Northeastern Pennsylvania Office Building

Christopher Havens

Construction Management

Dr. Chimay Anumba

October 16, 2011

Executive Summary

This technical report is intended to help comprehend the project schedule and the costs associated with the structural system and general conditions for the Northeastern Pennsylvania Office Building. It also provides a critical evaluation of this project's Leadership in Energy and Environmental Design (LEED) certification requirements. Finally, this report is intended to evaluate the benefits and disadvantages of the implementation of Building Information Modeling (BIM) for this particular project.

The detailed project schedule created in this report is a nine-month long schedule that does not have a set critical path. Each trade will follow each other in a sequential manner. Therefore, each trade is essentially on a project-wide critical path. If one trade falls behind in work, the subsequent trades are directly affected. To offset any project delays, four weeks have been provided at the end of the tentative completion date before the project is to be turned over to the owner.

A structural steel estimate has been provided for a typical work bay in the shop building. This structure is comprised of exterior and interior grade beams, spread footings, pier footings, a slab-on-grade, and a structural steel frame. When combined, these pieces form a structural system that costs about $60 per square foot. This cost is nearly 30% of the total construction cost for this project, which seems low for a project that does not contain any unique building features. This may be attributed to assumptions that were made due to a lack of cost information for pre-engineered buildings such as this.

The general conditions estimate performed in this report shows 11% of the building cost for this project being general conditions costs. The vast majority of the costs estimated were the project's personnel. This is surprising because one half of the general contractor's staff is only charging about 25% of their time to this project. With such a low amount of support staff time charged to this project, it would be expected that the personnel costs would not contribute to such a large portion of the general conditions cost.

Although the owner of the Northeastern Pennsylvania Office Building was not striving for a LEED certification on this project, an evaluation was performed to assess the possibility of receiving this certification if it were pursued. Based on this evaluation, this project did not qualify. Project variations have been provided that, if implemented, increase the possibility of this project becoming LEED certified. However, since the owner is not pursuing for this certification, it is not recommended that the project be altered.

The owner did not request the use of BIM on this project because they did not believe it would have with cost savings. If BIM had been used on this project, the owner may have been able to begin construction earlier because the model could have been used to receive approval for construction by the township authorities.

Table of Contents

Detailed Project Schedule

Detailed Project Schedule

The project schedule for the Northeastern Pennsylvania Office Building can be found in Appendix A of this report and is an approximately nine month long schedule that is portioned into five main categories: Sitework, Site Utilities, Pre-Engineered Metal Building, Office Building, and Shop Building. The Notice to Proceed is scheduled to be received on June 14, 2011, and the Project Turnover date is currently scheduled for March 6, 2012. The critical path of this project is unique because once work in an area of the building is complete, the next step of work follows in the same path. The project schedule reflects this type of sequence of work by clearly showing the lag between the start of one activity and the start of a second activity. The lag between starts of different activities range from zero days (setting base plates to erecting the building's structure) to about seven weeks (grading the site to stoning the pipe yard). The ensuing descriptions of each category of work on the project schedule will explain the flow of work throughout the project.

Sitework

Once the Notice to Proceed has been received by the General Contractor, they will instruct the sitework subcontractor to begin clearing and grubbing the entire project site. This process should be relatively easy for the subcontractor because the project site is a former landing strip for small aircraft and is now an open grass lot with minimal brush coverage. However, due to the large size of the site (19 acres), the subcontractor has been allowed four weeks to clear and grub the site. This work will move from the West to the East across the site since the building footprint is located on the West half of the site. This will allow work on the building's structure to begin as early as possible.

As clearing and grubbing is occurring across the site, grading will be following about two weeks behind in the same pattern. After the grading has passed the building footprint and begins work across the gravel laydown area, the stoning of the yard can begin. However, due to the stormwater drainage system used for laydown yard (further explained in the next section), the stoning of the yard must be placed after the stormwater system has begun.

The rest of the site work performed by subcontractors or the general contractor on this site is not critical in the driving of the project schedule. For example, the permanent fence that encompasses the entire project site can begin installation at any point in time, as long as it does not interrupt other trades' work and it is completed by Substantial Completion on February 7, 2012.

Site Utilities

A unique system is being implemented to help control the stormwater runoff once grading is completed in a section of the gravel laydown area. Due to regulations set forth by the township authorities, the gravel laydown area cannot be set as 8 inches of AASHTO #57 stone, as specified in the original contract documents. Rather, the project design team has proposed a system that will catch stormwater runoff from the laydown area and reuse that water in the shop building's wash bay. This system will only be used on a section covering approximately 4 acres on the East side of the building footprint. This area reduces the amount of the site's stormwater runoff enough that the township authorities have approved this system. It also reduces the amount of township water required to run the wash bay for this facility.

The other building site utilities will be run in a concurrent manner because they will be placed within a 20 foot wide utility easement on the North side of the project site. This utility easement will have been created by a contractor that is not included within this project's contract. Once created, the an electrical contractor that is also not associated with this project will be responsible for running electrical lines to an electrical substation in the Northwest corner of the project site. The electrical contractor for this project will be responsible for running electric from this substation to the shop and office buildings.

Other utility lines that will be run in this utility easement include a 6 inch gas main, an 8 inch sanitary sewer line, and telecommunication lines. On the south side of the project site, there is an existing township water main under State Road. The water supply for these buildings will be tapped off this underground water main.

Pre-Engineered Metal Building

As soon as the Notice to Proceed has been received, the structural steel contractor will begin performing reaction calculations and fabrication of steel members. Before the steel members arrive at the project site, however, the foundations for both the shop building and office buildings must be completed. When the steel has arrived on site, base plates for the office building will be set, followed by the structural steel for the office building. As the contractors finish their work on a portion of the office building, they will move workers to the shop building as needed to continue working efficiently.

Office and Shop Building

Once work on the foundation for the office building and shop building is completed, building systems that will be running within or below the building's slab, such as underground plumbing and underground electric, will be installed. The slab for each building will then be placed for both buildings.

The majority of the work in the office building is being installed concurrently with the work in the shop building. However, if the same type of work is being installed in both buildings, the office building work begins before work in the shop building occurs. For example, electric rough-in work is scheduled to begin in the office building about one week before it is scheduled to begin in the shop building. The schedule was created this way to help instill a flow of work for each subcontractor to follow. Subcontractors will be encouraged to work from East to West across the office building before working from South to North across the shop building.

After the slabs have been placed and the structures of the buildings have started to be erected, metal wall panels, windows, and metal stud walls can be installed where designated in the construction documents. Once this work has finished in one area of the building and moved to another area, the subsequent trades can begin work. These trades include electrical rough-in, mechanical rough-in, sprinklers, drywall, paint, electrical finishes, mechanical finishes, and other finishes.

Project Completion

Substantial Completion for the Northeastern Pennsylvania Office Building is currently scheduled for February 7, 2012, with punchlist inspections and corrections to follow. Four weeks have been provided in the project schedule for punchlist items because the Substantial Completion target is not a critical deadline for the owner of this project. The owner wants this project completed within a reasonable amount of time, but the buildings won't be occupied immediately. This is because the shop building and office building included in this thesis project are included in Phase 1 of a larger project that currently includes seven phases. Once Phase 1 and Phase 2 are completed, which both consist of an office and shop building, the buildings will be occupied by the owner. Since Phase 2 is not scheduled to be completed before the end of May 2012, the Turnover deadline set for early March 2012 on the project schedule is not being strictly enforced. A relatively small fee is being charged for delay in the project completion. This is to help ensure that the contractor finishes the contracted work within a reasonable time period if the Turnover deadline is not met.

Detailed Structural Systems Estimate

Detailed Structural Steel Estimate

The following structural system estimate for the Northeastern Pennsylvania Office Building was performed between column lines five and six in the shop building, as shown below in Figure 1. This bay is approximately forty feet wide and sixty-eight feet long. Each component of the structural system is priced and described below. The detailed structural estimate provided was calculated using RS Means, Building Construction Cost Data, 2012.

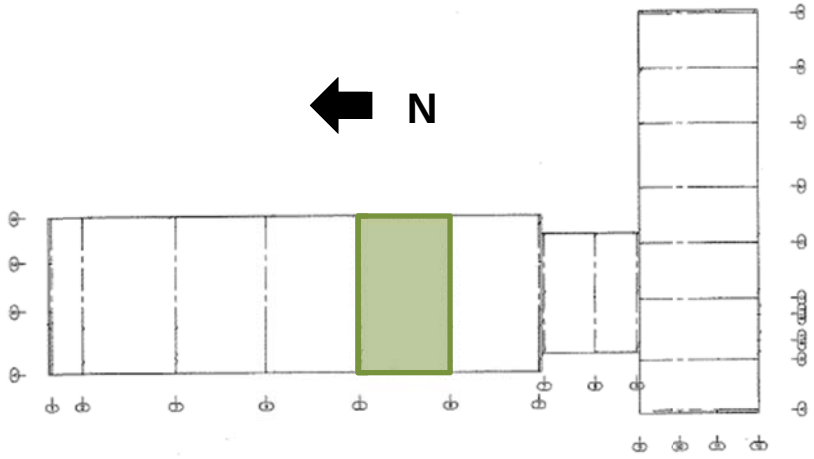


Figure 1. Shop Building Bay

Grade Beam Footings	Quantity	Unit	Cost/Unit	Total Cost
Concrete	26	CY	$112.00	$2,912.00
Formwork (ICF)	222	EA (5.33 SF EA)	$32.00	$7,104.00
Steel Reinforcement	0.870	TON	$2,000.00	$1,740.00
Placement	26	CY	$18.30	$475.80
				$12,231.80

The grade beams in this bay of the shop building are composed of exterior and interior grade beams. The exterior grade beams (8" wide, 4' deep) run North-South at the entrance and the exit of each bay, and they are formed using insulated concrete form (ICF) blocks. This grade beam has both #5 and #8 steel reinforcing in the horizontal direction, and #5 reinforcing bars in the vertical direction. The interior grade beams run East-West beneath the building's slab. These beams (2' wide, 2' deep) protect steel reinforcing (#8 reinforcing strands) that tie together pier footings across the building and prevents them from migrating away from each other. Both types of grade beams are comprised of 3,000 psi, normal weight concrete.

Spread Footings	Quantity	Unit	Cost/Unit	Total Cost
Concrete	20	CY	$112.00	$2,240.00
Formwork	226.5	SFCA	$6.70	$1,517.55
Steel Reinforcement	0.941	TON	$2,225.00	$2,093.70
Placement	20	CY	$50.00	$1,000.00
				$6,851.25

Rectangular, 18” deep spread footings are located in the four corners of the bay and each support a pier footing. The reinforcing steel used in these footings is #6 bars spaced one foot on center each way. Normal weight, 3,000 psi concrete was also used in the spread footings for this building.

Pier Footings	Quantity	Unit	Cost/Unit	Total Cost
Concrete	8.2	CY	$112.00	$918.40
Formwork	272	SFCA	$6.70	$1,822.40
Steel Reinforcement	0.372	TON	$2,225.00	$827.70
Placement	8.2	CY	$50.00	$410.00
				$3,978.50

Pier footings are located in each corner of the bay of the shop building on top of a spread footing. These footings are 34” deep and contain varying combinations and patterns of #4 and #6 reinforcing steel bars. Both the spread footings and the pier footings are formed with standard plywood formwork.

Slab-on-Grade	Quantity	Unit	Cost/Unit	Total Cost
Concrete	67.2	CY	$113.00	$7,593.60
Steel Reinforcement	1.817	TON	$2,125.00	$3,861.14
Placement	67.2	CY	$16.60	$1,115.52
Finishing	2720	SFCA	$0.71	$1,931.20
Saw Cuts	188	SFCA	$0.62	$116.56
				$14,618.02

Since loaded trucks will be constantly moving in and out of the shop building bay that has been chosen for this structural estimate, the concrete slab is thicker and more heavily reinforced than most concrete slabs throughout the rest of the building. It’s an 8” inch, 4,000 psi concrete slab that uses #4 steel bars spaced every foot in both directions. This slab will be finished with a float and will have multiple saw-cut control joints.

Steel	Quantity	Unit	Cost/Unit	Total Cost
Structural Framing	32	TON	$3,425.00	$109,600.00
Base Plates	5.44	SF	$42.00	$228.48
Bolts	26	EA	$9.65	$250.90
Anchor Bolts	16	EA	$9.45	$151.20
Purlins	4947	SFCA	$2.88	$14,247.36
				$124,377.94

Since this building is a pre-engineered metal building, the structural framing estimate contains assumptions that may jeopardize the accuracy of this estimate. A request was made to the structural steel subcontractor for accurate pricing information for comparing values, but no figures were ever received.

All structural members have been designed and fabricated for the design loads calculated at that particular location by the structural engineer. Therefore, the steel members for this building are not standard wide-flanged beam shapes and sizes. Below is a diagram that shows the frame that spans column lines five and six. Each steel member has been highlighted in a different color to show their varying sizes and shapes. In order to calculate an estimated cost for the structural steel, a value of 225 plf was assumed for all steel frame members.

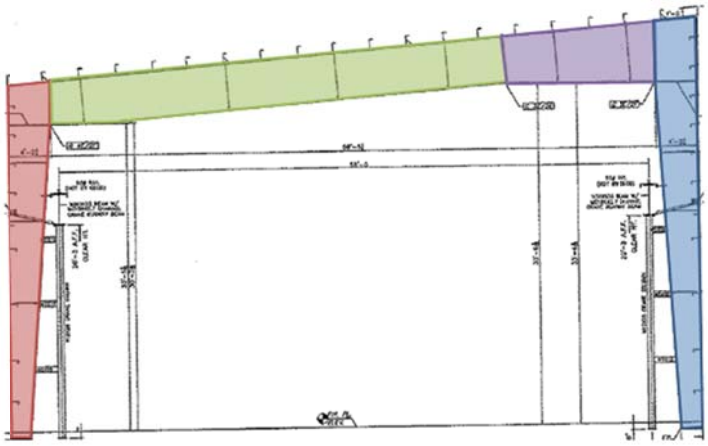


Figure 2. Pre-Engineered Metal Building Frame

The structural steel frames are attached to the pier footings by way of base plates and anchor bolts that are embedded into the concrete piers. Pieces of steel framing are fastened together using eight to ten bolts at each connection. Finally, horizontal purlins are used to laterally brace the structural frames.

Summary

Building System	Total Price	Price/SF
Structural Concrete	$37,679.57	$13.85
Structural Steel	$124,377.94	$45.73
		$59.59

When the price per square foot for the structural concrete and structural steel are combined, they total approximately $60 per square foot. This can then be multiplied by the total building square footage (shop building and office building) to get a total estimated structural cost of about $1,550,000. This means that slightly less than 30% of the total construction cost for this project is attributed to the structure of the shop building and the office building. A structural percentage of 30% seems low for an industrial/office building such as this. This is because there are no high quality finishes or architectural features on this project that would raise the project cost, and therefore lower the structural percentage. This percentage may also be lower than expected because of the assumption of 225 plf for the structural steel members. An assumed value such as this may be highly inaccurate with no actual pricing of pre-engineered metal frames available for comparison.

General Conditions Estimate

The general conditions estimate provided was calculated using RS Means, Building Construction Cost Data, 2012, as well as numbers provided by the project team. The general conditions are assumed to be distributed across the entire duration of the project. The total cost for the general conditions estimate for the Northeastern Pennsylvania Office Building is about $588,000. This is approximately 11% of the total project cost, which is very close in comparison to the industry average of about 10%. This value actually seems high for a project like this because items such as insurance, temporary fencing, protective walkways, security, and project signage, which would commonly be included in a project's general conditions, were not included. These items are not required because of the rural location of this project. Also, the signage is provided by the owner for this project.

The three sections that this general conditions estimate is comprised of include project personnel, construction facilities & equipment, and temporary utilities and miscellaneous costs. As seen in Figure 3 below, the project personnel accounted for approximately 70% of the general conditions estimate. The construction facilities and equipment costs accounted for about 9%, and the temporary utilities and miscellaneous costs accounted for approximately 21% of the general conditions estimate.

A breakdown of each line item included in the general conditions estimate for this project can be seen below. The durations for each line item have been approximated using the Detailed Project Schedule in Appendix A of this report. All cost information has either been extracted from RS Means cost data, which is referenced in Appendix C of this report, or was provided by the project team. When the total general conditions estimation is divided across the 8 ½ month schedule, the average cost is about $69,200 per month ($15,475 per week).

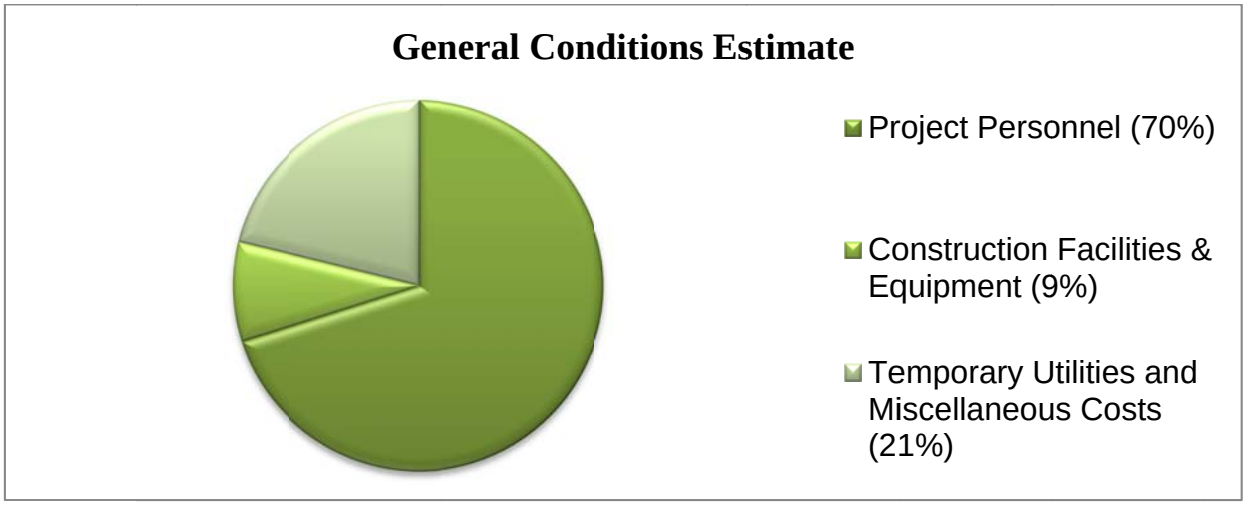


Figure 3. General Conditions Estimate by Percentage

Project Personnel

Item	Unit Rate	Unit	Quantity	Cost
Senior Operations Manager	$3,700	Week	10	$37,000
Field Operations Manager	$3,700	Week	10	$37,000
Project Manager	$3,275	Week	38	$124,405
Project Engineer	$2,000	Week	38	$76,000
Project Superintendent	$3,050	Week	38	$115,900
Safety & Quality Engineer	$2,200	Week	10	$22,000
			Total	**$412,305**

Construction Facilities & Equipment

Item	Unit Rate	Unit	Quantity	Cost
Office Trailers	$203 x 4 Trailers	Month	8 ½	$6,902
Office Supplies	$82.50 x 4 Trailers	Month	8 ½	$2,805
Temporary Restrooms	$180 x 2 Facilities	Month	8 ½	$3,060
Dumpsters/Recycling Bins	$505 x 2 Bins	Week	38	$38,380
			Total	**$51,147**

Temporary Utilities and Miscellaneous Costs

Item	Unit Rate	Unit	Quantity	Cost
Temporary Electric	$1.01 / CSF	Month	3	$787.80
Bonds	1.25%	Project	1	$68,750
Final Cleanup	0.5%	Project	1	$27,500
Permitting	0.5%	Project	1	$27,500
			Total	**$124,537.80**

LEED Evaluation

Leadership in Energy and Environmental Design (LEED) Certification

The Northeastern Pennsylvania Office Building was not designed with any intention to become LEED certified. Since there is a large push in today's construction industry to create more sustainable buildings and more environment-friendly projects, an analysis will be performed on this project to determine how many LEED credits the building would receive if it were to be constructed as per the construction documents. After this analysis, methods will be suggested that could lead this project to achieving additional LEED credits without significantly impacting either the project cost or the project schedule. Based on these suggestions, a recommendation will be made as to whether the project should indeed strive for LEED certification.

It should be noted that all LEED credits are based on "LEED 2009 for New Construction and Major Renovations" project checklist.

Existing LEED Credits

Based on the LEED project checklist that I have compiled for the Northeastern Pennsylvania Office Building (Appendix D), this project does not qualify for LEED certification. There are certain prerequisites that must be met for a project to be considered a candidate for certification. One of the eight prerequisites states that a building must reduce its water usage by at least 20%. Since the Northeastern Pennsylvania Office Building does not show any indication of any water usage reduction, it does not meet this basic requirement. This automatically denies this project from qualifying for LEED certification.

Although this project does not meet the proper requirements for LEED certification, I have completed a LEED project checklist to analyze the number of points that the Northeastern Pennsylvania Office Building has accumulated based on its existing construction documents.

Sustainable Sites

The prerequisite for the Sustainable Sites section, "Construction Activity Pollution Prevention" is properly met for this project because there is an Erosion and Sedimentation Control Plan being implemented on this site. One credit is available for site selection because this project is not located on prime farmland, within 100 feet of wetlands, and

does not violate other requirements for this credit. One credit is also available because of the stormwater quantity control aspect of this project. Since multiple acres of existing grass lot will be replaced with a gravel laydown yard, the township has required this project to design a system that reduces the amount of stormwater runoff that would be produced from this stoned area. The system that has been approved will collect stormwater from the laydown yard that will be used in the shop building's wash bay. Finally, the buildings will be using Galvalume metal roof panels. These roof panels are reflective, reducing the heat island effect produced from the construction of this project. This also makes a credit available within this category.

Water Efficiency

The stormwater runoff that is collected on site will also be used to water the vegetation around the building. This system makes up to four credits available in the water efficiency category. Also, the gray water that is used within the office building will be treated enough to be used in the wash bay of the shop building. This can be considered an innovative wastewater system that makes up to two additional credits available. However, as previously stated, the water usage has not been reduced for this project. Since this prerequisite is not being met, the project does not qualify for LEED certification.

Energy and Atmosphere

The Energy and Atmosphere category has three prerequisites that are all met for the Northeastern Pennsylvania Office Building. These prerequisites include commissioning of building systems, implementing minimum energy performance, and managing specific refrigerants. Although these are met, there are no other available credits within this category.

Materials and Resources

The prerequisite for the Materials and Resources category requires storage and collection of separate recyclables on the project site. This is met on the Northeastern Pennsylvania Office Building since there will be recycling bins available in the Northwest corner of the site. There are no available credits within this category.

Indoor Environment Quality

This project controls environmental tobacco smoke and performs indoor air quality checks, which are both prerequisites within this LEED certification category. A credit is available for the outdoor air delivery monitoring system used in the shop building. Since trucks will be pulling and out of the shop building each day, there will be carbon dioxide monitor placed in this building to monitor the gas levels in this space. A credit is also available because thermal sensors will be used in the office building to regulate the temperature of the office spaces.

Innovation and Design Process

Since the architect that designed this project had at least one LEED accredited professional involved with the design of the shop building and office building, one credit is available within this category.

Summary

If the Northeastern Pennsylvania Office Building met all of the prerequisites needed to qualify for LEED certification, the project would still not receive the certification. This is because the project would only acquire twelve credits. A minimum of forty credits is required to become LEED Certified.

Proposed LEED Credits

The following sections propose variations to the Northeastern Pennsylvania Office Building's construction documents that would provide additional credits toward this project becoming LEED Certification. These proposed variations are intended to have a minimal impact on the projects schedule and cost. A LEED project checklist has been provided in Appendix E of this report, which shows existing credits and proposed credits. Proposed credits are bolded on the detailed credit breakdown.

Sustainable Sites

Five additional credits could be added to the three previous credits available under the Sustainable Sites category with minimal negative impacts on the project design. For example, this project is a single phase of a multiphase project that will include buildings

similar to the Northeastern Pennsylvania Office Building. The owner of this project will also be constructing a housing unit for their worker to the West of this project. With the increase in personnel in this area in the near future, it may be beneficial for the owner to fund a stop for a local bus route. The bus could provide public transportation for not only the workers living in the housing development, but it could also be used by the employees that work in any of the buildings within this multiphase project. Access to public transportation would add two credits towards LEED certification. This would also allow for the parking lot onsite to be reduced because fewer workers would require parking spaces. Providing fewer parking spaces than needed by the building occupants makes two credits available. Finally, if bike racks were added in the building's parking lot and one of the three restrooms within the building the building incorporated a changing room, the project would pick up another credit.

Water Efficiency

If the water efficiency of this project were increased, the water usage would reduce. This could potentially make the buildings eligible for LEED certification by meeting all requirements. For a project such as this, the demand for water consumption is not extremely high and therefore could easily be reduced. The implementation of low-flow plumbing fixtures in the three bathrooms and kitchen area would easily reduce the amount of water consumed by approximately 30% since these are the only areas with running water. Not only would this qualify the building for LEED certification consideration, but it would also add two credits towards the certification.

Energy and Atmosphere

This category contains credits that may not be feasible for this project because they tend to add to the cost of this project. However, it is reasonable to believe that the building could receive up to seventeen points towards LEED certification that will have a payback period that will cover these additional costs. The building could optimize its energy performance by using energy-efficient light fixtures inside and outside the building. If the energy performance is improved by 20%, five credits would be added. Also, since the site is on an open lot that has no surrounding buildings or trees that would shade the roof, solar panels could be installed on the buildings. Depending on the number of panels used on the project, this could create nearly 10% renewable energy for this project and an additional five credits. Seven additional points could be accumulated by improving the project's commissioning, refrigerant management, and system measurement and verification.

Materials and Resources

Although recycling is available on site, it is currently not being monitored and recorded. If the recycled content of this construction was mandated to exceed 10% of the project's disposed material total, the building could receive an additional credit.

Indoor Environmental Quality

Requirement of the installation of low-emitting materials within a new construction project can added valuable credits towards achieving LEED certification. For example, if low-emitting adhesives and sealants, paints and coatings, flooring systems, and composite wood products were required for this project, four additional credits could be awarded.

Summary

With the implementation of the previously mentioned variations to the project documents for the Northeastern Pennsylvania Office Building, this project does have the ability to become LEED Certified. The combination of the credits already encompassed in the project and the variations that have been proposed, the building could accumulate forty-one points. This is one point over the minimum requirement to become LEED Certified. Since this leaves very little room for error when estimating the anticipated credits that the project could receive, I would not suggest that the Northeastern Pennsylvania Office Building strive for this certification. Since the owner does not have an evident want or need to have this project LEED Certified, I do not see them taking the financial and schedule increases that the proposed variations may incur. Also, with an estimation that is so close to the minimum requirement, it is possible that the project would end up not achieving every credit, and could not qualify for certification.

Building Information Modeling Use Evaluation

Building Information Modeling (BIM)

The project team for the Northeastern Pennsylvania Office Building did not use any formal form of Building Information Modeling for the project at hand. This is due to the fact that neither the shop building nor the office building has any extremely complex building systems within them. Also, the structure is a pre-engineered metal building which consists of steel frames that span the width of each building. Therefore, a plenum with a minimum height of two feet exists between the structural frame and the finished ceiling throughout both buildings. This open space allows for system components to be moved to alleviate most discrepancies and clashes between the different building systems. BIM can efficiently be used on projects that have tighter space to avoid discrepancies and clashes between a building's mechanical, electrical, plumbing, and fire suppression systems before the designs are completed.

Although this project is not implementing any Building Information Modeling, the following analysis has been performed to assess the feasibility and possibility of using this method. The major goals and uses of BIM have been listed under the assumption that BIM had been considered from the early stages of design on the Northeastern Pennsylvania Office Building. Also, a process map has been provided under this same assumption.

Major BIM Goals

Priority	Goal Description	Potential BIM Uses
High	Visualization for Township Authorities	3D Coordination
Medium	Owner Visualization	3D Coordination
Medium	Accurate As-Built Drawings	3D Coordination
Medium	Building Systems Estimates	Cost Estimation
Low	Eliminate Field Conflicts	3D Coordination

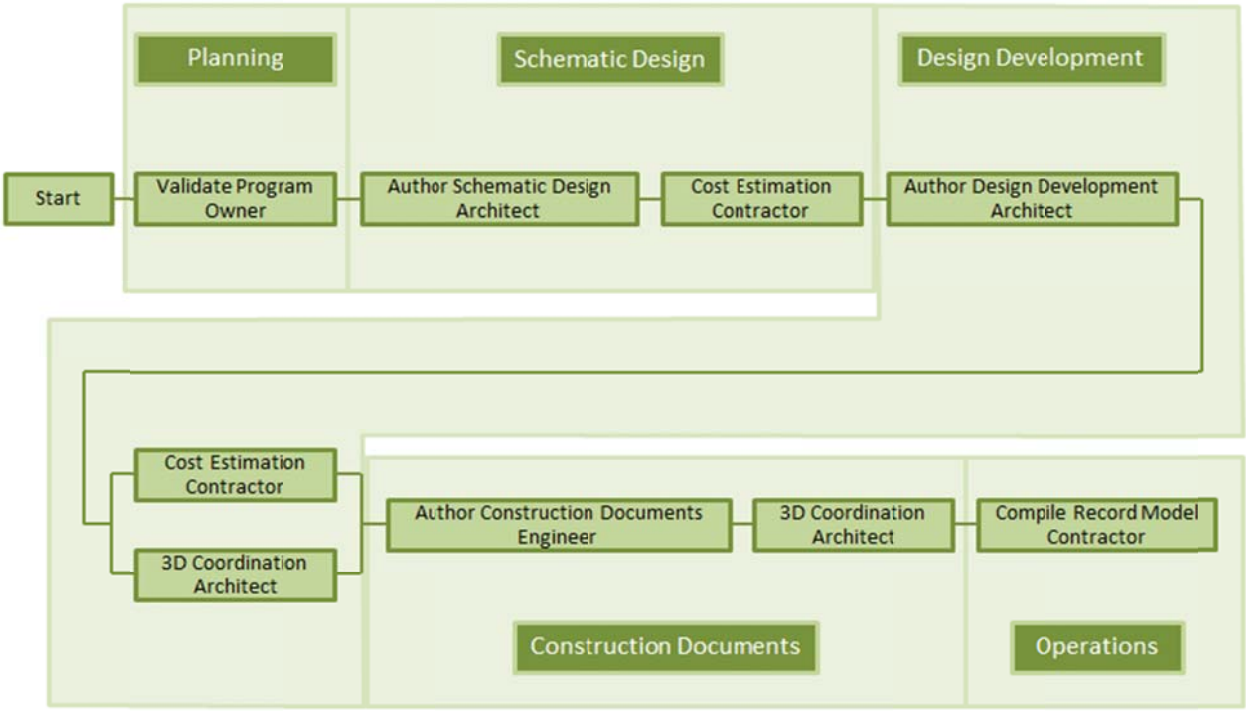
The design team and owner of the Northeastern Pennsylvania Office Building had some difficulties at the onset of this project because the land that they were preparing to construct a multiphase project on was previously undeveloped in a rural area. Because of this, the township authorities were hesitant to approve a construction project of this magnitude in this area. A visual representation of the project created in 3D software may have been beneficial to help show the township what was to be eventually constructed. The owner could also get a better visual representation of the project before construction if BIM had been implemented at the beginning of the design process. After the design

process had begun, the contractors on this project could have used the model to perform accurate cost estimations for their building systems. Also, as the systems were being installed, the architect could have updated the software to create an accurate set of as-built plans for their records and for the owner's records.

BIM Uses

X	Plan	X	Design	X	Construct	X	Operate
	Programming		Design Authoring		Site Utilization Plan		Building Maintenance Scheduling
	Site Analysis		Design Reviews		Construction System Design		Building System Analysis
		X	3D Coordination	X	3D Coordination		Asset Management
			Structural Analysis		Digital Fabrication		Space Management / Tracking
			Light Analysis		3D Control & Planning		Disaster Planning
			Energy Analysis		Record Modeling		Record Modeling
			Mechanical Analysis				
			Other Engineering Analysis				
			Sustainability (LEED) Evaluation				
			Code Validation				
	Phase Planning (4D Modeling)		Phase Planning (4D Modeling)		Phase Planning (4D Modeling)		Phase Planning (4D Modeling)
X	Cost Estimation	X	Cost Estimation		Cost Estimation		Cost Estimation
	Existing Conditions Modeling		Existing Conditions Modeling		Existing Conditions Modeling		Existing Conditions Modeling

Level One Process Overview Map



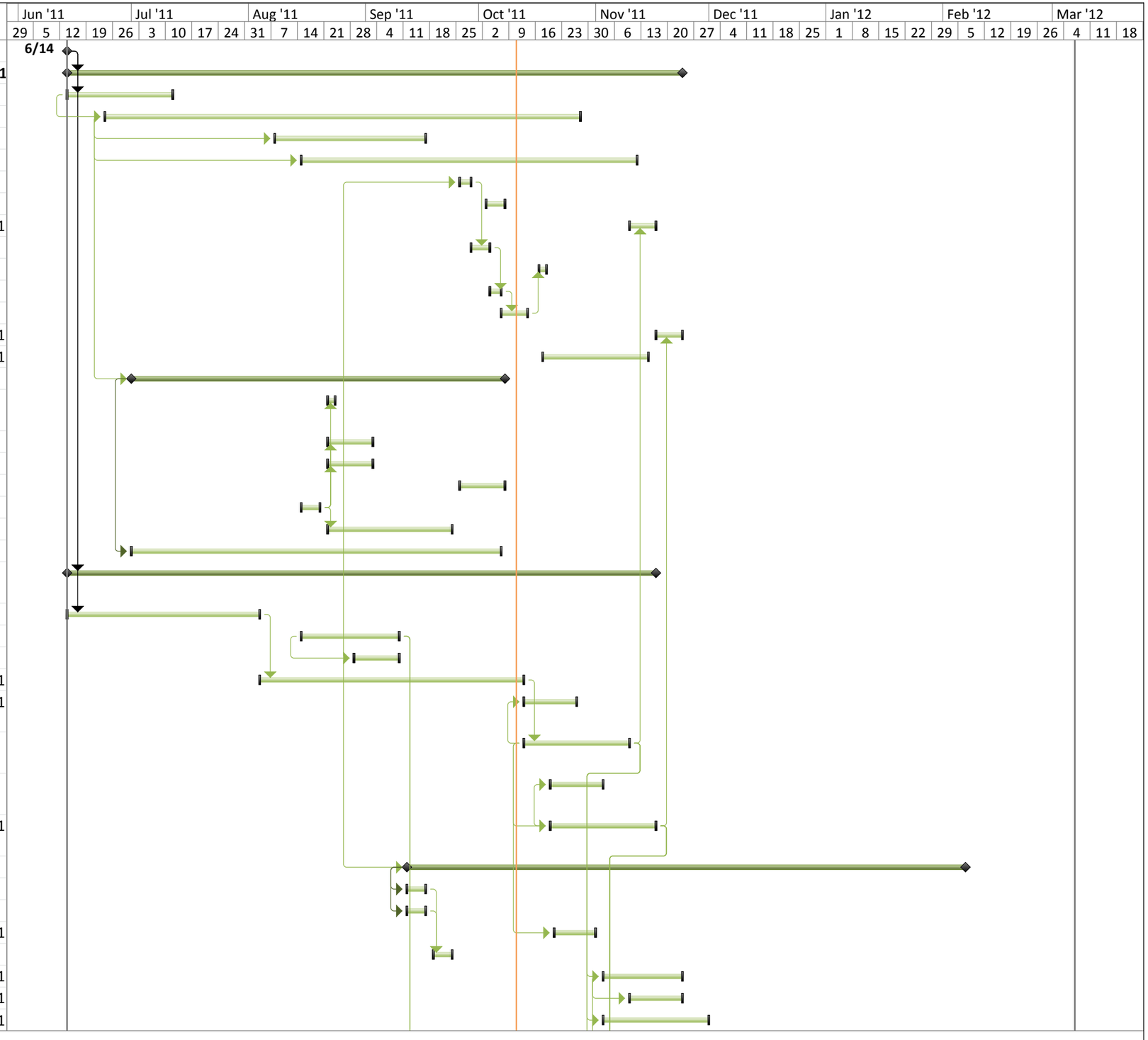
Assuming BIM were used on the Northeastern Pennsylvania Office Building, the owner and the township authorities could have seen a 3D model of the project while it was still in the planning stage. This may have decreased the delay in the project start-up by helping to receive the township's approval earlier. At this point, the architect could have also used this model to do cost estimations for the office building and shop building for Phase 1 of the multiphase project. During the design phase of this project, the design team could have seen discrepancies and clashes between different building systems. This would allow them an ample amount of time to redesign the systems to avoid these problem areas of the design. The model would have also been used by the contactors during the design phase to help put together an accurate estimate of the building systems for this project. Once the building has begun construction, the model could still be used to avoid problem areas, if there are any, which were not corrected in the design portion of this project. If the work being installed deviates from the construction documents, the contractor can record this new work using BIM. By recording this new information when it is installed, an accurate set of as-built plans can be derived from the model upon project completion.

Summary

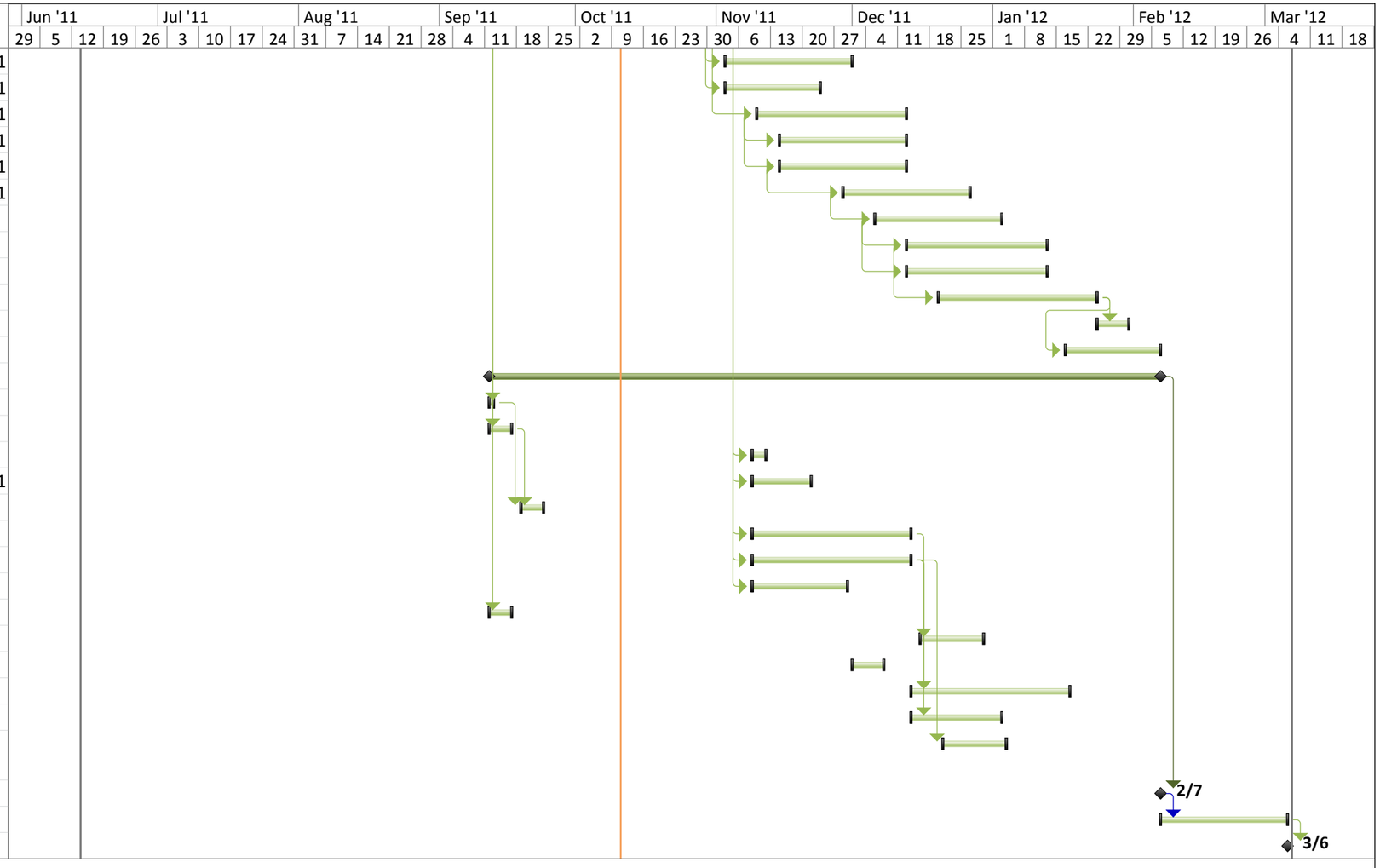
Although the benefits of the implementation of BIM for the Northeastern Pennsylvania Office Building seem to be enticing, it is not recommended to be used for this particular project. This is because the building systems are not overly complicated and would not create a significantly negative impact on the project to move portions of the systems. The large plenum above the finished ceiling height provides a substantial area for systems to be redirected or rerouted. The accurate set of as-built plans that would be generated from the modeling software could also be produced accurately if the contractor and the architect work together to update the construction documents as changes are made during construction. Although the estimations for the building systems could be produced more precisely with the use of BIM, the systems used in this project are fairly small with comparison to other projects of this size. The shop building has a small density of MEP systems for the size of the building, and therefore does not require a deep analysis of the systems in this space. The only practical aspect that BIM seems to contribute to this project is visual representation during the planning stage. If a 3D model were developed to show the township authorities what the project would look like after construction, the owner may have received approval earlier. This would have resulted in construction beginning earlier, and subsequently an earlier project turnover to the owner.

Appendix A: Detailed Project Schedule

ID	Task Mode	Task Name	Duration	Start	Finish
1		**Notice to Proceed**	**0 days**	**Tue 6/14/11**	**Tue 6/14/11**
2		**Sitework**	**117 days**	**Tue 6/14/11**	**Wed 11/23/11**
3		Clear and Grub	20 days	Tue 6/14/11	Mon 7/11/11
4		Grading	90 days	Fri 6/24/11	Thu 10/27/11
5		Site Electric	30 days	Mon 8/8/11	Fri 9/16/11
6		Stone Pipe Yard	65 days	Mon 8/15/11	Fri 11/11/11
7		Curbing	3 days	Mon 9/26/11	Wed 9/28/11
8		Dumpster/Flag Concrete	5 days	Mon 10/3/11	Fri 10/7/11
9		Dumpster Enclosure	5 days	Thu 11/10/11	Wed 11/16/11
10		Asphalt Paving Base	3 days	Thu 9/29/11	Mon 10/3/11
11		Asphalt Paving Top	2 days	Mon 10/17/11	Tue 10/18/11
12		Traffic & Panel Signage	3 days	Tue 10/4/11	Thu 10/6/11
13		Landscape	5 days	Fri 10/7/11	Thu 10/13/11
14		Dimensional Letters	5 days	Thu 11/17/11	Wed 11/23/11
15		Fence	20 days	Tue 10/18/11	Mon 11/14/11
16		**Site Utilities**	**71 days**	**Fri 7/1/11**	**Fri 10/7/11**
17		Electric Substation Underground	2 days	Mon 8/22/11	Tue 8/23/11
18		Electric	10 days	Mon 8/22/11	Fri 9/2/11
19		Telephone	10 days	Mon 8/22/11	Fri 9/2/11
20		Gas	10 days	Mon 9/26/11	Fri 10/7/11
21		Sanitary	5 days	Mon 8/15/11	Fri 8/19/11
22		Water	25 days	Mon 8/22/11	Fri 9/23/11
23		Stormwater	70 days	Fri 7/1/11	Thu 10/6/11
24		**Pre-Engineered Metal Building**	**112 days**	**Tue 6/14/11**	**Wed 11/16/11**
25		Reactions	37 days	Tue 6/14/11	Wed 8/3/11
26		Shop Foundations	20 days	Mon 8/15/11	Fri 9/9/11
27		Office Foundations	10 days	Mon 8/29/11	Fri 9/9/11
28		Fabrication	50 days	Thu 8/4/11	Wed 10/12/11
29		Set Office Building Base Plates	10 days	Thu 10/13/11	Wed 10/26/11
30		Erection of Office Building	20 days	Thu 10/13/11	Wed 11/9/11
31		Set Shop Building Base Plates	10 days	Thu 10/20/11	Wed 11/2/11
32		Erection of Shop Building	20 days	Thu 10/20/11	Wed 11/16/11
33		**Office Building**	**106 days**	**Mon 9/12/11**	**Mon 2/6/12**
34		Underground Piping	5 days	Mon 9/12/11	Fri 9/16/11
35		Underground Electric	5 days	Mon 9/12/11	Fri 9/16/11
36		Concrete Aprons	7 days	Fri 10/21/11	Mon 10/31/11
37		SOG	5 days	Mon 9/19/11	Fri 9/23/11
38		Metal Studs	15 days	Thu 11/3/11	Wed 11/23/11
39		Windows	10 days	Thu 11/10/11	Wed 11/23/11
40		Electric Rough-In	20 days	Thu 11/3/11	Wed 11/30/11



ID	Task Mode	Task Name	Duration	Start	Finish
41		Mech. Rough-in	20 days	Thu 11/3/11	Wed 11/30/11
42		Fire Sprinklers	15 days	Thu 11/3/11	Wed 11/23/11
43		Hang Drywall	23 days	Thu 11/10/11	Mon 12/12/11
44		Magnetic Wall Panels	20 days	Tue 11/15/11	Mon 12/12/11
45		Finish Drywall	20 days	Tue 11/15/11	Mon 12/12/11
46		Paint	20 days	Tue 11/29/11	Mon 12/26/11
47		Ceilings	20 days	Tue 12/6/11	Mon 1/2/12
48		Electric Finish	23 days	Tue 12/13/11	Thu 1/12/12
49		Mech. Finish	23 days	Tue 12/13/11	Thu 1/12/12
50		Ceramic Floor Tile	25 days	Tue 12/20/11	Mon 1/23/12
51		Install Doors	5 days	Tue 1/24/12	Mon 1/30/12
52		Install Casework	15 days	Tue 1/17/12	Mon 2/6/12
53		**Shop Building**	**106 days**	**Mon 9/12/11**	**Mon 2/6/12**
54		Underground Plumbing	1 day	Mon 9/12/11	Mon 9/12/11
55		Underground Electric	5 days	Mon 9/12/11	Fri 9/16/11
56		Concrete Aprons	3 days	Wed 11/9/11	Fri 11/11/11
57		Overhead Doors	9 days	Wed 11/9/11	Mon 11/21/11
58		SOG	5 days	Mon 9/19/11	Fri 9/23/11
59		Electric Rough-In	25 days	Wed 11/9/11	Tue 12/13/11
60		Mech. Rough-In	25 days	Wed 11/9/11	Tue 12/13/11
61		Fire Sprinklers	15 days	Wed 11/9/11	Tue 11/29/11
62		CMU	5 days	Mon 9/12/11	Fri 9/16/11
63		Paint	10 days	Fri 12/16/11	Thu 12/29/11
64		Install Cranes	5 days	Thu 12/1/11	Wed 12/7/11
65		Elec. Finish	25 days	Wed 12/14/11	Tue 1/17/12
66		Mech. Finish	14 days	Wed 12/14/11	Mon 1/2/12
67		Allowance Wash and Lube	10 days	Wed 12/21/11	Tue 1/3/12
68		**Substantial Completion**	**0 days**	**Tue 2/7/12**	**Tue 2/7/12**
69		Punchlist	20 days	Tue 2/7/12	Mon 3/5/12
70		**Turnover**	**0 days**	**Tue 3/6/12**	**Tue 3/6/12**



Appendix B: RS Means Cost Data (Structural System Estimate)

03 11 Concrete Forming

03 11 13 – Structural Cast-In-Place Concrete Forming

	03 11 13.45 Forms In Place, Footings		Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
4050	2 use		C-1	280	.114	SFCA	1.51	4.78		6.29	9
4100	3 use			305	.105		1.10	4.39		5.49	7.95
4150	4 use			315	.102		.89	4.25		5.14	7.55
5000	Spread footings, job-built lumber, 1 use			305	.105		1.90	4.39		6.29	
5050	2 use			371	.086		1.06	3.61		4.67	6.70
5100	[illegible]			401	.080		.76	3.34		4.10	6
5150	4 use			414	.077		.62	3.23		3.85	5.65
6000	Supports for dowels, plinths or templates, 2" x 2" footing			25	1.280	Ea.	4.92	53.50		58.42	88
6050	4" x 4" footing			22	1.455		9.85	61		70.85	104
6100	8" x 8" footing			20	1.600		19.70	67		86.70	125
6150	12" x 12" footing			17	1.882		24	79		103	147
7000	Plinths, job-built plywood, 1 use			250	.128	SFCA	2.49	5.35		7.84	11
7100	4 use			270	.119	"	.82	4.96		5.78	8.55
	03 11 13.47 Forms In Place, Gas Station Forms										
0010	**FORMS IN PLACE, GAS STATION FORMS**										
0050	Curb fascia, with template, 12 ga. steel, left in place, 9" high	G	1 Carp	50	.160	L.F.	13.10	7.05		20.15	25.50
1000	Sign or light bases, 18" diameter, 9" high	G		9	.889	Ea.	82.50	39		121.50	152
1050	30" diameter, 13" high	G		8	1		131	44		175	212
2000	Island forms, 10' long, 9" high, 3'-6" wide	G	C-1	10	3.200		365	134		499	610
2050	4' wide	G		9	3.556		380	149		529	645
2500	20' long, 9" high, 4' wide	G		6	5.333		610	223		833	1,025
2550	5' wide	G		5	6.400		635	268		903	1,100
	03 11 13.50 Forms In Place, Grade Beam										
0010	**FORMS IN PLACE, GRADE BEAM**	R031113-40									
0020	Job-built plywood, 1 use		C-2	530	.091	SFCA	2.68	3.89		6.57	8.95
0050	2 use	R031113-60		580	.083		1.48	3.55		5.03	7.05
0100	3 use			600	.080		1.07	3.43		4.50	6.50
0150	4 use			605	.079		.87	3.41		4.28	6.20
	03 11 13.55 Forms In Place, Mat Foundation										
0010	**FORMS IN PLACE, MAT FOUNDATION**	R031113-40									
0020	Job-built plywood, 1 use		C-2	290	.166	SFCA	2.55	7.10		9.65	13.75
0050	2 use	R031113-60		310	.155		1.05	6.65		7.70	11.40
0100	3 use			330	.145		.67	6.25		6.92	10.35
0120	4 use			350	.137		.62	5.90		6.52	9.75
	03 11 13.65 Forms In Place, Slab On Grade										
0010	**FORMS IN PLACE, SLAB ON GRADE**	R031113-40									
1000	Bulkhead forms w/keyway, wood, 6" high, 1 use		C-1	510	.063	L.F.	.87	2.63		3.50	4.99
1050	2 uses	R031113-60		400	.080		.48	3.35		3.83	5.65
1100	4 uses			350	.091		.28	3.83		4.11	6.20
1400	Bulkhead form for slab, 4-1/2" high, exp metal, incl keyway & stakes	G		1200	.027		1.13	1.12		2.25	2.96
1410	5-1/2" high	G		1100	.029		1.25	1.22		2.47	3.25
1420	7-1/2" high	G		960	.033		1.47	1.39		2.86	3.77
1430	9-1/2" high	G		840	.038		1.67	1.59		3.26	4.29
2000	Curb forms, wood, 6" to 12" high, on grade, 1 use			215	.149	SFCA	1.97	6.25		8.22	11.75
2050	2 use			250	.128		1.09	5.35		6.44	9.45
2100	3 use			265	.121		.79	5.05		5.84	8.65
2150	4 use			275	.116		.64	4.87		5.51	8.20
3000	Edge forms, wood, 4 use, on grade, to 6" high			600	.053	L.F.	.29	2.23		2.52	3.75
3050	7" to 12" high			435	.074	SFCA	.62	3.08		3.70	5.40
3500	For depressed slabs, 4 use, to 12" high			300	.107	L.F.	.58	4.46		5.04	7.50
3550	To 24" high			175	.183		.75	7.65		8.40	12.60
4000	For slab blockouts, to 12" high, 1 use			200	.160		.60	6.70		7.30	10.95

56

03 11 Concrete Forming

03 11 13 – Structural Cast-In-Place Concrete Forming

	03 11 13.85 Forms In Place, Walls		Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs Labor	Equipment	Total	Total Incl O&P
7860	To 8' high		C-2	800	.060	SFCA	.90	2.58		3.48	4.95
8060	Over 8' to 16' high			600	.080		.94	3.43		4.37	6.35
8600	Pilasters, 1 use			270	.178		2.52	7.65		10.17	14.55
8620	2 use			330	.145		1.39	6.25		7.64	11.15
8640	3 use			370	.130		1.01	5.55		6.56	9.65
8660	4 use			385	.125		.82	5.35		6.17	9.15
9010	Steel framed plywood, based on 50 uses of purchased										
9020	forms, and 4 uses of bracing lumber										
9060	To 8' high		C-2	600	.080	SFCA	.74	3.43		4.17	6.10
9260	Over 8' to 16' high			450	.107		.74	4.58		5.32	7.85
9460	Over 16' to 20' high			400	.120		.74	5.15		5.89	8.75
9475	For elevated walls, add							10%			
9480	For battered walls, 1 side battered, add						10%	10%			
9485	For battered walls, 2 sides battered, add						15%	15%			

03 11 19 – Insulating Concrete Forming

03 11 19.10 Insulating Forms, Left In Place

0010	**INSULATING FORMS, LEFT IN PLACE**										
0020	S.F. is for exterior face, but includes forms for both faces (total R22)										
2000	4" wall, straight block, 16" x 48" (5.33 S.F.)	G	2 Carp	90	.178	Ea.	17.60	7.85		25.45	31.50
2010	90 corner block, exterior 16" x 38" x 22" (6.67 S.F.)	G		75	.213		19.95	9.40		29.35	36.50
2020	45 corner block, exterior 16" x 34" x 18" (5.78 S.F.)	G		75	.213		20	9.40		29.40	36.50
2100	6" wall, straight block, 16" x 48" (5.33 S.F.)	G		90	.178		17.85	7.85		25.70	31.50
2110	90 corner block, exterior 16" x 32" x 24" (6.22 S.F.)	G		75	.213		21.50	9.40		30.90	38.50
2120	45 corner block, exterior 16" x 26" x 18" (4.89 S.F.)	G		75	.213		18.95	9.40		28.35	35.50
2130	Brick ledge block, 16" x 48" (5.33 S.F.)	G		80	.200		22.50	8.80		31.30	38
2140	Taper top block, 16" x 48" (5.33 S.F.)	G		80	.200		21	8.80		29.80	36.50
2200	8" wall, straight block, 16" x 48" (5.33 S.F.)	G		90	.178		18.40	7.85		26.25	32
2210	90 corner block, exterior 16" x 34" x 26" (6.67 S.F.)	G		75	.213		23.50	9.40		32.90	40.50
2220	45 corner block, exterior 16" x 28" x 20" (5.33 S.F.)	G		75	.213		20.50	9.40		29.90	37
2230	Brick ledge block, 16" x 48" (5.33 S.F.)	G		80	.200		23	8.80		31.80	39
2240	Taper top block, 16" x 48" (5.33 S.F.)	G		80	.200		21.50	8.80		30.30	37

03 11 19.60 Roof Deck Form Boards

0010	**ROOF DECK FORM BOARDS**	R051223-50									
0050	Includes bulb tee sub-purlins @ 32-5/8" O.C.										
0070	Non-asbestos fiber cement, 5/16" thick		C-13	2950	.008	S.F.	2.66	.39	.04	3.09	3.64
0100	Fiberglass, 1" thick			2700	.009		3.64	.42	.05	4.11	4.78
0500	Wood fiber, 1" thick	G		2700	.009		2.20	.42	.05	2.67	3.19

03 11 23 – Permanent Stair Forming

03 11 23.75 Forms In Place, Stairs

0010	**FORMS IN PLACE, STAIRS**	R031113-40									
0015	(Slant length x width), 1 use		C-2	165	.291	S.F.	4.66	12.50		17.16	24.50
0050	2 use	R031113-60		170	.282		2.65	12.10		14.75	21.50
0100	3 use			180	.267		1.99	11.45		13.44	19.80
0150	4 use			190	.253		1.65	10.85		12.50	18.50
1000	Alternate pricing method (1.0 L.F./S.F.), 1 use			100	.480	LF Rsr	4.66	20.50		25.16	36.50
1050	2 use			105	.457		2.65	19.65		22.30	33
1100	3 use			110	.436		1.99	18.75		20.74	31
1150	4 use			115	.417		1.65	17.90		19.55	29.50
2000	Stairs, cast on sloping ground (length x width), 1 use			220	.218	S.F.	1.86	9.35		11.21	16.45
2025	2 use			232	.207		1.03	8.90		9.93	14.80
2050	3 use			244	.197		.75	8.45		9.20	13.80

03 21 Reinforcement Bars

03 21 05 – Reinforcing Steel Accessories

	03 21 05.75 Splicing Reinforcing Bars		Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0810	#10 bars	G	C-5	40	1.400	Ea.	43	67.50	17.45	127.95	173
0900	#11 bars	G		32	1.750		48	84	22	154	209
0920	#14 bars	G	▼	24	2.333		74	112	29	215	291
1000	Sleeve type w/ferrous filler, for critical structures, #6 bars	G	C-25	72	.444		59	17.10		76.10	93
1210	#7 bars	G		64	.500		59.50	19.25		78.75	97
1220	#8 bars	G	▼	56	.571		63	22		85	105
1230	#9 bars	G	C-5	48	1.167		64.50	56	14.55	135.05	176
1240	#10 bars	G		40	1.400		69	67.50	17.45	153.95	201
1250	#11 bars	G		32	1.750		83	84	22	189	248
1260	#14 bars	G		24	2.333		104	112	29	245	325
1270	#18 bars	G	▼	16	3.500		106	168	43.50	317.50	430
2000	Weldable half coupler, taper threaded, #4 bars	G	E-16	120	.133		8.90	6.70	1.01	16.61	23
2100	#5 bars	G		112	.143		10.45	7.20	1.09	18.74	25.50
2200	#6 bars	G		104	.154		16.65	7.75	1.17	25.57	33.50
2300	#7 bars	G		96	.167		19.35	8.40	1.27	29.02	38
2400	#8 bars	G		88	.182		20	9.15	1.38	30.53	40
2500	#9 bars	G		80	.200		22	10.05	1.52	33.57	44
2600	#10 bars	G		72	.222		22.50	11.20	1.69	35.39	47
2700	#11 bars	G		64	.250		24.50	12.60	1.90	39	51
2800	#14 bars	G		56	.286		28	14.40	2.17	44.57	59
2900	#18 bars	G	▼	48	.333	▼	45.50	16.80	2.53	64.83	83

03 21 10 – Uncoated Reinforcing Steel

03 21 10.60 Reinforcing In Place

0015	**REINFORCING IN PLACE**, 50-60 ton lots, A615 Grade 60 R032110-10										
0020	Includes labor, but not material cost, to install accessories										
0030	Made from recycled materials	G									
0100	Beams & Girders, #3 to #7	G	4 Rodm	1.60	20	Ton	980	980		1,960	2,650
0150	#8 to #18 R032110-20	G		2.70	11.852		980	580		1,560	2,000
0200	Columns, #3 to #7	G		1.50	21.333		980	1,050		2,030	2,750
0250	#8 to #18	G		2.30	13.913		980	685		1,665	2,175
0300	Spirals, hot rolled, 8" to 15" diameter	G		2.20	14.545		1,525	715		2,240	2,850
0320	15" to 24" diameter R032110-40	G		2.20	14.545		1,475	715		2,190	2,750
0330	24" to 36" diameter	G		2.30	13.913		1,400	685		2,085	2,625
0340	36" to 48" diameter R032110-50	G		2.40	13.333		1,325	655		1,980	2,500
0360	48" to 64" diameter	G		2.50	12.800		1,475	630		2,105	2,600
0380	64" to 84" diameter R032110-70	G		2.60	12.308		1,525	605		2,130	2,675
0390	84" to 96" diameter	G		2.70	11.852		1,600	580		2,180	2,700
0400	Elevated slabs, #4 to #7 R032110-80	G		2.90	11.034		1,050	540		1,590	2,025
0500	Footings, #4 to #7	G		2.10	15.238		930	750		1,680	2,225
0550	#8 to #18	G		2.40	13.333		880	655		1,535	2,050
0600	Slab on grade, #3 to #7	G		2.30	13.913		930	685		1,615	2,125
0700	Walls, #3 to #7	G		3	10.667		930	525		1,455	1,850
0750	#8 to #18	G	▼	4	8	▼	930	395		1,325	1,650
0900	For other than 50 – 60 ton lots										
1000	Under 10 ton job, #3 to #7, add						25%	10%			
1010	#8 to #18, add						20%	10%			
1050	10 – 50 ton job, #3 to #7, add						10%				
1060	#8 to #18, add						5%				
1100	60 – 100 ton job, #3 to #7, deduct						5%				
1110	#8 to #18, deduct						10%				
1150	Over 100 ton job, #3 to #7, deduct						10%				
1160	#8 to #18, deduct						15%				

03 30 Cast-In-Place Concrete

03 30 53 – Miscellaneous Cast-In-Place Concrete

03 30 53.40 Concrete In Place

		Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
5300	Maximum	C-14B	1500	.139	S.F.	7.80	6.15	.50	14.45	18.55
5500	Lightweight, ready mix, including screed finish only,									
5510	not including forms or reinforcing									
5550	1:4 (2500 psi) for structural roof decks	C-14B	260	.800	C.Y.	136	35.50	2.86	174.36	207
5600	1:6 (3000 psi) for ground slab with radiant heat	C-14F	92	.783		133	31.50	.30	164.80	194
5650	1:3:2 (2000 psi) with sand aggregate, roof deck	C-14B	260	.800		133	35.50	2.86	171.36	204
5700	Ground slab (2000 psi)	C-14F	107	.673		133	27	.26	160.26	187
5900	Pile caps (3000 psi), incl. forms and reinf., sq. or rect., under 10 C.Y.	C-14C	54.14	2.069		159	87.50	.50	247	310
5950	Over 10 C.Y.		75	1.493		152	63	.36	215.36	265
6000	Triangular or hexagonal, under 10 C.Y.		53	2.113		122	89.50	.51	212.01	273
6050	Over 10 C.Y.		85	1.318		138	55.50	.32	193.82	237
6200	Retaining walls (3000 psi), gravity, 4' high see Section 32 32	C-14D	66.20	3.021		140	133	11.25	284.25	370
6250	10' high		125	1.600		134	70	5.95	209.95	262
6300	Cantilever, level backfill loading, 8' high		70	2.857		154	125	10.65	289.65	375
6350	16' high		91	2.198		147	96.50	8.20	251.70	320
6800	Stairs (3500 psi), not including safety treads, free standing, 3'-6" wide	C-14H	83	.578	LF Nose	5.10	25	.33	30.43	44.50
6850	Cast on ground		125	.384	"	4.35	16.70	.22	21.27	30.50
7000	Stair landings, free standing		200	.240	S.F.	4.12	10.45	.14	14.71	20.50
7050	Cast on ground		475	.101	"	3.37	4.39	.06	7.82	10.50

03 31 Structural Concrete

03 31 05 – Normal Weight Structural Concrete

03 31 05.25 Concrete, Hand Mix

0010	**CONCRETE, HAND MIX** for small quantities or remote areas									
0050	Includes bulk local aggregate, bulk sand, bagged Portland cement,									
0060	and water, using gas powered cement mixer	C-30	135	.059	C.F.	3.60	2.08	1.19	6.87	8.45
0125	2500 psi		135	.059		3.88	2.08	1.19	7.15	8.80
0130	3000 psi		135	.059		4.03	2.08	1.19	7.30	8.95
0135	3500 psi		135	.059		4.21	2.08	1.19	7.48	9.15
0140	4000 psi		135	.059		4.41	2.08	1.19	7.68	9.35
0145	4500 psi		135	.059		4.74	2.08	1.19	8.01	9.70
0150	5000 psi									
0300	Using pre-bagged dry mix and wheelbarrow (80-lb. bag = 0.6 C.F.)									
0340	4000 psi	1 Clab	48	.167	C.F.	5.80	5.85		11.65	15.35

03 31 05.35 Normal Weight Concrete, Ready Mix

0010	**NORMAL WEIGHT CONCRETE, READY MIX**, delivered	R033105-10								
0012	Includes local aggregate, sand, Portland cement, and water									
0015	Excludes all additives and treatments	R033105-20								
0020	2000 psi				C.Y.	91.50			91.50	101
0100	2500 psi	R033105-30				94			94	103
0150	3000 psi					102			102	112
0200	3500 psi	R033105-40				99.50			99.50	110
0300	4000 psi					103			103	113
0350	4500 psi	R033105-50				106			106	116
0400	5000 psi					109			109	120
0411	6000 psi					124			124	136
0412	8000 psi					202			202	223
0413	10,000 psi					287			287	315
0414	12,000 psi					345			345	380
1000	For high early strength cement, add					10%				
1010	For structural lightweight with regular sand, add					25%				

74

03 31 Structural Concrete

03 31 05 – Normal Weight Structural Concrete

	03 31 05.35 Normal Weight Concrete, Ready Mix	Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs Labor	Equipment	Total	Total Incl O&P
1300	For winter concrete (hot water), add				C.Y.	4.25			4.25	4.68
1400	For hot weather concrete (ice), add					9.35			9.35	10.25
1410	For mid-range water reducer, add					4.13			4.13	4.54
1420	For high-range water reducer/superplasticizer, add					6.35			6.35	6.95
1430	For retarder, add					2.71			2.71	2.98
1440	For non-Chloride accelerator, add					4.83			4.83	5.30
1450	For Chloride accelerator, per 1%, add					3.28			3.28	3.61
1460	For fiber reinforcing, synthetic (1 lb./C.Y.), add					6.65			6.65	7.30
1500	For Saturday delivery, add					8.85			8.85	9.70
1510	For truck holding/waiting time past 1st hour per load, add				Hr.	87.50			87.50	96.50
1520	For short load (less than 4 C.Y.), add per load				Ea.	112			112	124
2000	For all lightweight aggregate, add				C.Y.	45%				
	03 31 05.70 Placing Concrete									
0010	**PLACING CONCRETE** R033105-70									
0020	Includes labor and equipment to place, strike off and consolidate									
0050	Beams, elevated, small beams, pumped	C-20	60	1.067	C.Y.		40	12.85	52.85	75.50
0100	With crane and bucket	C-7	45	1.600			61	26	87	122
0200	Large beams, pumped	C-20	90	.711			27	8.55	35.55	50.50
0250	With crane and bucket	C-7	65	1.108			42	18.10	60.10	84
0400	Columns, square or round, 12" thick, pumped	C-20	60	1.067			40	12.85	52.85	75.50
0450	With crane and bucket	C-7	40	1.800			68.50	29.50	98	137
0600	18" thick, pumped	C-20	90	.711			27	8.55	35.55	50.50
0650	With crane and bucket	C-7	55	1.309			50	21.50	71.50	99.50
0800	24" thick, pumped	C-20	92	.696			26	8.40	34.40	49
0850	With crane and bucket	C-7	70	1.029			39	16.80	55.80	78
1000	36" thick, pumped	C-20	140	.457			17.25	5.50	22.75	32.50
1050	With crane and bucket	C-7	100	.720			27.50	11.75	39.25	55
1400	Elevated slabs, less than 6" thick, pumped	C-20	140	.457			17.25	5.50	22.75	32.50
1450	With crane and bucket	C-7	95	.758			29	12.40	41.40	57.50
1500	6" to 10" thick, pumped	C-20	160	.400			15.10	4.82	19.92	28.50
1550	With crane and bucket	C-7	110	.655			25	10.70	35.70	50
1600	Slabs over 10" thick, pumped	C-20	180	.356			13.40	4.28	17.68	25
1650	With crane and bucket	C-7	130	.554			21	9.05	30.05	42
1900	Footings, continuous, shallow, direct chute	C-6	120	.400			14.65	.46	15.11	23
1950	Pumped	C-20	150	.427			16.10	5.15	21.25	30
2000	With crane and bucket	C-7	90	.800			30.50	13.10	43.60	61
2100	Footings, continuous, deep, direct chute	C-6	140	.343			12.55	.39	12.94	19.60
2150	Pumped	C-20	160	.400			15.10	4.82	19.92	28.50
2200	With crane and bucket	C-7	110	.655			25	10.70	35.70	50
2400	Footings, spread, under 1 C.Y., direct chute	C-6	55	.873			32	.99	32.99	50
2450	Pumped	C-20	65	.985			37	11.85	48.85	69.50
2500	With crane and bucket	C-7	45	1.600			61	26	87	122
2600	Over 5 C.Y., direct chute	C-6	120	.400			14.65	.46	15.11	23
2650	Pumped	C-20	150	.427			16.10	5.15	21.25	30
2700	With crane and bucket	C-7	100	.720			27.50	11.75	39.25	55
2900	Foundation mats, over 20 C.Y., direct chute	C-6	350	.137			5	.16	5.16	7.80
2950	Pumped	C-20	400	.160			6.05	1.93	7.98	11.30
3000	With crane and bucket	C-7	300	.240			9.15	3.92	13.07	18.20
3200	Grade beams, direct chute	C-6	150	.320			11.70	.36	12.06	18.30
3250	Pumped	C-20	180	.356			13.40	4.28	17.68	25
3300	With crane and bucket	C-7	120	.600			23	9.80	32.80	46
3500	High rise, for more than 5 stories, pumped, add per story	C-20	2100	.030			1.15	.37	1.52	2.15

03 31 Structural Concrete

03 31 05 – Normal Weight Structural Concrete

03 31 05.70 Placing Concrete

		Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
3510	With crane and bucket, add per story	C-7	2100	.034	C.Y.		1.31	.56	1.87	2.61
3700	Pile caps, under 5 C.Y., direct chute	C-6	90	.533			19.55	.61	20.16	30.50
3750	Pumped	C-20	110	.582			22	7	29	41
3800	With crane and bucket	C-7	80	.900			34.50	14.70	49.20	68
3850	Pile cap, 5 C.Y. to 10 C.Y., direct chute	C-6	175	.274			10.05	.31	10.36	15.70
3900	Pumped	C-20	200	.320			12.05	3.85	15.90	22.50
3950	With crane and bucket	C-7	150	.480			18.30	7.85	26.15	36.50
4000	Over 10 C.Y., direct chute	C-6	215	.223			8.20	.25	8.45	12.80
4050	Pumped	C-20	240	.267			10.05	3.21	13.26	18.85
4100	With crane and bucket	C-7	185	.389			14.80	6.35	21.15	29.50
4300	Slab on grade, up to 6" thick, direct chute	C-6	110	.436			16	.50	16.50	25
4350	Pumped	C-20	130	.492			18.55	5.95	24.50	35
4400	With crane and bucket	C-7	110	.655			25	10.70	35.70	50
4600	Over 6" thick, direct chute	C-6	165	.291			10.65	.33	10.98	16.60
4650	Pumped	C-20	185	.346			13.05	4.17	17.22	24.50
4700	With crane and bucket	C-7	145	.497			18.90	8.10	27	38
4900	Walls, 8" thick, direct chute	C-6	90	.533			19.55	.61	20.16	30.50
4950	Pumped	C-20	100	.640			24	7.70	31.70	45.50
5000	With crane and bucket	C-7	80	.900			34.50	14.70	49.20	68
5050	12" thick, direct chute	C-6	100	.480			17.60	.55	18.15	27.50
5100	Pumped	C-20	110	.582			22	7	29	41
5200	With crane and bucket	C-7	90	.800			30.50	13.10	43.60	61
5300	15" thick, direct chute	C-6	105	.457			16.75	.52	17.27	26
5350	Pumped	C-20	120	.533			20	6.40	26.40	37.50
5400	With crane and bucket	C-7	95	.758	▼		29	12.40	41.40	57.50
5600	Wheeled concrete dumping, add to placing costs above									
5610	Walking cart, 50' haul, add	C-18	32	.281	C.Y.		9.95	1.77	11.72	17.25
5620	150' haul, add		24	.375			13.25	2.37	15.62	23
5700	250' haul, add	▼	18	.500			17.65	3.16	20.81	30.50
5800	Riding cart, 50' haul, add	C-19	80	.113			3.97	1.18	5.15	7.40
5810	150' haul, add		60	.150			5.30	1.57	6.87	9.90
5900	250' haul, add	▼	45	.200	▼		7.05	2.10	9.15	13.15

03 35 Concrete Finishing

03 35 29 – Tooled Concrete Finishing

03 35 29.30 Finishing Floors

0010	**FINISHING FLOORS**									
0012	Finishing requires that concrete first be placed, struck off & consolidated									
0015	Basic finishing for various unspecified flatwork									
0100	Bull float only	C-10	4000	.004	S.F.		.24		.24	.36
0125	Bull float & manual float		2000	.012			.48		.48	.71
0150	Bull float, manual float, & broom finish, w/edging & joints		1850	.013			.52		.52	.77
0200	Bull float, manual float & manual steel trowel	▼	1265	.019	▼		.76		.76	1.13
0210	For specified Random Access Floors in ACI Classes 1, 2, 3 and 4 to achieve									
0215	Composite Overall Floor Flatness and Levelness values up to F35/F25									
0250	Bull float, machine float & machine trowel (walk-behind)	C-10C	1715	.014	S.F.		.56	.03	.59	.86
0300	Power screed, bull float, machine float & trowel (walk-behind)	C-10D	2400	.010			.40	.05	.45	.65
0350	Power screed, bull float, machine float & trowel (ride-on)	C-10E	4000	.006	▼		.24	.06	.30	.43
0352	For specified Random Access Floors in ACI Classes 5, 6, 7 and 8 to achieve									
0354	Composite Overall Floor Flatness and Levelness values up to F50/F50									
0356	Add for two-dimensional restraightening after power float	C-10	6000	.004	S.F.		.16		.16	.24

03 35 Concrete Finishing

03 35 29 – Tooled Concrete Finishing

	03 35 29.30 Finishing Floors	Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0358	For specified Random or Defined Access Floors in ACI Class 7 to achieve									
0360	Composite Overall Floor Flatness and Levelness values up to F100/F100									
0362	Add for two-dimensional restraightening after bull float & power float	C-10	3000	.008	S.F.		.32		.32	.48
0364	For specified Superflat Defined Access Floors in ACI Class 9 to achieve									
0366	Minimum Floor Flatness and Levelness values of F100/F100									
0368	Add for 2-dim'l restraightening after bull float, power float, power trowel	C-10	2000	.012	S.F.		.48		.48	.71
0400	Integral topping and finish, using 1:1:2 mix, 3/16" thick	C-10B	1000	.040		.11	1.52	.25	1.88	2.68
0450	1/2" thick		950	.042		.29	1.60	.26	2.15	3.02
0500	3/4" thick		850	.047		.44	1.79	.29	2.52	3.50
0600	1" thick		750	.053		.59	2.03	.33	2.95	4.07
0800	Granolithic topping, laid after, 1:1:1-1/2 mix, 1/2" thick		590	.068		.33	2.58	.42	3.33	4.72
0820	3/4" thick		580	.069		.49	2.62	.43	3.54	4.96
0850	1" thick		575	.070		.65	2.64	.43	3.72	5.20
0950	2" thick		500	.080		1.30	3.04	.50	4.84	6.55
1200	Heavy duty, 1:1:2, 3/4" thick, preshrunk, gray, 20 M.S.F.		320	.125		.74	4.75	.78	6.27	8.85
1300	100 M.S.F.	▼	380	.105		.44	4	.66	5.10	7.25
1600	Exposed local aggregate finish, minimum	1 Cefi	625	.013		.23	.54		.77	1.05
1650	Maximum		465	.017		.68	.73		1.41	1.82
1800	Floor abrasives, .25 psf, aluminum oxide		850	.009		.45	.40		.85	1.09
1850	Silicon carbide		850	.009		.70	.40		1.10	1.36
2000	Floor hardeners, metallic, light service, .50 psf, add		850	.009		.65	.40		1.05	1.31
2050	Medium service, .75 psf		750	.011		.98	.45		1.43	1.74
2100	Heavy service, 1.0 psf		650	.012		1.31	.52		1.83	2.21
2150	Extra heavy, 1.5 psf		575	.014		1.96	.59		2.55	3.03
2300	Non-metallic, light service, .50 psf		850	.009		.26	.40		.66	.87
2350	Medium service, .75 psf		750	.011		.39	.45		.84	1.08
2400	Heavy service, 1.00 psf		650	.012		.52	.52		1.04	1.34
2450	Extra heavy, 1.50 psf	▼	575	.014	▼	.77	.59		1.36	1.72
2800	Trap rock wearing surface for monolithic floors									
2810	2.0 psf	C-10B	1250	.032	S.F.	.02	1.22	.20	1.44	2.08
3000	Floor coloring, dusted on (0.6 psf), add to above	1 Cefi	1300	.006		.67	.26		.93	1.11
3050	(1.0 psf), add to above	"	625	.013	▼	1.11	.54		1.65	2.02
3100	Colored powder only				Lb.	1.11			1.11	1.22
3600	1/2" topping using 0.6 psf powdered color	C-10B	590	.068	S.F.	4.98	2.58	.42	7.98	9.85
3650	1/2" topping using 1.0 psf powdered color	"	590	.068		5.45	2.58	.42	8.45	10.30
3800	Dustproofing, solvent-based, 1 coat	1 Cefi	1900	.004		.27	.18		.45	.55
3850	2 coats		1300	.006		.96	.26		1.22	1.44
4000	Epoxy-based, 1 coat		1500	.005		.13	.23		.36	.48
4050	2 coats		1500	.005		.27	.23		.50	.63
4400	Stair finish, float		275	.029			1.23		1.23	1.81
4500	Steel trowel finish		200	.040			1.69		1.69	2.49
4600	Silicon carbide finish, .25 psf	▼	150	.053	▼	.45	2.26		2.71	3.82

03 35 29.35 Control Joints, Saw Cut

0010	CONTROL JOINTS, SAW CUT									
0100	Sawcut control joints in green concrete									
0120	1" depth	C-27	2000	.008	L.F.	.03	.34	.07	.44	.62
0140	1-1/2" depth		1800	.009		.05	.38	.08	.51	.70
0160	2" depth	▼	1600	.010	▼	.07	.42	.09	.58	.79
0180	Sawcut joint reservoir in cured concrete									
0182	3/8" wide x 3/4" deep, with single saw blade	C-27	1000	.016	L.F.	.05	.68	.15	.88	1.22
0184	1/2" wide x 1" deep, with double saw blades		900	.018		.10	.75	.16	1.01	1.40
0186	3/4" wide x 1-1/2" deep, with double saw blades	▼	800	.020	▼	.20	.85	.19	1.24	1.67

05 05 Common Work Results for Metals

05 05 23 – Metal Fastenings

05 05 23.05 Anchor Bolts		Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0025	Single bolts installed in fresh concrete, no templates									
0030	Hooked w/nut and washer, 1/2" diameter, 8" long G	1 Carp	132	.061	Ea.	1.39	2.67		4.06	5.65
0040	12" long G		131	.061		1.54	2.69		4.23	5.85
0050	5/8" diameter, 8" long G		129	.062		3	2.74		5.74	7.50
0060	12" long G		127	.063		3.70	2.78		6.48	8.35
0070	3/4" diameter, 8" long G		127	.063		3.70	2.78		6.48	8.35
0080	12" long G		125	.064		4.62	2.82		7.44	9.45
0090	2-bolt pattern, including job-built 2-hole template, per set									
0100	J-type, incl. hex nut & washer, 1/2" diameter x 6" long G	1 Carp	21	.381	Set	4.55	16.80		21.35	31
0110	12" long G		21	.381		5.15	16.80		21.95	31.50
0120	18" long G		21	.381		6.10	16.80		22.90	32.50
0130	3/4" diameter x 8" long G		20	.400		9.50	17.65		27.15	37.50
0140	12" long G		20	.400		11.35	17.65		29	39.50
0150	18" long G		20	.400		14.10	17.65		31.75	42.50
0160	1" diameter x 12" long G		19	.421		19.90	18.55		38.45	50.50
0170	18" long G		19	.421		23.50	18.55		42.05	54.50
0180	24" long G		19	.421		28.50	18.55		47.05	59.50
0190	36" long G		18	.444		38	19.60		57.60	72
0200	1-1/2" diameter x 18" long G		17	.471		60	21		81	98
0210	24" long G		16	.500		71.50	22		93.50	113
0300	L-type, incl. hex nut & washer, 3/4" diameter x 12" long G		20	.400		10.75	17.65		28.40	39
0310	18" long G		20	.400		13.15	17.65		30.80	41.50
0320	24" long G		20	.400		15.60	17.65		33.25	44
0330	30" long G		20	.400		19.25	17.65		36.90	48
0340	36" long G		20	.400		21.50	17.65		39.15	51
0350	1" diameter x 12" long G		19	.421		16.95	18.55		35.50	47
0360	18" long G		19	.421		20.50	18.55		39.05	51
0370	24" long G		19	.421		25	18.55		43.55	56
0380	30" long G		19	.421		29	18.55		47.55	60.50
0390	36" long G		18	.444		33	19.60		52.60	66.50
0400	42" long G		18	.444		39.50	19.60		59.10	73.50
0410	48" long G		18	.444		44	19.60		63.60	78.50
0420	1-1/4" diameter x 18" long G		18	.444		30	19.60		49.60	63
0430	24" long G		18	.444		35	19.60		54.60	69
0440	30" long G		17	.471		40.50	21		61.50	76.50
0450	36" long G		17	.471		45.50	21		66.50	82.50
0460	42" long G	2 Carp	32	.500		51.50	22		73.50	90.50
0470	48" long G		32	.500		58.50	22		80.50	98
0480	54" long G		31	.516		68.50	23		91.50	110
0490	60" long G		31	.516		75	23		98	118
0500	1-1/2" diameter x 18" long G		33	.485		43.50	21.50		65	81
0510	24" long G		32	.500		50.50	22		72.50	89.50
0520	30" long G		31	.516		57	23		80	97.50
0530	36" long G		30	.533		65	23.50		88.50	108
0540	42" long G		30	.533		74	23.50		97.50	117
0550	48" long G		29	.552		82.50	24.50		107	129
0560	54" long G		28	.571		100	25		125	149
0570	60" long G		28	.571		110	25		135	160
0580	1-3/4" diameter x 18" long G		31	.516		61.50	23		84.50	103
0590	24" long G		30	.533		72	23.50		95.50	115
0600	30" long G		29	.552		83.50	24.50		108	129
0610	36" long G		28	.571		95	25		120	143
0620	42" long G		27	.593		106	26		132	157

05 05 Common Work Results for Metals

05 05 23 – Metal Fastenings

	05 05 23.20 Expansion Anchors		Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
6100	1/2" diameter, short	G	1 Carp	80	.100	Ea.	1.02	4.41		5.43	7.90
6200	Long	G		75	.107		1.24	4.70		5.94	8.60
6300	5/8" diameter, short	G		70	.114		1.63	5.05		6.68	9.55
6400	Long	G		65	.123		2.13	5.45		7.58	10.70
6600	Lead, #6 & #8, 3/4" long	G		260	.031		.16	1.36		1.52	2.27
6700	#10 - #14, 1-1/2" long	G		200	.040		.27	1.76		2.03	3.01
6800	#16 & #18, 1-1/2" long	G		160	.050		.32	2.21		2.53	3.74
6900	Plastic, #6 & #8, 3/4" long			260	.031		.04	1.36		1.40	2.13
7000	#8 & #10, 7/8" long			240	.033		.04	1.47		1.51	2.30
7100	#10 & #12, 1" long			220	.036		.05	1.60		1.65	2.53
7200	#14 & #16, 1-1/2" long			160	.050		.07	2.21		2.28	3.47
8000	Wedge anchors, not including layout or drilling										
8050	Carbon steel, 1/4" diameter, 1-3/4" long	G	1 Carp	150	.053	Ea.	.36	2.35		2.71	4.02
8100	3-1/4" long	G		140	.057		.48	2.52		3	4.41
8150	3/8" diameter, 2-1/4" long	G		145	.055		.44	2.43		2.87	4.22
8200	5" long	G		140	.057		.77	2.52		3.29	4.73
8250	1/2" diameter, 2-3/4" long	G		140	.057		.89	2.52		3.41	4.86
8300	7" long	G		125	.064		1.53	2.82		4.35	6
8350	5/8" diameter, 3-1/2" long	G		130	.062		1.60	2.71		4.31	5.95
8400	8-1/2" long	G		115	.070		3.40	3.07		6.47	8.45
8450	3/4" diameter, 4-1/4" long	G		115	.070		2.38	3.07		5.45	7.35
8500	10" long	G		95	.084		5.40	3.71		9.11	11.65
8550	1" diameter, 6" long	G		100	.080		8.60	3.53		12.13	14.90
8575	9" long	G		85	.094		11.20	4.15		15.35	18.70
8600	12" long	G		75	.107		12.05	4.70		16.75	20.50
8650	1-1/4" diameter, 9" long	G		70	.114		24	5.05		29.05	34
8700	12" long	G		60	.133		30.50	5.90		36.40	42.50
8750	For type 303 stainless steel, add						350%				
8800	For type 316 stainless steel, add						450%				
8950	Self-drilling concrete screw, hex washer head, 3/16" diam. x 1-3/4" long	G	1 Carp	300	.027	Ea.	.19	1.18		1.37	2.02
8960	2-1/4" long	G		250	.032		.20	1.41		1.61	2.39
8970	Phillips flat head, 3/16" diam. x 1-3/4" long	G		300	.027		.18	1.18		1.36	2.01
8980	2-1/4" long	G		250	.032		.20	1.41		1.61	2.39

	05 05 23.25 High Strength Bolts										
0010	HIGH STRENGTH BOLTS	R050523-10									
0020	A325 Type 1, structural steel, bolt-nut-washer set										
0100	1/2" diameter x 1-1/2" long	G	1 Sswk	130	.062	Ea.	.93	3.04		3.97	6.50
0120	2" long	G		125	.064		1.01	3.16		4.17	6.75
0150	3" long	G		120	.067		1.41	3.29		4.70	7.45
0170	5/8" diameter x 1-1/2" long	G		125	.064		1.65	3.16		4.81	7.45
0180	2" long	G		120	.067		1.77	3.29		5.06	7.85
0190	3" long	G		115	.070		2.18	3.43		5.61	8.55
0200	3/4" diameter x 2" long	G		120	.067		2.67	3.29		5.96	8.85
0220	3" long	G		115	.070		3.20	3.43		6.63	9.65
0250	4" long	G		110	.073		3.91	3.59		7.50	10.70
0300	6" long	G		105	.076		5.05	3.76		8.81	12.30
0350	8" long	G		95	.084		10	4.16		14.16	18.45
0360	7/8" diameter x 2" long	G		115	.070		3.73	3.43		7.16	10.25
0365	3" long	G		110	.073		4.41	3.59		8	11.25
0370	4" long	G		105	.076		5.30	3.76		9.06	12.55
0380	6" long	G		100	.080		6.75	3.95		10.70	14.50
0390	8" long	G		90	.089		10.70	4.39		15.09	19.65

05 12 Structural Steel Framing

05 12 23 – Structural Steel for Buildings

			Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
05 12 23.40 Lightweight Framing											
1310	7/8" diameter	G	E-3	850	.028	Lb.	1.50	1.41	.14	3.05	4.34
1320	1" diameter	G		1000	.024		1.50	1.20	.12	2.82	3.93
1330	Angle, 5" x 5" x 3/8"	G		2800	.009		1.50	.43	.04	1.97	2.47
1350	Hanging lintels, shop fabricated, average	G		850	.028		1.50	1.41	.14	3.05	4.34
1380	Roof frames, shop fabricated, 3'-0" square, 5" span	G	E-2	4200	.013		1.50	.64	.36	2.50	3.14
1400	Tie rod, not upset, 1-1/2" to 4" diameter, with turnbuckle	G	2 Sswk	800	.020		1.63	.99		2.62	3.56
1420	No turnbuckle	G		700	.023		1.56	1.13		2.69	3.74
1500	Upset, 1-3/4" to 4" diameter, with turnbuckle	G		800	.020		1.63	.99		2.62	3.56
1520	No turnbuckle	G		700	.023		1.56	1.13		2.69	3.74
05 12 23.45 Lintels											
0010	**LINTELS**										
0015	Made from recycled materials	G									
0020	Plain steel angles, shop fabricated, under 500 lb.	G	1 Bric	550	.015	Lb.	.96	.64		1.60	2.03
0100	500 to 1000 lb.	G		640	.013		.94	.55		1.49	1.86
0200	1,000 to 2,000 lb.	G		640	.013		.91	.55		1.46	1.83
0300	2,000 to 4,000 lb.	G		640	.013		.89	.55		1.44	1.81
0500	For built-up angles and plates, add to above	G					.31			.31	.34
0700	For engineering, add to above						.13			.13	.14
0900	For galvanizing, add to above, under 500 lb.						.30			.30	.33
0950	500 to 2,000 lb.						.27			.27	.30
1000	Over 2,000 lb.						.25			.25	.27
2000	Steel angles, 3-1/2" x 3", 1/4" thick, 2'-6" long	G	1 Bric	47	.170	Ea.	13.50	7.50		21	26
2100	4'-6" long	G		26	.308		24.50	13.55		38.05	47
2600	4" x 3-1/2", 1/4" thick, 5'-0" long	G		21	.381		31	16.80		47.80	59.50
2700	9'-0" long	G		12	.667		56	29.50		85.50	106
05 12 23.60 Pipe Support Framing											
0010	**PIPE SUPPORT FRAMING**										
0020	Under 10#/L.F., shop fabricated	G	E-4	3900	.008	Lb.	1.68	.41	.03	2.12	2.60
0200	10.1 to 15#/L.F.	G		4300	.007		1.65	.37	.03	2.05	2.51
0400	15.1 to 20#/L.F.	G		4800	.007		1.63	.33	.03	1.99	2.41
0600	Over 20#/L.F.	G		5400	.006		1.60	.30	.02	1.92	2.31
05 12 23.65 Plates											
0010	**PLATES**	R051223-80									
0015	Made from recycled materials	G									
0020	For connections & stiffener plates, shop fabricated										
0050	1/8" thick (5.1 lb./S.F.)	G				S.F.	6.40			6.40	7
0100	1/4" thick (10.2 lb./S.F.)	G					12.75			12.75	14.05
0300	3/8" thick (15.3 lb./S.F.)	G					19.15			19.15	21
0400	1/2" thick (20.4 lb./S.F.)	G					25.50			25.50	28
0450	3/4" thick (30.6 lb./S.F.)	G					38.50			38.50	42
0500	1" thick (40.8 lb./S.F.)	G					51			51	56
2000	Steel plate, warehouse prices, no shop fabrication										
2100	1/4" thick (10.2 lb./S.F.)	G				S.F.	8.65			8.65	9.50
05 12 23.70 Stressed Skin Steel Roof and Ceiling System											
0010	**STRESSED SKIN STEEL ROOF & CEILING SYSTEM**										
0020	Double panel flat roof, spans to 100'	G	E-2	1150	.049	S.F.	10	2.35	1.30	13.65	16.45
0100	Double panel convex roof, spans to 200'	G		960	.058		16.25	2.82	1.56	20.63	24.50
0200	Double panel arched roof, spans to 300'	G		760	.074		25	3.56	1.97	30.53	36
05 12 23.75 Structural Steel Members											
0010	**STRUCTURAL STEEL MEMBERS**	R051223-10									
0015	Made from recycled materials	G									

05 12 Structural Steel Framing

05 12 23 – Structural Steel for Buildings

05 12 23.77 Structural Steel Projects

			Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0900	7 to 15 stories R051223-25	G	E-6	14.20	9.014	Ton	2,600	440	126	3,166	3,750
1000	Over 15 stories	G	"	13.90	9.209	"	2,700	450	129	3,279	3,900
1100	For multi-story masonry wall bearing construction, add R051223-30							30%			
1300	Industrial bldgs., 1 story, beams & girders, steel bearing	G	E-5	12.90	6.202	"	2,500	305	125	2,930	3,425
1400	Masonry bearing	G	"	10	8	"	2,500	390	162	3,052	3,600
1500	Industrial bldgs., 1 story, under 10 tons,										
1510	steel from warehouse, trucked	G	E-2	7.50	7.467	Ton	3,000	360	200	3,560	4,150
1600	1 story with roof trusses, steel bearing	G	E-5	10.60	7.547	"	2,950	370	153	3,473	4,050
1700	Masonry bearing	G	"	8.30	9.639	"	2,950	470	195	3,615	4,275
1900	Monumental structures, banks, stores, etc., minimum	G	E-6	13	9.846	"	2,500	480	138	3,118	3,725
2000	Maximum	G	"	9	14.222	"	4,150	695	199	5,044	6,000
2200	Churches, minimum	G	E-5	11.60	6.897	"	2,325	335	140	2,800	3,300
2300	Maximum	G	"	5.20	15.385	"	3,100	750	310	4,160	5,050
2800	Power stations, fossil fuels, minimum	G	E-6	11	11.636	"	2,500	570	163	3,233	3,925
2900	Maximum	G	"	5.70	22.456	"	3,750	1,100	315	5,165	6,375
2950	Nuclear fuels, non-safety steel, minimum	G	"	7	18.286	"	2,500	895	256	3,651	4,575
3000	Maximum	G	"	5.50	23.273	"	3,750	1,125	325	5,200	6,450
3040	Safety steel, minimum	G	"	2.50	51.200	"	3,650	2,500	715	6,865	9,175
3070	Maximum	G	"	1.50	85.333	"	4,800	4,175	1,200	10,175	13,900
3100	Roof trusses, minimum	G	E-5	13	6.154	"	3,500	300	124	3,924	4,500
3200	Maximum	G	"	8.30	9.639	"	4,250	470	195	4,915	5,700
3210	Schools, minimum	G	"	14.50	5.517	"	2,500	269	112	2,881	3,350
3220	Maximum	G	"	8.30	9.639	"	3,650	470	195	4,315	5,050
3400	Welded construction, simple commercial bldgs., 1 to 2 stories	G	E-7	7.60	10.526	"	2,550	515	229	3,294	3,950
3500	7 to 15 stories	G	E-9	8.30	15.422	"	2,950	755	254	3,959	4,825
3700	Welded rigid frame, 1 story, minimum	G	E-7	15.80	5.063	"	2,600	247	110	2,957	3,400
3800	Maximum	G	"	5.50	14.545	"	3,375	710	315	4,400	5,300
3810	Fabrication shop costs (included in project material cost, above)										
3820	Mini mill base price, A992	G				Ton	860			860	945
3830	Mill extra for delivery to shop					"	265			265	292
3840	Shop extra for shop drawings and detailing					"	285			285	315
3850	Shop fabricating and handling					"	835			835	920
3860	Shop sandblasting and primercoat of paint					"	145			145	160
3870	Shop delivery to the job site					"	110			110	121
3880	Total material cost, shop fabricated, primed, delivered					"	2,500			2,500	2,750
3900	High strength steel mill spec extras:										
3950	A529, A572 (50 ksi) and A36: same as A992 steel (no extra)										
4000	Add to A992 price for A572 (60, 65 ksi)	G				Ton	100			100	110
4100	A242 and A588 Weathering	G				"	85			85	93.50
4200	Mill size extras for W-Shapes: 0 to 30 plf: no extra charge										
4210	Member sizes 31 to 65 plf, deduct	G				Ton	.01			.01	.01
4220	Member sizes 66 to 100 plf, deduct	G				"	5.60			5.60	6.15
4230	Member sizes 101 to 387 plf, add	G				"	56			56	61.50
4300	Column base plates, light, up to 150 lb	G	2 Sswk	2000	.008	Lb.	1.38	.39		1.77	2.12
4400	Heavy, over 150 lb.	G	E-2	7500	.007	"	1.44	.36	.20	2	2.42
4600	Castellated beams, light sections, to 50#/L.F., minimum	G	"	10.70	5.234	Ton	2,625	253	140	3,018	3,500
4700	Maximum	G	"	7	8	"	2,875	385	214	3,474	4,075
4900	Heavy sections, over 50# per L.F., minimum	G	"	11.70	4.786	"	2,750	231	128	3,109	3,550
5000	Maximum	G	"	7.80	7.179	"	3,000	345	192	3,537	4,100
5390	For projects 75 to 99 tons, add					"	10%				
5392	50 to 74 tons, add					"	20%				
5394	25 to 49 tons, add					"	30%	10%			
5396	10 to 24 tons, add					"	50%	25%			

05 12 Structural Steel Framing

05 12 23 – Structural Steel for Buildings

	05 12 23.77 Structural Steel Projects		Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
5398	2 to 9 tons, add					Ton	75%	50%			
5399	Less than 2 tons, add					↓	100%	100%			
	05 12 23.80 Subpurlins										
0010	**SUBPURLINS**	R051223-50									
0015	Made from recycled materials	G									
0020	Bulb tees, shop fabricated, painted, 32-5/8" O.C., 40 psf LL.										
0100	Type 178, max 8'-9" span, 2.15 plf, 2" high x 1-5/8" wide	G	E-1	4200	.006	S.F.	1.72	.28	.03	2.03	2.39
0200	Type 218, max 10'-2" span, 3.19 plf, 2-1/8" high x 1-1/8" wide	G	"	3100	.008		2	.38	.04	2.42	2.88
1420	For 24-5/8" spacing, add						33%	33%			
1430	For 48-5/8" spacing, deduct					↓	50%	50%			

05 14 Structural Aluminum Framing

05 14 23 – Non-Exposed Structural Aluminum Framing

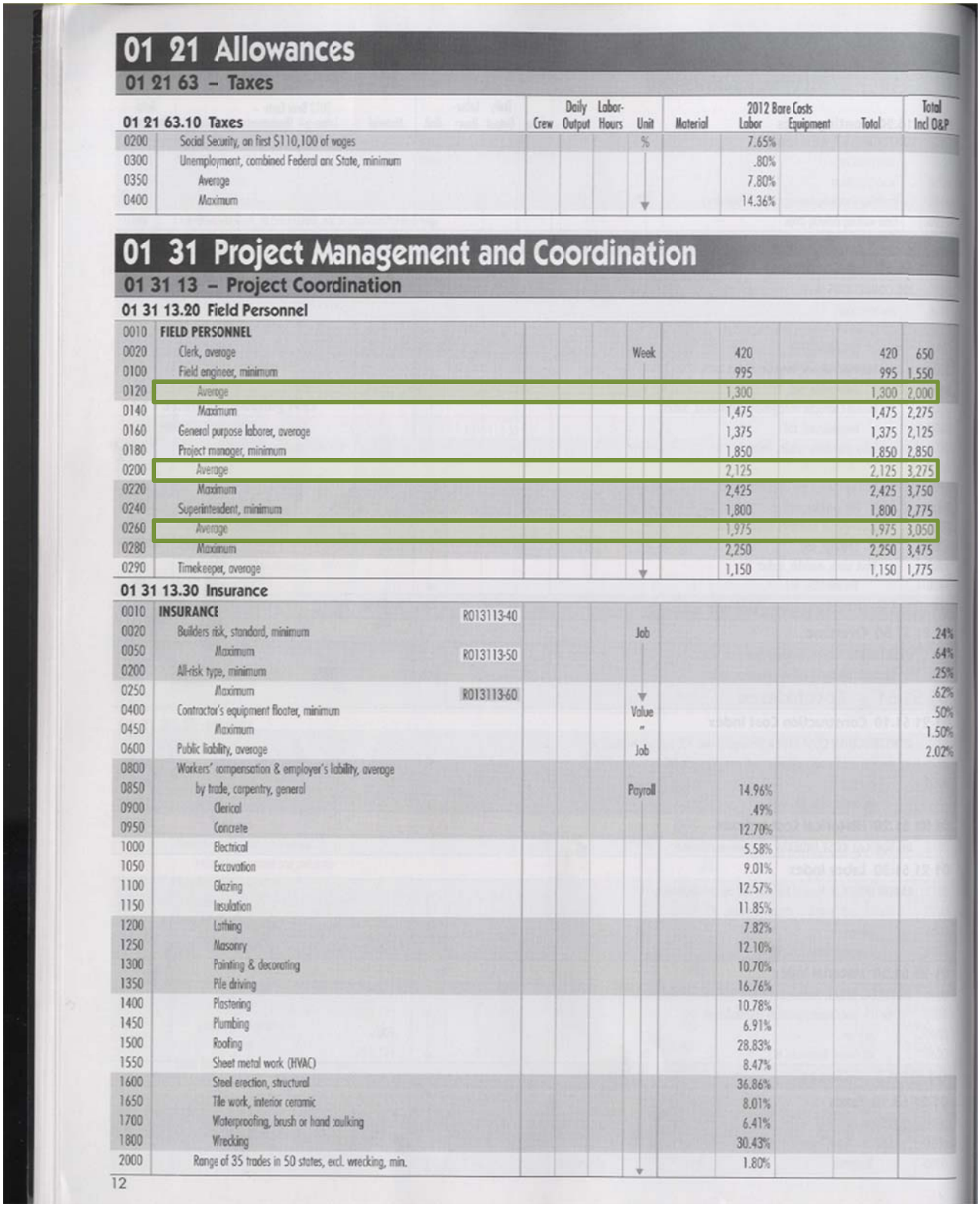
	05 14 23.05 Aluminum Shapes		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	**ALUMINUM SHAPES**										
0015	Made from recycled materials	G									
0020	Structural shapes, 1" to 10" members, under 1 ton	G	E-2	4000	.014	lb.	4.18	.68	.37	5.23	6.15
0050	1 to 5 tons	G		4300	.013		3.82	.63	.35	4.80	5.65
0100	Over 5 tons	G		4600	.012		3.65	.59	.33	4.57	5.40
0300	Extrusions, over 5 tons, stock shapes	G		1330	.042		3.39	2.03	1.13	6.55	8.45
0400	Custom shapes	G	↓	1330	.042	↓	3.39	2.03	1.13	6.55	8.45

05 15 Wire Rope Assemblies

05 15 16 – Steel Wire Rope Assemblies

	05 15 16.05 Accessories for Steel Wire Rope		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	**ACCESSORIES FOR STEEL WIRE ROPE**										
0015	Made from recycled materials	G									
1500	Thimbles, heavy duty, 1/4"	G	E-17	160	.100	ea.	.51	5.05		5.56	9.55
1510	1/2"	G		160	.100		2.23	5.05		7.28	11.45
1520	3/4"	G		105	.152		5.05	7.65		12.70	19.25
1530	1"	G		52	.308		10.15	15.50		25.65	38.50
1540	1-1/4"	G		38	.421		15.60	21		36.60	55
1550	1-1/2"	G		13	1.231		44	62		106	159
1560	1-3/4"	G		8	2		90.50	101		191.50	280
1570	2"	G		6	2.667		132	134		266	385
1580	2-1/4"	G		4	4		178	201		379	555
1600	Clips, 1/4" diameter	G		160	.100		2.58	5.05		7.63	11.85
1610	3/8" diameter	G		160	.100		2.83	5.05		7.88	12.10
1620	1/2" diameter	G		160	.100		4.55	5.05		9.60	14
1630	3/4" diameter	G		102	.157		7.40	7.90		15.30	22
1640	1" diameter	G		64	.250		12.30	12.60		24.90	36
1650	1-1/4" diameter	G		35	.457		20	23		43	63
1670	1-1/2" diameter	G		26	.615		27	31		58	85.50
1680	1-3/4" diameter	G		16	1		63.50	50.50		114	160
1690	2" diameter	G		12	1.333		70.50	67		137.50	198
1700	2-1/4" diameter	G		10	1.600		104	80.50		184.50	258
1800	Sockets, open swage, 1/4" diameter	G		160	.100		43.50	5.05		48.55	56.50
1810	1/2" diameter	G		77	.208		62.50	10.45		72.95	87
1820	3/4" diameter	G	↓	19	.842	↓	97	42.50		139.50	183

Appendix C: RS Means Cost Data (Gen. Conditions Estimate)



01 21 Allowances

01 21 63 – Taxes

01 21 63.10 Taxes		Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs Labor	Equipment	Total	Total Incl O&P
0200	Social Security, on first $110,100 of wages				%		7.65%			
0300	Unemployment, combined Federal and State, minimum						.80%			
0350	Average						7.80%			
0400	Maximum						14.36%			

01 31 Project Management and Coordination

01 31 13 – Project Coordination

01 31 13.20 Field Personnel

0010	FIELD PERSONNEL									
0020	Clerk, average				Week		420		420	650
0100	Field engineer, minimum						995		995	1,550
0120	Average						1,300		1,300	2,000
0140	Maximum						1,475		1,475	2,275
0160	General purpose laborer, average						1,375		1,375	2,125
0180	Project manager, minimum						1,850		1,850	2,850
0200	Average						2,125		2,125	3,275
0220	Maximum						2,425		2,425	3,750
0240	Superintendent, minimum						1,800		1,800	2,775
0260	Average						1,975		1,975	3,050
0280	Maximum						2,250		2,250	3,475
0290	Timekeeper, average						1,150		1,150	1,775

01 31 13.30 Insurance

0010	INSURANCE	R013113-40								
0020	Builders risk, standard, minimum				Job					.24%
0050	Maximum	R013113-50								.64%
0200	All-risk type, minimum									.25%
0250	Maximum	R013113-60								.62%
0400	Contractor's equipment floater, minimum				Value					.50%
0450	Maximum				-					1.50%
0600	Public liability, average				Job					2.02%
0800	Workers' compensation & employer's liability, average									
0850	by trade, carpentry, general				Payroll		14.96%			
0900	Clerical						.49%			
0950	Concrete						12.70%			
1000	Electrical						5.58%			
1050	Excavation						9.01%			
1100	Glazing						12.57%			
1150	Insulation						11.85%			
1200	Lathing						7.82%			
1250	Masonry						12.10%			
1300	Painting & decorating						10.70%			
1350	Pile driving						16.76%			
1400	Plastering						10.78%			
1450	Plumbing						6.91%			
1500	Roofing						28.83%			
1550	Sheet metal work (HVAC)						8.47%			
1600	Steel erection, structural						36.86%			
1650	Tile work, interior ceramic						8.01%			
1700	Waterproofing, brush or hand caulking						6.41%			
1800	Wrecking						30.43%			
2000	Range of 35 trades in 50 states, excl. wrecking, min.						1.80%			

12

01 52 Construction Facilities

01 52 13 – Field Offices and Sheds

01 52 13.20 Office and Storage Space

		Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**OFFICE AND STORAGE SPACE**									
0020	Office trailer, furnished, no hookups, 20' x 8', buy	2 Skwk	1	16	Ea.	8,550	725		9,275	10,500
0250	Rent per month					144			144	158
0300	32' x 8', buy	2 Skwk	.70	22.857		13,600	1,050		14,650	16,600
0350	Rent per month					185			185	203
0400	50' x 10', buy	2 Skwk	.60	26.667		22,300	1,200		23,500	26,500
0450	Rent per month					279			279	305
0500	50' x 12', buy	2 Skwk	.50	32		27,000	1,450		28,450	32,000
0550	Rent per month					365			365	400
0700	For air conditioning, rent per month, add					41.50			41.50	45.50
0800	For delivery, add per mile				Mile	4.60			4.60	5.05
0890	Delivery each way				Ea.	200			200	220
0900	Bunk house trailer, 8' x 40' duplex dorm with kitchen, no hookups, buy	2 Carp	1	16		37,300	705		38,005	42,100
0910	9 man with kitchen and bath, no hookups, buy		1	16		38,000	705		38,705	42,900
0920	18 man sleeper with bath, no hookups, buy		1	16		49,000	705		49,705	55,000
1000	Portable buildings, prefab, on skids, economy, 8' x 8'		265	.060	S.F.	86	2.66		88.66	98.50
1100	Deluxe, 8' x 12'		150	.107	"	96	4.70		100.70	113
1200	Storage boxes, 20' x 8', buy	2 Skwk	1.80	8.889	Ea.	2,625	405		3,030	3,500
1250	Rent per month					72			72	79
1300	40' x 8', buy	2 Skwk	1.40	11.429		3,325	520		3,845	4,450
1350	Rent per month					94			94	103
5000	Air supported structures, see Section 13 31 13.13									

01 52 13.40 Field Office Expense

0010	**FIELD OFFICE EXPENSE**									
0100	Office equipment rental average				Month	200			200	220
0120	Office supplies, average				"	75			75	82.50
0125	Office trailer rental, see Section 01 52 13.20									
0140	Telephone bill; avg. bill/month incl. long dist.				Month	81			81	89
0160	Lights & HVAC				"	152			152	167

01 54 Construction Aids

01 54 09 – Protection Equipment

01 54 09.50 Personnel Protective Equipment

0010	**PERSONNEL PROTECTIVE EQUIPMENT**									
0015	Hazardous waste protection									
0020	Respirator mask only, full face, silicone				Ea.	270			270	297
0030	Half face, silicone					42.50			42.50	46.50
0040	Respirator cartridges, 2 req'd/mask, dust or asbestos					2.64			2.64	2.90
0050	Chemical vapor					3.74			3.74	4.11
0060	Combination vapor and dust					6.45			6.45	7.10
0100	Emergency escape breathing apparatus, 5 min					465			465	510
0110	10 min					500			500	550
0150	Self contained breathing apparatus with full face piece, 30 min					1,750			1,750	1,925
0160	60 min					2,925			2,925	3,225
0200	Encapsulating suits, limited use, level A					1,200			1,200	1,325
0210	Level B					335			335	370
0300	Over boots, latex				Pr.	6.35			6.35	7
0310	PVC					23			23	25.50
0320	Neoprene					44			44	48.50
0400	Gloves, nitrile/PVC					21			21	23.50
0410	Neoprene coated					27.50			27.50	30.50

01 54 33 | Equipment Rental

			UNIT	HOURLY OPER. COST	RENT PER DAY	RENT PER WEEK	RENT PER MONTH	EQUIPMENT COST/DAY
40	5500	Trash pump, self-priming, gas, 2" diameter	Ea.	4.05	21	63	189	45
	5600	Diesel, 4" diameter		7.75	73.50	220	660	106
	5650	Diesel, 6" diameter		20.50	140	420	1,250	248
	5655	Grout Pump		21.80	177	530	1,600	280.40
	5700	Salamanders, L.P. gas fired, 100,000 Btu		3.33	12.65	38	114	34.25
	5705	50,000 Btu		2.50	10.35	31	93	26.20
	5720	Sandblaster, portable, open top, 3 C.F. capacity		.55	26.50	80	240	20.40
	5730	6 C.F. capacity		.90	40	120	360	31.20
	5740	Accessories for above		.12	20.50	62	186	13.35
	5750	Sander, floor		.59	19.65	59	177	15.50
	5760	Edger		.54	21.50	64	192	17.10
	5800	Saw, chain, gas engine, 18" long		1.95	19.65	59	177	27.40
	5900	Hydraulic powered, 36" long		.70	63.50	190	570	43.60
	5950	60" long		.70	65	195	585	44.60
	6000	Masonry, table mounted, 14" diameter, 5 H.P.		1.25	56.50	170	510	44
	6050	Portable cut-off, 8 H.P.		2.10	32.50	98	294	36.40
	6100	Circular, hand held, electric, 7-1/4" diameter		.14	4.67	14	42	3.90
	6200	12" diameter		.21	7.65	23	69	6.30
	6250	Wall saw, w/hydraulic power, 10 H.P.		7.00	60	180	540	92
	6275	Shot blaster, walk-behind, 20" wide		4.65	290	870	2,600	211.20
	6280	Sidewalk broom, walk-behind		2.09	60.50	182	545	53.10
	6300	Steam cleaner, 100 gallons per hour		3.35	66.50	200	600	65.80
	6310	200 gallons per hour		4.65	81.50	245	735	86.20
	6340	Tar Kettle/Pot, 400 gallons		5.50	78.50	235	705	91
	6350	Torch, cutting, acetylene-oxygen, 150' hose, excludes gases		.30	14	42	126	10.80
	6360	Hourly operating cost includes tips and gas		10.80				86.40
	6410	Toilet, portable chemical		.12	20	60	180	12.95
	6420	Recycle flush type		.14	24	72	216	15.50
	6430	Toilet, fresh water flush, garden hose,		.17	28.50	85	255	18.35
	6440	Hoisted, non-flush, for high rise		.14	23.50	71	213	15.30
	6465	Tractor, farm with attachment		18.25	275	825	2,475	311
	6500	Trailers, platform, flush deck, 2 axle, 25 ton capacity		5.20	112	335	1,000	108.60
	6600	40 ton capacity		6.75	155	465	1,400	147
	6700	3 axle, 50 ton capacity		7.25	172	515	1,550	161
	6800	75 ton capacity		9.05	225	675	2,025	207.40
	6810	Trailer mounted cable reel for high voltage line work		5.14	245	734	2,200	187.90
	6820	Trailer mounted cable tensioning rig		10.22	485	1,460	4,375	373.75
	6830	Cable pulling rig		68.64	2,725	8,180	24,500	2,185
	6900	Water tank trailer, engine driven discharge, 5000 gallons		6.75	145	435	1,300	141
	6925	10,000 gallons		9.20	202	605	1,825	194.60
	6950	Water truck, off highway, 6000 gallons		75.60	800	2,400	7,200	1,085
	7010	Tram car for high voltage line work, powered, 2 conductor		4.44	133	399	1,200	115.30
	7020	Transit (builder's level) with tripod		.09	15.35	46	138	9.90
	7030	Trench box, 3000 lb., 6' x 8'		.56	93	279	835	60.30
	7040	7200 lb., 6' x 20'		1.05	175	525	1,575	113.40
	7050	8000 lb., 8' x 16'		1.05	175	525	1,575	113.40
	7060	9500 lb., 8' x 20'		1.19	199	597	1,800	128.90
	7065	11,000 lb., 8' x 24'		1.25	209	627	1,875	135.40
	7070	12,000 lb., 10' x 20'		1.36	227	680	2,050	146.90
	7100	Truck, pickup, 3/4 ton, 2 wheel drive		11.50	58.50	175	525	127
	7200	4 wheel drive		11.75	75	225	675	139
	7250	Crew carrier, 9 passenger		16.30	86.50	260	780	182.40
	7290	Flat bed truck, 20,000 lb. GVW		17.60	125	375	1,125	215.80
	7300	Tractor, 4 x 2, 220 H.P.		24.60	197	590	1,775	314.80
	7410	330 H.P.		36.35	270	810	2,425	452.80
	7500	6 x 4, 380 H.P.		41.65	315	945	2,825	522.20
	7600	450 H.P.		50.75	380	1,145	3,425	635
	7610	Tractor, with A frame, boom and winch, 225 H.P.	▼	27.40	272	815	2,450	382.20

02 41 Demolition

02 41 19 – Selective Demolition

	02 41 19.18 Selective Demolition, Disposal Only		Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs Labor	Equipment	Total	Total Incl O&P
0500	Wood frame		B-3	247	.194	C.Y.		7.25	9.20	16.45	21.50
	02 41 19.19 Selective Facility Services Demolition										
0010	**SELECTIVE FACILITY SERVICES DEMOLITION**, Rubbish Handling	R024119-10									
0020	The following are to be added to the demolition prices										
0400	Chute, circular, prefabricated steel, 18" diameter		B-1	40	.600	L.F.	52	21.50		73.50	90.50
0440	30" diameter		"	30	.800	"	46.50	28.50		75	95
0600	Dumpster, weekly rental, 1 dump/week, 6 C.Y. capacity (2 Tons)					Week	460			460	505
0700	10 C.Y. capacity (3 Tons)						535			535	590
0725	20 C.Y. capacity (8 Tons)	R024119-20					630			630	695
0800	30 C.Y. capacity (7 Tons)						810			810	890
0840	40 C.Y. capacity (10 Tons)					▼	860			860	945
2000	Load, haul, dump and return, 50' haul, hand carried		2 Clab	24	.667	C.Y.		23.50		23.50	36
2005	Wheeled			37	.432			15.20		15.20	23.50
2040	51' to 100' haul, hand carried			16.50	.970			34		34	52.50
2045	Wheeled			25	.640			22.50		22.50	34.50
2080	Over 100' haul, add per 100 L.F., hand carried			35.50	.451			15.80		15.80	24.50
2085	Wheeled			54	.296			10.40		10.40	16
2120	In elevators, per 10 floors, add			140	.114			4.01		4.01	6.15
2130	Load, haul, dump and return, up to 50' haul, incl. up to 5 rsr stair, hand			23	.696			24.50		24.50	37.50
2135	Wheeled			35	.457			16.05		16.05	24.50
2140	6 – 10 riser stairs, hand carried			22	.727			25.50		25.50	39.50
2145	Wheeled			34	.471			16.50		16.50	25.50
2150	11 – 20 riser stairs, hand carried			20	.800			28		28	43
2155	Wheeled			31	.516			18.10		18.10	28
2160	21 – 40 riser stairs, hand carried			16	1			35		35	54
2165	Wheeled			24	.667			23.50		23.50	36
2170	100' haul, incl. 5 riser stair, hand carried			15	1.067			37.50		37.50	57.50
2175	Wheeled			23	.696			24.50		24.50	37.50
2180	6 – 10 riser stair, hand carried			14	1.143			40		40	61.50
2185	Wheeled			21	.762			26.50		26.50	41
2190	11 – 20 riser stair, hand carried			12	1.333			47		47	72
2195	Wheeled			18	.889			31		31	48
2200	21 – 40 riser stair, hand carried			8	2			70		70	108
2205	Wheeled			12	1.333			47		47	72
2210	Over 100' haul, add per 100 L.F., hand carried			35.50	.451			15.80		15.80	24.50
2215	Wheeled			54	.296	▼		10.40		10.40	16
2220	For each additional flight of stairs, up to 5 risers, add			550	.029	Flight		1.02		1.02	1.57
2225	6 – 10 risers, add			275	.058			2.04		2.04	3.14
2230	11 – 20 risers, add			138	.116			4.07		4.07	6.25
2235	21 – 40 risers, add		▼	69	.232	▼		8.15		8.15	12.50
3000	Loading & trucking, including 2 mile haul, chute loaded		B-16	45	.711	C.Y.		25.50	13	38.50	53.50
3040	Hand loading truck, 50' haul		"	48	.667			24	12.20	36.20	50
3080	Machine loading truck		B-17	120	.267			10	5.75	15.75	21.50
5000	Haul, per mile, up to 8 C.Y. truck		B-34B	1165	.007			.24	.50	.74	.92
5100	Over 8 C.Y. truck		"	1550	.005	▼		.18	.38	.56	.69
	02 41 19.20 Selective Demolition, Dump Charges										
0010	**SELECTIVE DEMOLITION, DUMP CHARGES**	R024119-10									
0020	Dump charges, typical urban city, tipping fees only										
0100	Building construction materials					Ton	82			82	90
0200	Trees, brush, lumber						70			70	77
0300	Rubbish only						70			70	77
0500	Reclamation station, usual charge					▼	82			82	90

01 45 Quality Control

01 45 23 – Testing and Inspecting Services

01 45 23.50 Testing		Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
4735	Soil density, nuclear method, ASTM D2922				Ea.				35	38.50
4740	Sand cone method ASTM D1556								27	30
4750	Moisture content, ASTM D 2216								9	10
4780	Permeability test, double ring infiltrometer								500	550
4800	Permeability, var. or constant head, undist., ASTM D 2434								227	250
4850	Recompacted								250	275
4900	Proctor compaction, 4" standard mold, ASTMD 698								123	135
4950	6" modified mold								68	75
5100	Shear tests, triaxial, minimum								410	450
5150	Maximum								545	600
5300	Direct shear, minimum, ASTM D 3080								320	350
5350	Maximum								410	450
5550	Technician for inspection, per day, earthwork								320	350
5650	Bolting								400	440
5750	Roofing								480	530
5790	Welding								480	530
5820	Non-destructive metal testing, dye penetrant				Day				310	340
5840	Magnetic particle								310	340
5860	Radiography								450	495
5880	Ultrasonic								310	340
6000	Welding certification, minimum				Ea.				91	100
6100	Maximum				"				250	275
7000	Underground storage tank									
7500	Volumetric tightness test ,<=12,000 gal.				Ea.				435	480
7510	<=30,000 gal.				"				615	675
7600	Vadose zone (soil gas) sampling, 10-40 samples, min.				Day				1,375	1,500
7610	Maximum				"				2,275	2,500
7700	Ground water monitoring incl. drilling 3 wells min.				Total				4,550	5,000
7710	Maximum				"				6,375	7,000
8000	X-ray concrete slabs				Ea.				182	200
9000	Thermographic testing, for bldg envelope heat loss, average 2,000 S.F. G				"					500

01 51 Temporary Utilities

01 51 13 – Temporary Electricity

01 51 13.80 Temporary Utilities		Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	TEMPORARY UTILITIES									
0100	Heat, incl. fuel and operation, per week, 12 hrs. per day	1 Skwk	100	.080	CSF Flr	36.50	3.63		40.13	45.50
0200	24 hrs. per day	"	60	.133		69.50	6.05		75.55	86
0350	Lighting, incl. service lamps, wiring & outlets, minimum	1 Elec	34	.235		2.80	12.15		14.95	21
0360	Maximum	"	17	.471		5.85	24.50		30.35	43
0400	Power for temp lighting only, 6.6 KWH, per month								.92	1.01
0430	11.8 KWH, per month								1.65	1.82
0450	23.6 KWH, per month								3.30	3.63
0600	Power for job duration incl. elevator, etc., minimum								47	51.50
0650	Maximum								110	121
1000	Toilet, portable, see Equip. Rental 01 54 33 in Reference Section									

01 31 Project Management and Coordination

01 31 13 – Project Coordination

	01 31 13.30 Insurance		Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs Labor	Equipment	Total	Total Incl O&P
2100	Average					Payroll		13.70%			
2200	Maximum							124.10%			
	01 31 13.40 Main Office Expense										
0010	**MAIN OFFICE EXPENSE** Average for General Contractors	R013113-50									
0020	As a percentage of their annual volume										
0125	Annual volume under 1 million dollars					% Vol.				17.50%	
0145	Up to 2.5 million dollars									8%	
0150	Up to 4.0 million dollars									6.80%	
0200	Up to 7.0 million dollars									5.60%	
0250	Up to 10 million dollars									5.10%	
0300	Over 10 million dollars									3.90%	
	01 31 13.50 General Contractor's Mark-Up										
0010	**GENERAL CONTRACTOR'S MARK-UP** on Change Orders										
0200	Extra work, by subcontractors, add					%					10%
0250	By General Contractor, add										15%
0400	Omitted work, by subcontractors, deduct all but										5%
0450	By General Contractor, deduct all but										7.50%
0600	Overtime work, by subcontractors, add										15%
0650	By General Contractor, add										10%
	01 31 13.60 Installing Contractor's Main Office Overhead										
0010	**INSTALLING CONTRACTOR'S MAIN OFFICE OVERHEAD**	R013113-50									
0020	As percent of direct costs, minimum					%				5%	
0050	Average									13%	
0100	Maximum									30%	
	01 31 13.80 Overhead and Profit										
0010	**OVERHEAD & PROFIT** Allowance to add to items in this										
0020	book that do not include Subs O&P, average					%				25%	
0100	Allowance to add to items in this book that										
0110	do include Subs O&P, minimum					%					5%
0150	Average										10%
0200	Maximum										15%
0300	Typical, by size of project, under $100,000									30%	
0350	$500,000 project									25%	
0400	$2,000,000 project									20%	
0450	Over $10,000,000 project									15%	
	01 31 13.90 Performance Bond										
0010	**PERFORMANCE BOND**	R013113-80									
0020	For buildings, minimum					Job					.60%
0100	Maximum										2.50%

01 32 Construction Progress Documentation

01 32 13 – Scheduling of work

01 32 13.50 Scheduling	Crew	Daily Output	Labor-Hours	Unit	2012 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010 **SCHEDULING**									
0020 Critical path, as % of architectural fee, minimum				%					.50%
0100 Maximum				"					1%
0300 Computer-update, micro, no plots, minimum				Ea.				455	500
0400 Including plots, maximum				"				1,450	1,600
0600 Rule of thumb, CPM scheduling, small job ($10 Million)				Job					.05%
0650 Large job ($50 Million +)									.03%
0700 Including cost control, small job									.08%
0750 Large job									.04%

01 32 33 – Photographic Documentation

01 32 33.50 Photographs									
0010 **PHOTOGRAPHS**									
0020 8" x 10", 4 shots, 2 prints ea., std. mounting				Set	475			475	520
0100 Hinged linen mounts					530			530	580
0200 8" x 10", 4 shots, 2 prints each, in color					415			415	460
0300 For I.D. slugs, add to all above					5.30			5.30	5.85
0500 Aerial photos, initial flyover, 6 shots, 1 print ea., 8" x 10"					845			845	925
0550 11" x 14" prints					1,025			1,025	1,125
0600 16" x 20" prints					1,200			1,200	1,325
0700 For full color prints, add					40%				40%
0750 Add for traffic control area					305			305	335
0900 For over 30 miles from airport, add per				Mile	5.45			5.45	6
1000 Vertical photography, 4 to 6 shots with									
1010 different scales, 1 print each				Set	1,125			1,125	1,225
1500 Time lapse equipment, camera and projector, buy					845			845	930
1550 Rent per month					305			305	335
1700 Cameraman and film, including processing, B.&W.				Day	1,375			1,375	1,525
1720 Color				"	1,375			1,375	1,525

01 41 Regulatory Requirements

01 41 26 – Permit Requirements

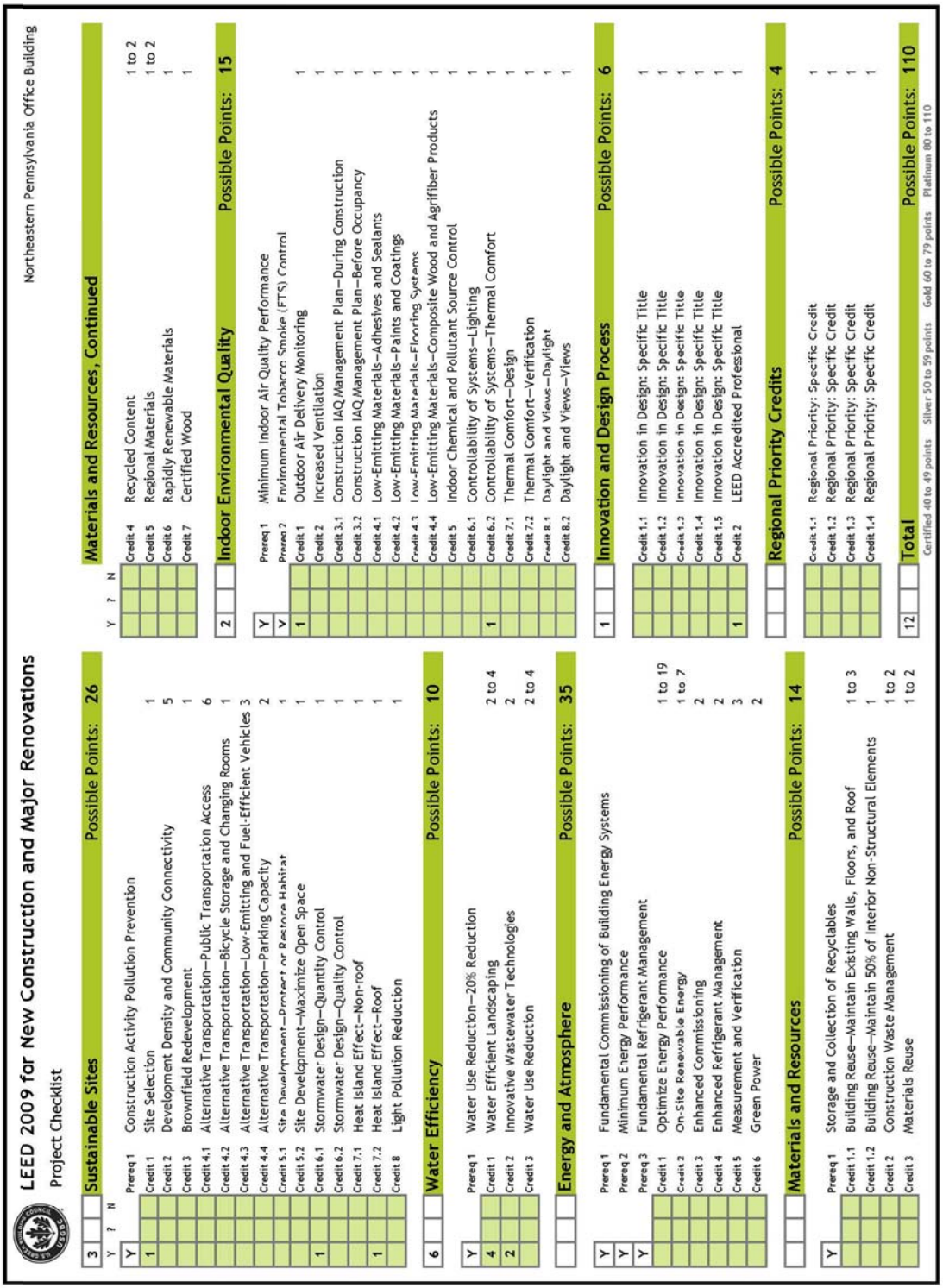
01 41 26.50 Permits									
0010 **PERMITS**									
0020 Rule of thumb, most cities, minimum				Job					.50%
0100 Maximum				"					2%

01 45 Quality Control

01 45 23 – Testing and Inspecting Services

01 45 23.50 Testing									
0010 **TESTING** and Inspecting Services									
0015 For concrete building costing $1,000,000, minimum				Project				4,725	5,200
0020 Maximum								38,000	41,800
0050 Steel building, minimum								4,725	5,200
0070 Maximum								14,800	16,300
0100 For building costing, $10,000,000, minimum								30,100	33,100
0150 Maximum								48,200	53,000
0200 Asphalt testing, compressive strength Marshall stability, set of 3				Ea.				145	165
0220 Density, set of 3								86	95
0250 Extraction, individual tests on sample								136	150

Appendix D: Existing LEED Scorecard



LEED 2009 for New Construction and Major Renovations

Project Checklist

Northeastern Pennsylvania Office Building

Y	?	N	Sustainable Sites	Possible Points: 26	
3					
Y			Prereq 1	Construction Activity Pollution Prevention	
1			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
			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
			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
			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
			Credit 8	Light Pollution Reduction	1
6			**Water Efficiency**	**Possible Points: 10**	
Y			Prereq 1	Water Use Reduction—20% Reduction	
4			Credit 1	Water Efficient Landscaping	2 to 4
2			Credit 2	Innovative Wastewater Technologies	2
			Credit 3	Water Use Reduction	2 to 4
			Energy and Atmosphere	**Possible Points: 35**	
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
			Credit 1	Optimize Energy Performance	1 to 19
			Credit 2	On-Site Renewable Energy	1 to 7
			Credit 3	Enhanced Commissioning	2
			Credit 4	Enhanced Refrigerant Management	2
			Credit 5	Measurement and Verification	3
			Credit 6	Green Power	2
			Materials and Resources	**Possible Points: 14**	
Y			Prereq 1	Storage and Collection of Recyclables	
			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
			Credit 2	Construction Waste Management	1 to 2
			Credit 3	Materials Reuse	1 to 2

Y	?	N	Materials and Resources, Continued		
			Credit 4	Recycled Content	1 to 2
			Credit 5	Regional Materials	1 to 2
			Credit 6	Rapidly Renewable Materials	1
			Credit 7	Certified Wood	1
2			**Indoor Environmental Quality**	**Possible Points: 15**	
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
			Credit 2	Increased Ventilation	1
			Credit 3.1	Construction IAQ Management Plan—During Construction	1
			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
			Credit 5	Indoor Chemical and Pollutant Source Control	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
			Credit 8.1	Daylight and Views—Daylight	1
			Credit 8.2	Daylight and Views—Views	1
1			**Innovation and Design Process**	**Possible Points: 6**	
			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
			Regional Priority Credits	**Possible Points: 4**	
			Credit 1.1	Regional Priority: Specific Credit	1
			Credit 1.2	Regional Priority: Specific Credit	1
			Credit 1.3	Regional Priority: Specific Credit	1
			Credit 1.4	Regional Priority: Specific Credit	1
12			**Total**	**Possible Points: 110**	

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

LEED 2009 for New Construction and Major Renovations

Project Checklist

Northeastern Pennsylvania Office Building

Sustainable Sites — Possible Points: 26

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

Notes:

Water Efficiency — Possible Points: 10

Y	?	N				
		N	d	Prereq 1	Water Use Reduction—20% Reduction	
4			d	Credit 1	Water Efficient Landscaping	2 to 4
					Reduce by 50%	2
				Y	No Potable Water Use or Irrigation	4
2			d	Credit 2	Innovative Wastewater Technologies	2
		N	d	Credit 3	Water Use Reduction	2 to 4
					Reduce by 30%	2
					Reduce by 35%	3
					Reduce by 40%	4

Notes:

0	0	0	**Energy and Atmosphere**	Possible Points:	**35**
Y	?	N			
Y			C Prereq 1 Fundamental Commissioning of Building Energy Systems		
Y			d Prereq 2 Minimum Energy Performance		
Y			d Prereq 3 Fundamental Refrigerant Management		
	?		d Credit 1 Optimize Energy Performance	1 to 19	
			Improve by 12% for New Buildings or 8% for Existing Building Renovations	1	
			Improve by 14% for New Buildings or 10% for Existing Building Renovations	2	
			Improve by 16% for New Buildings or 12% for Existing Building Renovations	3	
			Improve by 18% for New Buildings or 14% for Existing Building Renovations	4	
			Improve by 20% for New Buildings or 16% for Existing Building Renovations	5	
			Improve by 22% for New Buildings or 18% for Existing Building Renovations	6	
			Improve by 24% for New Buildings or 20% for Existing Building Renovations	7	
			Improve by 26% for New Buildings or 22% for Existing Building Renovations	8	
			Improve by 28% for New Buildings or 24% for Existing Building Renovations	9	
			Improve by 30% for New Buildings or 26% for Existing Building Renovations	10	
			Improve by 32% for New Buildings or 28% for Existing Building Renovations	11	
			Improve by 34% for New Buildings or 30% for Existing Building Renovations	12	
			Improve by 36% for New Buildings or 32% for Existing Building Renovations	13	
			Improve by 38% for New Buildings or 34% for Existing Building Renovations	14	
			Improve by 40% for New Buildings or 36% for Existing Building Renovations	15	
			Improve by 42% for New Buildings or 38% for Existing Building Renovations	16	
			Improve by 44% for New Buildings or 40% for Existing Building Renovations	17	
			Improve by 46% for New Buildings or 42% for Existing Building Renovations	18	
			Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations	19	
		N	d Credit 2 On-Site Renewable Energy	1 to 7	
			1% Renewable Energy	1	
			3% Renewable Energy	2	
			5% Renewable Energy	3	
			7% Renewable Energy	4	
			9% Renewable Energy	5	
			11% Renewable Energy	6	
			13% Renewable Energy	7	
		N	C Credit 3 Enhanced Commissioning	2	
		N	d Credit 4 Enhanced Refrigerant Management	2	

Notes:

		N	☐	Credit 5	Measurement and Verification	3
		N	☐	Credit 6	Green Power	2

0	0	0					
Materials and Resources						Possible Points:	14
Y	?	N					
Y			d	Prereq 1	Storage and Collection of Recyclables		
		N	c	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof		1 to 3
					Reuse 55%		1
					Reuse 75%		2
					Reuse 95%		3
		N	c	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements		1
		N	c	Credit 2	Construction Waste Management		1 to 2
					50% Recycled or Salvaged		1
					75% Recycled or Salvaged		2
		N	c	Credit 3	Materials Reuse		1 to 2
					Reuse 5%		1
					Reuse 10%		2
		N	c	Credit 4	Recycled Content		1 to 2
					10% of Content		1
					20% of Content		2
		N	c	Credit 5	Regional Materials		1 to 2
					10% of Materials		1
					20% of Materials		2
		N	c	Credit 6	Rapidly Renewable Materials		1
		N	c	Credit 7	Certified Wood		1

Notes:

2	0	0	**Indoor Environmental Quality**	Possible Points:	**15**
Y	?	N			
Y			d Prereq 1 Minimum Indoor Air Quality Performance		
Y			d Prereq 2 Environmental Tobacco Smoke (ETS) Control		
1			d Credit 1 Outdoor Air Delivery Monitoring	1	
		N	d Credit 2 Increased Ventilation	1	
		N	C Credit 3.1 Construction IAQ Management Plan—During Construction	1	
		N	C Credit 3.2 Construction IAQ Management Plan—Before Occupancy	1	
		N	C Credit 4.1 Low-Emitting Materials—Adhesives and Sealants	1	
		N	C Credit 4.2 Low-Emitting Materials—Paints and Coatings	1	
		N	C Credit 4.3 Low-Emitting Materials—Flooring Systems	1	
		N	C Credit 4.4 Low-Emitting Materials—Composite Wood and Agrifiber Products	1	
		N	d Credit 5 Indoor Chemical and Pollutant Source Control	1	
		N	d Credit 6.1 Controllability of Systems—Lighting	1	
1			d Credit 6.2 Controllability of Systems—Thermal Comfort	1	
		N	d Credit 7.1 Thermal Comfort—Design	1	
	?		d Credit 7.2 Thermal Comfort—Verification	1	
		N	d Credit 8.1 Daylight and Views—Daylight	1	
		N	d Credit 8.2 Daylight and Views—Views	1	

Notes:

1	0	0	**Innovation and Design Process**	Possible Points:	**6**
Y	?	N			
		N	d/C Credit 1.1 Innovation in Design: Specific Title	1	
		N	d/C Credit 1.2 Innovation in Design: Specific Title	1	
		N	d/C Credit 1.3 Innovation in Design: Specific Title	1	
		N	d/C Credit 1.4 Innovation in Design: Specific Title	1	
		N	d/C Credit 1.5 Innovation in Design: Specific Title	1	
1			d/C Credit 2 LEED Accredited Professional	1	

Notes:

0	0	0	**Regional Priority Credits**	Possible Points:	**4**
Y	?	N			
			d/C Credit 1.1 Regional Priority: Specific Credit	1	
		N	d/C Credit 1.2 Regional Priority: Specific Credit	1	
		N	d/C Credit 1.3 Regional Priority: Specific Credit	1	
		N	d/C Credit 1.4 Regional Priority: Specific Credit	1	

Notes:

12	0	0	**Total**	Possible Points: **110**

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

Appendix E: Proposed LEED Scorecard

LEED 2009 for New Construction and Major Renovations

Project Checklist

Northeastern Pennsylvania Office Building

Sustainable Sites — Possible Points: 26

Y	?	N			
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
			Credit 2	Development Density and Community Connectivity	5
			Credit 3	Brownfield Redevelopment	1
2			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
2			Credit 4.4	Alternative Transportation—Parking Capacity	2
			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
			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
			Credit 8	Light Pollution Reduction	1

Water Efficiency — Possible Points: 10

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

Energy and Atmosphere — Possible Points: 35

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

Materials and Resources — Possible Points: 14

Y			Prereq 1	Storage and Collection of Recyclables	
			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
			Credit 2	Construction Waste Management	1 to 2
			Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

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

Indoor Environmental Quality — Possible Points: 15

Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
			Credit 2	Increased Ventilation	1
			Credit 3.1	Construction IAQ Management Plan—During Construction	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
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
			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
			Credit 8.1	Daylight and Views—Daylight	1
			Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

			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

Regional Priority Credits — Possible Points: 4

			Credit 1.1	Regional Priority: Specific Credit	1
			Credit 1.2	Regional Priority: Specific Credit	1
			Credit 1.3	Regional Priority: Specific Credit	1
			Credit 1.4	Regional Priority: Specific Credit	1

Total — Possible Points: 110

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

LEED 2009 for New Construction and Major Renovations

Project Checklist

Sustainable Sites — Possible Points: 26

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

Notes:

Water Efficiency — Possible Points: 10

Y	?	N				
Y			d	Prereq 1	Water Use Reduction—20% Reduction	
4			d	Credit 1	Water Efficient Landscaping	2 to 4
					Reduce by 50%	2
				Y	No Potable Water Use or Irrigation	4
2			d	Credit 2	Innovative Wastewater Technologies	2
2			d	Credit 3	Water Use Reduction	2 to 4
					Reduce by 30%	2
					Reduce by 35%	3
					Reduce by 40%	4

Notes:

17	0	0	**Energy and Atmosphere**	Possible Points:	**35**
Y	?	N			
Y			c Prereq 1 Fundamental Commissioning of Building Energy Systems		
Y			d Prereq 2 Minimum Energy Performance		
Y			d Prereq 3 Fundamental Refrigerant Management		
5			d Credit 1 Optimize Energy Performance	1 to 19	
			Improve by 12% for New Buildings or 8% for Existing Building Renovations	1	
			Improve by 14% for New Buildings or 10% for Existing Building Renovations	2	
			Improve by 16% for New Buildings or 12% for Existing Building Renovations	3	
			Improve by 18% for New Buildings or 14% for Existing Building Renovations	4	
			Improve by 20% for New Buildings or 16% for Existing Building Renovations	5	
			Improve by 22% for New Buildings or 18% for Existing Building Renovations	6	
			Improve by 24% for New Buildings or 20% for Existing Building Renovations	7	
			Improve by 26% for New Buildings or 22% for Existing Building Renovations	8	
			Improve by 28% for New Buildings or 24% for Existing Building Renovations	9	
			Improve by 30% for New Buildings or 26% for Existing Building Renovations	10	
			Improve by 32% for New Buildings or 28% for Existing Building Renovations	11	
			Improve by 34% for New Buildings or 30% for Existing Building Renovations	12	
			Improve by 36% for New Buildings or 32% for Existing Building Renovations	13	
			Improve by 38% for New Buildings or 34% for Existing Building Renovations	14	
			Improve by 40% for New Buildings or 36% for Existing Building Renovations	15	
			Improve by 42% for New Buildings or 38% for Existing Building Renovations	16	
			Improve by 44% for New Buildings or 40% for Existing Building Renovations	17	
			Improve by 46% for New Buildings or 42% for Existing Building Renovations	18	
			Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations	19	
5			d Credit 2 On-Site Renewable Energy	1 to 7	
			1% Renewable Energy	1	
			3% Renewable Energy	2	
			5% Renewable Energy	3	
			7% Renewable Energy	4	
			9% Renewable Energy	5	
			11% Renewable Energy	6	
			13% Renewable Energy	7	
2			c Credit 3 Enhanced Commissioning	2	
2			d Credit 4 Enhanced Refrigerant Management	2	

Notes:

3			C	Credit 5	Measurement and Verification	3
		N	C	Credit 6	Green Power	2

1	0	0			**Materials and Resources**	**Possible Points:**	**14**
Y	?	N					
Y			d	Prereq 1	Storage and Collection of Recyclables		
		N	c	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof		1 to 3
					Reuse 55%		1
					Reuse 75%		2
					Reuse 95%		3
		N	c	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements		1
		N	c	Credit 2	Construction Waste Management		1 to 2
					50% Recycled or Salvaged		1
					75% Recycled or Salvaged		2
		N	c	Credit 3	Materials Reuse		1 to 2
					Reuse 5%		1
					Reuse 10%		2
1			c	Credit 4	Recycled Content		1 to 2
					10% of Content		1
					20% of Content		2
		N	c	Credit 5	Regional Materials		1 to 2
					10% of Materials		1
					20% of Materials		2
		N	c	Credit 6	Rapidly Renewable Materials		1
		N	c	Credit 7	Certified Wood		1

Notes:

6	0	0					
Y	?	N			**Indoor Environmental *Quality***	Possible Points:	**15**
Y			d	Prereq 1	Minimum Indoor Air Quality Performance		
Y			d	Prereq 2	Environmental Tobacco Smoke (ETS) Control		
1			d	Credit 1	Outdoor Air Delivery Monitoring	1	
		N	d	Credit 2	Increased Ventilation	1	
		N	C	Credit 3.1	Construction IAQ Management Plan—During Construction	1	
		N	C	Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1	
1			C	Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1	
1			C	Credit 4.2	Low-Emitting Materials—Paints and Coatings	1	
1			C	Credit 4.3	Low-Emitting Materials—Flooring Systems	1	
1			C	Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1	
		N	d	Credit 5	Indoor Chemical and Pollutant Source Control	1	
		N	d	Credit 6.1	Controllability of Systems—Lighting	1	
1			d	Credit 6.2	Controllability of Systems—Thermal Comfort	1	
		N	d	Credit 7.1	Thermal Comfort—Design	1	
	?		d	Credit 7.2	Thermal Comfort—Verification	1	
		N	d	Credit 8.1	Daylight and Views—Daylight	1	
		N	d	Credit 8.2	Daylight and Views—Views	1	

Notes:

1	0	0					
Y	?	N			**Innovation and Design Process**	Possible Points:	**6**
		N	d/C	Credit 1.1	Innovation in Design: Specific Title	1	
		N	d/C	Credit 1.2	Innovation in Design: Specific Title	1	
		N	d/C	Credit 1.3	Innovation in Design: Specific Title	1	
		N	d/C	Credit 1.4	Innovation in Design: Specific Title	1	
		N	d/C	Credit 1.5	Innovation in Design: Specific Title	1	
1			d/C	Credit 2	LEED Accredited Professional	1	

Notes:

0	0	0					
Y	?	N			**Regional Priority Credits**	Possible Points:	**4**
			d/C	Credit 1.1	Regional Priority: Specific Credit	1	
		N	d/C	Credit 1.2	Regional Priority: Specific Credit	1	
		N	d/C	Credit 1.3	Regional Priority: Specific Credit	1	
		N	d/C	Credit 1.4	Regional Priority: Specific Credit	1	

Notes:

41	0	0	**Total**	Possible Points: **110**

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