Submission Category: Construction Management

Date: 14 December 2012

I. Summary Narrative

A. Table of Contents / Introduction

The construction management portion of this project encompasses the three design engineering disciplines. The construction managers were tasked with ensuring an integrated building design that addressed the delivery method, project planning, budget, and schedule. This integration began by developing a BIM Execution Plan, which helped define team dynamics. For further explanation of this, please see the Introduction section on Page 2.

The construction delivery method proposed for this project meets Pennsylvania state regulations that the construction manager must act as an agent and not hold any contracts. Nexus proposes utilizing 17 subcontractors. The four prime or major subcontractors will be the general works, concrete, mechanical and plumbing, and electrical contractors. For further explanation on the delivery method, please see Page 5.

The project planning portion of this project is largely composed of site logistics planning during and after construction. The site logistics plans developed for construction show how the various trades will be able to easily flow on site from one task to another. The new site plan shows how the building was repositioned to the center of the northern half of the site to accommodate space for the pool. For further explanation on site logistics, please see Page 7.

For most construction projects, the budget is usually the first item defined during the feasibility study and programming phases. Based on PlanCon funding limits for elementary schools, the state funding would total $5,297,230[1] (see Appendix H). As local funding will be low due to the economic status of Reading, this state allocation will be welcome and help the community construct a school that can be used by all local residents, not just the elementary students. Thus, Nexus proposes a $195 cost per square foot and total project cost of $17.5 million. For further cost justifications, please see Page 5, and a more detailed breakdown in Appendix E.

Nexus plans for the new school to be built in 15 months. This fast track project must start immediately following the end of the 2013-2014 school year (June 9, 2014) and continue throughout the following school year (2014-2015), and finally end before the subsequent academic year commences (August 21, 2015). For more details on the total project schedule, please see Page 7, and Appendix F.

B. Summary Narrative

1. Executive Summary

Introduction

The inception of this project involved understanding the given data and information regarding the new elementary school in Reading, Pennsylvania. As the team coordinators, the construction managers developed a BIM Execution Plan to help all four disciplines integrate their systems. This execution plan specifically defines the roles to be fulfilled by the construction managers, structural engineers, mechanical engineers, and lighting/electrical engineers (see Appendix A). In addition, it defines the information exchanges between the four disciplines, and what information is needed by and for each discipline to allow Nexus' design to progress (see Appendix A).

Outlining objectives and goals was necessary to facilitate each discipline's ability to work independently and produce their respective system designs. By defining these goals, each of Nexus' disciplines had a mutual understanding of the expectations of the team's final product. This prevented the team from having to perform rework, extra work, and duplicate work. Increasing the team's efficiency and effectiveness was critical throughout this project for each discipline to meet the several interim submissions scheduled by Nexus. Thus, the construction managers' time spent planning in the early phases of this competition's project facilitate more productive team communication and progress meetings. Thus, the interrelatedness of Nexus' building systems reduces redundancy and enhances the architecture of the school building (See Image 1).

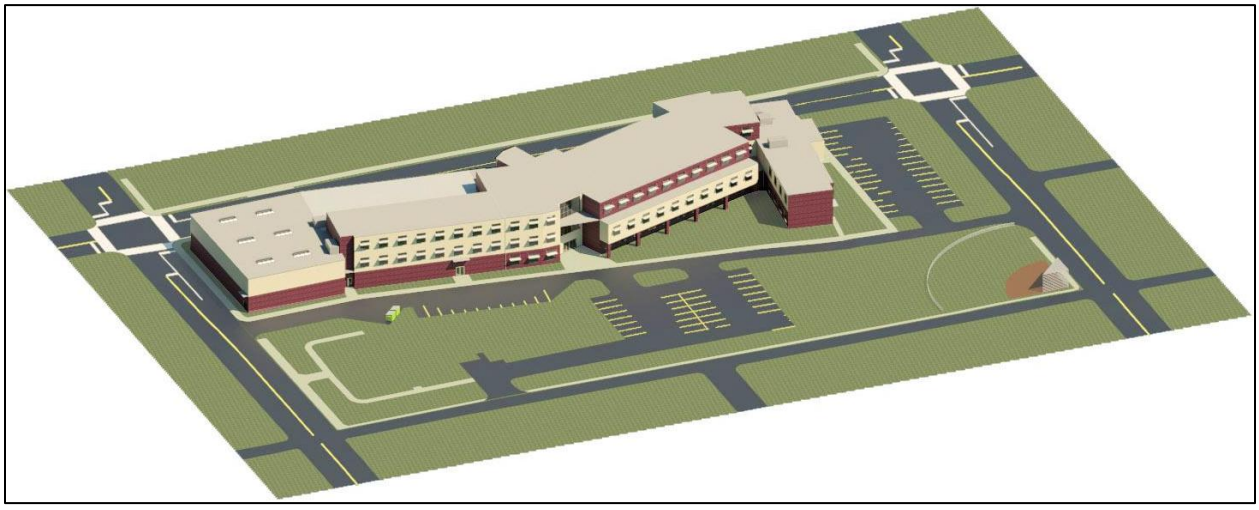


Image 1: Final Building Rendering (existing building not shown for clarity of the new design)

Owner Goals

Nexus defined several owner objectives for the construction of Reading School District's new elementary school. Nexus was able to meet these objectives through team-defined project goals and individual discipline goals. The objectives can be lumped into three categories, as seen in Table 1.

Reading School District's Objectives
Safety and Security
Lifecycle and Maintenance
Cost Effectiveness

Table 1: Owner Objectives

First, safety is a concern for Reading School District, the parents in the community, and most importantly the students of the district. By increasing the safety on the elementary school campus, students feel more comfortable and willing to come to school. As a result, student attendance rates are expected to rise with Nexus' design. In addition, having a sense of 'unseen' security will enhance the feeling of safety in the new building.

Second, Reading School District desires a building that can endure for 100 years. Yet, this building must be adaptable and flexible with new emerging technologies, learning styles, and teaching techniques. The integration of the community into the use of the building will increase wear and tear on the finish materials. The flexibility of the spaces designed into the building help increase its lifecycle while the systems selected reduce the need for routine maintenance.

Third, Reading School District wants a building that is both cost effective in the short term, but also cost efficient in the long term. The city of Reading is economically disadvantaged and therefore will not independently have the necessary funds to support the construction of a new elementary school. Moreover, they receive little state and federal funding due to the poor testing performance of their students. By reducing initial cost, and maintaining a low life-cycle (operations and maintenance) cost, Reading will be able to afford a new elementary school now and in the future. Nexus' building system and material selections alleviate first costs, while helping keep future cost low.

Nexus Goals

Nexus' project goals help achieve the owner objectives and are supported by the individual discipline goals. Nexus' project goals can also be lumped into three main categories, as seen in Table 2.

Nexus' Project Goals
Integration
Lean Practices
Learning Tool

Table 2: Nexus' Project Goals

First, integration is the all-encompassing goal of meeting the owner's objectives. Integration involves not only team work and collaboration, but also the integration of the building systems and components. As the main theme of the architecture of the building was already established, Nexus focused on integrating

the structural, mechanical, and electrical aspects of the building through predefined discipline goals and established information exchanges.

Second, this holistic building integration was produced through lean practices. These lean practices include reduce, reuse, recover. Reduce, reuse, recover involves all disciplines, specifically construction management through less construction waste, a shorter construction schedule, and sustainable materials.

Third, Nexus desired to create a building that could be used as a learning tool for the end users. The building has exposed ceilings, painted and exposed structural, mechanical, and electrical elements, along with an exterior façade and site that can be used as teaching tools. All of these items were coordinated through extensive planning and team performance requirements.

Project Goals / Requirements

To reinforce the project goals, and meet the owner objectives, the construction management team also defined three goals for the construction discipline. The decisions made in the narrative and rationale section below were all based off of these goals and the support they provided to the project goals and how they met the owner objectives (see Table 3).

Construction Management Goals
Efficiency
Lifecycle
Cost Advantage

Table 3: Construction Management Goals

First, efficiency incorporates the lifecycle and cost advantage by teaching the owner to use the building and its systems as they were designed to reap the full potential of the system's respective attributes. However, for construction, this is best evidenced through the construction process explained in this report. The total project schedule explains the importance of planning in the early stages of project conception to help reduce actual construction time on site, which, as a result, reduces disturbances to the neighborhood and existing school on site.

Second, lifecycle is accomplished through material and building system selection and maintainability. Moreover, maintaining the existing elementary school and allowing Reading School District to use it as they deem appropriate in the future is a lifecycle choice. This building, without the daily foot-traffic of hundreds of elementary school students, will last longer and can be utilized for ancillary district needs.

Third, cost advantage comes from value engineering principles implemented through building material and system selection, construction labor costs, schedule sequencing, and lifecycle analyses. Cost advantage assists in finding the comfortable medium between first cost and lifecycle costs.

2. Narrative Description of Systems / Solutions

Reading School District is one of the least affluent school districts in Pennsylvania. The state average for dollars allocated to each student is $14,535, whereas Reading only allocates $12,989 per student. The vast majority (84%) of Reading's educational revenue comes from state and federal revenue. Only 12% of the district's educational revenue flows from local funding[2]. Reading's economic situation had a major impact on the projected cost budget for the project and ultimately Nexus' design. Luckily, with over five million dollars coming from the state, the new elementary school will be less of a burden on the local residents. (see Page 10) With the unique aspects Nexus incorporated into the school, the community will have the benefit of a recreational multi-purpose space which also functions as an auditorium, a 24-hour health center, and classroom space open for night learning.

Reading School District's students consistently underperform in comparison to their Pennsylvania counterparts[2]. This may be a product of the fact that they are not allocated the same resources as their counterparts. Or, the environment in which they learn may have an impact on how they perform. Thus, Nexus strove to design a cost effective building which encourages students to attend class and creates an environment which is conducive to each student's individual learning style. Nexus' plans for this educational environment are detailed through its building systems and functional use of learning spaces.

Reading School District's new 89,500 square foot elementary school will be built with the aid of several local contractors. With both state and local funding, the innovative learning facility will be constructed under the Construction Manager Agent with multi-prime contractors delivery method (see Appendix B). This is a form of the standard design-bid-build delivery method. The construction management agent will act as the school district's advocate throughout the preconstruction and construction processes. However, the construction manager will not be responsible (own) any of the subcontracts on the project. Thus, the school district will incur the risks associated with the contracts.

The two largest preconstruction endeavors involve schedule and cost estimations. For this project, Nexus determined that the construction schedule will start in early June immediately after school adjourns for the summer. Construction must then be completed by the end of the following August, approximately 15 months later. Thus, early schedule estimates show that the design phase of the project will need to start in September 2012.

The construction manager will be responsible for overseeing all of the preconstruction and construction efforts. The preconstruction efforts encompass preliminary cost estimates, schedule projections, risk and constructability analyses. Additionally, the construction manager may define project execution guidelines and work flow interchanges. The work flow interchanges will most likely be managed through an internet-based project management document system. These documents include construction drawings, shop drawings, change

order requests, change orders, request for information, cost accounting reports, architectural supplementary information, and additional information. Next, the construction manager will begin with site investigation, verifying the geotechnical report discoveries, utility tie-in points, along with obtaining necessary construction permits from local jurisdictions. Moreover, the construction manager will develop a sustainability work plan with explicit strategies that will reinforce Reading School District's emphasis on addressing energy conservation and environmentalism in the new school.

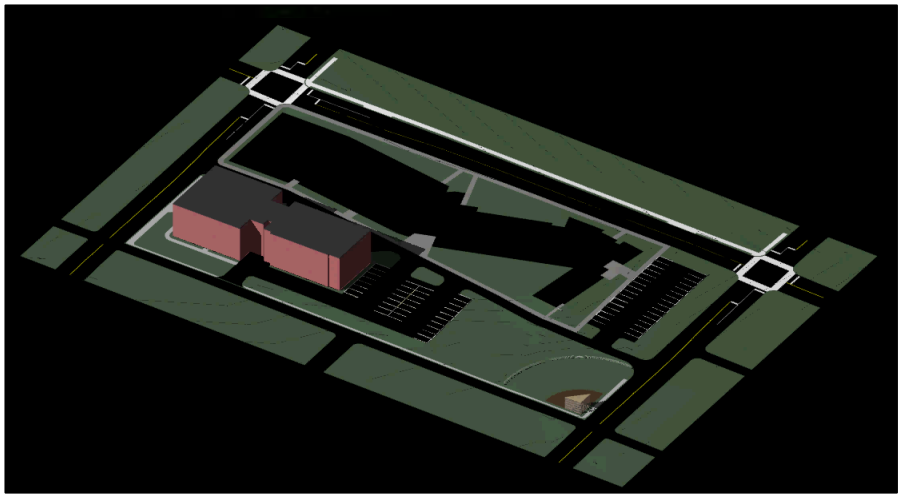
At this junction, the construction manager typically analyzes the design and engineering aspects of the building and determines the 15 month construction schedule. Thereafter, the construction manager will develop a cost estimate for the entire project. Then, after writing scopes of work, they will develop an estimate for each work scope. Once a bid schedule for the entire project is defined, the construction manager will send out invitations to bid to qualified subcontractors, with an emphasis on local contractors. Once bids are received in March 2014, the construction manager will conduct scope reviews of the subcontractors' bids and select the lowest bidder for each scope (based on Pennsylvania state regulations for public school project that receive federal, state, and local funding). The school district, as the owner of the subcontracts, will award and hold the subcontracts throughout the entirety of the project.

Long Lead Items
Steel Mill Order
Insulated Concrete Form Order
Concrete Order
Sheetmetal Order
Mechanical Units and Equipment

Table 4: Lead Items identified by Nexus

It is important to note that while writing scopes of work, the construction manager must identify, with the architect and engineers, long lead items (see Table 4). It is necessary for the respective subcontractors to order these items so that they are delivered to the site and installed on time. These requirements are normal on most projects, but even more so on this project as 89,500 square feet needs to be constructed in 15 months. The next step involves submittals. The construction manager will need to require the subcontractors to have all submittals approved before construction starts in June 2014. Having the submittals approved will help ensure all lead times are met and construction begins on the schedule mobilization date (June 9, 2014).

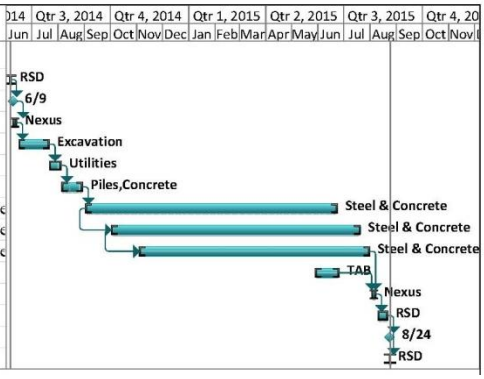
As stated above, with the scopes of work defined, a bid schedule will be developed. This schedule will be utilized to hold the subcontractors to dates they bid based on their respective scopes of work (see Appendix F). The sequencing of the schedule was in conjunction with developing a 4-dimensional model in Navisworks (See Figure 1). To develop this model, a 3-dimensional model was imported from Revit. The Revit model incorporated architectural, structural, mechanical, plumbing, and lighting / electrical aspects. The Navisworks model was utilized for schedule, sequencing, constructability, and clash-detection purposes. Thus, the Navisworks model was the greatest tool to show systems integration and team collaboration.



The last day of the 2013-2014 Reading School District academic year is Friday, June 6, 2014. On Monday, June 9, 2014, the construction manager will be given a Notice to Proceed. This first major construction milestone means that the site is ready to be mobilized.

Figure 1: Navisworks model showing new elementary school footprint on site

ID	Task Name	Duration	Start	Finish	Resource Names
1	**Construction**				
2	*Last Day of School*	1 day	Fri 6/6/14	Fri 6/6/14	RSD
3	*Notice to Proceed*	0 days	Mon 6/9/14	Mon 6/9/14	Nexus
4	*Mobilization*	5 days	Mon 6/9/14	Fri 6/13/14	Nexus
5	Excavation	25 days	Mon 6/16/14	Mon 7/21/14	Excavation
6	Utilities	10 days	Tue 7/22/14	Mon 8/4/14	Utilities
7	Foundation	19 days	Tue 8/5/14	Fri 8/29/14	Piles,Concrete
8	First Floor	205 days	Tue 9/2/14	Tue 6/23/15	Steel & Concrete
9	Second Floor	202 days	Thu 10/2/14	Mon 7/20/15	Steel & Concrete
10	Third Floor	188 days	Tue 11/4/14	Fri 7/31/15	Steel & Concrete
11	Commissioning	20 days	Fri 5/29/15	Thu 6/25/15	TAB
12	Demobilization	5 days	Mon 8/3/15	Fri 8/7/15	Nexus
13	FF&E	10 days	Mon 8/10/15	Fri 8/21/15	RSD
14	*Substantial Completion*	0 days	Mon 8/24/15	Mon 8/24/15	Nexus
15	*First Day of School*	1 day	Mon 8/24/15	Mon 8/24/15	RSD



Schedule: Construction Milestone Schedule

Continuing with the theme of the schedule meeting Nexus' project goals, the site logistics plans meet Nexus' team goals of integration and sustainability and the school district's objectives of safety, accessibility, flexibility, and cost benefit (see Appendix D). To begin, the site logistics plan encompasses the entire project site, surrounding roads, and the existing elementary school on site (see Figure 2). First, it is imperative to notice the new elementary school was repositioned to the center of the top of the site. This was due in large part to accommodate room for the pool on the west end. The baseball field proportions were not affected, thus maintaining the existing playground area. As seen in the final site plan for the finished building, the parking area in the northeast corner was reduced in size due to the building moving east. This displaced parking was moved to a new central lot, increasing the size of the existing lot. The bus lane will remain one way, with traffic progressing from west to east.

Experience

Prior to creating a learning environment, safety had to be established. Reading is near the top of the crime rate list in Pennsylvania, so Nexus focused heavily on the importance of

maintaining the safety and security of the students. In order to maintain the secure feel Nexus turned the educational campus in on itself to shelter the students (see Figure 3). This inward turn created a large group congregation space on the inside of the campus. This area allows students to congregate away from the main roads and the dangers of the community.

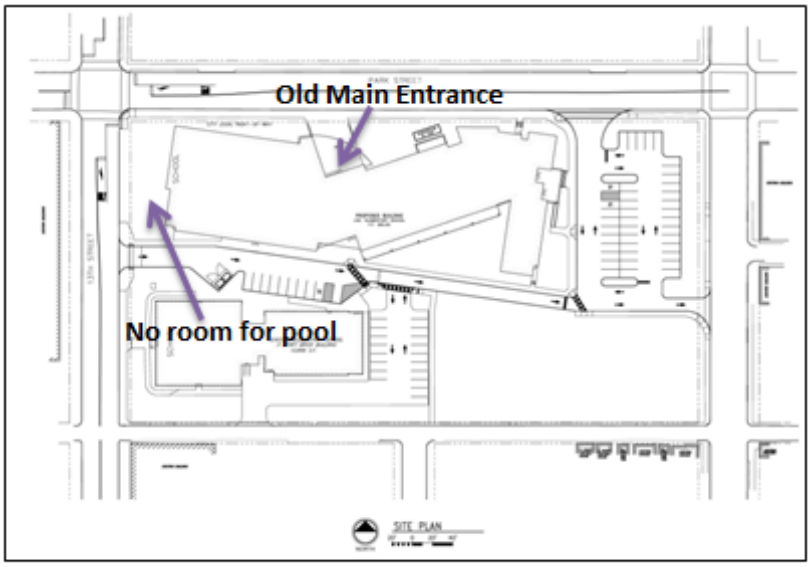


Figure 2: Site plan provided by AEI Competition

Community

Even though Nexus believes it is not in the district's best interest to build a swimming pool at this point in time, the pool has been designed and incorporated into the project as best as possible. The pool sits on the west end of the site and shares a wall with the gymnasium and a stairwell. The building was shifted towards the east end of the site in order to accommodate

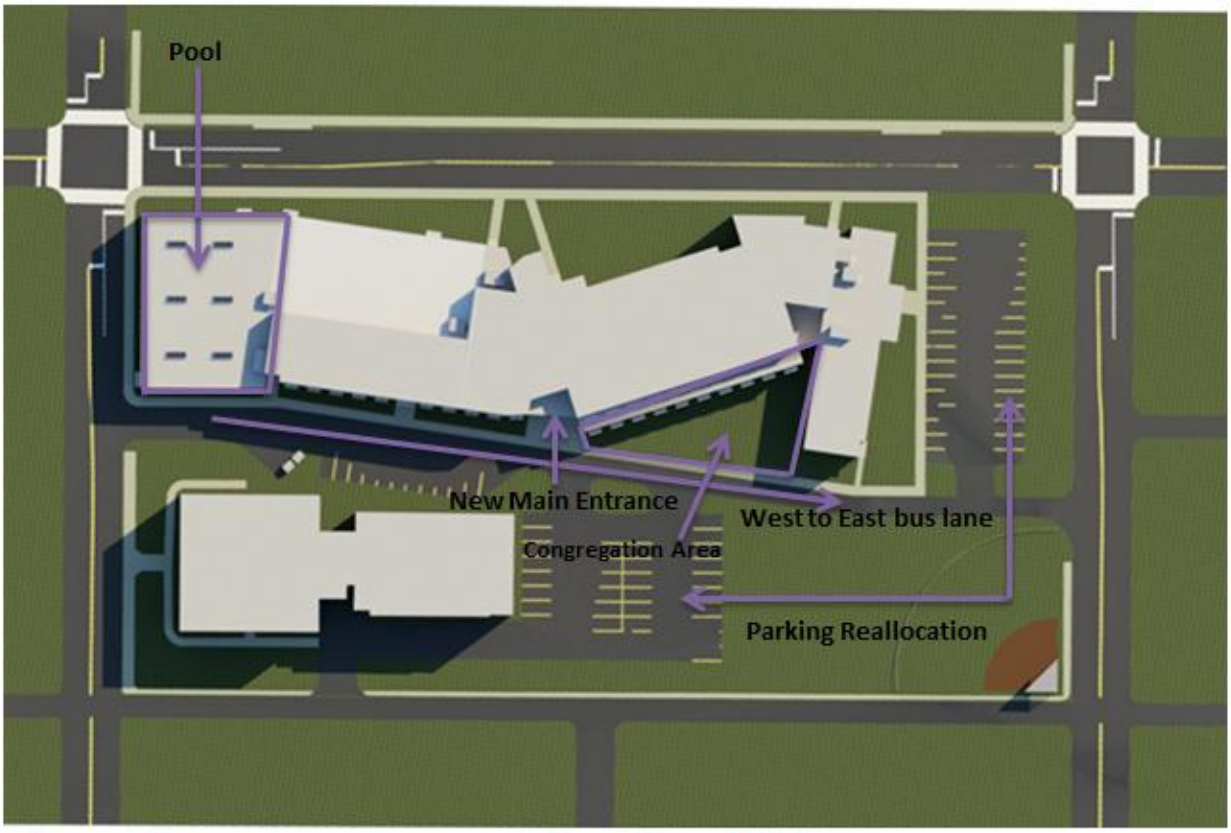


Figure 3: Nexus site plan (building moved east, parking reallocated, pool addition)

the pool. The pool's mechanical, structural and electrical systems are all independent of the rest of the school building to allow for a second phase potential. The projected cost of the pool is $2.5 million which increases the cost per square foot of the school from $195/SF to $223/SF (see Appendix E). If Reading chooses not to build the pool, the building will stay shifted to the east to provide a small safety buffer between 13th Street and the building. This will also allow for the necessary space to build a pool in the future.

Education

Material selection was heavily driven by the theme of using the building as a learning tool (See Image 2). Creating a very visible structure and mechanical system can be used to help better educate the students. Using high impact gypsum wall board on metal studs as opposed to concrete block is another way Nexus tried to soften the environment in which students learn.

The maintenance aspect of the district's objectives involves the flexibility of the school's multiple spaces. Gypsum wall board on metal stud allows the owner to more easily change the layout of classrooms and other spaces. There is minimal lateral cross bracing so it would be conceivable to remove a wall and turn two classrooms into one larger classroom. The open ceiling plane also allows for the mechanical or lighting layouts to be changed much more easily. Excluding a drop ceiling also allows for future telecommunication or electrical cables to be run, accommodating new technology. The floors of the classrooms have been selected as carpet tile so that when accidents happen there is minimal maintenance and floor tiles can easily be replaced.

Image 2: Example classroom with finishes, furnishings, and equipment

There is also an economical benefit to many of these material selections. The material and labor costs associated with a drop ceiling (not included in the classrooms) become direct savings to the owner and provide all the benefits denoted above. By simply using finished concrete for the flooring in the hallway saves on finishes and labor as well, while not sacrificing aesthetics. These are all upfront cost savings which are imperative to meeting Reading's budget.

The overhangs / lightshelves are also an important part of another one of Nexus' goals - the reduction of lifecycle costs. Reducing direct light from entering the classrooms helps create a better learning environment and reduces the amount of solar heat gain. Reducing solar gain helps to cut down on the use of the mechanical system and ultimately reduces the energy consumption of the building and saves Reading School District money. In the case of the lobby, an abundant amount of glazing allows light into the atrium space. This helps to illuminate the lobby and hallways and reduces the need for luminaires in these spaces. This is a savings of both upfront costs and lifecycle costs.

3. Rationale for System Selections and Solutions

Another aspect of the delivery method for this project involves the subcontractors. Pursuant to Pennsylvania contract law, as previously stated, based on Pennsylvania state regulations for public school projects that receive state and local funding, there must be a minimum of four prime contractors. These prime contractors will most likely be defined as a general works subcontractor, concrete subcontractor, mechanical and plumbing subcontractor, and electrical subcontractor. The list below is a general overview of each subcontractor's scope of work.

- General Works - $1,800,000
  - metal stud interior partitions; gypsum wallboard; casework; finishes; painting; exterior and interior doors; retractable wall systems in gymnasium and stage
- Concrete - $2,425,000
  - footers; pile caps / column piers; insulated concrete forms; cast-in-place concrete walls; slab-on-decks; slab-on-grades
- Mechanical and Plumbing - $4,120,000
  - mechanical equipment and units; sheetmetal; piping; domestic and sanitary piping; diffusers, registers, grilles
- Electrical - $1,575,000
  - electrical equipment; transformers; switchgear; utility connections; conduit; wiring; fixtures; luminaires
- Data - $350,000
  - cable trays; data and telecommunication wiring; data and telecommunication devices
- Excavation - $400,000
  - soil excavation; hauling offsite; disposal of contaminated soil
- Utilities - $125,000
  - Underground utility runs and connections
- Piles - $200,000
  - steel-driven piles
- Structural Steel - $1,275,000

  - structural steel members (HSS columns and lateral bracing); wide-flange girders and beams; joists; trusses; truss braces; metal decking; shear studs
- Roofing - $700,000
  - built-up white membrane roofing
- Curtain Wall - $300,000
  - curtain wall elements in classroom spaces; aluminum panel exterior cladding
- Masonry - $1,400,000
  - concrete masonry unit infill walls; face-brick exterior cladding
- Glazing - $850,000
  - glazing elements
- Carpet - $200,000
  - carpet tiles in the classroom spaces
- Flooring - $300,000
  - finished concrete flooring in corridors and auxiliary spaces; gymnasium hardwood floor; stage floor
- Elevator - $175,000
  - elevator
- Fire Protection - $175,000
  - sprinkler piping and heads
- Testing, Adjusting, Balancing - $80,000
  - mechanical, plumbing, electrical, and fire protection system commissioning

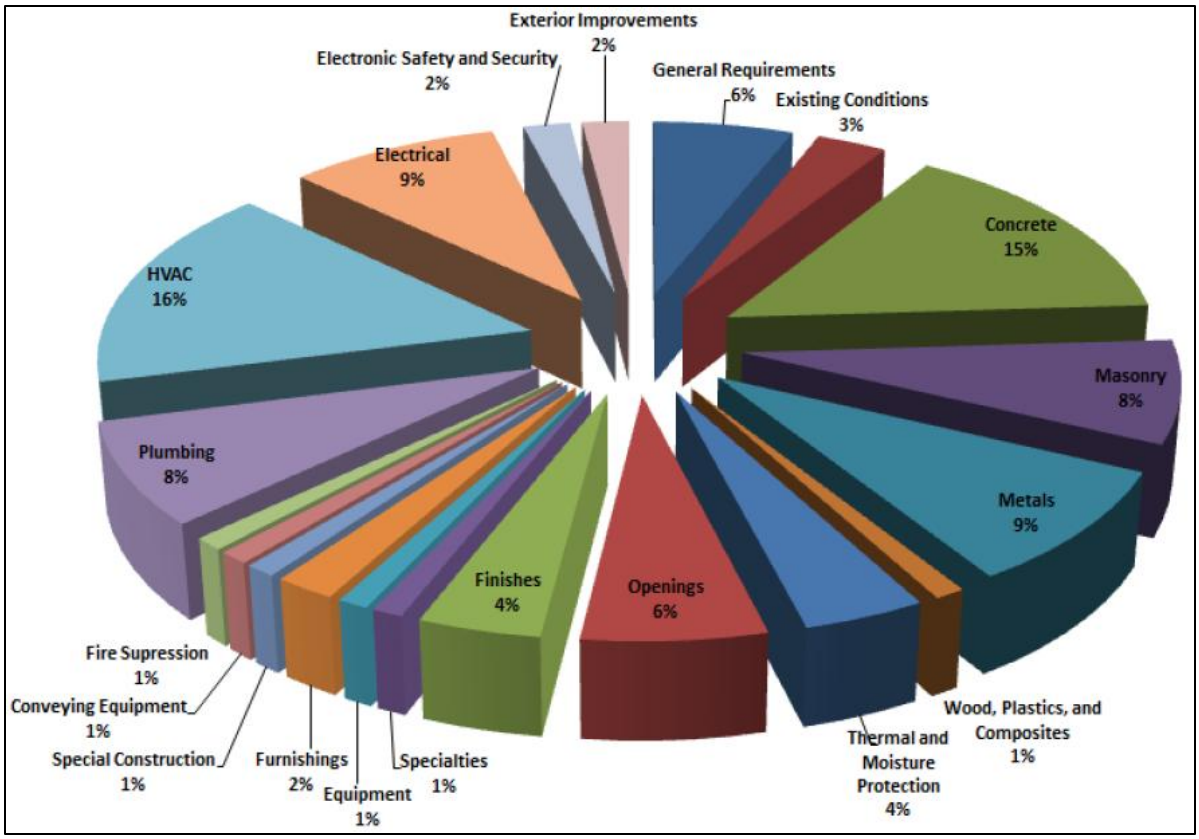


Chart 1: Cost breakdown by CSI Masterformat

The project schedule was developed based on the 15 month construction period (see Appendix F). It reinforces Nexus' project goal of reducing construction time on site. Reducing this duration will have a smaller impact on the environment and most likely reduce construction cost since labor is the most expensive part of construction. All of these factors meet the school district's objectives of cost benefit, sustainability, and functionality.

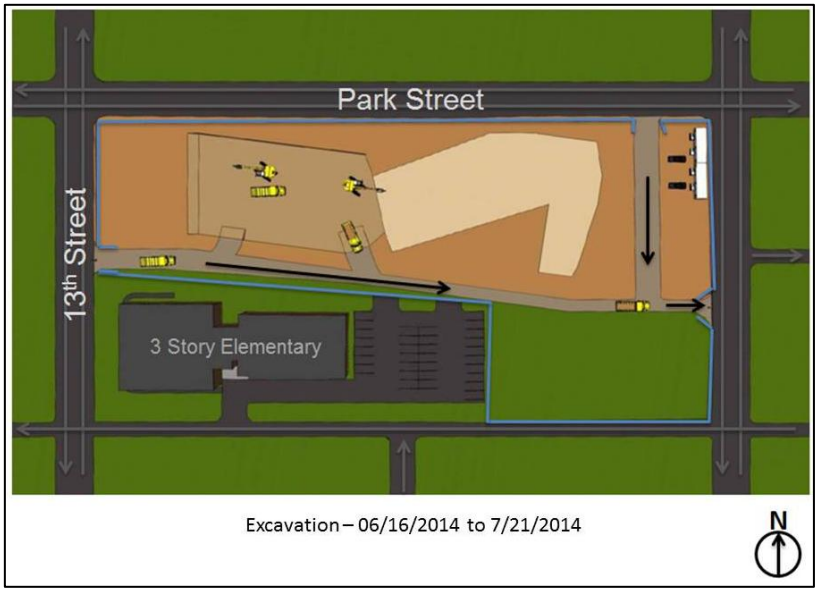


Figure 4: Excavation Site Plan

Immediately after the Notice to Proceed, excavation will begin and last for approximately five weeks (See Figure 4). No other contractor will be permitted on site due to the presence of contaminated soils. Thereafter, prior to the foundation work commencing, the utilities contractor will perform their necessary work on site. The sequencing of the foundation work will proceed as it did during excavation, from the west to east side of the site. After the steel-driven piles are installed, the concrete strip footers and pile caps will follow. Lastly, the pool and basement walls and slabs will be cast.

In essence, the concrete work on each floor will lead the steel work (See Figure 5). The steel work will remain one to two building sections behind. On the first floor, the structural steel columns will be erected first. They will be braced to the ground with guyed wires. This will require the use of a crawler crane positioned on the south access road of the site. As the crane moves eastward to erect the basement beams, the concrete pump will be positioned in the pool and gym region of the site to start placing the slabs-on-grade and first lift of insulated concrete form walls. The insulated concrete form walls, although only cast in 14 foot lifts, will be temporarily braced until the steel members supporting them are erected. This end of the building is the most concrete intensive. Then, the first floor beams (second level floor support) will be erected. The classroom area is the most steel-intensive erection area. Consequently, the second and third levels will proceed in a very similar manner.

Next on the schedule is the metal decking placement and slab-on-deck placement. Following this, the curtain wall (brick and metal stud backup) will be stick-built and insulated to meet the same thermal requirements as the insulated concrete form walls. Then the masonry contractor can mobilize and set up scaffolding to start the face-brick installation. In concurrence with this work on upper floors, the curtain wall contractor will begin the aluminum panel installations.

Once the exterior walls are complete, the glazing contractor will install the window modules. While this is happening, the roofing contractor will make the building water-tight for interior construction to begin.

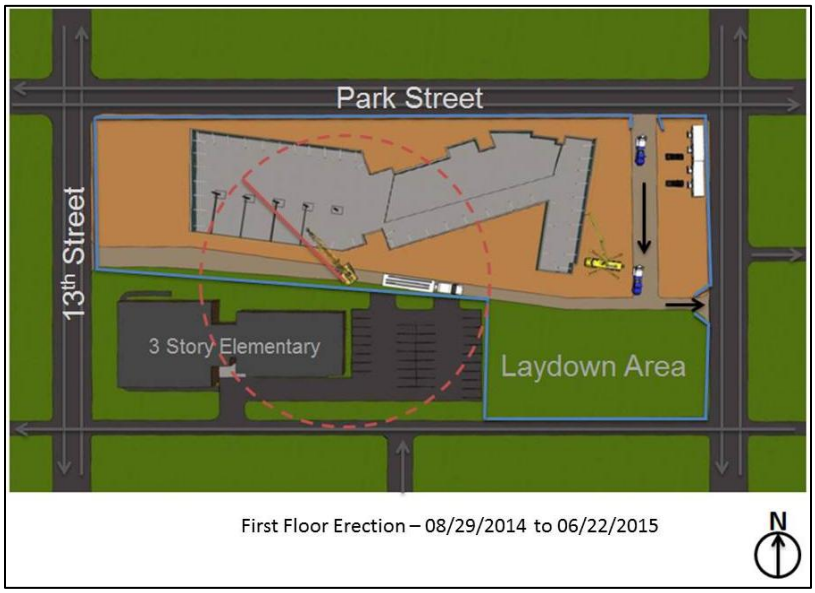


Figure 5: Steel and concrete sequence plan

The main entrance of the building is a glass curtain wall on the upper two floors, and aluminum paneled curtain wall on the first level. This area will be left open and unconstructed for a hoist to be positioned there for material access into the building. Once this is underway, the mechanical, plumbing, electrical, and fire protection work can begin. These various rough-ins will be followed by the metal stud wall framing and gypsum wallboard tasks. Finishing work by the general works contractor will include casework installation, fixtures, and painting. Then, the carpet tile floors can be installed in the classrooms along with the concrete finished flooring in the corridors. Lastly, the testing, adjusting, and balancing contractor can test the building automated systems.

To reach substantial completion, the construction manager and remaining subcontractors on site will demobilize so the end-users have two weeks to move into the building. Also during these two weeks, any new equipment training for the end-users will be conducted. Finally, school will begin on Monday, August 24, 2015 for the 2015-2016 academic year.

A construction fence will be installed on the northern and eastern halves of the site to protect the students, teachers, and staff members of the current elementary school, pedestrians on the sidewalks, and traffic passengers. The proposed new bus lane will be the guide for the main access road. However, it is important to note that this access road will only have an entrance to it from the west end during excavation work. This will help with dump truck flow continuity in removal of the contaminated soil. Also important to note is that the north gate will only be utilized as an entrance while the east gate will only be utilized as an exit. By having two gates, Nexus is allowing for the possibility of a union and non-union gate, along with the possibility of having a third gate (the west gate) for site access in the case of a labor strike.

General site logistics items to note are the site trailers (most likely utilized by the construction manager and four prime contractors) with space available for parking. The placement of the trailers between the two main gates is to oversee deliveries and other vehicles arriving on site.

Various storage containers and laydown areas can be staged in the south-eastern region of the site. The concrete pump will be staged between the south access road and building at all times to leave the road open for concrete trucks. In addition, this road will be used for the crawler crane and steel delivery trucks. In the case of a bottleneck, due to the safety concerns of the crane and its delivery trucks, the steel contractor will have precedence of the access road over the concrete contractor (which has more mobile equipment and trucks).

Safe site working conditions will be achieved largely through contractor work practices, but also with the site fence. The site fence will double as a security fence for the site during construction. The building footprint will be lit at night to attempt to prevent vandalism, which is of great concern in the city of Reading. Furthermore, the site's accessibility and flexibility are displayed through the two access roads and three gates. The site will contain a comingled dumpster for offsite recycling. This will help cut down on contractor material waste and promote material reuse. Lastly, the school district will notice cost benefits by the site only being occupied for the 15 month construction durations.

Experience

The theme of safety was carried into the building by maintaining one secure entrance. The one entrance ensures that no unwanted visitors enter the school, which is crucial at an elementary school with small, school-aged children. Not having a site fence with barbed wire or metal detectors at all entrances, but rather having hidden security cameras and putting the main entrance on the interior part of the site increases the 'unseen' sense of security.

Achieving LEED certification helps meet the district's objective of lifecycle savings. Nexus took the approach of focusing on the learning environment in order to meet this requirement. An excellent example of this is the mechanical system. In order to create a comfortable learning environment the mechanical system had to be sized to improve indoor air quality by increasing the amount of outside air provided. The motive for this was improving the learning environment but it in turn also helped us meet LEED requirements under the indoor environmental quality category. The learning environment mentality also applies to the water efficiency, energy and atmosphere, materials and resources, and sustainable site categories (see Appendix I for a LEED Checklist Reference).

Community

One of the major concerns that Nexus has is the addition of a pool to the school. The first concern is that the pool is a considerable strain on the project budget. The maintenance required for a pool also increase life-cycle costs. A pool also poses a potential safety threat (drowning) to the occupants of the school. Nexus has provided the pool as a potential later phase to help accommodate Reading School District's budget. Nexus believes that it might be

in the school district's best interest to inquire Albright University about accessing their aquatic facilities prior to taking on the upfront and maintenance costs associated with a pool. Overall, due to the cost and time constraints for this elementary school project, the pool does not seem to align well with the goals laid out by the owner or by Nexus.

Education

Nexus also focused heavily on the operations and maintenance costs which will be borne by Reading for the life of the building. Another excellent example of this is the carpet tiles in the classrooms. When accidents occur the tiles can be easily taken up and replaced. This requires minimal material and there is very little labor associated with this change. There are also operations and maintenance costs saved by using static overhangs on the exterior of the building above the windows as opposed to other operable systems. This saves on training school employees as well as future maintenance costs when operable louvers may malfunction.

Nexus chose to leave the existing elementary school in place to be repurposed as the Reading School District saw fit. Choosing to keep the elementary school was driven by a few factors. Not demolishing the building created a large savings in both cost and schedule. The reuse of a building is also a very sustainable concept and helps keep unnecessary waste out of landfills. The economic status of Reading was already addressed and Nexus did not think it was very logical to deprive them of an already existing resource.

Conclusion

In conclusion, Nexus believes that they have met Reading School District's owner objectives through the support of the project and discipline specific goals. By integrating the three other design disciplines, maximizing the strengths of the required delivery method, engineering efficient construction site plans, sustaining low first and lifecycle costs, and maintaining a short schedule arranged around the academic year, Nexus' construction management team will provide the owner with the best elementary school and the most enjoyable construction services.

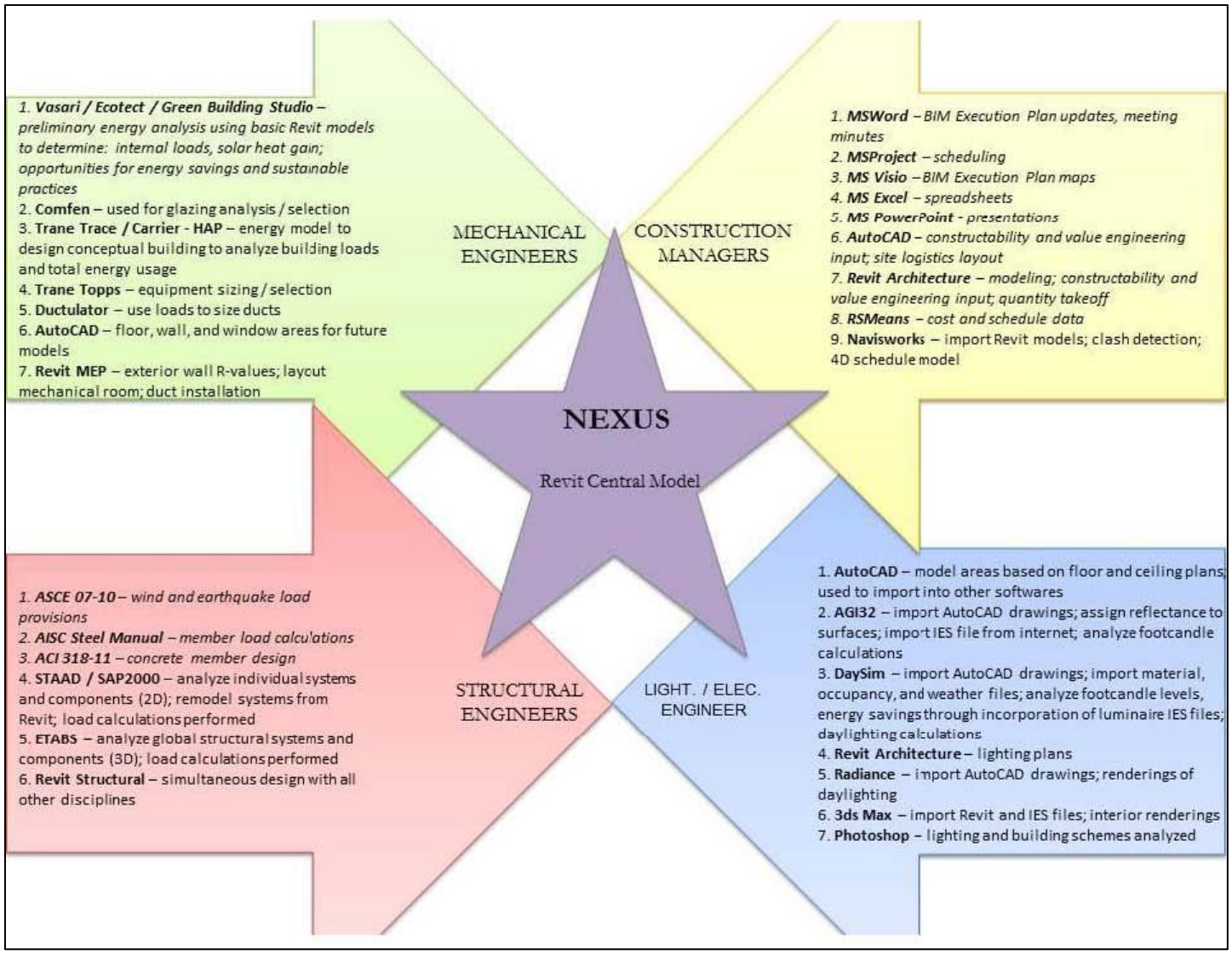
Nexus' Project Accomplishments		
Construction Management Goals	**Nexus' Project Goals**	**Owner Objectives**
Efficiency →	**Integration** →	**Safety & Security**
Lifecycle →	**Lean Practices** →	**Lifecycle and Maintenance**
Cost Advantage →	**Learning Tool** →	**Cost Effectiveness**

Table 5: Nexus' Project Accomplishments

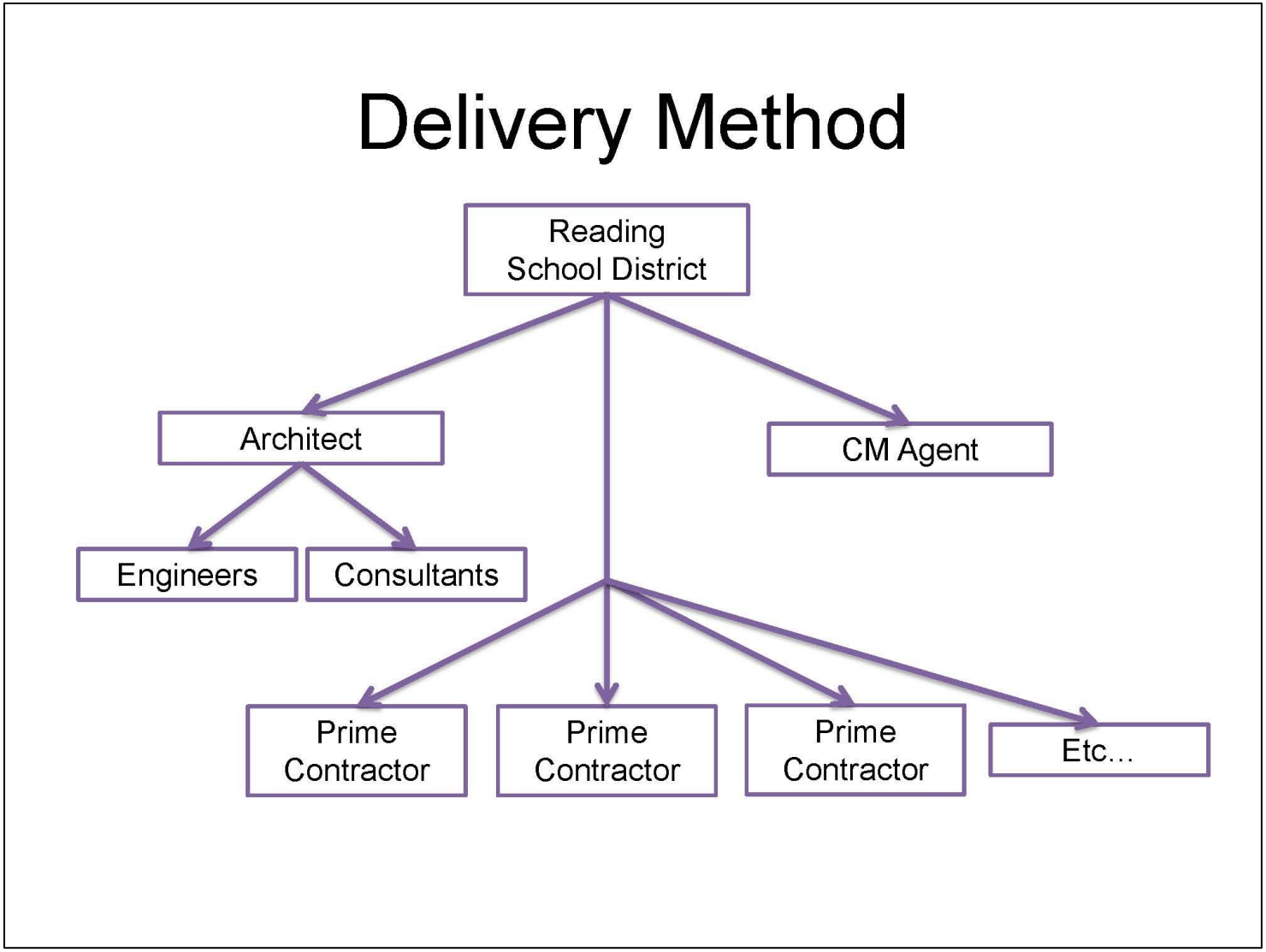
II. Supporting Documentation

Appendix A : Nexus Discipline Roles and Responsibilities

Appendix A: Nexus Software Information Exchanges

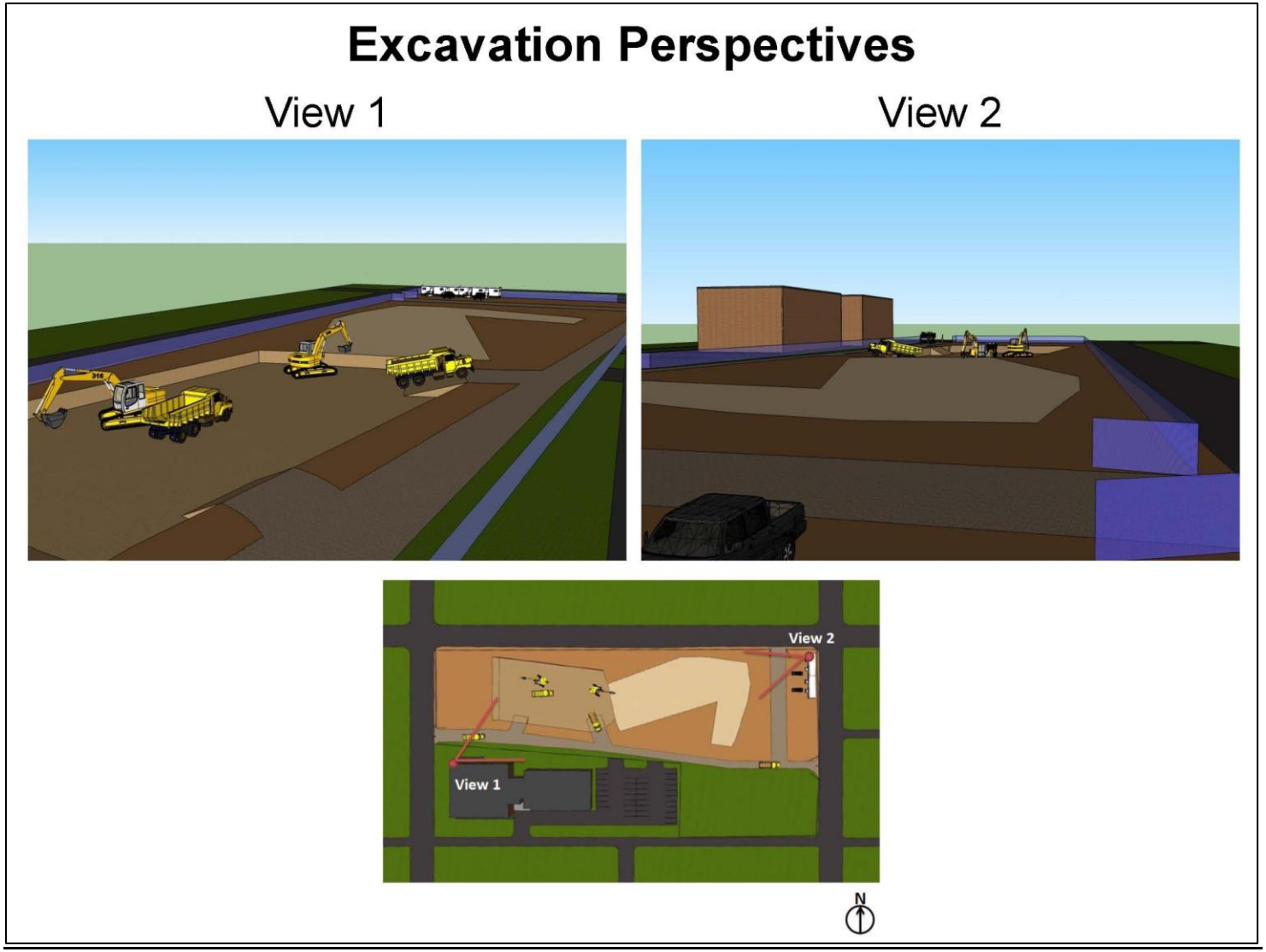


Appendix B: Construction Management Agent with Multi-Prime Contractor Design-Bid-Build Delivery Method



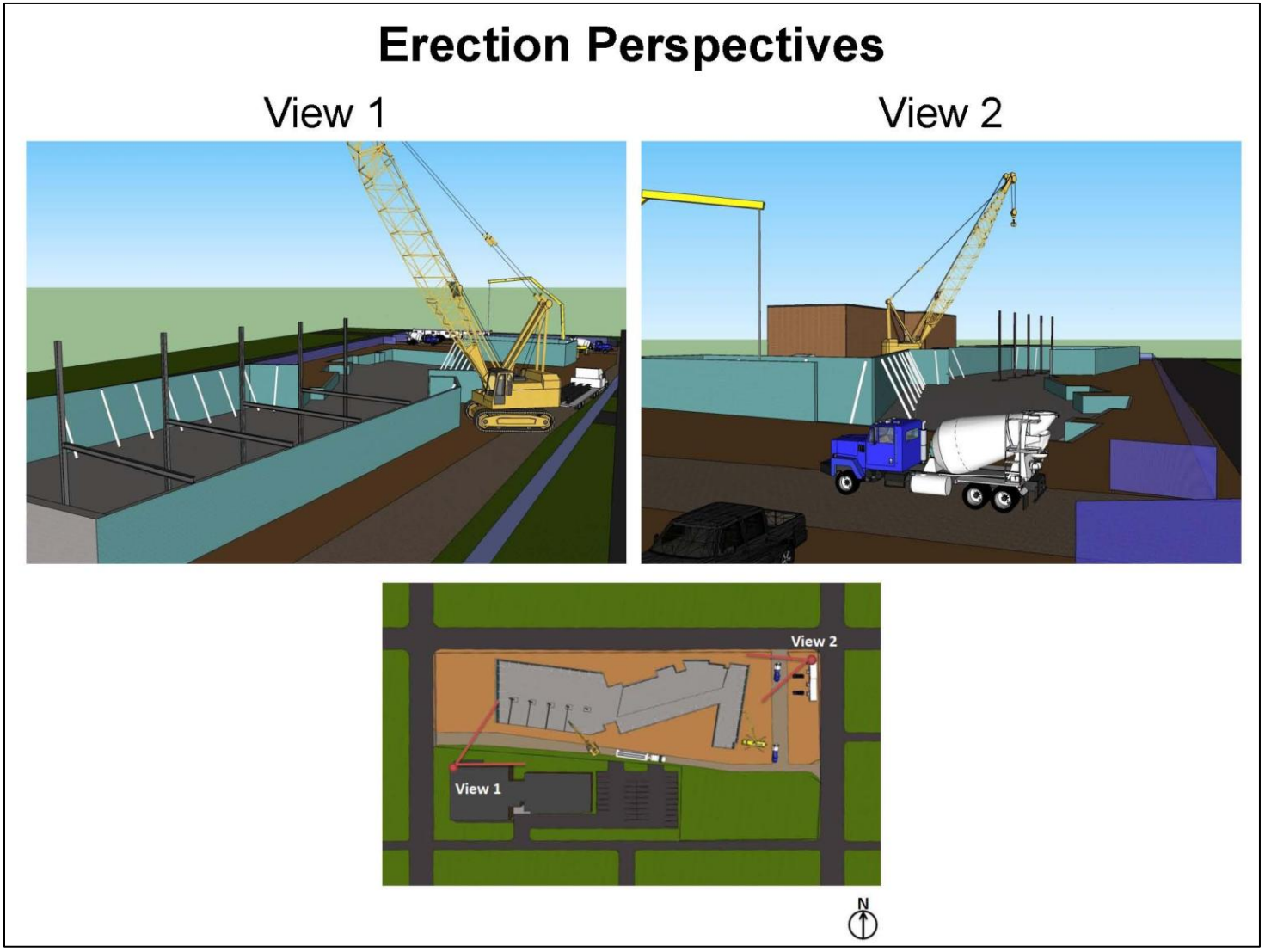
Appendix C: Excavation Site Plan

Appendix C: Excavation



Appendix D: Erection Site Plan

Appendix D: Erection



Appendix E: Cost Breakdown (without pool)

Cost Breakdown				
		Cost/SF	% of Cost	Cost
Division 1	General Requirements	$ 11.73	6%	$ 1,050,000
Division 2	Existing Conditions	$ 5.86	3%	$ 525,000
Division 3	Concrete	$ 29.32	15%	$ 2,625,000
Division 4	Masonry	$ 15.64	8%	$ 1,400,000
Division 5	Metals	$ 17.59	9%	$ 1,575,000
Division 6	Wood, Plastics, and Composites	$ 1.95	1%	$ 175,000
Division 7	Thermal and Moisture Protection	$ 7.82	4%	$ 700,000
Division 8	Openings	$ 11.73	6%	$ 1,050,000
Division 9	Finishes	$ 7.82	4%	$ 700,000
Division 10	Specialties	$ 1.95	1%	$ 175,000
Division 11	Equipment	$ 1.95	1%	$ 175,000
Division 12	Furnishings	$ 3.91	2%	$ 350,000
Division 13	Special Construction	$ 1.95	1%	$ 175,000
Division 14	Conveying Equipment	$ 1.95	1%	$ 175,000
Division 21	Fire Supression	$ 1.95	1%	$ 175,000
Division 22	Plumbing	$ 15.64	8%	$ 1,400,000
Division 23	HVAC	$ 31.28	16%	$ 2,800,000
Division 26	Electrical	$ 17.59	9%	$ 1,575,000
Division 28	Electronic Safety and Security	$ 3.91	2%	$ 350,000
Division 32	Exterior Improvements	$ 3.91	2%	$ 350,000
	Cost / SF	**$195.48**	**Total**	**$ 17,500,000**

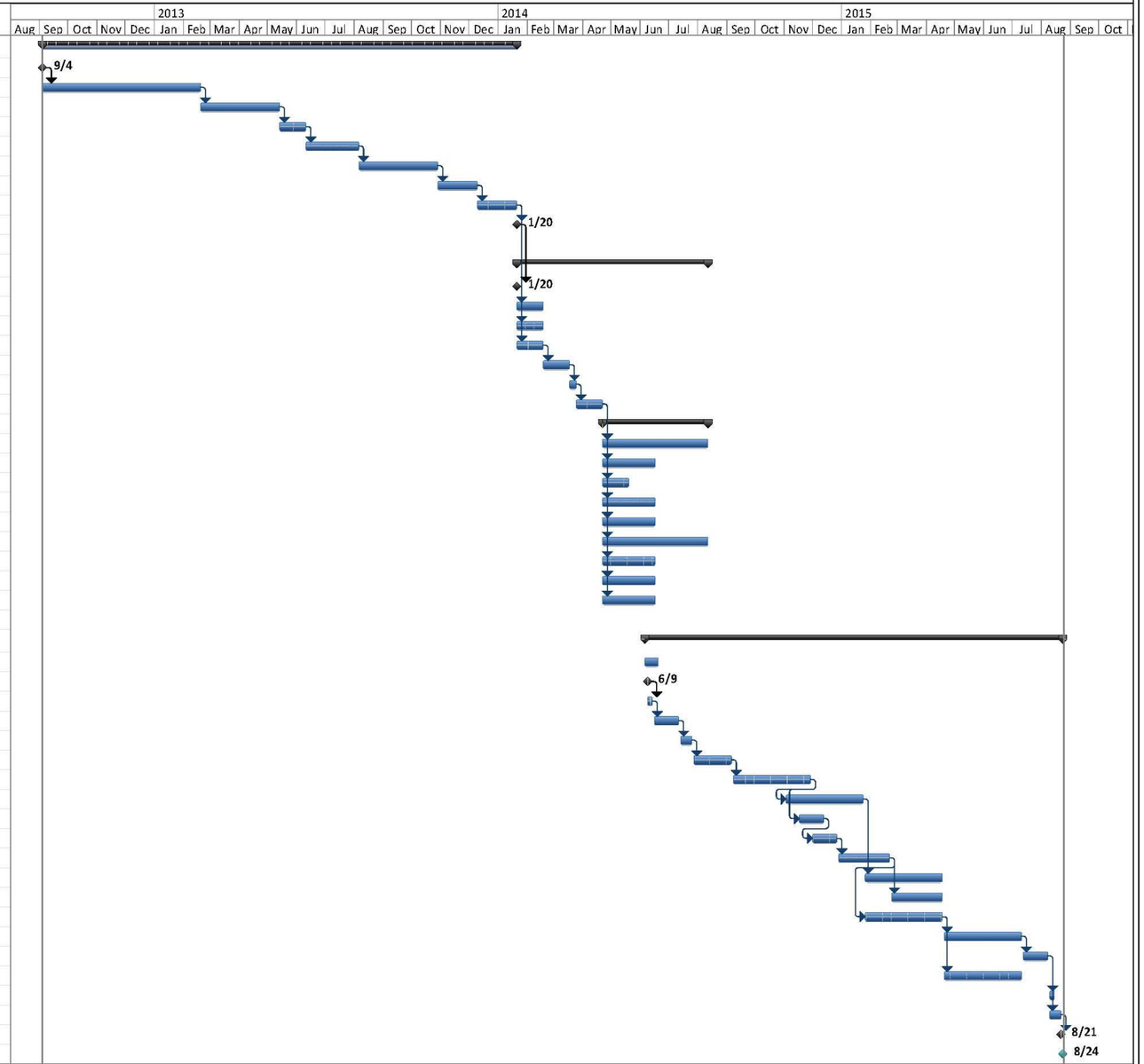
Appendix E: Cost Breakdown (with pool)

Cost Breakdown w/ Pool				
		Cost/SF	% of Cost	Cost
Division 1	General Requirements	$ 11.73	6%	$ 1,050,000
Division 2	Existing Conditions	$ 5.86	3%	$ 525,000
Division 3	Concrete	$ 31.28	15%	$ 2,800,000
Division 4	Masonry	$ 15.64	8%	$ 1,400,000
Division 5	Metals	$ 15.64	8%	$ 1,400,000
Division 6	Wood, Plastics, and Composites	$ 1.95	1%	$ 175,000
Division 7	Thermal and Moisture Protection	$ 7.82	4%	$ 700,000
Division 8	Openings	$ 11.73	6%	$ 1,050,000
Division 9	Finishes	$ 7.82	4%	$ 700,000
Division 10	Specialties	$ 1.95	1%	$ 175,000
Division 11	Equipment	$ 1.95	1%	$ 175,000
Division 12	Furnishings	$ 3.91	2%	$ 350,000
Division 13	Special Construction	$ 1.95	1%	$ 175,000
	Pool	$ 27.93	-	$ 2,500,000
Division 14	Conveying Equipment	$ 1.95	1%	$ 175,000
Division 21	Fire Supression	$ 1.95	1%	$ 175,000
Division 22	Plumbing	$ 15.64	8%	$ 1,400,000
Division 23	HVAC	$ 33.23	16%	$ 2,975,000
Division 26	Electrical	$ 17.59	9%	$ 1,575,000
Division 28	Electronic Safety and Security	$ 3.91	2%	$ 350,000
Division 32	Exterior Improvements	$ 1.95	2%	$ 175,000
	Cost / SF	**$ 223.41**	**Total**	**$ 20,000,000**

Appendix F: Design, Preconstruction, and Milestone Construction Schedule

Reading Area School District
New Elementary School

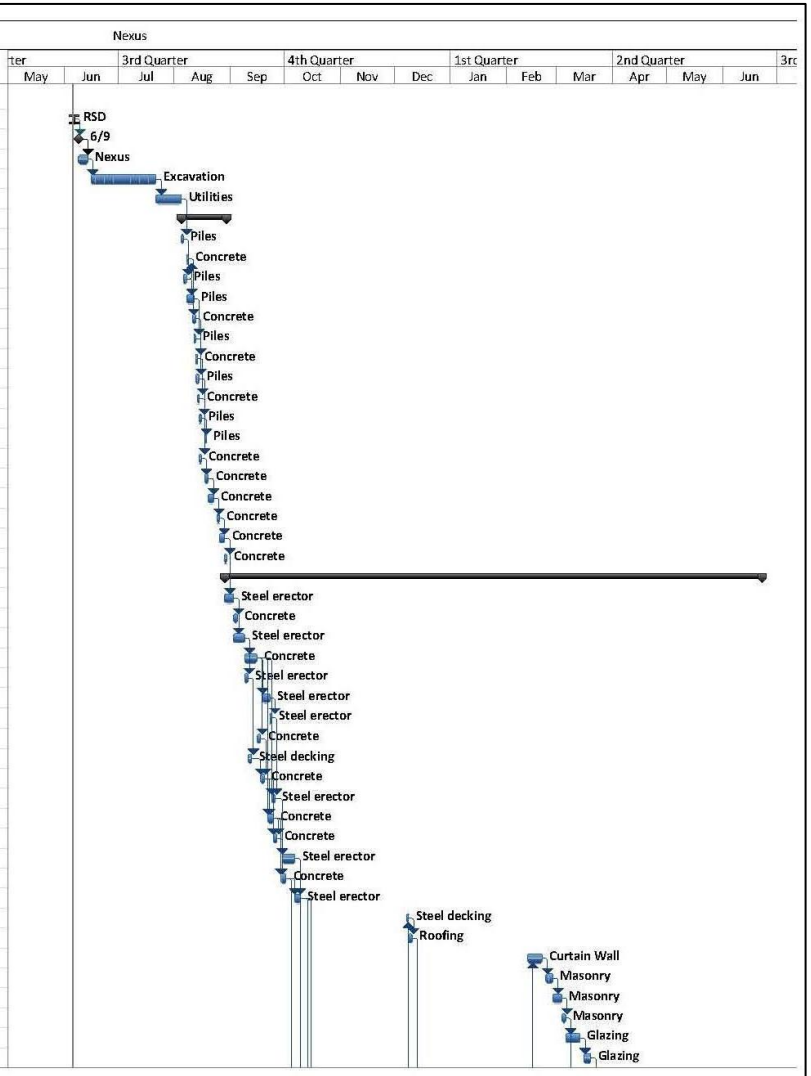
ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**Design**	**360 days**	**Tue 9/4/12**	**Mon 1/20/14**	
2		*Notice to Proceed*	0 days	Tue 9/4/12	Tue 9/4/12	
3		Feasibility Study	6 mons	Tue 9/4/12	Mon 2/18/13	2
4		Programming	3 mons	Tue 2/19/13	Mon 5/13/13	3
5		Conceptual Design	1 mon	Tue 5/14/13	Mon 6/10/13	4
6		Schematic Design	2 mons	Tue 6/11/13	Mon 8/5/13	5
7		Design Development	3 mons	Tue 8/6/13	Mon 10/28/13	6
8		50% Construction Documents	1.5 mons	Tue 10/29/13	Mon 12/9/13	7
9		Construction Documents	1.5 mons	Tue 12/10/13	Mon 1/20/14	8
10		*Substantial Completion*	0 days	Mon 1/20/14	Mon 1/20/14	9
11						
12		**Preconstruction**	**145 days**	**Mon 1/20/14**	**Mon 8/11/14**	
13		Design Complete	0 days	Mon 1/20/14	Mon 1/20/14	10
14		Estimate Complete	1 mon	Tue 1/21/14	Mon 2/17/14	9
15		Bid Schedule Complete	1 mon	Tue 1/21/14	Mon 2/17/14	9
16		Scopes of Work Defined	1 mon	Tue 1/21/14	Mon 2/17/14	9
17		Invitation to Bid	1 mon	Tue 2/18/14	Mon 3/17/14	16
18		Subcontractor Awarding	1 wk	Tue 3/18/14	Mon 3/24/14	17
19		Submittals	1 mon	Tue 3/25/14	Mon 4/21/14	18
20		Lead Times - Delivery Times	**80 days**	**Tue 4/22/14**	**Mon 8/11/14**	
21		Steel Mill Order	4 mons	Tue 4/22/14	Mon 8/11/14	19
22		ICF Order	2 mons	Tue 4/22/14	Mon 6/16/14	19
23		Concrete Order	1 mon	Tue 4/22/14	Mon 5/19/14	19
24		Sheetmetal	2 mons	Tue 4/22/14	Mon 6/16/14	19
25		Fans	2 mons	Tue 4/22/14	Mon 6/16/14	19
26		AHUs	4 mons	Tue 4/22/14	Mon 8/11/14	19
27		Pumps	2 mons	Tue 4/22/14	Mon 6/16/14	19
28		Cooling Tower	2 mons	Tue 4/22/14	Mon 6/16/14	19
29		Boiler	2 mons	Tue 4/22/14	Mon 6/16/14	19
30						
31		**Construction**	**316 days**	**Fri 6/6/14**	**Mon 8/24/15**	
32		Last Day of School	10 days	Fri 6/6/14	Thu 6/19/14	
33		*Notice to Proceed*	0 days	Mon 6/9/14	Mon 6/9/14	
34		*Mobilization*	1 wk	Mon 6/9/14	Fri 6/13/14	33
35		Excavation	1 mon	Mon 6/16/14	Fri 7/11/14	34
36		Utilities	2 wks	Mon 7/14/14	Fri 7/25/14	35
37		Foundation	1.5 mons	Mon 7/28/14	Fri 9/5/14	36
38		ICF Walls	3 mons	Mon 9/8/14	Fri 11/28/14	37
39		Structural Steel	3 mons	Mon 11/3/14	Fri 1/23/15	38FS-1 mon
40		Metal Decking	1 mon	Mon 11/17/14	Fri 12/12/14	38FS-2 wks
41		Slab-On-Deck	1 mon	Mon 12/1/14	Fri 12/26/14	40FS-2 wks
42		Roofing	2 mons	Mon 12/29/14	Fri 2/20/15	41
43		Building Façade	3 mons	Mon 1/26/15	Fri 4/17/15	39
44		Glazing	2 mons	Mon 2/23/15	Fri 4/17/15	42
45		MEP Rough-Ins	3 mons	Mon 1/26/15	Fri 4/17/15	42FS-1 mon
46		Interiors	3 mons	Mon 4/20/15	Fri 7/10/15	45
47		Finishes	1 mon	Mon 7/13/15	Fri 8/7/15	46
48		Commissioning	3 mons	Mon 4/20/15	Fri 7/10/15	45
49		*Demobilization*	1 wk	Mon 8/10/15	Fri 8/14/15	47
50		*FF&E*	2 wks	Mon 8/10/15	Fri 8/21/15	47
51		*Substantial Completion*	0 days	Fri 8/21/15	Fri 8/21/15	50
52		**First Day of School**	0 days	Mon 8/24/15	Mon 8/24/15	



Appendix F: Detailed Construction Schedule

Nexus

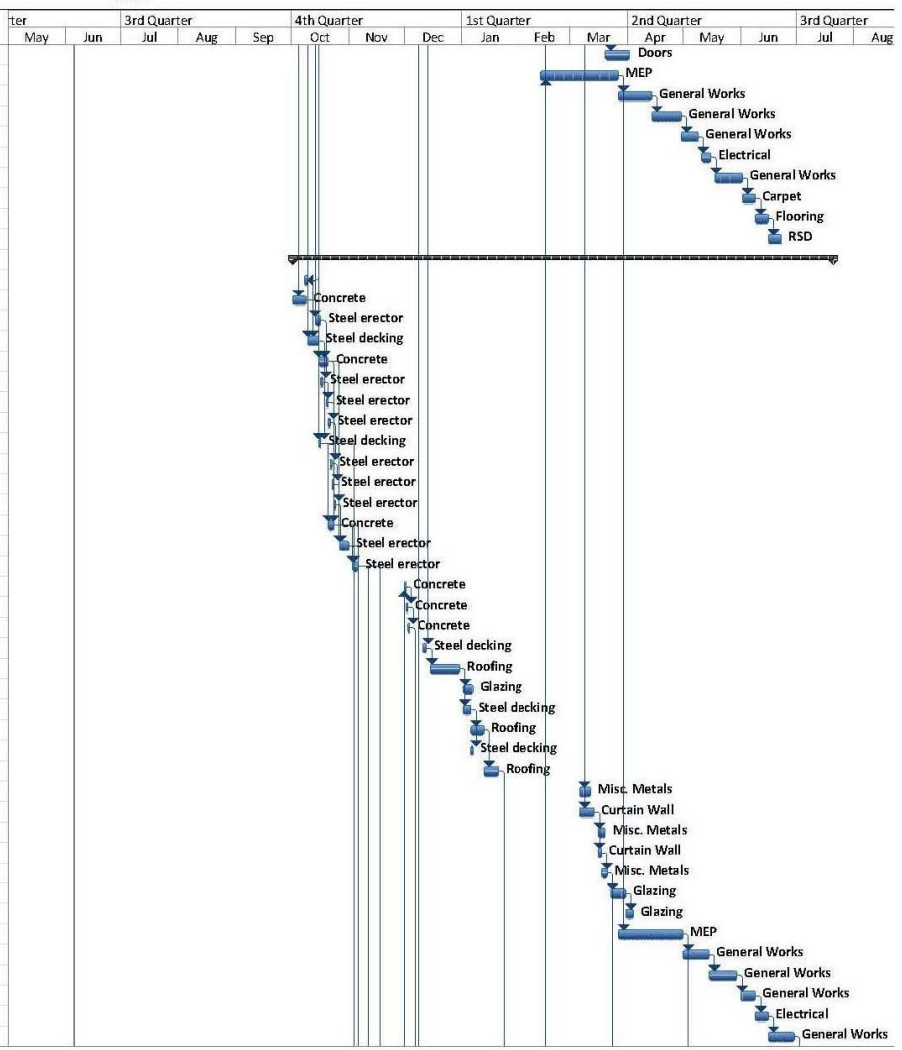
ID	Task Name	Duration	Start	Finish	Resource Names
1	**Construction**				
2	*Last Day of School*	1 day	Fri 6/6/14	Fri 6/6/14	RSD
3	*Notice to Proceed*	0 days	Mon 6/9/14	Mon 6/9/14	Nexus
4	*Mobilization*	5 days	Mon 6/9/14	Fri 6/13/14	Nexus
5	Excavation	25 days	Mon 6/16/14	Mon 7/21/14	Excavation
6	Utilities	10 days	Tue 7/22/14	Mon 8/4/14	Utilities
7	**Foundation**	**19 days**	**Tue 8/5/14**	**Fri 8/29/14**	
8	piles - pool	1 day	Tue 8/5/14	Tue 8/5/14	Piles
9	footers - pool	1 day	Fri 8/8/14	Fri 8/8/14	Concrete
10	piles - gym north	2 days	Wed 8/6/14	Thu 8/7/14	Piles
11	piles - gym south	2 days	Fri 8/8/14	Mon 8/11/14	Piles
12	footer - gym	2 days	Mon 8/11/14	Tue 8/12/14	Concrete
13	piles - stair north	1 day	Tue 8/12/14	Tue 8/12/14	Piles
14	footers -stair	1 day	Wed 8/13/14	Wed 8/13/14	Concrete
15	piles - classroom	2 days	Wed 8/13/14	Thu 8/14/14	Piles
16	footers -classroom	1 day	Thu 8/14/14	Thu 8/14/14	Concrete
17	piles - NE corner	1 day	Fri 8/15/14	Fri 8/15/14	Piles
18	piles - east	1 day	Mon 8/18/14	Mon 8/18/14	Piles
19	footers - east	1 day	Fri 8/15/14	Fri 8/15/14	Concrete
20	pool walls	2 days	Mon 8/18/14	Tue 8/19/14	Concrete
21	pool slabs	3 days	Wed 8/20/14	Fri 8/22/14	Concrete
22	pool deck slab	1 day	Mon 8/25/14	Mon 8/25/14	Concrete
23	basement walls	3 days	Tue 8/26/14	Thu 8/28/14	Concrete
24	basement slab	1 day	Fri 8/29/14	Fri 8/29/14	Concrete
25	**First Floor**	**205 days**	**Fri 8/29/14**	**Mon 6/22/15**	
26	pool and gym columns	2 days	Fri 8/29/14	Tue 9/2/14	Steel erector
27	gym slab on grade 1st	2 days	Wed 9/3/14	Thu 9/4/14	Concrete
28	classroom columns	4 days	Wed 9/3/14	Mon 9/8/14	Steel erector
29	pool and gym walls 1st lift	5 days	Tue 9/9/14	Mon 9/15/14	Concrete
30	basement beams	2 days	Tue 9/9/14	Wed 9/10/14	Steel erector
31	pool beams	2 days	Fri 9/19/14	Mon 9/22/14	Steel erector
32	pool and gym girders	1 day	Tue 9/23/14	Tue 9/23/14	Steel erector
33	classroom slab on grade 1st	2 days	Tue 9/16/14	Wed 9/17/14	Concrete
34	classroom metal decking	2 days	Thu 9/11/14	Fri 9/12/14	Steel decking
35	classroom slab on deck 1st	2 days	Thu 9/18/14	Fri 9/19/14	Concrete
36	pool and gym beams 1st	2 days	Wed 9/24/14	Thu 9/25/14	Steel erector
37	classroom walls 1st lift	3 days	Mon 9/22/14	Wed 9/24/14	Concrete
38	east slab on grade 1st	2 days	Thu 9/25/14	Fri 9/26/14	Concrete
39	classroom beams 1st	5 days	Tue 9/30/14	Mon 10/6/14	Steel erector
40	east walls 1st	3 days	Mon 9/29/14	Wed 10/1/14	Concrete
41	east beams 1st	3 days	Tue 10/7/14	Thu 10/9/14	Steel erector
42	classroom 1st floor roof decking	1 day	Mon 12/8/14	Mon 12/8/14	Steel decking
43	classroom 1st floor roof	2 days	Tue 12/9/14	Wed 12/10/14	Roofing
44	classroom curtain walls 1st	6 days	Fri 2/13/15	Fri 2/20/15	Curtain Wall
45	pool and gym brick 1st	4 days	Mon 2/23/15	Thu 2/26/15	Masonry
46	classroom brick 1st	3 days	Fri 2/27/15	Tue 3/3/15	Masonry
47	east brick 1st	2 days	Wed 3/4/15	Thu 3/5/15	Masonry
48	windows 1st floor icf	6 days	Fri 3/6/15	Fri 3/13/15	Glazing
49	windows 1st floor cw	4 days	Mon 3/16/15	Thu 3/19/15	Glazing



Appendix F: Detailed Construction Schedule (cont.)

Nexus

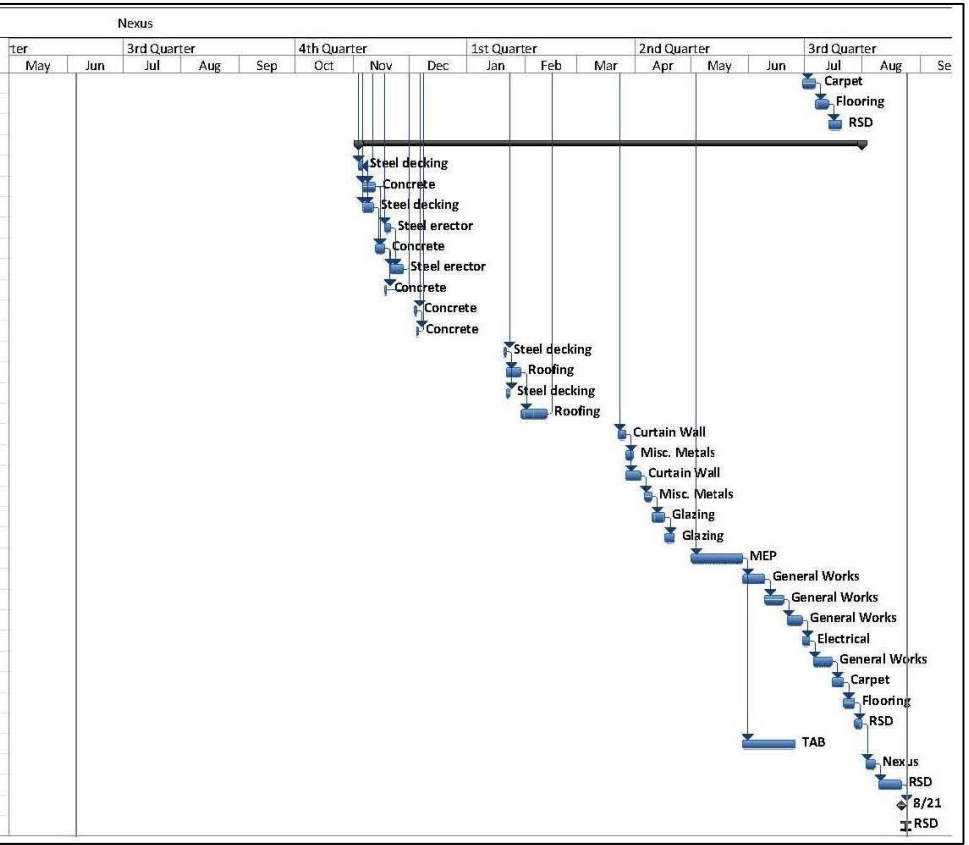
ID	Task Name	Duration	Start	Finish	Resource Names
50	exterior doors 1st floor	9 days	Fri 3/20/15	Wed 4/1/15	Doors
51	MEFP rough-ins	30 days	Fri 2/13/15	Thu 3/26/15	MEP
52	stud walls	12 days	Fri 3/27/15	Mon 4/13/15	General Works
53	gypsum wallboard	12 days	Tue 4/14/15	Wed 4/29/15	General Works
54	casework	7 days	Thu 4/30/15	Fri 5/8/15	General Works
55	fixtures	5 days	Mon 5/11/15	Fri 5/15/15	Electrical
56	finishes	10 days	Mon 5/18/15	Mon 6/1/15	General Works
57	carpet tile flooring	5 days	Tue 6/2/15	Mon 6/8/15	Carpet
58	concrete floor finishing	5 days	Tue 6/9/15	Mon 6/15/15	Flooring
59	equipment	5 days	Tue 6/16/15	Mon 6/22/15	RSD
60	**Second Floor**	**202 days**	**Thu 10/2/14**	**Mon 7/20/15**	
61	gym metal decking	2 days	Wed 10/8/14	Thu 10/9/14	
62	pool and gym walls 2nd lift	5 days	Thu 10/2/14	Wed 10/8/14	Concrete
63	gym beams 2nd	3 days	Tue 10/14/14	Thu 10/16/14	Steel erector
64	classroom metal decking	4 days	Fri 10/10/14	Wed 10/15/14	Steel decking
65	classroom walls 2nd lift	3 days	Thu 10/16/14	Mon 10/20/14	Concrete
66	pool trusses north	1 day	Fri 10/17/14	Fri 10/17/14	Steel erector
67	pool trusses south	1 day	Mon 10/20/14	Mon 10/20/14	Steel erector
68	pool truss braces	1 day	Tue 10/21/14	Tue 10/21/14	Steel erector
69	east metal decking	1 day	Thu 10/16/14	Thu 10/16/14	Steel decking
70	gym trusses west	1 day	Wed 10/22/14	Wed 10/22/14	Steel erector
71	gym trusses east	1 day	Thu 10/23/14	Thu 10/23/14	Steel erector
72	gym truss braces	1 day	Fri 10/24/14	Fri 10/24/14	Steel erector
73	east walls 2nd	3 days	Tue 10/21/14	Thu 10/23/14	Concrete
74	classroom beams 2nd	5 days	Mon 10/27/14	Fri 10/31/14	Steel erector
75	east beams roof	3 days	Mon 11/3/14	Wed 11/5/14	Steel erector
76	gym slab on deck 2nd	1 day	Mon 12/1/14	Mon 12/1/14	Concrete
77	classroom slab on deck 2nd	1 day	Tue 12/2/14	Tue 12/2/14	Concrete
78	east slab on deck 2nd	1 day	Wed 12/3/14	Wed 12/3/14	Concrete
79	pool and gym roof decking	2 days	Thu 12/11/14	Fri 12/12/14	Steel decking
80	pool and gym roof	10 days	Mon 12/15/14	Tue 12/30/14	Roofing
81	pool and gym skylights	3 days	Fri 1/2/15	Tue 1/6/15	Glazing
82	classroom 2nd floor roof decking	2 days	Fri 1/2/15	Mon 1/5/15	Steel decking
83	classroom 2nd floor roof	5 days	Tue 1/6/15	Mon 1/12/15	Roofing
84	east roof decking	1 day	Tue 1/6/15	Tue 1/6/15	Steel decking
85	east roof	6 days	Tue 1/13/15	Tue 1/20/15	Roofing
86	pool and gym aluminum panel 2nd	4 days	Fri 3/6/15	Wed 3/11/15	Misc. Metals
87	classroom curtain walls 2nd	6 days	Fri 3/6/15	Fri 3/13/15	Curtain Wall
88	classroom aluminum panel 2nd	4 days	Mon 3/16/15	Thu 3/19/15	Misc. Metals
89	east curtain wall 2nd	2 days	Mon 3/16/15	Tue 3/17/15	Curtain Wall
90	east aluminum panel 2nd	3 days	Wed 3/18/15	Fri 3/20/15	Misc. Metals
91	windows 2nd floor icf	6 days	Mon 3/23/15	Mon 3/30/15	Glazing
92	windows 2nd floor cw	4 days	Tue 3/31/15	Fri 4/3/15	Glazing
93	MEFP rough-ins	25 days	Fri 3/27/15	Thu 4/30/15	MEP
94	stud walls	10 days	Fri 5/1/15	Thu 5/14/15	General Works
95	gypsum wallboard	10 days	Fri 5/15/15	Fri 5/29/15	General Works
96	casework	6 days	Mon 6/1/15	Mon 6/8/15	General Works
97	fixtures	5 days	Tue 6/9/15	Mon 6/15/15	Electrical
98	finishes	10 days	Tue 6/16/15	Mon 6/29/15	General Works



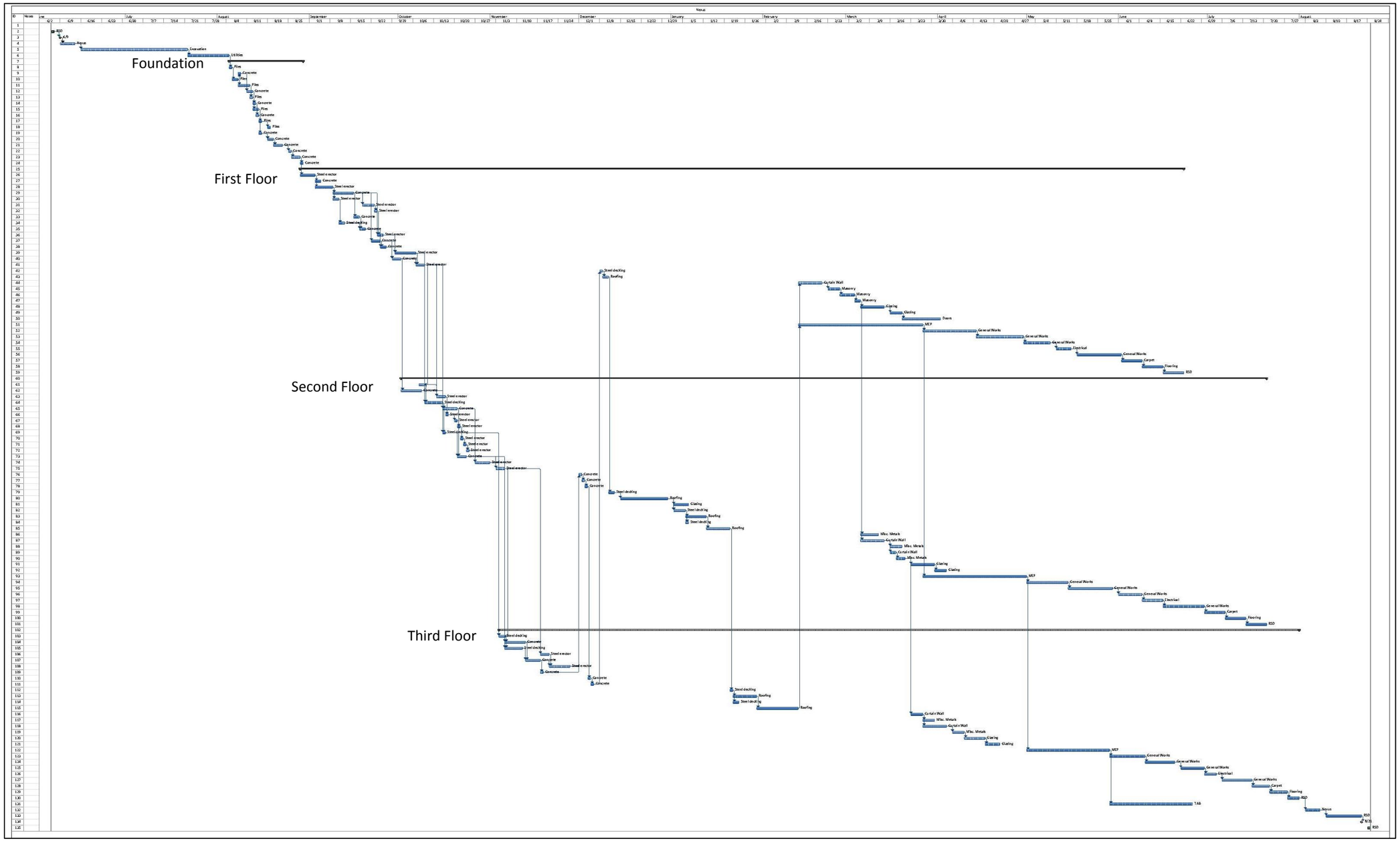
Appendix F: Detailed Construction Schedule (cont.)

Nexus

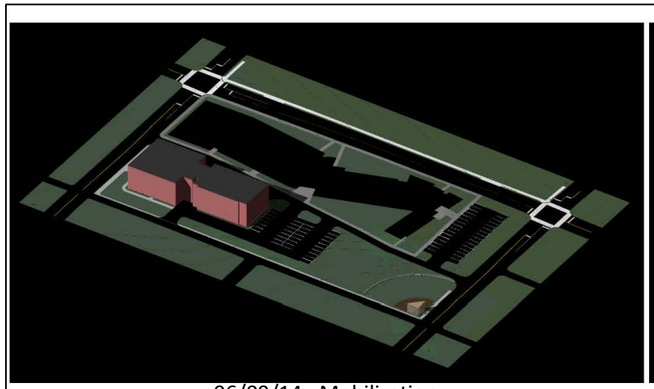
ID	Task Name	Duration	Start	Finish	Resource Names
99	carpet tile flooring	5 days	Tue 6/30/15	Mon 7/6/15	Carpet
100	concrete floor finishing	5 days	Tue 7/7/15	Mon 7/13/15	Flooring
101	equipment	5 days	Tue 7/14/15	Mon 7/20/15	RSD
102	**Third Floor**	**188 days**	**Tue 11/4/14**	**Fri 7/31/15**	
103	gym metal decking 3rd	2 days	Tue 11/4/14	Wed 11/5/14	Steel decking
104	gym walls 3rd lift	5 days	Thu 11/6/14	Wed 11/12/14	Concrete
105	classroom metal decking	4 days	Thu 11/6/14	Tue 11/11/14	Steel decking
106	gym beams roof	3 days	Tue 11/18/14	Thu 11/20/14	Steel erector
107	classroom walls 3rd lift	3 days	Thu 11/13/14	Mon 11/17/14	Concrete
108	classroom beams roof	5 days	Fri 11/21/14	Thu 11/27/14	Steel erector
109	east walls 3rd lift	1 day	Tue 11/18/14	Tue 11/18/14	Concrete
110	gym slab on deck 3rd	1 day	Thu 12/4/14	Thu 12/4/14	Concrete
111	classroom slab on deck 3rd	1 day	Fri 12/5/14	Fri 12/5/14	Concrete
112	gym roof decking	1 day	Wed 1/21/15	Wed 1/21/15	Steel decking
113	gym roof	6 days	Thu 1/22/15	Thu 1/29/15	Roofing
114	classroom roof decking	2 days	Thu 1/22/15	Fri 1/23/15	Steel decking
115	classroom roof	10 days	Fri 1/30/15	Thu 2/12/15	Roofing
116	gym curtain walls 3rd	4 days	Mon 3/23/15	Thu 3/26/15	Curtain Wall
117	gym aluminum panel 3rd	2 days	Fri 3/27/15	Mon 3/30/15	Misc. Metals
118	clasroom curtain walls 3rd	6 days	Fri 3/27/15	Fri 4/3/15	Curtain Wall
119	classroom aluminum panel 3rd	4 days	Mon 4/6/15	Thu 4/9/15	Misc. Metals
120	windows 3rd floor icf	5 days	Fri 4/10/15	Thu 4/16/15	Glazing
121	windows 3rd floor cw	3 days	Fri 4/17/15	Tue 4/21/15	Glazing
122	MEFP rough-ins	19 days	Fri 5/1/15	Thu 5/28/15	MEP
123	stud walls	8 days	Fri 5/29/15	Tue 6/9/15	General Works
124	gypsum wallboard	8 days	Wed 6/10/15	Fri 6/19/15	General Works
125	casework	6 days	Mon 6/22/15	Mon 6/29/15	General Works
126	fixtures	4 days	Tue 6/30/15	Fri 7/3/15	Electrical
127	finishes	8 days	Mon 7/6/15	Wed 7/15/15	General Works
128	carpet tile flooring	4 days	Thu 7/16/15	Tue 7/21/15	Carpet
129	concrete floor finishing	4 days	Wed 7/22/15	Mon 7/27/15	Flooring
130	equipment	4 days	Tue 7/28/15	Fri 7/31/15	RSD
131	*Commissioning*	20 days	Fri 5/29/15	Thu 6/25/15	TAB
132	*Demobilization*	5 days	Mon 8/3/15	Fri 8/7/15	Nexus
133	*FF&E*	10 days	Mon 8/10/15	Fri 8/21/15	RSD
134	*Substantial Completion*	0 days	Fri 8/21/15	Fri 8/21/15	Nexus
135	*First Day of School*	1 day	Mon 8/24/15	Mon 8/24/15	RSD



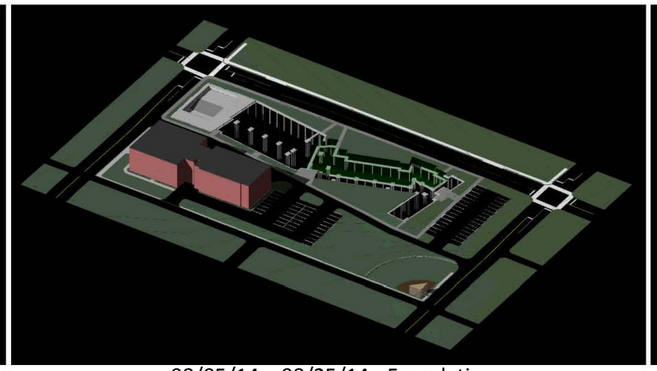
Appendix F: Construction Schedule displaying floor-by-floor sequencing



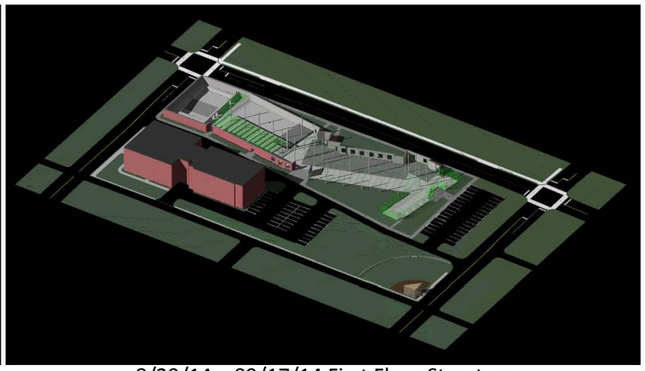
Appendix G: Navisworks 4D model (construction sequencing)



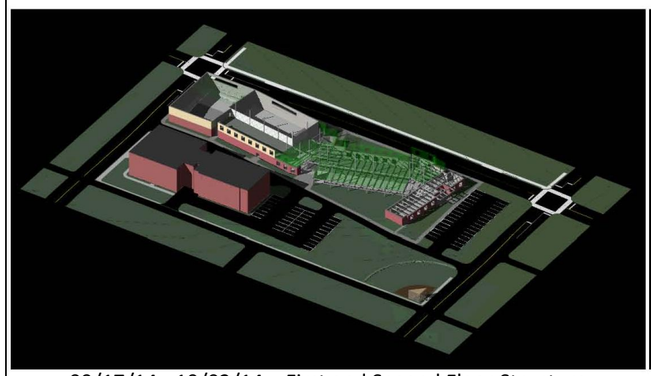
06/09/14 - Mobilization



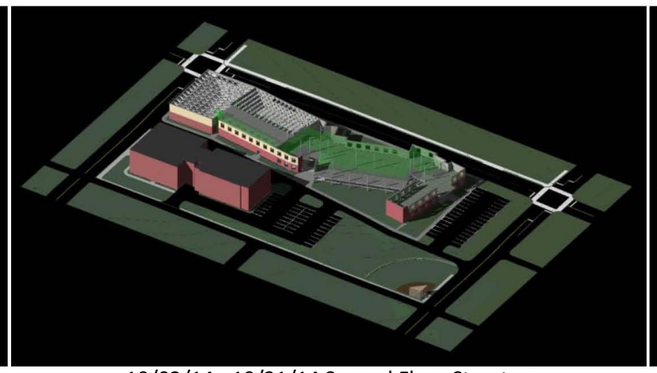
08/05/14 – 08/25/14 - Foundation



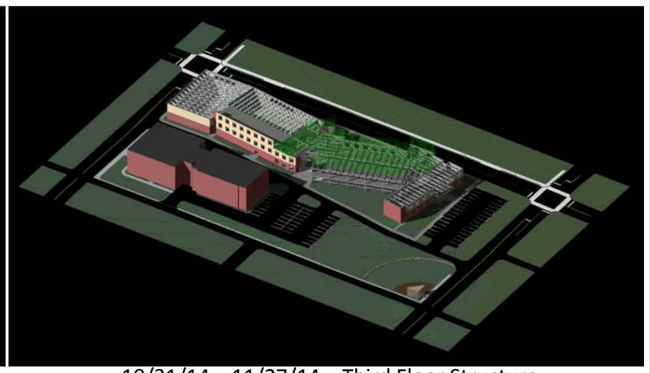
8/29/14 – 09/17/14 First Floor Structure



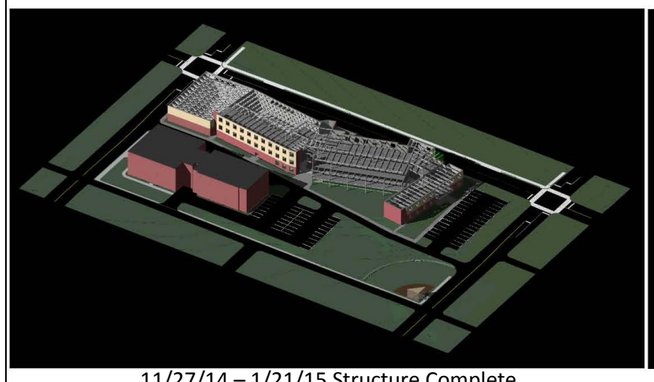
09/17/14 - 10/02/14 – First and Second Floor Structure



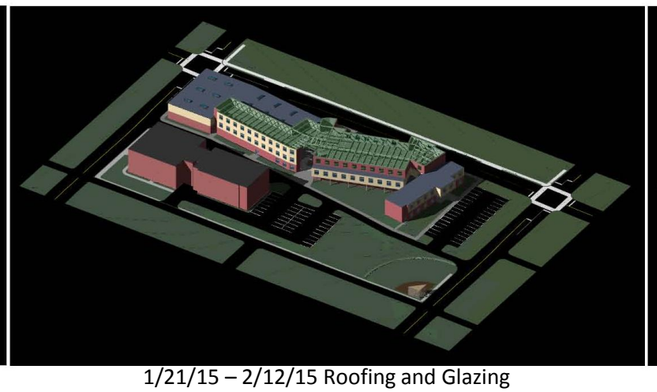
10/02/14 - 10/31/14 Second Floor Structure



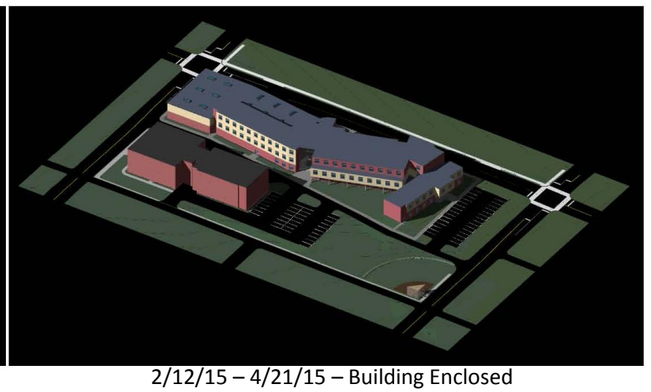
10/31/14 – 11/27/14 – Third Floor Structure



11/27/14 – 1/21/15 Structure Complete



1/21/15 – 2/12/15 Roofing and Glazing

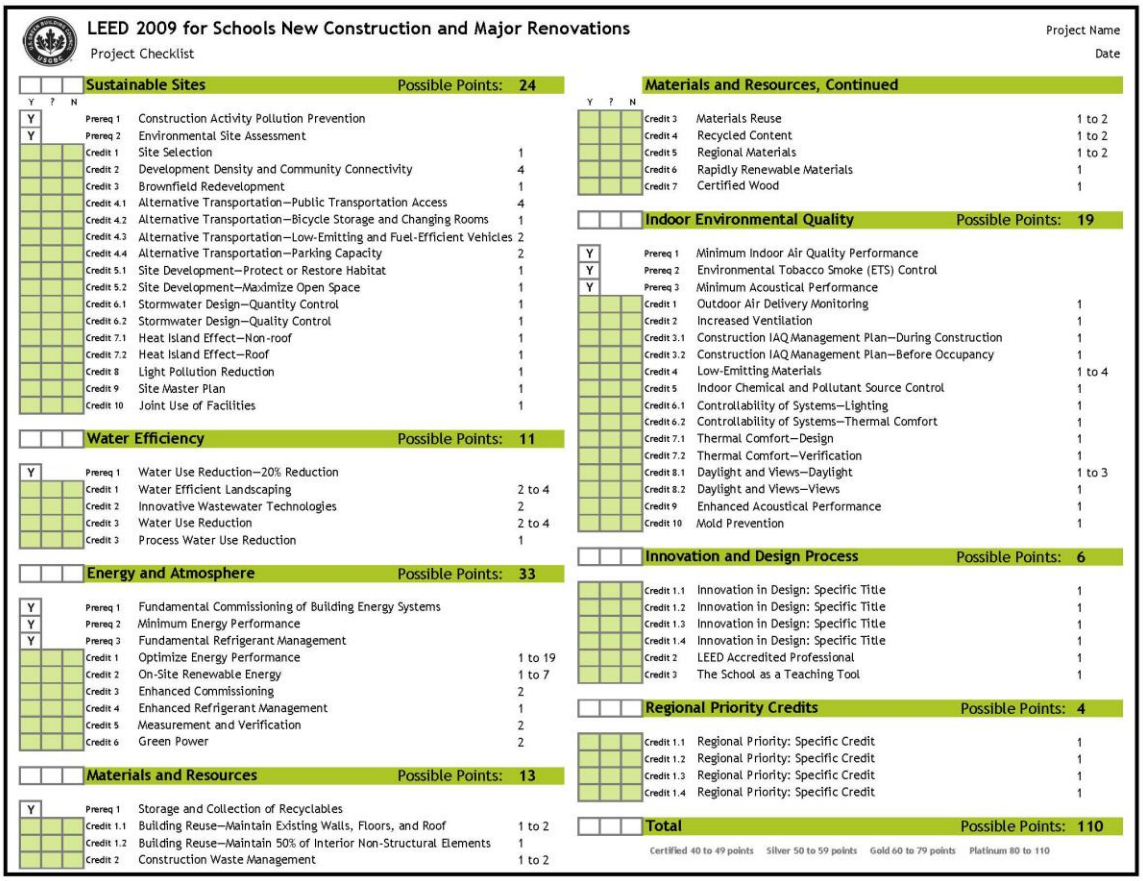


2/12/15 – 4/21/15 – Building Enclosed

Appendix H: References

PlanCon Calculation	
Full time equivalent capacity	875 students
Conversion factor	1.3205
Rated Pupil Capacity	1155 students
Elementary legislated per pupil amount	$4,700
$4,700 x 1155 =	
Reimbursable Amount	$5,428,500
Additional Funding for LEED Silver Certification	$470
$470 x 1155 =	
Total Additional Funding for LEED Silver Certification	$542,850
$5,428,500 + $542,850 =	
Total Reimbursable Project Cost	$5,971,350
$5,428,500 / $17,500,000 =	
Reimbursable Percent	34.12%
Minus 0.5% reduction until final project accounting	33.62%
Reading School District - Market Value Aid Ratio	0.9003
$17,500,000 * 0.3362 * 0.9003 =	
State of Pennsylvania Contribution	**$5,296,915.05**

Appendix I: LEED 2009 Checklist



LEED 2009 for Schools New Construction and Major Renovations

Project Checklist

Project Name

Date

Y	?	N			
			Sustainable Sites	**Possible Points:**	**24**
Y			Prereq 1	Construction Activity Pollution Prevention	
Y			Prereq 2	Environmental Site Assessment	
			Credit 1	Site Selection	1
			Credit 2	Development Density and Community Connectivity	4
			Credit 3	Brownfield Redevelopment	1
			Credit 4.1	Alternative Transportation—Public Transportation Access	4
			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	2
			Credit 4.4	Alternative Transportation—Parking Capacity	2
			Credit 5.1	Site Development—Protect or Restore Habitat	1
			Credit 5.2	Site Development—Maximize Open Space	1
			Credit 6.1	Stormwater Design—Quantity Control	1
			Credit 6.2	Stormwater Design—Quality Control	1
			Credit 7.1	Heat Island Effect—Non-roof	1
			Credit 7.2	Heat Island Effect—Roof	1
			Credit 8	Light Pollution Reduction	1
			Credit 9	Site Master Plan	1
			Credit 10	Joint Use of Facilities	1
			Water Efficiency	**Possible Points:**	**11**
Y			Prereq 1	Water Use Reduction—20% Reduction	
			Credit 1	Water Efficient Landscaping	2 to 4
			Credit 2	Innovative Wastewater Technologies	2
			Credit 3	Water Use Reduction	2 to 4
			Credit 3	Process Water Use Reduction	1
			Energy and Atmosphere	**Possible Points:**	**33**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
			Credit 1	Optimize Energy Performance	1 to 19
			Credit 2	On-Site Renewable Energy	1 to 7
			Credit 3	Enhanced Commissioning	2
			Credit 4	Enhanced Refrigerant Management	1
			Credit 5	Measurement and Verification	2
			Credit 6	Green Power	2
			Materials and Resources	**Possible Points:**	**13**
Y			Prereq 1	Storage and Collection of Recyclables	
			Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 2
			Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
			Credit 2	Construction Waste Management	1 to 2

Y	?	N			
			Materials and Resources, Continued		
			Credit 3	Materials Reuse	1 to 2
			Credit 4	Recycled Content	1 to 2
			Credit 5	Regional Materials	1 to 2
			Credit 6	Rapidly Renewable Materials	1
			Credit 7	Certified Wood	1
			Indoor Environmental Quality	**Possible Points:**	**19**
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
Y			Prereq 3	Minimum Acoustical Performance	
			Credit 1	Outdoor Air Delivery Monitoring	1
			Credit 2	Increased Ventilation	1
			Credit 3.1	Construction IAQ Management Plan—During Construction	1
			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
			Credit 4	Low-Emitting Materials	1 to 4
			Credit 5	Indoor Chemical and Pollutant Source Control	1
			Credit 6.1	Controllability of Systems—Lighting	1
			Credit 6.2	Controllability of Systems—Thermal Comfort	1
			Credit 7.1	Thermal Comfort—Design	1
			Credit 7.2	Thermal Comfort—Verification	1
			Credit 8.1	Daylight and Views—Daylight	1 to 3
			Credit 8.2	Daylight and Views—Views	1
			Credit 9	Enhanced Acoustical Performance	1
			Credit 10	Mold Prevention	1
			Innovation and Design Process	**Possible Points:**	**6**
			Credit 1.1	Innovation in Design: Specific Title	1
			Credit 1.2	Innovation in Design: Specific Title	1
			Credit 1.3	Innovation in Design: Specific Title	1
			Credit 1.4	Innovation in Design: Specific Title	1
			Credit 2	LEED Accredited Professional	1
			Credit 3	The School as a Teaching Tool	1
			Regional Priority Credits	**Possible Points:**	**4**
			Credit 1.1	Regional Priority: Specific Credit	1
			Credit 1.2	Regional Priority: Specific Credit	1
			Credit 1.3	Regional Priority: Specific Credit	1
			Credit 1.4	Regional Priority: Specific Credit	1
			Total	**Possible Points:**	**110**

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

Appendix J: References

References

1. PlanCon data from the Commonwealth of Pennsylvania (2012) <http://www.portal.state.pa.us/portal/server.pt/community/reimbursable_projects/7463#CALCULATIONOF>

2. The Commonwealth Foundation (2011) <http://www.openpagov.org/education_revenue_and_expenses.asp>