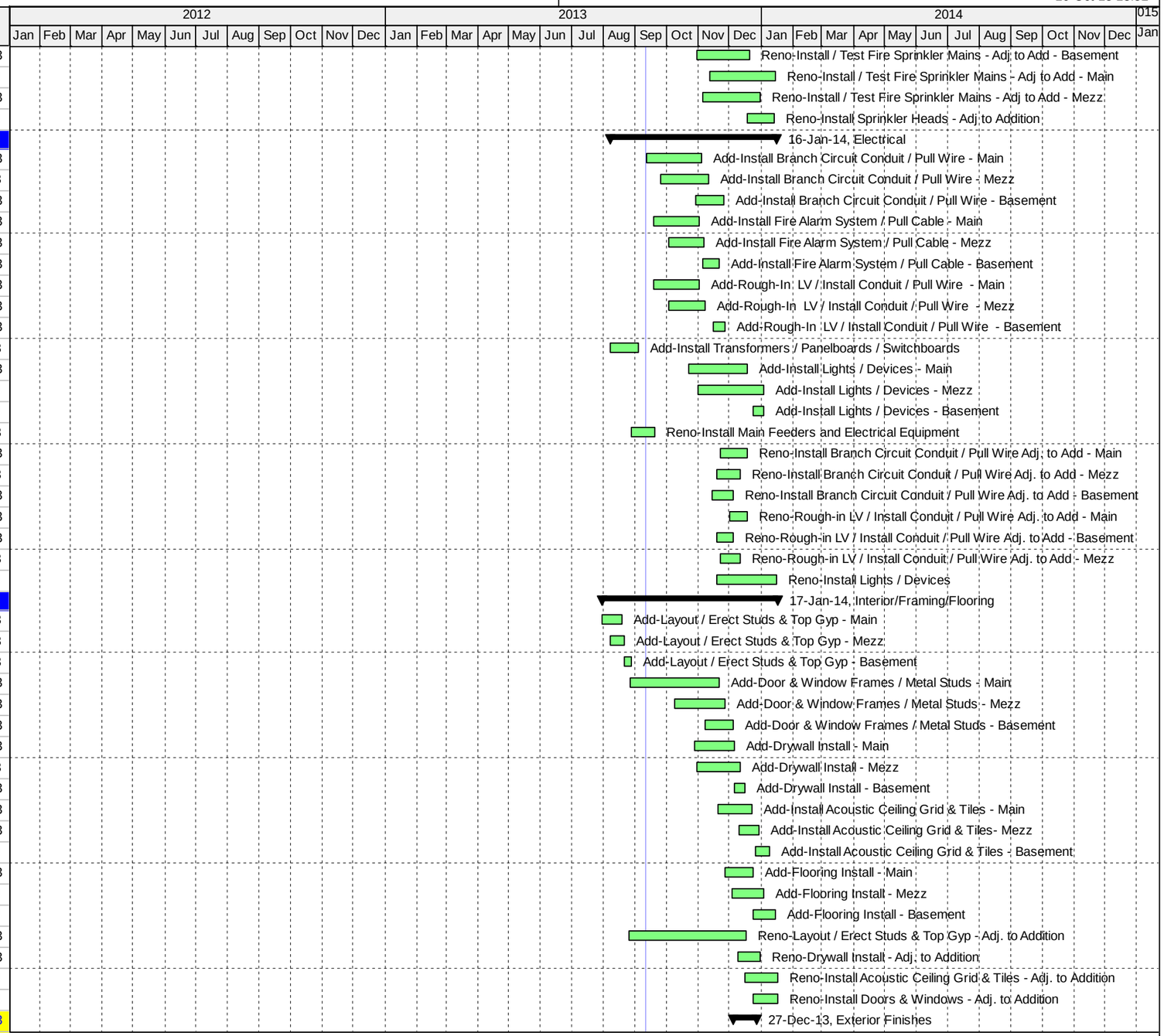
Activity Name	Original Duration	Start	Finish
Add-CWS/CWR - Excavate, Install, Test, Backfill	5	06-Aug-13	12-Aug-13
Add-Storm Line Install	5	12-Aug-13	16-Aug-13
Add-Backfill	2	13-Aug-13	14-Aug-13
Underslab Electrical Basement	3	13-May-13	15-May-13
Underslab Plumbing Basement	5	07-May-13	13-May-13
Underslab Drainage System	5	14-Oct-13	18-Oct-13
Superstructure	102	20-May-13	11-Oct-13
Steel Erection Start	0	20-May-13	
Steel	100	20-May-13	09-Oct-13
Add-Erect Structural Steel & Metal Deck - C. West	29	20-May-13	28-Jun-13
Add-Erect Structural Steel & Metal Deck - C. East	11	24-Jun-13	09-Jul-13
Add-Erect Structural Steel & Metal Deck - O. West	8	27-Jun-13	09-Jul-13
Add-Erect Structural Steel & Metal Deck - O. East	13	10-Jul-13	26-Jul-13
Reno-Erect Structural Steel & Metal Deck- Adjecent to Ad	76	24-Jun-13	09-Oct-13
Concrete	67	10-Jul-13	11-Oct-13
Add-Slab on Metal Deck - Main West	5	10-Jul-13	16-Jul-13
Add-Slab on Metal Deck - Main East	5	29-Jul-13	02-Aug-13
Add-Slab on Metal Deck - Mezz. West	5	17-Jul-13	23-Jul-13
Add-Slab on Metal Deck - Mezz. East	5	05-Aug-13	09-Aug-13
Add-FRP Equipment Pads - Basement / Mezz	8	22-Jul-13	31-Jul-13
Reno-FRP Slab on Deck - Adj. to Addition West	6	04-Oct-13	11-Oct-13
Reno-FRP Slab on Deck - Adj. to Addition East	16	20-Sep-13	11-Oct-13
Building Enclosure	99	10-Jul-13	26-Nov-13
Glazing	52	12-Sep-13	22-Nov-13
Add-Glazing System - West Elev.	8	12-Sep-13	23-Sep-13
Add-Glazing System - South Elev. West	10	24-Sep-13	07-Oct-13
Add-Glazing System - South Elev. East	15	09-Oct-13	29-Oct-13
Add-Glazing System - Entrance	8	24-Oct-13	04-Nov-13
Add-Glazing System - East Elev.	8	30-Oct-13	08-Nov-13
Add-Glazing System - Atrium	10	11-Nov-13	22-Nov-13
Drywall	42	10-Jul-13	06-Sep-13
Add-Ext. Wall Framing / Studs - N. Elev. West	13	10-Jul-13	26-Jul-13
Add-Ext. Wall Framing / Studs - N. Elev. East	8	16-Jul-13	25-Jul-13
Add-Ext. Wall Framing / Studs - S. Elev. West	13	29-Jul-13	14-Aug-13
Add-Ext. Wall Framing / Studs - S. Elev. East	15	12-Aug-13	30-Aug-13
Add-Ext. Wall Framing / Studs - West Elev.	6	26-Aug-13	03-Sep-13
Add-Ext. Wall Framing / Studs - East Elev.	14	19-Aug-13	06-Sep-13
Add-Ext. Wall Framing / Studs - Atrium	5	22-Aug-13	28-Aug-13
Masonry	80	05-Aug-13	25-Nov-13
Add-Face Brick - West Elev.	15	05-Aug-13	23-Aug-13
Add-Face Brick - South Elev. West	20	26-Aug-13	23-Sep-13
Add-Face Brick - South Elev. East	10	24-Sep-13	07-Oct-13
Add-Face Brick - East Elev.	15	08-Oct-13	28-Oct-13
Add-Face Brick - North Elev.	2	29-Oct-13*	30-Oct-13
Add-Face Brick - Atrium	5	19-Nov-13*	25-Nov-13
Metal Wall Panels	55	28-Aug-13	13-Nov-13
Add-MWP - West Elev.	10	28-Aug-13	11-Sep-13
Add-MWP - South Elev. West	8	17-Sep-13	26-Sep-13



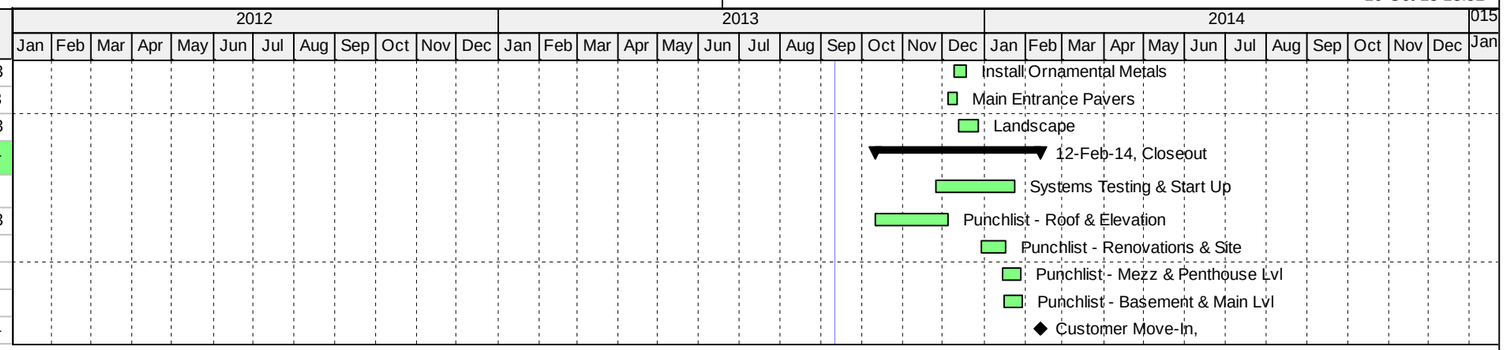
Activity Name	Original Duration	Start	Finish
Add-MWP - South Elev. East	12	01-Oct-13	16-Oct-13
Add-MWP - East Elev.	5	24-Oct-13	30-Oct-13
Add-MWP - Atrium	10	31-Oct-13	13-Nov-13
Roofing	85	30-Jul-13	26-Nov-13
Add-Upper Roof - North	6	30-Jul-13	06-Aug-13
Add-Upper Roof - West	12	15-Aug-13	30-Aug-13
Add-Upper Roof - East	21	09-Sep-13	07-Oct-13
Add-Lower Roof - West	8	24-Sep-13	03-Oct-13
Add-Lower Roof - Mezz Lvl	4	08-Oct-13	11-Oct-13
Building Watertight	0		26-Nov-13
MEP, Interiors & Finishes	135	10-Jul-13	17-Jan-14
Plumbing	131	10-Jul-13	13-Jan-14
Add-Storm Piping / Roof Drains & Connections	34	10-Jul-13	26-Aug-13
Add-Install/Insulate Water main/branch - Mezz	53	12-Sep-13	25-Nov-13
Add-Install/Insulate Water main/branch - Main	62	28-Aug-13	22-Nov-13
Add-Install/Insulate Water main/branch - Basement	42	08-Oct-13	05-Dec-13
Add-Install Waste/Vents - Main	12	07-Aug-13	22-Aug-13
Add-Install Waste/Vents - Mezz	7	16-Aug-13	26-Aug-13
Add-Install Waste/Vents - Basement	8	29-Aug-13	10-Sep-13
Add-Plumbing Finishes	32	27-Nov-13	13-Jan-14
Reno-Install/Insulate Water Main - Adj to Addition	15	24-Oct-13	13-Nov-13
Reno-Install Waste/Vents - Adj to Addition	28	11-Sep-13	18-Oct-13
Mechanical	123	22-Jul-13	13-Jan-14
Add-HVAC Piping Install /Insulate - Main	56	06-Sep-13	22-Nov-13
Add-HVAC Piping Install / Insulate - Mezz	48	19-Sep-13	25-Nov-13
Add-HVAC Piping Install / Insulate - Basement	30	22-Oct-13	03-Dec-13
Add-HVAC Piping Install / Insulate - Penthouse	19	21-Oct-13	14-Nov-13
Add-Steam & Condensate System Piping Install/Insulate -	60	26-Aug-13	18-Nov-13
Add-Install / Connect HVAC Equipment	54	04-Sep-13	18-Nov-13
Add-Install VAV	39	10-Oct-13	04-Dec-13
Add-Install Water Heaters / Pumps	4	22-Jul-13	25-Jul-13
Add- Connect Water Heaters / Pumps	10	05-Nov-13	18-Nov-13
Add-HVAC Finishes (Diffusers, Grilles & Controls) - Mezz	74	12-Sep-13	26-Dec-13
Add-HVAC Finishes (Diffusers, Grilles & Controls) - Main	20	27-Nov-13	26-Dec-13
Add-HVAC Finishes (Diffusers, Grilles & Controls) - Base	6	27-Dec-13	03-Jan-14
Reno-Install / Insulate Duct Mains - Adjacent to Addition -	10	24-Oct-13	06-Nov-13
Reno-Install / Insulate Duct Mains - Adjacent to Addition -	6	31-Oct-13	07-Nov-13
Reno-Install / Insulate Duct Mains - Adjacent to Addition -	9	15-Oct-13	25-Oct-13
Reno-Install / Insulate / Test HVAC Piping - Basement	21	05-Nov-13	04-Dec-13
Reno-HVAC Finishes (Diffusers, Grilles & Controls) - Adj	20	16-Dec-13	13-Jan-14
Fire Protection	91	06-Sep-13	14-Jan-14
Add-Install/Test Fire Sprinkler Piping - Main	71	06-Sep-13	16-Dec-13
Add-Install/Test Fire Sprinkler Piping - Mezz	9	17-Sep-13	27-Sep-13
Add-Install/Test Fire Sprinkler Piping - Basement	53	22-Oct-13	06-Jan-14
Add-Install Sprinkler Heads - Main	9	03-Dec-13	13-Dec-13
Add-Install Sprinkler Heads - Mezz	3	23-Dec-13	26-Dec-13
Add-Install Sprinkler Heads - Basement	2	02-Jan-14	03-Jan-14



Activity Name	Original Duration	Start	Finish
Reno-Install / Test Fire Sprinkler Mains - Adj to Add - Base	36	31-Oct-13	20-Dec-13
Reno-Install / Test Fire Sprinkler Mains - Adj to Add - Main	44	12-Nov-13	14-Jan-14
Reno-Install / Test Fire Sprinkler Mains - Adj to Add - Mez	39	05-Nov-13	31-Dec-13
Reno-Install Sprinkler Heads - Adj to Addition	18	18-Dec-13	13-Jan-14
Electrical	114	07-Aug-13	16-Jan-14
Add-Install Branch Circuit Conduit / Pull Wire - Main	38	12-Sep-13	04-Nov-13
Add-Install Branch Circuit Conduit / Pull Wire - Mezz	34	25-Sep-13	11-Nov-13
Add-Install Branch Circuit Conduit / Pull Wire - Basement	20	29-Oct-13	25-Nov-13
Add-Install Fire Alarm System / Pull Cable - Main	32	19-Sep-13	01-Nov-13
Add-Install Fire Alarm System / Pull Cable - Mezz	25	03-Oct-13	06-Nov-13
Add-Install Fire Alarm System / Pull Cable - Basement	13	05-Nov-13	21-Nov-13
Add-Rough-In LV / Install Conduit / Pull Wire - Main	32	19-Sep-13	01-Nov-13
Add-Rough-In LV / Install Conduit / Pull Wire - Mezz	26	03-Oct-13	07-Nov-13
Add-Rough-In LV / Install Conduit / Pull Wire - Basement	8	15-Nov-13	26-Nov-13
Add-Install Transformers / Panelboards / Switchboards	19	07-Aug-13	03-Sep-13
Add-Install Lights / Devices - Main	40	23-Oct-13	18-Dec-13
Add-Install Lights / Devices - Mezz	44	01-Nov-13	03-Jan-14
Add-Install Lights / Devices - Basement	8	24-Dec-13	03-Jan-14
Reno-Install Main Feeders and Electrical Equipment	16	28-Aug-13	19-Sep-13
Reno-Install Branch Circuit Conduit / Pull Wire Adj. to Add	18	22-Nov-13	18-Dec-13
Reno-Install Branch Circuit Conduit / Pull Wire Adj. to Add	16	19-Nov-13	11-Dec-13
Reno-Install Branch Circuit Conduit / Pull Wire Adj. to Add	14	14-Nov-13	04-Dec-13
Reno-Rough-in LV / Install Conduit / Pull Wire Adj. to Add ·	13	02-Dec-13	18-Dec-13
Reno-Rough-in LV / Install Conduit / Pull Wire Adj. to Add ·	11	19-Nov-13	04-Dec-13
Reno-Rough-in LV / Install Conduit / Pull Wire Adj. to Add ·	13	22-Nov-13	11-Dec-13
Reno-Rough-in LV / Install Conduit / Pull Wire Adj. to Add ·	13	22-Nov-13	11-Dec-13
Reno-Install Lights / Devices	41	19-Nov-13	16-Jan-14
Interior/Framing/Flooring	120	31-Jul-13	17-Jan-14
Add-Layout / Erect Studs & Top Gyp - Main	14	31-Jul-13	19-Aug-13
Add-Layout / Erect Studs & Top Gyp - Mezz	11	07-Aug-13	21-Aug-13
Add-Layout / Erect Studs & Top Gyp - Basement	6	21-Aug-13	28-Aug-13
Add-Door & Window Frames / Metal Studs - Main	62	27-Aug-13	21-Nov-13
Add-Door & Window Frames / Metal Studs - Mezz	35	09-Oct-13	26-Nov-13
Add-Door & Window Frames / Metal Studs - Basement	18	08-Nov-13	04-Dec-13
Add-Drywall Install - Main	29	28-Oct-13	06-Dec-13
Add-Drywall Install - Mezz	29	31-Oct-13	11-Dec-13
Add-Drywall Install - Basement	7	06-Dec-13	16-Dec-13
Add-Install Acoustic Ceiling Grid & Tiles - Main	23	20-Nov-13	23-Dec-13
Add-Install Acoustic Ceiling Grid & Tiles- Mezz	14	10-Dec-13	30-Dec-13
Add-Install Acoustic Ceiling Grid & Tiles - Basement	10	27-Dec-13	09-Jan-14
Add-Flooring Install - Main	19	27-Nov-13	24-Dec-13
Add-Flooring Install - Mezz	22	04-Dec-13	03-Jan-14
Add-Flooring Install - Basement	16	24-Dec-13	15-Jan-14
Reno-Layout / Erect Studs & Top Gyp - Adj. to Addition	80	26-Aug-13	17-Dec-13
Reno-Drywall Install - Adj. to Addition	16	09-Dec-13	31-Dec-13
Reno-Install Acoustic Ceiling Grid & Tiles - Adj. to Addition	24	16-Dec-13	17-Jan-14
Reno-Install Doors & Windows - Adj. to Addition	18	24-Dec-13	17-Jan-14
Exterior Finishes	16	05-Dec-13	27-Dec-13



Activity Name	Original Duration	Start	Finish
Install Ornamental Metals	8	09-Dec-13*	18-Dec-13
Main Entrance Pavers	5	05-Dec-13	11-Dec-13
Landscape	10	13-Dec-13*	27-Dec-13
Closeout	87	11-Oct-13	12-Feb-14
Systems Testing & Start Up	42	26-Nov-13*	24-Jan-14
Punchlist - Roof & Elevation	38	11-Oct-13	04-Dec-13
Punchlist - Renovations & Site	15	30-Dec-13*	17-Jan-14
Punchlist - Mezz & Penthouse Lvl	10	15-Jan-14*	28-Jan-14
Punchlist - Basement & Main Lvl	10	16-Jan-14*	29-Jan-14
Customer Move-In	0		12-Feb-14



APPENDIX B-1

DETAILED STRUCTURAL SYSTEM ESTIMATE

STEEL & METALS									
CODE	DESCRIPTION	QUANTITY	UNIT	WEIGHT/LF	TONS	MAT TOTAL	LABOR T	EQUIP T	TOTAL
053113505800	3" Deep 20 Ga. Metal Deck	21,000.00	SF	-	-	$ 50,820.00	$ 13,860.00	$ 1,260.00	$ 65,940.00
053123503250	3" Deep 20 Ga. Roof Deck	21,000.00	SF	-	-	$ 52,500.00	$ 11,130.00	$ 1,050.00	$ 64,680.00
051223174650	HSS 10x10x1/2	60.00	Ea	-	-	$ 78,288.00	$ 4,121.40	$ 2,173.20	$ 84,582.60
051223174550	HSS 6x6x1/4	4.00	Ea	-	-	$ 1,304.80	$ 245.84	$ 126.80	$ 1,677.44
051223176800	W12X50	274.00	LF	50.00	6.85	$ 18,259.36	$ 879.54	$ 460.32	$ 19,599.22
051223177200	W12X87	189.00	LF	87.00	8.22	$ 21,842.73	$ 635.04	$ 330.75	$ 22,808.52
051223750120	W6x15	63.26	LF	15.00	0.47	$ 1,267.73	$ 349.20	$ 182.19	$ 1,799.11
051223750320	W8X15	114.73	LF	15.00	0.86	$ 2,299.19	$ 633.31	$ 330.42	$ 3,262.92
051223750360	W8X24	18.43	LF	24.00	0.22	$ 592.52	$ 110.76	$ 57.87	$ 761.16
051223750370	W8X28	27.69	LF	28.00	0.39	$ 1,032.28	$ 166.42	$ 86.95	$ 1,285.65
051223750600	W10X12	823.41	LF	12.00	4.94	$ 13,158.09	$ 4,545.22	$ 2,371.42	$ 20,074.74
051223750620	W10X15	116.09	LF	15.00	0.87	$ 2,326.44	$ 640.82	$ 334.34	$ 3,301.60
051223751100	W12X16	8.07	LF	16.00	0.06	$ 173.02	$ 30.34	$ 15.82	$ 219.18
051223751500	W12X26	396.64	LF	26.00	5.16	$ 13,676.15	$ 1,491.37	$ 777.41	$ 15,944.93
051223751520	W12X35	19.58	LF	35.00	0.34	$ 912.43	$ 79.89	$ 41.71	$ 1,034.02
051223751900	W14X26	655.47	LF	26.00	8.52	$ 22,600.61	$ 2,189.27	$ 1,140.52	$ 25,930.39
051223752100	W14X30	153.08	LF	30.00	2.30	$ 6,135.45	$ 563.33	$ 292.38	$ 6,991.16
051223752340	W14X53	27.97	LF	53.00	0.74	$ 1,981.12	$ 115.52	$ 60.42	$ 2,157.05
051223752360	W14X74	55.82	LF	74.00	2.07	$ 5,514.46	$ 242.82	$ 127.27	$ 5,884.54
051223752700	W16X26	869.00	LF	26.00	11.30	$ 29,963.12	$ 2,876.39	$ 1,494.68	$ 34,334.19
051223752900	W16X31	711.07	LF	31.00	11.02	$ 29,488.07	$ 2,616.74	$ 1,358.14	$ 33,462.95
051223753300	W18X35	1,057.01	LF	35.00	18.50	$ 49,256.67	$ 5,263.91	$ 2,082.31	$ 56,602.89
051223753500	W18X40	490.38	LF	40.00	9.81	$ 26,048.99	$ 2,442.09	$ 966.05	$ 29,457.13
051223753700	W18X50	139.60	LF	50.00	3.49	$ 9,302.94	$ 731.50	$ 288.97	$ 10,323.42
051223753920	W18X65	152.90	LF	65.00	4.97	$ 13,253.37	$ 810.37	$ 319.56	$ 14,383.30
051223754100	W21X44	307.97	LF	44.00	6.78	$ 18,084.00	$ 1,382.79	$ 548.19	$ 20,014.97
051223754300	W21X50	22.12	LF	50.00	0.55	$ 1,474.08	$ 99.32	$ 39.37	$ 1,612.77
051223754900	W24X55	531.11	LF	55.00	14.61	$ 38,856.01	$ 2,283.77	$ 902.89	$ 42,042.67
051223755100	W24X62	322.86	LF	62.00	10.01	$ 26,629.49	$ 1,388.30	$ 548.86	$ 28,566.65
051223755300	W24X68	537.92	LF	68.00	18.29	$ 48,627.97	$ 2,313.06	$ 914.46	$ 51,855.49
051223755500	W24X76	273.05	LF	76.00	10.38	$ 27,739.15	$ 1,174.12	$ 464.19	$ 29,377.45
051223755700	W24X84	40.39	LF	84.00	1.70	$ 4,517.22	$ 178.52	$ 70.68	$ 4,766.42
051223755720	W24X94	38.22	LF	94.00	1.80	$ 4,772.88	$ 168.92	$ 66.88	$ 5,008.68
051223755740	W24X104	36.34	LF	104.00	1.89	$ 5,045.94	$ 165.33	$ 65.40	$ 5,276.67
051223755780	W24X146	36.06	LF	146.00	2.63	$ 7,024.06	$ 164.07	$ 64.91	$ 7,253.03
051223755800	W27X84	36.70	LF	84.00	1.54	$ 434.54	$ 147.17	$ 57.99	$ 639.70
051223755920	W27X114	131.48	LF	114.00	7.49	$ 19,974.21	$ 546.95	$ 215.62	$ 20,736.79
051223756100	W30X99	33.20	LF	99.00	1.64	$ 442.86	$ 132.13	$ 52.12	$ 627.11
051223756580	W30X191	108.42	LF	191.00	10.35	$ 27,587.54	$ 462.97	$ 183.24	$ 28,233.75
051223756700	W33X118	41.92	LF	118.00	2.47	$ 6,602.85	$ 170.20	$ 67.49	$ 6,840.54
051223400668	C12X20.7	78.84	LF	-	-	$ 455.72	$ 2,090.15	$ 234.17	$ 2,780.03
051223400668	C6X8.2	186.00	LF	-	-	$ 1,075.10	$ 4,930.95	$ 552.43	$ 6,558.48
051223175700	HSS 12X8X1/2	60.00	Ea	-	-	$ 78,288.00	$ 4,121.40	$ 2,173.20	$ 84,582.60
051223175600	HSS 12X8X4	21.00	Ea	-	-	$ 9,296.70	$ 1,290.66	$ 665.70	$ 11,253.06
052116502340	28LH13	525.00	LF	25.00	6.56	$ 12,936.00	$ 1,412.25	$ 598.50	$ 14,946.75
052116502420	36LH15	550.00	LF	36.00	9.90	$ 19,272.00	$ 1,479.50	$ 627.00	$ 21,378.50
SUBTOTAL						$ 811,133.84	$ 82,873.59	$ 26,842.79	$ 920,850.22
MISC. MATERIAL (5%)						$ 40,556.69	$ 4,143.68	$ 1,342.14	$ 46,042.51
TOTAL						$ 851,690.53	$ 87,017.27	$ 28,184.92	**$ 966,892.73**

CONCRETE & REINFORCING										
CODE	DESCRIPTION	QUANTITY	UNIT	MAT / U	MAT TOTAL	LAB / U	LABOR T	EQUIP / U	EQUIP T	TOTAL
033053403940	Strip Footing - ADD	51.85	CY	115.91	$ 6,009.93	81.96	$ 4,249.63	0.92	$ 47.70	$ 10,307.26
033053403850	Spread Footings - ADD	147.70	CY	170.41	$ 25,169.56	76.50	$ 11,299.05	0.86	$ 127.02	$ 36,595.63
033053404350	Retaining Wall - ADD	220.83	CY	160.89	$ 35,529.34	225.39	$ 49,772.87	31.13	$ 6,874.44	$ 92,176.65
033053403200	Slab on Grade NW - ADD	446.00	CY	102.94	$ 45,911.24	43.71	$ 19,494.66	0.62	$ 276.52	$ 65,682.42
033053403250	Elevated Slab - ADD	165.00	CY	216.25	$ 35,681.25	165.97	$ 27,385.05	22.02	$ 3,633.30	$ 66,699.60
032110600500	Reinforcing - #3 - #7 - ADD	27.00	TN	938.00	$ 25,326.00	1,139.00	$ 30,753.00	-	$ -	$ 56,079.00
032205500300	WWF - Add	220.00	CSF	16.27	$ 3,579.40	27.67	$ 6,087.40	-	$ -	$ 9,666.80
030505100070	Demo Concrete - ETR	11.00	CY	-	$ -	150.00	$ 1,650.00	32.26	$ 354.86	$ 2,004.86
033053403200	SOG NW - ETR	7.00	CY	102.94	$ 720.58	43.71	$ 305.97	0.62	$ 4.34	$ 1,030.89
033053403250	Elevated Slab - ETR	4.00	CY	216.25	$ 865.00	165.97	$ 663.88	22.02	$ 88.08	$ 1,616.96
031113450050	Formwork - Footings	2,150.00	SFCA	3.40	$ 7,310.00	3.09	$ 6,643.50	-	$ -	$ 13,953.50
031113351500	Formwork - Elevated Slabs	21,000.00	SF	1.25	$ 26,250.00	4.23	$ 88,830.00	-	$ -	$ 115,080.00
031113651100	Formwork - Slab on Grade	1,500.00	LF	0.44	$ 660.00	2.79	$ 4,185.00		$ -	$ 4,845.00
SUBTOTAL					$ 213,012.30		$ 251,320.01		$ 11,406.26	$ 475,738.57
MISC. MATERIAL (5%)					$ 10,650.61		$ 12,566.00		$ 570.31	$ 23,786.93
TOTAL					$ 223,662.91		$ 263,886.01		$ 11,976.57	**$ 499,525.50**

FOOTINGS						
MARK	SIZE	Volume	REINF	QUANTITY	CONCRETE (cy) 2500 PSF	REBAR
F4	4X4X12	16	5#5	2	32	10 #5
F5	5X5X12	25	5#5	7	175	35 #5
F6	6X6X14	42	7#5	8	336	56 #5
F6A	6X6X18	54	7#5	2	108	14 #5
F7	7X7X18	73.5	6#7	9	661.5	54 #7
F8	8X8X20	106.25	7#7	14	1487.5	98 #7
F9	9X9X22	148.5	8#7	8	1188	64 #7

APPENDIX B-2

ASSEMBLIES MEP ESTIMATE

MEP ASSEMBLIES ESTIMATE										
Assembly Type	Quantity	Assembly Number	Description	Unit	Material O&P	Installation O&P	Total O&P	Ext. Material O&P	Ext. Installation O&P	Ext. Total O&P
Plumbing Assemblies	7	D20108201880	Water cooler, electric, wall hung, dual height, 14.3	Ea.	$ 1,476.10	$ 546.25	$ 2,022.35	$ 10,332.70	$ 3,823.75	$ 14,156.45
	3	D20101102160	Water closet, vitreous china, bowl only with flush valve, floor mount, 18" high bowl, ADA compliant	Ea.	$ 855.12	$ 690.46	$ 1,545.58	$ 2,565.36	$ 2,071.38	$ 4,636.74
	18	D20101102080	Water closet, vitreous china, bowl only with flush valve, wall hung	Ea.	$ 1,934.20	$ 707.94	$ 2,642.14	$ 34,815.60	$ 12,742.92	$ 47,558.52
	3	D20102102000	Urinal, vitreous china, wall hung	Ea.	$ 636.25	$ 699.20	$ 1,335.45	$ 1,908.75	$ 2,097.60	$ 4,006.35
	7	D20103101760	Lavatory w/trim, vanity top, stainless, self-rimming, 25" x 22"	Ea.	$ 855.12	$ 624.91	$ 1,480.03	$ 5,985.84	$ 4,374.37	$ 10,360.21
	3	D20103101960	Lavatory w/trim, vanity top, vitreous china, 19" x 16"	Ea.	$ 748.23	$ 655.50	$ 1,403.73	$ 2,244.69	$ 1,966.50	$ 4,211.19
	21	D20402102040	Roof drain, DWV PVC, 4" diam, diam, 10' high	Ea.	$ 453.01	$ 769.12	$ 1,222.13	$ 9,513.21	$ 16,151.52	$ 25,664.73
	400	D20908100880	Pipe cast iron, soil, B & S, service weight, 4" diameter	L.F.	$ 18.93	$ 19.23	$ 38.16	$ 7,572.00	$ 7,692.00	$ 15,264.00
	700	D20908100940	Pipe cast iron, soil, B & S, service weight, 8" diameter	L.F.	$ 49.37	$ 38.02	$ 87.39	$ 34,559.00	$ 26,614.00	$ 61,173.00
	600	D20908100920	Pipe cast iron, soil, B & S, service weight, 6" diameter	L.F.	$ 32.07	$ 22.72	$ 54.79	$ 19,242.00	$ 13,632.00	$ 32,874.00
	550	D20908100840	Pipe cast iron, soil, B & S, service weight, 2" diameter	L.F.	$ 10.18	$ 16.78	$ 26.96	$ 5,599.00	$ 9,229.00	$ 14,828.00
	750	D20908101260	Copper tubing, hard temper, solder, type K, 3/4" diameter	L.F.	$ 10.94	$ 7.95	$ 18.89	$ 8,205.00	$ 5,962.50	$ 14,167.50
	1200	D20908101280	Copper tubing, hard temper, solder, type K, 1"	L.F.	$ 14.66	$ 8.91	$ 23.57	$ 17,592.00	$ 10,692.00	$ 28,284.00
	400	D20908101300	Copper tubing, hard temper, solder, type K, 1-1/4" diameter	L.F.	$ 18.22	$ 10.49	$ 28.71	$ 7,288.00	$ 4,196.00	$ 11,484.00
	450	D20908101340	Copper tubing, hard temper, solder, type K, 2"	L.F.	$ 36.65	$ 14.68	$ 51.33	$ 16,492.50	$ 6,606.00	$ 23,098.50
	450	D20908101380	Copper tubing, hard temper, solder, type K, 3"	L.F.	$ 78.39	$ 19.67	$ 98.06	$ 35,275.50	$ 8,851.50	$ 44,127.00
	700	D20908101500	Copper tubing, hard temper, solder, type K, 6"	L.F.	$ 437.74	$ 43.26	$ 481.00	$ 306,418.00	$ 30,282.00	$ 336,700.00
HVAC Asseblies	46000	D30301103960	Packaged chiller, air cooled, with fan coil unit, schools and colleges,, 20,000 SF,76.66 ton	S.F.	$ 8.50	$ 4.41	$ 12.91	$ 391,000.00	$ 202,860.00	$ 593,860.00
	1	D20202402260	Electric water heater, commercial, 100< F rise, 500 gal, 240 KW 984 GPH	Ea.	$ 61,589.00	$ 2,534.60	$ 64,123.60	$ 61,589.00	$ 2,534.60	$ 64,123.60
	17	D30401341080	VAV Terminal, Hot Water Reheat 800 CFM	Ea.	$ 3,232.15	$ 3,430.45	$ 6,662.60	$ 54,946.55	$ 58,317.65	$ 113,264.20
	46000	D30105101760	Apartment building heating system, fin tube radiation, forced hot water, 1,000 SF area, 10,000 CF vol	S.F.	$ 7.31	$ 4.44	$ 11.75	$ 336,260.00	$ 204,240.00	$ 540,500.00
	5	D30501301010	Space heater, suspended, horizontal mount, hot water, propeller fan, 20 MBH	Ea.	$ 2,036.00	$ 1,332.85	$ 3,368.85	$ 10,180.00	$ 6,664.25	$ 16,844.25
	1	D30401261010	Fan coil A/C system, horizontal housing, electric heat, controls, 2 pipe, 1/2 ton	Ea.	$ 2,545.00	$ 2,119.45	$ 4,664.45	$ 2,545.00	$ 2,119.45	$ 4,664.45
	2	D30406101040	Plate heat exchanger, 1800 GPM	Ea.	$ 176,623.00	$ 30,273.40	$ 206,896.40	$ 353,246.00	$ 60,546.80	$ 413,792.80
	4	D30302141400	Heating/cooling system,heat pump 3 ton, one zone, SEER 14, 1200 SF	Ea.	$ 6,617.00	$ 4,304.45	$ 10,921.45	$ 26,468.00	$ 17,217.80	$ 43,685.80
	10	D30401341080	VAV Terminal, Hot Water Reheat 2000 CFM	Ea.	$ 5,420.85	$ 7,603.80	$ 13,024.65	$ 54,208.50	$ 76,038.00	$ 130,246.50
	46000	D30105301920	Commercial building heating systems, terminal unit heaters, forced hot water, 10,000 SF bldg,100,000 CF, total, 2 floors	S.F.	$ 4.52	$ 4.02	$ 8.54	$ 207,920.00	$ 184,920.00	$ 392,840.00
Fire Protection Assemblies	1045	D40909100340	Dispersion nozzle, FM200 1-1/2" dispersion nozzle	Ea.	$ 69.22	$ 41.95	$ 111.17	$ 72,334.90	$ 43,837.75	$ 116,172.65
	150000	D40104101100	Wet pipe sprinkler systems, steel, ordinary hazard, 1 floor, 50,000 SF	S.F.	$ 1.68	$ 2.06	$ 3.74	$ 252,000.00	$ 309,000.00	$ 561,000.00

Electrical & Lighting Assemblies	1	D50102400600	Switchgear installation, incl switchboard, panels & circuit breaker, 277/480 V, 1600 A	Ea.	$ 32,781.60	$ 9,698.33	$ 42,479.93	$ 32,781.60	$ 9,698.33	$ 42,479.93
	1	D50102400620	Switchgear installation, incl switchboard, panels & circuit breaker, 277/480 V, 2000 A	Ea.	$ 40,035.00	$ 10,716.23	$ 50,751.23	$ 40,035.00	$ 10,716.23	$ 50,751.23
	350	D50201250560	Receptacle duplex 120 V grounded, 20 A with box, plate, 3/4" EMT & wire	Ea.	$ 46.63	$ 242.03	$ 288.66	$ 16,320.50	$ 84,710.50	$ 101,031.00
	46000	D50202100540	Fluorescent fixtures recess mounted in ceiling, 2.4 watt per SF, 60 FC, 15 fixtures @ 32 watt per 1000 SF	S.F.	$ 2.31	$ 6.16	$ 8.47	$ 106,260.00	$ 283,360.00	$ 389,620.00
	46000	D50201300320	Wall switches, 2.5 per 1000 SF	S.F.	$ 0.12	$ 0.51	$ 0.63	$ 5,520.00	$ 23,460.00	$ 28,980.00
	46	D50309200104	Internet wiring, 4 data/voice outlets per 1000 S.F.	M.S.F.	$ 320.28	$ 1,034.87	$ 1,355.15	$ 14,732.88	$ 47,604.02	$ 62,336.90
	35	D50309100240	Communication and alarm systems, includes outlets, boxes, conduit and wire, sound systems, 30 outlets	Ea.	$ 13,941.60	$ 27,030.90	$ 40,972.50	$ 487,956.00	$ 946,081.50	$ 1,434,037.50

TOTAL MECHANICAL ASSEMBLIES COST	$ 1,498,363.05	$ 815,458.55	$ 2,313,821.60
TOTAL ELECTRICAL ASSEMBLIES COST	$ 703,605.98	$ 1,405,630.58	$ 2,109,236.56
TOTAL PLUMBING ASSEMBLIES COST	$ 525,609.15	$ 166,985.04	$ 692,594.19
TOTAL FIRE PROTECTION ASSEMBLIES COST	$ 324,334.90	$ 352,837.75	$ 677,172.65
TOTAL	**$ 3,051,913.08**	**$ 2,740,911.92**	**$ 5,792,825.00**

APPENDIX C

SITE LAYOUT PLANNING

Intramural Building Addition and Renovation

Site Logistics - Excavation

Gonzalo Lay

TECH REPORT II

10/16/2013

Sidewalks
Roads/Streets
Street Light
Building Entrance/Exit
Tree Protection
Existing Trees
Portable Toilets
Dumpsters
Material Storage
Fire Hydrant
Vehicular Parking
Construction Site Entrance/Exit
Office Trailers
Temporary Electric
Site Fence
Equipment Storage
Concrete Truck
Crane & Mandrel
Concrete Washout
LMDG Start Point
LMDG Work Flow
Concrete Pump

Intramural Building Addition and Renovation

Site Logistics - Excavation

Gonzalo Lay

TECH REPORT II

10/16/2013

Sidewalks
Roads/Streets
Street Light
Building Entrance/Exit
Tree Protection
Existing Trees
Portable Toilets
Dumpsters
Material Storage
Fire Hydrant
Vehicular Parking
Construction Site Entrance/Exit
Office Trailers
Temporary Electric
Site Fence
Equipment Parking
Equipment Storage
Excavator
Front End Loader
Dump Truck
Basement Exc. Flow
West Exc. Flow
East Exc. Flow
Site Entry Flow
Site Exit Flow
1 Excavation Phase

Intramural Building Addition and Renovation

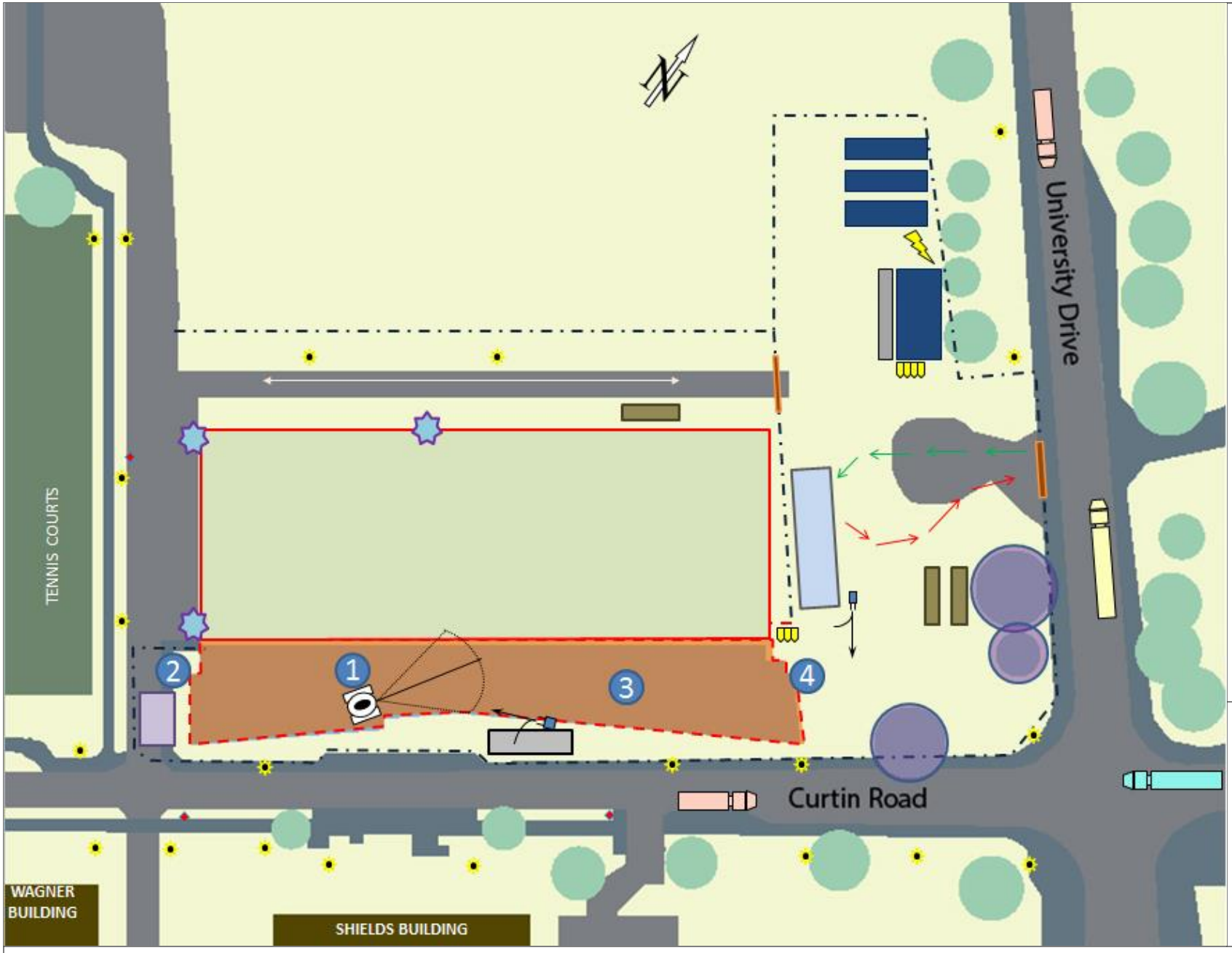
Site Logistics - Substructure

Gonzalo Lay

TECH REPORT II

10/16/2013

Sidewalks
Roads/Streets
Street Light
Building Entrance/Exit
Tree Protection
Existing Trees
Portable Toilets
Dumpsters
Concrete / Formwork
Fire Hydrant
Vehicular Parking
Construction Site Entrance/Exit
Office Trailers
Temporary Electric
Site Fence
Equipment Storage
Rebar Laydown
Slab Pour
Spread Footing
Retaining Wall
Concrete Truck
Strip Footings
Wall Pour Flow
Material Delivery
Site Exit Flow
Site Entry Flow
2 Pour Phase



Intramural Building Addition and Renovation

Site Logistics – Superstructure Steel

Gonzalo Lay

TECH REPORT II

10/16/2013

Sidewalks
Roads/Streets
Street Light
Building Entrance/Exit
Tree Protection
Existing Trees
Portable Toilets
Dumpsters
Material Laydown
Fire Hydrant
Vehicular Parking
Construction Site Entrance/Exit
Office Trailers
Temporary Electric
Site Fence
Equipment Storage
Steel Laydown
Forklift
Mobile Crane
Site Exit Flow
Site Entry Flow
Crane Location
Material Delivery

APPENDIX D

GENERAL CONDITIONS ESTIMATE

DESCRIPTION	EA	QUANTITY	UNIT	RATE	TOTAL COST
Personnel Costs					
Project Executive	1	54	Week	2,525.00	$ 136,350.00
Project Manager	1	54	Week	2,225.00	$ 120,150.00
Project Superintendent	1	54	Week	2,050.00	$ 110,700.00
Assistant PM	1	54	Week	1,925.00	$ 103,950.00
MEP Coordinator	1	54	Week	1,925.00	$ 103,950.00
Safety Coordinator	1	54	Week	1,925.00	$ 103,950.00
Admin - Secretary	1	54	Week	1,475.00	$ 79,650.00
Office - Field					
Trailer Rental	2	13	Month	305.00	$ 7,930.00
Office Equipment Rental	1	13	Month	200.00	$ 2,600.00
Lights & HVAC	1	13	Month	152.00	$ 1,976.00
Office Supplies	1	13	Month	75.00	$ 975.00
Site Fence	1	2325	LF	23.85	$ 55,451.25
Telephone	1	13	Month	81.00	$ 1,053.00
Time Lapse Camera	0	1	Ea	2,650.00	$ 2,650.00
Postage	1	13	Month	200.00	$ 2,600.00
Field Operations					
Signage	60	0	SF	31.50	$ 1,890.00
Temporary Toilets	7	54	Week	62.00	$ 23,436.00
Water Supply	1	13	Month	63.00	$ 819.00
Temporary Power, 400 Amp	1	-	Ea	2,275.00	$ 2,275.00
Insurance & Bonds					
Builders Risks Insurance	Owner				
Liabilities Insurance		19,858,861.00	Job	2.02%	$ 401,148.99
Payment & Performance Bond		19,858,861.00	Job	0.70%	$ 139,012.03
Permits		19,858,861.00	Job	0.50%	$ 99,294.31
Waste Management					
Dumpsters	3	54	Week	565.00	$ 91,530.00
Total					$ 1,593,340.57

APPENDIX E

LEED EVALUATION

Code	Credit Name	Classification	Points
Sustainable Sites			
1.0	Site Selection	Minimal	1
2.0	Development Density and Community Connectivity	Minimal	5
4.1	Alternate Transportation - Public Transportation Access	Minimal	6
	The building will be used as a fitness and recreational facility. Intramural sporting events take place - consider facility for the community		
4.2	Alt. Transportation: Bicycle Storage & Changing Rooms	Significant	1
5.2	Site Development: Maximize Open Space	Significant	1
6.1	Storm Water Design: Quantity Control	Mandatory	1
6.2	Storm Water Design: Quantity Control	Significant	1
7.2	Heat Island Effect: Roof	Significant	1
Energy and Atmosphere			
1.0	Water Efficient Landscaping	Minimal	4
Energy and Atmosphere			
3.0	Enhanced Commissioning	Mandatory	2
4.0	Enhanced Refrigerant Management	Mandatory	2
	Ensure that refrigerants used do not pollute the environment		
6.0	Green Power	Mandatory	2
Materials and Resources			
2.1	Construction Waste Management: Divert 50-75% from Disposal	Mandatory	2
	Recycle non-hazardous materials, properly dispose hazardous materials.		
4.0	Recycled Content: 10-20%	Mandatory	2
	Glazing		
5.1	Regional Materials: 10-20%	Mandatory	2
	Extracted, harvested or recovered materials within 500 miles of the project site (face brick, glazing)		
7.0	Certified Wood	Mandatory	1
Indoor Environmental Quality			
1.0	Outdoor Air Delivery Monitoring	Mandatory	1
3.1	Construction IAQ Management Plan: During Construction	Mandatory	1
3.2	Construction IAQ Management Plan: Before Occupancy	Mandatory	1
	Proper cleaning of ductwork and filters		
4.1	Low-Emitting Materials: Adhesives and Sealants	Mandatory	1
4.2	Low-Emitting Materials: Paints and Coatings	Mandatory	1
4.3	Low-Emitting Materials: Carpet Systems	Mandatory	1
4.4	Low-Emitting Materials: Composite Wood & Agrifiber Products	Mandatory	1
5.0	Indoor Chemical Pollutant Source Control	Mandatory	1

6.1	Controllability of Systems: Lighting	Mandatory	1
6.2	Controllability of Systems: Thermal Comfort	Significant	1
7.1	Thermal Comfort: Design	Significant	1
7.2	Thermal Comfort: Verification	Mandatory	1
8.1	Daylight and Views: Daylight	Significant	1
	Day lighting maintain in at least 75% of the building's occupied spaces (Addition only)		
Innovation and Design Process			
1.0	Innovation in Design	Significant	
	Operational Curtain Wall System		1
	Installation of Rain Harvesting System		1
2.0	LEED Accredited Professional	Mandatory	1
Total Minimum Points Under Criteria			**50**