Technical Report 2

October 19, 2011

Courtesy of RLPS Architects

Courtesy of RLPS Architects

Masonic Village at Sewickley

Sewickley, PA

Jason Drake

Construction Option

Advisor: Craig Dubler

Executive Summary

Technical Report 2 provides a more in-depth analysis on construction related activities for Masonic Village at Sewickley. The evaluations in this report cover project schedule, structural system estimate, general conditions estimate, LEED evaluation, and BIM use evaluation. Each topic is thoroughly examined with respect to its individual application to the construction process.

A detailed project schedule was first compiled in order to understand how long various phases and activities are expected to take. Slated from September 23, 2010 – September 27, 2012, the detailed schedule involved in this report is made up of 160 items. As expected, phase 2 is the longest phase and takes 9 months to complete. This is because phase 2 is where the majority of new construction takes place. Throughout the course of the project, a total of $774,000 is devoted to general conditions costs. General conditions were evaluated through four major categories, staffing, temporary utilities, facilities/equipment, and miscellaneous expenses. Project staffing was found to be the largest but was closely followed by facilities/equipment cost.

The detailed structural estimate included a 16 item breakdown of each major load bearing component for both the substructure and superstructure. Whether it was concrete, masonry, or wood, the volume of each material was calculated and RS Means was used to compile an estimate. The foundation was estimated at $485,761.85, floor construction came in at $640,294.62, bearing walls were calculated to be $1,268,289.53, and the roofing system was found to be $228,175. The overall cost of the structure was estimated to be $2,622,521. This is only a 2.7% difference from the actual cost.

Although neither BIM nor a LEED rating was actually pursued on the project, a critical evaluation of each was still performed for the building. Using a LEED 2009 for Healthcare scorecard, the project surprisingly earned enough points to obtain a LEED rating even though they are not pursing it. A total of 55 points could potentially be earned and is enough credits to achieve LEED silver. The BIM evaluation weighs the pros and cons of using BIM on the project and states how it could have been implemented to further benefit project development. A total of nine items were decided to be of value to the project team and used to compile a level 1 process map. This map shows a detailed layout of which stages of development each use benefits. Overall, BIM could have been used most effectively to help resolve difficult coordination issues in the field and avoid incurring costly change orders.

Table of Contents

Detailed Project Schedule

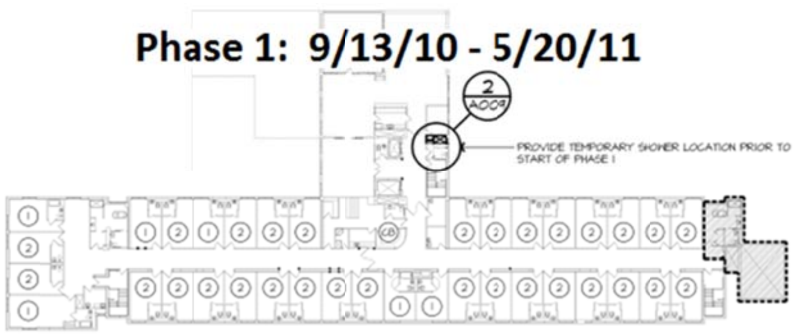
A detailed project schedule for Masonic Village at Sewickley has been assembled to further break down the five major phases of construction. A more detailed breakdown of activities creates an opportunity for a better analysis of project planning and correlation of activities. A full detailed project schedule can be viewed in **Appendix A**, which further illustrates the lifecycle of the project on a step-by-step basis.

Upon completion of the design process, a GMP was signed by Weber Murphy Fox in which they were officially able to begin construction activity. Due to the sequencing of the project, external factors such as weather have a more significant impact at the beginning of the schedule than it does towards the end. This is due to the fact that phases 1-3 are new construction and phases 4-5 are interior renovations. Therefore, the ability to keep on track during the early stages of development has the ability to either make or break the construction manger's anticipated final completion date. Expected dates of construction activity have thus far been scheduled from September 13, 2010 – September 27, 2012. This time frame reflects both the 66,455 SF of new construction, as well as the 40,000 SF of interior renovations to the existing nursing facility. Dates of several processes critical to the construction schedule are provided in below in Table 1.

(**Table 1:** Building Process Dates)

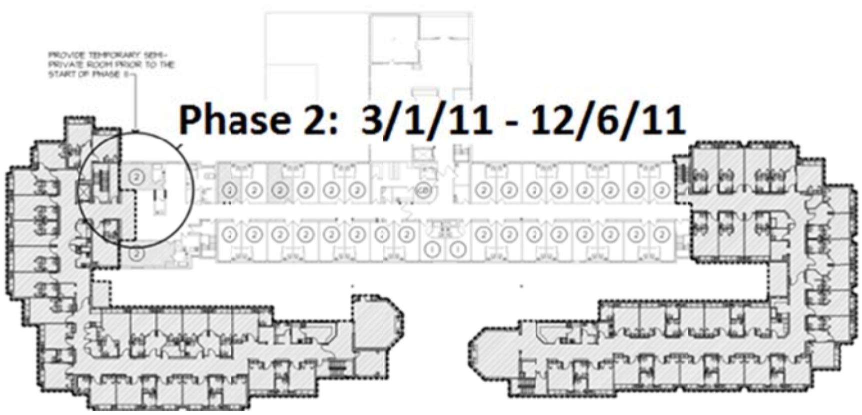
Site Development:	9/14/10 – 12/23/10
Foundations:	1/3/11 – 1/28/11
Concrete Placement:	1/24/11 – 2/24/12
Precast Planks:	3/15/11 – 3/21/12
Masonry:	3/18/11 – 3/30/12
MEP:	4/18/11 – 9/12/12
Roofing:	6/10/11 – 4/17/12
Building Enclosure:	6/28/11 – 5/2/12
Finishes:	8/8/11 – 9/13/12
Openings:	9/5/11 – 8/2/12
Final Site Work:	5/7/12 – 8/31/12
Turnover/Commissioning:	8/31/12 – 9/27/12

Project phasing of the facility is also a unique aspect of the construction schedule. The owner intends to chase the construction team around the building and occupy the spaces as each phase becomes complete. Therefore it is essential for project development to remain on or ahead of schedule, so as to avoid creating delays in anticipated move-in dates. Following the completion of phase three, all residents are planned to be relocated to the newly constructed additions. The shift will allow renovation work to begin on the previously existing resident rooms. A breakdown of project phasing paired with expected dates of construction is displayed in Figures 1-5.



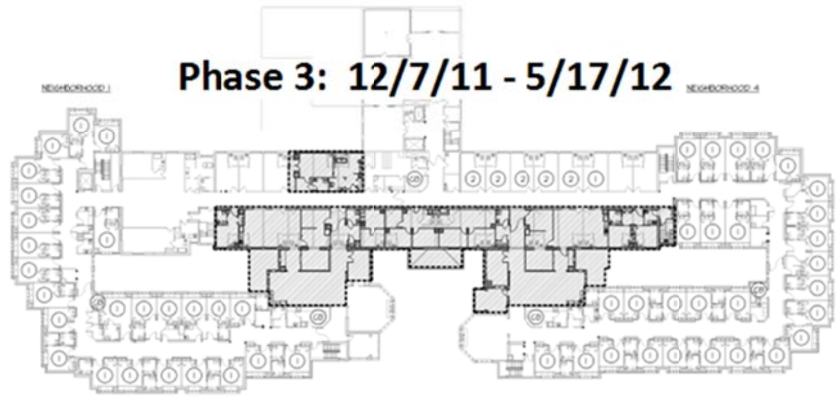
(**Figure 1:** Phase 1 Construction Dates)

- Courtesy of Reese, Lower, Patrick, & Scott Architects, LTD



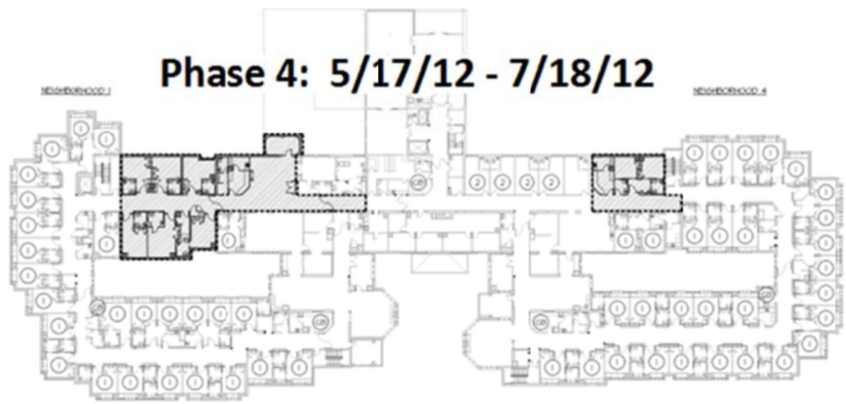
(**Figure 2:** Phase 2 Construction Dates)

- Courtesy of Reese, Lower, Patrick, & Scott Architects, LTD



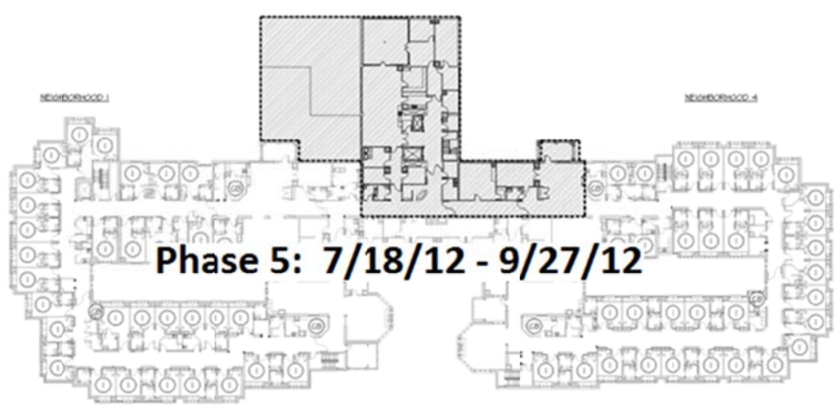
(**Figure 3:** Phase 3 Construction Dates)

- Courtesy of Reese, Lower, Patrick, & Scott Architects, LTD



(**Figure 4:** Phase 4 Construction Dates)

- Courtesy of Reese, Lower, Patrick, & Scott Architects, LTD



(**Figure 5:** Phase 5 Construction Dates)

- Courtesy of Reese, Lower, Patrick, & Scott Architects, LTD

Detailed Assemblies Estimate

Since there are no typical bays, a detailed assemblies estimate was performed as opposed to a detailed structural system estimate. In order to create a detailed assemblies estimate for Masonic Village at Sewickley, the structural system was broken down into four major categories and further subdivided into 16 individual components. The larger categories include foundation, floor construction, bearing walls, and roofing system. The generated estimate includes labor, material, and equipment cost in the figures used for computation. Cost values were obtained from RS Means Assemblies Cost Data 2011 and paired with actual dimension of line items extracted from project drawings and specifications. **Appendix B** displays all tabulated values used in conducting the structural system estimate.

Foundation:

Four different foundation elements were included in this portion of the estimate. The building's foundation includes continuous strip footings, caissons, grade beams, and underpinning of the existing assisted living building. Since the building is positioned on a hillside the 2nd floor, as well as the 1st, each requires the use of strip footings. The smaller 1st floor region contains 555 LF of footings, whereas the 2nd floor calls out 828 LF. Both footings are made of the same concrete mix and are dimensioned at 2' wide by 1' thick. Caissons are second on the list of foundation elements. Between Building A and Building B there are a total of 40 caissons in the makeup of the foundation. Each caisson is 3' in diameter and approximately 11' deep. Atop the caissons rest a number of grade beams. Grade beams in the foundation differ vastly in size and span. The grade beams 2'6" wide by 4'0" deep are the most abundant on site, adding up to 386 LF. Not very far behind them are grade beams sized at 2' wide by 4' deep. Only trailing by five feet, there are a grand total of 381 LF. The third size used on site is much larger in girth, at 4' wide by 4' deep, and make up a length of 223 LF. Lastly are the heftiest grade beams of all, which account for only 60 LF of the building's substructure. These beams are 4' wide by 6' deep. The final element considered in foundation work is underpinning. Given that both the additions each connect to the existing building in two separate locations, engineers have dictated a need for underpinning the foundation of the original building. An estimated 86 CY of concrete will be needed for this procedure. The following values taken from RS Means Assemblies Cost Data 2011 and used to estimate the cost of foundation work at **$485,761.85:**

Strip Footing	-	$36.95/LF
Caissons	-	$1,735/EA
Grade Beam (2'6"x4')	-	$325/LF
Grade Beam (2'x4')	-	$243/LF
Grade Beam (4'x4')	-	$412/LF
Grade Beam (4'x6')	-	$421/LF
Underpinning	-	$350/CY

Floor Construction:

Floor construction is comprised of two primary components. These constituents are slabs on grade and precast concrete planks. Two different size slab thickness were used in conjunction with the project. The sub-grade 1st floor of Building A calls for a 6" reinforced slab. This slab covers the entire 3,835 SF 1st floor region. The second slab on grade used for the project is a 4" reinforced slab. This size slab is used for the entirety of the 2nd floor. The amount of 2nd story floor space requiring a slab on grade is roughly 28,529 SF. The remaining square feet will require elevated floor space. All elevated floors are made of 10" thick precast concrete planks, which span across the bays of the structure. Between the 2nd and 3rd floor, 35,301 SF of floor space require the use of this type of system. All estimated values of precast include the desired 2" concrete topping slab called for in the design specifications. The numbers below were used to generate an estimate of **$640,294.62** for the total floor construction:

6" Slab on Grade	-	$5.98/SF
4" Slab on Grade	-	$4.96/SF
Precast Concrete Planks	-	$13.48/SF

Bearing Walls:

Two types of wall assemblies were implemented in Masonic Village at Sewickley. The first system, which was used on a very small scale, was cast-in-place (CIP) concrete. All concrete was placed using a concrete pump truck. Both the means of placement and formwork were considered in the values used to conduct the estimate. The only region of the building that actually uses CIP concrete walls is the first floor. The 3,835 SF area only has 379 LF of concrete bearing walls. Therefore, the predominant means of structural support is CMU load bearing walls. Two different sizes of block were implemented in the structure. The first size, which is 8"x16"x16", is used below grade. Blocking of this size accounts for 15,990 SF. The second size CMU used on the project is dimensioned at 8"x8"x16". This is typically the standard size CMU most often used in construction. The amount needed to construct all exterior bearing walls is 45,521 SF, whereas the quantity demanded for interior bearing walls comes in at 40,227 SF. The total estimate for bearing walls in the building was found to be **$1,268,289.53**, which is certainly the most dominant number in the structural system estimate. The succeeding values were used for calculations:

Cast in Place Walls	-	$261/LF
16" CMU	-	$14.25/SF
8" CMU	-	$10.98/SF

Roofing System:

Lastly, the roofing system was analyzed to complete the structural system estimate. The building's roof is comprised of prefabricated wood trusses, covered with 5/8" sheathing. The trusses were estimated on a square foot basis. The total amount of roof space to be enclosed is 45,635 SF. RS Means Assemblies Cost Data 2011 provided a value of $2.50/SF of roof space, which includes both material and labor. To account for the 5/8" sheathing, another $2.50/SF was added to the estimate. This provided a final roof system value of $5/SF. Upon multiplying this amount by the overall square footage, the roofing system has been estimated to be **$228,175.**

The following tables provide an overview of the detailed structural system estimate for the project. Table 2illustrates how much of the estimate each major system accounts for, whereas Table 3 provides an itemized breakdown of individual structural components within the systems. The total detailed structural estimate has been computed at **$2,622,521**. When compared to the real value of $2,552,600 used by the construction team, there is a difference of only 2.7%. Given that a detailed estimate is accurate to ± 5%, the calculated value is within a reasonable margin of error.

(**Table 2:** Structural System Costs)

Item	Percentage	Overall Cost
Foundation	18.5%	$485,761.85
Floor Construction	24.4%	$640,294.62
Bearing Walls	48.4%	$1,268,289.53
Roofing System	8.7%	$228,175.00
TOTAL:	**100%**	**$2,622,521.00**

(**Table 3:** Structural System Breakdown)

Item	Unit	Cost/Unit	Cost
1st Floor Strip Footing	555 LF	$36.95/LF	$20,507.25
2nd Floor Strip Footing	828 LF	$36.95/LF	$30,594.60
Caissons (3' x 11')	40 EA	$1,735/EA	$69,400.00
Grade Beam (Size 1)	386 LF	$325/LF	$125,450.00
Grade Beam (Size 2)	381 LF	$243/LF	$92,583.00
Grade Beam (Size 3)	223 LF	$412/LF	$91,867.00
Grade Beam (Size 4)	60 LF	$421/LF	$25,260.00
Underpinning	86 CY	$350/CY	$30,100.00
6" Slab on Grade	3,835 SF	$5.98/SF	$22,933.30
4" Slab on Grade	28,529 SF	$4.96/SF	$141,503.84
Precast Planks w/2" Topping	35,301 SF	$13.48/SF	$475,857.48
Cast-in-Place Walls	379 LF	$261/LF	$98,919.00
16" Exterior CMU Walls	15,990 SF	$14.25/SF	$227,857.50
8" Exterior CMU Walls	45,521 SF	$10.98/SF	$499,820.58
8" Interior CMU Walls	40,227 SF	$10.98/SF	$441,692.45
Trusses & Sheathing	45,635 SF	$5.00/SF	$228,175.00
TOTAL:			**$2,622,521.00**

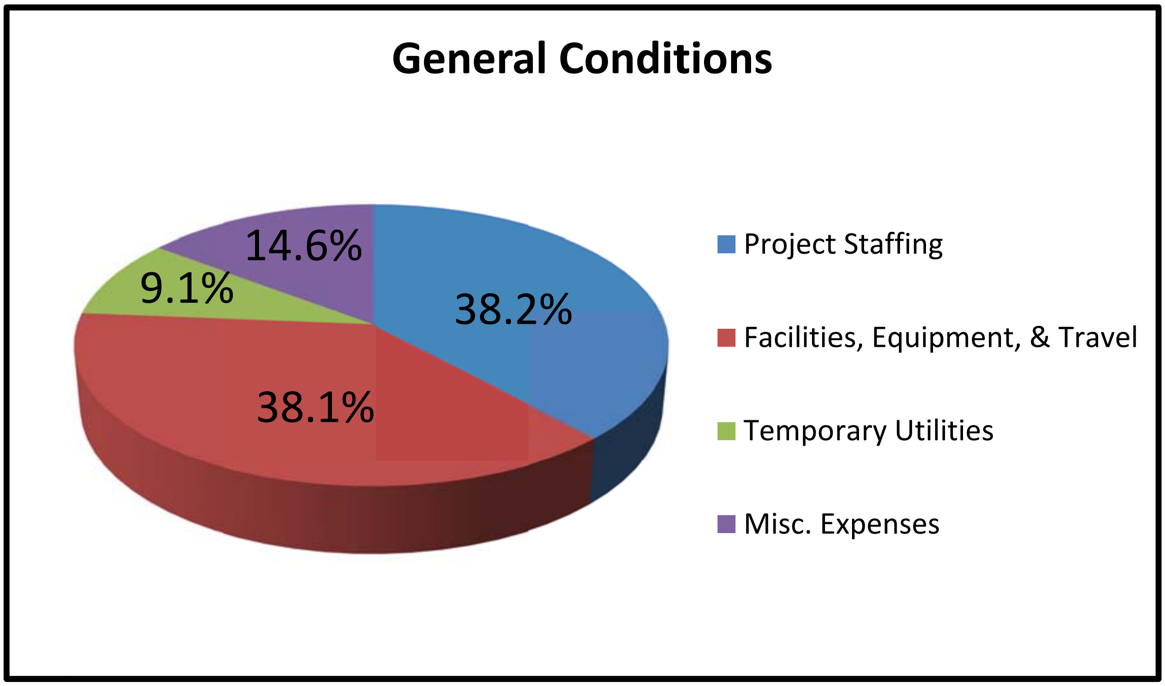
General Conditions Estimate

The general conditions estimate created for Masonic Village at Sewickley has been broken down into several different components. These categories include project staffing, facilities and equipment, temporary utilities, and miscellaneous expenses. Table 4 illustrates each of these costs on a week-by-week breakdown. To view a more detailed general conditions estimate refer to Table 6 of **Appendix C**.

(**Table 4:** Basic GC Breakdown)

	Weekly Rate	Unit	Quantity	Total Cost
Project Staffing	$2,788	Week	106	$295,488
Facilities, Equipment, & Travel	$1,068	Week	106	$113,256
Temporary Utilities	$664	Week	106	$70,400
Miscellaneous Expenses	$2,782	Week	106	$294,856
TOTAL:	**$7,302**	**Week**	**106**	**$774,000**

The estimate for project staffing is the total combination of three constituents. These items include the field engineer, project supervision, and miscellaneous labor. Considering there are only full-time two staff members and two that are dedicated to this particular project part-time, labor only accounted for slightly more than one-third of the total general conditions cost. Although labor makes up an uncharacteristically low percentage of the overall general conditions cost, it helped in providing a competitive total price for the owner. The second category in the breakdown is a compilation of five components. Facilities and equipment is made up of the field office, temporary toilet, storage trailers, travel, and equipment rental. Travel makes up the largest part of this category, being estimated at $72,096. This is because the field engineer makes a 200 mile round trip to the site each and every day, as well as the project manager's 300 mile weekly round trip. It becomes evident that this excessive charge offsets some of the savings created by a small project team. Temporary utilities are the third item in the analysis. Included in the estimate is temporary water, electric, and heat. Temporary heat is the largest part of this portion at $32,000, followed by temporary electric at $24,000, and trailed lastly by temporary water at $14,400. The remaining items in the detailed general conditions estimate not yet accounted for have been lumped into a single category titled miscellaneous expenses. A graphical representation showing the percent of general conditions each category makes up can be seen in Figure 6.



(**Figure 6:** GC Breakdown by Category)

The overall general conditions cost for the project has been estimated at $774,000 of the total GMP. Also included in **Appendix C** is a list of fees and contingency costs, located in Table 7. The project team was involved in a number of pre-construction activities. The fee for such work has been billed at $151,000. The total construction management fee for the actual construction process is listed at $453,000. Given the struggling economic conditions of current times, this fee has been reduced to only 2% of the total cost of construction. The final line item in Table 7 is construction contingency. The project team has been allotted $2,094,846 for contingency. Therefore, the total billable charges between fees and contingency provide a maximum total of amount of $2,698,846.

LEED Evaluation

Masonic Village at Sewickley is not currently pursing any sort of LEED accredited rating. Nonetheless, a complete scorecard of LEED 2009 for Healthcare: New Construction and Major Renovations has been assembled to assess all LEED points the project currently qualifies for. This scorecard can also be used to direct specific attention to points that may be attainable with minimal additional effort by the project team. A completed LEED for Healthcare scorecard can be viewed in **Appendix D**. The intent of the evaluation is to further help bring to light the possibility of actually achieving a LEED rating on the project.

Sustainable Sites is the first major category included on the scorecard. This section accounts for 18 of 110 possible points. The most important thing to note about this category is that the project meets both prerequisites necessary to actually earn the points within the sustainable sites section. Prerequisites include construction activity pollution prevention and environmental site assessment, both of which focus on airborne dust generation, soil erosion control, and environmental contamination. The building's strongest areas in the sustainable sites category are alternative transportation, stormwater design, and having a connection to the natural world. Site conditions allow for public transportation access as well as bicycle storage and changing rooms. The size of the parking lot meets local zoning requirements but is not excessive, this encourages carpooling and alternative means of transportation. Stormwater drainage is also a critical issue in this section. An extensive stormwater system provides ample quality control for reducing environmental disruptions to natural hydrology and managing stormwater runoff. The last strong point in this section is connection to the natural world. Two large courtyards constructed in each of the building's wings provide an outdoor place of respite, allowing patients and staff to benefit from direct access to a natural environment. Judging by the existing conditions the project was awarded 5 points for alternative transportation, 2 points for stormwater drainage, 2 points for connection to the natural world, and 2 points for other. This adds up to 11 out 18 points for the sustainable sites category.

Water efficiency ranks as a 9 point category. Once again the building meets both prerequisites. It experiences a 20% reduction in water usage and minimizes potable water use for cooling equipment. The project scored very well in this section and achieved a minimum of 1 point for each topic. After a detailed investigation, Masonic Village at Sewickley earned 7 out of 9 points on this part of the scorecard. Low flow toilets are the primary contributor to the facility's reduced water consumption. Achieving the reduction provided 5 LEED points in the water efficiency portion. The remaining 2 points were earned by eliminating the use of potable water in both mechanical systems and landscape irrigation.

Energy and atmosphere is the largest point category on the scorecard. Although it supports only seven topics, this section accounts for 39 possible LEED points. Energy and atmosphere has three prerequisites, which the project surprisingly fulfills once again. Each prerequisite's primary focus is on the building's energy efficiency. The single most important topic in this section, and more importantly the entire scorecard, is to optimize energy performance. This single line item can range anywhere from 1 to 24 LEED points. Table 5 illustrates the required efficiency for a given amount of points. Top of the line mechanical units with advanced control systems have been implemented on the project. High efficiency boilers, cooling tower, and advanced lighting control systems are the primary focus resulting in the building's exceptional reduction in energy. Upon meeting with the project manager, the building is an anticipated to have a 36% reduction in energy consumption when compared to similar facilities throughout the United States. This allowed for 18 LEED points to be awarded for the optimizing energy item. 2 additional points were allotted for the advanced control systems that are being installed to compliment the project's efficient MEP systems. A total of 20 LEED points were awarded to the project under the energy and atmosphere section of the scorecard.

(**Table 5:** Points for Optimizing Energy Performance)

New Buildings	Existing Building Renovations	Points
12%	8%	1
14%	10%	2
16%	12%	3
18%	14%	5
20%	16%	7
22%	18%	9
24%	20%	11
26%	22%	13
28%	24%	14
30%	26%	15
32%	28%	16
34%	30%	17
36%	32%	18
38%	34%	19
40%	36%	20
42%	38%	21
44%	40%	22
46%	42%	23
48%	44%	24

- Courtesy of usgbc.org

The next topic on the scorecard is materials and resources. This category contains two prerequisites. It is believed that the project satisfies both these requirements, however only one is known for certain. Provided all prerequisites are accounted for, Masonic Village at Sewickley earned 6 out of 16 points on this portion of the scorecard. These points were earned through things like utilizing local resources, implementing non-mercury based lamps, and supplying an adequate amount of freestanding furniture.

The final category in which the project meets the necessary prerequisites is indoor environmental quality. A total of 18 points can be obtained in this section. Outdoor air monitoring and indoor chemical and pollutant source control play a huge part in earning points for the facility. Also contributing to indoor environmental quality is the controllability of lighting and thermal comfort systems. Nonetheless, it is still important to have a reconnection with the outdoor natural environment. The implementation of numerous large windows plays a huge role in further developing this scenario. Large windows provide a lot of natural light to indoor space, which has ultimately been proven to have a positive effect on an individual's personal mentality. In public gathering spaces, large windows provide just a small barrier between inside and outside. Overall, the project was given 10 out of 18 points for indoor environmental quality.

The last two categories are innovation in design and regional priorities. Not only did the project not meet either section's prerequisites, it did not even qualify for a single topic within the categories. Since there was no integrated project delivery, the building is somewhat lacking in innovative designs to the structure. The regional priority section deals with reaching out to the community and further educating the public on the benefits of LEED. Not much attention was given to this section either. Between the two categories 0 out of 10 points were awarded.

Overall, Masonic Village at Sewickley scored surprisingly better than might have been expected for a facility being one to not purse a rating. The project as a whole earned 55 out of 110 points. By definition, this is a LEED Silver rating. Upon meeting with the project manager to further review the scorecard, it was discovered that the project team was unaware of how many LEED points they actually qualify for. Research from Technical Report 2 is currently being used to inform the project team of the building's current qualifications and discuss the opportunity of actually earning a LEED rating on the project.

BIM Use Evaluation

Building Information Modeling (BIM) has been deemed to be one of the three major forces of change within the building construction industry. BIM is rapidly gaining popularity amongst industry professionals due to overall efficiency and increased project quality. The idea behind it is to integrate all four stages of a building's development into one distinct model. Planning, design, construction, and operation are the four constituents comprising each of these categories. Unfortunately BIM was not implemented on Masonic Village at Sewickley. Nevertheless, a critical evaluation was performed ranking the importance of several topics and deciding whether or not it would have been economical to use on the project.

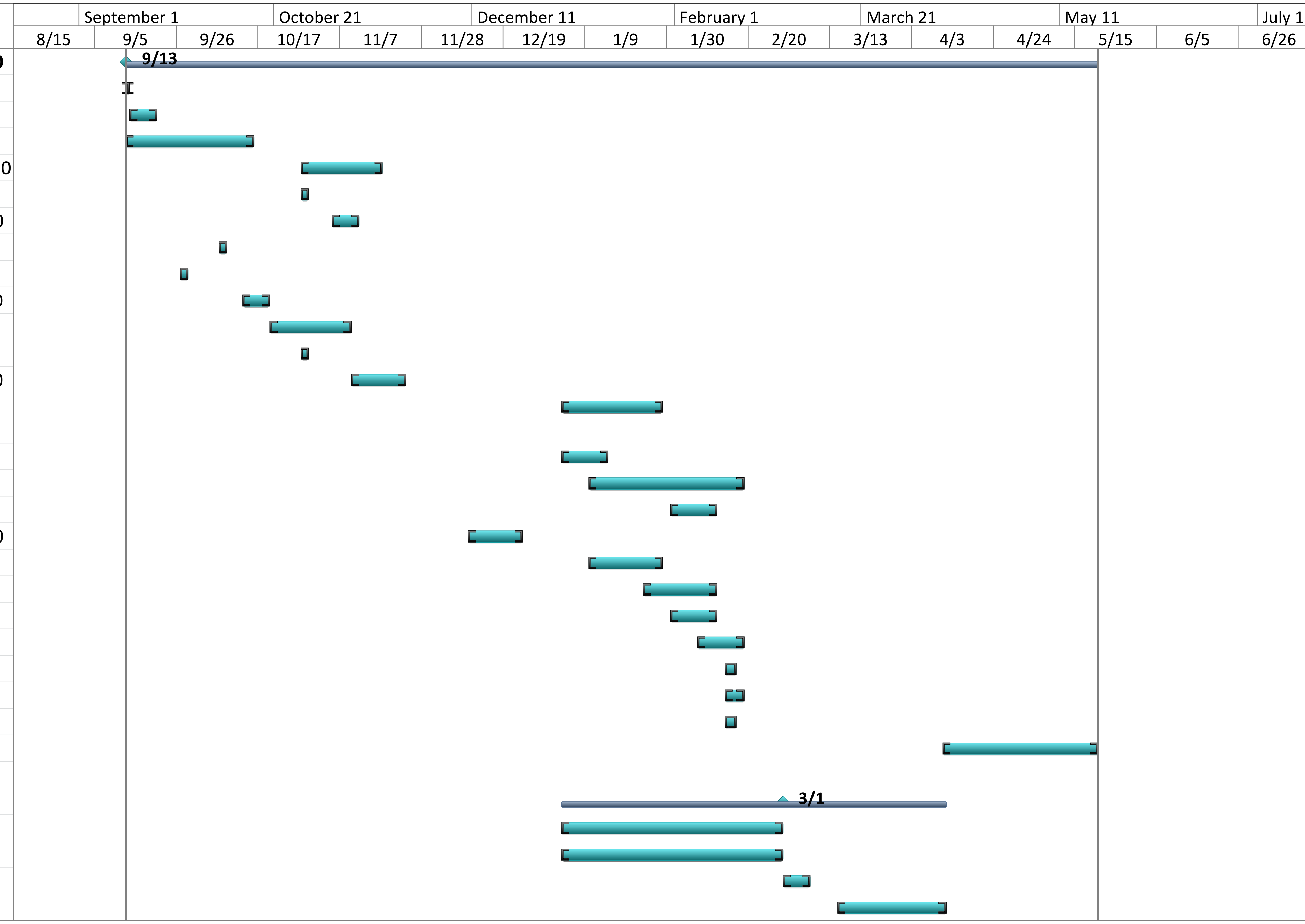
The first step in deciding the appropriateness of BIM on a project is to complete a BIM use evaluation. Believed to be of potential importance to the project, 13 possible uses were analyzed. Each use was classified as having high, medium, or low value to the overall building process based on resources, competency, and experience of the project team. After weighing the pros and cons of each use, individual topics were ultimately given a yes, no, or maybe rating as to whether or not they should be executed. A complete chart of each use can be viewed in Table 7 of **Appendix E**. As a result, six out of thirteen categories were decided to have positive benefits to the building and given a “yes” for project use, all of which were rated as having high value on the overall project. These components are record modeling, 4D modeling, design authoring, existing conditions, and 3D coordination of both the design and construction processes. These particular issues thrive largely on the concept of coordination. Coordination is a huge concern of the project team since both additions have to be tied back into an existing structure and renovation work has to match up with currently installed systems. Listed to “maybe” have a net positive benefit to the building process is cost estimating, design review, and programming. Each of these elements are items believed to genuinely benefit the project but are not necessary due to the current procedures already in place. Things like cost estimating would certainly be made easier than the use of traditional methods but needs to be compared with the time required for inexperienced users to learn the software. Lastly is the “no” category. Four of the analyzed items earned this rating. Maintenance scheduling, building systems analysis, and energy analyses are largely for use on the operation side of BIM. Given the low level of interest expressed by the owner in such regions, it was determined that the benefits of implementing these types of uses would not outweigh cost. Although rankings of each BIM use were based on potential advantages to the building process, it was noted that final decisions also varied tremendously with the amount of background each user has with the program.

The second part of the BIM evaluation was to take the useful components established in Table 7 and proceed with BIM execution planning. The first step in this process is to develop a Level 1 process map of the included items. Such process maps take into account all advantageous BIM uses and show how they progress through the four stages of project development, planning, design, construction, and operation. All components given a rating of “yes” or “maybe” were included in the formation of the process map displayed in **Appendix E**. Each element is applied to its proper category, where a breakout region displays all types of information exchanged between different entities. As a result, a record model is produced in which the owner can use as reference during operation of the building.

Based on the overall undertakings of the building, BIM certainly could have served some very effective uses on the project. Considering the floors of the additions have to match up with the existing building, a reduced plenum space ultimately becomes the result of each wing. The team has experienced numerous change orders in regard to such an outcome. Coordination is by far one of the most critical factors controlling both schedule and quality. Implementing BIM in the early stages of development may have significantly reduced the amount of clashes experienced in the field through a time efficient method. All BIM uses that specifically focus on coordination of MEP work would provide an advantage to this specific project and would create a better overall finished product.

Appendix A
Detailed Project Schedule

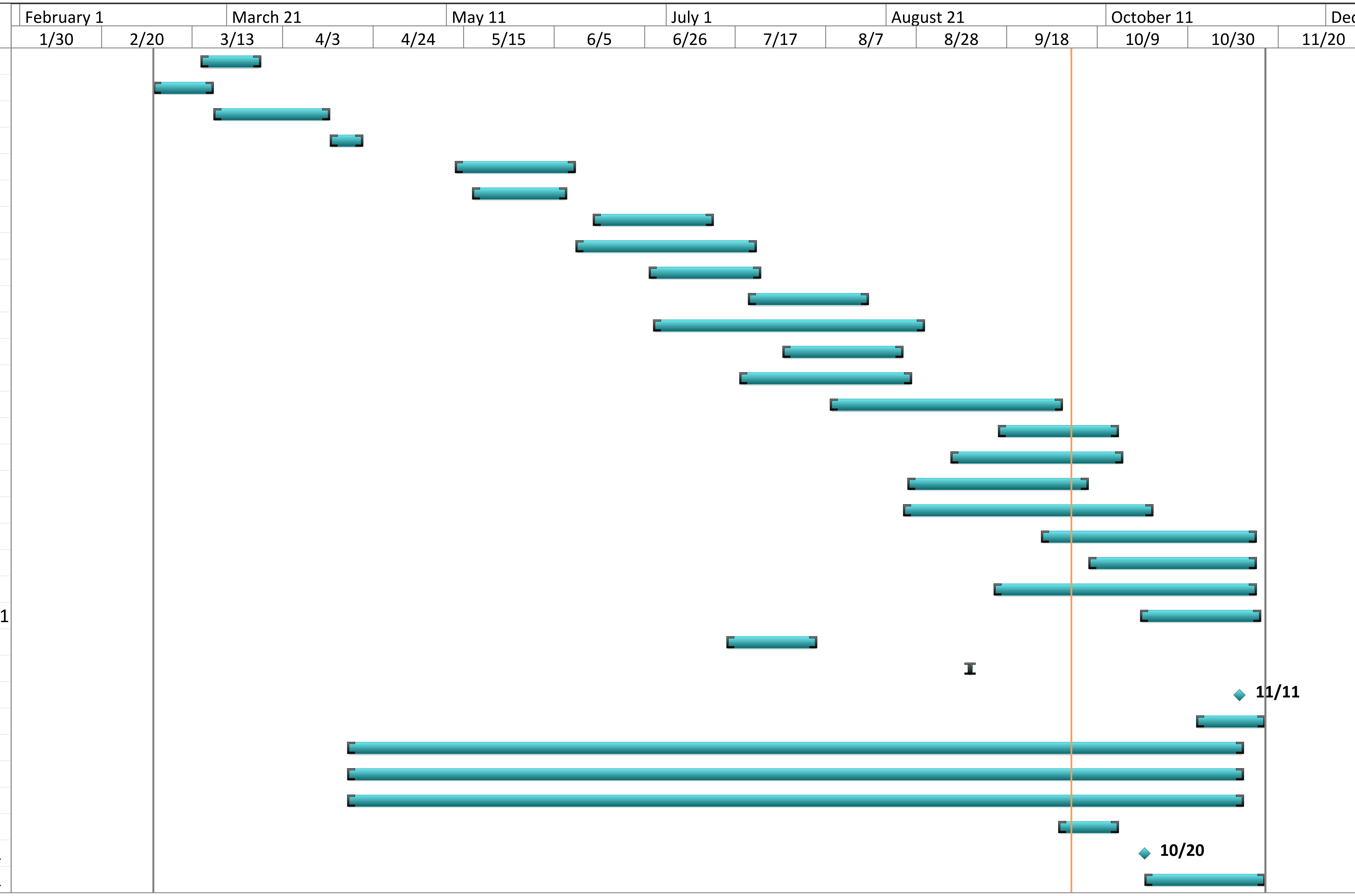
Notes	Task Name	Duration	Start	Finish
1	**Phase 1 and Foundations**	**0 days**	**Mon 9/13/10**	**Mon 9/13/10**
2	Contract	1 day	Mon 9/13/10	Mon 9/13/10
3	Establish Access Road	5 days	Tue 9/14/10	Mon 9/20/10
4	DOH Permit	25 days	Mon 9/13/10	Fri 10/15/10
5	Relocate Existing Shower Rooms	15 days	Thu 10/28/10	Wed 11/17/10
6	Build Partition at Door	2 days	Thu 10/28/10	Fri 10/29/10
7	Demolition of Existing Building/Site	5 days	Fri 11/5/10	Thu 11/11/10
8	Preliminary Building Layout	2 days	Thu 10/7/10	Fri 10/8/10
9	E & S Control (by CM)	2 days	Mon 9/27/10	Tue 9/28/10
10	Clear & Grub	5 days	Wed 10/13/10	Tue 10/19/10
11	Grade for Building B	15 days	Wed 10/20/10	Tue 11/9/10
12	Layout Building	2 days	Thu 10/28/10	Fri 10/29/10
13	Caissons	10 days	Wed 11/10/10	Tue 11/23/10
14	Excavate/Pour Caisson Caps & Grade Beams	20 days	Mon 1/3/11	Fri 1/28/11
15	Footings Building B	10 days	Mon 1/3/11	Fri 1/14/11
16	Ivany Wall Building B	30 days	Mon 1/10/11	Fri 2/18/11
17	CMU Foundations Building B	10 days	Mon 1/31/11	Fri 2/11/11
18	Rough Grade Building A	10 days	Fri 12/10/10	Thu 12/23/10
19	Excavate/Pour Footings Building A	15 days	Mon 1/10/11	Fri 1/28/11
20	Concrete Walls Building A	15 days	Mon 1/24/11	Fri 2/11/11
21	Masonry Foundations Building A	10 days	Mon 1/31/11	Fri 2/11/11
22	Backfill Building B/Ivany Wall	10 days	Mon 2/7/11	Fri 2/18/11
23	Waterproof Building A	3 days	Mon 2/14/11	Wed 2/16/11
24	Subbase for Slabs	5 days	Mon 2/14/11	Fri 2/18/11
25	Foundation Drain/Backfill Building A	3 days	Mon 2/14/11	Wed 2/16/11
26	Temporary Resident Rooms	30 days	Mon 4/11/11	Fri 5/20/11
27				
28	**Pase 2 Additions**	**0 days**	**Tue 3/1/11**	**Tue 3/1/11**
29	Shop Drawings/ Submittals/ Clearances	41 days	Mon 1/3/11	Mon 2/28/11
30	Precast Plank Drawings & Fabrication	41 days	Mon 1/3/11	Mon 2/28/11
31	Mobilize	5 days	Tue 3/1/11	Mon 3/7/11
32	Mockups	20 days	Tue 3/15/11	Mon 4/11/11



Project: Project1
Date: Mon 10/3/11

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

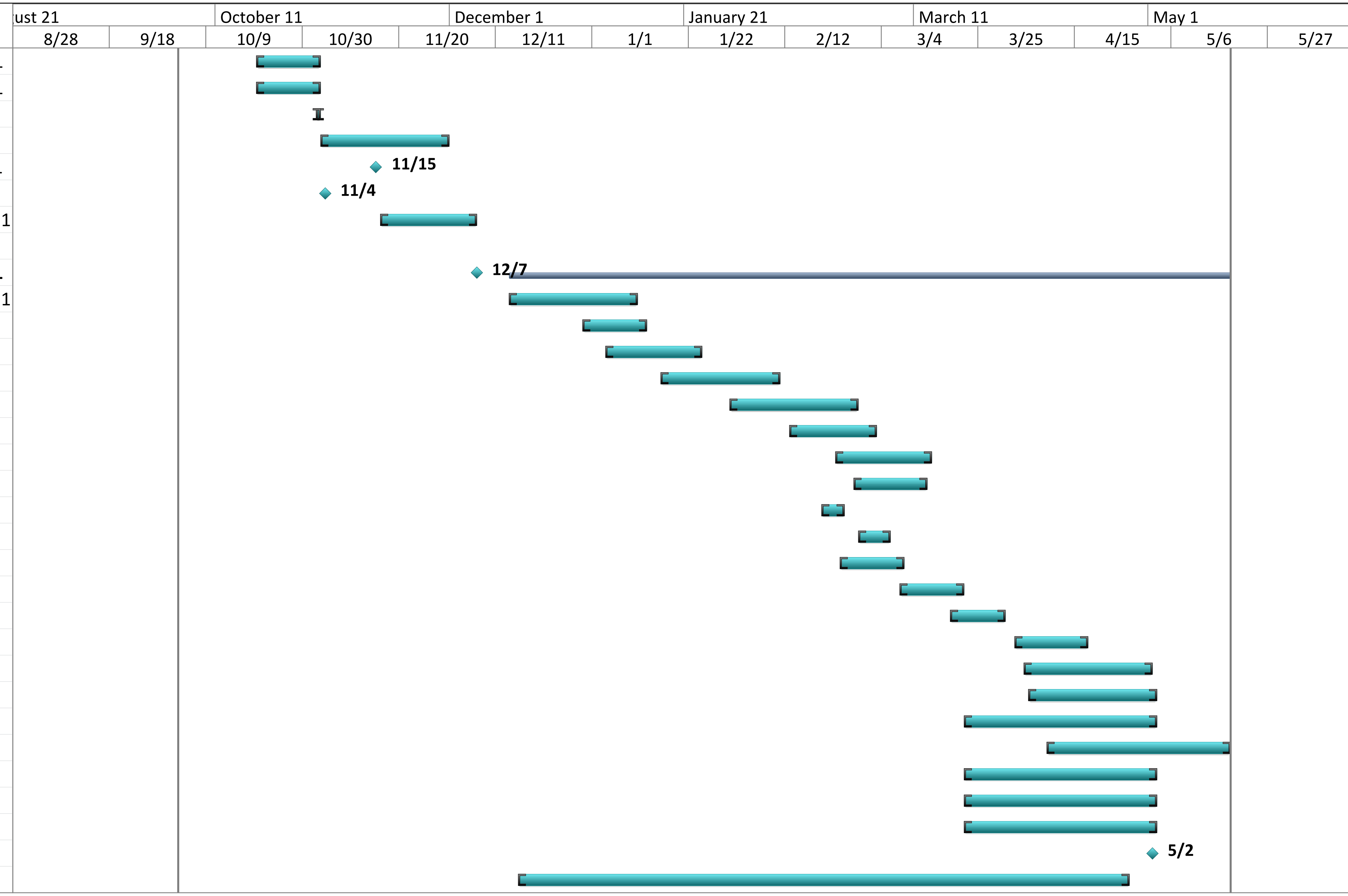
Notes	Task Name	Duration	Start
33	1st Floor Precast Plank	10 days	Tue 3/15/11
34	Concrete Slab on Grade	10 days	Fri 3/4/11
35	2nd Floor CMU Walls	19 days	Fri 3/18/11
36	3rd Floor Precast Plank	5.88 days	Thu 4/14/11
37	3rd Floor CMU Walls	20 days	Fri 5/13/11
38	Elevator Rough In	16 days	Tue 5/17/11
39	Steel Stair Framing	20 days	Tue 6/14/11
40	Roof Framing, Sheathing, & Finish	30 days	Fri 6/10/11
41	EPDM Roofing	20 days	Mon 6/27/11
42	Soffit, Fascia, Gutters	20 days	Wed 7/20/11
43	Brick Casing	45 days	Tue 6/28/11
44	Vinyl Siding	20 days	Thu 7/28/11
45	Windows & Exterior Doors	30 days	Mon 7/18/11
46	GWB/Wall Assemblies	40 days	Mon 8/8/11
47	Wall Finishes	20 days	Fri 9/16/11
48	Doors, Frames, & Hardware	30 days	Mon 9/5/11
49	Ceilings	30 days	Fri 8/26/11
50	Painting	42 days	Thu 8/25/11
51	Floor Finishes	36 days	Mon 9/26/11
52	Casework & Millwork	27 days	Fri 10/7/11
53	Ceramic Tile	43 days	Thu 9/15/11
54	Elevator Installation	20 days	Wed 10/19/11
55	Food Service Ventilators	15 days	Fri 7/15/11
56	Food Service Verification	1 day	Fri 9/9/11
57	Food Service Inspection Allegheny County Health	0 days	Fri 11/11/11
58	Food Service Demonstration, Testing, & Punch List	12 days	Tue 11/1/11
59	Plumbing	150 days	Mon 4/18/11
60	HVAC	150 days	Mon 4/18/11
61	Electrical	150 days	Mon 4/18/11
62	Comcast & Verizon Systems	10 days	Fri 9/30/11
63	Phase 2 Substantial Completion	0 days	Thu 10/20/11
61	Punch List	20 days	Thu 10/20/11



Project: Project1
Date: Mon 10/3/11

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

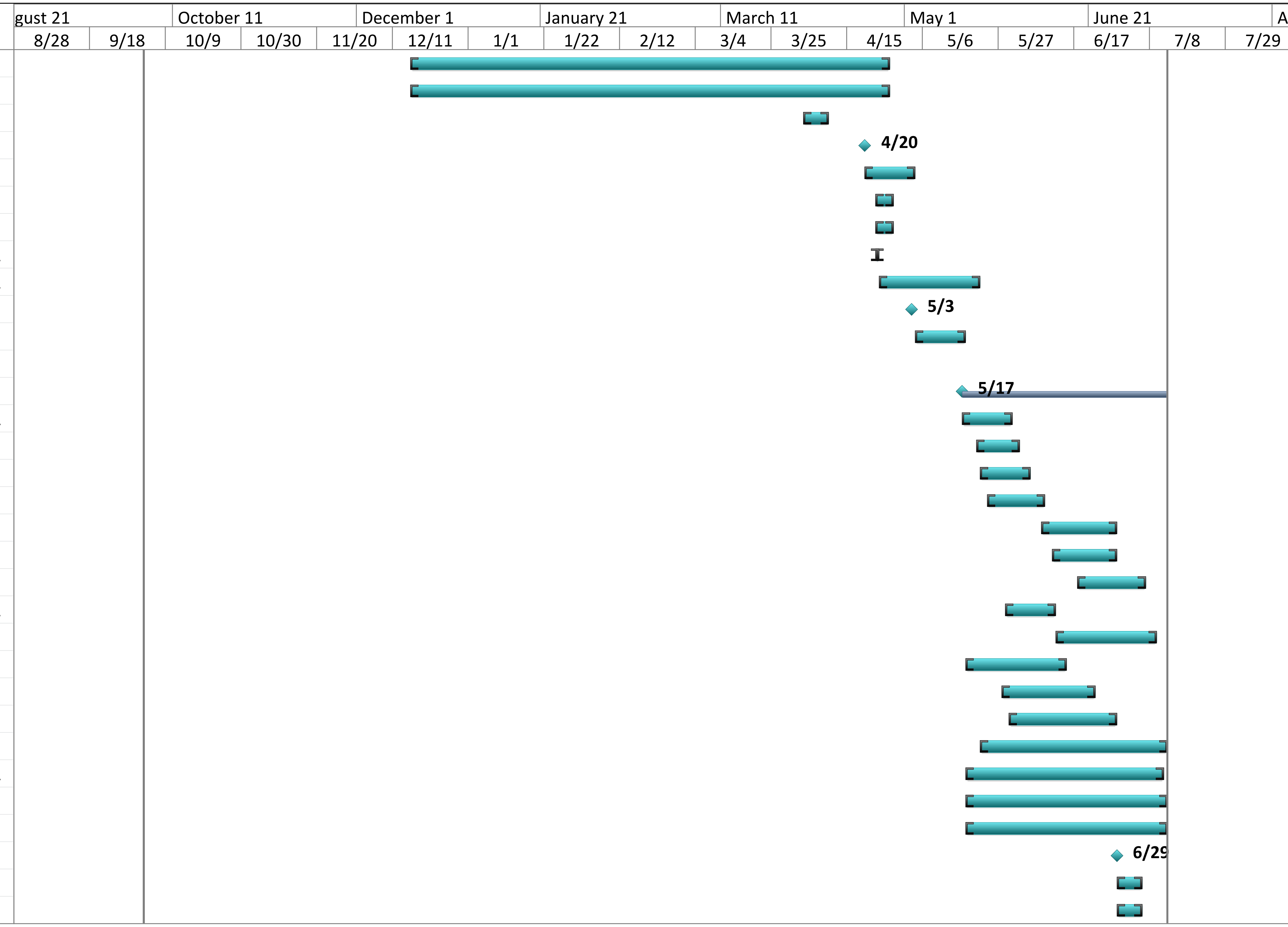
Notes	Task Name	Duration	Start
65	MVS Furniture	10 days	Thu 10/20/11
66	MVS IT & Communications	10 days	Thu 10/20/11
67	DOH Inspection - Life Safety	1 day	Wed 11/2/11
68	DOH Inspection - Nursing Division	20 days	Thu 11/3/11
69	Phase 2 Complete	0 days	Tue 11/15/11
70	MVS Laying of Cornerstone	0 days	Fri 11/4/11
71	Owner Move into new Phase 2 Additions	15 days	Wed 11/16/11
72			
73	**Phase 3**	**0 days**	**Wed 12/7/11**
74	Demolition of Existing Areas	20 days	Wed 12/14/11
75	Unit Masonry/Concrete Patching	10 days	Fri 12/30/11
76	Interior Framing	15 days	Wed 1/4/12
77	GWB Renovation Areas	20 days	Mon 1/16/12
78	Wall Finishes Renovation Areas	20 days	Tue 1/31/12
79	Ceiling Renovation Areas	15 days	Mon 2/13/12
80	Floor Finishes Renovation Areas	15 days	Thu 2/23/12
81	Doors, Frames, & Hardware Renovation Areas	12 days	Mon 2/27/12
82	2nd Floor Concrete Slab on Grade	5 days	Mon 2/20/12
83	MVS Room Modifications	5 days	Tue 2/28/12
84	2nd Floor CMU Walls	10 days	Fri 2/24/12
85	3rd Floor Precast Plank & Topping	10 days	Thu 3/8/12
86	3rd Floor CMU Walls	10 days	Mon 3/19/12
87	Phase 3 Roof Framing, Sheathing, & Finish	12 days	Mon 4/2/12
88	GWB/Wall Assemblies - Addition	20 days	Wed 4/4/12
89	Floor, Wall, & Ceiling - Addition	20 days	Thu 4/5/12
90	Painting	30 days	Thu 3/22/12
91	EIFS & Exterior Finishes	30 days	Mon 4/9/12
92	Ceramic Tile	30 days	Thu 3/22/12
93	Casework & Millwork	30 days	Thu 3/22/12
94	Food Service Equipment	30 days	Thu 3/22/12
95	Food Service Inspection Allegheny County Health	0 days	Wed 5/2/12
96	Plumbing	95 days	Fri 12/16/11



Project: Project1
Date: Mon 10/3/11

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

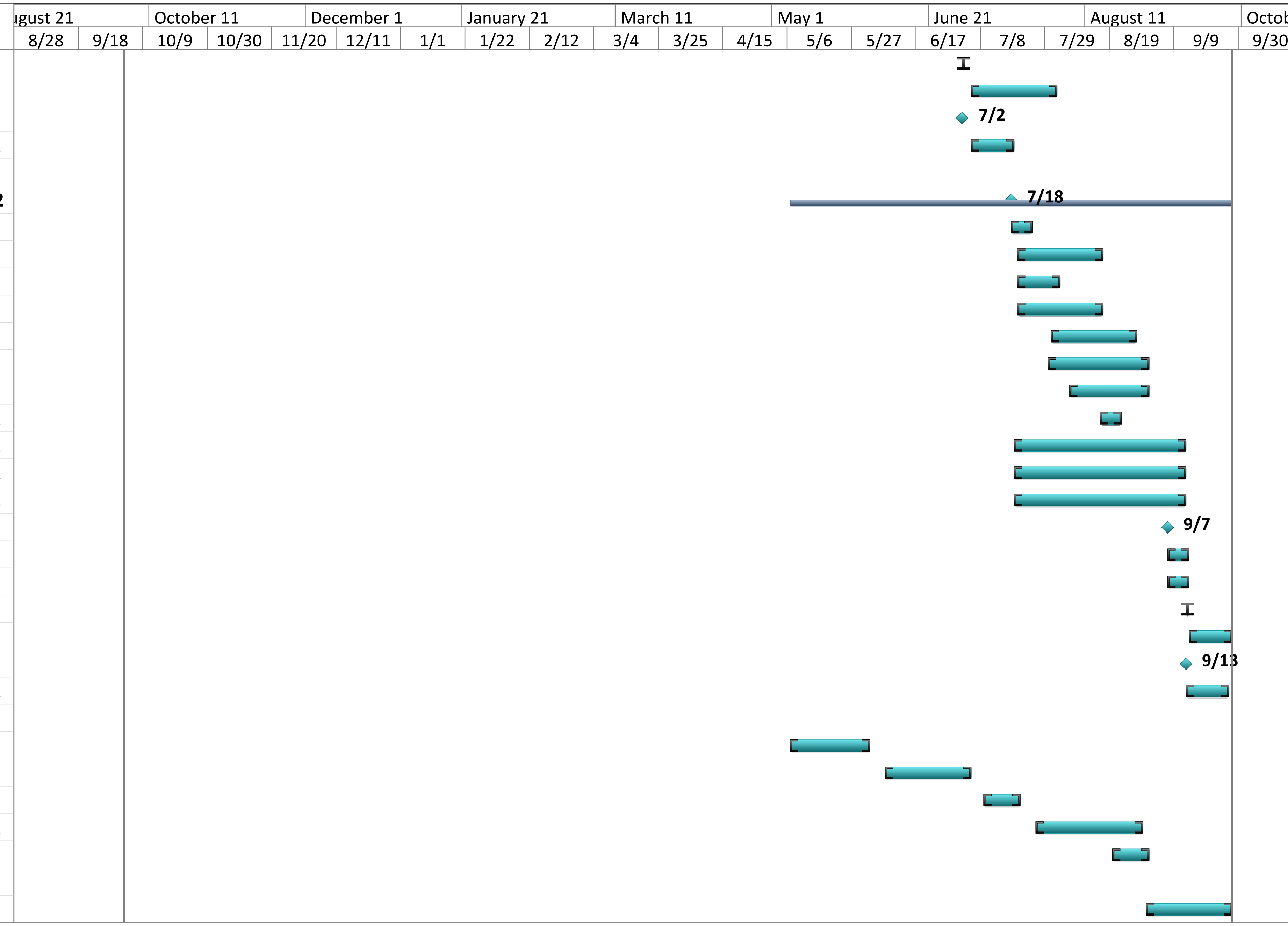
Notes	Task Name	Duration	Start	Finish
97	HVAC	95 days	Fri 12/16/11	Thu 4/26/12
98	Electrical	95 days	Fri 12/16/11	Thu 4/26/12
99	Comcast & Verizon Systems	5 days	Tue 4/3/12	Mon 4/9/12
100	Phase 3 Substantial Completion	0 days	Fri 4/20/12	Fri 4/20/12
101	Phase 3 Punch List	10 days	Fri 4/20/12	Thu 5/3/12
102	MVS Furniture	5 days	Mon 4/23/12	Fri 4/27/12
103	MVS IT & Communications	5 days	Mon 4/23/12	Fri 4/27/12
104	DOH Inspection - Life Safety	1 day	Mon 4/23/12	Mon 4/23/12
105	DOH Inspection - Nursing Division	20 days	Tue 4/24/12	Mon 5/21/12
106	Phase 3 Complete	0 days	Thu 5/3/12	Thu 5/3/12
107	Owner Move into Phase 3 Areas	10 days	Fri 5/4/12	Thu 5/17/12
108				
109	**Phase 4**	**0 days**	**Thu 5/17/12**	**Thu 5/17/12**
110	Demolition of Existing Areas	10 days	Thu 5/17/12	Wed 5/30/12
111	Unit Masonry/Concrete Patching	10 days	Mon 5/21/12	Fri 6/1/12
112	Interior Framing	10 days	Tue 5/22/12	Mon 6/4/12
113	GWB - Wall Assemblies & Patching	12 days	Thu 5/24/12	Fri 6/8/12
114	Wall Finishes	15 days	Fri 6/8/12	Thu 6/28/12
115	Ceilings	14 days	Mon 6/11/12	Thu 6/28/12
116	Floor Finishes	15 days	Mon 6/18/12	Fri 7/6/12
117	Doors, Frames, & Hardware	10 days	Tue 5/29/12	Mon 6/11/12
118	Painting	20 days	Tue 6/12/12	Mon 7/9/12
119	EIFS & Exterior Finishes	20 days	Fri 5/18/12	Thu 6/14/12
120	Ceramic Tile	20 days	Mon 5/28/12	Fri 6/22/12
121	Casework & Millwork	22 days	Wed 5/30/12	Thu 6/28/12
122	Elevators	38 days	Tue 5/22/12	Thu 7/12/12
123	Plumbing	39 days	Fri 5/18/12	Wed 7/11/12
124	HVAC	40 days	Fri 5/18/12	Thu 7/12/12
125	Electrical	40 days	Fri 5/18/12	Thu 7/12/12
126	Phase 4 Substantial Completion	0 days	Fri 6/29/12	Fri 6/29/12
127	Punch List	5 days	Fri 6/29/12	Thu 7/5/12
128	MVS Furniture	5 days	Fri 6/29/12	Thu 7/5/12



Project: Project1
Date: Mon 10/3/11

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

Notes	Task Name	Duration	Start	Finish
129	DOH Inspection - Life Safety	1 day	Mon 7/2/12	Mon 7/2/12
130	DOH Inspection - Nursing Division	20 days	Thu 7/5/12	Wed 8/1/12
131	Phase 4 Complete	0 days	Mon 7/2/12	Mon 7/2/12
132	Owner Move into Phase 4 Areas	10 days	Thu 7/5/12	Wed 7/18/12
133				
134	**Phase 5**	**0 days**	**Wed 7/18/12**	**Wed 7/18/12**
135	Demolition of Existing Areas	5 days	Wed 7/18/12	Tue 7/24/12
136	GWB & Patching	20 days	Fri 7/20/12	Thu 8/16/12
137	Doors, Frames, & Hardware	10 days	Fri 7/20/12	Thu 8/2/12
138	Ceilings	20 days	Fri 7/20/12	Thu 8/16/12
139	Floor Finishes	20 days	Tue 7/31/12	Mon 8/27/12
140	Painting	25 days	Mon 7/30/12	Fri 8/31/12
141	Casework & Millwork	20 days	Mon 8/6/12	Fri 8/31/12
142	Facility Chutes	5 days	Thu 8/16/12	Wed 8/22/12
143	Plumbing	40 days	Thu 7/19/12	Wed 9/12/12
144	HVAC	40 days	Thu 7/19/12	Wed 9/12/12
145	Electrical	40 days	Thu 7/19/12	Wed 9/12/12
146	Phase 5 Substantial Completion	0 days	Fri 9/7/12	Fri 9/7/12
147	Punch List	5 days	Fri 9/7/12	Thu 9/13/12
148	MVS Furniture	5 days	Fri 9/7/12	Thu 9/13/12
149	DOH Inspection - Life Safety	1 day	Thu 9/13/12	Thu 9/13/12
150	DOH Inspection - Nursing Division	10 days	Fri 9/14/12	Thu 9/27/12
151	Phase 5 Complete	0 days	Thu 9/13/12	Thu 9/13/12
152	Owner Move into Phase 5 Areas	10 days	Thu 9/13/12	Wed 9/26/12
153				
154	Final Site Grading	20 days	Mon 5/7/12	Fri 6/1/12
155	Site Concrete	20 days	Thu 6/7/12	Wed 7/4/12
156	Asphalt Paving	10 days	Mon 7/9/12	Fri 7/20/12
157	Landscaping	25 days	Thu 7/26/12	Wed 8/29/12
158	Patio Trellis & Columns	10 days	Mon 8/20/12	Fri 8/31/12
159				
160	Punch List & Close Out	20 days	Fri 8/31/12	Thu 9/27/12



Project: Project1
Date: Mon 10/3/11

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

Appendix B
Detailed Assemblies Estimate Data

Assemblies Estimate Data:

Foundation

A1010 110	Strip Footings		COST PER L.F.	
		MAT.	INST.	TOTAL
2100	Strip footing, load 2.6 KLF, soil capacity 3 KSF, 16" wide x 8" deep plain	7.55	13.10	20.65
2300	Load 3.9 KLF, soil capacity, 3 KSF, 24" wide x 8" deep, plain	9.40	14.35	23.75
2500	Load 5.1KLF, soil capacity 3 KSF, 24" wide x 12" deep, reinf. RA1010 -140	14.95	22	36.95
2700	Load 11.1KLF, soil capacity 6 KSF, 24" wide x 12" deep, reinf.	14.95	22	36.95
2900	Load 6.8 KLF, soil capacity 3 KSF, 32" wide x 12" deep, reinf.	18.25	24	42.25
3100	Load 14.8 KLF, soil capacity 6 KSF, 32" wide x 12" deep, reinf.	18.25	24	42.25
3300	Load 9.3 KLF, soil capacity 3 KSF, 40" wide x 12" deep, reinf.	21.50	25.50	47
3500	Load 18.4 KLF, soil capacity 6 KSF, 40" wide x 12" deep, reinf.	21.50	26	47.50
3700	Load 10.1KLF, soil capacity 3 KSF, 48" wide x 12" deep, reinf.	24	28	52
3900	Load 22.1KLF, soil capacity 6 KSF, 48" wide x 12" deep, reinf.	25.50	29.50	55
4100	Load 11.8KLF, soil capacity 3 KSF, 56" wide x 12" deep, reinf.	28	31	59
4300	Load 25.8KLF, soil capacity 6 KSF, 56" wide x 12" deep, reinf.	30.50	33.50	64
4500	Load 10KLF, soil capacity 3 KSF, 48" wide x 16" deep, reinf.	30.50	32	62.50
4700	Load 22KLF, soil capacity 6 KSF, 48" wide, 16" deep, reinf.	31	33	64
4900	Load 11.6KLF, soil capacity 3 KSF, 56" wide x 16" deep, reinf.	34.50	46	80.50
5100	Load 25.6KLF, soil capacity 6 KSF, 56" wide x 16" deep, reinf.	36.50	48	84.50
5300	Load 13.3KLF, soil capacity 3 KSF, 64" wide x 16" deep, reinf.	40	38.50	78.50
5500	Load 29.3KLF, soil capacity 6 KSF, 64" wide x 16" deep, reinf.	42.50	41.50	84
5700	Load 15KLF, soil capacity 3 KSF, 72" wide x 20" deep, reinf.	53	46.50	99.50
5900	Load 33KLF, soil capacity 6 KSF, 72" wide x 20" deep, reinf.	56	49.50	105.50
6100	Load 18.3KLF, soil capacity 3 KSF, 88" wide x 24" deep, reinf.	75	58.50	133.50
6300	Load 40.3KLF, soil capacity 6 KSF, 88" wide x 24" deep, reinf.	81	65	146
6500	Load 20KLF, soil capacity 3 KSF, 96" wide x 24" deep, reinf.	81.50	62	143.50
6700	Load 44 KLF, soil capacity 6 KSF, 96" wide x 24" deep, reinf.	86	67	153

RS Means Assemblies Cost Data: 2011 (Page 2)

A1020 310	Caissons		COST EACH	
		MAT.	INST.	TOTAL
2200	Caisson, stable ground, 3000 PSI conc, 10 KSF brng, 200K load, 2'-0"x50'-0	885	1,850	2,735
2400	400K load, 2'-6"x50'-0"	1,475	2,950	4,425
2600	800K load, 3'-0"x100'-0" RA1020 -200	4,025	7,050	11,075
2800	1200K load, 4'-0"x100'-0"	6,900	8,875	15,775
3000	1600K load, 5'-0"x150'-0"	15,500	13,700	29,200
3200	2400K load, 6'-0"x150'-0"	22,600	17,800	40,400
3400	3200K load, 7'-0"x200'-0"	40,800	25,900	66,700
5000	Wet ground, 3000 PSI conc., 10 KSF brng, 200K load, 2'-0"x50'-0"	765	2,600	3,365
5200	400K load, 2'-6"x50'-0"	1,275	4,450	5,725
5400	800K load, 3'-0"x100'-0"	3,475	12,000	15,475
5600	1200K load, 4'-0"x100'-0"	5,975	17,800	23,775
5800	1600K load, 5'-0"x150'-0"	13,300	38,400	51,700
6000	2400K load, 6'-0"x150'-0"	19,500	47,200	66,700
6200	3200K load, 7'-0"x200'-0"	35,000	76,000	111,000
7800	Soft rock, 3000 PSI conc., 10 KSF brng, 200K load, 2'-0"x50'-0"	765	14,100	14,865
8000	400K load, 2'-6"x50'-0"	1,275	22,900	24,175
8200	800K load, 3'-0"x100'-0"	3,475	60,000	63,475
8400	1200K load, 4'-0"x100'-0"	5,975	88,500	94,475
8600	1600K load, 5'-0"x150'-0"	13,300	180,500	193,800
8800	2400K load, 6'-0"x150'-0"	19,500	214,500	234,000
9000	3200K load, 7'-0"x200'-0"	35,000	342,500	377,500

RS Means Assemblies Cost Data: 2011 (Page 22)

A1020 210	Grade Beams	COST PER L.F.		
		MAT.	INST.	TOTAL
2220	Grade beam, 15' span, 28" deep, 12" wide, 8 KLF load	32.50	48.50	81
2240	14" wide, 12 KLF load	33.50	49	82.50
2260	40" deep, 12" wide, 16 KLF load (RA1020 -230)	33.50	60	93.50
2280	20 KLF load	38.50	64.50	103
2300	52" deep, 12" wide, 30 KLF load	44.50	81	125.50
2320	40 KLF load	54.50	90	144.50
2340	50 KLF load	64.50	98	162.50
3360	20' span, 28" deep, 12" wide, 2 KLF load	20.50	37.50	58
3380	16" wide, 4 KLF load	27.50	42	69.50
3400	40" deep, 12" wide, 8 KLF load	33.50	60	93.50
3420	12 KLF load	42.50	67	109.50
3440	14" wide, 16 KLF load	51.50	75	126.50
3460	52" deep, 12" wide, 20 KLF load	55.50	91	146.50
3480	14" wide, 30 KLF load	76.50	109	185.50
3500	20" wide, 40 KLF load	90	114	204
3520	24" wide, 50 KLF load	112	130	242
4540	30' span, 28" deep, 12" wide, 1 KLF load	21.50	38.50	60
4560	14" wide, 2 KLF load	34.50	53	87.50
4580	40" deep, 12" wide, 4 KLF load	41	63	104
4600	18" wide, 8 KLF load	58	77.50	135.50
4620	52" deep, 14" wide, 12 KLF load	73.50	106	179.50
4640	20" wide, 16 KLF load	90.50	115	205.50
4660	24" wide, 20 KLF load	112	131	243
4680	36" wide, 30 KLF load	161	164	325
4700	48" wide, 40 KLF load	212	200	412
5720	40' span, 40" deep, 12" wide, 1 KLF load	29.50	56	85.50

RS Means Assemblies Cost Data: 2011 (Page 20)

Floor Construction

A1030 120	Plain & Reinforced		COST PER S.F. MAT.	COST PER S.F. INST.	COST PER S.F. TOTAL
2220	Slab on grade, 4" thick, non industrial, non reinforced		1.99	2.47	4.46
2240	Reinforced		2.13	2.83	4.96
2260	Light industrial, non reinforced	RA1030 -200	2.59	3.03	5.62
2280	Reinforced		2.73	3.39	6.12
2300	Industrial, non reinforced		3.22	6.35	9.57
2320	Reinforced		3.36	6.70	10.06
3340	5" thick, non industrial, non reinforced		2.32	2.54	4.86
3360	Reinforced		2.46	2.90	5.36
3380	Light industrial, non reinforced		2.93	3.10	6.03
3400	Reinforced		3.07	3.46	6.53
3420	Heavy industrial, non reinforced		4.19	7.55	11.74
3440	Reinforced		4.31	7.95	12.26
4460	6" thick, non industrial, non reinforced		2.76	2.49	5.25
4480	Reinforced		3.01	2.97	5.98
4500	Light industrial, non reinforced		3.38	3.05	6.43
4520	Reinforced		3.78	3.69	7.47
4540	Heavy industrial, non reinforced		4.65	7.65	12.30
4560	Reinforced		4.90	8.15	13.05
5580	7" thick, non industrial, non reinforced		3.10	2.58	5.68
5600	Reinforced		3.38	3.09	6.47
5620	Light industrial, non reinforced		3.73	3.14	6.87
5640	Reinforced		4.01	3.65	7.66
5660	Heavy industrial, non reinforced		5	7.55	12.55
5680	Reinforced		5.25	8.05	13.30

RS Means Assemblies Cost Data: 2011 (Page 24)

B1010 230 — Precast Plank with 2" Concrete Topping

	SPAN (FT.)	SUPERIMPOSED LOAD (P.S.F.)	TOTAL DEPTH (IN.)	DEAD LOAD (P.S.F.)	TOTAL LOAD (P.S.F.)	COST PER S.F. MAT.	COST PER S.F. INST.	COST PER S.F. TOTAL
2000	10	40	6	75	115	7	5.50	12.50
2100		75	8	75	150	8.05	5.05	13.10
2200		100	8	75	175	8.05	5.05	13.10
2500	15	40	8	75	115	8.05	5.05	13.10
2600		75	8	75	150	8.05	5.05	13.10
2700		100	8	75	175	8.05	5.05	13.10
2800	20	40	8	75	115	8.05	5.05	13.10
2900		75	8	75	150	8.05	5.05	13.10
3000		100	8	75	175	8.05	5.05	13.10
3100	25	40	8	75	115	8.05	5.05	13.10
3200		75	8	75	150	8.05	5.05	13.10
3300		100	10	80	180	8.80	4.68	13.48
3400	30	40	10	80	120	8.80	4.68	13.48
3500		75	10	80	155	8.80	4.68	13.48
3600		100	10	80	180	8.80	4.68	13.48
3700	35	40	12	95	135	9.15	4.40	13.55
3800		75	12	95	170	9.15	4.40	13.55
3900		100	14	95	195	9.70	4.18	13.88
4000	40	40	12	95	135	9.15	4.40	13.55
4500		75	14	95	170	9.70	4.18	13.88
5000	45	40	14	95	135	9.70	4.18	13.88

RS Means Assemblies Cost Data: 2011 (Page 70)

A20 Basement Construction

A2020 Basement Walls

A2020 110 Walls, Cast in Place

	WALL HEIGHT (FT.)	PLACING METHOD	CONCRETE (C.Y. per L.F.)	REINFORCING (LBS. per L.F.)	WALL THICKNESS (IN.)	COST PER L.F. MAT.	COST PER L.F. INST.	COST PER L.F. TOTAL
3200	6'	pumped	.111	4.95	6	22	74	96
3220			.149	7.20	8	27	77	104
3240			.184	9.00	10	32	78.50	110.50
3260			.222	10.8	12	37	81	118
3280			.260	12.15	14	41.50	82	123.50
3300			.300	14.39	16	47	84.50	131.50
5000	8'	direct chute	.148	6.6	6	29.50	96.50	126
5020			.199	9.6	8	36.50	99.50	136
5040			.250	12	10	43	101	144
5060			.296	14.39	12	49	103	152
5080			.347	16.19	14	51	104	155
5100			.394	19.19	16	62	108	170
5200	8'	pumped	.148	6.6	6	29.50	99	128.50
5220			.199	9.6	8	36.50	103	139.50
5240			.250	12	10	43	105	148
5260			.296	14.39	12	49	107	156
5280			.347	16.19	14	51	108	159
5300			.394	19.19	16	62	113	175
6020	10'	direct chute	.248	12	8	45.50	124	169.50
6040			.307	14.99	10	53	126	179
6060			.370	17.99	12	61.50	129	190.50
6080			.433	20.24	14	69.50	131	200.50
6100			.493	23.99	16	77.50	135	212.50
6220	10'	pumped	.248	12	8	45.50	128	173.50
6240			.307	14.99	10	53	130	183
6260			.370	17.99	12	61.50	135	196.50
6280			.433	20.24	14	69.50	137	206.50
6300			.493	23.99	16	77.50	141	218.50
7220	12'	pumped	.298	14.39	8	54.50	154	208.50
7240			.369	17.99	10	64	157	221
7260			.444	21.59	12	73.50	162	235.50
7280			.52	24.29	14	83	164	247
7300			.591	28.79	16	93	168	261
7420	12'	crane & bucket	.298	14.39	8	54.50	160	214.50
7440			.369	17.99	10	64	165	229
7460			.444	21.59	12	73.50	171	244.50
7480			.52	24.29	14	83	175	258
7500			.591	28.79	16	93	182	275

RS Means Assemblies Cost Data: 2011 (Page 29)

Bearing Walls

B2010 111	Reinforced Concrete Block Wall - Regular Weight						
	TYPE	SIZE (IN.)	STRENGTH (P.S.I.)	VERT. REINF & GROUT SPACING	COST PER S.F. MAT.	INST.	TOTAL
5400	Hollow	8x8x16	2,000	#4 @ 48"	3.11	7.25	10.36
5430				#5 @ 32"	3.33	7.65	10.98
5440				#5 @ 16"	3.84	8.75	12.59
5450		8x8x16	4,500	#4 @ 48"	3.63	7.35	10.98
5480				#5 @ 32"	3.86	7.65	11.51
5490				#5 @ 16"	4.37	8.75	13.12
5500		12x8x16	2,000	#4 @ 48"	4.38	9.35	13.73
5530				#5 @ 32"	4.67	9.65	14.32
5540				#5 @ 16"	5.40	10.80	16.20
5550			4,500	#4 @ 48"	4.90	9.35	14.25
5580				#5 @ 32"	5.20	9.65	14.85
5590				#5 @ 16"	5.90	10.80	16.70
6100	75% solid	6x8x16	2,000	#4 @ 48"	3.13	6.80	9.93
6130				#5 @ 32"	3.28	7	10.28
6140				#5 @ 16"	3.55	7.75	11.30
6150			4,500	#4 @ 48"	3.49	6.80	10.29
6180				#5 @ 32"	3.64	7	10.64
6190				#5 @ 16"	3.91	7.75	11.66
6200		8x8x16	2,000	#4 @ 48"	3.52	7.30	10.82
6230				#5 @ 32"	3.68	7.55	11.23
6240				#5 @ 16"	3.97	8.45	12.42
6250			4,500	#4 @ 48"	4.23	7.30	11.53
6280				#5 @ 32"	4.39	7.55	11.94
6290				#5 @ 16"	4.68	8.45	13.13
6300		12x8x16	2,000	#4 @ 48"	5.05	9.35	14.40
6330				#5 @ 32"	5.25	9.60	14.85
6340				#5 @ 16"	5.65	10.50	16.15
6350			4,500	#4 @ 48"	5.70	9.35	15.05
6380				#4 @ 32"	5.95	9.60	15.55
6390				#5 @ 16"	6.35	10.50	16.85
6500	Solid-double Wythe	2-4x8x16	2,000	#4 @ 48" E.W.	5.20	13.45	18.65
6530				#5 @ 16" E.W.	5.90	14.30	20.20
6550			4,500	#4 @ 48" E.W.	7	13.35	20.35
6580				#5 @ 16" E.W.	7.70	14.20	21.90
6600		2-6x8x16	2,000	#4 @ 48" E.W.	5.95	14.40	20.35
6630				#5 @ 16" E.W.	6.60	15.25	21.85
6650			4,000	#4 @ 48" E.W.	8.35	14.30	22.65
6680				#5 @ 16" E.W.	9.05	15.15	24.20

RS Means Assemblies Cost Data: 2011 (Page 134)

Roofing System

B1020 102	Wood/Flat or Pitched	COST PER S.F.		
		MAT.	INST.	TOTAL
2500	Flat rafter, 2"x4", 12" O.C.	1.03	1.62	2.65
2550	16" O.C.	.93	1.39	2.32
2600	24" O.C.	.75	1.19	1.94
2900	2"x6", 12" O.C.	1.27	1.62	2.89
2950	16" O.C.	1.11	1.39	2.50
3000	24" O.C.	.87	1.18	2.05
3300	2"x8", 12" O.C.	1.51	1.75	3.26
3350	16" O.C.	1.29	1.49	2.78
3400	24" O.C.	.99	1.26	2.25
3700	2"x10", 12" O.C.	1.98	2	3.98
3750	16" O.C.	1.64	1.67	3.31
3800	24" O.C.	1.22	1.37	2.59
4100	2"x12", 12" O.C.	2.28	2.02	4.30
4150	16" O.C.	1.87	1.69	3.56
4200	24" O.C.	1.38	1.39	2.77
4500	2"x14", 12" O.C.	2.68	2.94	5.62
4550	16" O.C.	2.17	2.39	4.56
4600	24" O.C.	1.58	1.86	3.44
4900	3"x6", 12" O.C.	2.53	1.71	4.24
4950	16" O.C.	2.06	1.46	3.52
5000	24" O.C.	1.50	1.23	2.73
5300	3"x8", 12" O.C.	3.22	1.91	5.13
5350	16" O.C.	2.57	1.61	4.18
5400	24" O.C.	1.84	1.33	3.17
5700	3"x10", 12" O.C.	3.86	2.18	6.04
5750	16" O.C.	3.06	1.81	4.87
5800	24" O.C.	2.17	1.47	3.64
6100	3"x12", 12" O.C.	4.59	2.62	7.21
6150	16" O.C.	3.61	2.14	5.75
6200	24" O.C.	2.53	1.69	4.22

RS Means Assemblies Cost Data: 2011 (Page 106)

Appendix C

General Conditions Summary

GENERAL CONDITIONS	Cost ($)
Permits & Fees	34,160
Field Engineer	83,136
Supervision	166,272
Misc. Labor	46,080
Travel	72,096
Misc. Materials & Shipping	61,000
Testing & Surveying	106,000
Field Office	17,760
Temporary Toilet	9,600
Temporary Utilities	70,400
Security & Safety	5,800
Storage Trailers	12,000
Trash Removal	48,000
Snow Removal	8,000
Final Cleanup	31,896
Equipment Rental	1,800
TOTAL	**774,000**

(**Table 6:** General Conditions Cost)

Fees & Contingency	Cost ($)
Pre-Construction Fee	151,000
Construction Fee	453,000
Construction Contingency	2,094,846
TOTAL	**2,698,846**

(**Table 7:** Fees & Contingency)

Appendix D
LEED Scorecard

LEED 2009 for Healthcare: New Construction and Major Renovations

Project Checklist

Project Name: Masonic Village at Sewickley

Date: 10/19/11

Y	?	N		Sustainable Sites	Possible Points: 18
Y	11				
Y			Prereq 1	Construction Activity Pollution Prevention	
Y			Prereq 2	Environmental Site Assessment	
		N	Credit 1	Site Selection	0
Y			Credit 2	Development Density and Community Connectivity	1
		N	Credit 3	Brownfield Redevelopment	0
Y			Credit 4.1	Alternative Transportation—Public Transportation Access	3
Y			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Roon	1
		N	Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Ve	0
Y			Credit 4.4	Alternative Transportation—Parking Capacity	1
		N	Credit 5.1	Site Development—Protect or Restore Habitat	0
Y			Credit 5.2	Site Development—Maximize Open Space	1
Y			Credit 6.1	Stormwater Design—Quantity Control	1
Y			Credit 6.2	Stormwater Design—Quality Control	1
		N	Credit 7.1	Heat Island Effect—Non-roof	0
		N	Credit 7.2	Heat Island Effect—Roof	0
		N	Credit 8	Light Pollution Reduction	0
Y			Credit 9.1	Connection to the Natural World—Places of Respite	1
Y			Credit 9.2	Connection to the Natural World—Direct Exterior Access for Patie	1

Y	?	N		Water Efficiency	Possible Points: 9
Y	7				
Y			Prereq 1	Water Use Reduction—20% Reduction	
Y			Prereq 2	Minimize Potable Water Use for Medical Equipment Cooling	
Y			Credit 1	Water Efficient Landscaping—No Potable Water Use or No Irrig	1
Y			Credit 2	Water Use Reduction: Measurement & Verification	1
Y			Credit 3	Water Use Reduction	2
Y			Credit 4.1	Water Use Reduction—Building Equipment	1
Y			Credit 4.2	Water Use Reduction—Cooling Towers	1
Y			Credit 4.3	Water Use Reduction— Food Waste Systems	1

Y	?	N		Energy and Atmosphere	Possible Points: 39
Y	20				
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
Y			Credit 1	Optimize Energy Performance	18
		N	Credit 2	On-Site Renewable Energy	0
		N	Credit 3	Enhanced Commissioning	0
	?		Credit 4	Enhanced Refrigerant Management	0
Y			Credit 5	Measurement and Verification	2
		N	Credit 6	Green Power	0
		N	Credit 7	Community Contaminant Prevention—Airborne Releases	0

Y	?	N		Materials and Resources	Possible Points: 16
	6	N			
Y			Prereq 1	Storage and Collection of Recyclables	
	?		Prereq 2	PBT Source Reduction—Mercury	
		N	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	0
		N	Credit 1.2	Building Reuse—Maintain Interior Non-Structural Elements	0
		N	Credit 2	Construction Waste Management	0
Y			Credit 3	Sustainably Sourced Materials and Products	1
Y			Credit 4.1	PBT Source Reduction—Mercury in Lamps	1
Y			Credit 4.2	PBT Source Reduction—Lead, Cadmium, and Copper	2
Y			Credit 5	Furniture and Medical Furnishings	1
Y			Credit 6	Resource Use—Design for Flexibility	1

Y	?	N		Indoor Environmental Quality	Possible Points: 18
Y	11				
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
Y			Prereq 3	Hazardous Material Removal or Encapsulation	
Y			Credit 1	Outdoor Air Delivery Monitoring	1
Y			Credit 2	Acoustic Environment	1
Y			Credit 3.1	Construction IAQ Management Plan—During Construction	1
Y			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
		N	Credit 4	Low-Emitting Materials	0
Y			Credit 5	Indoor Chemical and Pollutant Source Control	1
Y			Credit 6.1	Controllability of Systems—Lighting	1
Y			Credit 6.2	Controllability of Systems—Thermal Comfort	1
Y			Credit 7	Thermal Comfort—Design and Verification	1
Y			Credit 8.1	Daylight and Views—Daylight	2
Y			Credit 8.2	Daylight and Views—Views	1

Y	?	N		Innovation in Design	Possible Points: 6
	0	N			
		N	Prereq 1	Integrated Project Planning and Design	
		N	Credit 1.1	Innovation in Design: Specific Title	0
		N	Credit 1.2	Innovation in Design: Specific Title	0
		N	Credit 1.3	Innovation in Design: Specific Title	0
		N	Credit 1.4	Innovation in Design: Specific Title	0
	?		Credit 2	LEED Accredited Professional	0
		N	Credit 3	Integrated Project Planning and Design	0

Y	?	N		Regional Priority Credits	Possible Points: 4
	0	N			
		N	Credit 1.1	Regional Priority: Specific Credit	0
		N	Credit 1.2	Regional Priority: Specific Credit	0
		N	Credit 1.3	Regional Priority: Specific Credit	0
		N	Credit 1.4	Regional Priority: Specific Credit	0

Sil		55		Total	Possible Points: 110

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

- Courtesy of usgbc.org

Appendix E
BIM Execution Planning

(Table 7: BIM Uses)

BIM Use*	Value to Project	Responsible Party	Value to Resp Party	Capability Rating			Additional Resources / Competencies Required to Implement	Notes	Proceed with Use
	High / Med / Low		High / Med / Low	Scale 1-3 (1 = Low)					YES / NO / MAYBE
				Resources	Competency	Experience			
Maintenance Scheduling	Low	Facility Manager	Med	1	2	1		Not worth added expense.	No
Building Systems Analysis	Low	Facility Manager	Low	3	1	1	Require Training	Have the resources but lack the drive to pursue it.	No
Record Modeling	High	Contractor	Med	2	2	1	Need Software Training	Very useful tool to owner for	Yes
		Facility Manager	High	1	1	1	Need Software Training	facilities management once	
		Designer	Med	3	3	3		construction is complete.	
Site Utilization Planning	Low	Contractor		3	2	1		Makes owner aware of site layout	No
		Facility Manager		1	1	1		for each phase of the project.	
		Civil Engineer		3	2	2			
3D Coordination (Construction)	High	Contractor	High	2	2	1		Minimizes clashes and change	Yes
		Subcontractor	High	1	1	1	Lacking Software Knowledge	orders in the field.	
		Designer	Low	2	3	2			
Energy Analysis	Low	Facility Manager	Med	2	1	1		Not of great importance to the owner.	No
4D Modeling	High	Contractor	High	3	2	2		Helps owner understanding project	Yes
		Facility Manager	High	1	1	1	Need Software Training	phasing.	
Design Authoring	High	Architect	High	3	3	2		Allows for better quality control of	Yes
		MEP Engineer	Med	2	?	?		design and true collaboration.	
		Structural Eng.	Med	2	?	?			
Cost Estimation	Med	Contractor	High	3	2	2		Traditional estimating methods already work efficiently for the project team.	Maybe
Design Reviews	Med	Architect	Med	2	2	?		Helps visualize design aspects.	Maybe
3D Coordination (Design)	High	Architect	High	3	2	2		Makes sure the engineers and the	Yes
		MEP Engineer	High	2	?	?	Will Need Coordination Software	architect understand where each	
		Structural Eng.	Med	2	?	?	Will Need Coordination Software	others work will be located.	
Existing Conditions Modeling	High	Engineers	High	2	3	2		Would be extremely useful for the	Yes
		Subcontractors	Med	1	2	1	Will Need Training on Laser Scans	renovation phases of the project.	
		Architect	High	3	3	2			
Programming	Med	Architect	Med	3	3	3		Better layout of design.	Maybe
		Owner	Med	1	1	1			

* Additional BIM Uses as well as information on each Use can be found at http://www.engr.psu.edu/ae/cic/bimex/

- Courtesy of http://bim.psu.edu/Uses/default.aspx

LEVEL 1: BIM EXECUTION PLANNING PROCESS
Project Title

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team
http://www.engr/psu.edu/ae/cic/bimex