

During the summer of 2005, Phoenixville Area School District decided to hire an architect and construction manager for the construction of a new elementary school. Because of enrollment projection and to replace the aging East Pikeland elementary school, the school district decided to build a 650 student elementary school on a fallow site next to the Kimberton Fair Grounds. This school was originally proposed to be open for the 2008 school year but because of delays due to site containments, the proposed completion date was pushed back to January 2010. The school was prepared to pay \$26 million for the construction but because of delays that number was closer to \$30 million. The cost of construction including all fees was \$27.7 million (\$270 dollars per square foot) plus \$2 million for the site. The construction alone without fees is \$22 million and \$25.5 million with fees. These numbers are comparable to D4Cost and RS Means Square Foot Estimates performed today.

The site will have to be grub and the site closure plan will have to be completed before any major work on this site can be completed. Spread footings support the structural steel for the building. The footings for this building will be placed using traditional forming methods and pumped into place and then machine vibrated. The building's walls are made up of mostly CMU except metal studs are used in several locations. The exterior of the building contains a CMU veneer as well as cementitious siding. The mechanical system of the building is an all air system with individual water source heat pumps to heat each zone. There are also various heat recovery units, roof top units. The system is dependent on two boilers and single cooling tower. Kimberton is protected by an active automated fire extinguishing system with each sprinkler head having no more than 130ft of coverage. Fire walls separated the building in two and protect area of vertical movement. The elementary school distributes 240/277V throughout the building and steps it down to 208/120v using 5 transformers throughout the building. The building is backed by a 125 KW generator.

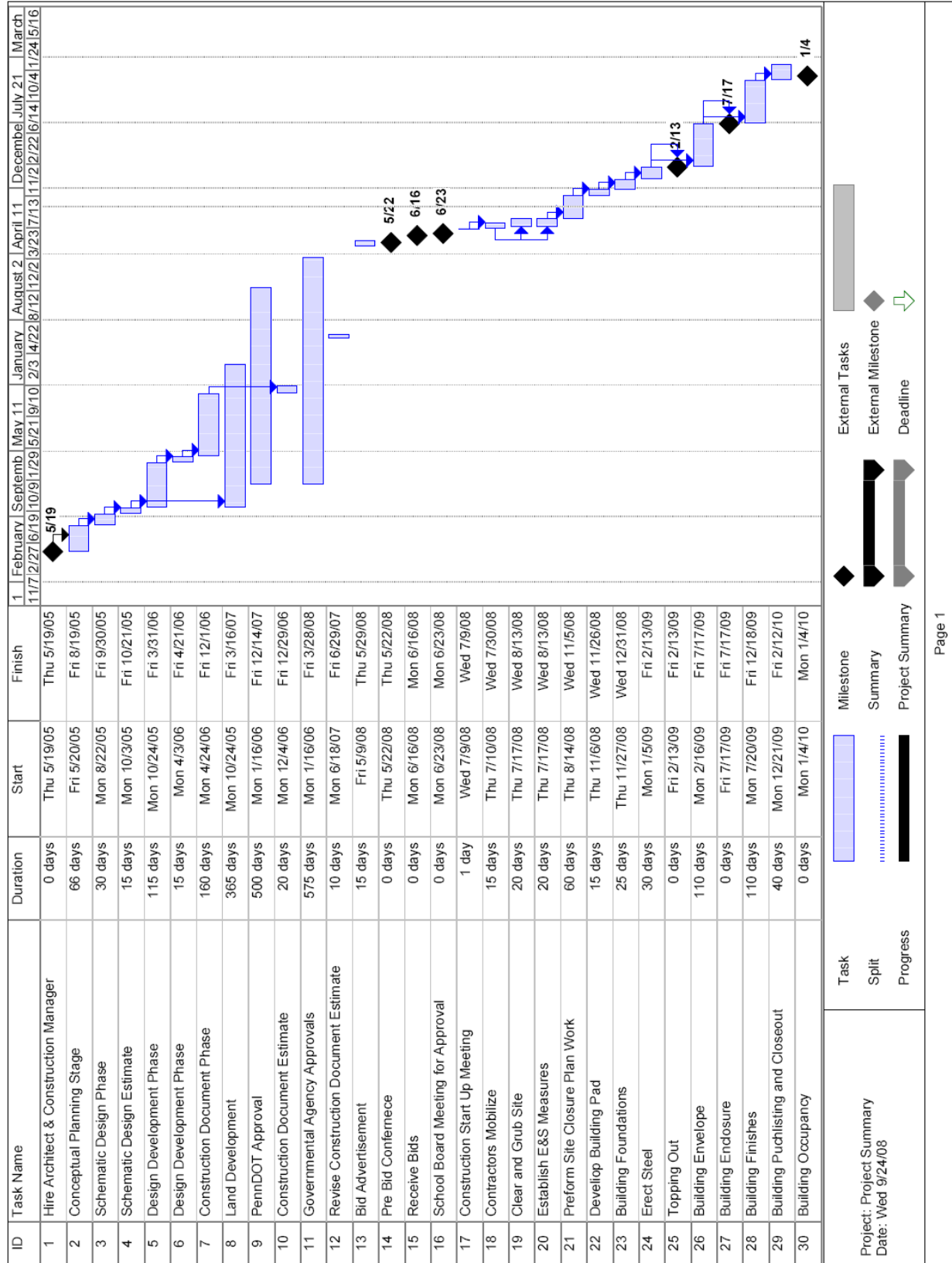
The site of Kimberton is complicated by the site closure plan. The 3.85 acre area of the closure plan will be a retention pond and should not delay the construction of the building once ground is broken. The main access for construction will be from Route 113. There are no fire hydrants on site however the fire hall is on the neighboring property. Existing utilities are under Cold Stream Road and will be supplied to the elementary school via the service drive between CJ tire and Emery Oil to the mechanical room on west side of the building. There are no buildings in the area that will interfere with construction. Overall the site is relatively open and should allow for plenty of lay down area.

The Kimberton project is being delivered with a design-bid-build method with 15 multiple prime contracts and a construction management agency overseeing. Each Contract is held by the owner (Phoenixville Area School District). The construction manager will run the day to day management of the project and the school will release the payments. Foreman Program and Construction Managers plan to staff the job with a project manager and site manager. The FPCM will act as the liaison between prime contractors, architect, and owner.

Please note: Because this project was never completed, a percentage of the information contained in this report is based on what was planned or typically would have happened had this project gone forward. Throughout this report different tenses may be used as if the project is still going to be completed. Please ignore these inconsistencies as the project will not be completed. The chain of events that lead to the abandonment of the project will be analyzed in future reports.

A. Project Summary Schedule.....	3
B. Building Systems Summary	5
C. Project Cost Evaluation	10
D. Site Plan of Existing Conditions	16
E. Local Conditions	20
F. Client Information	21
G. Project Delivery System.....	22
H. Staffing Plan.....	24
I. Appendix.....	25

Tech Report 1 Project Schedule Summary



Kimberton Elementary School
East Pikeland Township, Chester County, PA

Ralph Kreider
Construction Option: Messner

Tech Report 1 Project Schedule Summary

Key Elements of Construction Sequences:

Foundation Sequence:

This would be a logical sequence of work for the foundation. The foundation starts in the mechanical room with the spread footings. Each spread footing will have to be formed up, and rebar will be placed, then poured. After that, they will pour each of the footings working towards the classroom wing. Then they will remove the form work. After the formwork can be removed from each of the spread footings, the concrete contractor will form up the wall footings in between the spread footing. These will require two sides of formwork and the rebar will be placed in between the two sides. Once the rebar is placed, the concrete will be poured. After a few days of curing the formwork is removed. After the wall footings are placed, the concrete contractor will begin to form the piers that are required on several of the columns. These will be filled with the required rebar and the concrete will be poured. Then formwork is removed. All of the concrete will be placed directly from the truck or will be pumped to the location whichever is easiest. This completes the majority foundation work.

Structural Sequence:

The structural steel will be delivered as the foundations are being poured. There is plenty of shakedown area around the future bus turn around and parking lot that space should not be a problem. The structural steel will follow the foundation. It will be placed starting at the mechanical room and working towards the classroom wing. The crane will be located relocated as little as possible along the way. First the steel plates will be put on top of the piers or spread footings at each column location. Then the columns will preliminarily be bolted in place to allow for later plumbing. As the columns are placed the beams will be placed (hopefully with multiple beam picks to increase efficiency) in between the columns where they will be preliminarily bolted as well. The beams and columns will then be plumbed and aligned. After plumbing and aligning the steel beams, the second floor deck and roof deck will be bolted or welded to the beams. The shear studs will also be welded in place at this point. Before the concrete can be placed, all of the embeds will need to be placed on the deck. The basic structure will be finished when all the concrete floors are poured (slab on grade and slab on metal deck).

Finish Sequence:

This building will not require as much drywall finishing as do many buildings. However, there is a large amount of interior masonry. This will proceed in the same fashion as the rest of the building starting in the mechanical room area and moving towards the classrooms. The masons placing the CMU will be followed by the concrete slab on grade (with all embeds coordinated). This will require a little coordination because some of the CMU needs to be placed before the slab on grade while other CMU is placed on top of the slab on grade. Also the MEP trades need to rough in inside many of these CMU walls. After the mason has finished, the drywall contractor will place all of the metal studs and allow for the MEP trades to rough in their work. Most of the metal studs are located inside the administration area and on the second floor in the classroom wing. After the metal studs and rough in is completed, they can begin to hang and finish the drywall on top of the studs. As area becomes available then the painter can move and begin to finish them. After painting takes place, the ceiling grid can be hung and light fixtures, registers, speakers, and ceiling tile can be dropped. This is also the time that the most of the devices, fixtures, cabinets, etc. will be installed. After all of that is complete, we can put the floor down in place and the building (besides odds and ends) is complete.

Tech Report 1 Building Systems Summary

Yes/No	Work Scope (If yes, address these questions / issues)
Yes	<p>Demolition Requirements A large amount of trees will have to be removed from site and those over 6 inches in diameter will have to be replanted. Basic grubbing of the site.</p> <p>There is also a large site closure plan for the Kimberton Elementary School Property. It involves a large amount of excavation and fill to mitigate the risk to the occupants of the site. The area of Closure Plan is located on the northwest corner of site. It is approximately 3.85 acres. At its largest extents it's about 400ft by 460 ft. The fill area is the entire 3.85 acres and ranges between 10 and 4 feet deep. The excavation area is approximately 61,000 SF and the maximum depth of the remediation area is approximately 10 ft below grade until the bedrock layer is reached. The estimated volume of excavation matter is 8,425.4 cubic yards (CY). One third (2,125 CY) of the volume is thought to be native soil and can be used for clean fill. The remaining 6,300 CY will be removed from site and treated.</p>
Yes	<p>Cast in Place Concrete The large majority of the concrete in Kimberton Elementary is in the foundation and first floor. Spread footings support the steel structure. Most footings range from 4x4 to 10x10 and have a depth from 1 foot to 2.333 feet. The exterior walls are supported by a foundation wall that is 1 foot deep at most locations throughout the building. A 4" cast in place concrete slab with 6x6 W2.9xW2.9 WWF on 4" of drainage fill with a high grade vapor barrier is used as the ground floor on most of the building. The second floor also has a concrete deck that is 1.5 inches thick topped with 2.5 inches of standard weight concrete. The concrete is placed directly from the truck or pumped to various locations throughout the building. The concrete once placed, will be vibrated with a mechanical vibrator to ensure that the aggregate has settled properly.</p>
Yes	<p>Structural Steel Frame The structural system for Kimberton Elementary School is structural steel. The floor system is a 1.5 inch 20 gauge composite deck with 2.5 inches of normal weight concrete topping. The deck concrete is reinforced with 6x6-W2.1xW2.1 WWF. The total floor thickness is 4 inches. The roof is also covered by 1.5 inches of 20 gauge type B steel deck which it protected from the weather by either asphalt shingles or a single ply membrane. The steel members supporting the 40 pounds per square foot live load of the classrooms are W18x40 steel I beams spanning approximately 32 feet at a 5.5 foot spacing. W27x84's support the multi-room classrooms which span 50 feet at a 5 foot spacing. Most of the roof is supported by K-series joists. Non-standard Gable Shaped LH Joists span the 54 feet over the media center. Over the cafeteria 44LH15 joist span 72 feet. The gym roof is supported by custom designed gable trusses that span 64 feet. These trusses are cross-braced with W8x15. The majority of the steel structure is supported by HSS8x8x1/4 columns. The corners contain HSS8x8x1/2 columns. At various locations throughout the building there are HSS12x8x5/8 columns. W8x24 columns support the wood trusses of the main entrance canopy as well as various other entry roofs around the building.</p>

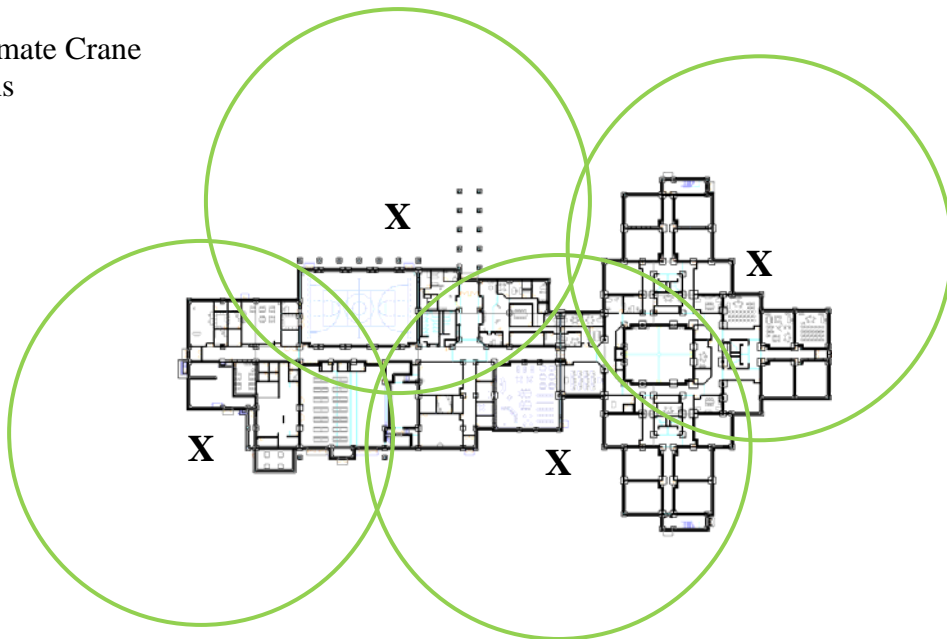
Tech Report 1 Building Systems Summary

The steel structure of this building temporarily braced to maintain that the framing is safe, plumb and in true alignment. Typical a contractor would use steel cables to cross brace the structure until all final connections were made. The cables would be place diagonal between columns to maintain square. The cables would be maintained until the final supporting structure has been erected. Kimberton will be supported from moment forces by CMU sheer walls throughout the building. The roof trusses will be lateral braced between using steel angles.

The erection of the steel would be done by a standard crawler crane. The steel would be erected starting near the mechanical room. Based on logic of crane placement total of four picks will be used. The first pick will be in the southwest corner outside the mechanical room and kitchen. The second pick will be next to the gym and main entrance. The third pick will be in the southwest corner of the classroom wing, located outside the media center. The final pick will be in the northeast corner of the building to erect the remaining section of the classroom wing.

Based on my calculation of the largest lift on this job being the steel trusses for the gym, a Manitowoc model 8000 crawler crane would easily be able to lift all of the steel lifts for this job. The Gym truss weighs 6750lb and with a 20% safety factor that weight is 8100lbs. The furthest lift for the building is approximately 100 ft. (the lift for the gym truss will be only about 75 feet). For extra safety, the critical pick was calculated at 105 feet. The height of the building should not be a factor because it only raises 30 feet at the highest point but for added safety a boom angel of 40 degrees was assumed. The crane boom will be far above the 30 feet. At the critical lift the Model 8000 is able to pick 8.5 tons at 105 feet and a boom length of 160 feet. The Manitowoc Model 8000 is rated at 80 ton lift capacity and has a 200' foot heavy lift boom.

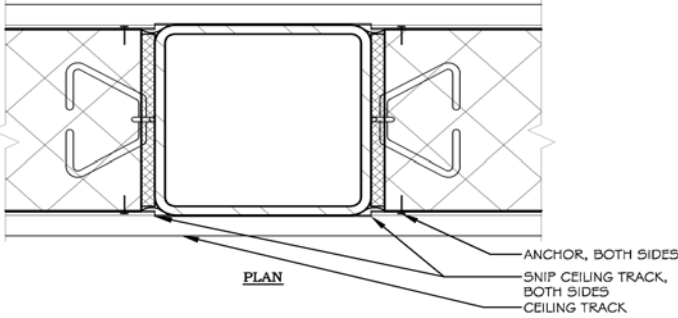
Approximate Crane Locations



Tech Report 1 Building Systems Summary

No	<p>Precast Concrete: There are no large amounts of precast concrete on Kimberton Elementary that need to be considered above and beyond normal construction.</p>
Yes	<p>Mechanical System: The mechanical system of Kimberton was originally proposed as a geothermal heat pump system. This was scratched however because of contaminated groundwater under the site and contaminated soil in the northwest corner. The system was instead changed to a water source heat pump. Each room is served by its own water source heat pump which average about CFM of 1200 to 690 and having a cooling capacity of on average of 26 MBH. The media center has its own roof top unit which has a 3000 CFM, 82 MBH cooling and 80 MBH heating capacity. Most of the classroom heat pumps are housed in the second floor mechanical room. These individual heat pumps allow for localized temperature setting without the need for reheat which increase efficiency.</p> <p>6 water source heat recovery units are on top of the roof to provide cooling and heating for the 104,000 sq ft building. The Des Champs manufactured classroom HRUs provide a total of 761 MBH cooling, 457 MBH heating, and about 20,000 CFM and are housed on the mechanical mezzanine. The remaining 4 HRUs serve the activities wing of the building are above the cafeteria and have a 706 MBH cooling, 424 MBH heating and 18,000 CFM. The heat recovery units supply all of the outside air to the individual heat pumps. Each heat recovery unit has an energy wheel to help the efficiency of the entire HVAC system. The system is dependent on two boilers and single cooling tower</p> <p>The heating and cooling for the building is distributed almost 100% all air from the individual heat pumps and roof top units. Each unit is also connected to a cold water supply and return from the main cooling tower. The mechanical rooms are located in the southwest corner of the building as well as on the eastern second floor.</p> <p>Fire Suspension System: Kimberton Elementary has an active automated fire extinguishing system and smoke detectors throughout the building. The building is equipped with audio/visual fire alarms in every classroom, gymnasium, cafeteria, etc. and all corridors. The school contains only quick response rated heads that have a maximum coverage of 130 ft. Each Classroom contains nine concealed pendent heads and the concealed hallway heads are place about every twelve feet. Various other types of heads are used throughout the larger assembly areas.</p> <p>There are very few fire walls around located in Kimberton Elementary. There is a major two hour fire rated wall between the classroom wing and activities wing. The walls around the stairwells have a one hour fire rating. The elevator is also required to have one hour fire rating. Around the electrical, storage, and vertical shafts there are smoke partitions. All fire walls are required to go from floor to deck.</p>

Tech Report 1 Building Systems Summary

<p>Yes</p>	<p>Electrical System</p> <p>The elementary school gets its power from electrical lines under the nearby cold stream road. The power is stepped down from 33KV to 480/277V in a PECO transformer outside the building. The lines then run underground into the main electrical room and main switchboard which is in the southwest corner (plan east) of the building. The power is distributed throughout the building at 480V/277V and is stepped down to 120/208V using 5 transformers. One main transformer is located in the main mechanical room while the other main transformer is located in an electrical closet in the classroom wing. Most of the lighting is powered by 277V and is not stepped down from the PECO supplied power. There are 40 panel boards throughout the building to power the lighting, receptacles and various types of equipment. The emergency circuit is power by a 125 KW backup generator that serves only a single light from each classroom and various lights throughout the corridors. There are also three other panel boards powered by the emergency generator. These panel boards power all the refrigeration units, emergency systems (fire, security, intercom, and telephones), and various receptacles throughout the building.</p>
<p>Yes</p>	<p>Masonry</p> <p>All the masonry walls in Kimberton Elementary are non-load bearing. Most first floor interior walls are made up of standard 8x8x16 CMU block. The exterior walls on the first floor are made up of a CMU wall with a CMU veneer on the exterior. The masonry veneer has four different types of finish that are used at various locations throughout the building. A darker split face block is used above ground level. Above the darker split face block on a number of facades is a tan sand blasted CMU veneer. The different facades are transitioned between by a ground face almost white CMU veneer</p> <p>The standard CMU is tied to the steel columns every 16 inches vertically using standard masonry to steel connections that allow expansion and contraction at different rates. The Masonry veneer is tied to CMU wall standard masonry dovetail connection strips. It is connected at least every four course in various locations to the CMU wall</p>  <p>Because the maximum height of the building is about 30 feet above final grade, standard scaffolding will be used on this building. Hydraulic scaffolding or other methods are not necessary. The material will be staged using a standard masonry petty bone.</p>

Kimberton Elementary School
 East Pikeland Township, Chester County, PA

Ralph Kreider
 Construction Option: Messner

Tech Report 1 Building Systems Summary

No	Curtain wall There is no major curtain wall on Kimberton Elementary School. There is a large storefront entry at the main entrance, as well as large windows in the media center and cafeteria. They are all made of aluminum framed glazing that have been designed by the architect and will be field verified and fabricated in the window contractor's shop.
No	Support of Excavation No large amount of below grade excavation will have to take place. The deepest trenches are around five feet and will not be supported. If they have to go deeper, the contractor will simply use step backs to ensure the safety of the personnel working in the trenches. The deepest foundation for the building is approximately six feet below final grade. These areas will have a series of step back and will be back filled after the building foundation is complete and inspected.

Kimberton Elementary School
East Pikeland Township, Chester County, PA

Ralph Kreider
Construction Option: Messner

Please note: Because this project was not completed, this information is a combination of estimates and actual bid data. While great effort was made to interpret this data correctly some interpolation was necessary because of the contract style.

Actual Building Construction Cost (CC)(estimated):

- \$19,600,000 Bid Building Cost (Total Building Cost – Site Work)
- \$190 /SF (\$19,600,000/103,000 sq ft)

Total Project Cost:

- \$27,700,000 Bid Project Cost (total building cost including site plus Arch and CM fees)
- \$270 / SF (\$27,700,000/103,000 sq ft)

Building Systems Costs (Cost and Cost/SF)			
Building Systems	Cost	Cost/SF	Notes
Concrete	\$665,339	\$6.46	From FPCM Estimate
Masonry	\$2,207,741	\$21.44	From FPCM Estimate
Structural	\$2,099,224	\$20.39	From FPCM Estimate
HVAC	\$3,100,447.00	\$30.11	From Low Bid Contract
Plumbing	\$1,251,384.00	\$12.15	From Low Bid Contract
Fire Protection	\$368,643.00	\$3.58	From Low Bid Contract
Electrical	\$2,653,131.00	\$25.76	From Low Bid Contract
Data	\$316,030.00	\$3.07	From Low Bid Contract
Flooring Finishes	\$781,052	\$7.58	From Low Bid Contract
General Conditions	\$896,768	\$8.71	From FPCM Estimate

Prime Contract Break Down			
Prime Contract	Final FPCM Estimate	Low Base Bids	Low Bidder Based on Base Bid
1 GENERAL CONSTRUCTION	\$14,600,530.00	\$14,087,000.00	Miller Bros.
2 ROOFING	\$988,049.00	\$997,764.00	J.M. Young & Sons
3 ALUMINUM ENTR AND WIND	\$411,968.00	\$389,791.00	Glass Erectors
4 CERAMIC AND QUARRY TILE	\$532,665.00	\$578,600.00	Roman Mosaic.
5 ACOUSTICAL AND DRYWALL	\$955,738.00	\$1,058,700.00	All Walls and Ceilings
6 RESILIENT FLOOR & CARPET	\$248,387.00	\$240,776.00	DeGol Brothers
7 PAINTING	\$208,553.00	\$174,700.00	Thomas Painting .
8 VISUAL DISPLAY	\$128,207.00	\$97,850.00	Thoma Inc.
9 FOOD SERVICE EQUIPMENT	\$338,568.00	\$316,500.00	Clark Food Service Equip.
10 GENERAL CASEWORK	\$443,810.00	\$349,800.00	Polyvision, Inc
12 PLUMBING	\$1,251,384.00	\$1,013,000.00	Frey Lutz Corp.
13 FIRE PROTECTION	\$368,643.00	\$398,125.00	Wayman Fire Protection
14 HVAC	\$3,100,447.00	\$3,265,000.00	Frey Lutz Corp.
15 ELECTRICAL	\$2,653,131.00	\$2,249,000.00	Silas Bolef
16 DATA CABLING	\$316,030.00	\$320,600.00	Atlantic Coast Comm
TOTAL	\$26,546,110.00	\$25,537,206.00	-\$1,008,904

Summary of the low bidders on the multiple prime contracts. These are the amounts that the contract would have been signed at, had the project continued.

Comparison Between FPCM and Contractor Estimate					
Code	Division Name	%	Sq. Cost	Estimated	Contractor
1	General Requirements	4.01%	\$8.71	\$896,768	\$1,043,198
2	Site Work	24.95%	\$54.19	\$5,579,788	\$6,490,893
3	Concrete	2.97%	\$6.46	\$665,339	\$773,980
4	Masonry	9.87%	\$21.44	\$2,207,741	\$2,568,236
5	Metals	9.39%	\$20.39	\$2,099,224	\$2,441,999
6	Wood & Plastics	0.92%	\$2.00	\$205,625	\$239,201
7	Thermal & Moisture Protection	4.62%	\$10.03	\$1,032,945	\$997,764
8	Doors & Windows	2.71%	\$5.90	\$607,177	\$389,791
9	Finishes	5.51%	\$11.96	\$1,231,545	\$2,052,776
10	Specialties	1.67%	\$3.63	\$373,470	\$434,453
11	Equipment	1.58%	\$3.42	\$352,382	\$414,350
12	Furnishings	3.05%	\$6.63	\$682,430	\$349,800
14	Conveying Systems	0.37%	\$0.79	\$81,700	\$95,041
15	Mechanical	17.18%	\$37.31	\$3,842,035	\$4,676,125
16	Electrical	11.22%	\$24.37	\$2,509,525	\$2,569,600
	Total Building Costs	100.00%	\$217.21	\$22,367,694	\$25,537,206
	with Profit and Overhead			\$25,671,110	\$25,537,206
	Total Building Costs minus site	100.00%	\$195.11	\$20,091,322	\$19,046,313

Building Cost per CSI MasterFormat based on Forman Program and Construction Managers original estimate before escalation. This estimate is compared to the prime contractor's low bids. Note: the contracts for the prime contractors are not divided strictly based upon the CSI MasterFormat, some interpolation was necessary.

Parametric D4Cost Estimate:				
Code	Division Name	%	Sq. Cost	Projected
00	Bidding Requirements	1.27	2.75	283,217
01	General Requirements	2.81	6.08	626,631
02	Site Work	6.36	13.76	1,417,733
03	Concrete	2.90	6.27	646,306
04	Masonry	11.20	24.22	2,494,976
05	Metals	6.62	14.31	1,473,908
06	Wood & Plastics	1.04	2.26	232,443
07	Thermal & Moisture Protection	4.64	10.05	1,034,760
08	Doors & Windows	3.05	6.59	678,591
09	Finishes	5.61	12.12	1,248,803
10	Specialties	1.90	4.12	424,124
11	Equipment	2.40	5.19	534,256
12	Furnishings	1.29	2.79	287,692
13	Special Construction	0.64	1.38	141,704
14	Conveying Systems	0.30	0.66	67,614
15	Mechanical	13.56	29.33	3,020,840
16	Electrical	9.17	19.84	2,043,622
21	Fire Suppression	0.56	1.20	123,683
22	Plumbing	2.62	5.67	583,912
23	HVAC	4.73	10.22	1,052,984
26	Electrical	6.79	14.68	1,511,675
27	Communications	0.03	0.06	6,197
31	Earthwork	3.98	8.60	885,541
32	Exterior Improvements	3.44	7.43	765,291
33	Utilities	3.10	6.70	690,428
	Total Building Costs	100.00	216.28	22,276,931

Kimberton Elementary School Square Foot Building Estimate			
RS Means Source:	Year: 2007	Model #:	M.560
Page(s):	80-81	Ext. Wall Type:	Decorative Concrete Block
Area:	102583 (From Revit Model)	Frame:	Steel Frame
Perimeter:	2642.9 (From Revit Model)	Story Height:	14
The Area fall between:	above	and	65000
		Base Cost per Square Foot:	\$105.40
Cost Adjustment Type:	Perimeter Adjustment	Per SF Adj.	\$9.23
Cost Adjustment Type:	Story Height Adjustment	Per SF Adj.	\$1.30
		Adjusted Base cost Per Square Foot:	\$115.93
Base Building Cost:	\$115.93	x	102583
		=	\$11,892,577.08
Basement Cost:	none	x	
		=	
		Total Cost:	\$11,892,577.08
RS Means Additions			
Additions	Clock System (50 Room)	Amount:	\$33,200.00
Additions	Flagpole (Aluminum 40' High)	Amount:	\$3,025.00
Additions	Kitchen Equipment (Broiler)	Amount:	\$6,700.00
Additions	Kitchen Equipment (Cooler)	Amount:	\$8,550.00
Additions	Kitchen Equipment (Dishwasher)	Amount:	\$4,225.00
Additions	Kitchen Equipment (Food Warmer)	Amount:	\$4,800.00
Additions	Kitchen Equipment (Freezer)	Amount:	\$8,550.00
Additions	Kitchen Equipment (Ice Cube Maker)	Amount:	\$1,500.00
Additions	Kitchen Equipment (Range)	Amount:	\$8,700.00
Additions	Classroom Chairs (700 Set)	Amount:	\$84,000.00
Additions	Sound System (Amplifier)	Amount:	\$2,050.00
Additions	Sound System (ceiling or wall) ~50	Amount:	\$8,250.00
		Total Cost:	\$12,066,127
Multiplier Type:	Location (West Chester)	Value:	1.07
Multiplier Type:	Time (.04+.04 Approximated)	Value:	1.08
Allowances:			
Addition:	none	Amount:	
		Total Square Foot Estimate for Building:	\$13,943,616.45

Kimberton Elementary School
East Pikeland Township, Chester County, PA

Ralph Kreider
Construction Option: Messner

RS Assembly Estimate Based on Square Foot			
Assembly	% of Total	Cost per SF	Total Cost
A Substructure	11.0%	\$14.95	\$1,533,797.81
B. Shell			
B10 Superstructure	4.5%	\$6.12	\$627,462.74
B20 Exterior Enclosure	8.5%	\$11.55	\$1,185,207.40
B30 Roofing	5.4%	\$7.34	\$752,955.29
C. Interiors	25.7%	\$34.93	\$3,583,509.43
D. Services			
D10 Conveying	0.0%	\$0.80	\$81,700.00
D20 Plumbing	6.1%	\$8.29	\$850,560.60
D30 HVAC	21.8%	\$29.63	\$3,039,708.39
D40 Fire Protection	2.3%	\$3.13	\$320,703.18
D50 Electrical	14.6%	\$19.85	\$2,035,768.00
E. Equipment & Furnishings	10.0%	\$13.59	\$1,394,361.65
F Special Construction		\$3.90	\$400,000.00
G. Building Sitework Additions		\$50.49	\$5,179,788.00
Jobsite OH & GC's	18 <small>Time (# months)</small>	\$49,820.44 <small>Monthly Cost</small>	\$896,768.00
Subtotal			\$21,882,290.48
Contractors Fee		10%	\$2,188,229.05
Designer's Fee		6%	\$1,312,937.43
Total Cost of Building			\$25,383,000

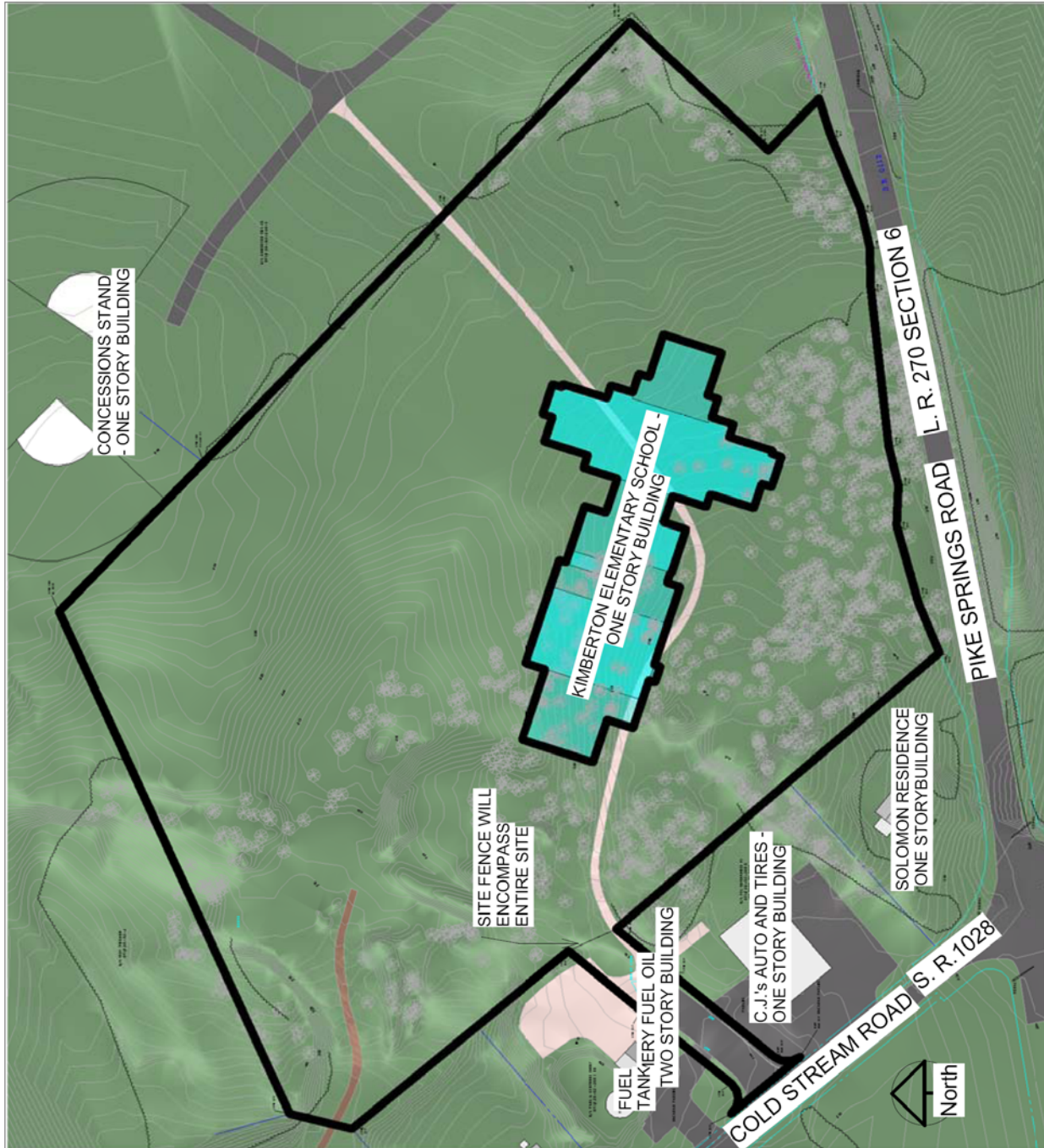
Note: Conveying, Special Construction, and Site Work were not included in the RS Means Square Foot Estimate. These numbers are taken from the Foreman Program and Construction Managers Detailed Estimate

First off, it is important to discuss that there are no actual building costs for Kimberton Elementary because it was never built. The closest to actual building cost and what will be used for actual building cost in this report are the bids of the low bidders on the project. These bids, however, are difficult to analyze because they are not broken down into the CSI Master Format. Foreman's original estimate without escalation and the contractor's low bids are within \$150,000 of each other. So therefore, I will use this original building systems estimate to compare it to the RS Means and D4Cost estimates.

The D4Cost cost estimate does not include profit and overhead and therefore is very comparable (less than \$100,000) to the FPCM estimate (without profit and overhead). It seems that the D4 cost estimate severely underestimates the electrical and mechanical systems of the building (approx. \$1 million each).

Without making any modifications to the RS Means square foot estimate. The RS Means without modifications the square foot estimate is about \$14 million which is about \$8 million less than the FPCM estimate. If the site work, elevator and special construction (site closure plan) are added into the RS Means square foot estimate, it makes the two estimates without profit and overhead within \$500,000 of the FPCM estimate. With profit and overhead added, the difference is less than \$300,000.

Overall the estimates were all very similar. This is most likely due to the fact that Kimberton Elementary is pretty much a spec elementary school. There are not many modifications to it that make it more expensive than other elementary schools. There were several differences between the different assemblies in the estimates but these seemed to balance out in the end.



Phoenixville Area School District	Kimberton Elementary School	Existing Site Plan	
		Project number	3279
		Date	May 9, 2008
		Drawn by	Ralph G. Kreider
		C2	
		Checked by	Ralph G. Kreider
		Scale	1" = 160'-0"

Kimberton Elementary School
 East Pikeland Township, Chester County, PA

Ralph Kreider
 Construction Option: Messner

Notes on site plan: At present scale, it is impossible to have everything that is required in the site plan check list. Addition full scale site plans are included in the appendix of this report. Kimberton is a two story building located in the lower half of the 19.8 acre site. All Existing Utilities run underneath Cold Stream Road and Pike Springs Road (Route 113). There are no utilities underneath the proposed site of Kimberton Elementary School. The new water, gas, electrical, and communication lines for the school will run underneath the service road between Emery Oil and CJ Tire. The lines will run into the southwest corner of Kimberton Elementary. (See CMX utility plan for details.) There are no fire hydrants or temporary lights on site, however the fire department is located on the neighboring property. There is currently no pedestrian traffic through the site and construction fences around the entire site will be used to prevent any unauthorized person to wonder on site. No overhead protection will be required. All roads surrounding the site are two way roads and the site will be accessed for construction directly from route 113.

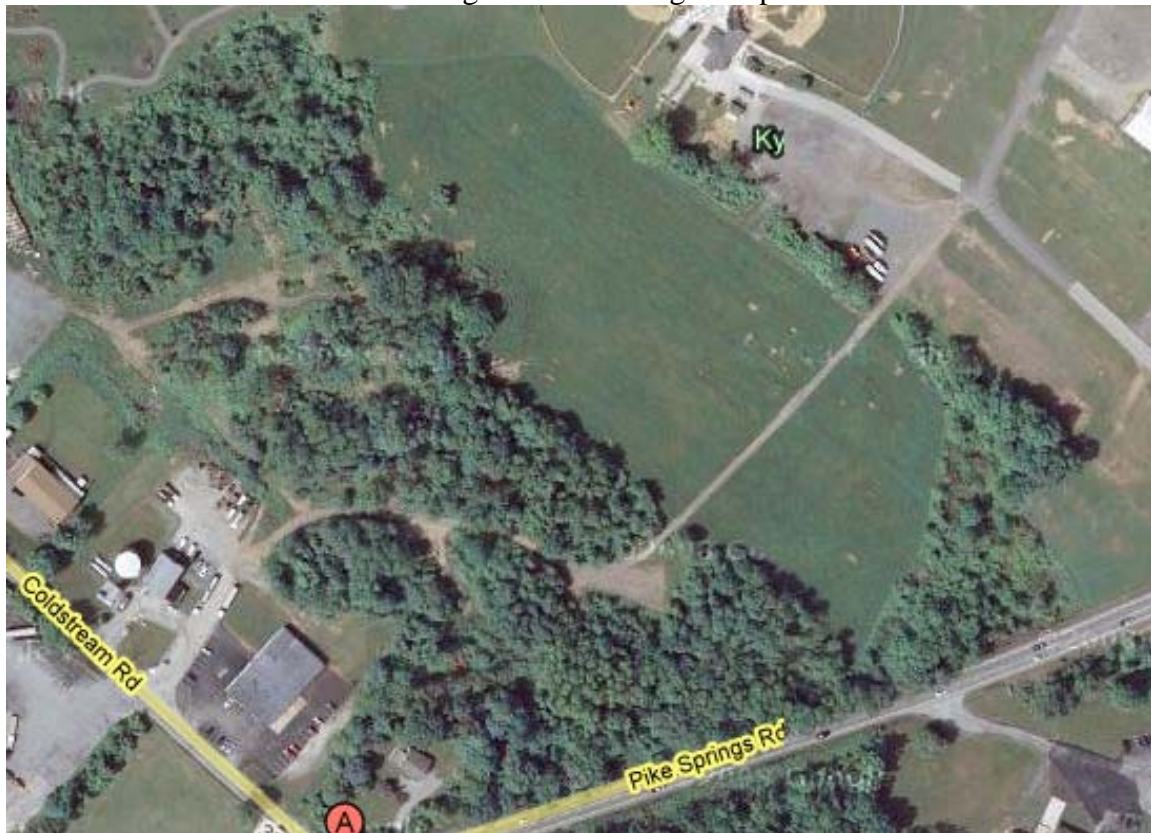
Rendering of Current Site Conditions



Bird's Eye View of site (maps.live.com)



Existing Site from Google Maps



See appendix for additional site plans

One of the most important factors and areas of risk is the site closure plan for the Kimberton Elementary School Property. It involves large amounts of excavation and fill to mitigate the risk to the occupants of the site. Below is an excerpt from the site closure plan to provide a background and history of the proposed Kimberton Elementary School Site.

1.1 Site Background and History

The KES Property is located on the northeast corner of the intersection of Cold Stream Road and Route 113, in the Township of East Pikeland, Chester County, Pennsylvania. The property occupies approximately 19.8 acres and is currently undeveloped land; however, historical information indicates that open portions of the property were used for agricultural production. An estimated 3.85 acres in the northwestern corner of the property had been utilized by a construction firm (e.g., C. Raymond Davis) for storage, burning and disposal of construction-related materials, and a small section (approximately 2,000 square feet) reportedly had also been used by the Township to dispose of household municipal waste during the 1950s/1960s. A section of a former rail line also ran through the northwestern section of the property.

The property consists of open, grass fields on the eastern/northeastern two-thirds of the site and wooded areas cover the remainder of the property area. KES Property topography is primarily gently to moderately sloping; however, the northern/northwestern portion exhibits variable terrain, which resulted from historical filling operations. An unpaved access road divides the property and provides access from Cold Stream Road to the west and the Kimberton Fire Company property to the east.

In addition to the Fire Company, adjacent properties consist of municipal parkland to the north, residential and undeveloped land to the south, and commercial properties to the west. The current commercial tracts include Emery Oil, a collision auto repair facility, and unoccupied commercial properties. Farther west, across Cold Stream Road is the Henry Company, which currently manufactures asphalt products. The Henry Company property is the location of the Kimberton Superfund Site, which has been investigated by USEPA since 1981. A chlorinated solvent groundwater plume associated with releases from the Kimberton Superfund Site has impacted local groundwater and remedial actions and monitoring are continuing. The groundwater plume extends to one of the Superfund site monitoring wells (MW-17), which is located at the western KES property border.

Area of Closure Plan is located on the northwest corner of site. It is approximately 3.85 acres. At its largest extents, it's about 400ft by 460 ft. The fill area of the entire 3.85 acres and ranges between 10 and 4 feet deep. The excavation area is approximately 61,000 SF and the maximum depth of the remediation area is approximately 10 ft below grade until the bedrock layer is reached. The estimated volume of excavation matter is 8,425.4 cubic yards (CY). One third (2,125 CY) of the volume is thought to be native soil and can be used for clean fill. The remaining 6,300 CY will be removed from site and treated. See Appendix for Site Closure Plan Map

Methods of Construction:

The Chester County Area prefers the methods that would have been used to build Kimberton Elementary School. Most commercial buildings in the area are built with structural steel framing with a concrete spread foundation and slab on grade. Like most schools, the exteriors are veneered with either brick or spilt face block. The façade is backed up by either metal stud or CMU. Most schools have a flat EPDM roof. Kimberton has an EPDM roof in addition to a gabled shingled roof. Also like most other schools in Pennsylvania, this school will use a multiple prime method to deliver the project. Most other delivery methods using in the area are construction managers at risk or general contractors.

Construction Parking:

Construction parking is available on site in what will be the future parking lots as well as the eventual soccer field. If parking is not available due to construction on these areas, contractors will be permitted to use the neighboring Kimberton fairgrounds.

Recycling and Tipping Fees:

Recycling is available at no extra cost from the waste management providers in the area. It is not a requirement of the project and therefore will be up to each contractor to implement on their own behalf. The tipping fees for the recycled product are the same as none recyclable waste.

Waste disposal for the project could have been handled by Waste Management. They charge \$659 for week of rental of a 30 yard container. This quote includes removal of 5 tons of debris. An additional \$73 dollars is charged per ton over 5 tons. A. J. Blosenski, Allied Waste - Valley Forge District, Ches-Mont Disposal can also be used in this area.

Soil/Subsurface water conditions:

The northwest corner of this site was used for municipal waste in the 50's/60's and construction waste until purchased buy the school district. This use creates the need for a site closure plan. Site additional information in the site plan section.

The soil at Kimberton is made up of four major types: Silty Gravel with Sand (GM), Silty Sand (SM), Sandy Silty Clay (CL-ML), Lean Clay (CL). Each varies in amount and location. All of the test boar samples came up dry. Therefore there will not be a problem with the water table and there will be no need to have any pumping of ground water. The top soil varies in depth from 2" to 6". Auger refusal was between 10 feet and 21 feet. It appears that there could be a some rock under the gymnasium and the cafeteria. This should not pose a huge concern because the depth of the foundation is rather shallow at those locations.

The owner of Kimberton Elementary School is the Phoenixville Area School District. As of 2006, the enrollment of the school district was 3,302. The school is located in the northwestern part of Chester county, PA and is home of the phantoms. The school encompasses an area of 19.5 square miles. At the last census 28,299 people lived in the district.

Phoenixville is building the new school to replace an aging East Pikeland Elementary. The School is one of three elementary schools in the Phoenixville area school district. The building was built as the East Pikeland Consolidated School in 1928. It was the first

multiple room school in the township. It currently educates 1st through 5th grades. Additionally, studies were completed by the school district. Based on future enrollment projections as 650 student school was required. A 20% cushion was built into the enrollment number to allow for growth.

When beginning the Kimberton project, the school district expected to have the entire project completed for about 26 million dollars and in time for the 2008 school year. However due to delays, the school was prepared to pay \$30 million for the entire project at the time of construction. They expected the school to be open in January of 2010 to allow the temporary relocation of the Phoenixville Middle School while that building was being renovated. It was very important to have this building completed on time to allow for the middle school renovation to take place. The building will be occupied in one phase.

The school desired a normal quality elementary school. They did not try to do anything too advanced but did try to incorporate a few green ideals without going LEED certified. Some examples of these are a white roof, solar panel and researched into the feasibility of geothermal heating. In order for this to be a successful project for the school it will need to have good specs, good drawings, minimal change orders, good end products, and most importantly all parties involved need to be satisfied especially the people of the township.

Home of the PHANTOMS



The mission of Phoenixville Area School District is to prepare, inspire, and graduate students to meet the challenges of the future.

Figure 1: School Logo and Mission Statement



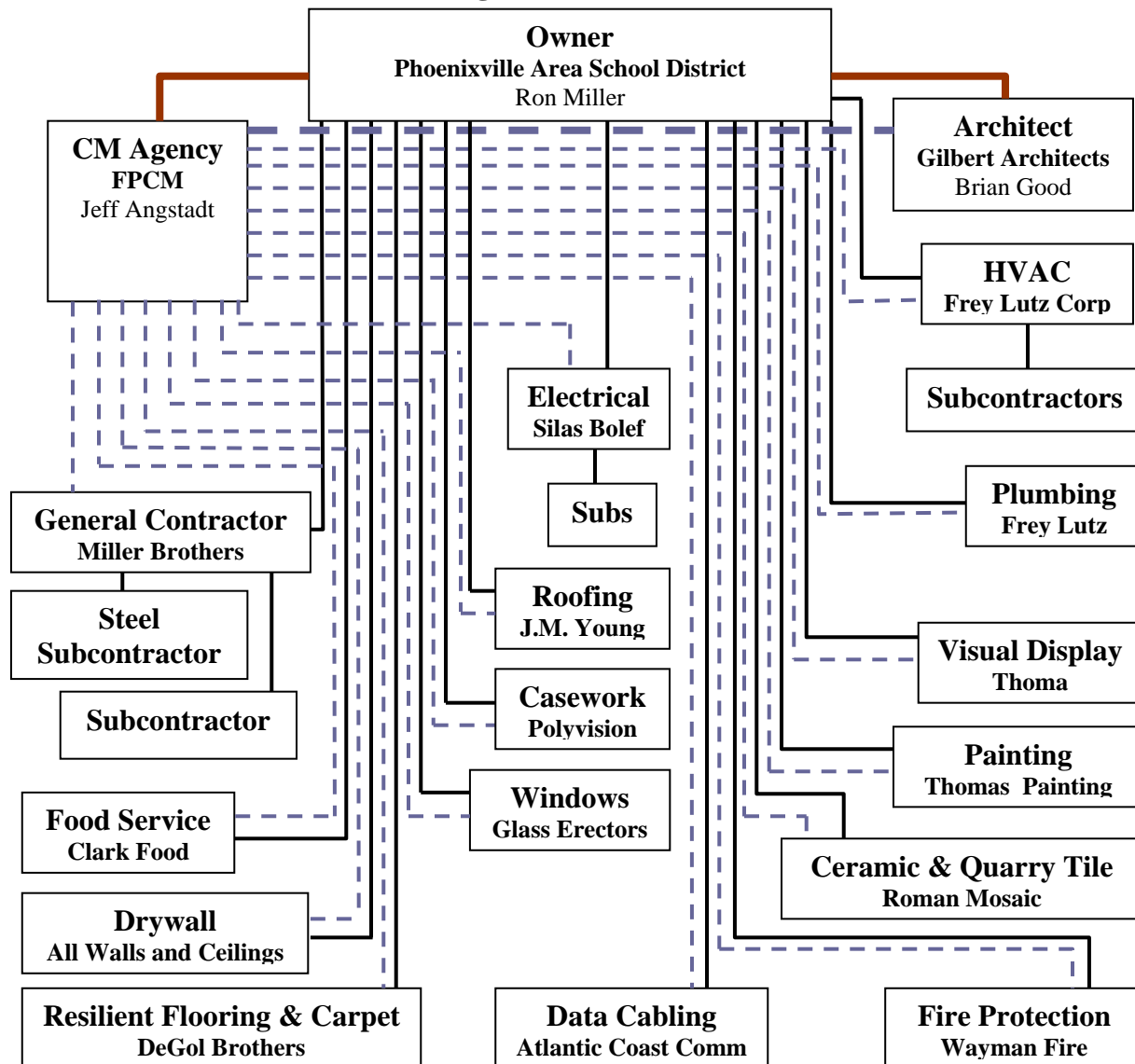
Figure 2: East Pikeland Elementary



Figure 3: Aerial of East Pikeland Elementary (google.com)

The project is being delivered using a design-bid-build method with multiple prime contracts and a construction management agency overseeing. The contracts are divided into 15 prime contracts: General Construction, Roofing Construction, Aluminum Entrances and Windows Construction, Ceramic and Quarry Tile Construction, Acoustical and Drywall Construction, Resilient Flooring and Carpeting, Painting Construction, Visual Display Construction, Food Service Equipment Construction, General Casework Construction, Plumbing Construction, Fire Protection Construction, HVAC Construction, Electrical Construction, Data Cabling Construction. Each Contract is held by the owner (Phoenixville Area School District). The construction manager will run the day to day management of the project and the school will release the payments.

Organizational Chart:



Kimberton Elementary School
East Pikeland Township, Chester County, PA

Ralph Kreider
Construction Option: Messner

Note on organizational Chart: Solid lines are contractual agreements. Most major contractual agreements are between the owner and the parties. The thick solid lines are contracts made directly with the school and were not publicly bid. All other contracts were publicly bid. Each prime contractor is permitted to choose their own subcontractors. The dashed lines are lines of communication and are not contractually binding. There are also many other lines of communication that are not illustrated. The construction manager is to help facilitate those lines of communication.

The multiple prime delivery method of project delivery was chosen because of a Pennsylvania State requirement for school construction. PA requires a multiple prime delivery method for school projects. In most cases, this requirement creates the need for a construction manager on the project because most schools do not have the ability to manage large construction projects with their own personnel.

The architect, Gilbert, was chosen by the school administration and approved by the school board. The architect's contract amount is based upon a percentage of the project cost. For Kimberton Elementary School the contract price was approximately 1.5 million dollars.

The Construction Manager, Foreman Program and Construction Managers, was chosen in much of the same manner as the architect. Foreman has developed a relationship with Phoenixville Area School District on a previous project and the school board approved awarding Foreman the construction management contract at the administration's suggestion.

All the prime contracts were selected as using public bid. The low bid contractor was selected by law and the school board was to award the contracts. Each contractor is responsible for their own bonds and insurance in most cases. Each contractor is responsible for showing proof of a Bid Bond, Performance Bond, and Payment Bond.

The insurance for this project is a little more complicated than the bonds. All parties are responsible for having their own worker's compensation insurance, employer's liability insurance, and unemployment insurance. For the project, the owner will purchase all-risk insurance, fire and extended coverage insurance, owner's liability, property insurance, loss of use insurance, and boiler and machinery insurance. Each prime contractor is responsible for purchasing its own contractor's liability insurance, contractual liability insurance, public liability, comprehensive automobile insurance, product and operations insurance, stored materials, and environmental (population) liability (for those contractors who are performing site work. The construction manager and architect have relatively no insurance to purchase.

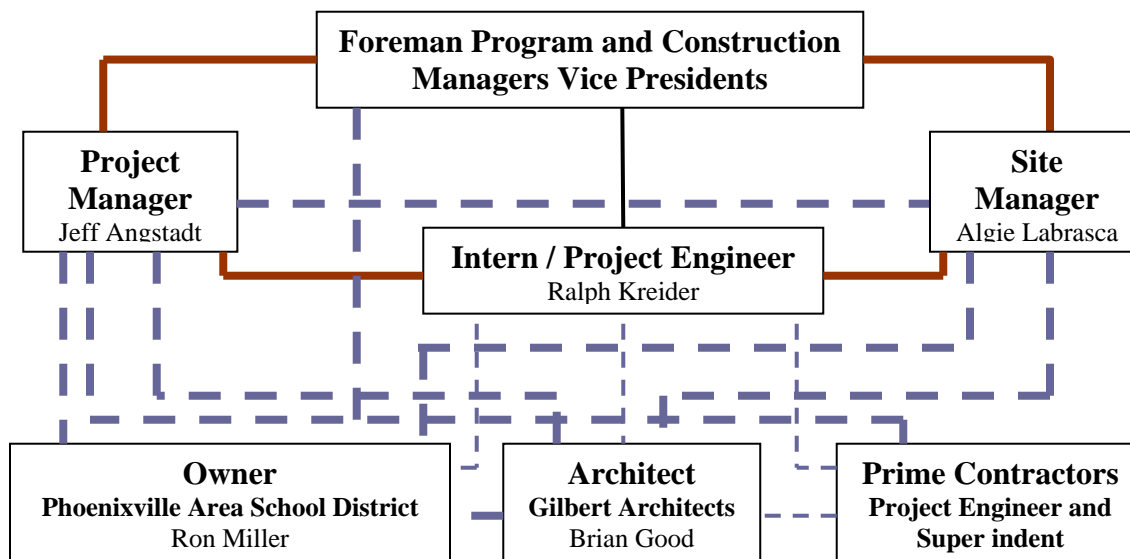
The appropriate contract type and delivery system for this project was selected. It is appropriate because it is required by law. The school district is not however required to have a construction manager. They chose to do so in order to manage the multiple prime contracts and have a better overall project. The school district does not have the experience or the resources to manage the construction project themselves. There may have been cheaper or more effective ways to deliver this project but with the current legal system it was the only conceivable delivery method. The only real decision the school and the construction manager had to make was the number of prime contracts that would be awarded. The number of prime contracts was based on the amount of work in each CSI division and the capabilities of each trade to perform their work well as a prime contract. The school district could have also applied for exception to the law but did not deem this to be necessary.

The Construction Manager (Foreman Program and Construction Managers) has allotted a project manager and site manager for the entire 18 month construction schedule of the project. The project manager is scheduled for 20 hours a week and the site manager is scheduled 40 hours a week. After turnover of the building, FPCM will allot 10 hours a week for a project manager for 2 months of closeout. Also during that time, FPCM has allotted 40 hours a week for a site manager. During the preconstruction of this project, FPCM scheduled 10-15 hours a week of a Project Manager. The preconstruction process for this project was about three years. Extra hours would be allowed for the three estimating periods during the preconstruction phase. There was a full-time intern (Project Engineer) scheduled for the project both summers (total of 24 weeks).

Project Staffing Allotment/Plan

Role	Preconstruction (156 weeks)	Construction (78 weeks)	Closeout (8 weeks)	Total
Project Manager	1560 hours	1560 hours	80 hours	3200 hours
Site Manager	0 hours	3120 hours	320 hours	3440 hours
Intern	120 hours	960 hours		1080 hours

Organization Chart



Note: The heavy solid lines indicate direct boss. The light solid line indicates secondary boss. The dashed lines are lines of communication.

The main project management staff for the construction of Kimberton Elementary consists of a FPCM project manager and FPCM site manager. The two positions are overseen by the vice presidents of the company. FPCM will also have a project engineer/intern assigned to the job, who is supervised by both the project manager and the site manager. Both the site manager and the project manager are in constant communication with the owner, architect, and prime contractors. The project engineer is also in contact with the owner architect and prime contractors but on a less formal manner. The architect and prime contractors have basically the same management setup as FPCM with a project manager and superintendent. The owner has a facilities manager, Ron Miller, a superintendent, and a school board that makes its decisions. The prime contracts have communication with the owner and architect; however the CM usually facilitates it.

Appendix Contents:

- **RS Means Square Foot Estimate Pages**
- **Original D4Cost Estimate**
- **Original Foreman Estimate**
- **Original Cost Summary From Low Bids**
- **Existing Conditions Plan (CMX engineering)**
- **Utilities Plan (CMX Engineering)**
- **Proposed Site Plan (CMX Engineering)**
- **Site Closure Plan Map (CMX Engineering)**
- **Site Closure Plan Erupt**
- **Manitowoc model 8000 product guide**
- **Summary of Multiple Contracts From Specs**
- **Sample of Soil Reports**