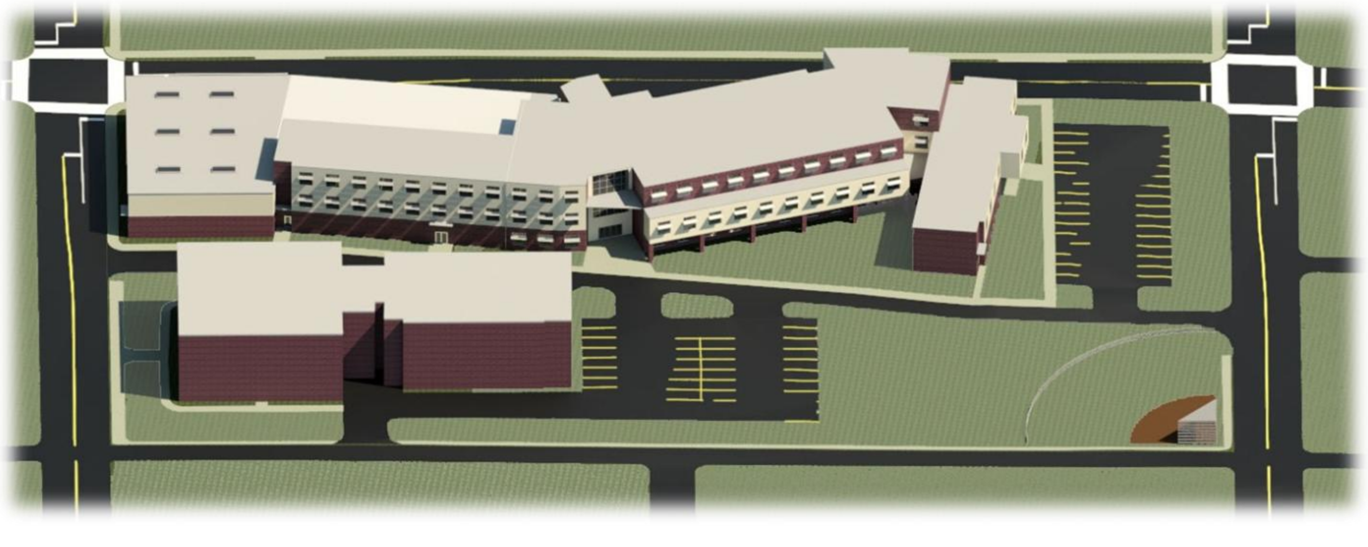
22 February 2013

nexus

CONSTRUCTION MANAGEMENT



Team Registration Number: 02-2013

1. Executive Summary

1.1 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 most essential goal of both the Reading School District and Nexus is everyone's **safety** and wellbeing. Nexus approached safety from the inception of the project – from design to construction and most importantly end use. For a further explanation, please see **Page 5**.

The construction **delivery method** proposed for this project meets Pennsylvania state regulations, which states that the construction manager must act as an agent and not hold any contracts. Nexus proposes utilizing 17 subcontractors. For a further explanation on the delivery method, please see **Page 6** and page 19 of the Appendix.

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 flow on site. 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 potential pool. For further explanation on site logistics, please see **Page 7**.

For most construction projects, the **budget** is 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 help the community construct a school that can be used by all local residents, not just the elementary students. Thus, Nexus proposes a $200 cost per square foot and total project cost of $17.5 million. For further cost justifications, please see **Page 10**, and pages 22-26 of the Appendix.

Nexus plans for the new school to be built in a 15 month **schedule**. This fast track project must start immediately following the end of the 2013-2014 school year (June 9, 2014), 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 13**, and pages 27-30 of the Appendix.

1.2 BIM Execution Plan

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 designs. This execution plan specifically defines the roles to be fulfilled by the construction managers, structural engineers, mechanical engineers, and lighting/electrical engineers (see page 16 of the Appendix). 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 page 17 of the Appendix).

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. These goals guided Nexus' decisions and ultimately helped to prevent unnecessary 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. As a result, the interrelatedness of Nexus' building systems reduces redundancy and enhances the architecture of the school building (See Figure 1).

Nexus' Mission Statement:

To develop a design that merges education with the community in a facility that is safe and cost effective while functioning as a learning tool.

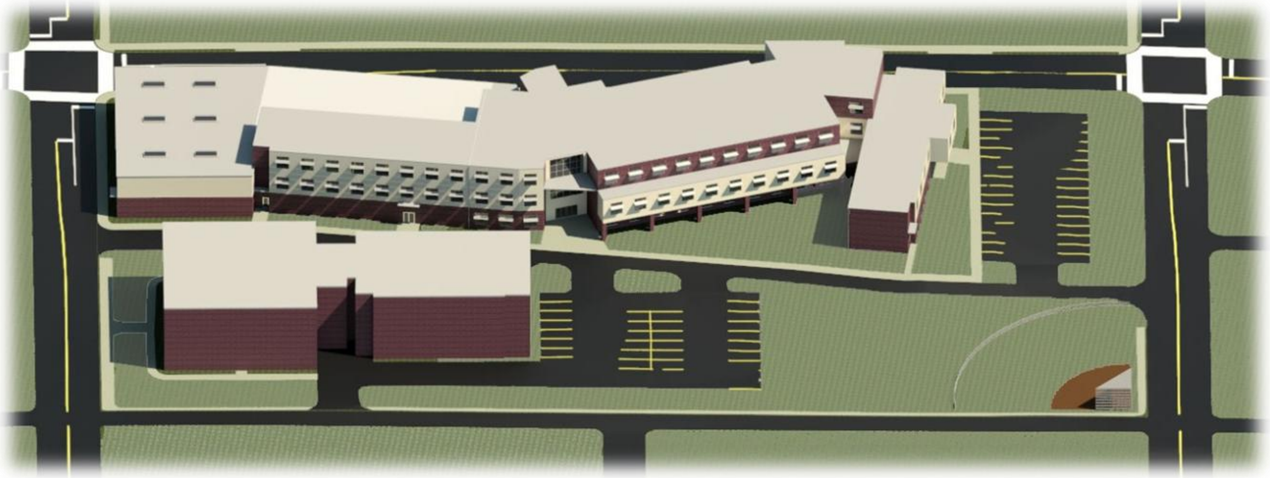


Figure 1: Final Building Rendering (existing building not shown for clarity of the new design)

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

Figure 2: Arrows indicate flow of support via project goals, ultimately achieving the owner objectives

1.3 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.

safety & security

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 will feel more comfortable and willing to come to school. As a result of Nexus' design, student attendance rates are expected to rise. In addition, having a sense of 'unseen' security will enhance the feeling of safety in the new building.

lifecycle & maintenance

Second, Reading School District desires a building that can endure for 100 years. Yet, this building must be adaptable, flexible, and able to accommodate new emerging technologies, learning styles, and teaching techniques. The flexibility of the spaces designed into the building help increase its lifecycle, while the systems selected reduce the need for routine maintenance.

cost effective

Third, Reading School District wants a building that is both cost effective in both the short and 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. By reducing the building's initial cost and maintaining a low operations and maintenance cost, Reading will be able to afford a new school both now and in the future.

1.4 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.

integration

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 information exchanges.

reduce, recover, reuse

Second, this holistic building integration was produced through lean practices. These lean practices include reduce, reuse, and recover, which pertain to all disciplines. Specific lean focuses of construction management include producing less construction waste, maintaining a shorter construction schedule, and utilizing sustainable materials.

learning tool

Third, Nexus desired to create a building that could be used as a learning tool for the end users. The building has exposed ceilings, which highlights its 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.

1.5 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 sections below reflect these goals and in turn the team and owner goals (see Figure 3).

Construction Management Goals
Efficiency
Lifecycle
Cost Advantage

Figure 3: Construction Management Goals

First, efficiency incorporates the constructability, lifecycle, and cost advantages by teaching the owner to use the building and its systems as they were designed. This will allow the owner to reap the full potential of the integrated building systems. 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 the project's conception to help reduce actual construction time on site, which, as a result, reduces disturbances to the neighborhood and existing school on site.

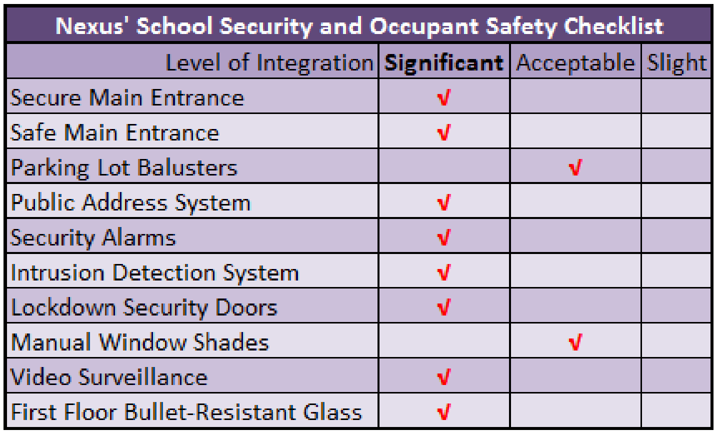
Second, lifecycle is accomplished through material and building system selection and maintainability. Through value engineering, with both quality and cost considerations, Nexus chose building systems that were simple to operate and maintain by the Reading School District maintenance staff. LEED requirements were also taken into consideration when making building system design decisions.

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 costs and lifecycle costs.

2. Safety and Security

2.1 Building Security and Occupant Safety

Safety is of upmost importance to Nexus. Nexus has taken the approach that safety is not solely a field responsibility, but rather an obligation to be borne by all parties involved. Both safety and security were addressed starting in the design phase and carried all the way through operations and maintenance.



Nexus' School Security and Occupant Safety Checklist			
Level of Integration	**Significant**	Acceptable	Slight
Secure Main Entrance	√		
Safe Main Entrance	√		
Parking Lot Balusters		√	
Public Address System	√		
Security Alarms	√		
Intrusion Detection System	√		
Lockdown Security Doors	√		
Manual Window Shades		√	
Video Surveillance	√		
First Floor Bullet-Resistant Glass	√		

Figure 4: Security Analysis

Reading's violent crime rate was 133.52% higher than the national average in 2010[2]. This, along with recent events, had a major impact on the approach that Nexus took towards designing for safety. The original main entrance of the school was located on the North side of the building next to a highly trafficked road. Nexus took some design liberties and moved the main entrance to the South side of the building, so it faces the interior of the school campus. Balusters were added to prevent unwanted cross traffic through the center of the educational campus (see page 18 of the Appendix). To further ensure student and faculty safety, all windows on the first floor have been designed as bullet-resistant glass (see Figure 4).

Safety was carried into the building by providing a single secure main entrance that requires visitors to pass through the reception area prior to entering the school. Nexus provides a sense of unseen security through the use of hidden cameras monitoring the main entrance. Some of the other security features that were designed include a public address system with speakers in each classroom (not only for daily announcements, but also security purposes), security alarms triggered by an intrusion detection system at all exterior doors, automatic lockdown security doors in the corridors that double as fire doors, and manual shades to cover the classroom door window and sidelight. These measures were all considered prior to even excavating.

Safety will also be the top priority for the project during construction. Safe site working conditions will be achieved largely through contractor work practices. According to the contract all parties on site must meet, and in some cases exceed, OSHA regulations. Nexus recommends that additional safety precautions be considered such as daily toolbox talks, subcontractor company safety procedures, and a mandatory 5' tie-off rule. A construction fence will be installed to protect the students, teachers, and staff members of the current elementary school, as well as pedestrians on the sidewalks and traffic passengers. The site fence will double as a security fence for the site during construction. The building footprint will remain lit at night to prevent vandalism and theft.

3. Delivery Method

3.1 Delivery Method

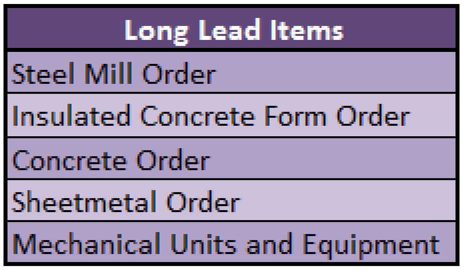
Reading School District's new 89,000 square foot elementary school will be built with the aid of several local contractors. With both state and local funding, the innovative learning facility will be constructed under a Construction Manager Agent with a multi-prime contractor delivery method (see page 19 of the Appendix). 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 associated risks. This is not Nexus' preferred method; however, it is the state-mandated construction method.

Another aspect of the delivery method for this project involves the subcontractors. Pursuant to Pennsylvania contract law 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 be defined as a general works subcontractor, concrete subcontractor, mechanical and plumbing subcontractor, and electrical subcontractor.

3.3 Delivery Method Rationale

The construction manager will be responsible for overseeing all of the preconstruction and construction efforts. The preconstruction efforts encompass preliminary cost estimates, schedule projections, and risk and constructability analyses. Additionally, the construction manager may define project execution guidelines and work flow interchanges. The work flow interchanges will be managed through an internet-based project management document system. These documents include construction drawings, shop drawings, change order requests, change orders, requests for information, cost accounting reports, architectural supplementary information, and additional information. Next, the construction manager will obtain the necessary construction permits from local jurisdictions, commence site investigation, verify the geotechnical report discoveries, and coordinate utility tie-in points. 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 analyzes the design and engineering aspects of the building and determines the construction schedule. Thereafter, the construction manager will develop a cost estimate for the entire project. Then, they will write and develop cost estimates for each scope of work. Once a bid schedule for the entire project is defined, the construction manager will send out bid invitations to prequalified 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 projects 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

Figure 5: Lead Items Identified by Nexus

It is important to note that while writing scopes of work, the construction manager, with the architect and engineers, must identify long lead items (see Figure 5). It is necessary for the respective subcontractors to order these items from their vendors 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 since 89,000 square feet need 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 scheduled mobilization date (June 9, 2014).

4. Project Planning

4.1 Site Plans

The site logistics plans were created with Nexus' team goals of integration and sustainability and the school district's objectives of safety, accessibility, flexibility, and cost benefit in mind. To begin, the site logistics plan encompasses the entire project site, surrounding roads, and the existing elementary school on site (see Figure 6). First, it is imperative to note that Nexus repositioned the proposed elementary school to the center of the top of the site (see Figure 7). This was done to accommodate for the pool on the west end. 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 baseball field proportions were not affected, thus maintaining the existing playground area. The bus lane will remain one way, with traffic progressing from west to east.

Prior to creating a learning environment, safety had to be established. In order to maintain the feeling of security, Nexus turned the educational campus in on itself to shelter the students (see Figure 7). This inward turn allows students to congregate on the inside of the campus, away from the main roads and the dangers of the 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 the pool. The pool's mechanical, structural and electrical systems are all independent of the rest of the school building to allow for a potential second phase. The projected cost of the pool is $2.68 million, which increases the cost per square foot of the school from $200/SF to $231/SF (see page 25 of the Appendix). 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 potentially build a pool in the future.

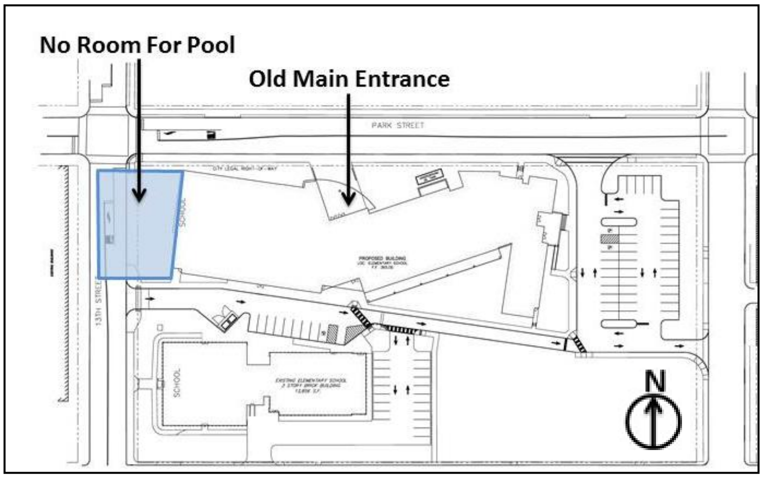


Figure 6: Original Site Plan Provided by the AEI Competition

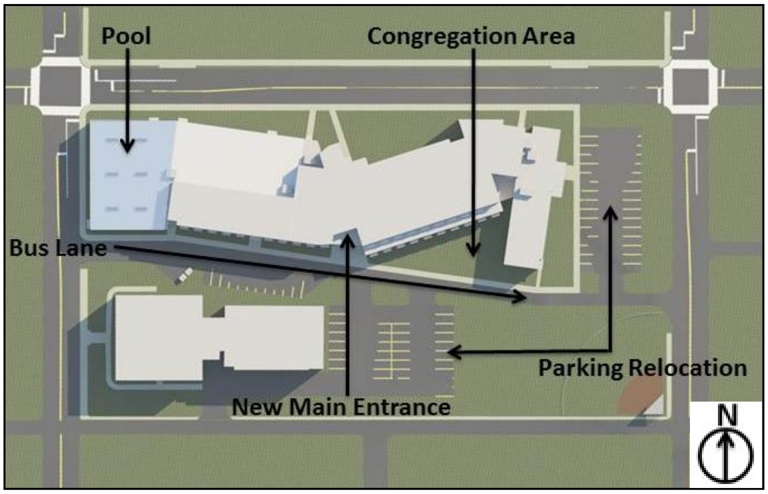


Figure 7: Nexus' Revised Campus Plan (building moved east, parking reallocated, and pool addition)

4.2 Site Plans Rationale

Nexus chose to leave the existing elementary school in place to be repurposed as the Reading School District sees 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 sustainable principle 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 eliminate an already existing resource.

The proposed bus lane will be the guide for the main access road during construction. 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 since no soil will be stockpiled on site due to contamination. It is also important to note that the north gate will only be utilized as an entrance while the east gate will only be utilized as an exit (see Figure 8). 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.

Figure 8: Excavation Site Plan

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 (see pages 20 and 21 of the Appendix). In the case of a bottleneck, due to the safety concerns of the crane and its delivery trucks, the steel contractor will have priority of the access road over the concrete contractor (who has more mobile equipment and trucks).

The site will contain a comingled dumpster for offsite recycling. This will help cut down on contractor material waste and promote material reuse, garnering LEED points as well. Due to the relatively short 15 month construction duration, the school district will be able to gain quicker access to their recreational field and auxiliary spaces. This will help reduce the impact on the local traffic patterns and neighborhood inconveniences.

5. Cost Estimate

5.1 Reading School District

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 is locally funded[3]. Reading's economic situation had a major impact on the projected cost budget for the project and ultimately Nexus' design.

Reading School District's students consistently underperform in comparison to their Pennsylvania counterparts[2] (see Figure 9). This may be a product of the fact that they do not have the same resources as students in other districts. The environment in which they learn may also have an impact on how they perform. Thus, Nexus strove to design a cost effective building that encourages students to attend class and creates a flexible environment which accommodates each student's individual learning style.

Grade 5 - Non-proficient Students		
	PA State Average	Reading SD
Math	23%	38%
Reading	32%	53%

Figure 9: Student Proficiency Statistics

5.2 Value Engineering

One of the most visible, but perhaps unnoticed, structural aspects of the building are the slabs-on-grade and slabs-on-deck. These slabs are the walking surface through the corridors in the entire school. The epoxy finish with added color increase the aesthetics of the flooring. By not applying a tile flooring system in the corridors, the school district will be able to save $79,800 (see Figure 10). Another cost savings measure involved the exclusion of acoustic ceiling tiles. By not installing a grid and hanger system in each classroom, the corridors, and auxiliary spaces, the school district will be able to save $195,156.

Value Engineered Finishes			
	SF	$/SF	Total
Concrete with Epoxy Finish	21,000	$ 0.51	$ 10,710
VCT	21,000	$ (4.31)	$ (90,510)
Acoustic Ceiling Tile	55,600	$ (3.51)	$(195,156)
Total Savings			**$ (296,376)**

Figure 10: Cost Savings

The maintenance aspect of the district's objectives involves the flexibility of the school's multiple spaces. Gypsum wall board on metal studs 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 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 there is minimal maintenance and floor tiles can easily be replaced.

Figure 11: Teacher Perspective of a Typical Classroom

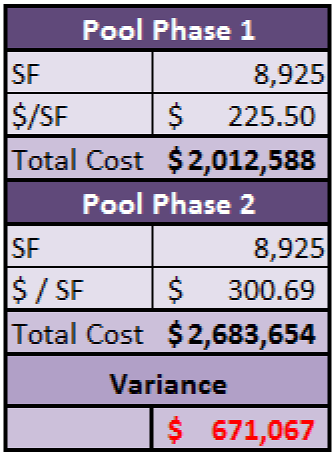
There is also an economical benefit to many of these material selections. The exclusion of a drop ceiling saves on material and labor costs, which become direct savings to the owner, while still providing all the benefits denoted above (see Figure 11). Using finished concrete for the flooring in the hallway saves on finishes and labor costs 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, saving Reading School District money. In the case of the lobby, an abundant amount of glazing allows light into the atrium. This helps to illuminate the lobby and hallways and reduces the need for luminaires in these spaces. This results in a savings of both upfront costs and lifecycle costs.

Nexus also focused heavily on the operations and maintenance costs which will be borne by Reading for the life of the building. 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.

5.2 Cost Considerations

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 to improve 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 page 31 in the Appendix).



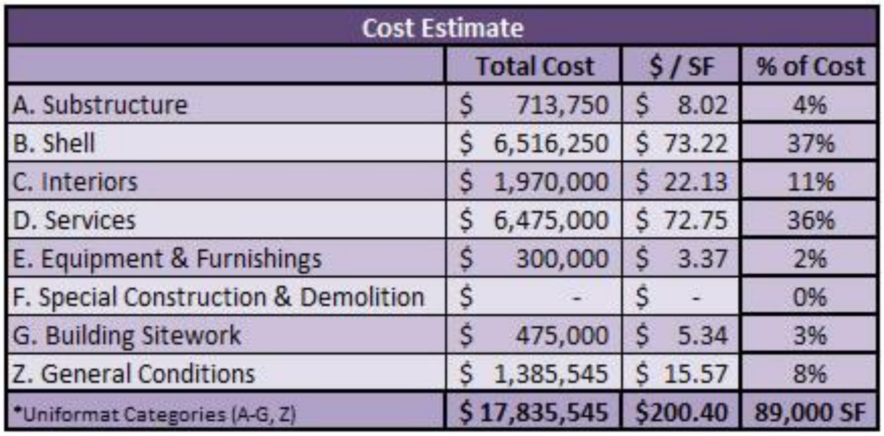
Pool Phase 1	
SF	8,925
$/SF	$ 225.50
Total Cost	**$ 2,012,588**
Pool Phase 2	
SF	8,925
$ / SF	$ 300.69
Total Cost	**$ 2,683,654**
Variance	
	$ 671,067

Figure 12: Pool Cost Comparisons

One of the major concerns that Nexus has is the addition of a pool. The first concern is that the pool is a considerable strain on the project budget (see Figure 12). The maintenance required for a pool also increases life-cycle costs. Additionally, a pool 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 Nexus.

5.3 Cost Estimate Rationale

In order to help fund the project, Nexus delved into the multiple resources available to public school districts in Pennsylvania. The largest contribution from the state involves PlanCon funds. The $5,297,230 from PlanCon will alleviate the financial burden of the new school on the local residents (see page 26 in the Appendix).

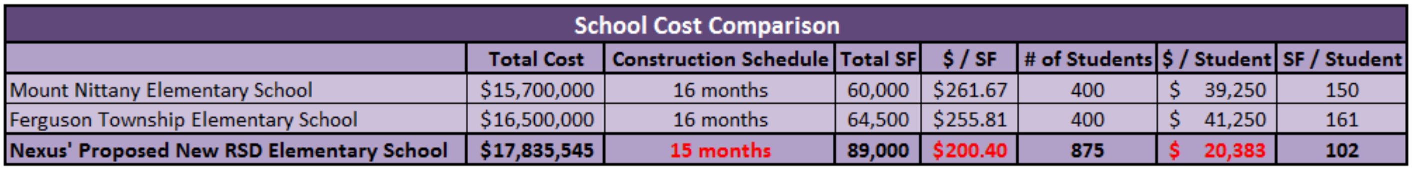


Cost Estimate			
	Total Cost	**$ / SF**	**% of Cost**
A. Substructure	$ 713,750	$ 8.02	4%
B. Shell	$ 6,516,250	$ 73.22	37%
C. Interiors	$ 1,970,000	$ 22.13	11%
D. Services	$ 6,475,000	$ 72.75	36%
E. Equipment & Furnishings	$ 300,000	$ 3.37	2%
F. Special Construction & Demolition	$ -	$ -	0%
G. Building Sitework	$ 475,000	$ 5.34	3%
Z. General Conditions	$ 1,385,545	$ 15.57	8%
*Uniformat Categories (A-G, Z)	**$ 17,835,545**	**$200.40**	**89,000 SF**

Figure 11: Summary Cost Estimate

Once the project budget was defined, Nexus defined scopes of work for the 17 different subcontractors. These scopes of work detail the work to be put in place by each subcontractor and the value of the contracts (see page 33 of the Appendix).

Figure 14 displays the construction cost and schedule along with student data for two elementary schools built in the last few years. Despite having the highest total cost (by $1,335,545), Nexus' design has the shortest construction schedule (by one month), lowest cost per square foot (by $55.41), and lowest cost per student (by $18, 867). The other two schools have a fewer number of students (by 475) yet more square feet allocated per student (by 48 square feet). Therefore, Nexus believes it has provided Reading School District with one of the most economical designs for new elementary schools in recent years.



School Cost Comparison							
	Total Cost	**Construction Schedule**	**Total SF**	**$ / SF**	**# of Students**	**$ / Student**	**SF / Student**
Mount Nittany Elementary School	$15,700,000	16 months	60,000	$261.67	400	$ 39,250	150
Ferguson Township Elementary School	$16,500,000	16 months	64,500	$255.81	400	$ 41,250	161
Nexus' Proposed New RSD Elementary School	**$17,835,545**	**15 months**	**89,000**	**$200.40**	**875**	**$ 20,383**	**102**

Figure 14: This data documents Nexus' efforts to reduce cost and schedule for RSD's new elementary school

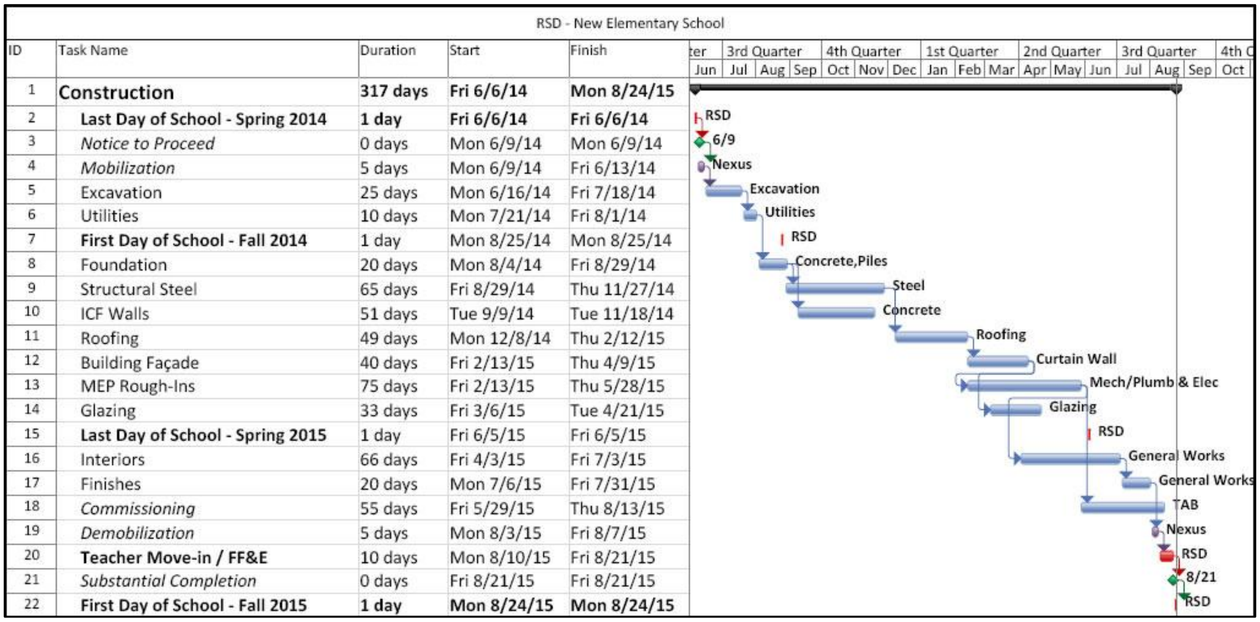
6. Construction Schedule

6.1 Schedule and Sequencing

The two largest preconstruction endeavors involve scheduling 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, preliminary schedule estimates show that the design phase of the project will need to begin in September 2012.

As stated above, with the scopes of work defined, a bid schedule will then be developed. This schedule will be utilized to hold the subcontractors to the dates that they bid. The sequencing of the schedule was done in conjunction with the development of a 4-dimensional model in Navisworks. 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 scheduling, sequencing, constructability analysis, and clash-detection. Thus, the Navisworks model was the best 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 (see Figure 15).



RSD - New Elementary School

ID	Task Name	Duration	Start	Finish
1	**Construction**	**317 days**	**Fri 6/6/14**	**Mon 8/24/15**
2	**Last Day of School - Spring 2014**	**1 day**	**Fri 6/6/14**	**Fri 6/6/14**
3	*Notice to Proceed*	0 days	Mon 6/9/14	Mon 6/9/14
4	*Mobilization*	5 days	Mon 6/9/14	Fri 6/13/14
5	Excavation	25 days	Mon 6/16/14	Fri 7/18/14
6	Utilities	10 days	Mon 7/21/14	Fri 8/1/14
7	**First Day of School - Fall 2014**	1 day	Mon 8/25/14	Mon 8/25/14
8	Foundation	20 days	Mon 8/4/14	Fri 8/29/14
9	Structural Steel	65 days	Fri 8/29/14	Thu 11/27/14
10	ICF Walls	51 days	Tue 9/9/14	Tue 11/18/14
11	Roofing	49 days	Mon 12/8/14	Thu 2/12/15
12	Building Façade	40 days	Fri 2/13/15	Thu 4/9/15
13	MEP Rough-Ins	75 days	Fri 2/13/15	Thu 5/28/15
14	Glazing	33 days	Fri 3/6/15	Tue 4/21/15
15	**Last Day of School - Spring 2015**	1 day	Fri 6/5/15	Fri 6/5/15
16	Interiors	66 days	Fri 4/3/15	Fri 7/3/15
17	Finishes	20 days	Mon 7/6/15	Fri 7/31/15
18	*Commissioning*	55 days	Fri 5/29/15	Thu 8/13/15
19	*Demobilization*	5 days	Mon 8/3/15	Fri 8/7/15
20	**Teacher Move-in / FF&E**	10 days	Mon 8/10/15	Fri 8/21/15
21	*Substantial Completion*	0 days	Fri 8/21/15	Fri 8/21/15
22	**First Day of School - Fall 2015**	**1 day**	**Mon 8/24/15**	**Mon 8/24/15**

Figure 15: Construction Milestone Schedule

6.2 Schedule Rationale

The construction schedule reinforces Nexus' project goal of reducing construction time on site. Reducing this duration will have a smaller impact on the environment and will most likely reduce construction costs 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.

Immediately after the Notice to Proceed, excavation will begin and last for approximately five weeks. 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 16). 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. This end of the building is the most concrete intensive. The insulated concrete form walls, although only cast in 14 foot lifts, will be temporarily braced until the steel members supporting them are erected. 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.

Figure 16: Superstructure Erection Plan

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 the 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.

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 in order 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.

7. 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 highest quality elementary school and the most enjoyable construction services.

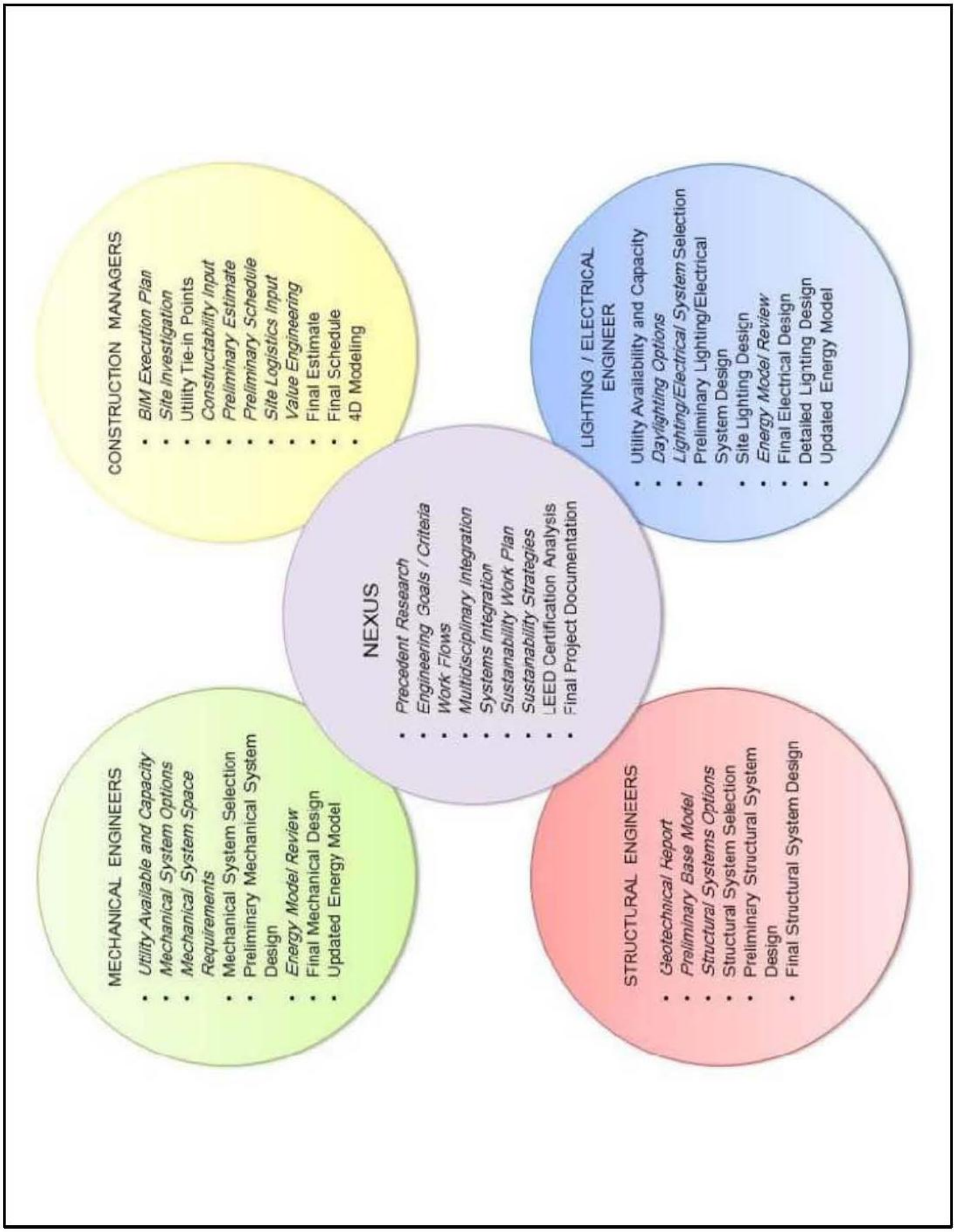
7.1 References

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

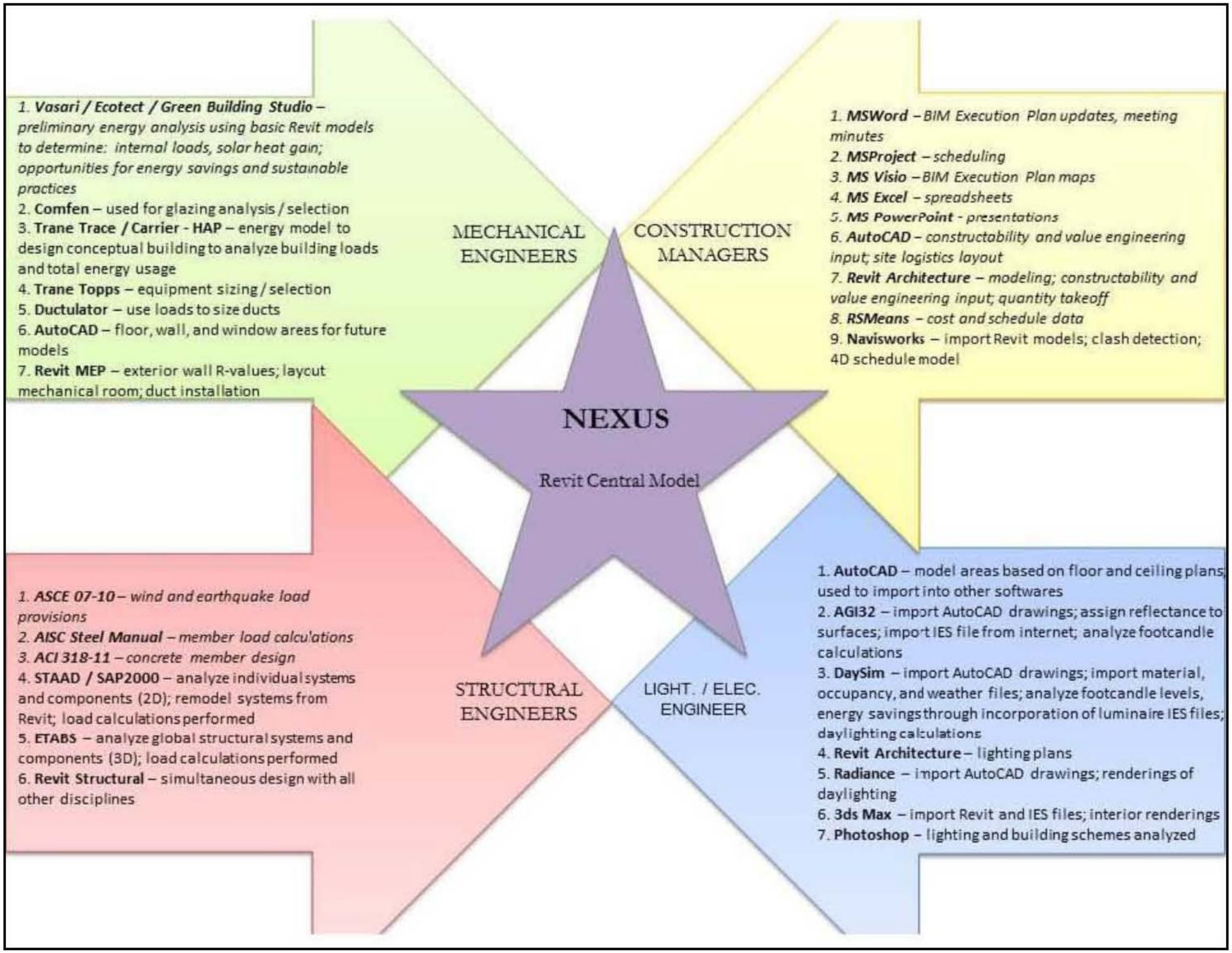
2. PA crime rates (2010) <http://www.cityrating.com/crime-statistics/pennsylvania/reading.html#.UQAdifUrMtg>

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

NEXUS DISCIPLINE ROLES AND RESPONSIBILITIES



NEXUS SOFTWARE INFORMATION EXCHANGES



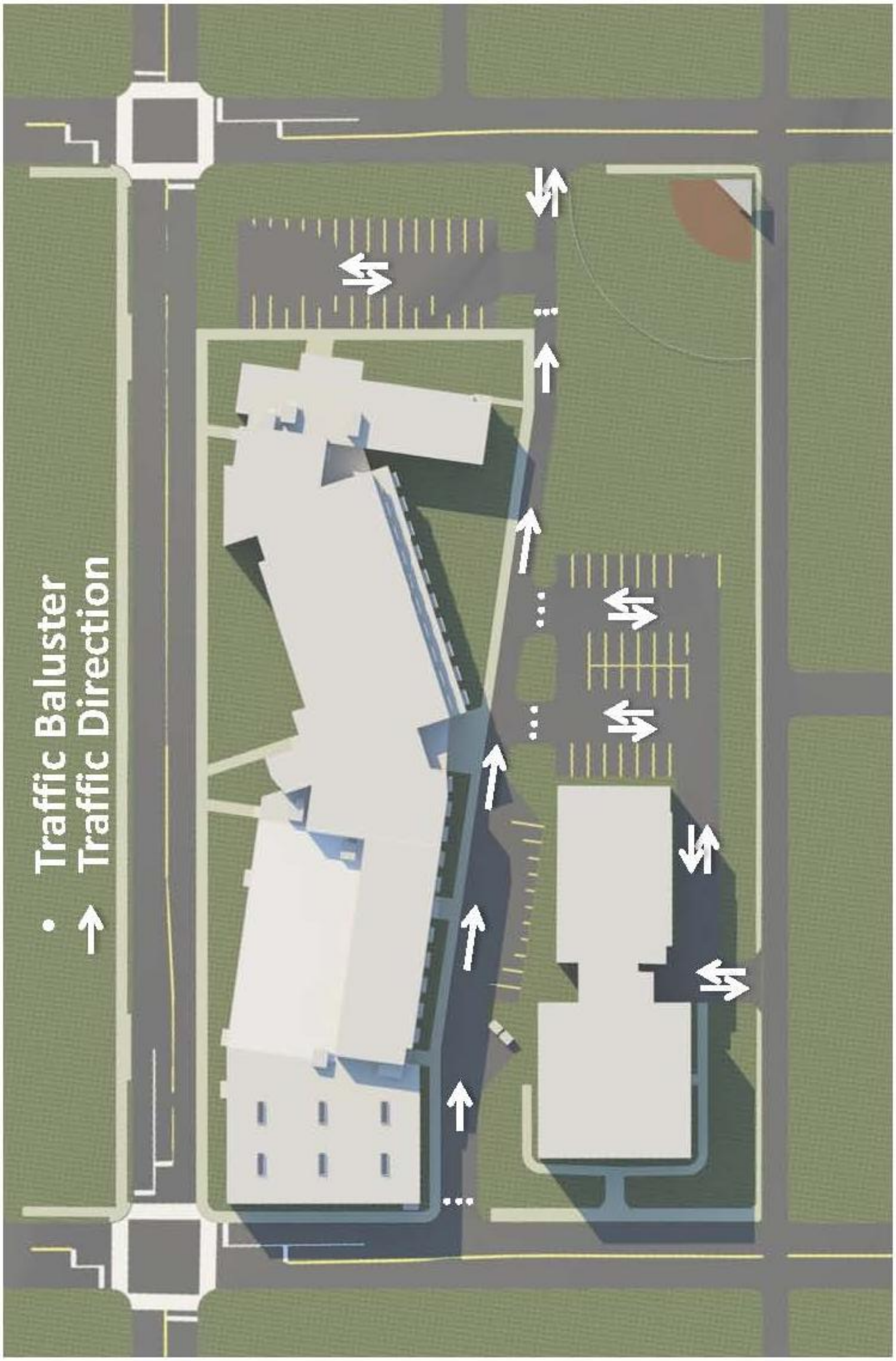
1. ***Vasari / Ecotect / Green Building Studio*** *– preliminary energy analysis using basic Revit models to determine: internal loads, solar heat gain; opportunities for energy savings and sustainable practices*
2. **Comfen** – used for glazing analysis / selection
3. **Trane Trace / Carrier - HAP** – energy model to design conceptual building to analyze building loads and total energy usage
4. **Trane Topps** – equipment sizing / selection
5. **Ductulator** – use loads to size ducts
6. **AutoCAD** – floor, wall, and window areas for future models
7. **Revit MEP** – exterior wall R-values; layout mechanical room; duct installation

1. ***MSWord*** *– BIM Execution Plan updates, meeting minutes*
2. ***MSProject*** *– scheduling*
3. ***MS Visio*** *– BIM Execution Plan maps*
4. ***MS Excel*** *– spreadsheets*
5. ***MS PowerPoint*** *- presentations*
6. ***AutoCAD*** *– constructability and value engineering input; site logistics layout*
7. ***Revit Architecture*** *– modeling; constructability and value engineering input; quantity takeoff*
8. ***RSMeans*** *– cost and schedule data*
9. **Navisworks** – import Revit models; clash detection; 4D schedule model

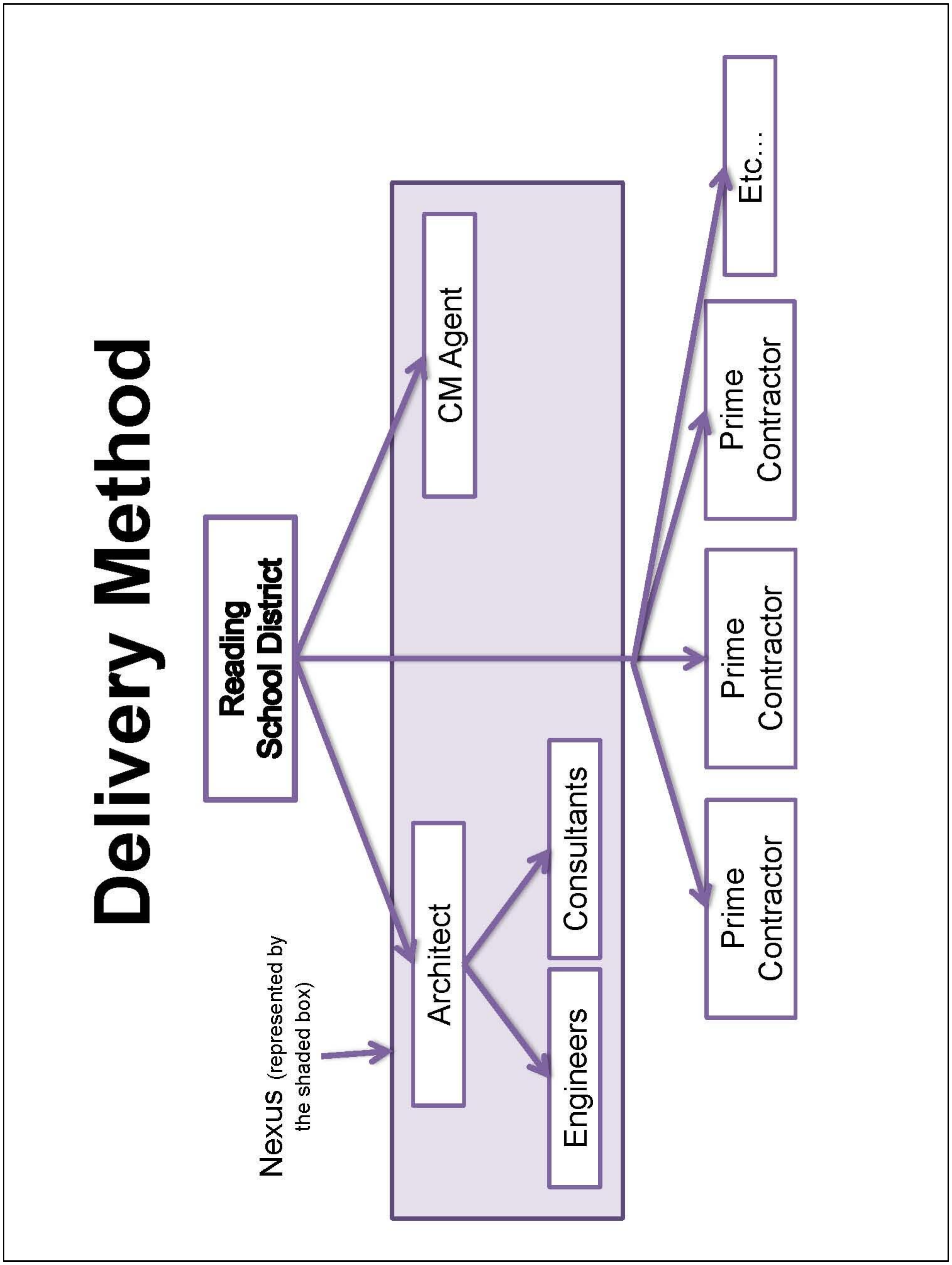
1. ***ASCE 07-10*** *– wind and earthquake load provisions*
2. ***AISC Steel Manual*** *– member load calculations*
3. ***ACI 318-11*** *– concrete member design*
4. **STAAD / SAP2000** – analyze individual systems and components (2D); remodel systems from Revit; load calculations performed
5. **ETABS** – analyze global structural systems and components (3D); load calculations performed
6. **Revit Structural** – simultaneous design with all other disciplines

1. **AutoCAD** – model areas based on floor and ceiling plans; used to import into other softwares
2. **AGI32** – import AutoCAD drawings; assign reflectance to surfaces; import IES file from internet; analyze footcandle calculations
3. **DaySim** – import AutoCAD drawings; import material, occupancy, and weather files; analyze footcandle levels, energy savings through incorporation of luminaire IES files; daylighting calculations
4. **Revit Architecture** – lighting plans
5. **Radiance** – import AutoCAD drawings; renderings of daylighting
6. **3ds Max** – import Revit and IES files; interior renderings
7. **Photoshop** – lighting and building schemes analyzed

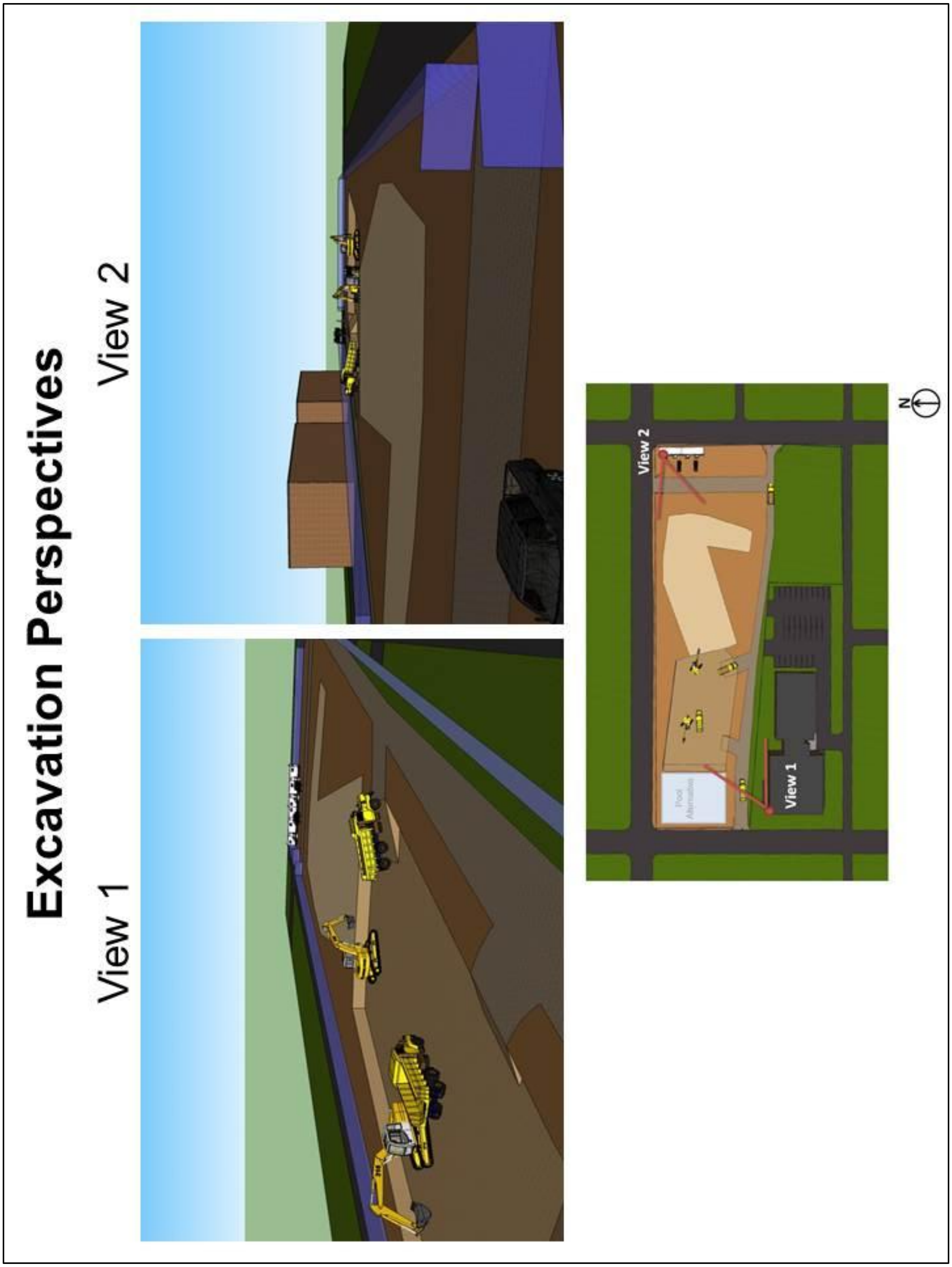
TRAFFIC PLAN



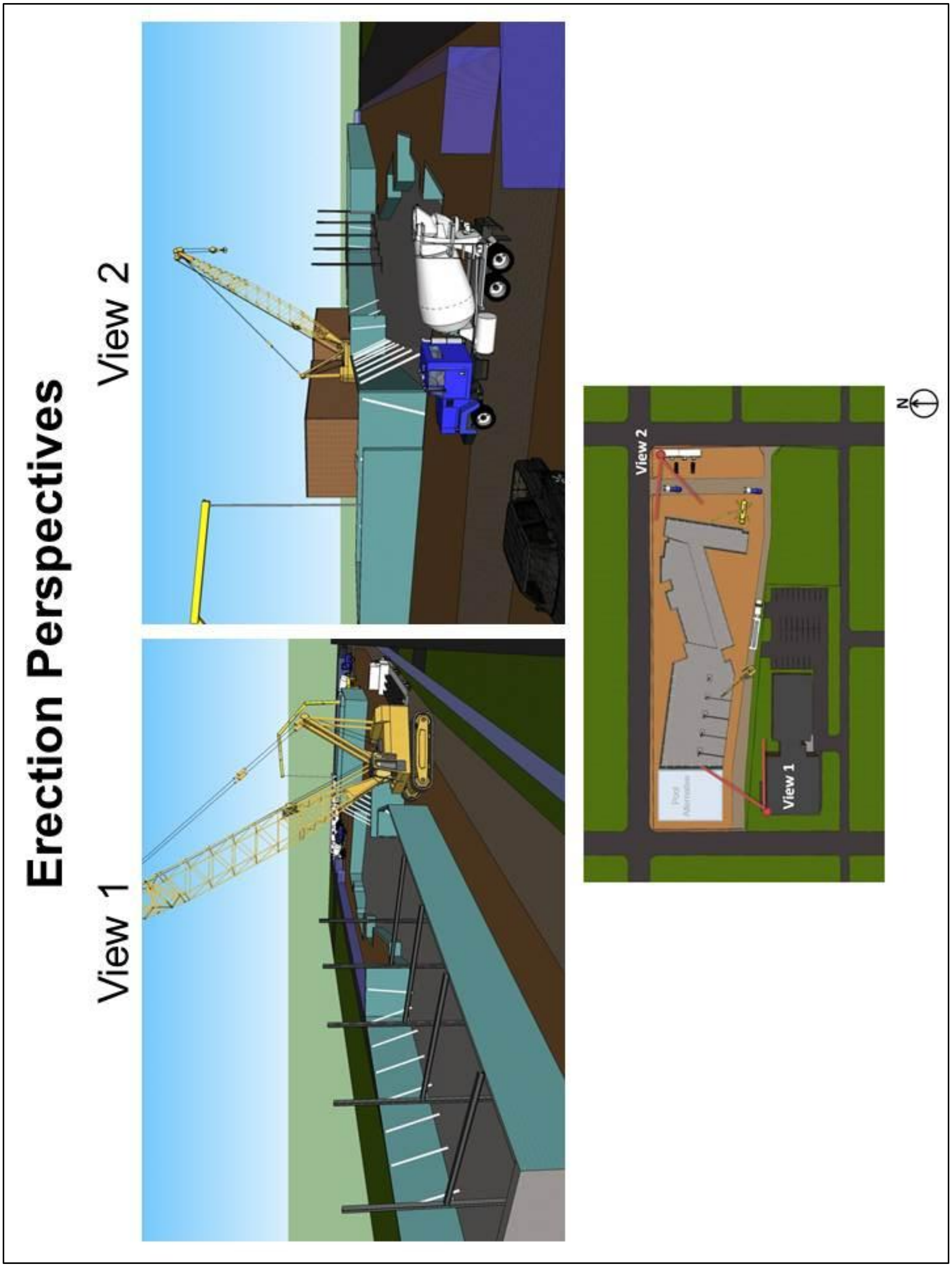
CONSTRUCTION MANAGER AGENT – MULTI-PRIME DESIGN-BID-BUILD



EXCAVATION SITE PLAN



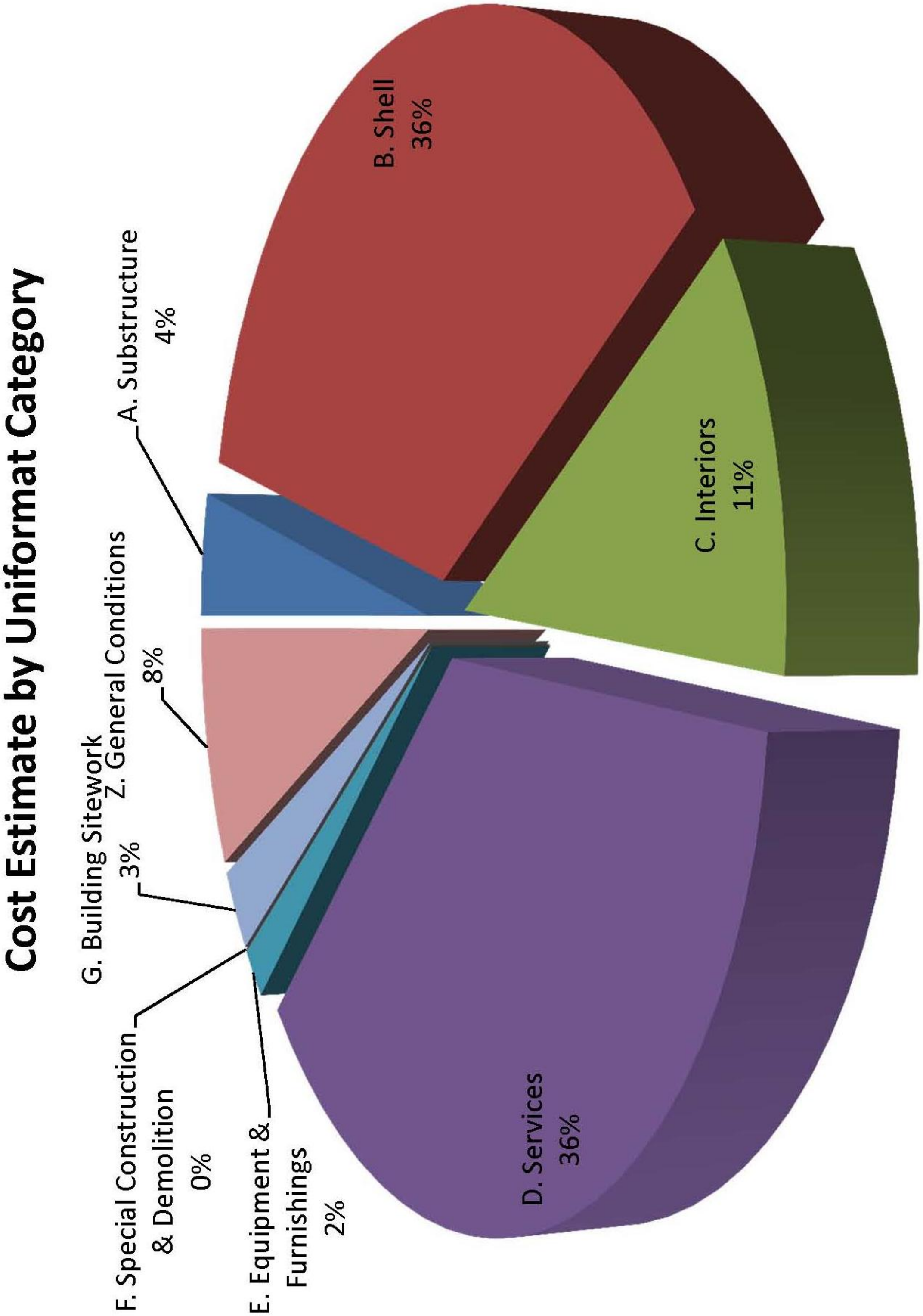
SUPERSTRUCTURE ERECTION PLANS



UNIFORMAT DETAILED COST ESTIMATE

Uniformat Cost Estimate					
A. Substructure	**$ 713,750**	A10 Foundations	$ 459,750	A1010 Standard Foundations	$ 138,500
				A1020 Special Foundations	$ 200,000
				A1030 Slab on Grade	$ 121,250
		A20 Basement Construction	$ 254,000	A2010 Basement Excavation	$ 150,000
				A2020 Basement Walls	$ 104,000
B. Shell	**$ 6,390,250**	B10 Superstructure	$ 1,777,250	B1010 Floor Construction	$ 1,381,000
				B1020 Roof Construction	$ 396,250
		B20 Exterior Enclosures	$ 3,908,000	B2010 Exterior Walls	$ 3,239,000
				B2020 Exterior Windows	$ 629,000
				B2030 Exterior Doors	$ 40,000
		B30 Roofing	$ 705,000	B3010 Roof Coverings	$ 700,000
				B3020 Roof Openings	$ 5,000
C. Interiors	**$ 1,970,000**	C10 Interior Construction	$ 965,000	C1010 Partitions	$ 830,000
				C1020 Interior Doors	$ 75,000
				C1030 Fittings	$ 60,000
		C20 Stairs	$ 110,000	C2010 Stair Construction	$ 103,000
				C2020 Stair Finishes	$ 7,000
		C30 Interior Finishes	$ 895,000	C3010 Wall Finishes	$ 180,000
				C3020 Floor Finishes	$ 500,000
				C3030 Ceiling Finishes	$ 215,000
D. Services	**$ 6,475,000**	D10 Conveying	$ 175,000	D1010 Elevators & Lifts	$ 175,000
				D1020 Escalators & Moving Walks	$ -
				D1090 Other Conveying Systems	$ -
		D20 Plumbing	$ 1,400,000	D2010 Plumbing Fixtures	$ 100,000
				D2020 Domestic Water Distribution	$ 300,000
				D2030 Sanitary Waste	$ 240,000
				D2040 Rain Water Drainage	$ 74,000
				D2090 Other Plumbing Systems	$ 686,000
		D30 HVAC	$ 2,800,000	D3010 Energy Supply	$ -
				D3020 Heat Generating Systems	$ 140,000
				D3030 Cooling Generating Systems	$ 280,000
				D3040 Distribution Systems	$ 520,000
				D3050 Terminal & Package Units	$ 840,000
				D3060 Controls & Instrumentation	$ 360,000
				D3070 Systems Testing & Balancing	$ 200,000
				D3090 Other HVAC Systems & Equipment	$ 460,000
		D40 Fire Protection	$ 175,000	D4010 Sprinklers	$ 105,000
				D4020 Standpipes	$ 62,000
				D4030 Fire Protection Specialties	$ 8,000
				D4090 Other Fire Protection Systems	$ -
		D50 Electrical	$ 1,925,000	D5010 Electrical Service & Distribution	$ 551,250
				D5020 Lighting and Branch Wiring	$ 1,023,750
				D5030 Communications & Security	$ 350,000
				D5090 Other Electrical Systems	$ -
E. Equipment & Furnishings	**$ 300,000**	E10 Equipment	$ -	E1010 Commercial Equipment	$ -
				E1020 Institutional Equipment	$ -
				E1030 Vehicular Equipment	$ -
				E1090 Other Equipment	$ -
		E20 Furnishings	$ 300,000	E2010 Fixed Furnishings	$ 200,000
				E2020 Movable Furnishings	$ 100,000
F. Special Construction & Demolition	**$ -**	F10 Special Construction	$ -	F1010 Special Structures	$ -
				F1020 Integrated Construction	$ -
				F1030 Special Construction Systems	$ -
				F1040 Special Facilities	$ -
				F1050 Special Controls and Instrumentation	$ -
		F20 Selective Building Demolition	$ -	F2010 Building Elements Demolition	$ -
				F2020 Hazardous Components Abatement	$ -
G. Building Sitework	**$ 601,000**	G10 Site Preparation	$ 175,000	G1010 Site Clearing	$ -
				G1020 Site Demolition and Relocations	$ -
				G1030 Site Earthwork	$ 125,000
				G1040 Hazardous Waste Remediation	$ 50,000
		G20 Site Improvements	$ 301,000	G2010 Roadways	$ 127,500
				G2020 Parking Lots	$ 133,500
				G2030 Pedestrian Paving	$ 15,000
				G2040 Site Development	$ -
				G2050 Landscaping	$ 25,000
		G30 Site Mechanical Utilities	$ 75,000	G3010 Water Supply	$ 13,000
				G3020 Sanitary Sewer	$ 15,000
				G3030 Storm Sewer	$ 16,000
				G3040 Heating Distribution	$ 12,000
				G3050 Cooling Distribution	$ 8,000
				G3060 Fuel Distribution	$ 11,000
				G3090 Other Site Mechanical Utilities	$ -
		G40 Site Electrical Utilities	$ 50,000	G4010 Electrical Distribution	$ 10,000
				G4020 Site Lighting	$ 25,000
				G4030 Site Communications & Security	$ 15,000
				G4090 Other Site Electrical Utilities	$ -
		G90 Other Site Construction	$ -	G9010 Service and Pedestrian Tunnels	$ -
				G9090 Other Site Systems & Equipment	$ -
Z. General Conditions	**$ 1,385,545**	Z10 Design Allowance	$ -		
		Z20 Overhead & Profit	$ 1,385,545	Z2010 Overhead	$ 1,072,995
				Z2020 Profit	$ 312,550
TOTAL	**$ 17,835,545**				

BUILDING GENERAL CONDITIONS COST ESTIMATE



BUILDING GENERAL CONDITIONS COST ESTIMATE

General Conditions Cost Estimate

Personnel	Quantity	Unit	Unit Price	Total Cost
Project manager	60	Week	$ 2,125.00	$ 127,500
Engineer	60	Week	$ 1,300.00	$ 78,000
Superintendent	60	Week	$ 1,975.00	$ 118,500
Clerk	60	Week	$ 420.00	$ 25,200
				$ 349,200
Facilities	Quantity	Unit	Unit Price	Total Cost
Trailer (32'x8')	15	Month	$ 185.00	$ 2,775
Dumpster (40 CY, 1 dump/wk.)	12	Month	$ 860.00	$ 10,320
Portable toilet	15	Month	$ 180.00	$ 2,700
Storage (40' x 8')	15	Month	$ 385.00	$ 5,775
Office expenses	15	Month	$ 460.00	$ 6,900
Gravel road (8")	500	SY	$ 11.73	$ 5,865
				$ 34,335
Protection	Quantity	Unit	Unit Price	Total Cost
Site fence (6' tall)	4000	LF	$ 5.16	**$ 20,640**
Temporary Utilities	Quantity	Unit	Unit Price	Total Cost
Heat (w/ fuel, 12hrs., /wk.)	5400	CSF * wk.	$ 40.13	$ 216,702
Lighting	900	CSF	$ 14.95	$ 13,455
Power (lighting, 11.8 KWH))	6750	CSF * mn.	$ 1.65	$ 11,138
Power (job)	6750	CSF * mn.	$ 47.00	$ 317,250
Water	15	Month	$ 63.00	$ 945
				$ 559,490
Insurance, Bonds, Taxes	Quantity	Unit	Unit Price	Total Cost
Builder's risk (0.64%)	0.0064	Job		$ 105,280
				$ 105,280
Mobilization/Demobilization	Quantity	Unit	Unit Price	Total Cost
Mobilization	6	/equipment	$ 350.00	$ 2,100
Demobilization	6	/equipment	$ 325.00	$ 1,950
				$ 4,050
Fee	Quantity	Unit	Unit Price	Total Cost
1.9%	0.019	Job		**$ 312,550**
General Conditions Total				**$ 1,385,545**
Building Direct Cost (materials put in place)				**$ 16,450,000**
Gross Total (builidng direct cost + general conditions)				**$ 17,835,544.50**
Adjustment Factors	Quantity	Unit	Unit Price	Total Cost
PA Sales Tax (6%)	0.06	Job		$ 1,070,133
Available work space (-2%)	-0.02	Job		$ (356,711)
Good GC/CM management (-2%)	-0.02	Job		$ (356,711)
Location Factor (0.98)	-0.02	Job		$ (356,711)
				$ -
**all information in this table is referenced from RSMeans Building Construction Cost Data 2013*				
Building Net Total (building direct cost + general conditions)				**$ 17,835,545**

POOL GENERAL CONDITIONS COST ESTIMATE – PHASE TWO

Phase 2 Pool Cost Estimate

Personnel	Quantity	Unit	Unit Price	Total Cost
Project manager	12	Week	$ 2,125.00	$ 25,500
Engineer	12	Week	$ 1,300.00	$ 15,600
Superintendent	12	Week	$ 1,975.00	$ 23,700
				$ 64,800
Facilities	Quantity	Unit	Unit Price	Total Cost
Trailer (32'x8')	3	Month	$ 185.00	$ 555
Dumpster (40 CY, 1 dump/wk.)	3	Month	$ 860.00	$ 2,580
Portable toilet	3	Month	$ 180.00	$ 540
Office expenses	3	Month	$ 460.00	$ 1,380
Gravel road (8")	100	SY	$ 11.73	$ 1,173
				$ 6,228
Protection	Quantity	Unit	Unit Price	Total Cost
Site fence (6' tall)	400	LF	$ 5.16	**$ 2,064**
Temporary Utilities	Quantity	Unit	Unit Price	Total Cost
Lighting	893	CSF	$ 14.95	$ 13,350
Power (lighting, 11.8 KWH))	1340	CSF * mn.	$ 1.65	$ 2,211
Power (job)	670	CSF * mn.	$ 47.00	$ 31,490
Water	3	Month	$ 63.00	$ 189
				$ 47,240
Insurance, Bonds, Taxes	Quantity	Unit	Unit Price	Total Cost
Builder's risk (0.64%)	0.0064	Job		$ 15,974
				$ 15,974
Mobilization/Demobilization	Quantity	Unit	Unit Price	Total Cost
Mobilization	6	/equipment	$ 350.00	$ 2,100
Demobilization	6	/equipment	$ 325.00	$ 1,950
				$ 4,050
Fee	Quantity	Unit	Unit Price	Total Cost
1.9%	0.019	Job		**$ 47,422**
General Conditions Total				**$ 187,778**
Building Direct Cost **(materials put in place)**				**$ 2,495,876**
Gross Total (builidng direct cost + general conditions)				**$ 2,683,654**
Adjustment Factors	Quantity	Unit	Unit Price	Total Cost
PA Sales Tax (6%)	0.06	Job		$ 161,019
Available work space (-2%)	-0.02	Job		$ (53,673)
Good GC/CM management (-2%)	-0.02	Job		$ (53,673)
Location Factor (0.98)	-0.02	Job		$ (53,673)
				$ -
**all information in this table is referenced from RSMeans Building Construction Cost Data 2013*				
Building Net Total (building direct cost + general conditions)				**$ 2,683,654**

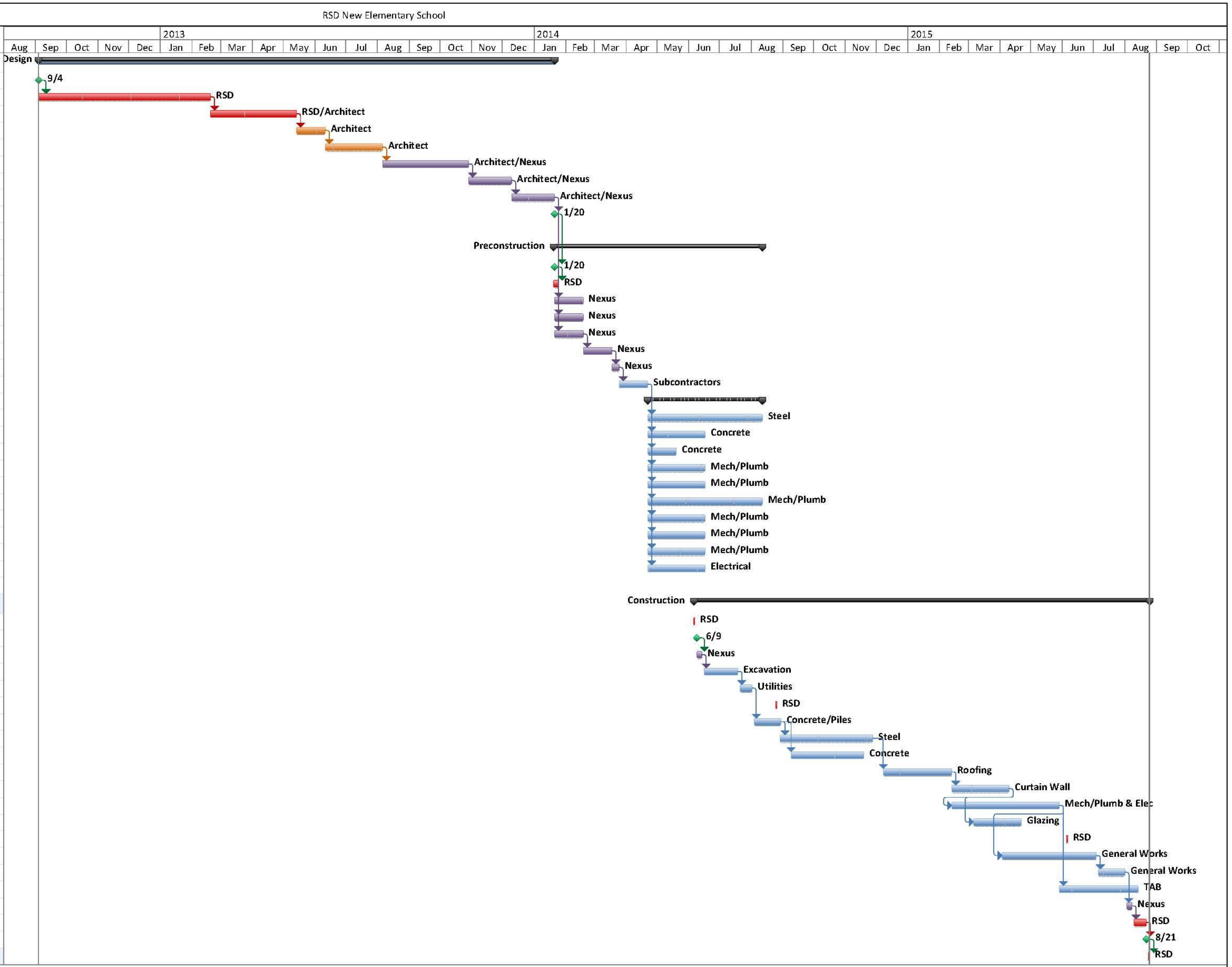
PLANCON COST CALCULATION

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**

DESIGN, PRECONSTRUCTION, AND CONSTRUCTION MILESTONE SCHEDULE

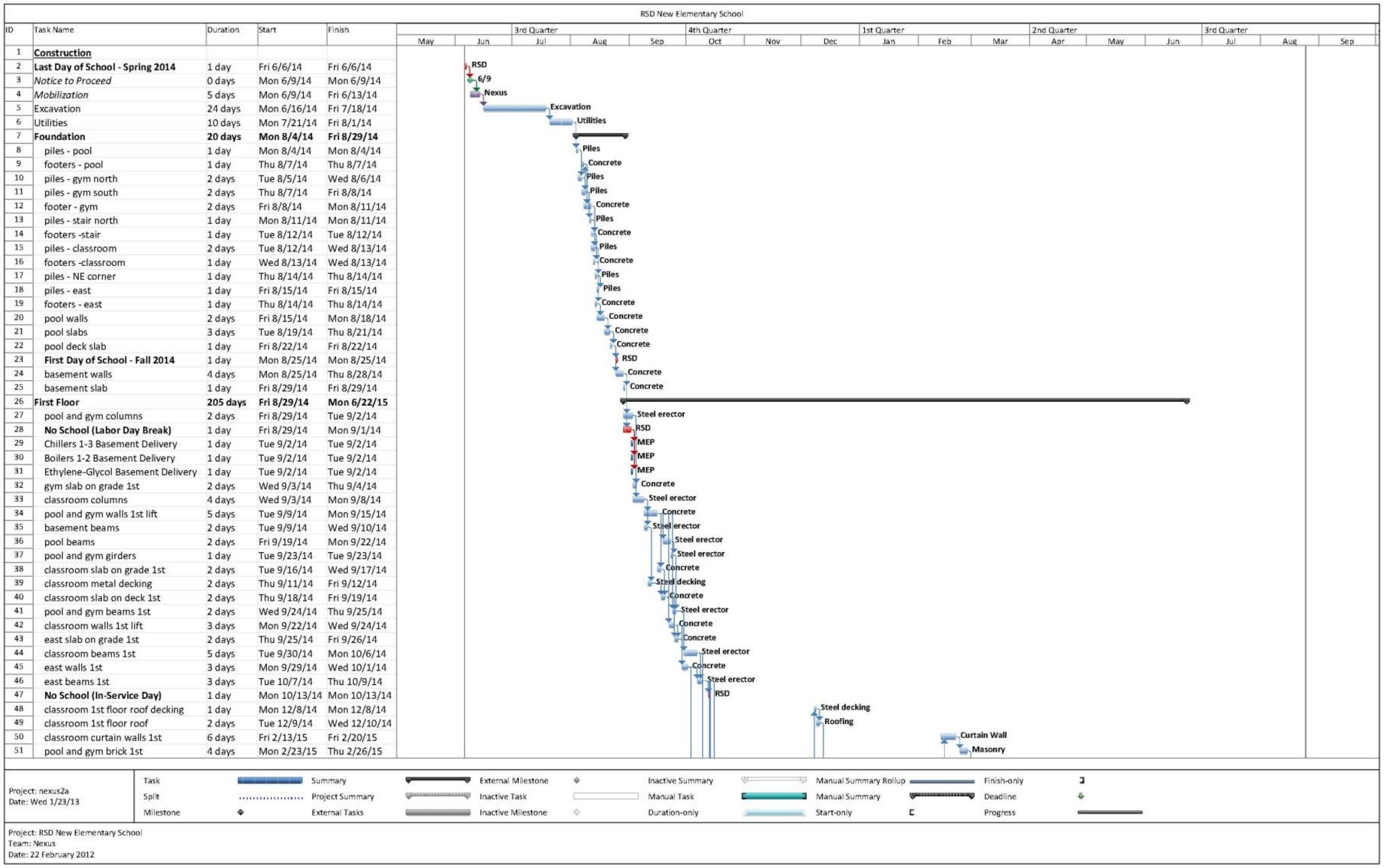
RSD New Elementary School

ID	Task Name	Duration	Start	Finish
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	120 days	Tue 9/4/12	Mon 2/18/13
4	Programming	60 days	Tue 2/19/13	Mon 5/13/13
5	Conceptual Design	20 days	Tue 5/14/13	Mon 6/10/13
6	Schematic Design	40 days	Tue 6/11/13	Mon 8/5/13
7	Design Development	60 days	Tue 8/6/13	Mon 10/28/13
8	50% Construction Documents	30 days	Tue 10/29/13	Mon 12/9/13
9	Construction Documents	30 days	Tue 12/10/13	Mon 1/20/14
10	*Substantial Completion*	0 days	Mon 1/20/14	Mon 1/20/14
11				
12	**Preconstruction**	**146 days**	**Mon 1/20/14**	**Mon 8/11/14**
13	Design Complete	0 days	Mon 1/20/14	Mon 1/20/14
14	*Pool Decision Deadline*	5 days	Mon 1/20/14	Fri 1/24/14
15	Estimate Complete	20 days	Tue 1/21/14	Mon 2/17/14
16	Bid Schedule Complete	20 days	Tue 1/21/14	Mon 2/17/14
17	Scopes of Work Defined	20 days	Tue 1/21/14	Mon 2/17/14
18	Invitation to Bid	20 days	Tue 2/18/14	Mon 3/17/14
19	Subcontractor Awarding	5 days	Tue 3/18/14	Mon 3/24/14
20	Submittals	20 days	Tue 3/25/14	Mon 4/21/14
21	Lead Times - Delivery Times	**80 days**	**Tue 4/22/14**	**Mon 8/11/14**
22	Steel Mill Order	80 days	Tue 4/22/14	Mon 8/11/14
23	ICF Order	40 days	Tue 4/22/14	Mon 6/16/14
24	Concrete Order	20 days	Tue 4/22/14	Mon 5/19/14
25	Sheetmetal	40 days	Tue 4/22/14	Mon 6/16/14
26	Fans	40 days	Tue 4/22/14	Mon 6/16/14
27	AHUs	80 days	Tue 4/22/14	Mon 8/11/14
28	Pumps	40 days	Tue 4/22/14	Mon 6/16/14
29	Cooling Tower	40 days	Tue 4/22/14	Mon 6/16/14
30	Boiler	40 days	Tue 4/22/14	Mon 6/16/14
31	Feeders	40 days	Tue 4/22/14	Mon 6/16/14
32				
33	**Construction**	**317 days**	**Fri 6/6/14**	**Mon 8/24/15**
34	**Last Day of School - Spring 2014**	**1 day**	**Fri 6/6/14**	**Fri 6/6/14**
35	*Notice to Proceed*	0 days	Mon 6/9/14	Mon 6/9/14
36	*Mobilization*	5 days	Mon 6/9/14	Fri 6/13/14
37	Excavation	25 days	Mon 6/16/14	Fri 7/18/14
38	Utilities	10 days	Mon 7/21/14	Fri 8/1/14
39	**First Day of School - Fall 2014**	1 day	Mon 8/25/14	Mon 8/25/14
40	Foundation	20 days	Mon 8/4/14	Fri 8/29/14
41	Structural Steel	65 days	Fri 8/29/14	Thu 11/27/14
42	ICF Walls	51 days	Tue 9/9/14	Tue 11/18/14
43	Roofing	49 days	Mon 12/8/14	Thu 2/12/15
44	Building Façade	40 days	Fri 2/13/15	Thu 4/9/15
45	MEP Rough-Ins	75 days	Fri 2/13/15	Thu 5/28/15
46	Glazing	33 days	Fri 3/6/15	Tue 4/21/15
47	**Last Day of School - Spring 2015**	1 day	Fri 6/5/15	Fri 6/5/15
48	Interiors	66 days	Fri 4/3/15	Fri 7/3/15
49	Finishes	20 days	Mon 7/6/15	Fri 7/31/15
50	*Commissioning*	55 days	Fri 5/29/15	Thu 8/13/15
51	*Demobilization*	5 days	Mon 8/3/15	Fri 8/7/15
52	**Teacher Move-in / FF&E**	10 days	Mon 8/10/15	Fri 8/21/15
53	*Substantial Completion*	0 days	Fri 8/21/15	Fri 8/21/15
54	**First Day of School - Fall 2015**	**1 day**	**Mon 8/24/15**	**Mon 8/24/15**



Project: RSD New Elementary School
Team: Nexus
Date: 22 February 2013

DETAILED CONSTRUCTION SCHEDULE



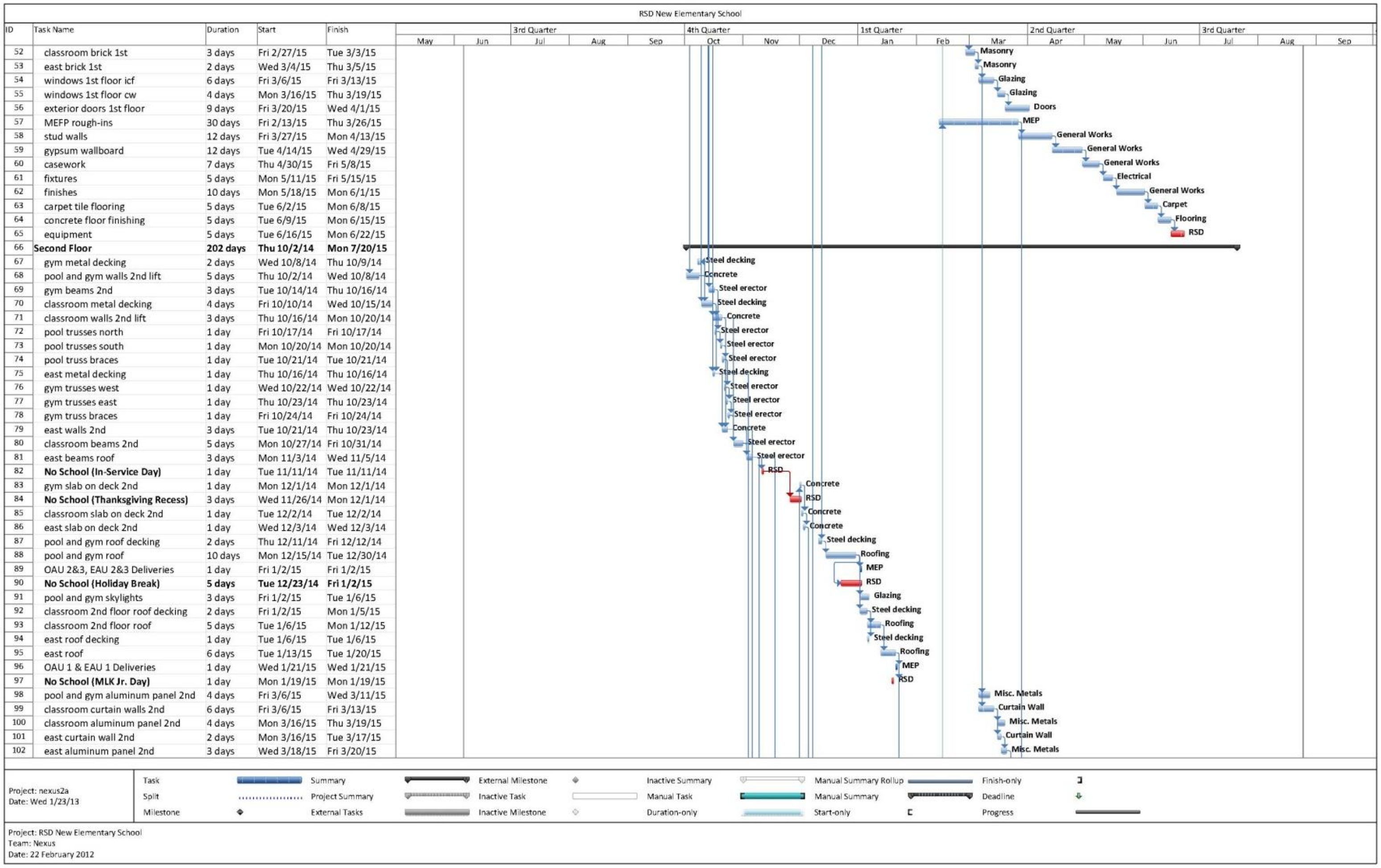
RSD New Elementary School

ID	Task Name	Duration	Start	Finish
1	**Construction**			
2	**Last Day of School - Spring 2014**	1 day	Fri 6/6/14	Fri 6/6/14
3	*Notice to Proceed*	0 days	Mon 6/9/14	Mon 6/9/14
4	*Mobilization*	5 days	Mon 6/9/14	Fri 6/13/14
5	Excavation	24 days	Mon 6/16/14	Fri 7/18/14
6	Utilities	10 days	Mon 7/21/14	Fri 8/1/14
7	**Foundation**	**20 days**	**Mon 8/4/14**	**Fri 8/29/14**
8	piles - pool	1 day	Mon 8/4/14	Mon 8/4/14
9	footers - pool	1 day	Thu 8/7/14	Thu 8/7/14
10	piles - gym north	2 days	Tue 8/5/14	Wed 8/6/14
11	piles - gym south	2 days	Thu 8/7/14	Fri 8/8/14
12	footer - gym	2 days	Fri 8/8/14	Mon 8/11/14
13	piles - stair north	1 day	Mon 8/11/14	Mon 8/11/14
14	footers -stair	1 day	Tue 8/12/14	Tue 8/12/14
15	piles - classroom	2 days	Tue 8/12/14	Wed 8/13/14
16	footers -classroom	1 day	Wed 8/13/14	Wed 8/13/14
17	piles - NE corner	1 day	Thu 8/14/14	Thu 8/14/14
18	piles - east	1 day	Fri 8/15/14	Fri 8/15/14
19	footers - east	1 day	Thu 8/14/14	Thu 8/14/14
20	pool walls	2 days	Fri 8/15/14	Mon 8/18/14
21	pool slabs	3 days	Tue 8/19/14	Thu 8/21/14
22	pool deck slab	1 day	Fri 8/22/14	Fri 8/22/14
23	**First Day of School - Fall 2014**	1 day	Mon 8/25/14	Mon 8/25/14
24	basement walls	4 days	Mon 8/25/14	Thu 8/28/14
25	basement slab	1 day	Fri 8/29/14	Fri 8/29/14
26	**First Floor**	**205 days**	**Fri 8/29/14**	**Mon 6/22/15**
27	pool and gym columns	2 days	Fri 8/29/14	Tue 9/2/14
28	**No School (Labor Day Break)**	1 day	Fri 8/29/14	Mon 9/1/14
29	Chillers 1-3 Basement Delivery	1 day	Tue 9/2/14	Tue 9/2/14
30	Boilers 1-2 Basement Delivery	1 day	Tue 9/2/14	Tue 9/2/14
31	Ethylene-Glycol Basement Delivery	1 day	Tue 9/2/14	Tue 9/2/14
32	gym slab on grade 1st	2 days	Wed 9/3/14	Thu 9/4/14
33	classroom columns	4 days	Wed 9/3/14	Mon 9/8/14
34	pool and gym walls 1st lift	5 days	Tue 9/9/14	Mon 9/15/14
35	basement beams	2 days	Tue 9/9/14	Wed 9/10/14
36	pool beams	2 days	Fri 9/19/14	Mon 9/22/14
37	pool and gym girders	1 day	Tue 9/23/14	Tue 9/23/14
38	classroom slab on grade 1st	2 days	Tue 9/16/14	Wed 9/17/14
39	classroom metal decking	2 days	Thu 9/11/14	Fri 9/12/14
40	classroom slab on deck 1st	2 days	Thu 9/18/14	Fri 9/19/14
41	pool and gym beams 1st	2 days	Wed 9/24/14	Thu 9/25/14
42	classroom walls 1st lift	3 days	Mon 9/22/14	Wed 9/24/14
43	east slab on grade 1st	2 days	Thu 9/25/14	Fri 9/26/14
44	classroom beams 1st	5 days	Tue 9/30/14	Mon 10/6/14
45	east walls 1st	3 days	Mon 9/29/14	Wed 10/1/14
46	east beams 1st	3 days	Tue 10/7/14	Thu 10/9/14
47	**No School (In-Service Day)**	1 day	Mon 10/13/14	Mon 10/13/14
48	classroom 1st floor roof decking	1 day	Mon 12/8/14	Mon 12/8/14
49	classroom 1st floor roof	2 days	Tue 12/9/14	Wed 12/10/14
50	classroom curtain walls 1st	6 days	Fri 2/13/15	Fri 2/20/15
51	pool and gym brick 1st	4 days	Mon 2/23/15	Thu 2/26/15

Project: nexus2a
Date: Wed 1/23/13

Project: RSD New Elementary School
Team: Nexus
Date: 22 February 2012

DETAILED COONSTRUCTION SCHEDULE CONT.



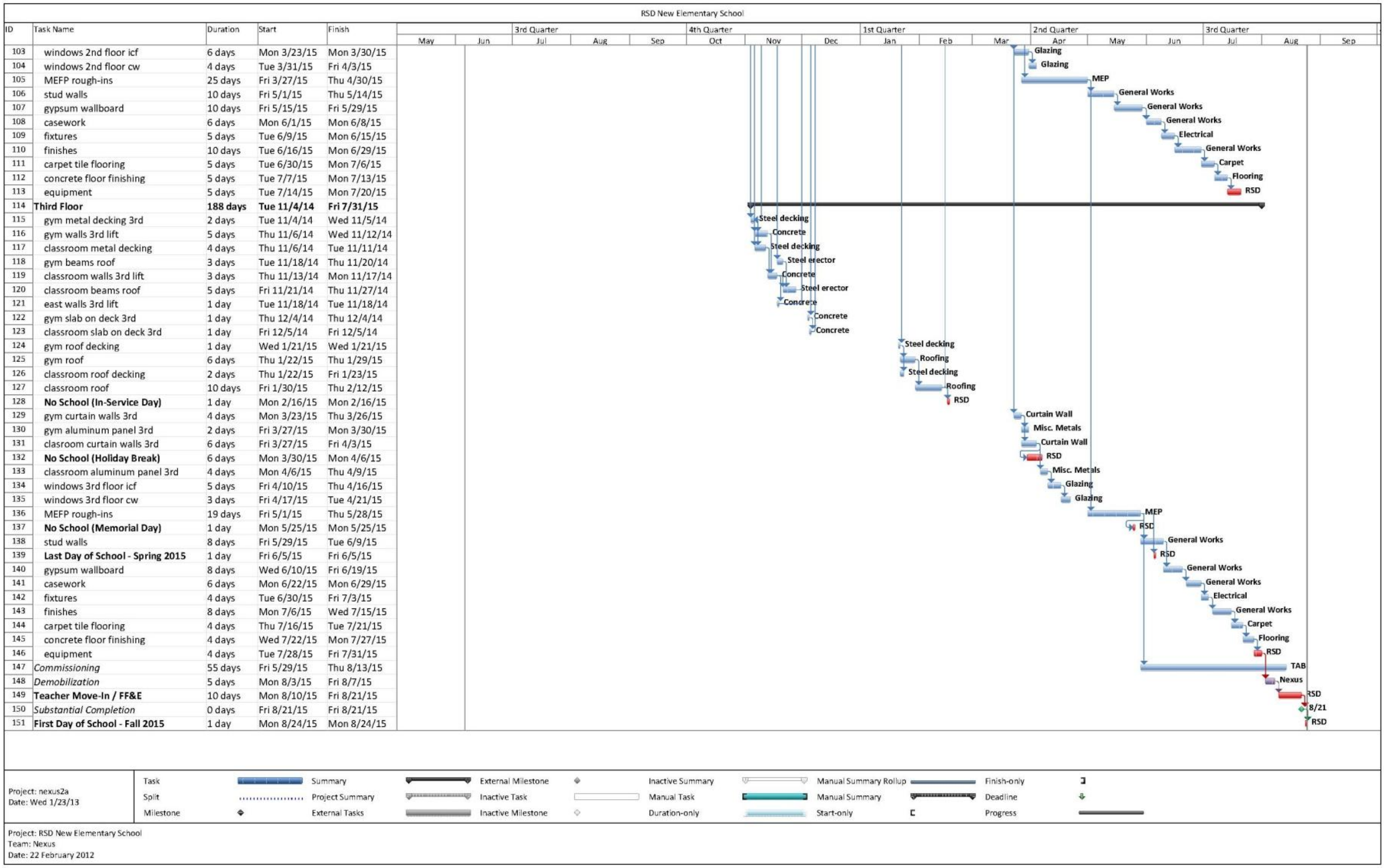
ID	Task Name	Duration	Start	Finish
52	classroom brick 1st	3 days	Fri 2/27/15	Tue 3/3/15
53	east brick 1st	2 days	Wed 3/4/15	Thu 3/5/15
54	windows 1st floor icf	6 days	Fri 3/6/15	Fri 3/13/15
55	windows 1st floor cw	4 days	Mon 3/16/15	Thu 3/19/15
56	exterior doors 1st floor	9 days	Fri 3/20/15	Wed 4/1/15
57	MEFP rough-ins	30 days	Fri 2/13/15	Thu 3/26/15
58	stud walls	12 days	Fri 3/27/15	Mon 4/13/15
59	gypsum wallboard	12 days	Tue 4/14/15	Wed 4/29/15
60	casework	7 days	Thu 4/30/15	Fri 5/8/15
61	fixtures	5 days	Mon 5/11/15	Fri 5/15/15
62	finishes	10 days	Mon 5/18/15	Mon 6/1/15
63	carpet tile flooring	5 days	Tue 6/2/15	Mon 6/8/15
64	concrete floor finishing	5 days	Tue 6/9/15	Mon 6/15/15
65	equipment	5 days	Tue 6/16/15	Mon 6/22/15
66	**Second Floor**	**202 days**	**Thu 10/2/14**	**Mon 7/20/15**
67	gym metal decking	2 days	Wed 10/8/14	Thu 10/9/14
68	pool and gym walls 2nd lift	5 days	Thu 10/2/14	Wed 10/8/14
69	gym beams 2nd	3 days	Tue 10/14/14	Thu 10/16/14
70	classroom metal decking	4 days	Fri 10/10/14	Wed 10/15/14
71	classroom walls 2nd lift	3 days	Thu 10/16/14	Mon 10/20/14
72	pool trusses north	1 day	Fri 10/17/14	Fri 10/17/14
73	pool trusses south	1 day	Mon 10/20/14	Mon 10/20/14
74	pool truss braces	1 day	Tue 10/21/14	Tue 10/21/14
75	east metal decking	1 day	Thu 10/16/14	Thu 10/16/14
76	gym trusses west	1 day	Wed 10/22/14	Wed 10/22/14
77	gym trusses east	1 day	Thu 10/23/14	Thu 10/23/14
78	gym truss braces	1 day	Fri 10/24/14	Fri 10/24/14
79	east walls 2nd	3 days	Tue 10/21/14	Thu 10/23/14
80	classroom beams 2nd	5 days	Mon 10/27/14	Fri 10/31/14
81	east beams roof	3 days	Mon 11/3/14	Wed 11/5/14
82	**No School (In-Service Day)**	1 day	Tue 11/11/14	Tue 11/11/14
83	gym slab on deck 2nd	1 day	Mon 12/1/14	Mon 12/1/14
84	**No School (Thanksgiving Recess)**	3 days	Wed 11/26/14	Mon 12/1/14
85	classroom slab on deck 2nd	1 day	Tue 12/2/14	Tue 12/2/14
86	east slab on deck 2nd	1 day	Wed 12/3/14	Wed 12/3/14
87	pool and gym roof decking	2 days	Thu 12/11/14	Fri 12/12/14
88	pool and gym roof	10 days	Mon 12/15/14	Tue 12/30/14
89	OAU 2&3, EAU 2&3 Deliveries	1 day	Fri 1/2/15	Fri 1/2/15
90	**No School (Holiday Break)**	**5 days**	**Tue 12/23/14**	**Fri 1/2/15**
91	pool and gym skylights	3 days	Fri 1/2/15	Tue 1/6/15
92	classroom 2nd floor roof decking	2 days	Fri 1/2/15	Mon 1/5/15
93	classroom 2nd floor roof	5 days	Tue 1/6/15	Mon 1/12/15
94	east roof decking	1 day	Tue 1/6/15	Tue 1/6/15
95	east roof	6 days	Tue 1/13/15	Tue 1/20/15
96	OAU 1 & EAU 1 Deliveries	1 day	Wed 1/21/15	Wed 1/21/15
97	**No School (MLK Jr. Day)**	1 day	Mon 1/19/15	Mon 1/19/15
98	pool and gym aluminum panel 2nd	4 days	Fri 3/6/15	Wed 3/11/15
99	classroom curtain walls 2nd	6 days	Fri 3/6/15	Fri 3/13/15
100	classroom aluminum panel 2nd	4 days	Mon 3/16/15	Thu 3/19/15
101	east curtain wall 2nd	2 days	Mon 3/16/15	Tue 3/17/15
102	east aluminum panel 2nd	3 days	Wed 3/18/15	Fri 3/20/15

Project: nexus2a
Date: Wed 1/23/13

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

Project: RSD New Elementary School
Team: Nexus
Date: 22 February 2012

DETAILED CONSTRUCTION SCHEDULE CONT.



RSD New Elementary School

ID	Task Name	Duration	Start	Finish
103	windows 2nd floor icf	6 days	Mon 3/23/15	Mon 3/30/15
104	windows 2nd floor cw	4 days	Tue 3/31/15	Fri 4/3/15
105	MEFP rough-ins	25 days	Fri 3/27/15	Thu 4/30/15
106	stud walls	10 days	Fri 5/1/15	Thu 5/14/15
107	gypsum wallboard	10 days	Fri 5/15/15	Fri 5/29/15
108	casework	6 days	Mon 6/1/15	Mon 6/8/15
109	fixtures	5 days	Tue 6/9/15	Mon 6/15/15
110	finishes	10 days	Tue 6/16/15	Mon 6/29/15
111	carpet tile flooring	5 days	Tue 6/30/15	Mon 7/6/15
112	concrete floor finishing	5 days	Tue 7/7/15	Mon 7/13/15
113	equipment	5 days	Tue 7/14/15	Mon 7/20/15
114	**Third Floor**	**188 days**	**Tue 11/4/14**	**Fri 7/31/15**
115	gym metal decking 3rd	2 days	Tue 11/4/14	Wed 11/5/14
116	gym walls 3rd lift	5 days	Thu 11/6/14	Wed 11/12/14
117	classroom metal decking	4 days	Thu 11/6/14	Tue 11/11/14
118	gym beams roof	3 days	Tue 11/18/14	Thu 11/20/14
119	classroom walls 3rd lift	3 days	Thu 11/13/14	Mon 11/17/14
120	classroom beams roof	5 days	Fri 11/21/14	Thu 11/27/14
121	east walls 3rd lift	1 day	Tue 11/18/14	Tue 11/18/14
122	gym slab on deck 3rd	1 day	Thu 12/4/14	Thu 12/4/14
123	classroom slab on deck 3rd	1 day	Fri 12/5/14	Fri 12/5/14
124	gym roof decking	1 day	Wed 1/21/15	Wed 1/21/15
125	gym roof	6 days	Thu 1/22/15	Thu 1/29/15
126	classroom roof decking	2 days	Thu 1/22/15	Fri 1/23/15
127	classroom roof	10 days	Fri 1/30/15	Thu 2/12/15
128	**No School (In-Service Day)**	1 day	Mon 2/16/15	Mon 2/16/15
129	gym curtain walls 3rd	4 days	Mon 3/23/15	Thu 3/26/15
130	gym aluminum panel 3rd	2 days	Fri 3/27/15	Mon 3/30/15
131	clasroom curtain walls 3rd	6 days	Fri 3/27/15	Fri 4/3/15
132	**No School (Holiday Break)**	6 days	Mon 3/30/15	Mon 4/6/15
133	classroom aluminum panel 3rd	4 days	Mon 4/6/15	Thu 4/9/15
134	windows 3rd floor icf	5 days	Fri 4/10/15	Thu 4/16/15
135	windows 3rd floor cw	3 days	Fri 4/17/15	Tue 4/21/15
136	MEFP rough-ins	19 days	Fri 5/1/15	Thu 5/28/15
137	**No School (Memorial Day)**	1 day	Mon 5/25/15	Mon 5/25/15
138	stud walls	8 days	Fri 5/29/15	Tue 6/9/15
139	**Last Day of School - Spring 2015**	1 day	Fri 6/5/15	Fri 6/5/15
140	gypsum wallboard	8 days	Wed 6/10/15	Fri 6/19/15
141	casework	6 days	Mon 6/22/15	Mon 6/29/15
142	fixtures	4 days	Tue 6/30/15	Fri 7/3/15
143	finishes	8 days	Mon 7/6/15	Wed 7/15/15
144	carpet tile flooring	4 days	Thu 7/16/15	Tue 7/21/15
145	concrete floor finishing	4 days	Wed 7/22/15	Mon 7/27/15
146	equipment	4 days	Tue 7/28/15	Fri 7/31/15
147	*Commissioning*	55 days	Fri 5/29/15	Thu 8/13/15
148	*Demobilization*	5 days	Mon 8/3/15	Fri 8/7/15
149	**Teacher Move-In / FF&E**	10 days	Mon 8/10/15	Fri 8/21/15
150	*Substantial Completion*	0 days	Fri 8/21/15	Fri 8/21/15
151	**First Day of School - Fall 2015**	1 day	Mon 8/24/15	Mon 8/24/15

Project: nexus2a
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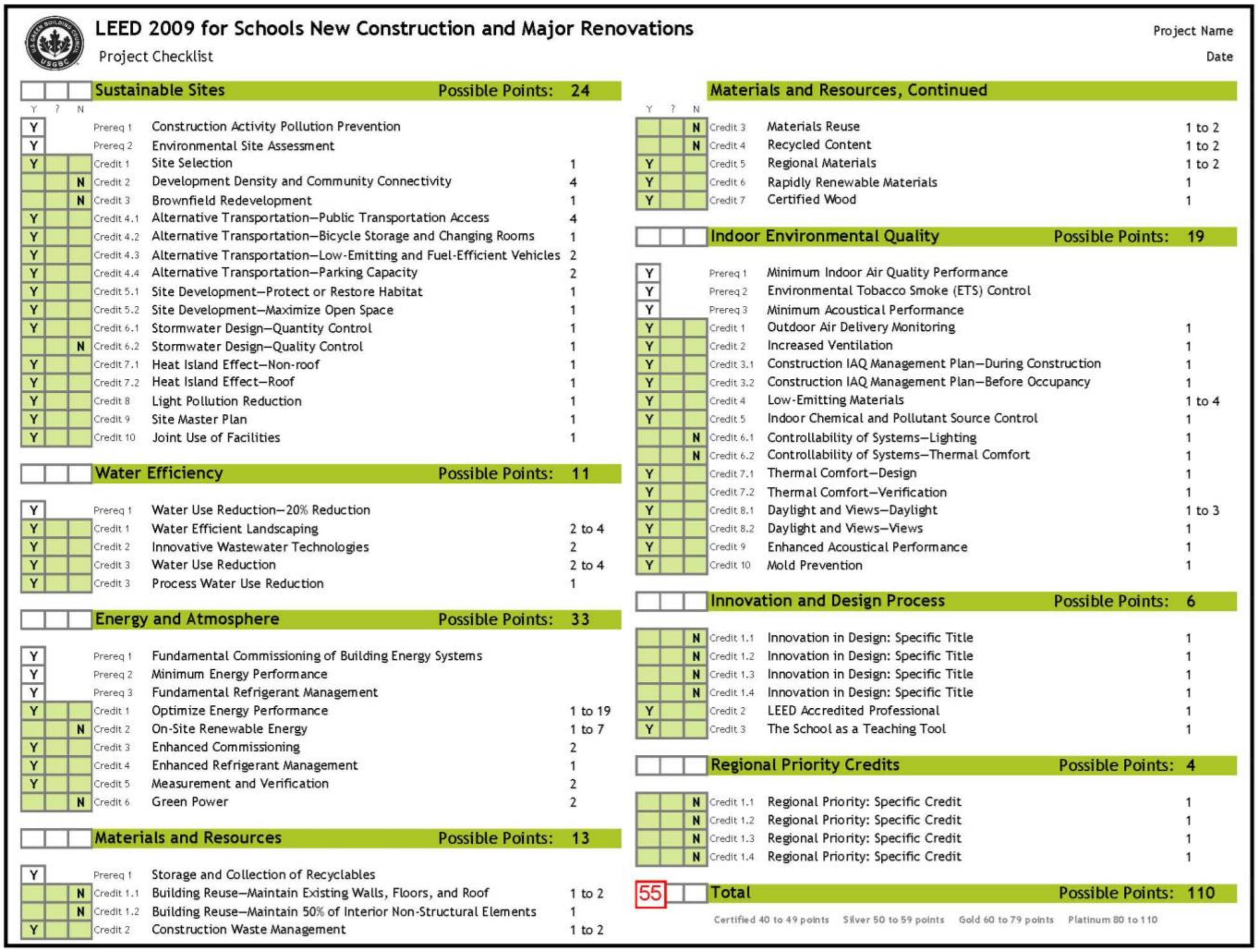
Project: RSD New Elementary School
Team: Nexus
Date: 22 February 2012

LEED CHECKLIST



LEED 2009 for Schools New Construction and Major Renovations

Project Checklist

Project Name

Date

Sustainable Sites — Possible Points: 24

Y	?	N			
Y			Prereq 1	Construction Activity Pollution Prevention	
Y			Prereq 2	Environmental Site Assessment	
Y			Credit 1	Site Selection	1
		N	Credit 2	Development Density and Community Connectivity	4
		N	Credit 3	Brownfield Redevelopment	1
Y			Credit 4.1	Alternative Transportation—Public Transportation Access	4
Y			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
Y			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	2
Y			Credit 4.4	Alternative Transportation—Parking Capacity	2
Y			Credit 5.1	Site Development—Protect or Restore Habitat	1
Y			Credit 5.2	Site Development—Maximize Open Space	1
Y			Credit 6.1	Stormwater Design—Quantity Control	1
		N	Credit 6.2	Stormwater Design—Quality Control	1
Y			Credit 7.1	Heat Island Effect—Non-roof	1
Y			Credit 7.2	Heat Island Effect—Roof	1
Y			Credit 8	Light Pollution Reduction	1
Y			Credit 9	Site Master Plan	1
Y			Credit 10	Joint Use of Facilities	1

Water Efficiency — Possible Points: 11

Y			Prereq 1	Water Use Reduction—20% Reduction	
Y			Credit 1	Water Efficient Landscaping	2 to 4
Y			Credit 2	Innovative Wastewater Technologies	2
Y			Credit 3	Water Use Reduction	2 to 4
Y			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	
Y			Credit 1	Optimize Energy Performance	1 to 19
		N	Credit 2	On-Site Renewable Energy	1 to 7
Y			Credit 3	Enhanced Commissioning	2
Y			Credit 4	Enhanced Refrigerant Management	1
Y			Credit 5	Measurement and Verification	2
		N	Credit 6	Green Power	2

Materials and Resources — Possible Points: 13

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

Materials and Resources, Continued

Y	?	N			
		N	Credit 3	Materials Reuse	1 to 2
		N	Credit 4	Recycled Content	1 to 2
Y			Credit 5	Regional Materials	1 to 2
Y			Credit 6	Rapidly Renewable Materials	1
Y			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	
Y			Credit 1	Outdoor Air Delivery Monitoring	1
Y			Credit 2	Increased Ventilation	1
Y			Credit 3.1	Construction IAQ Management Plan—During Construction	1
Y			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
Y			Credit 4	Low-Emitting Materials	1 to 4
Y			Credit 5	Indoor Chemical and Pollutant Source Control	1
		N	Credit 6.1	Controllability of Systems—Lighting	1
		N	Credit 6.2	Controllability of Systems—Thermal Comfort	1
Y			Credit 7.1	Thermal Comfort—Design	1
Y			Credit 7.2	Thermal Comfort—Verification	1
Y			Credit 8.1	Daylight and Views—Daylight	1 to 3
Y			Credit 8.2	Daylight and Views—Views	1
Y			Credit 9	Enhanced Acoustical Performance	1
Y			Credit 10	Mold Prevention	1

Innovation and Design Process — Possible Points: 6

		N	Credit 1.1	Innovation in Design: Specific Title	1
		N	Credit 1.2	Innovation in Design: Specific Title	1
		N	Credit 1.3	Innovation in Design: Specific Title	1
		N	Credit 1.4	Innovation in Design: Specific Title	1
Y			Credit 2	LEED Accredited Professional	1
Y			Credit 3	The School as a Teaching Tool	1

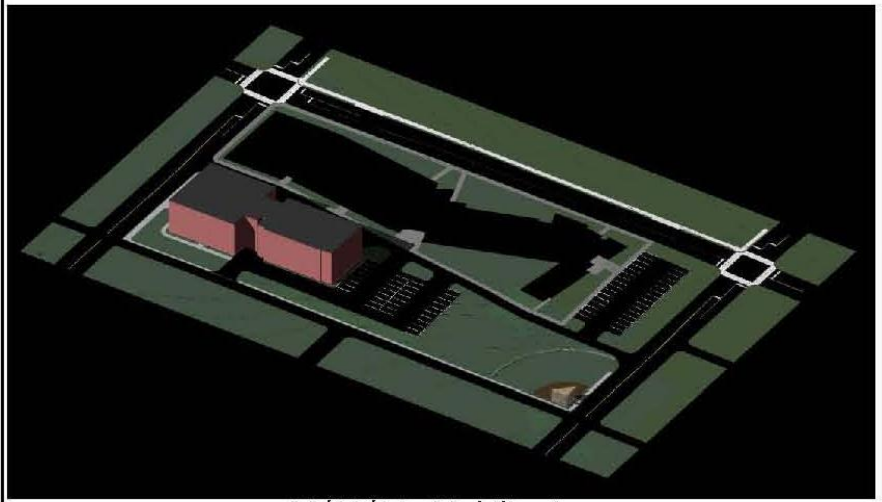
Regional Priority Credits — Possible Points: 4

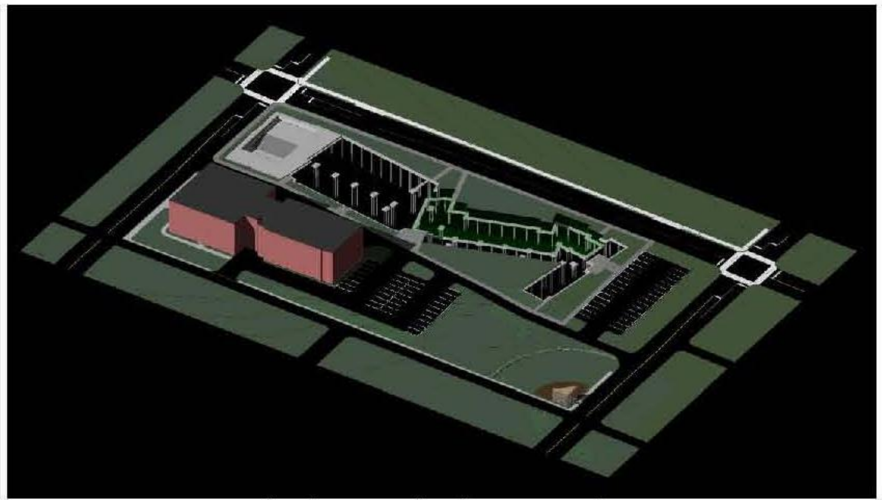
		N	Credit 1.1	Regional Priority: Specific Credit	1
		N	Credit 1.2	Regional Priority: Specific Credit	1
		N	Credit 1.3	Regional Priority: Specific Credit	1
		N	Credit 1.4	Regional Priority: Specific Credit	1

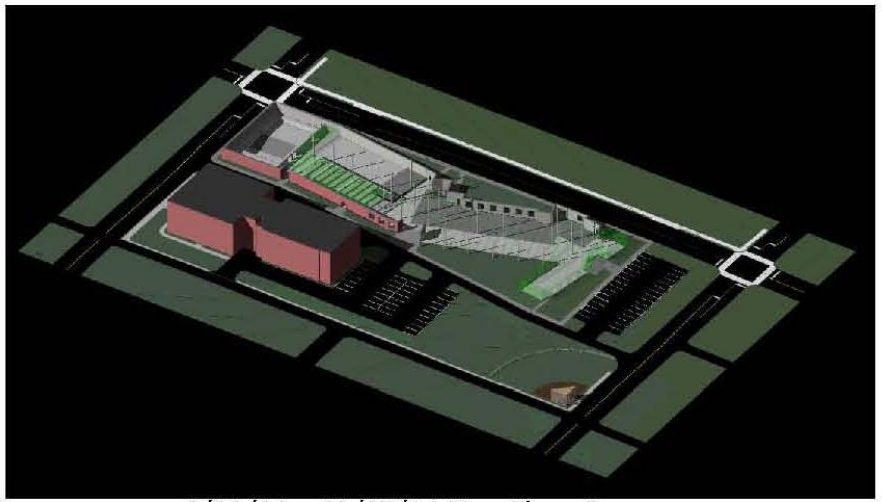
55			Total	Possible Points: 110

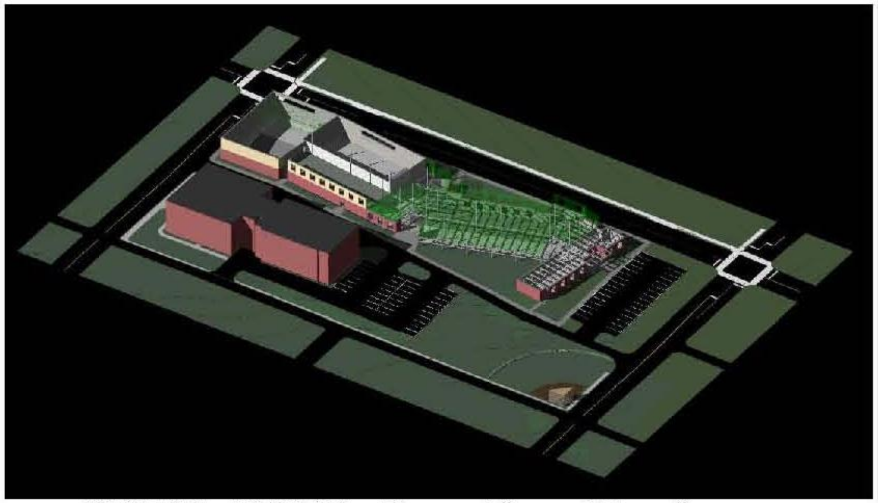
Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

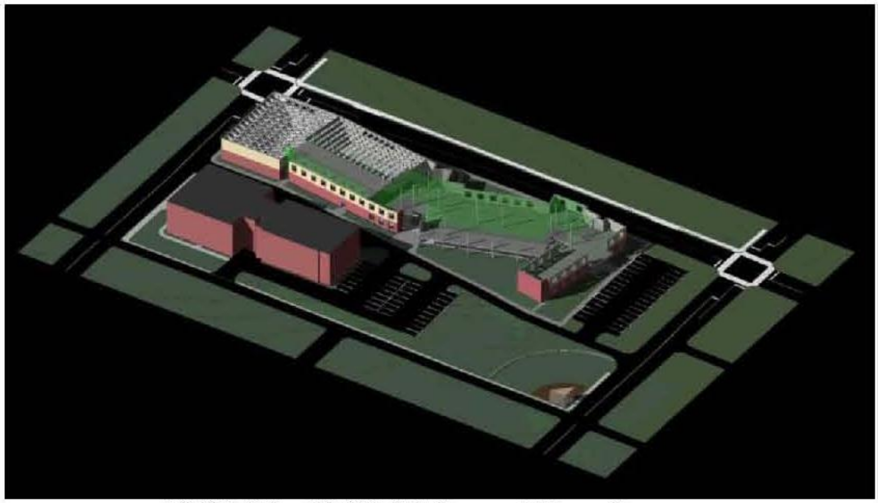
NAVISWORKS 4D MODEL SEQUENCE

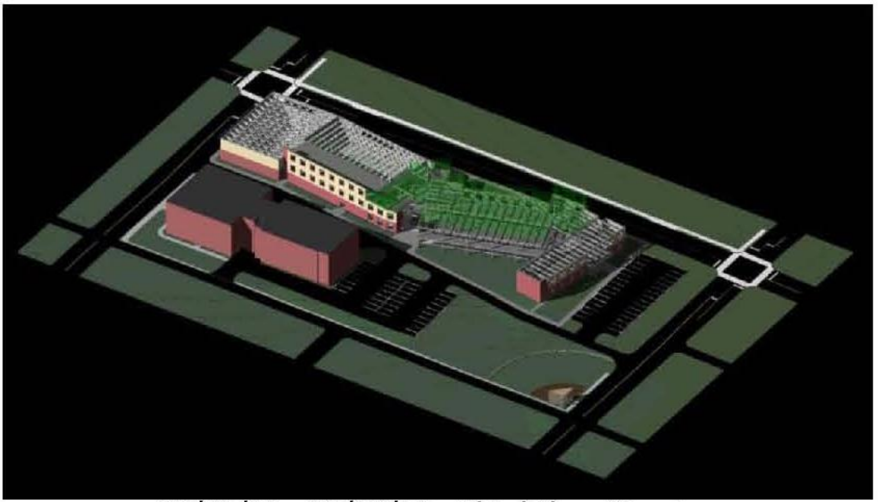

06/09/14 - Mobilization

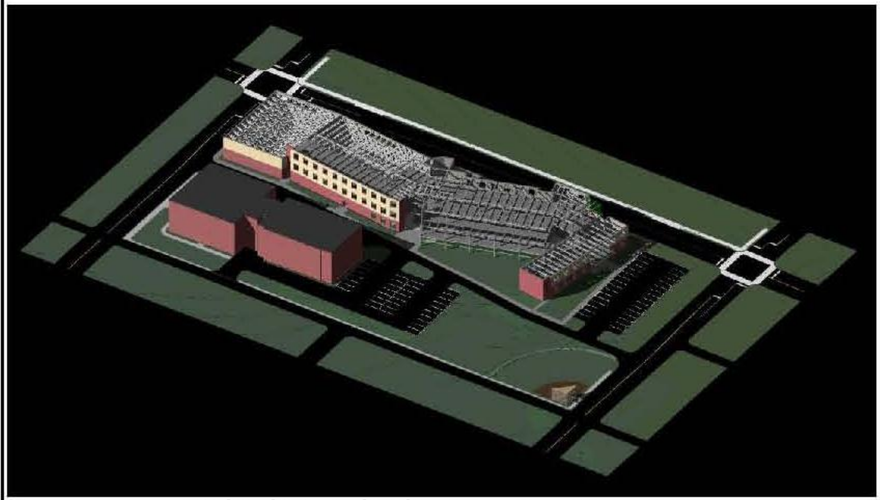

08/05/14 – 08/25/14 - Foundation

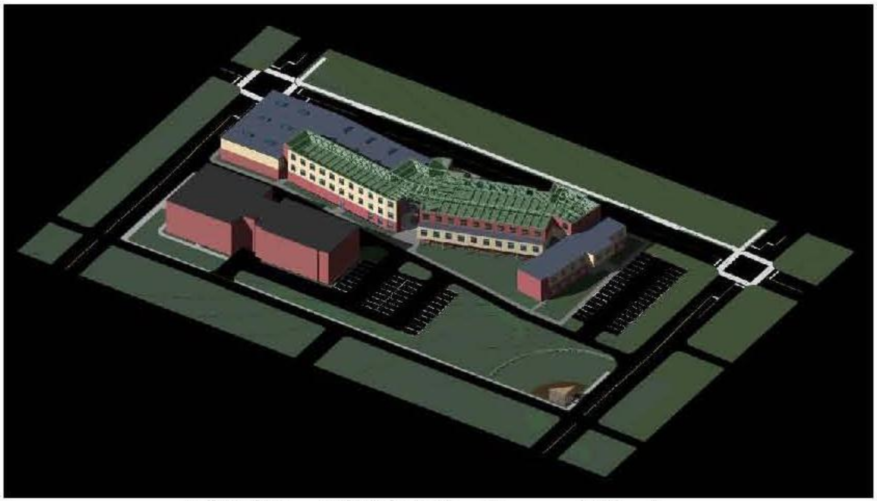

8/29/14 – 09/17/14 First Floor Structure

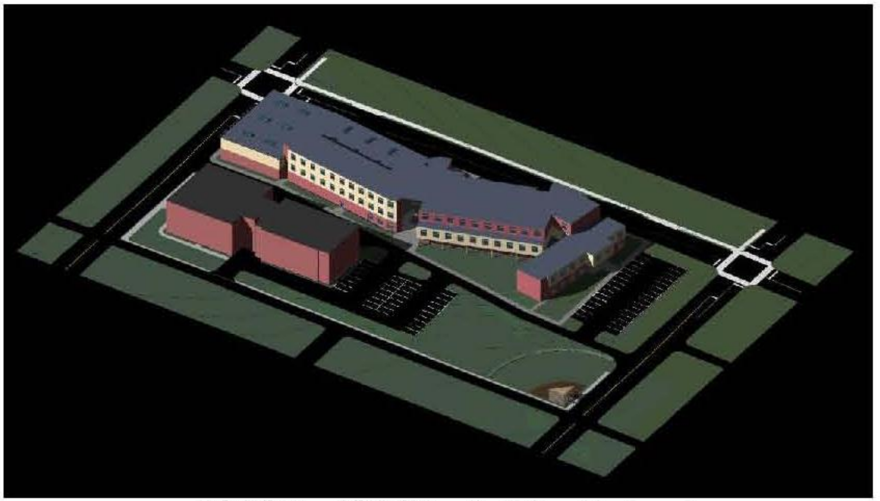

09/17/14 - 10/02/14 – First and Second Floor Structure


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

SCOPES 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