

October 19th, 2011

Technical Assignment 2



Unionville High School Additions and Renovations

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Executive Summary

Technical Assignment Two is aimed at providing a more detailed view of the Unionville High School Building Additions and Renovations project. The project consists of both new construction as well as renovations and has a total size of 319,000 square feet. Analyses within the report include a more detailed project schedule, an estimation of the structural system for the building, a general conditions estimate, a LEED evaluation based on the most recent rating system, and an analysis of the use or potential use of BIM for the Unionville High School Building Additions and Renovations.

As an educational project, the Unionville High School project proposes many issues. One of the main issues for this project in particular is the task of keeping specific portions of the building in use as other are under construction. In order to produce a high quality product on time without disturbing the building inhabitants, a detailed phasing plan was created to develop the schedule. A detailed schedule for the project has been created and is included within the report. Ultimately, the project **began on June 16th 2009** and is set to **conclude on September 28th 2012**. Note: the project is roughly three months ahead of schedule as of the creation of this report; the original completion date was December 28th 2012.

For the detailed structural system estimate, one of the new additions to the building was analyzed. Using a new portion of the building or this estimate, Area D, allowed for a more accurate structural system investigation. In total, the cost from the estimate structural system for Area D is approximately **\$3,394,000.00**. A general conditions estimate is also contained within the report, with the total estimate coming to **\$4,400,000.00**.

Green building is growing in importance and is arguably the most important factor for new construction in today's industry. In this report, an analysis is done on both the LEED 2007 system and the LEED 2009 system. The 2007 system is analyzed because the project was designed using this specification, while the 2009 system is also evaluated to determine how the project would have been rated using the most recent evaluation. Under the LEED 2007 system, the project is qualified to receive a **LEED 2007 Silver Certification**; due to changes and additional credits being added to the new system, the project is qualified to receive only a **LEED 2009 Certification**.

Finally, the use of BIM on the project is outlined. Although BIM was not used for this project as part of the original design, the potential use of BIM is outlined and detailed. In summary, it is in my opinion that **BIM use would have been of value** for the project if the circumstances of the project permitted. For the project as it was designed, however, BIM was not applicable and therefore was not employed.

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Detailed Project Schedule

Projects including additions and renovations to a building require that some or most of the building remain in use during the construction process. As a result, the Unionville High School Building Additions and Renovations project follows a carefully designed phased construction schedule. The GMP contract was developed and agreed upon between UCFS and Wohlsen Construction as a result of a hard bid public work job. Overall, the project design spanned from June of 2008 until 2009, with construction initially slated to begin on June 22nd, 2009 and finish on December 28th, 2012. As of October 19th 2011 when this report was completed, the estimated finish for the project had moved up roughly three months and is expected to be completed on September 29th, 2012. With multiple phases during construction, the project team was able to develop a schedule in order to efficiently complete building construction while limiting the disruption of everyday life for students and faculty.

Each phase of construction focuses on one portion of construction, although some phases do incorporate multiple areas of the building. The first phase focuses on the addition of a new wing which will house District Offices and classroom space. Phase three focuses on the addition of the new Auditorium as well as the renovation of existing spaces within the building. The existing auditorium is renovated into Choral and Tech Ed rooms during phase three, and phase four sees the demolition of an existing portion of the building in order to make room for the new Gymnasium. Overall the project duration (as of this report) is set to span 39 months from June 15th 2009 until September 28th 2012. The phasing plan, as well as a map outlining the areas of the building, can be seen in APPENDIX A. Phase descriptions and phase timelines are listed below.

Phase Descriptions

- ❖ **Phase 1:** Construction of the New 3 story addition, set to house the Unionville-Chadds Ford School District Administrative Offices, Classrooms, and Science labs.
- ❖ **Phase 2:** Construction of the New Auditorium, Art rooms, and Family and Consumer Classrooms.
- ❖ **Phase 2A:** Renovation of existing Large Group Instruction, Library, Faculty Restrooms, Cafeteria, and Kitchen.
- ❖ **Phase 2B & 2C:** Renovation of existing District Administrative Offices into High School Offices, Science Labs, and Classrooms.
- ❖ **Phase 2D:** Renovation of existing High School Offices, Music Area, and Faculty Dining.
- ❖ **Phase 2E:** Renovation of existing Science Labs and Classrooms.
- ❖ **Phase 2F:** Renovation of existing Classrooms
- ❖ **Phase 2G:** Renovation of the existing Computer Applications Labs and Classrooms.
- ❖ **Phase 2H, 2I, 2J:** Renovation of existing Classrooms.
- ❖ **Phase 3:** Renovation of existing Auditorium into Choral Room and Tech Ed Classrooms.
- ❖ **Phase 4:** Demolition of existing Classroom and Tech Ed Wing and Weight Room.
- ❖ **Phase 4A:** Renovation of existing Gymnasium, Locker and Team Rooms.
- ❖ **Phase 4B:** Demolition of existing Auxiliary gym.

Phase Timelines

Design	June 16th 2008 – June 12th 2009
Phase 1	June 15th, 2009 – June 25th, 2010
Phase 2	June 9th 2010 – June 23rd 2011
Phase 2A	June 2nd 2010 – July 28th 2011
Phase 2B & 2C	June 30th 2010 – December 31st 2010
Phase 2D	January 6th 2011 – June 27th 2011
Phase 2E	January 3rd 2011 – January 21st 2011
Phase 2F	January 24th 2011 – February 11th 2011
Phase 2G	February 14th 2011 – March 4th 2011
Phase 2H	March 14th 2011 – April 1st 2011
Phase 2I & 2J	April 4th 2011 – June 3rd 2011
Phase 3	June 9th 2011 – December 30th 2011
Phase 4	July 7th 2011 – April 27th 2012
Phase 4A	May 24th 2011 – September 28th 2012
Phase 4B	April 30th 2012 – June 29th 2011

Overall, phased construction was easily the best choice for a project of this type. While working during school hours presents many challenges, phased construction allows for the careful planning of construction in order to manage the interaction between construction and everyday life. Thus far, construction has gone accordingly and the schedule has been met. As a result, normal school activities have gone uninterrupted while construction continues to be completed according to schedule.

The entire project schedule can be seen in APPENDIX B.

Detailed Structural System Estimate

As a large project with both new additions and renovations there are many different types of construction going on throughout the project life cycle. This detailed structural estimate focuses on one of the major new additions to the building; Phase one for the Unionville High School Additions and Renovations projects encompasses the construction of a new wing containing the Administrative Office building for the Unionville-Chadds Ford School District as well as new classroom and science lab space (this area of the project is known as Area D, see Figure 1). Quantity takeoffs and specific cost information regarding each line item can be found, organized by CSI Masterformat, in APPENDIX C. The following items have been included in this estimate.

- ❖ Spread Footings
- ❖ Strip Footings
- ❖ Concrete Piers
- ❖ Slab-On-Grade
- ❖ CMU Foundation Walls
- ❖ Concrete Retaining Wall
- ❖ Structural Steel Columns and Beams
- ❖ Elevated Concrete Slabs on Metal Decking
- ❖ Metal Roof Decking

This detailed estimate has been produced using *RS Means Building Construction Cost Data 2011*. For the purpose of this estimate, total costs exclude overhead and profit. The estimate is broken down into cost estimates for typical bays based on specific floors, as the typical bay for the first and second floor was the same while the third floor and roof needed analyses for individual bays. Organizing the estimate in this manner allowed for a more realistic estimate than assuming one typical bay for all three floors and the roof. Structural steel values throughout the estimate include all steel members but exclude connections. Descriptions, specific assumptions, and total costs for each floor can be seen below. A location factor of 108.9 for Westchester Pennsylvania will be applied to the final cost for the entire structural system. Values have been rounded up to allow for easier interpretation of the data.

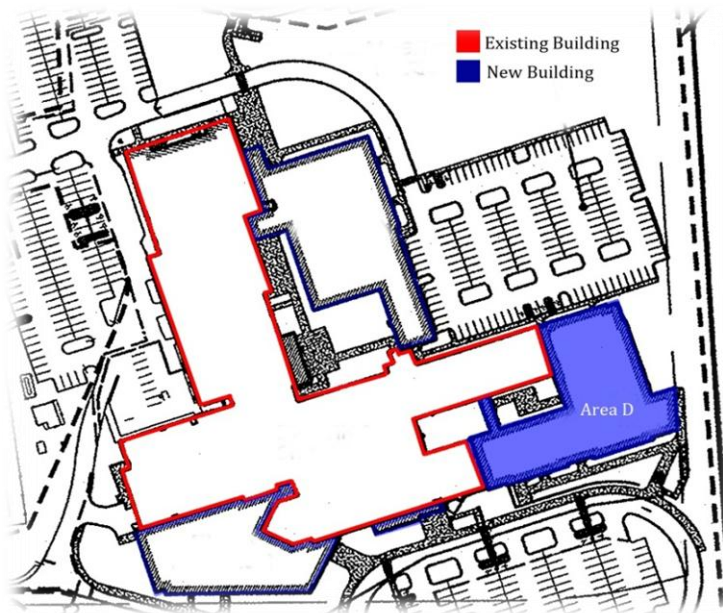


Figure 1: Area D

Foundation and First Floor

The foundation for the portion of the building being analyzed for this estimate, Area D, includes spread footings, strip footings, concrete piers, slab-on-grade, CMU foundation walls, and a small concrete retaining wall. Typical bay size for this floor is assumed to be 24'-1" x 28'0", or 675 square feet. A 4" slab-on-grade is to be pumped into place on top of 4" of crushed stone (which has not been included in this estimate) with 6x6W1.4x1.4 WWF. Each structural steel column sits on a spread footing, with select columns resting on reinforced concrete piers. These piers as well as the strip footings, concrete retaining wall, and CMU foundation walls have all been accounted for in the overall cost per square foot of the foundation estimate by adding their entire value to the extrapolated data from the typical bay. These items have not been included as a part of the cost of the typical bay, as these items do not show up regularly. Cost information can be seen below.

Foundation and First Floor | Cost per bay

Material	\$10,000.00
Labor	\$8,500.00
Equipment	\$350.00
Total	\$19,000

Foundation and First Floor | Cost per S.F.

Material	\$15.00
Labor	\$12.50
Equipment	\$0.50
Total	\$28.00

Foundation and First Floor | Cost for Entire Area D

Material	\$470,000.00
Labor	\$390,000.00
Equipment	\$15,500.00.00
Total	\$875,500.00

Second Floor

Like the foundation and first floor typical bay, the second floor bay is assumed to be 24'-1" x 28'-0", or 675 square feet. An elevated slab is composed of 1.5" thick 18 gauge metal decking and 3" of normal weight concrete. Concrete is to be pumped and is to have a compressive strength of 4000 psi with 6x6 W1.4x1.4 WWF.

Second Floor | Cost per bay

Material	\$18,000.00
Labor	\$2,000.00
Equipment	\$500.00
Total	\$20,500.00

Second Floor | Cost per S.F.

Material	\$27.00
Labor	\$3.00
Equipment	\$0.75
Total	\$30.75

Second Floor | Cost for Entire Area D

Material	\$800,000.00
Labor	\$90,000.00
Equipment	\$21,000.00
Total	\$910,000.00

Third Floor

The third floor typical bay is a bit larger than the previous two and is assumed to be 24'-8" x 37'-6", or 925 square feet. An elevated slab is to be used like the second floor, with a system using 1.5" thick metal decking and 3" of normal weight, pumped concrete with a compressive strength of 4000 psi with 6x6 W1.4x1.4 WWF making up the flooring system for the third floor.

Third Floor | Cost per bay

Material	\$21,500.00
Labor	\$2,500.00
Equipment	\$500.00
Total	\$24,500

Third Floor | Cost per S.F.

Material	\$23.25
Labor	\$2.50
Equipment	\$0.50
Total	\$26.25

Third Floor | Cost for Entire Area D

Material	\$695,000.00
Labor	\$75,000.00
Equipment	\$16,000.00
Total	\$786,000.00

Roof

Larger than both of the two previous bays, the typical bay for the roof structure measures 24'-8" x 41'-10", or 1032 square feet. 1.5" thick metal roof decking will be installed to top out the structure for this portion of the building, with no concrete being applied to the top of the deck.

Roof | Cost per bay

Material	\$17,000.00
Labor	\$1,500.00
Equipment	\$500.00
Total	\$19,000

Roof | Cost per S.F.

Material	\$16.50
Labor	\$1.50
Equipment	\$.50
Total	\$18.50

Roof | Cost for Entire Area D

Material	\$490,000.00
Labor	\$40,000.00
Equipment	\$14,000.00
Total	\$544,000.00

Structural System Cost

The data below displays information regarding the estimate for the cost for the entire project. Values for specific Material, Labor, Equipment, and Total Cost are calculated for Concrete, Structural Steel, and the Structural System as a whole, including the cost with the location factor applied.

Concrete | Cost per S.F.

Material	\$16.50
Labor	\$16.00
Equipment	\$0.10
Total	\$32.60

Structural Steel | Cost per S.F.

Material	\$66.75
Labor	\$4.40
Equipment	\$1.60
Total	\$72.75

Complete Structural System Cost | Total Cost

Material	\$2,450,000.00
Labor	\$600,500.00
Equipment	\$66,000.00
Total	\$3,116,000.00
Total With Location Factor	\$3,394,00.00

Overall, the estimated cost for the entire structural system for Area D comes to **\$3,394,000.00**. While this estimate has included most of the items within the structural system, some items have been left out. Exclusion of certain items, such as steel connections and construction joints, can change the value of the estimate. Another potential issue with using RS means is the accuracy of the cost data. RS means cost data provides national averages, which may not be on par with the cost of the material, labor, and equipment used for this specific project. Finally, a typical bay can provide a quality estimate but may not extrapolate quite accurately enough to truly represent the cost of the system. For this reason, typical bays were selected for each floor.

Again, all information regarding this structural estimate can be found in APPENDIX C, organized by floor and further by CSI Masterformat.

General Conditions Estimate

Rather than estimating just one portion of the project (as was done with the structural estimate), the entire project has been accounted for in this general conditions estimate. The source for the information used to develop this general conditions estimate comes from *RS Means Building Construction Costs 2011*.

Several assumptions have been used to produce this estimate:

- ❖ Project Information
 - Project Duration:
 - 183 Weeks
 - 42 Months (original schedule)
 - Construction Site size
 - 900,000 Square Feet
 - 21 Acres
 - Construction Site Perimeter
 - Perimeter: 4,300 Linear Feet

- ❖ Field Personnel
 - 'Clerk' has been used to estimate the cost of a Project Assistant
 - 'Field Engineer' has been used to estimate the cost of a Project Engineer

- ❖ Temporary Utilities
 - The only temporary utilities accounted for in this estimate refer to the utilities providing power, electricity, HVAC, etc. to the trailer. All power and other utilities for the project are assumed to have been provided by existing portions of the building.

Construction fees and contingencies have been excluded from this estimate. Due to the lack of some 'Total Cost' information for certain items used in this estimate, all costs have been quantified using 'Total Cost including O&P' data. Final values include a *location factor of 108.9* and have been rounded to more easily interpret the cost data. Based on these assumptions, the following cost information has been derived.

General Conditions | Total Cost

Total Cost including O&P	\$4,020,000.00
Total Cost with Location Factor	\$4,400,000.00
Construction Cost	\$52,000,000.00
General Conditions % of Total Cost	\$8.5%

At 8.5%, this estimate is within a reasonable range in terms of price relative to the overall project cost. Most costs were calculated to be incurred for the entire duration of the project, but several costs were estimated based on their estimated duration on the project. Small variations may have altered the value of the estimate due to the exclusion of specific items from the estimate, namely items that RS Means did not have a specific value for. A further breakdown of the estimate can be seen below, with the entire project cost being divided into monthly costs for four main categories: Field Personnel, Insurance and Bonds, General Construction Costs, and Office and Storage Space. These values are derived from the General Conditions Cost with the location factor (108.9) applied.

General Conditions | Cost Per Month (including Location Factor)

Project Staff	\$41,500.00
Insurance and Bonds	\$37,000.00
General Construction Costs	\$25,000.00
Office and Storage Space	\$1,000.00
Total Cost	\$104,500.00

With more than \$100,000.00 per month in general conditions costs, it is clear that the schedule must be followed precisely. Not only would a delay produce direct costs, but liquidated damages (agreed upon in the contract) would be incurred as well. Note: Although some costs in the estimate are not incurred for the entire duration of the project, these values have been calculated as a division of the entire cost by the duration of the project in order to provide a rough estimate of monthly costs. This calculation allows for a quick view at which portions of the general condition contribute more to the job cost than others.

All General Conditions estimate information can be found in APPENDIX D.

LEED Evaluation

LEED, Leadership in Energy and Environmental Design, is a major part of the construction industry and has grown significantly since its inception in March 2000. Green building promotes sustainable design and building construction practices and provides a rating system for owners or other perspective builders to follow in hopes of earning a LEED certification. This section will provide two analyses: LEED for Schools 2007 and LEED 2009 for New Construction and Major Renovations. As design and construction for the Unionville High School Building Additions and Renovations project began prior to the inception of LEED 2009, the project is eligible to be rated based on the 2007 system and will receive a 2007 certification upon completion should it meet the necessary requirements. An analysis of the project based on the 2007 system will provide information regarding the ranking that the project will receive (should all proposed requirements be met). A LEED 2009 scorecard is also filled out to determine which ranking the project would get if it were to be judged based on the new system, as well as certain categories and points that the project could target to improve the LEED rating.

LEED for Schools 2007 Analysis

The LEED for Schools 2007 rating system provides a checklist structured more towards educational projects offering a maximum of 79 points. Items such as “classroom acoustics, master planning, mold prevention, and environmental site assessment” (USGBC.org) are rated in order to provide an education specific rating for K-12 school projects. The rankings for the 2007 system are as follows:

LEED for Schools 2007 Certification Ratings

Certified	29-36 points
Silver	37-43 points
Gold	44-57 points
Platinum	58-79 points

After completing the checklist, the Unionville High School Building Additions and Renovations project team applied to qualify for **40 points** and ultimately aims to receive a LEED for Schools 2007 Silver Certification. Due to the fact that construction began before the LEED 2009 system was completely implemented, should these points be achieved the project will receive the **2007 Silver Certification**. A filled out LEED for Schools Scorecard showing in detail which points were achieved has been filled out and is available in APPENDIX E.

LEED 2009 for New Construction and Major Renovations

The Unionville High School Building Additions and Renovations project was developed before the LEED 2009 system, as mentioned above, and as such will be rated based on the 2007 system. This analysis is provided in order to outline which points the original design qualifies for based on the 2009 system as well as areas that the project could improve on or target in order to improve the rating. With nearly 140% as many points (110 total points compared to 79 points), it is safe to say that the new system has been developed to provide a more accurate assessment of how sustainable a given project is. The certification breakdown can be seen below.

LEED 2009 Certification Ratings

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

Based on the 2009 system, the UHS project is set to earn **43 credits** and earn a LEED certified rating. While this in and of itself can be considered a success, there is certainly room for improvement should the owner be interested in earning a Silver or better certification. Based on the original design, there are several areas that could be improved slightly in order to earn more points as well as new areas that have not been targeted in the original sustainable design goals and could be achieved with a minimal amount of effort. Possible improvements will be mentioned but obtainability will not be analyzed as it is difficult to determine exactly how feasible attaining extra credits might be based on the budget available, the desire to achieve these credits, and how the work to achieve these goals might affect the schedule. Each point category is outlined and suggested pursuit of additional points within each category is described.

Sustainable Sites

The first section in LEED 2009 is Sustainable Sites and is aimed at reducing pollution as a result of construction, minimalizing the projects' impact on the surrounding environment, and preservation of existing natural and green areas. A total of 26 points are possible within this category, with the majority of the points focusing on Alternative Transportation (12 points). For this project, just six points were obtained in the Sustainable Sites portion of the checklist. Alternative transportation is an area that was difficult for this project to target successfully. While one point was gained for Bicycle storage, the other points remained untouched. As both a high school and a school district administrative office, parking capacity needed to remain large enough to serve faculty, students, and administrative office personnel. Although not targeted as part of the initial LEED evaluation, the credit for Development Density and Community Connectivity may be an option as an additional credit as this project either meets all requirements or could do so with minimal effort. Overall, several points were gained here but the inability to target the alternative transportation credits within this section kept the score low.

Water Efficiency

As such a valuable commodity, water use reduction is of supreme importance in today's construction industry. The Water Efficiency section of the LEED scorecard focuses on improvement of water use efficiency, reduction wastewater production, and reduction of water use for landscaping purposes. With a score of two out of a possible ten credits, this area of the checklist was again difficult to target for this specific project. The two credits were gained as a result of reducing landscaping water use by 50%. With significant effort already being put into this area of the project to cut landscaping water usage in half, the complete reduction of potable water use may be a credit worth targeting. Waste water reduction was also targeted, but only to reduce the usage by a total of 20%. While this was worth one credit in the 2007 LEED rating system, the lowest threshold for reduction in the 2009 system is 30% reduction. An increase in reduction by 10% may be another reasonable goal for the project and gain two additional credits.

Energy and Atmosphere

The Energy and Atmosphere section provides the opportunity for a large quantity of points, targeting the reduction of energy use throughout the building, reduction of mechanical operating costs, increased energy efficiency, and the potential use of on-site and renewable energy sources. Targeting improvement of energy use is worth 19 of the 35 total credits for this section. As designed, the UHS project is aiming to improve energy performance by 24% for new buildings and 20% for renovations, worth seven credits. It is reasonable to believe that small changes could be made to improve this reduction, perhaps all the way to 28% improvement for new buildings and 24% for renovations. As for renewable energy, the implementation of solar panels on some or all areas of the roof could provide enough energy to receive an addition credit.

Materials and Resources

The Materials and Resources section focuses on the proper handling of materials during construction, namely the recycling of construction waste, reuse of existing structures, and the use of regional materials for the project. Overall, this project aims to achieve 11 out of a possible 14 credits. As designed, the project is aiming to reuse 75% of the original building and recycle or salvage 50% of construction waste. Improving these numbers to 95% reuse and 75% construction waste recycled could be achieved with minimal effort would add several credits to the building total.

Indoor Environment Quality

As the name indicates, the focus of this section is to increase or maintain a high indoor environment quality. This section focuses on the quality of the indoor environment during construction by implementing strict guidelines prior to construction as well as using low-emitting materials. Other areas of emphasis include pollutant control and inhabitant productivity and comfort. This building's design meets many of these requirements, achieving 11 out of 15 possible credits. Using low-emitting flooring systems as well (the only low-emission category not targeted) would gain an additional credit.

Innovation and Design Process

This section of the scorecard promotes the creation of new credits for project teams. Items that go beyond the requirement for other credits may be considered for additional credits in this section. Surpassing energy or water efficiency credit thresholds may be a way to gain such credits.

Regional Priority Credits

Regional Priority credits provide motivation for projects to target credits that are more important for buildings in their specific area. For this project, three regional priority credits were met: Materials and Resources credit 2: 50% Construction Waste Recycled or Salvaged, Sustainable Sites credit 5.1: Protect or Restore habitat, and Sustainable Sites credit 6.1: Stormwater design quantity control. These three credits are of more importance to the Southeastern Pennsylvania location and as such carry more importance during this sustainability analysis.

Conclusion

Ultimately, the project has room for improvement in terms of the LEED 2009 rating system. Combined with the 43 original points, the addition of the previously mentioned suggestions could ultimately result in a **10 point** increase in points to a total of **53 points**. At 53 points, the project would qualify for a **Silver Certification** in the LEED 2009 system. Again, the suggestions made are very general; some of these addition credits may actually be attainable, while others may be completely unachievable and out of the scope for this particular project.

A filled out LEED 2009 for New Construction and Major Renovations scorecard can be viewed in APPENDIX F.

Building Information Modeling Use Evaluation

As the construction industry continues to grow and technology continues to develop, the use of Building Information Modeling is emerging rapidly. For this project, BIM was not implemented as part of the original project design. In this section, the potential for BIM use on this project will be analyzed; project goals, potential BIM uses, and those uses that are most sensible for the project are outlined in this section.

With almost a countless number of uses for Building Information Modeling, it may be difficult to determine which ways to best use the technology. To begin this process, potential project goals are developed prior to design and analyzed to determine which of these goals are worth pursuing. Each goal serves a specific purpose, with some being of more value to the project than other. Some goals incorporate a single BIM use, while others use BIM for multiple reasons. Proposed goals are listed below, with the BIM uses ultimately determined for the project listed as well.

Major BIM Goals and Potential BIM Uses

PRIORITY (HIGH/ MED/ LOW)	GOAL DESCRIPTION	POTENTIAL BIM USES
High	Phased Construction and Project Flow Planning	3D Coordination, 4D Modeling, Design Authoring
High	Construction Progress Tracking	4D Modeling, Programming, Design Authoring, Record Modeling
Low	MEP Trade Clash Detection	3D Coordination, Design Authoring
Med	Increase Sustainable Design Goal efficiency	LEED Evaluation
High	Improve/Increase Construction Productivity	3D Coordination, 4D Modeling, Construction System Design, 3D Control and Planning,
Med	Cost Tracking and Estimating	Cost Estimation

BIM Use Analysis

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

After analyzing the potential goals suggested early in this section and determining those that are worth pursuing, it is determined that BIM could be implemented during each phase of the project, with the majority of BIM use coming during the construct phase. Ultimately, 3D Planning and 4D Modeling appear to be of the highest value for this particular project, although cost evaluation could prove useful to track costs during a long project such as this. In total, eight BIM uses are to be implemented for the proposed use of BIM on this specific project; these uses and what they provide to a project are outlined below.

Building Information Modeling Uses Implemented

- Record Modeling**
- 3D Control and Planning**
- 3D Coordination**
- Design Authoring**
- LEED Evaluation**
- Programming**
- 4D Modeling**
- Cost Estimation**

BIM Use Descriptions

- ❖ Record modeling refers to the process of depicting the physical and environmental aspects of a given project. Information regarding MEP and Architectural systems, as well as information regarding planning for the project is contained within this model. Pre-build specifications can be linked with as-built specifications, showing how the two phases of construction match up and can help to resolve disputes during construction.
- ❖ 3D Control and Planning uses a model in order to help layout the construction of the building. Component drawings can be created to aid foreman onsite and can lead to increased communication and more efficient layout.
- ❖ Similar to 3D Control and Planning, 3D Coordination uses a model to decrease errors during construction. Clash detection is performed using the model to determine areas of concern between multiple trades. The ability to detect potential hang ups prior to work being placed in the field is invaluable to any project where keeping the schedule is of critical importance. Other key values of 3D Coordination include more accurate as built drawings, construction visualization for specific trades, and overall project coordination.
- ❖ Design Authoring is the basic building block of any BIM model. Authoring software is used to create a Building Information Model, with design conditions based on each specific project. This model is used to depict the project, while other software is used in combination with this model in order to increase the type and amount of information that is incorporated with that model. Ultimately, design authoring is the first step in the process of utilizing a BIM model and allows for increased coordination and better project visualization.
- ❖ Using BIM to perform a LEED evaluation provides added value to a project that is already targeting a LEED certification. The ability to use BIM to evaluate the project based on LEED criteria allows for a more accurate depiction of the sustainable design and construction goals. Energy use within the building can be tracked more easily as all sustainable features of the project can be modeled and tracked throughout the lifecycle of the project.
- ❖ Programming helps to determine how efficiently a project's use of space is. The BIM model allows the visualization of the spatial qualities of the project and helps to expedite decisions regarding these requirements.
- ❖ 4D Modeling is one of the most important uses of BIM for this specific project. This process uses the 4D model to plan phased occupancy (a major feature of the Unionville High School Building project) for both additions and renovations. The project team benefits from the 4D model to better understand the phasing of the project, identify potential schedule or phasing issues, and track information regarding specific project materials.
- ❖ Cost estimation uses the BIM model in order to create accurate cost estimates as well as take-offs of different materials used during construction. Change order costs as well as costs for other design changes can be determined with more efficiency.

Note: The Penn State BIM Execution Planning Guide V2.0 was used in large part to acquire this information. This guide can be found at www.engr.psu.edu/BIM.

BIM Implementation

In order to efficiently utilize BIM for a construction project, all affected parties must be involved. Using a Building Information Model is most effective when everyone in the project team can benefit from its use. For this specific project, it is proposed that a model is created by each individual party (Architect, Engineer, Trades, etc.) once the design process has concluded.

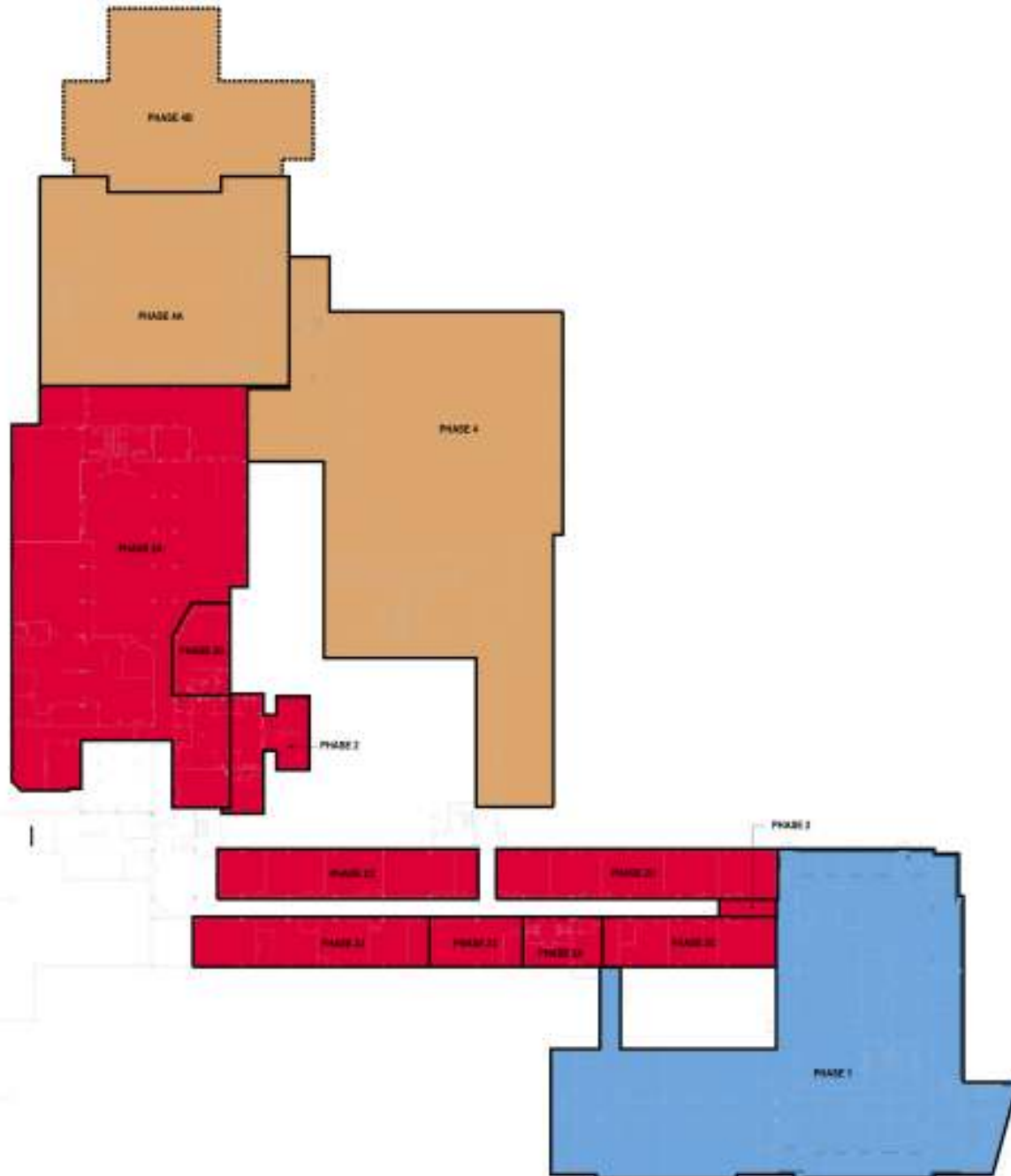
Each portion of the model will be created by a separate party (architecture, MEP, structural, site, etc.). Once each model has been constructed, each of these separate models is to be combined and held by the General Contractor. When coordination is scheduled, all parties will meet and each part of the model will be combined at that time. This allows all parties to remain abreast of the current state of the projects, see how their system fits relative to other systems, and see how other systems may be affected by theirs. The CM will maintain control over the model at all times in order to provide access to the model to the owner. At the completion of the project, the complete and up to date model will be turned over to the owner. At that time, any baseline training needed for the owner to understand use of the model would be administered.

For this project, BIM may not be appropriate based on the subcontractors selected, the knowledge of BIM for involved parties, and the owner's desire to have access to this information after construction is completed. Although BIM was *not* utilized on this project, it *would* in my opinion benefit the project team if the circumstances permitted. Several key areas of the project could benefit from the specific BIM uses outlined, especially in regards to the Phase Planning and Cost Estimation. The use of BIM would have to be determined prior to construction and even prior to bidding, as some potential subcontractors may be unable to effectively utilize this technology. Once selected, subcontractors, engineers, and the architect would be responsible for producing their specific models. The models would then be managed by the General Contractor, and all parties would come together in times of collaboration.

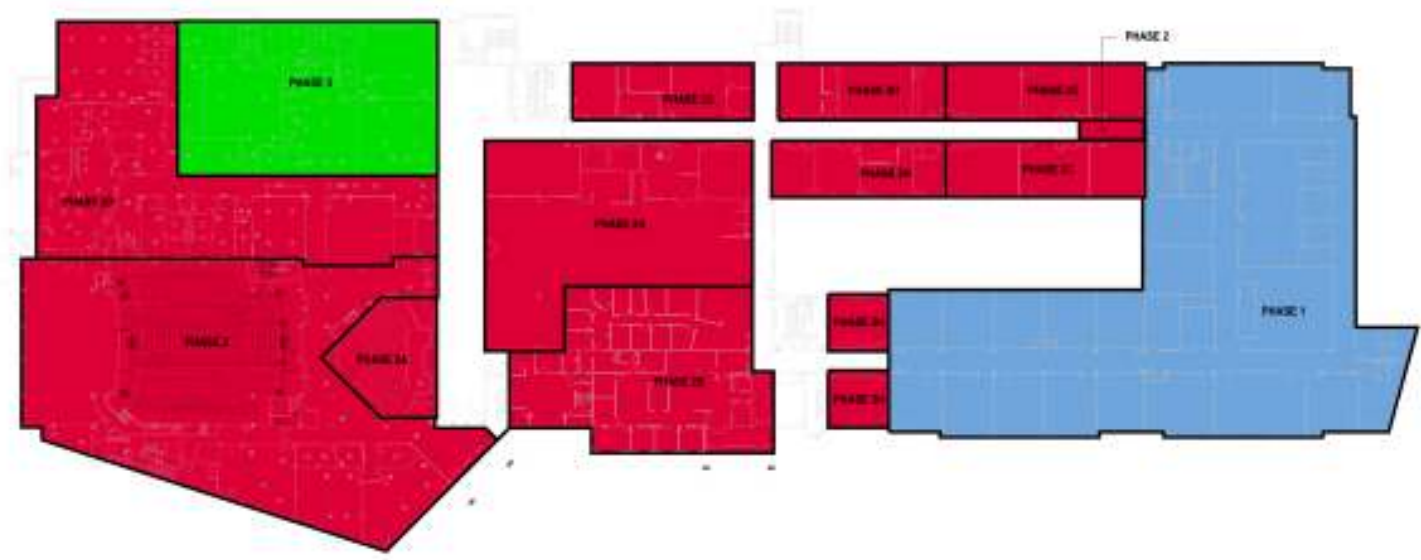
Overall, I believe that BIM use could have been beneficial for this project. The addition of this technology would allow more precise cost management for the project and would help to give everyone involve a better visual understanding of the project prior to construction as well as during construction. Under the circumstances (BIM experience and proficiency of all involved parties), however, BIM use may have been difficult to implement for this project and as a result was not used for the Unionville High School Building Additions and Renovations project.

A BIM Goal Use Analysis worksheet as well as a BIM Process map can be seen in APPENDIX G.

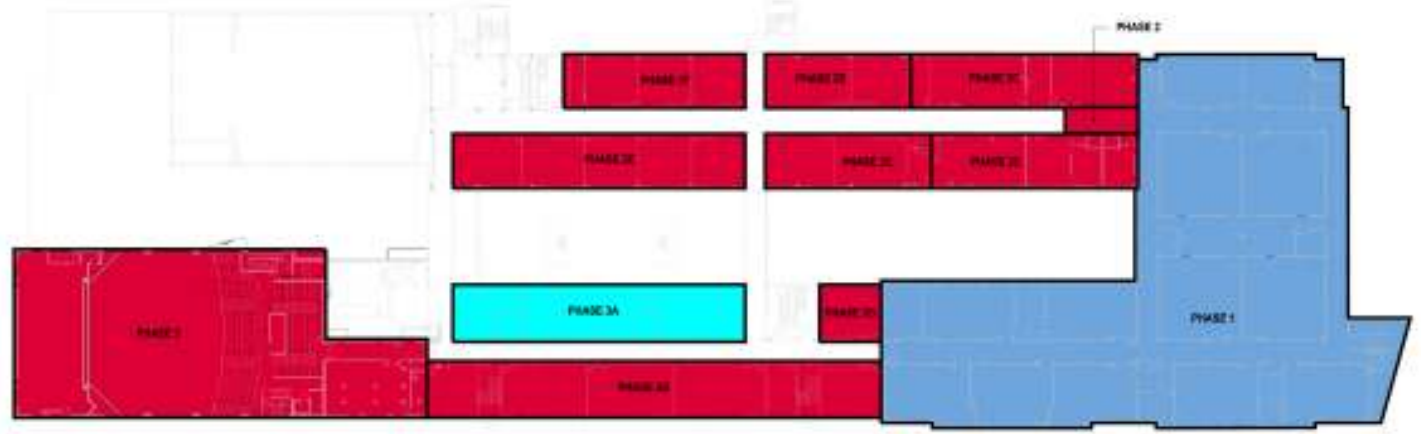
APPENDIX A – Phasing Plan and Building Area Key



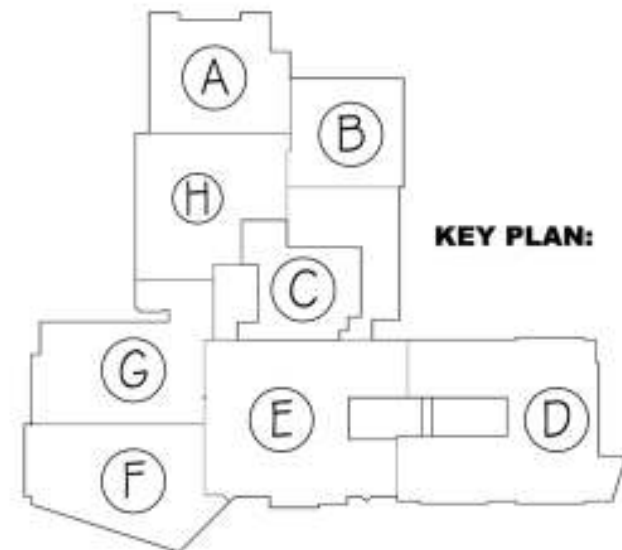
FIRST FLOOR LEVEL MASTER PHASING PLAN
SCALE: 1/4"=1'-0"



SECOND FLOOR LEVEL MASTER PHASING PLAN
SCALE: 1/4"=1'-0"



THIRD FLOOR LEVEL MASTER PHASING PLAN
SCALE: 1/4"=1'-0"

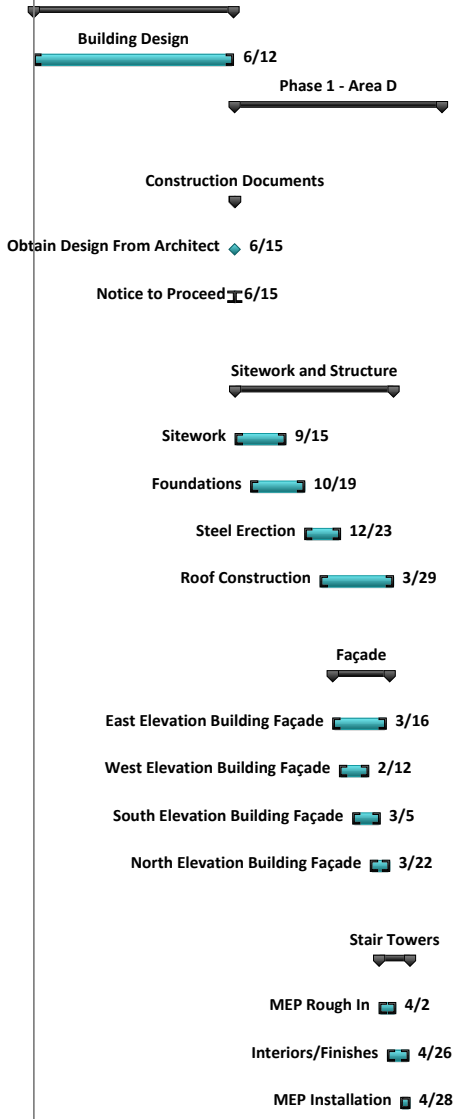


KEY PLAN:

PHASING KEY:		
■	PHASE 1	22 JUNE, 2009 - 25 JUNE, 2010
■	PHASE 2	28 JUNE, 2010 - 01 JULY, 2011
	PHASE 2A	14 JUNE, 2010 - 15 AUGUST, 2010
	PHASE 2B	28 JUNE, 2010 - 31 DECEMBER, 2010
	PHASE 2C	06 SEPTEMBER, 2010 - 31 DECEMBER, 2010
	PHASE 2D	03 JANUARY, 2011 - 01 JULY 2011
	PHASE 2E	03 JANUARY, 2011 - 21 JANUARY, 2011
	PHASE 2F	24 JANUARY, 2011 - 11 FEBRUARY, 2011
	PHASE 2G	14 FEBRUARY, 2011 - 04 MARCH, 2011
	PHASE 2H	07 MARCH, 2011 - 25 MARCH, 2011
	PHASE 2I	28 MARCH, 2011 - 15 APRIL, 2011
	PHASE 2J	18 APRIL, 2011 - 06 MAY, 2011
■	PHASE 3	04 JULY, 2011 - 30 DECEMBER, 2011
■	PHASE 3A	13 JUNE, 2011 - 12 AUGUST, 2011
■	PHASE 4	02 JANUARY, 2012 - 28 SEPTEMBER, 2012
	PHASE 4A	18 JUNE, 2012 - 02 NOVEMBER, 2012
	PHASE 4B	05 NOVEMBER, 2012 - 28 DECEMBER, 2012

APPENDIX B – Detailed Project Schedule

ID	Task Mode	Task Name	Duration	Start	Finish	January 1	October 1	July 1	April 1	January 1	October 1	July 1	April 1							
						1/13	5/25	10/5	2/15	6/28	11/8	3/21	8/1	12/12	4/24	9/4	1/15	5/27	10/7	2/17
1		Design Development	260 days	Mon 6/16/08	Fri 6/12/09															
2		Building Design	260 days	Mon 6/16/08	Fri 6/12/09															
3		Phase 1 - Area D	270 days?	Mon 6/15/09	Fri 6/25/10															
4		<New Task>																		
5		Construction Documents	1 day?	Mon 6/15/09	Mon 6/15/09															
6		Obtain Design From Architect	0 days	Mon 6/15/09	Mon 6/15/09															
7		Notice to Proceed	1 day	Mon 6/15/09	Mon 6/15/09															
8		<New Task>																		
9		Sitework and Structure	205 days?	Tue 6/16/09	Mon 3/29/10															
10		Sitework	66 days	Tue 6/16/09	Tue 9/15/09															
11		Foundations	70 days	Tue 7/14/09	Mon 10/19/09															
12		Steel Erection	47 days	Tue 10/20/09	Wed 12/23/09															
13		Roof Construction	95 days	Tue 11/17/09	Mon 3/29/10															
14		<New Task>																		
15		Façade	73 days?	Thu 12/10/09	Mon 3/22/10															
16		East Elevation Building Façade	69 days	Thu 12/10/09	Tue 3/16/10															
17		West Elevation Building Façade	39 days	Tue 12/22/09	Fri 2/12/10															
18		South Elevation Building Façade	36 days	Fri 1/15/10	Fri 3/5/10															
19		North Elevation Building Façade	25 days	Tue 2/16/10	Mon 3/22/10															
20		<New Task>																		
21		Stair Towers	40 days?	Thu 3/4/10	Wed 4/28/10															
22		MEP Rough In	22 days	Thu 3/4/10	Fri 4/2/10															
23		Interiors/Finishes	27 days	Fri 3/19/10	Mon 4/26/10															
24		MEP Installation	13 days	Mon 4/12/10	Wed 4/28/10															
25		<New Task>																		

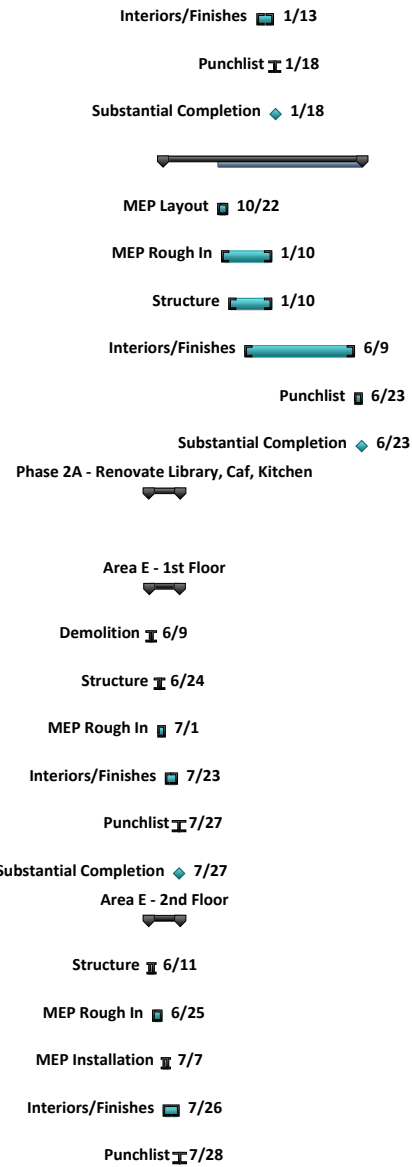


Project: Tech 2 Detailed Schedule Date: Fri 10/14/11	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone		External Milestone		Manual Task		Start-only			
	Summary		Inactive Task		Duration-only		Finish-only			

ID	Task Mode	Task Name	Duration	Start	Finish	January 1		October 1		July 1		April 1		January 1		October 1		July 1		April 1							
						1/13	5/25	10/5	2/15	6/28	11/8	3/21	8/1	12/12	4/24	9/4	1/15	5/27	10/7	2/17							
26		First Floor	158 days?	Wed 11/18/09	Fri 6/25/10	First Floor																					
27		MEP Rough In	56 days	Wed 11/18/09	Wed 2/3/10	MEP Rough In																					
28		MEP Layout	39 days	Wed 12/2/09	Mon 1/25/10	MEP Layout																					
29		MEP Installation	61 days	Wed 12/9/09	Wed 3/3/10	MEP Installation																					
30		Sprinkler Installation	91 days	Thu 12/31/09	Thu 5/6/10	Sprinkler Installation																					
31		Interiors/Finishes	80 days	Thu 2/18/10	Wed 6/9/10	Interiors/Finishes																					
32		Punchlist	9 days	Tue 6/15/10	Fri 6/25/10	Punchlist																					
33		Substantial Completion First Floor	0 days	Fri 6/25/10	Fri 6/25/10	Substantial Completion First Floor																					
34		<New Task>																									
35		Second Floor	144 days?	Thu 11/19/09	Tue 6/8/10	Second Floor																					
36		MEP Rough In	77 days	Thu 11/19/09	Fri 3/5/10	MEP Rough In																					
37		MEP Layout	42 days	Thu 12/10/09	Fri 2/5/10	MEP Layout																					
38		MEP Installation	60 days	Fri 12/18/09	Thu 3/11/10	MEP Installation																					
39		Sprinkler Installation	67 days	Fri 1/22/10	Mon 4/26/10	Sprinkler Installation																					
40		Interiors/Finishes	76 days	Thu 2/11/10	Thu 5/27/10	Interiors/Finishes																					
41		Punchlist	8 days	Fri 5/28/10	Tue 6/8/10	Punchlist																					
42		Substantial Completion 2nd Floor	0 days	Tue 6/8/10	Tue 6/8/10	Substantial Completion 2nd Floor																					
43		<New Task>																									
44		Third Floor	151 days	Thu 11/26/09	Fri 6/25/10	Third Floor																					
45		MEP Rough In	81 days	Thu 11/26/09	Thu 3/18/10	MEP Rough In																					
46		MEP Layout	50 days	Fri 12/11/09	Thu 2/18/10	MEP Layout																					
47		MEP Installation	65 days	Thu 12/24/09	Wed 3/24/10	MEP Installation																					
48		Sprinkler Installation	51 days	Wed 2/3/10	Wed 4/14/10	Sprinkler Installation																					
49		Interiors/Finishes	84 days	Wed 2/10/10	Mon 6/7/10	Interiors/Finishes																					
50		Punchlist	8 days	Tue 6/8/10	Thu 6/17/10	Punchlist																					

Project: Tech 2 Detailed Schedule Date: Fri 10/14/11	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			

ID	Task Mode	Task Name	Duration	Start	Finish	January 1		October 1		July 1		April 1		January 1		October 1		July 1		April 1	
						1/13	5/25	10/5	2/15	6/28	11/8	3/21	8/1	12/12	4/24	9/4	1/15	5/27	10/7	2/17	
76		Interiors/Finishes	22 days	Wed 12/15/10	Thu 1/13/11																
77		Punchlist	3 days	Fri 1/14/11	Tue 1/18/11																
78		Substantial Completion	0 days	Tue 1/18/11	Tue 1/18/11																
79		Auditorium/Stage/Balcony	259 days	Mon 6/28/10	Thu 6/23/11																
80		MEP Layout	14 days	Tue 10/5/10	Fri 10/22/10																
81		MEP Rough In	65 days	Tue 10/12/10	Mon 1/10/11																
82		Structure	56 days	Mon 10/25/10	Mon 1/10/11																
83		Interiors/Finishes	143 days	Tue 11/23/10	Thu 6/9/11																
84		Punchlist	10 days	Fri 6/10/11	Thu 6/23/11																
85		Substantial Completion	0 days	Thu 6/23/11	Thu 6/23/11																
86		Phase 2A - Renovate Library, Caf, Kitchen	41 days	Wed 6/2/10	Wed 7/28/10																
87		<New Task>																			
88		Area E - 1st Floor	39 days	Thu 6/3/10	Tue 7/27/10																
89		Demolition	5 days	Thu 6/3/10	Wed 6/9/10																
90		Structure	5 days	Fri 6/18/10	Thu 6/24/10																
91		MEP Rough In	10 days	Fri 6/18/10	Thu 7/1/10																
92		Interiors/Finishes	16 days	Fri 7/2/10	Fri 7/23/10																
93		Punchlist	2 days	Mon 7/26/10	Tue 7/27/10																
94		Substantial Completion	0 days	Tue 7/27/10	Tue 7/27/10																
95		Area E - 2nd Floor	41 days	Wed 6/2/10	Wed 7/28/10																
96		Structure	8 days	Wed 6/2/10	Fri 6/11/10																
97		MEP Rough In	13 days	Wed 6/9/10	Fri 6/25/10																
98		MEP Installation	8 days	Mon 6/28/10	Wed 7/7/10																
99		Interiors/Finishes	21 days	Mon 6/28/10	Mon 7/26/10																
100		Punchlist	2 days	Tue 7/27/10	Wed 7/28/10																



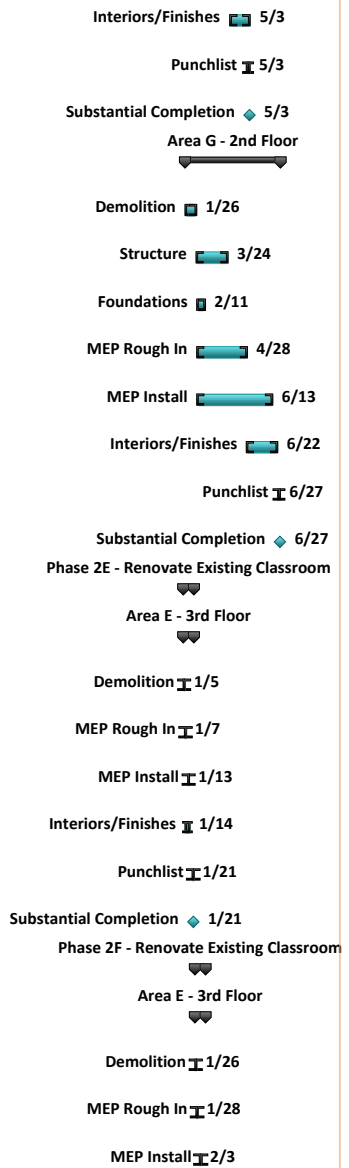
Project: Tech 2 Detailed Schedule
Date: Fri 10/14/11

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			

ID	Task Mode	Task Name	Duration	Start	Finish	January 1		October 1		July 1		April 1		January 1		October 1		July 1		April 1					
						1/13	5/25	10/5	2/15	6/28	11/8	3/21	8/1	12/12	4/24	9/4	1/15	5/27	10/7	2/17					
101		Substantial Completion	0 days	Wed 7/28/10	Wed 7/28/10	Substantial Completion 7/28																			
102		Area H - 1st Floor	41 days	Wed 6/2/10	Wed 7/28/10	Area H - 1st Floor																			
103		Asbestos Abatement	4 days	Wed 6/2/10	Mon 6/7/10	Asbestos Abatement 6/7																			
104		Structure	18 days	Thu 6/3/10	Sat 6/26/10	Structure 6/26																			
105		Foundations	9 days	Wed 6/9/10	Mon 6/21/10	Foundations 6/21																			
106		MEP Rough In	11 days	Mon 6/14/10	Sat 6/26/10	MEP Rough In 6/26																			
107		MEP Install/Test	24 days	Fri 6/18/10	Wed 7/21/10	MEP Install/Test 7/21																			
108		Interiors/Finishes	19 days	Wed 6/30/10	Mon 7/26/10	Interiors/Finishes 7/26																			
109		Punchlist	2 days	Tue 7/27/10	Wed 7/28/10	Punchlist 7/28																			
110		Substantial Completion	0 days	Wed 7/28/10	Wed 7/28/10	Substantial Completion 7/28																			
111		Phase 2B & 2C - Renovate District Office	133 days	Wed 6/30/10	Fri 12/31/10	Phase 2B & 2C - Renovate District Office																			
112		Area E - 2nd Floor	133 days	Wed 6/30/10	Fri 12/31/10	Area E - 2nd Floor																			
113		Demolition	15 days	Wed 6/30/10	Tue 7/20/10	Demolition 7/20																			
114		Foundations	12 days	Wed 7/21/10	Thu 8/5/10	Foundations 8/5																			
115		Structure	25 days	Thu 7/29/10	Wed 9/1/10	Structure 9/1																			
116		MEP Install	84 days	Wed 7/21/10	Mon 11/15/10	MEP Install 11/15																			
117		Interiors/Finishes	44 days	Tue 10/19/10	Fri 12/17/10	Interiors/Finishes 12/17																			
118		Punchlist	10 days	Mon 12/20/10	Fri 12/31/10	Punchlist 12/31																			
119		Substantial Completion	0 days	Fri 12/31/10	Fri 12/31/10	Substantial Completion 12/31																			
120		Phase 2D - Renovate HS Offices, Music & Family Dining	123 days	Thu 1/6/11	Mon 6/27/11	Phase 2D - Renovate HS Offices, Music & Family Dining																			
121		Area E - 2nd Floor	84 days	Thu 1/6/11	Tue 5/3/11	Area E - 2nd Floor																			
122		Demolition	15 days	Thu 1/6/11	Wed 1/26/11	Demolition 1/26																			
123		Structure	7 days	Thu 1/27/11	Fri 2/4/11	Structure 2/4																			
124		MEP Rough In	10 days	Thu 1/27/11	Wed 2/9/11	MEP Rough In 2/9																			
125		MEP Install	47 days	Fri 2/25/11	Mon 5/2/11	MEP Install 5/2																			

Project: Tech 2 Detailed Schedule Date: Fri 10/14/11	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			

ID	Task Mode	Task Name	Duration	Start	Finish	January 1		October 1		July 1		April 1		January 1		October 1		July 1		April 1	
						1/13	5/25	10/5	2/15	6/28	11/8	3/21	8/1	12/12	4/24	9/4	1/15	5/27	10/7	2/17	
126		Interiors/Finishes	27 days	Mon 3/28/11	Tue 5/3/11																
127		Punchlist	5 days	Wed 4/27/11	Tue 5/3/11																
128		Substantial Completion	0 days	Tue 5/3/11	Tue 5/3/11																
129		Area G - 2nd Floor	123 days	Thu 1/6/11	Mon 6/27/11																
130		Demolition	15 days	Thu 1/6/11	Wed 1/26/11																
131		Structure	42 days	Wed 1/26/11	Thu 3/24/11																
132		Foundations	12 days	Thu 1/27/11	Fri 2/11/11																
133		MEP Rough In	66 days	Thu 1/27/11	Thu 4/28/11																
134		MEP Install	98 days	Thu 1/27/11	Mon 6/13/11																
135		Interiors/Finishes	41 days	Wed 4/27/11	Wed 6/22/11																
136		Punchlist	3 days	Thu 6/23/11	Mon 6/27/11																
137		Substantial Completion	0 days	Mon 6/27/11	Mon 6/27/11																
138		Phase 2E - Renovate Existing Classroom	15 days	Mon 1/3/11	Fri 1/21/11																
139		Area E - 3rd Floor	15 days	Mon 1/3/11	Fri 1/21/11																
140		Demolition	3 days	Mon 1/3/11	Wed 1/5/11																
141		MEP Rough In	2 days	Thu 1/6/11	Fri 1/7/11																
142		MEP Install	3 days	Tue 1/11/11	Thu 1/13/11																
143		Interiors/Finishes	7 days	Thu 1/6/11	Fri 1/14/11																
144		Punchlist	2 days	Thu 1/20/11	Fri 1/21/11																
145		Substantial Completion	0 days	Fri 1/21/11	Fri 1/21/11																
146		Phase 2F - Renovate Existing Classroom	15 days	Mon 1/24/11	Fri 2/11/11																
147		Area E - 3rd Floor	15 days	Mon 1/24/11	Fri 2/11/11																
148		Demolition	3 days	Mon 1/24/11	Wed 1/26/11																
149		MEP Rough In	2 days	Thu 1/27/11	Fri 1/28/11																
150		MEP Install	1 day	Thu 2/3/11	Thu 2/3/11																

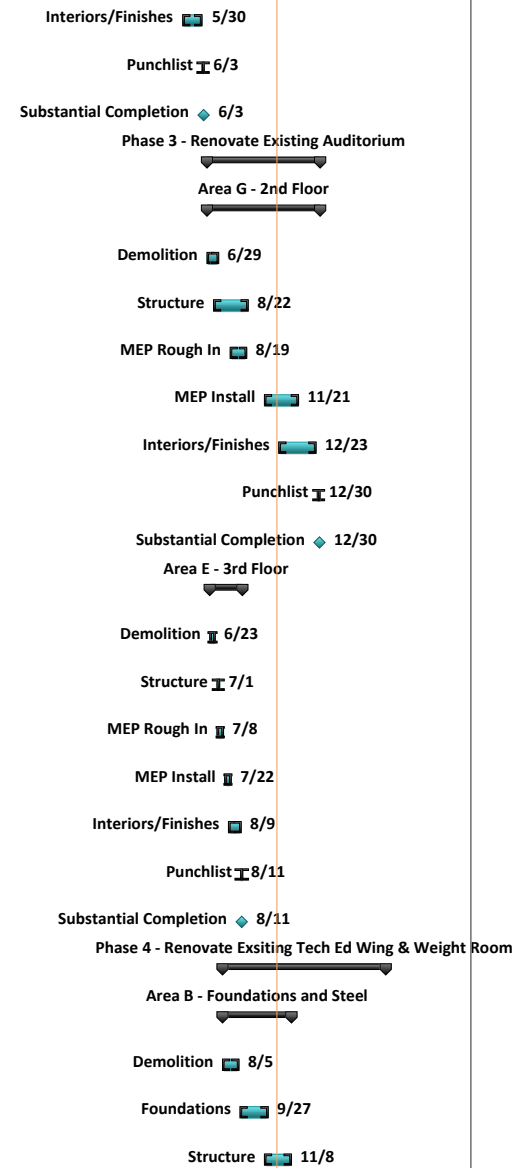


Project: Tech 2 Detailed Schedule Date: Fri 10/14/11	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone		External Milestone		Manual Task		Start-only			
	Summary		Inactive Task		Duration-only		Finish-only			

ID	Task Mode	Task Name	Duration	Start	Finish	January 1		October 1		July 1		April 1		January 1		October 1		July 1		April 1					
						1/13	5/25	10/5	2/15	6/28	11/8	3/21	8/1	12/12	4/24	9/4	1/15	5/27	10/7	2/17					
151		Interiors/Finishes	6 days	Fri 1/28/11	Fri 2/4/11	Interiors/Finishes 2/4																			
152		Punchlist	2 days	Thu 2/10/11	Fri 2/11/11	Punchlist 2/11																			
153		Substantial Completion	0 days	Fri 2/11/11	Fri 2/11/11	Substantial Completion 2/11																			
154		Phase 2G - Renovate Existing Computer Labs and Classrooms	15 days	Mon 2/14/11	Fri 3/4/11	Phase 2G - Renovate Existing Computer Labs and Classrooms																			
155		Area E - 3rd Floor	15 days	Mon 2/14/11	Fri 3/4/11	Area E - 3rd Floor																			
156		Demolition	5 days	Mon 2/14/11	Fri 2/18/11	Demolition 2/18																			
157		MEP Rough In	2 days	Mon 2/21/11	Tue 2/22/11	MEP Rough In 2/22																			
158		MEP Install	3 days	Wed 2/23/11	Fri 2/25/11	MEP Install 2/25																			
159		Interiors/Finishes	10 days	Mon 2/21/11	Fri 3/4/11	Interiors/Finishes 3/4																			
160		Punchlist	1 day	Fri 3/4/11	Fri 3/4/11	Punchlist 3/4																			
161		Substantial Completion	0 days	Fri 3/4/11	Fri 3/4/11	Substantial Completion 3/4																			
162		Phase 2H - Renovate Existing Classrooms	15 days	Mon 3/14/11	Fri 4/1/11	Phase 2H - Renovate Existing Classrooms																			
163		Area E - 2nd Floor	15 days	Mon 3/14/11	Fri 4/1/11	Area E - 2nd Floor																			
164		Demolition	4 days	Mon 3/14/11	Thu 3/17/11	Demolition 3/17																			
165		MEP Rough In	5 days	Tue 3/15/11	Mon 3/21/11	MEP Rough In 3/21																			
166		MEP Install	6 days	Thu 3/17/11	Thu 3/24/11	MEP Install 3/24																			
167		Interiors/Finishes	11 days	Thu 3/17/11	Thu 3/31/11	Interiors/Finishes 3/31																			
168		Punchlist	2 days	Thu 3/31/11	Fri 4/1/11	Punchlist 4/1																			
169		Substantial Completion	0 days	Fri 4/1/11	Fri 4/1/11	Substantial Completion 4/1																			
170		Phase 2I & 2J - Renovate Existing Classrooms	45 days	Mon 4/4/11	Fri 6/3/11	Phase 2I & 2J - Renovate Existing Classrooms																			
171		Area E - 1st Floor	45 days	Mon 4/4/11	Fri 6/3/11	Area E - 1st Floor																			
172		Demolition	8 days	Mon 4/4/11	Wed 4/13/11	Demolition 4/13																			
173		Structure	3 days	Tue 4/12/11	Thu 4/14/11	Structure 4/14																			
174		MEP Rough In	12 days	Fri 4/8/11	Mon 4/25/11	MEP Rough In 4/25																			
175		MEP Install	22 days	Thu 4/14/11	Fri 5/13/11	MEP Install 5/13																			

Project: Tech 2 Detailed Schedule Date: Fri 10/14/11	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			

ID	Task Mode	Task Name	Duration	Start	Finish	January 1		October 1		July 1		April 1		January 1		October 1		July 1		April 1	
						1/13	5/25	10/5	2/15	6/28	11/8	3/21	8/1	12/12	4/24	9/4	1/15	5/27	10/7	2/17	
176		Interiors/Finishes	25 days	Tue 4/26/11	Mon 5/30/11																
177		Punchlist	4 days	Tue 5/31/11	Fri 6/3/11																
178		Substantial Completion	0 days	Fri 6/3/11	Fri 6/3/11																
179		Phase 3 - Renovate Existing Auditorium	147 days	Thu 6/9/11	Fri 12/30/11																
180		Area G - 2nd Floor	147 days	Thu 6/9/11	Fri 12/30/11																
181		Demolition	15 days	Thu 6/9/11	Wed 6/29/11																
182		Structure	45 days	Tue 6/21/11	Mon 8/22/11																
183		MEP Rough In	22 days	Thu 7/21/11	Fri 8/19/11																
184		MEP Install	44 days	Wed 9/21/11	Mon 11/21/11																
185		Interiors/Finishes	50 days	Mon 10/17/11	Fri 12/23/11																
186		Punchlist	5 days	Mon 12/26/11	Fri 12/30/11																
187		Substantial Completion	0 days	Fri 12/30/11	Fri 12/30/11																
188		Area E - 3rd Floor	43 days	Tue 6/14/11	Thu 8/11/11																
189		Demolition	8 days	Tue 6/14/11	Thu 6/23/11																
190		Structure	5 days	Mon 6/27/11	Fri 7/1/11																
191		MEP Rough In	10 days	Mon 6/27/11	Fri 7/8/11																
192		MEP Install	10 days	Mon 7/11/11	Fri 7/22/11																
193		Interiors/Finishes	17 days	Mon 7/18/11	Tue 8/9/11																
194		Punchlist	2 days	Wed 8/10/11	Thu 8/11/11																
195		Substantial Completion	0 days	Thu 8/11/11	Thu 8/11/11																
196		Phase 4 - Renovate Existing Tech Ed Wing & Weight Room	212 days	Thu 7/7/11	Fri 4/27/12																
197		Area B - Foundations and Steel	89 days	Thu 7/7/11	Tue 11/8/11																
198		Demolition	22 days	Thu 7/7/11	Fri 8/5/11																
199		Foundations	37 days	Mon 8/8/11	Tue 9/27/11																
200		Structure	35 days	Wed 9/21/11	Tue 11/8/11																



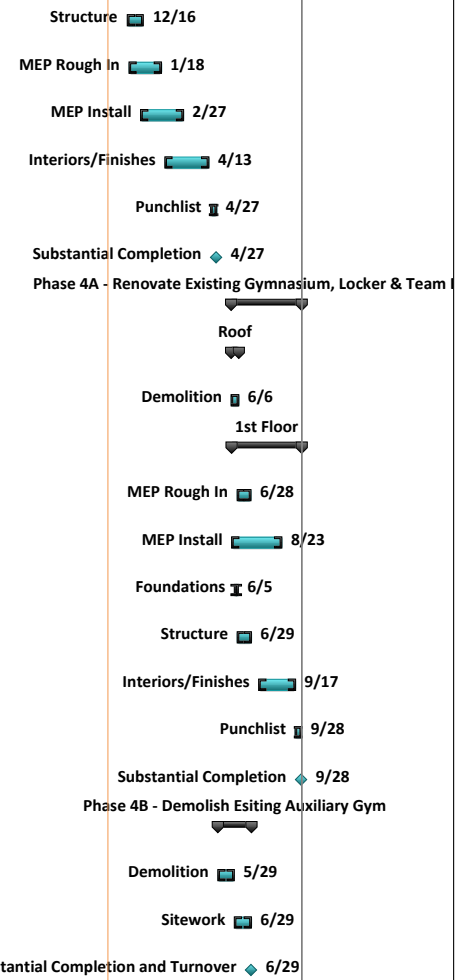
Project: Tech 2 Detailed Schedule Date: Fri 10/14/11	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone		External Milestone		Manual Task		Start-only			
	Summary		Inactive Task		Duration-only		Finish-only			

ID	Task Mode	Task Name	Duration	Start	Finish	January 1		October 1		July 1		April 1		January 1		October 1		July 1		April 1	
						1/13	5/25	10/5	2/15	6/28	11/8	3/21	8/1	12/12	4/24	9/4	1/15	5/27	10/7	2/17	
201		Area B - Façade	52 days	Wed 10/12/11	Thu 12/22/11																
202		East Elevation Building Façade	37 days	Wed 10/12/11	Thu 12/1/11																
203		North Elevation Building Façade	34 days	Wed 10/19/11	Mon 12/5/11																
204		South Elevation Building Façade	32 days	Wed 11/2/11	Thu 12/15/11																
205		West Elevation Building Façade	32 days	Wed 11/9/11	Thu 12/22/11																
206		Area B - First Floor	105 days	Wed 11/30/11	Tue 4/24/12																
207		MEP Rough In	24 days	Wed 11/30/11	Mon 1/2/12																
208		MEP Install	38 days	Tue 1/3/12	Thu 2/23/12																
209		Structure	6 days	Wed 11/30/11	Wed 12/7/11																
210		Interiors/Finishes	55 days	Wed 1/25/12	Tue 4/10/12																
211		Punchlist	10 days	Wed 4/11/12	Tue 4/24/12																
212		Substantial Completion	0 days	Tue 4/24/12	Tue 4/24/12																
213		Area B - First Floor Corridor	29 days	Tue 1/24/12	Mon 3/5/12																
214		MEP Layout	1 day	Tue 1/24/12	Wed 1/25/12																
215		MEP Rough In	2 days	Fri 1/27/12	Mon 1/30/12																
216		MEP Install	15 days	Fri 1/27/12	Thu 2/16/12																
217		Interiors/Finishes	19 days	Wed 2/8/12	Mon 3/5/12																
218		Area C - Foundations and Steel	121 days	Thu 8/18/11	Thu 2/2/12																
219		Foundations	26 days	Thu 8/18/11	Thu 9/22/11																
220		Structure	95 days	Fri 9/23/11	Thu 2/2/12																
221		Area C - Façade	38 days	Wed 11/9/11	Fri 12/30/11																
222		North Elevation Building Façade	23 days	Wed 11/9/11	Fri 12/9/11																
223		South Elevation Building Façade	23 days	Wed 11/23/11	Fri 12/23/11																
224		West Elevation Building Façade	23 days	Wed 11/30/11	Fri 12/30/11																
225		Area B - First Floor	116 days	Fri 11/18/11	Fri 4/27/12																



Project: Tech 2 Detailed Schedule Date: Fri 10/14/11	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			

ID	Task Mode	Task Name	Duration	Start	Finish	January 1		October 1		July 1		April 1		January 1		October 1		July 1		April 1	
						1/13	5/25	10/5	2/15	6/28	11/8	3/21	8/1	12/12	4/24	9/4	1/15	5/27	10/7	2/17	
226		Structure	21 days	Fri 11/18/11	Fri 12/16/11																
227		MEP Rough In	43 days	Mon 11/21/11	Wed 1/18/12																
228		MEP Install	56 days	Mon 12/12/11	Mon 2/27/12																
229		Interiors/Finishes	58 days	Wed 1/25/12	Fri 4/13/12																
230		Punchlist	9 days	Tue 4/17/12	Fri 4/27/12																
231		Substantial Completion	0 days	Fri 4/27/12	Fri 4/27/12																
232		Phase 4A - Renovate Existing Gymnasium, Locker & Team Rooms	92 days	Thu 5/24/12	Fri 9/28/12																
233		Roof	10 days	Thu 5/24/12	Wed 6/6/12																
234		Demolition	10 days	Thu 5/24/12	Wed 6/6/12																
235		1st Floor	91 days	Fri 5/25/12	Fri 9/28/12																
236		MEP Rough In	19 days	Mon 6/4/12	Thu 6/28/12																
237		MEP Install	65 days	Fri 5/25/12	Thu 8/23/12																
238		Foundations	5 days	Wed 5/30/12	Tue 6/5/12																
239		Structure	20 days	Mon 6/4/12	Fri 6/29/12																
240		Interiors/Finishes	47 days	Fri 7/13/12	Mon 9/17/12																
241		Punchlist	10 days	Mon 9/17/12	Fri 9/28/12																
242		Substantial Completion	0 days	Fri 9/28/12	Fri 9/28/12																
243		Phase 4B - Demolish Existing Auxiliary Gym	45 days	Mon 4/30/12	Fri 6/29/12																
244		Demolition	22 days	Mon 4/30/12	Tue 5/29/12																
245		Sitework	23 days	Wed 5/30/12	Fri 6/29/12																
246		Project Substantial Completion and Turnover	0 days	Fri 6/29/12	Fri 6/29/12																



Project: Tech 2 Detailed Schedule
Date: Fri 10/14/11

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 C – Detailed Structural System Estimate and Takeoffs

Foundation and 1st Floor | Cost For 1 Bay

CSI Division	Item	Type	Unit	Unit Cost			Total	Total Including O&P	Quantity	Material	Labor	Equipment	Total	Total Including O&P	
				Material	Labor	Equipment									
Concrete															
03 11 13.25 5650	Forms in Place, Column	Job built, 12"x12" column, 4 use	SFCA	\$ 0.71	\$ 5.80		\$ 6.51	\$ 9.70	16	\$ 11.36	\$ 92.80		\$ 104.16	\$ 155.20	
03 11 13.65 3000	Forms in Place, Slab on Grade	Edge forms, wood, on grade, to 6" high	L.F.	\$ 0.27	\$ 2.18		\$ 2.45	\$ 3.64	750	\$ 202.50	\$ 1,635.00		\$ 1,837.50	\$ 2,730.00	
03 15 13.50 20	Waterstops	PVC, ribbed 3/16" thick, 4" wide	L.F.	\$ 0.95	\$ 2.22		\$ 3.17	\$ 4.46	750	\$ 712.50	\$ 1,665.00		\$ 2,377.50	\$ 3,345.00	
03 21 10.60 600	Uncoated Reinforcing Steel	Slab on grade, #3-#7	Ton	\$ 855.00	\$ 515.00		\$ 1,370.00	\$ 2,025.00	0.94	\$ 803.70	\$ 484.10		\$ 1,287.80	\$ 1,903.50	
03 22 05.50 100	Welded Wire Fabric	6x6 W1.4xW1.4 21 lb. per C.S.F.	C.S.F.	\$ 12.50	\$ 22.00		\$ 34.50	\$ 49.50	55.56	\$ 694.50	\$ 1,222.32		\$ 1,916.82	\$ 2,750.22	
03 30 53.40 3850	Cast-In-Place Concrete	Footings 3000PSI, spread, > 5 CY	C.Y.	\$ 171.00	\$ 61.50	\$ 0.31	\$ 232.81	\$ 283.00	8.61	\$ 1,472.31	\$ 529.52	\$ 2.67	\$ 2,004.49	\$ 2,436.63	
03 30 53.40 4650	Cast-In-Place Concrete	SOG 3500 PSI, 4" thick	C.Y.	\$ 117.00	\$ 61.50	\$ 0.38	\$ 178.88	\$ 225.00	8.32	\$ 973.44	\$ 511.68	\$ 3.16	\$ 1,488.28	\$ 1,872.00	
03 30 53.40 6250	Cast-In-Place Concrete	Retaining Wall, 10' High	C.Y.	\$ 129.00	\$ 68.50	\$ 6.10	\$ 203.60	\$ 254.00	37.04	\$ 4,778.16	\$ 2,537.24	\$ 225.94	\$ 7,541.34	\$ 9,408.16	
03 31 05.70 4650	Concrete Placement	SOG, Up to 6" thick, pumped	C.Y.		\$ 12.75	\$ 4.26	\$ 17.01	\$ 24.00	8.32		\$ 106.08	\$ 35.44	\$ 141.52	\$ 199.68	
03 35 29.30 150	Finishing Floors	Bull float, manual float, broom finish w/ edging and joints	S.F.		\$ 0.50		\$ 0.50	\$ 0.74	674.33		\$ 337.17		\$ 337.17	\$ 499.00	
03 35 29.30 300	Finishing Floors	Power screed, bull float, machine float, trowel (walk-behind)	S.F.		\$ 0.39	\$ 0.04	\$ 0.43	\$ 0.62	674.33		\$ 262.99	\$ 26.97	\$ 289.96	\$ 418.08	
Metals															
05 05 23.05 70	Anchor Bolts	3/4", hooked w/ nut and washer, 8" long	Ea	\$ 3.65	\$ 2.17		\$ 6.36	\$ 8.15	16	\$ 58.40	\$ 34.72		\$ 101.76	\$ 130.40	
05 12 23.65 500	Base Plates	1" thick	S.F.	\$ 46.00			\$ 46.00	\$ 50.50	4	\$ 184.00			\$ 184.00	\$ 202.00	
05 12 23.75 900	Structural Steel Members	W10x49	L.F.	\$ 60.50	\$ 4.82	\$ 2.95	\$ 68.27	\$ 78.00	13	\$ 786.50	\$ 62.66	\$ 38.35	\$ 887.51	\$ 1,014.00	
										Total Material	Total Labor	Total Equipment	Total	Total Including O&P	
										Cost Per Bay	\$ 10,677.37	\$ 9,481.27	\$ 332.54	\$ 20,499.82	\$ 27,063.88
										Cost Per S.F.	\$ 15.83	\$ 14.06	\$ 0.49	\$ 30.40	\$ 40.13

Foundation and 1st Floor | Cost for Entire Foundation

Note: These items have been estimated as a cost for the entire foundation, rather than one typical bay, as these items are not present in each bay and would not have been properly estimated using the typical bay method.

CSI Division	Item	Type	Unit	Unit Cost			Total	Total Including O&P	Quantity	Material	Labor	Equipment	Total	Total Including O&P	
				Material	Labor	Equipment									
03 31 05.35 300	Structural Concrete for Piers	4000psi	C.Y.	\$ 103.00			\$ 103.00	\$ 113.00	10.52	\$ 1,083.56			\$ 1,083.56	\$ 1,188.76	
03 21 10.60 200	Uncoated Reinforcing Steel	Columns, #3-#7	Ton	\$ 900.00	\$ 675.00		\$ 1,575.00	\$ 2,075.00	2.06	\$ 1,854.00	\$ 1,390.50		\$ 3,244.50	\$ 4,274.50	
03 30 53.40 3920	Cast-In-Place Concrete	Strip Footings, 18" x 9", unreinforced	C.Y.	\$ 141.00	\$ 132.00	\$ 0.67	\$ 273.67	\$ 360.00	74	\$ 10,434.00	\$ 9,768.00	\$ 49.58	\$ 20,251.58	\$ 26,640.00	
Masonry															
04 22 10.30 500	Concrete Unit Masonry	Interlocking, 8"x16" x 16" thick	S.F.	\$ 11.05	\$ 6.75	\$ 0.68	\$ 18.48	\$ 23.00	800	\$ 8,840.00	\$ 5,400.00	\$ 544.00	\$ 14,784.00	\$ 18,400.00	
										Cost For Bldg	\$ 22,211.56	\$ 16,558.50	\$ 593.58	\$ 39,363.64	\$ 50,503.26

Roof | Cost for 1 Bay

CSI Division	Item	Type	Unit	Unit Cost			Total	Total Including O&P	Quantity	Material	Labor	Equipment	Total	Total Including O&P
				Material	Labor	Equipment								
Metals														
05 12 23.75 4100	Structural Steel Members	W21x44	L.F	\$ 54.50	\$ 3.60	\$ 1.63	\$ 59.73	\$ 68.00	233.82	\$ 12,743.19	\$ 841.75	\$ 381.13	\$ 13,966.07	\$ 15,899.76
05 12 23.75 4300	Structural Steel Members	W21x50	L.F	\$ 62.00	\$ 3.60	\$ 1.63	\$ 67.23	\$ 76.00	41.83	\$ 2,593.46	\$ 150.59	\$ 68.18	\$ 2,812.23	\$ 3,179.08
05 31 13.50 2100	Roof Decking	1.5", 22 gauge	S.F.	\$ 1.42	\$ 0.35	\$ 0.02	\$ 1.79	\$ 2.21	1032	\$ 1,465.44	\$ 361.20	\$ 20.64	\$ 1,847.28	\$ 2,280.72
										Total Material	Total Labor	Total Equipment	Total	Total Including O&P
										Cost Per Bay	\$ 1,353.54	\$ 469.95	\$ 18,625.58	\$ 21,359.56
										Cost Per S.F.	\$ 1.31	\$ 0.46	\$ 18.05	\$ 20.70

Concrete | Cost for Entire Project

CSI Division	Item	Type	Unit	Unit Cost			Total	Total Including O&P	Quantity	Material	Labor	Equipment	Total	Total Including O&P
				Material	Labor	Equipment								
Concrete														
03 11 13.25 5650	Forms in Place, Column	Job built, 12"x12" column, 4 use	SFCA	\$ 0.71	\$ 5.80		\$ 6.51	\$ 9.70	16	\$ 11.36	\$ 92.80		\$ 104.16	\$ 155.20
03 11 13.65 3000	Forms in Place, Slab on Grade	Edge forms, wood, on grade, to 6" high	L.F.	\$ 0.27	\$ 2.18		\$ 2.45	\$ 3.64	750	\$ 202.50	\$ 1,635.00		\$ 1,837.50	\$ 2,730.00
03 15 13.50 20	Waterstops	PVC, ribbed 3/16" thick, 4" wide	L.F.	\$ 0.95	\$ 2.22		\$ 3.17	\$ 4.46	750	\$ 712.50	\$ 1,665.00		\$ 2,377.50	\$ 3,345.00
03 21 10.60 600	Uncoated Reinforcing Steel	Slab on grade, #3-#7	Ton	\$ 855.00	\$ 515.00		\$ 1,370.00	\$ 2,025.00	0.94	\$ 803.70	\$ 484.10		\$ 1,287.80	\$ 1,903.50
03 22 05.50 100	Welded Wire Fabric	6x6 W1.4xW1.4 21 lb. per C.S.F.	C.S.F.	\$ 12.50	\$ 22.00		\$ 34.50	\$ 49.50	6.74	\$ 84.29	\$ 148.35		\$ 232.64	\$ 333.79
03 30 53.40 3850	Cast-In-Place Concrete	Footings 3000PSI, spread, > 5 CY	C.Y.	\$ 171.00	\$ 61.50	\$ 0.31	\$ 232.81	\$ 283.00	8.61	\$ 1,472.31	\$ 529.52	\$ 2.67	\$ 2,004.49	\$ 2,436.63
03 30 53.40 4650	Cast-In-Place Concrete	SOG 3500 PSI, 4" thick	C.Y.	\$ 117.00	\$ 61.50	\$ 0.38	\$ 178.88	\$ 225.00	8.32	\$ 973.44	\$ 511.68	\$ 3.16	\$ 1,488.28	\$ 1,872.00
03 30 53.40 6250	Cast-In-Place Concrete	Retaining Wall, 10' High	C.Y.	\$ 129.00	\$ 68.50	\$ 6.10	\$ 203.60	\$ 254.00	37.04	\$ 4,778.16	\$ 2,537.24	\$ 225.94	\$ 7,541.34	\$ 9,408.16
03 31 05.70 4650	Concrete Placement	SOG, Up to 6" thick, pumped	C.Y.		\$ 12.75	\$ 4.26	\$ 17.01	\$ 24.00	8.32		\$ 106.08	\$ 35.44	\$ 141.52	\$ 199.68
03 35 29.30 150	Finishing Floors	Bull float, manual float, broom finish w/ edging and joints	S.F.		\$ 0.50		\$ 0.50	\$ 0.74	674.33		\$ 337.17		\$ 337.17	\$ 499.00
03 35 29.30 300	Finishing Floors	Power screed, bull float, machine float, trowel (walk-behind)	S.F.		\$ 0.39	\$ 0.04	\$ 0.43	\$ 0.62	674.33		\$ 262.99	\$ 26.97	\$ 289.96	\$ 418.08
									Total per s.f.	\$ 13.40	\$ 12.32	\$ 0.44	\$ 26.16	\$ 34.55
		2nd Floor							Total for floor	\$ 424,311.18	\$ 386,255.29	\$ 13,681.73	\$ 824,248.21	\$ 1,087,134.53
Concrete														
03 22 05.00 100	Welded Wire Fabric	6x6 W1.4xW1.4 21 lb. per C.S.F.	C.S.F.	\$ 12.50	\$ 22.00		\$ 34.50	\$ 49.50	6.74	\$ 84.29	\$ 148.35		\$ 232.64	\$ 333.79
03 31 05.35 300	Structural Concrete	4000psi	C.Y.	\$ 103.00			\$ 103.00	\$ 113.00	6.24	\$ 642.72			\$ 642.72	\$ 705.12
03 31 05.70 1400	Placing Concrete	Elevated slab, less than 6", pumped	C.Y.		\$ 16.80	\$ 5.60	\$ 22.40	\$ 31.50	6.24		\$ 104.83	\$ 34.94	\$ 139.78	\$ 196.56
03 35 29.30 150	Finishing Floors	Bull float, manual float, broom finish w/ edging and joints	S.F.		\$ 0.50		\$ 0.50	\$ 0.74	925		\$ 462.50		\$ 462.50	\$ 684.50
03 35 29.30 300	Finishing Floors	Power screed, bull float, machine float, trowel (walk-behind)	S.F.		\$ 0.39	\$ 0.04	\$ 0.43	\$ 0.62	674.33		\$ 262.99	\$ 26.97	\$ 289.96	\$ 418.08
									Total per s.f.	\$ 1.08	\$ 1.45	\$ 0.09	\$ 2.62	\$ 3.47
		3rd Floor							Total for floor	\$ 32,343.72	\$ 43,539.81	\$ 2,754.61	\$ 78,638.13	\$ 104,016.93
Concrete														
03 22 05.00 100	Welded Wire Fabric	6x6 W1.4xW1.4 21 lb. per C.S.F.	C.S.F.	\$ 12.50	\$ 22.00		\$ 34.50	\$ 49.50	9.25	\$ 115.63	\$ 203.50		\$ 319.13	\$ 457.88
03 31 05.30 300	Structural Concrete	4000psi	C.Y.	\$ 103.00			\$ 103.00	\$ 113.00	8.56	\$ 881.68			\$ 881.68	\$ 967.28
03 31 05.70 1400	Placing Concrete	Elevated slab, less than 6", pumped	C.Y.		\$ 16.80	\$ 5.60	\$ 16.80	\$ 31.50	8.56		\$ 143.81	\$ 47.936	\$ 191.74	\$ 269.64
03 35 29.30 150	Finishing Floors	Bull float, manual float, broom finish w/ edging and joints	S.F.		\$ 0.50		\$ 0.50	\$ 0.74	925		\$ 462.50		\$ 462.50	\$ 684.50
03 35 29.30 300	Finishing Floors	Power screed, bull float, machine float, trowel (walk-behind)	S.F.		\$ 0.39	\$ 0.04	\$ 0.43	\$ 0.62	925		\$ 360.75	\$ 37.00	\$ 397.75	\$ 573.50
									Total per s.f.	\$ 1.08	\$ 1.27	\$ 0.09	\$ 2.44	\$ 3.19
									Total for floor	\$ 32,345.03	\$ 37,964.04	\$ 2,754.68	\$ 73,063.75	\$ 95,766.32
									Total for Entire Project	\$ 488,999.92	\$ 467,759.15	\$ 19,191.02	\$ 975,950.09	\$ 1,286,917.79

Structural Steel | Cost for Entire Project

Foundations and 1st Floor														
CSI Division	Item	Type	Unit	Unit Cost			Total	Total Including O&P	Quantity	Material	Labor	Equipment	Total	Total Including O&P
				Material	Labor	Equipment								
05 05 23.05 70	Anchor Bolts	3/4", hooked w/ nut and washer, 8" long	Ea	\$ 3.65	\$ 2.17		\$ 6.36	\$ 8.15	16	\$ 58.40	\$ 34.72		\$ 101.76	\$ 130.40
05 12 23.65 500	Base Plates	1" thick	S.F.	\$ 46.00			\$ 46.00	\$ 50.50	4	\$ 184.00			\$ 184.00	\$ 202.00
05 12 23.75 900	Structural Steel Members	W10x49	L.F.	\$ 60.50	\$ 4.82	\$ 2.95	\$ 68.27	\$ 78.00	13	\$ 786.50	\$ 62.66	\$ 38.35	\$ 887.51	\$ 1,014.00
									Total per s.f.	\$ 1.53	\$ 0.14	\$ 0.06	\$ 1.74	\$ 2.00
									Total for floor	\$ 45,774.32	\$ 4,332.30	\$ 1,706.14	\$ 52,197.14	\$ 59,899.46
2nd Floor														
05 12 23.75 900	Structural Steel Members	W10x49	L.F.	\$ 60.50	\$ 4.82	\$ 2.95	\$ 68.27	\$ 78.00	13.5	\$ 816.75	\$ 65.07	\$ 39.83	\$ 921.65	\$ 1,053.00
05 12 23.75 3300	Structural Steel Members	W18x35	L.F.	\$ 43.50	\$ 3.99	\$ 1.80	\$ 49.29	\$ 56.50	52	\$ 2,262.00	\$ 207.48	\$ 93.60	\$ 2,563.08	\$ 2,938.00
05 12 23.75 3500	Structural Steel Members	W18x40	L.F.	\$ 49.50	\$ 3.99	\$ 1.80	\$ 55.29	\$ 63.50	72	\$ 3,564.00	\$ 287.28	\$ 129.60	\$ 3,980.88	\$ 4,572.00
05 12 23.75 5500	Structural Steel Members	W24x76	L.F.	\$ 94.00	\$ 3.45	\$ 1.56	\$ 99.01	\$ 111.00	28	\$ 2,632.00	\$ 96.60	\$ 43.68	\$ 2,772.28	\$ 3,108.00
05 12 23.75 5720	Structural Steel Members	W24x94	L.F.	\$ 116.00	\$ 3.55	\$ 1.60	\$ 121.15	\$ 136.00	28	\$ 3,248.00	\$ 99.40	\$ 44.80	\$ 3,392.20	\$ 3,808.00
05 12 23.75 5920	Structural Steel Members	W27x114	L.F.	\$ 141.00	\$ 3.33	\$ 1.51	\$ 145.84	\$ 162.00	24	\$ 3,384.00	\$ 79.92	\$ 36.24	\$ 3,500.16	\$ 3,888.00
05 31 13.50 5120	Floor Decking	1.5" Thick	S.F.	\$ 1.92	\$ 0.43	\$ 0.03	\$ 2.38	\$ 2.90	674.33	\$ 1,294.71	\$ 289.96	\$ 20.23	\$ 1,604.91	\$ 1,955.56
									Total per s.f.	\$ 25.51	\$ 1.67	\$ 0.61	\$ 27.78	\$ 31.62
									Total for floor	\$ 765,269.09	\$ 50,081.35	\$ 18,150.23	\$ 833,500.68	\$ 948,610.78
3rd Floor														
05 12 23.75 900	Structural Steel Members	W10x49	L.F.	\$ 60.50	\$ 4.82	\$ 2.95	\$ 68.27	\$ 78.00	15	\$ 907.50	\$ 72.30	\$ 44.25	\$ 1,024.05	\$ 1,170.00
05 12 23.75 4500	Structural Steel Members	W21x62	L.F.	\$ 76.50	\$ 3.70	\$ 1.67	\$ 81.87	\$ 92.50	37.5	\$ 2,868.75	\$ 138.75	\$ 62.625	\$ 3,070.13	\$ 3,468.75
05 12 23.75 4700	Structural Steel Members	W21x68	L.F.	\$ 84.00	\$ 3.70	\$ 1.67	\$ 89.37	\$ 101.00	112.5	\$ 9,450.00	\$ 416.25	\$ 187.875	\$ 10,054.13	\$ 11,362.50
05 12 23.75 4720	Structural Steel Members	W21x83	L.F.	\$ 103.00	\$ 3.83	\$ 1.73	\$ 108.56	\$ 121.00	24.67	\$ 2,541.01	\$ 94.49	\$ 42.6791	\$ 2,678.18	\$ 2,985.07
05 12 23.75 5500	Structural Steel Members	W27x94	L.F.	\$ 116.00	\$ 3.22	\$ 1.45	\$ 120.67	\$ 135.00	24.67	\$ 2,861.72	\$ 79.44	\$ 35.7715	\$ 2,976.93	\$ 3,330.45
05 31 13.50 5120	Floor Decking	1.5" Thick	S.F.	\$ 1.92	\$ 0.43	\$ 0.03	\$ 2.38	\$ 2.90	925	\$ 1,776.00	\$ 397.75	\$ 27.75	\$ 2,201.50	\$ 2,682.50
									Total per s.f.	\$ 22.06	\$ 1.30	\$ 0.43	\$ 23.79	\$ 27.03
									Total for floor	\$ 661,783.14	\$ 38,885.63	\$ 13,003.80	\$ 713,672.57	\$ 810,787.14
Roof														
05 12 23.75 4100	Structural Steel Members	W21x44	L.F.	\$ 54.50	\$ 3.60	\$ 1.63	\$ 59.73	\$ 68.00	233.82	\$ 12,743.19	\$ 841.75	\$ 381.13	\$ 13,966.07	\$ 15,899.76
05 12 23.75 4300	Structural Steel Members	W21x50	L.F.	\$ 62.00	\$ 3.60	\$ 1.63	\$ 67.23	\$ 76.00	41.83	\$ 2,593.46	\$ 150.59	\$ 68.18	\$ 2,812.23	\$ 3,179.08
05 31 13.50 2100	Roof Decking	1.5", 22 gauge	S.F.	\$ 1.42	\$ 0.35	\$ 0.02	\$ 1.79	\$ 2.21	1032	\$ 1,465.44	\$ 361.20	\$ 20.64	\$ 1,847.28	\$ 2,280.72
									Total per s.f.	\$ 16.28	\$ 1.31	\$ 0.46	\$ 18.05	\$ 20.70
									Total for floor	\$ 488,484.92	\$ 39,351.29	\$ 13,662.78	\$ 541,498.98	\$ 620,983.63
Total for Entire Project										\$ 1,961,311.47	\$ 132,650.57	\$ 46,522.95	\$ 2,140,869.37	\$ 2,440,281.01

Entire Structural System | Cost Per Bay

Cost Per Bay					
	Material	Labor	Equipment	Total	Total Incl. O&P
Foundation/1st	\$ 10,067.16	\$ 8,407.30	\$ 332.54	\$ 18,815.64	\$ 24,647.45
2nd	\$ 17,928.47	\$ 2,104.39	\$ 469.89	\$ 20,502.75	\$ 23,660.61
3rd	\$ 21,402.29	\$ 2,369.53	\$ 485.89	\$ 24,257.70	\$ 27,952.07
Roof	\$ 16,802.09	\$ 1,353.54	\$ 469.95	\$ 18,625.58	\$ 21,359.56
Cost Per S.F.					
	Material	Labor	Equipment	Total	Total Incl. O&P
Foundation/1st	\$ 14.93	\$ 12.47	\$ 0.49	\$ 27.90	\$ 36.55
2nd	\$ 26.59	\$ 3.12	\$ 0.70	\$ 30.40	\$ 35.09
3rd	\$ 23.14	\$ 2.56	\$ 0.53	\$ 26.22	\$ 30.22
Roof	\$ 16.28	\$ 1.31	\$ 0.46	\$ 18.05	\$ 20.70
Entire Building	\$ 80.94	\$ 19.46	\$ 2.17	\$ 102.58	\$ 122.56
Total Cost					
	Material	Labor	Equipment	Total	Total Incl. O&P
Foundation/1st	\$ 470,085.51	\$ 390,587.59	\$ 15,387.87	\$ 876,445.35	\$ 1,147,033.99
2nd	\$ 797,612.81	\$ 93,621.16	\$ 20,904.84	\$ 912,138.81	\$ 1,052,627.72
3rd	\$ 694,128.16	\$ 76,849.67	\$ 15,758.48	\$ 786,736.32	\$ 906,553.46
Roof	\$ 488,484.92	\$ 39,351.29	\$ 13,662.78	\$ 541,498.98	\$ 620,983.63
Entire Building	\$ 2,450,311.39	\$ 600,409.71	\$ 65,713.98	\$ 3,116,819.46	\$ 3,727,198.79
W/ Location Factor = 1.089	\$ 2,668,389.11	\$ 653,846.17	\$ 71,562.52	\$ 3,394,216.39	\$ 4,058,919.49

Takeoffs | Foundations and 1st Floor

Typical Bay Data			
Column Lines	Distance (ft)	Distance (in)	Area (sf)
DD to EE	28.00	336.00	674.33
49 to 50	24.08	289.00	

Slab on Grade				
Thickness (ft)	Thickness (in)	D1 (ft)	D2 (ft)	Volume (CY)
0.33	4	28.00	24.08	8.32

WWF	
Type	Area (sf)
6x6 W1.4xW1.4	674.33

Vapor Barrier	
Type	Area (sf)
10 Mil	674.33

Waterstops	
Type	L.F.
Flexible PVC	750.00

Footing (F10) Concrete				
Thickness (ft)	Area (sf)	Volume (CY)	Quantity (CY)	Total Volume
2.00	100.00	7.41	2.00	14.81

Footing (F11) Concrete				
Thickness (ft)	Area (sf)	Volume (CY)	Quantity	Total Volume
2.00	121.00	8.96	1.00	8.96

Footing (F12) Concrete				
Thickness (ft)	Area (sf)	Volume (CY)	Quantity	Total Volume
2.00	144.00	10.67	1.00	10.67

Footing (F10) Reinforcement							
Size	Directions	Length (ft)	Bar Quantity	Footing Quantity	Total Quantity	Length (ft)	Weight (TON)
#6	2	9	12	2	48	432	0.32

Footing (F11) Reinforcement							
Size	Directions	Length (ft)	Bar Quantity	Footing Quantity	Total Quantity	Length (ft)	Weight (TON)
#8	2	10	10	1	20	200	0.27

Footing (F12) Reinforcement							
Size	Directions	Length (ft)	Bar Quantity	Footing Quantity	Total Quantity	Length (ft)	Weight (TON)
#8	2	11	12	1	24	264	0.35

Columns						
Name	Type	Height (ft)	Quantity	Length (linear ft)	Weight (lb)	Total Weight (lb)
C2	W10x49	13	2	26	1274	2834
C3	W10x60	13	2	26	1560	

Base Plates	
Size	Quantity
1"x16"x16"	2
1.25"x16"x16"	2

Anchor Bolts			
Type	Quantity per Column	# of Columns	Total Quantity
3/4" phi, 9" penetration, 4" hook, 4.5" projection, standard thread w/ washers and hex nuts	4	4	16

Footing Formwork						
Name	Type	Thickness (ft)	D1 (ft)	D2 (ft)	Length (ft)	Formwork Area (sf)
F10	Wooden	2	10	10	40	80
F11	Wooden	2	11	11	44	88
F12	Wooden	2	12	12	48	96

S.O.G. Formwork				
Type	Thickness (ft)	D1	D2	Length (ft)
Wooden	0.33	24.08	28	104.16

Concrete Retaining Wall				
Type	Thickness (ft)	L.F.	Height	Volume (CY)
Reinf. C.	1.00	100.00	10.00	37.04

Strip Footing				
Type	Thickness (ft)	Width (ft)	Length (ft)	Volume (CY)
SF24	1.00	2.00	750.00	55.56

CMU Block Foundation Wall		
Type	Thickness (ft)	Length (lf)
16" CMU	16"	800.00

Piers						
Type	Thickness (ft)	D1	D2	Volume (CY)	Quantity	Total Volume
P1	2.00	1.83	1.83	0.25	39	9.71

Type	Thickness (ft)	D1	D2	Volume (CY)	Quantity	Total Volume
P2	2.00	3.00	1.83	0.41	2	0.81

Pier Reinforcement						
Size	# of Piers	Quantity	Length (ft)	Sum of Length	Weight	Total Weight (TON)
#8	39	8	2	624	1666.08	2.06
#3	39	2	6	468	175.968	

Pier P1 Reinforcement					
Size	# of Piers	Quantity	Length (ft)	Sum of Length	Weight
#8	2	12	2	48	128.16
#3	2	2	6	24	90.24

Takeoffs | 2ND Floor

Typical Bay Data				Beams					
Column Lines	Distance (ft)	Distance (in)	Area (sf)	Type	Length (ft)	Quantity	Weight (lb)	Length (lf)	Total Weight (lb)
DD to EE	28.00	336.00	674.33	W18x35	28	1	980	28	12196
49 to 50	24.08	289.00		W18x35	24	1	840	24	
				W18x40	24	3	2880	72	
				W24x76	28	1	2128	28	
				W24x94	28	1	2632	28	
				W27x114	24	1	2736	24	

Columns						
Name	Type	Height (ft)	Quantity	Length (linear ft)	Weight (lb)	Total Weight (lb)
C2	W10x49	13.5	2	27	1323	2943
C3	W10x60	13.5	2	27	1620	

Slab on Metal Deck					
Name	Type	Depth (in)	Gauge	Concrete Thickness (in)	Volume
S-1	Composite	1.5	18	3	6.24

Takeoffs | 3rd Floor

Typical Bay Data				Beams					
Column Lines	Distance (ft)	Distance (in)	Area (sf)	Type	Length (ft)	Quantity	Weight (lb)	Total Length (lf)	Total Weight (lb)
GG to JJ	24.67	336.00	925.00	W21x73	37.50	3	8212.50	113	24638
47 to 48.3	37.50	289.00		W21x57	37.50	1	2137.50	38	2138
				W21x76	24.67	1	1874.67	25	1875
				W27x94	24.67	1	2318.67	25	2319

Columns						
Name	Type	Height (ft)	Quantity	Length (linear ft)	Weight (lb)	Total Weight (lb)
C2	W10x49	15	2	30	1470	3270
C3	W10x60	15	2	30	1800	

Slab on Metal Deck					
Name	Type	Depth (in)	Gauge	Concrete Thickness (in)	
S-1	Composite	1.5	18	3	

Takeoffs | Roof

Typical Bay Data				Metal Roof Deck			
Column Lines	Distance (ft)	Distance (in)	Area (sf)	Name	Type	Depth (in)	Gauge
GG to JJ	24.67	336.00	1031.89	S-2	Roof Deck	1.5	22
47 to 48.7	41.83	289.00					

Beams					
Type	Length (ft)	Quantity	Weight (lb)	Total Length (lf)	Total Weight (lb)
W21x44	41.83	5	9203.33	209	46017
W21x44	24.67	1	1085.33	25	1085
W21x50	41.83	1	2091.67	42	2092

APPENDIX D – General Conditions Estimate

General Conditions Estimate | Total Costs (w/ Monthly Costs)

CSI Division	Item	Type	Unit	Unit Cost			Total	Total Including O&P	Quantity	Total Cost Including O&P	Total Cost Per Month	
				Material	Labor	Equipment						
General Requirements												
Summary of Work												
01 11 31.20 0350	Construction Management Fees	\$50M job, min	Project				4%	4%		\$ 2,080,000.00	\$ 49,523.81	
Project Management and Coordination												
01 31 13.20 20	Field Personnel	Clerk, average	Week		410		410	630	183	\$ 115,290.00	\$ 2,745.00	
01 31 13.20 120	Field Personnel	Field Engineer, average	Week		1265		1265	1950	183	\$ 356,850.00	\$ 8,496.43	
01 31 13.20 200	Field Personnel	Project Manager, average	Week		2075		2075	3175	183	\$ 581,025.00	\$ 13,833.93	
01 31 13.20 260	Field Personnel	Superintendent, average	Week		1925		1925	2950	183	\$ 539,850.00	\$ 12,853.57	
01 31 13.30 20	Insurance	Builder's risk, standard, minimum	Job					0.24%		\$ 124,800.00	\$ 2,971.43	
01 31 13.90 20	Performance Bond	For buildings, minimum	Job					2.50%		\$ 1,300,000.00	\$ 30,952.38	
Construction Progress Documentation												
01 32 13.50 650	Scheduling	Rule of Thumb, CPM, Large job (\$50M +)	Job					0.03%		\$ 156,000.00	\$ 3,714.29	
Regulatory Requirements												
01 41 26.50 20	Permits	Rule of Thumb, most cities, minimum	Job					0.50%		\$ 2,600.00	\$ 61.90	
Quality Control												
01 45 23.50 50	Testing	Steel building, minimum	Job					5200	1	\$ 5,200.00	\$ 123.81	
Construction Facilities												
01 15 13.80 1000	Temporary Facilities	Temporary toilets, rent portable toilet, chemical	Each	0.11	18.65	56	168	180.1	294	\$ 52,949.40	\$ 1,260.70	
01 52 13.20 400	Office and Storage Space	Trailer, furnished, no hookups, 50'x10', buy	Each	23,300	1175		24475	27500	1	\$ 27,500.00	\$ 654.76	
01 52 13.30 1200	Office and Storage Space	Storage Box, 40'x8' rent per month	Each	94			94	103	2	\$ 206.00	\$ 4.90	
01 52 13.20 140	Field Office Expense	Telephone bill: avg bill/month inc. long dist.	Month	81			81	89	42	\$ 3,738.00	\$ 89.00	
01 52 13.20 160	Field Office Expense	Lights and HVAC	Month	152			152	167	42	\$ 7,014.00	\$ 167.00	
Construction Aids												
0154 09.60 6220	Safety	Safety Supplies and First Aid Kits	Month	24.5			24.5	27	42	\$ 1,134.00	\$ 27.00	
Equipment Mobilization												
01 54 36.50 20	Mobilization	Doze, loader, backhoe, excav., grader, paver, roller	Each		69	116	185	233	1	\$ 233.00	\$ 5.55	
01 54 36.50 2100	Mobilization	Crane, truck-mounted, over 75 ton	Each		259	46.5	305.5	440	1	\$ 440.00	\$ 10.48	
Temporary Barriers and Enclosures												
01 55 23.50 50	Roads and Sidewalks	Roads, gravel fill, no surfaceing, 4" gravel depth	S.Y.	4	2.43	0.45	6.88	8.6	100	\$ 860.00	\$ 20.48	
Temporary Barriers and Enclosures												
01 56 26.50 250	Temporary Fencing	Rented chain link, 6' high, over 1000' (up to 12 mo.)	L.F.	10.45	9		19.45	25	4300	\$ 107,500.00	\$ 2,559.52	
Project Identification												
01 56 13.50 20	Signs	High intensity reflectorized, no posts, buy	S.F.	26.5			26.5	29.5	25	\$ 737.50	\$ 17.56	
Examination and Preparation												
01 71 23.13 1100	Construction Layout	Crew for layout of bldg, trenching, 2 person crew	Day		690	69.5	759.5	1125	16	\$ 18,000.00	\$ 428.57	
Cleaning and Waste Management												
01 76 13.20 20	Cleaning Up	After job completion, minimum	Job				0.30%	0.30%		\$ 156,000.00	\$ 3,714.29	
Commisioning												
01 91 13.50 150	Building Commisioning	Basic building commissioning, maximum	%				0.50%	0.50%		\$ 260,000.00	\$ 6,190.48	
Existing Conditions												
Surveys												
02 21 13.09 20	Topographical Surveys	Topographical Surveying, conventional, minimum	Acre	18.2	340	21	379.2	565	21	\$ 11,865.00	\$ 282.50	
02 21 13.13 320	Boundary and Survey Markers	Lot location and lines, large quantities, average	Acre	51.5	900	55.5	1007	1500	21	\$ 31,500.00	\$ 750.00	
Selective Demolition												
02 41 19.23 800	Selective Demolition, Rubbish Handling	Dumpster, weekly rental, 1 dump/wk, 30 C.Y. capacity	Week	750			750	825	183	\$ 150,975.00	\$ 3,594.64	
Erosion and Sedimentation Controls												
31 25 14.16 1000	Rolled Erosion Control Mats and Blankets	Silt fence, polypropylene, 3' high, ideal conditions	L.F.	0.41	0.58		0.99	1.34	4300	\$ 5,762.00	\$ 137.19	
										Total Cost	\$ 4,018,028.90	\$ 95,667.35
										Total Cost with Location Factor	\$ 4,375,633.47	\$ 104,181.75

General Conditions Estimate | Sub Category Monthly Costs

Item	Type	Total Cost Including O&P	Monthly Cost	Monthly Cost W/ Location Factor
Field Personnel		\$ 1,593,015.00	\$ 37,928.93	\$ 41,304.60
Insurance and Bonds		\$ 1,424,800.00	\$ 33,923.81	\$ 36,943.03
General Construction Costs		\$ 961,755.90	\$ 22,898.95	\$ 24,936.96
Office and Storage Space		\$ 38,458.00	\$ 915.67	\$ 997.16
Total Cost		\$ 4,018,028.90	\$ 95,667.35	\$ 104,181.75
Total Cost with Location Factor		\$ 4,375,633.47	\$ 104,181.75	\$ 113,453.93

Note: These categories have been developed in order to best summarize the items used in the general conditions estimate. Lumping of specific items gives a quick snapshot of which items contributed what quantity of the total cost.

APPENDIX E – LEED for Schools 2007



LEED for Schools 2007 Registered Project Checklist

Project Name: Unionville High School

Project Address: 750 Unionville Road, Kennett Square, PA

Yes	?	No	Project Totals (Pre-Certification Estimates)		79 Points
40			SILVER		Certified: 29-36 points Silver: 37-43 points Gold: 44-57 points Platinum: 58-79 points

Yes	?	No	Sustainable Sites		16 Points
8					
Yes			Prereq 1	Construction Activity Pollution Prevention	Required
Yes			Prereq 2	Environmental Site Assessment	Required
			Credit 1	Site Selection	1
			Credit 2	Development Density & Community Connectivity	1
			Credit 3	Brownfield Redevelopment	1
			Credit 4.1	Alternative Transportation, Public Transportation	1
1			Credit 4.2	Alternative Transportation, Bicycle Use	1
			Credit 4.3	Alternative Transportation, Low-Emitting & Fuel Efficient Vehicles	1
			Credit 4.4	Alternative Transportation, Parking Capacity	1
1			Credit 5.1	Site Development, Protect or Restore Habitat	1
			Credit 5.2	Site Development, Maximize Open Space	1
1			Credit 6.1	Stormwater Design, Quantity Control	1
1			Credit 6.2	Stormwater Design, Quality Control	1
			Credit 7.1	Heat Island Effect, Non-Roof	1
1			Credit 7.2	Heat Island Effect, Roof	1
1			Credit 8	Light Pollution Reduction	1
1			Credit 9	Site Master Plan	1
1			Credit 10	Joint Use of Facilities	1



LEED for Schools 2007 Registered Project Checklist

Yes	?	No		
2			Water Efficiency 7 Points	

1			Credit 1.1	Water Efficient Landscaping , Reduce by 50%	1
			Credit 1.2	Water Efficient Landscaping , No Potable Use or No Irrigation	1
			Credit 2	Innovative Wastewater Technologies	1
1			Credit 3	Water Use Reduction	1 to 3
			--> Credit 3.1	20% Reduction	1
			Credit 3.2	30% Reduction	2
			Credit 3.3	40% Reduction	3
			Credit 4	Process Water Use Reduction , 20% Reduction	1

Yes	?	No		
6			Energy & Atmosphere 17 Points	

Yes			Prereq 1	Fundamental Commissioning of the Building Energy Systems	Required
Yes			Prereq 2	Minimum Energy Performance	Required
Yes			Prereq 3	Fundamental Refrigerant Management	Required

***Note for EA1:** All LEED for Schools projects registered after June 26, 2007 are required to achieve at least two (2) points.

5			Credit 1	Optimize Energy Performance	2 to 10
			Credit 1.2	14% New Buildings / 7% Existing Building Renovations	2
			Credit 1.3	17.5% New Buildings / 10.5% Existing Building Renovations	3
			Credit 1.4	21% New Buildings / 14% Existing Building Renovations	4
			--> Credit 1.5	24.5% New Buildings / 17.5% Existing Building Renovations	5
			Credit 1.6	28% New Buildings / 21% Existing Building Renovations	6
			Credit 1.7	31.5% New Buildings / 24.5% Existing Building Renovations	7
			Credit 1.8	35% New Buildings / 28% Existing Building Renovations	8
			Credit 1.9	38.5% New Buildings / 31.5% Existing Building Renovations	9
			Credit 1.10	42% New Buildings / 35% Existing Building Renovations	10
			Credit 2	On-Site Renewable Energy	1 to 3
			Credit 2.1	2.5% Renewable Energy	1
			Credit 2.2	7.5% Renewable Energy	2
			Credit 2.3	12.5% Renewable Energy	3
			Credit 3	Enhanced Commissioning	1
1			Credit 4	Enhanced Refrigerant Management	1
			Credit 5	Measurement & Verification	1
			Credit 6	Green Power	1



LEED for Schools 2007 Registered Project Checklist

Yes ? No

9			Materials & Resources		13 Points
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Yes	?	No		
1			Prereq 1 Storage & Collection of Recyclables	Required
			Credit 1.1 Building Reuse , Maintain 75% of Existing Walls , Floors & Roof	1
			Credit 1.2 Building Reuse , Maintain 95% of Existing Walls , Floors & Roof	1
1			Credit 1.3 Building Reuse , Maintain 50% of Interior Non-Structural Elements	1
			Credit 2.1 Construction Waste Management , Divert 50% from Disposal	1
			Credit 2.2 Construction Waste Management , Divert 75% from Disposal	1
1			Credit 3.1 Materials Reuse , 5%	1
1			Credit 3.2 Materials Reuse , 10%	1
1			Credit 4.1 Recycled Content , 10% (post-consumer + 1/2 pre-consumer)	1
1			Credit 4.2 Recycled Content , 20% (post-consumer + 1/2 pre-consumer)	1
			Credit 5.1 Regional Materials , 10% Extracted, Processed & Manufactured	1
1			Credit 5.2 Regional Materials , 20% Extracted, Processed & Manufactured	1
1			Credit 6 Rapidly Renewable Materials	1
			Credit 7 Certified Wood	1



LEED for Schools 2007 Registered Project Checklist

Yes	?	No		
13			Indoor Environmental Quality	20 Points

Yes	?	No		
Yes			Prereq 1	Minimum IAQ Performance Required
Yes			Prereq 2	Environmental Tobacco Smoke (ETS) Control Required
Yes			Prereq 3	Minimum Acoustical Performance Required
1			Credit 1	Outdoor Air Delivery Monitoring 1
1			Credit 2	Increased Ventilation 1
1			Credit 3.1	Construction IAQ Management Plan, During Construction 1
1			Credit 3.2	Construction IAQ Management Plan, Before Occupancy 1
1			Credit 4	Low-Emitting Materials 1 to 4
1			Credit 5	Indoor Chemical & Pollutant Source Control 1
1			Credit 6.1	Controllability of Systems, Lighting 1
1			Credit 6.2	Controllability of Systems, Thermal Comfort 1
			Credit 7.1	Thermal Comfort, Design 1
			Credit 7.2	Thermal Comfort, Verification 1
2			Credit 8.1	Daylight & Views, Daylight 75% of Spaces 1 to 3
			-->	75% of classrooms (Required for either points below) 1
			-->	90% of classrooms 2
				75% of other spaces 3
1			Credit 8.2	Daylight & Views, Views for 90% of Spaces 1
1			Credit 9	Enhanced Acoustical Performance, 40 dBA / RC level of 32 1
				Enhanced Acoustical Performance, 35 dBA / RC level of 27 1
1			Credit 10	Mold Prevention 1

Yes	?	No		
2			Innovation & Design Process	6 Points

Yes	?	No		
			Credit 1.1	Innovation in Design: Provide Specific Title 1
			Credit 1.2	Innovation in Design: Provide Specific Title 1
			Credit 1.3	Innovation in Design: Provide Specific Title 1
			Credit 1.4	Innovation in Design: Provide Specific Title 1
1			Credit 2	LEED® Accredited Professional 1
1			Credit 3	School as a Teaching Tool 1

APPENDIX F – LEED 2009 for New Construction and Major Renovations



LEED 2009 for New Construction and Major Renovations

Project Checklist

Unionville High School Building Additions and Renovations

October 15th, 2011

6 Sustainable Sites Possible Points: 26

Y	?	N			
Y			Prereq 1	Construction Activity Pollution Prevention	
			Credit 1	Site Selection	1
			Credit 2	Development Density and Community Connectivity	5
			Credit 3	Brownfield Redevelopment	1
			Credit 4.1	Alternative Transportation—Public Transportation Access	6
1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
			Credit 4.4	Alternative Transportation—Parking Capacity	2
1			Credit 5.1	Site Development—Protect or Restore Habitat	1
			Credit 5.2	Site Development—Maximize Open Space	1
1			Credit 6.1	Stormwater Design—Quantity Control	1
1			Credit 6.2	Stormwater Design—Quality Control	1
			Credit 7.1	Heat Island Effect—Non-roof	1
			Credit 7.2	Heat Island Effect—Roof	1
1			Credit 8	Light Pollution Reduction	1

2 Water Efficiency Possible Points: 10

Y	?	N			
Y			Prereq 1	Water Use Reduction—20% Reduction	
2			Credit 1	Water Efficient Landscaping	2 to 4
			Credit 2	Innovative Wastewater Technologies	2
			Credit 3	Water Use Reduction	2 to 4

9 Energy and Atmosphere Possible Points: 35

Y	?	N			
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
7			Credit 1	Optimize Energy Performance	1 to 19
			Credit 2	On-Site Renewable Energy	1 to 7
			Credit 3	Enhanced Commissioning	2
2			Credit 4	Enhanced Refrigerant Management	2
			Credit 5	Measurement and Verification	3
			Credit 6	Green Power	2

11 Materials and Resources Possible Points: 14

Y	?	N			
Y			Prereq 1	Storage and Collection of Recyclables	
2			Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
			Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
1			Credit 2	Construction Waste Management	1 to 2
2			Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

Y	?	N			
2			Credit 4	Recycled Content	1 to 2
2			Credit 5	Regional Materials	1 to 2
1			Credit 6	Rapidly Renewable Materials	1
1			Credit 7	Certified Wood	1

11 Indoor Environmental Quality Possible Points: 15

Y	?	N			
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
1			Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
			Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
			Credit 7.1	Thermal Comfort—Design	1
			Credit 7.2	Thermal Comfort—Verification	1
1			Credit 8.1	Daylight and Views—Daylight	1
1			Credit 8.2	Daylight and Views—Views	1

1 Innovation and Design Process Possible Points: 6

Y	?	N			
			Credit 1.1	Innovation in Design: Specific Title	1
			Credit 1.2	Innovation in Design: Specific Title	1
			Credit 1.3	Innovation in Design: Specific Title	1
			Credit 1.4	Innovation in Design: Specific Title	1
			Credit 1.5	Innovation in Design: Specific Title	1
1			Credit 2	LEED Accredited Professional	1

3 Regional Priority Credits Possible Points: 4

Y	?	N			
1			Credit 1.1	Regional Priority: MRC2: Recycle/Salvage 50%	1
1			Credit 1.2	Regional Priority: SSC5.1	1
1			Credit 1.3	Regional Priority: SSC6.1	1
			Credit 1.4	Regional Priority: Specific Credit	1

43 Total Possible Points: 110

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

APPENDIX G – BIM Use Evaluation

BIM Use*	Value to Project	Responsible Party	Value to	Capability Rating			Additional Resources / Competencies Required	Notes	Proceed with Use
				High / Med / Low	High / Med / Low	Scale 1-3 (1 = Low)			
				Resources	Competency	Experience			YES / NO / MAYBE
Record Modeling	MED	Contractor	MED	2	2	2	Software/Training for software		YES
		Owner	HIGH	1	1	1	Software/Training for software		
		Designer	MED	3	3	3			
Site Utilization Planning	MED	Contractor	HIGH	1	1	1			NO
3D Control and Planning	MED	Contractor	HIGH	2	2	2			YES
		Subcontractors	HIGH	2	2	2			
3D Coordination	HIGH	Contractor	HIGH	2	2	2	Software/Training for software		YES
		Subcontractors	HIGH	1	1	1	Software/Training for software		
		Designer	MED	3	3	3			
Design Authoring	HIGH	Contractor	HIGH	2	2	2	Software/Training for software		YES
		Owner	HIGH	1	1	1	Software/Training for software		
		Designer	MED	3	3	3			
LEED Evaluation	HIGH	Contractor	HIGH	2	3	3		LEED Project, value is high	YES
		Owner	HIGH	2	1	1	Software/Training for software		
		Designer	HIGH	2	3	3	Software/Training for software		
Programming	MED	Contractor	HIGH	2	2	2			MAYBE
		Owner	HIGH	1	1	1	Software/Training for software		
		Designer	MED	3	3	3			
4D Modeling	HIGH	Contractor	HIGH	2	2	2	Software/Training for software	Uses: Phasing and Construction	MAYBE
								New software required	
Cost Estimation	MED	Contractor	HIGH	3	2	2			YES

