

# 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've been used to receive approval for construction by the township authorities.

# Table of Contents

I.	Executive Summary.....	2
II.	Detailed Project Schedule.....	4
III.	Detailed Structural Systems Estimate.....	7
IV.	General Condition Estimate.....	11
V.	LEED Evaluation.....	13
VI.	Building Information Modeling Use Evaluation.....	18
VII.	Appendix A: Detailed Project Schedule.....	22
VIII.	Appendix B: RS Means Cost Data (Structural System Estimate).....	25
IX.	Appendix C: RS Means Cost Data (Gen. Conditions Estimate).....	37
X.	Appendix D: Existing LEED Scorecard.....	44
XI.	Appendix E: Proposed LEED Scorecard.....	51

# 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 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 to 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.

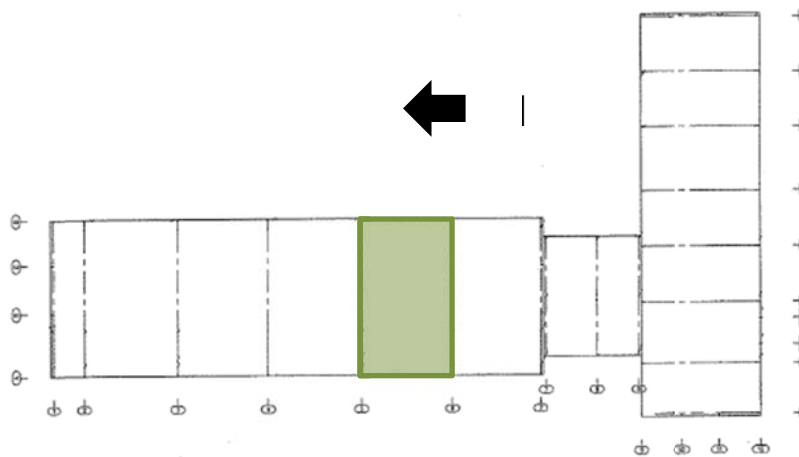


Figure 1. Shop Building Bay

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
				<b>\$12,231.80</b>

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
				<b>\$6,851.25</b>

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
				<b>\$3,978.50</b>

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
				<b>\$14,618.02</b>

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
				<b>\$124,377.94</b>

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.

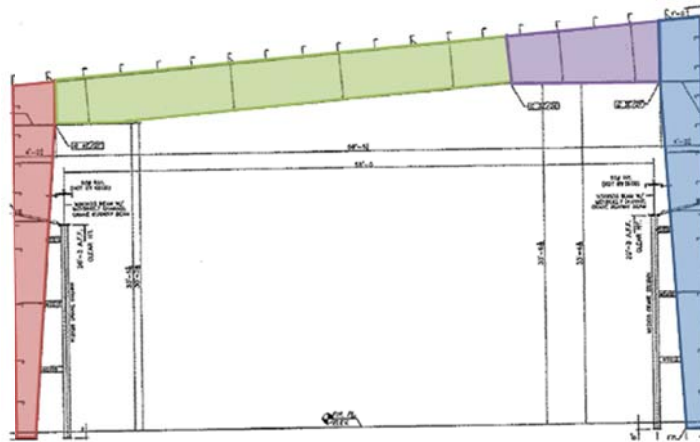


Figure 2. Pre-Engineered Metal Building Frame

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
		<b>\$59.59</b>

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).

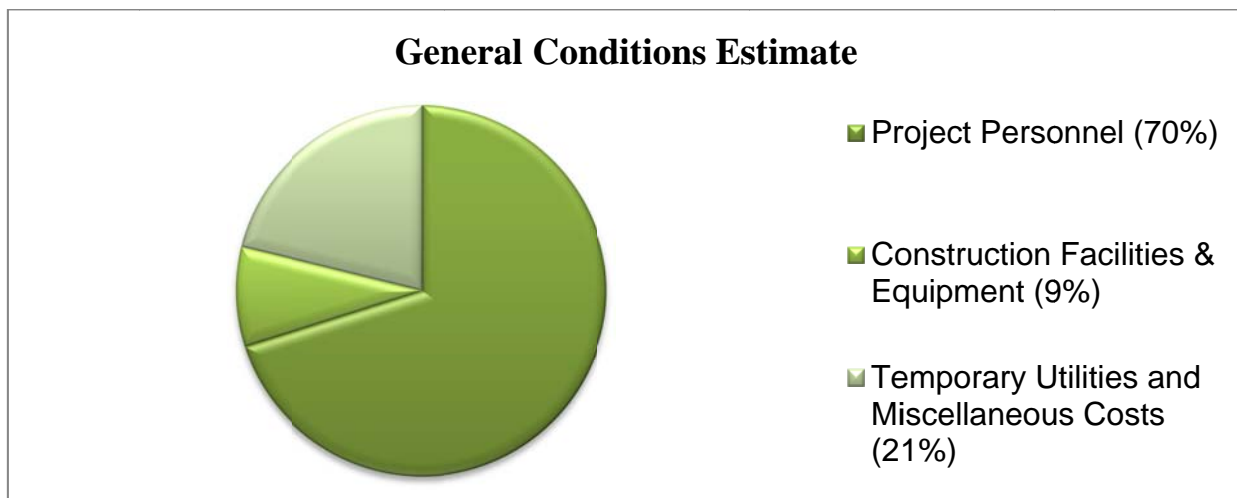


Figure 3. General Conditions Estimate by Percentage

## 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
<b>Total</b>				<b>\$412,305</b>

## 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
<b>Total</b>				<b>\$51,147</b>

## 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
<b>Total</b>				<b>\$124,537.80</b>

\*\* (Values provided directly from the General Contractor)

## **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 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 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 add 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

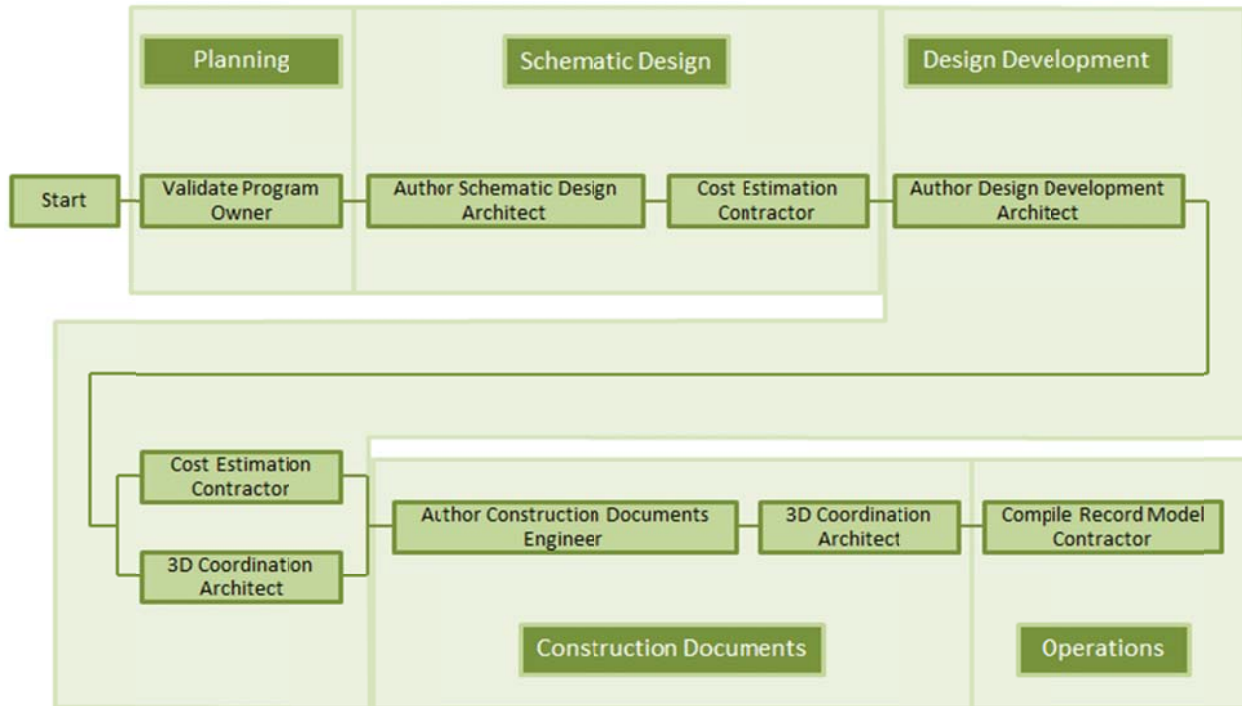
The design team and owner of the Northeastern Pennsylvania Office Building had some difficulties at the onset of this project because the land that they were preparing to construct a multiphase project on was previously undeveloped in a rural area. Because of this, the township authorities were hesitant 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 contractors 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**







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

<b>03 11 Concrete Forming</b>											
<b>03 11 13 – Structural Cast-In-Place Concrete Forming</b>											
<b>03 11 13.45 Forms In Place, Footings</b>											
		Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs Labor	Equipment	Total	Total Ind 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	8.89	
5050	2 use		371	.086		1.06	3.61		4.67	6.70	
5100	3 use		401	.080		.76	3.34		4.10	6	
5150	4 use		414	.077		.62	3.23		3.85	5.45	
6000	Supports for dowels, plinths or templates, 2' x 2' footing		25	1.280	Eq.	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	
<b>03 11 13.47 Forms In Place, Gas Station Forms</b>											
<b>FORMS IN PLACE, GAS STATION FORMS</b>											
0010	Curb fascia, with template, 12 ga. steel, left in place, 9" high	G	1 Cap	50	.160	L.F.	13.10	7.05	20.15	25.50	
0050	Sign or light bases, 18" diameter, 9" high	G		9	.889	Eq.	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	
<b>03 11 13.50 Forms In Place, Grade Beam</b>											
<b>FORMS IN PLACE, GRADE BEAM</b>											
0010	Job-built plywood, 1 use		R031113-40	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
<b>03 11 13.55 Forms In Place, Mat Foundation</b>											
<b>FORMS IN PLACE, MAT FOUNDATION</b>											
0010	Job-built plywood, 1 use		R031113-40	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
<b>03 11 13.65 Forms In Place, Slab On Grade</b>											
<b>FORMS IN PLACE, SLAB ON GRADE</b>											
1000	Bulkhead forms w/keyway, wood, 6" high, 1 use		R031113-40	C-1	510	.063	L.F.	.87	2.63	3.50	4.99
1850	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, ind 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

## 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 Base Costs		Total	Total Incl O&P
							Labor	Equipment		
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 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

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	En.	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" (5.38 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

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	3.09
0100	Fiberglass, 1" thick				2700	.009		3.64	.42	4.11
0500	Wood fiber, 1" thick	G			2700	.009		2.20	.42	2.67

### 03 11 23 – Permanent Stair Forming

#### 03 11 23.75 Forms In Place, Stairs

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
0050	2 use				170	.282		2.65	12.10	14.75
0100	3 use		R031113-60		180	.267		1.99	11.45	13.44
0150	4 use				190	.253		1.65	10.85	12.50
1000	Alternate pricing method (1.0 L.F./S.F.), 1 use				100	.480	LF Rsr	4.66	20.50	25.16
1050	2 use				105	.457		2.65	19.65	22.30
1100	3 use				110	.436		1.99	18.75	20.74
1150	4 use				115	.417		1.65	17.90	19.55
2000	Stairs, cast on sloping ground (length x width), 1 use				220	.218	S.F.	1.86	9.35	11.21
2025	2 use				232	.207		1.03	8.90	9.93
2050	3 use				244	.197		.75	8.45	9.20



## 03 21 Reinforcement Bars

### 03 21 05 – Reinforcing Steel Accessories

03 21 05.75 Splicing Reinforcing Bars		Crew	Daily Output	Labor-Hours	Unit	Material	2012 Base Costs		Total	Total Incl O&P	
							Labor	Equipment			
0810	#10 bars	G	C-5	40	1.400	Eq.	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/fibrous 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	▼	14	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	Rebar, #8 Girders, #3 to #7	G	4 Rodm	1.40	20	Ton	980	980		1,960	2,650
0150	#8 to #18	R032110-20	G		2.70	11.852	990	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		990	750		1,680	2,225
0550	Slab on grade, #3 to #7	G		2.10	13.913		990	685		1,675	2,125
0600	Walls, #3 to #7	G		3	10.667		990	525		1,455	1,850
0750	#8 to #18	G	▼	4	8	▼	990	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	Material	2012 Base Costs		Total	Total Incl O&P
							Labor	Equipment		
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, not including forms or reinforcing									
5510										
5550	1:4 (2500 psi) for structural roof decks	C-14B	260	.800	C.Y.	134	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	Can'tilever, 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, see 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, see 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, and water, using gas powered cement mixer									
0060										
0125	2500 psi	C-30	135	.059	C.F.	3.60	2.08	1.19	6.87	8.45
0130	3000 psi		135	.059		3.88	2.08	1.19	7.15	8.80
0135	3500 psi		135	.059		4.03	2.08	1.19	7.30	8.95
0140	4000 psi		135	.059		4.21	2.08	1.19	7.48	9.15
0145	4500 psi		135	.059		4.41	2.08	1.19	7.68	9.35
0150	5000 psi		135	.059		4.74	2.08	1.19	8.01	9.70
0300	Using pre-bagged dry mix and wheelbarrow (80-lb. bag = 0.6 C.F.)									
0340	4000 psi	1 Club	40	.167	C.F.	5.80	5.85		11.65	15.25

#### 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			C.Y.	91.50			91.50	101
0020	2000 psi					94			94	103
0100	2500 psi	R033105-30				102			102	112
0150	3000 psi					99.50			99.50	110
0280	3500 psi	R033105-40				103			103	113
0300	4000 psi					104			104	114
0350	4500 psi	R033105-50				109			109	120
0400	5000 psi					124			124	136
0411	6000 psi					202			202	223
0412	8000 psi					287			287	315
0413	10,000 psi					345			345	380
0414	12,000 psi									
1000	For high early strength cement, add					10%				
1010	For structural lightweight with regular sand, add					25%				

# 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 Base Costs		Total	Total Ind O&P
							labor	Equipment		
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				En.	112			112	124
2000	For all lightweight aggregate, add				C.Y.	45%				

## 03 31 05.70 Placing Concrete

03 31 05.70 PLACING CONCRETE		R033105-70								
0010	Includes labor and equipment to place, strike off and consolidate									
0020	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	Material	2012 Bare Costs		Total	Total Incl O&P
							Labor	Equipment		
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	24.30
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

03 35 29.30 FINISHING FLOORS		Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs		Total	Total Incl O&P
							Labor	Equipment		
0010	<b>FINISHING FLOORS</b>									
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	.006	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		1285	.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 restraining 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	Material	2012 Bare Costs Labor	Equipment	Total	Total Ind O&P
0358	For specified Random or Defined Access Floors in ACI Class 9 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-dir/1 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	Monolithic 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, prestunk, 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

CONTROL JOINTS, SAW CUT		Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs Labor	Equipment	Total	Total Ind O&P
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	Material	2012 Bare Costs 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 Corp	132	.061	Eq.	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	9.85
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 Corp	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		40	21	61	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 Corp	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	108
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	Material	2012 Bare Costs Labor	Equipment	Total	Total Incl O&P
6100	1/2" diameter, short	G	1 Corp	80	.100	Eq.	1.02	4.41	5.43	7.93
6200	Long	G		75	.107		1.24	4.70	5.94	8.44
6300	5/8" diameter, short	G		70	.114		1.63	5.05	6.68	9.55
6400	Long	G		85	.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	2.52
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 Corp	150	.053	Eq.	.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 Corp	300	.027	Eq.	.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	<b>HIGH STRENGTH BOLTS</b>									
0020	A325 Type 1, structural steel, bolt-nut-washer set		R050523-10							
0100	1/2" diameter x 1-1/2" long	G	1 Sowlk	130	.062	Eq.	.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

### 05 12 23.40 Lightweight Framing

	Crew	Daily Output	Labor-Hours	Unit	Material	2012 Base Costs			Total	Total Incl O&P
						Labor	Equipment			
1310	G	E-3	850	.028	Lb.	1.50	1.41	.14	3.05	4.34
1320	G		1000	.024		1.50	1.20	.12	2.82	3.93
1330	G		2800	.009		1.50	.43	.04	1.97	2.47
1350	G		850	.028		1.50	1.41	.14	3.05	4.34
1380	G	E-2	4200	.013		1.50	.64	.36	2.50	3.14
1400	G	2 Sawk	800	.020		1.63	.99		2.62	3.56
1420	G		700	.023		1.56	1.13		2.69	3.74
1500	G		800	.020		1.63	.99		2.62	3.56
1520	G		700	.023		1.56	1.13		2.69	3.74

### 05 12 23.45 Lintels

0010	<b>LINTELS</b>									
0015	G									
0020	G	1 Bric	550	.015	Lb.	.96	.64		1.60	2.03
0100	G		640	.013		.94	.55		1.49	1.86
0200	G		640	.013		.91	.55		1.46	1.83
0300	G		640	.013		.89	.55		1.44	1.81
0500	G					.31			.31	.34
0700	G					.13			.13	.14
0900	G					.30			.30	.33
0950	G					.27			.27	.30
1000	G					.25			.25	.27
2000	G	1 Bric	47	.170	Es.	13.50	7.50		21	26
2100	G		26	.308		24.50	13.55		38.05	47
2600	G		21	.381		31	16.80		47.80	59.50
2700	G		12	.667		56	29.50		85.50	106

### 05 12 23.60 Pipe Support Framing

0010	<b>PIPE SUPPORT FRAMING</b>									
0020	G	E-4	3900	.008	Lb.	1.68	.41	.03	2.12	2.60
0200	G		4300	.007		1.65	.37	.03	2.05	2.51
0400	G		4800	.007		1.63	.33	.03	1.99	2.41
0600	G		5400	.006		1.60	.30	.02	1.92	2.31

### 05 12 23.65 Plates

0010	<b>PLATES</b>									
0015	G									
0020	G									
0050	G				S.F.	6.40			6.40	7
0100	G					12.75			12.75	14.05
0300	G					19.15			19.15	21
0400	G					25.50			25.50	28
0450	G					38.50			38.50	47
0500	G					51			51	56
2000	G									
2100	G				S.F.	8.65			8.65	9.50

### 05 12 23.70 Stressed Skin Steel Roof and Ceiling System

0010	<b>STRESSED SKIN STEEL ROOF &amp; CEILING SYSTEM</b>									
0020	G	E-2	1150	.049	S.F.	10	2.35	1.30	13.65	16.45
0100	G		960	.058		16.25	2.82	1.56	20.63	24.50
0200	G		760	.074		25	3.56	1.97	30.53	36

### 05 12 23.75 Structural Steel Members

0010	<b>STRUCTURAL STEEL MEMBERS</b>									
0015	G									

# 05 12 Structural Steel Framing

## 05 12 23 – Structural Steel for Buildings

### 05 12 23.77 Structural Steel Projects

Code	Description	G	Crew	Daily Output	Labor-Hours	Unit	Material	2012 Base Costs			Total	Total Ind O&P
								Labor	Equipment	Total		
0900	7 to 15 stories		E-6	14.20	9.014		2,600	440	126	3,166	3,750	
1000	Over 15 stories		E-6	13.90	9.209		2,700	450	129	3,279	3,900	
1100	For multi-story masonry wall bearing construction, add							30%				
1300	Industrial bldgs., 1 story, beams & girders, steel bearing		E-5	12.90	6.202		2,500	305	125	2,930	3,425	
1400	Masonry bearing						2,500	390	162	3,052	3,600	
1500	Industrial bldgs., 1 story, under 10 tons, steel from warehouse, trucked											
1510			E-2	7.50	7.467	Ton	3,000	360	200	3,560	4,150	
1600	1 story with roof trusses, steel bearing		E-5	10.60	7.547		2,950	370	153	3,473	4,050	
1700	Masonry bearing		*	8.30	9.639		2,950	470	195	3,615	4,275	
1900	Monumental structures, banks, stores, etc., minimum		E-6	13	9.846		2,500	480	138	3,118	3,725	
2000	Maximum		*	9	14.222		4,150	695	199	5,044	6,000	
2200	Churches, minimum		E-5	11.60	6.897		2,325	335	140	2,800	3,300	
2300	Maximum		*	5.20	15.385		3,100	750	310	4,160	5,050	
2800	Power stations, fossil fuels, minimum		E-6	11	11.636		2,500	570	163	3,233	3,925	
2900	Maximum			5.70	22.456		3,750	1,100	315	5,165	6,375	
2950	Nuclear fuels, non-safety steel, minimum			7	18.286		2,500	895	256	3,651	4,575	
3000	Maximum			5.50	23.273		3,750	1,125	325	5,200	6,450	
3040	Safety steel, minimum			2.50	51.200		3,650	2,500	715	6,865	9,175	
3070	Maximum			1.50	85.333		4,800	4,175	1,200	10,175	13,900	
3100	Roof trusses, minimum		E-5	13	6.154		3,500	300	124	3,924	4,500	
3200	Maximum			8.30	9.639		4,250	470	195	4,915	5,700	
3210	Schools, minimum			14.50	5.517		2,500	269	112	2,881	3,350	
3220	Maximum			8.30	9.639		3,650	470	195	4,315	5,050	
3400	Welded construction, simple commercial bldgs., 1 to 2 stories		E-7	7.60	10.526		2,550	515	229	3,294	3,950	
3500	7 to 15 stories		E-9	8.30	15.422		2,950	755	254	3,959	4,825	
3700	Welded rigid frame, 1 story, minimum		E-7	15.80	5.063		2,600	247	110	2,957	3,400	
3800	Maximum		*	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					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 primer coat 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)					Ton	100			100	110	
4100	A242 and A588 Weathering					"	85			85	93.50	
4200	Mill size extras for W-Shapes: 0 to 30 pfl; no extra charge											
4210	Member sizes 31 to 65 pfl, deduct					Ton	.01			.01	.01	
4220	Member sizes 66 to 100 pfl, deduct						5.60			5.60	6.35	
4230	Member sizes 101 to 387 pfl, add						56			56	61.50	
4300	Column base plates, light, up to 150 lb		2 Sawk	2000	.008	Lb.	1.38	.39		1.77	2.02	
4400	Heavy, over 150 lb.		E-2	7500	.007	"	1.44	.36	.20	2	2.42	
4600	Castellated beams, light sections, to 50#/LF., minimum			10.70	5.234	Ton	2,625	253	140	3,018	3,500	
4700	Maximum			7	8		2,875	385	214	3,474	4,075	
4900	Heavy sections, over 50# per LF., minimum			11.70	4.786		2,750	231	128	3,109	3,550	
5000	Maximum			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	Material	2012 Bare Costs Labor	2012 Bare Costs 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	<b>SUBPURLINS</b>	R051223-50								
0015	Made from recycled materials	G								
0020	Bulb tees, shop fabricated, painted, 32-5/8" O.C., 40 psi LL.									
0100	Type 178, max 8'-9" span, 2.15 pft, 2" high x 1-5/8" wide	G	E-1	4200	.006	S.F.	1.72	.28	.03	2.03
0200	Type 218, max 10'-2" span, 3.19 pft, 2-1/8" high x 1-1/8" wide	G	*	3100	.008		2	.38	.04	2.42
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

0010	<b>ALUMINUM SHAPES</b>									
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
0050	1 to 5 tons	G		4300	.013		3.82	.63	.35	4.80
0100	Over 5 tons	G		4600	.012		3.65	.59	.33	4.57
0300	Extrusions, over 5 tons, stock shapes	G		1330	.042		3.39	2.03	1.13	6.55
0400	Custom shapes	G	↓	1330	.042	↓	3.39	2.03	1.13	6.55

## 05 15 Wire Rope Assemblies

### 05 15 16 – Steel Wire Rope Assemblies

#### 05 15 16.05 Accessories for Steel Wire Rope

0010	<b>ACCESSORIES FOR STEEL WIRE ROPE</b>									
0015	Made from recycled materials	G								
1500	Thimbles, heavy duty, 1/4"	G	E-17	160	.100	in.	.51	5.05		5.56
1510	1/2"	G		160	.100		2.23	5.05		7.28
1520	3/4"	G		105	.152		5.05	7.65		12.70
1530	1"	G		52	.308		10.15	15.50		25.65
1540	1-1/4"	G		38	.421		15.60	21		36.60
1550	1-1/2"	G		13	1.231		44	62		106
1560	1-3/4"	G		8	2		90.50	101		191.50
1570	2"	G		6	2.667		132	134		266
1580	2-1/4"	G		4	4		178	201		379
1600	Clips, 1/4" diameter	G		160	.100		2.58	5.05		7.63
1610	3/8" diameter	G		160	.100		2.83	5.05		7.88
1620	1/2" diameter	G		160	.100		4.55	5.05		9.60
1630	3/4" diameter	G		102	.157		7.40	7.90		15.30
1640	1" diameter	G		64	.250		12.30	12.60		24.90
1650	1-1/4" diameter	G		35	.457		20	23		43
1670	1-1/2" diameter	G		26	.615		27	31		58
1680	1-3/4" diameter	G		16	1		63.50	50.50		114
1690	2" diameter	G		12	1.333		70.50	67		137.50
1700	2-1/4" diameter	G		10	1.600		104	80.50		184.50
1800	Sockets, open swage, 1/4" diameter	G		160	.100		43.50	5.05		48.55
1810	1/2" diameter	G		77	.208		62.50	10.45		72.95
1820	3/4" diameter	G		19	.842		97	42.50		139.50

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

## 01 21 Allowances

### 01 21 63 – Taxes

01 21 63.10 Taxes		Daily Crew	Labor-Output	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

01 31 13.20 FIELD PERSONNEL										
0010	CLERK, average			Week						
0020	Field engineer, minimum						420		420	650
0100	Average						995		995	1,550
0120	Maximum						1,300		1,300	2,000
0140	General purpose laborer, average						1,475		1,475	2,275
0160	Project manager, minimum						1,375		1,375	2,125
0180	Average						1,850		1,850	2,850
0200	Maximum						2,125		2,125	3,275
0220	Superintendent, minimum						2,425		2,425	3,750
0240	Average						1,800		1,800	2,775
0260	Maximum						1,975		1,975	3,050
0280	Timekeeper, average						2,250		2,250	3,475
0290							1,150		1,150	1,775

#### 01 31 13.30 Insurance

01 31 13.30 INSURANCE										
0010	Builders risk, standard, minimum	R013113-40		Job						.24%
0020	Maximum	R013113-50								.64%
0050	All-risk type, minimum									.25%
0200	Maximum	R013113-60								.62%
0250	Contractor's equipment floater, minimum			Value						.50%
0400	Maximum									1.50%
0450	Public liability, average			Job						2.02%
0600	Workers' compensation & employer's liability, average									
0800	by trade, carpentry, general			Payroll			14.96%			
0850	Cerical						.49%			
0900	Concrete						12.70%			
0950	Electrical						5.58%			
1000	Excavation						9.01%			
1050	Glazing						12.57%			
1100	Insulation						11.85%			
1150	Lathing						7.82%			
1200	Masonry						12.10%			
1250	Painting & decorating						10.70%			
1300	Pile driving						16.76%			
1350	Plastering						10.78%			
1400	Plumbing						6.91%			
1450	Roofing						28.83%			
1500	Sheet metal work (HVAC)						8.47%			
1550	Steel erection, structural						36.86%			
1600	Tile work, interior ceramic						8.01%			
1650	Waterproofing, brush or hand troweling						6.41%			
1700	Wrecking						30.43%			
1800	Range of 35 trades in 50 states, excl. wrecking, min.						1.80%			
2000										



# 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	Material	2012 Base Costs Labor	Equipment	Total	Total Incl O&P
<b>01 52 13.20 OFFICE AND STORAGE SPACE</b>									
0010									
0020									
0200									
0250									
0300									
0350									
0400									
0450									
0500									
0550									
0700									
0800									
0890									
0900									
0910									
0920									
1000									
1100									
1200									
1250									
1300									
1350									
5000									

### 01 52 13.40 Field Office Expense

<b>01 52 13.40 FIELD OFFICE EXPENSE</b>									
0010									
0100									
0120									
0125									
0140									
0160									

# 01 54 Construction Aids

## 01 54 09 – Protection Equipment

### 01 54 09.50 Personnel Protective Equipment

<b>01 54 09.50 PERSONNEL PROTECTIVE EQUIPMENT</b>									
0010									
0015									
0020									
0030									
0040									
0050									
0060									
0100									
0110									
0150									
0160									
0200									
0210									
0300									
0310									
0320									
0400									
0410									

**01 54 | Construction Aids**

<b>01 54 33   Equipment Rental</b>		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	105
	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	25.20
	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	5.30
	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	66.80
	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	Tam 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	63.30
	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		Daily	Labor-			2012 Base Costs			Total
0500	Wood frame	Crew	Output	Hours	Unit	Material	Labor	Equipment	Incl O&P
0500	Wood frame	B-3	247	.194	C.Y.		7.25	9.20	16.45
<b>02 41 19.19 Selective Facility Services Demolition</b>									
0010	<b>SELECTIVE FACILITY SERVICES DEMOLITION, Rubbish Handling</b> 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
0440	30" diameter	"	30	.800	"	46.50	28.50		75
0600	Dumpster weekly rental, 1 dump/week, 6 C.Y. capacity (2 Tons)				Week	460			460
0700	10 C.Y. capacity (3 Tons)					535			535
0725	20 C.Y. capacity (8 Tons) R024119-20					630			630
0800	30 C.Y. capacity (7 Tons)					810			810
0840	40 C.Y. capacity (10 Tons)					860			860
2000	Load, haul, dump and return, 50' haul, hand carried	2 Clab	24	.667	C.Y.		23.50		23.50
2005	Wheeled		37	.432			15.20		15.20
2040	51' to 100' haul, hand carried		16.50	.970			34		34
2045	Wheeled		25	.640			22.50		22.50
2080	Over 100' haul, add per 100 L.F., hand carried		35.50	.451			15.80		15.80
2085	Wheeled		54	.296			10.40		10.40
2120	In elevators, per 10 floors, add		140	.114			4.01		4.01
2130	Load, haul, dump and return, up to 50' haul, incl. up to 5 riser stair, hand		23	.696			24.50		24.50
2135	Wheeled		35	.457			16.05		16.05
2140	6 - 10 riser stairs, hand carried		22	.727			25.50		25.50
2145	Wheeled		34	.471			16.50		16.50
2150	11 - 20 riser stairs, hand carried		20	.800			28		28
2155	Wheeled		31	.516			18.10		18.10
2160	21 - 40 riser stairs, hand carried		16	1			35		35
2165	Wheeled		24	.667			23.50		23.50
2170	100' haul, incl. 5 riser stair, hand carried		15	1.067			37.50		37.50
2175	Wheeled		23	.696			24.50		24.50
2180	6 - 10 riser stair, hand carried		14	1.143			40		40
2185	Wheeled		21	.762			26.50		26.50
2190	11 - 20 riser stair, hand carried		12	1.333			47		47
2195	Wheeled		18	.889			31		31
2200	21 - 40 riser stair, hand carried		8	2			70		70
2205	Wheeled		12	1.333			47		47
2210	Over 100' haul, add per 100 L.F., hand carried		35.50	.451			15.80		15.80
2215	Wheeled		54	.296			10.40		10.40
2220	For each additional flight of stairs, up to 5 rises, add		550	.029	Flight		1.02		1.02
2225	6 - 10 risers, add		275	.058			2.04		2.04
2230	11 - 20 risers, add		138	.116			4.07		4.07
2235	21 - 40 risers, add		69	.232			8.15		8.15
3000	Loading & trucking, including 2 mile haul, chute loaded	B-16	45	.711	C.Y.		25.50	13	38.50
3040	Hand loading truck, 50' haul	"	48	.667			24	12.20	36.20
3080	Machine loading truck	B-17	120	.267			10	5.75	15.75
5000	Haul, per mile, up to 8 C.Y. truck	B-34B	1165	.007			.24	.50	.74
5100	Over 8 C.Y. truck	"	1550	.005			.18	.38	.56
<b>02 41 19.20 Selective Demolition, Dump Charges</b>									
0010	<b>SELECTIVE DEMOLITION, DUMP CHARGES</b> R024119-10								
0020	Dump charges, typical urban city, tipping fees only								
0100	Building construction materials				Ton	82			82
0200	Trees, brush, lumber					70			70
0300	Rubbish only					70			70
0500	Reclamation station, usual charge					82			82



# 01 45 Quality Control

## 01 45 23 – Testing and Inspecting Services

01 45 23.50 Testing		Daily Crew	Output	Labor-Hours	Unit	Material	2012 Bare Costs		Total	Total Ind O&P
							Labor	Equipment		
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, ASTM D 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 los, average 2,000 S.F.				"					500

# 01 51 Temporary Utilities

## 01 51 13 – Temporary Electricity

### 01 51 13.80 Temporary Utilities

01 51 13.80 TEMPORARY UTILITIES		Daily Crew	Output	Labor-Hours	Unit	Material	2012 Bare Costs		Total	Total Ind O&P
							Labor	Equipment		
0100	TEMPORARY UTILITIES									
0100	Heat, incl. fuel and operation, per week, 12 hrs. per day	1 Skwk	100	.080	CSF Fr	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		5.95	24.50		30.25	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

		Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs		Total	Total Incl O&P
							Labor	Equipment		
<b>01 31 13.30 Insurance</b>										
2100	Average				Payroll		13.70%			
2200	Maximum				↓		124.10%			
<b>01 31 13.40 Main Office Expense</b>										
0010	<b>MAIN OFFICE EXPENSE</b> 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%
<b>01 31 13.50 General Contractor's Mark-Up</b>										
0010	<b>GENERAL CONTRACTOR'S MARK-UP</b> 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%
<b>01 31 13.60 Installing Contractor's Main Office Overhead</b>										
0010	<b>INSTALLING CONTRACTOR'S MAIN OFFICE OVERHEAD</b>									R013113-50
0020	As percent of direct costs, minimum				%					5%
0050	Average									13%
0100	Maximum				↓					30%
<b>01 31 13.80 Overhead and Profit</b>										
0010	<b>OVERHEAD &amp; PROFIT</b> 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%
<b>01 31 13.90 Performance Bond</b>										
0010	<b>PERFORMANCE BOND</b>									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

Code	Description	Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs			Total Incl O&P
							Labor	Equipment	Total	
0010	<b>SCHEDULING</b>									
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

Code	Description	Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs			Total Incl O&P
							Labor	Equipment	Total	
0010	<b>PHOTOGRAPHS</b>									
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									
0500	Aerial photos, initial fly-over, 6 shots, 1 print ea., 8" x 10"					5.30			5.30	5.85
0550	11" x 14" prints					845			845	925
0600	16" x 20" prints					1,025			1,025	1,125
0700	For full color prints, add					1,200			1,200	1,325
0750	Add for traffic control area					40%				40%
0900	For over 30 miles from airport, add per					305			305	335
1000	Vertical photography, 4 to 6 shots with				Mile	5.45			5.45	6
1010	different scales, 1 print each									
1500	Time lapse equipment, camera and projector, buy				Set	1,125			1,125	1,225
1550	Rent per month					845			845	930
1700	Cameraman and film, including processing, B.&W.					305			305	335
1720	Color				Day	1,375			1,375	1,525
					"	1,375			1,375	1,525

## 01 41 Regulatory Requirements

### 01 41 26 – Permit Requirements

#### 01 41 26.50 Permits

Code	Description	Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs			Total Incl O&P
							Labor	Equipment	Total	
0010	<b>PERMITS</b>									
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

Code	Description	Crew	Daily Output	Labor-Hours	Unit	Material	2012 Bare Costs			Total Incl O&P
							Labor	Equipment	Total	
0010	<b>TESTING and Inspecting Services</b>									
0015	For concrete building costing \$1,000,000, minimum				Project				4,725	5,200
0020	Maximum									
0050	Steel building, minimum								38,000	41,800
0070	Maximum								4,725	5,200
0100	For building costing, \$10,000,000, minimum								14,800	16,300
0150	Maximum								30,100	33,100
0200	Asphalt testing, compressive strength Marshall stability, set of 3								48,200	53,000
0220	Density, set of 3				Ea.				145	165
0250	Extraction, individual tests on sample								86	95
									136	150



# Appendix D: Existing LEED Scorecard

3		Y		?		N		Materials and Resources, Continued		
<b>Sustainable Sites</b>		Possible Points: 26						Possible Points: 15		
Y	1	Prereq 1	Construction Activity Pollution Prevention					Credit 4	Recycled Content	1 to 2
		Credit 1	Site Selection					Credit 5	Regional Materials	1 to 2
		Credit 2	Development Density and Community Connectivity					Credit 6	Rapidly Renewable Materials	1
		Credit 3	Brownfield Redevelopment					Credit 7	Certified Wood	1
		Credit 4.1	Alternative Transportation—Public Transportation Access					<b>Indoor Environmental Quality</b>		
		Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms					2		
		Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles					Prereq 1	Minimum Indoor Air Quality Performance	
		Credit 4.4	Alternative Transportation—Parking Capacity					Prereq 2	Environmental Tobacco Smoke (ETS) Control	
		Credit 5.1	Site Development—Protect or Restore Habitat					Credit 1	Outdoor Air Delivery Monitoring	1
		Credit 5.2	Site Development—Maximize Open Space					Credit 2	Increased Ventilation	1
		Credit 6.1	Stormwater Design—Quantity Control					Credit 3.1	Construction IAQ Management Plan—During Construction	1
		Credit 6.2	Stormwater Design—Quality Control					Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
		Credit 7.1	Heat Island Effect—Non-roof					Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
		Credit 7.2	Heat Island Effect—Roof					Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
		Credit 8	Light Pollution Reduction					Credit 4.3	Low-Emitting Materials—Flooring Systems	1
								Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
6								Credit 5.1	Indoor Chemical and Pollutant Source Control	1
<b>Water Efficiency</b>		Possible Points: 10						Credit 6.1	Controllability of Systems—Lighting	1
Y	4	Prereq 1	Water Use Reduction—20% Reduction					Credit 6.2	Controllability of Systems—Thermal Comfort	1
		Credit 1	Water Efficient Landscaping					Credit 7.1	Thermal Comfort—Design	1
		Credit 2	Innovative Wastewater Technologies					Credit 7.2	Thermal Comfort—Verification	1
		Credit 3	Water Use Reduction					Credit 8.1	Daylight and Views—Daylight	1
								Credit 8.2	Daylight and Views—Views	1
<b>Energy and Atmosphere</b>		Possible Points: 35						<b>Innovation and Design Process</b>		
Y	1	Prereq 1	Fundamental Commissioning of Building Energy Systems					1		Possible Points: 6
Y	1	Prereq 2	Minimum Energy Performance					Credit 1.1	Innovation in Design: Specific Title	1
Y	1	Prereq 3	Fundamental Refrigerant Management					Credit 1.2	Innovation in Design: Specific Title	1
		Credit 1	Optimize Energy Performance					Credit 1.3	Innovation in Design: Specific Title	1
		Credit 2	On-Site Renewable Energy					Credit 1.4	Innovation in Design: Specific Title	1
		Credit 3	Enhanced Commissioning					Credit 1.5	Innovation in Design: Specific Title	1
		Credit 4	Enhanced Refrigerant Management					Credit 2	LEED Accredited Professional	1
		Credit 5	Measurement and Verification					<b>Regional Priority Credits</b>		
		Credit 6	Green Power					4		Possible Points: 4
<b>Materials and Resources</b>		Possible Points: 14						Credit 1.1	Regional Priority: Specific Credit	1
Y	1	Prereq 1	Storage and Collection of Recyclables					Credit 1.2	Regional Priority: Specific Credit	1
		Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof					Credit 1.3	Regional Priority: Specific Credit	1
		Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements					Credit 1.4	Regional Priority: Specific Credit	1
		Credit 2	Construction Waste Management					<b>Total</b>		
		Credit 3	Materials Reuse					12		Possible Points: 110
								Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110		



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
			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
			c	Credit 3	Enhanced Commissioning	2
			d	Credit 4	Enhanced Refrigerant Management	2

Notes:

N		
N		

C Credits 5 Measurement and Verification  
 C Credit 6 Green Power

3  
2



0 0 0

Possible Points: 14

Materials and Resources

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





# LEED 2009 for New Construction and Major Renovations Project Checklist

Northeastern Pennsylvania Office Building

8	0	0	0
---	---	---	---

Y ? N d/C

Y	?	N	d/C	Points
Y				1
1		N		5
		N		1
2				6
1				1
		N		3
2				2
		N		1
		N		1
1				1
		N		1
		N		1
1				1
		N		1

Possible Points: 26

Notes:

8	0	0	0
---	---	---	---

Y ? N

Y	?	N	Points
Y			2 to 4
4			2
			4
2			2
2			2 to 4
			2
			3
			4

Possible Points: 10

Notes:

17	0	0
----	---	---

**Energy and Atmosphere**

Possible Points: 35

Notes:

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
					Improve by 12% for New Buildings or 8% for Existing Building Renovations
					Improve by 14% for New Buildings or 10% for Existing Building Renovations
					Improve by 16% for New Buildings or 12% for Existing Building Renovations
					Improve by 18% for New Buildings or 14% for Existing Building Renovations
					Improve by 20% for New Buildings or 16% for Existing Building Renovations
					Improve by 22% for New Buildings or 18% for Existing Building Renovations
					Improve by 24% for New Buildings or 20% for Existing Building Renovations
					Improve by 26% for New Buildings or 22% for Existing Building Renovations
					Improve by 28% for New Buildings or 24% for Existing Building Renovations
					Improve by 30% for New Buildings or 26% for Existing Building Renovations
					Improve by 32% for New Buildings or 28% for Existing Building Renovations
					Improve by 34% for New Buildings or 30% for Existing Building Renovations
					Improve by 36% for New Buildings or 32% for Existing Building Renovations
					Improve by 38% for New Buildings or 34% for Existing Building Renovations
					Improve by 40% for New Buildings or 36% for Existing Building Renovations
					Improve by 42% for New Buildings or 38% for Existing Building Renovations
					Improve by 44% for New Buildings or 40% for Existing Building Renovations
					Improve by 46% for New Buildings or 42% for Existing Building Renovations
					Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations
5			d	Credit 2	On-Site Renewable Energy
					1% Renewable Energy
					3% Renewable Energy
					5% Renewable Energy
					7% Renewable Energy
					9% Renewable Energy
					11% Renewable Energy
					13% Renewable Energy
2			c	Credit 3	Enhanced Commissioning
2			d	Credit 4	Enhanced Refrigerant Management

1 to 19

1 to 7

3		
		N

C Credit 5 Measurement and Verification  
 C Credit 6 Green Power

3  
2







6	0	0	0
---	---	---	---

**Indoor Environmental Quality**

Possible Points: 15

Y	?	N		
			d	Preq 1 Minimum Indoor Air Quality Performance
Y			d	Preq 2 Environmental Tobacco Smoke (ETS) Control
Y			d	Credit 1 Outdoor Air Delivery/Monitoring
1		N	d	Credit 2 Increased Ventilation
		N	c	Credit 3.1 Construction IAQ Management Plan—During Construction
		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
		N	d	Credit 5 Indoor Chemical and Pollutant Source Control
		N	d	Credit 6.1 Controllability of Systems—Lighting
1		N	d	Credit 6.2 Controllability of Systems—Thermal Comfort
		N	d	Credit 7.1 Thermal Comfort—Design
	?	N	d	Credit 7.2 Thermal Comfort—Verification
		N	d	Credit 8.1 Daylight and Views—Daylight
		N	d	Credit 8.2 Daylight and Views—Views

Notes:

1	0	0	0
---	---	---	---

**Innovation and Design Process**

Possible Points: 6

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

Notes:

0	0	0	0
---	---	---	---

**Regional Priority Credits**

Possible Points: 4

Y	?	N		
		N	d/C	Credit 1.1 Regional Priority: Specific Credit
		N	d/C	Credit 1.2 Regional Priority: Specific Credit
		N	d/C	Credit 1.3 Regional Priority: Specific Credit
		N	d/C	Credit 1.4 Regional Priority: Specific Credit

Notes:

41	0	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