



KIMBERTON ELEMENTARY SCHOOL

EAST PIKELAND TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA



BUILDING STATISTICS:

- **Size:** 104,000 sq ft – Two Stories
- **Construction:** July 2008 – Jan 2010
- **Construction Cost:** \$25.3 Million
- **Delivery Method:** Design-Bid-Build with Multiple Prime and CM Agency

ARCHITECTURE:

- 650 students Elementary
- Two main wings: Classroom and Activities
- 30 730 SF classrooms
- 2 computer labs
- 3000 SF media center
- 650 seat auditorium/cafeteria
- 6000 SF gymnasium with full basketball and volleyball courts

BUILDING ENVELOPE:

- Masonry Veneer Exterior
- Split face block on first floor
- Green cementitious siding used on second floor
- Asphalt shingled gabled roof on top of the classrooms, media center, gymnasium, and entry
- White single-ply membrane flat roof on remainder of building

STRUCTURAL:

- Structural Steel Building
- 1.5" 20 GA composite deck with 2.5" of NW concrete
- Classroom live load is 40 PSF
- Most columns are HSS8x8x1/2
- Spread footing support columns
- First floor is 4" cast-in-place concrete slab with 6x6 W2.9xW2.9 WWF



MECHANICAL:

- Water source heat pump
- Individual heat pumps for each classroom housed in the second floor mechanical room
- 6 water source heat recovery units manufactured by Des Champs housed on the roof
- Originally designed as geothermal heat pump

ELECTRICAL:

- Disturbed through building at 480/277V
- Supply Voltage is 33KV
- 5 Local Transformers step down to 208/120V
- Lighting uses 277V
- 125 KW Backup Generator
- 40 panel boards located throughout school

LIGHTING:

- 59 lighting types
- Classrooms use 3 32W T8 lamps
- Switching allows for 3 light levels
- The media center contains pendent and drop lights
- Gymnasium lighting is produced by high bay fluorescents
- Cafeteria/auditorium has dimmable metal halide lights

PROJECT TEAM:

- **OWNER:** Phoenixville Area School District
- **CONSTRUCTION MANGER:** Foreman Program and Construction Managers
- **ARCHITECT:** Gilbert Architects
- **STRUCTURAL:** Baker, Ingram, & Associates
- **M.E.P.:** Snyder Hoffman & Associates



RALPH GARY KREIDER
2009 CONSTRUCTION OPTION

[HTTP://WWW.ENGR.PSU.EDU/AE/THESIS/PORTFOLIOS/2009/RGK5000/](http://www.engr.psu.edu/ae/thesis/portfolios/2009/RGK5000/)



Executive Summary:

To replace the aging East Pikeland elementary school, the Phoenixville Area School District decided to build a 650 student elementary school on a fallow site next to the Kimberton Fair Grounds. Because of delays due to site containments, the proposed completion date was pushed back to January 2010. The cost of construction including all fees was \$27.7 million (\$270 dollars per square foot) plus \$2 million for the site.

The site of Kimberton is complicated by the site closure plan. This project was cancelled due to contaminated groundwater underneath the proposed site. The site contained VOCs such as trichloroethylene, dichloroethylene, and vinyl chloride in aquifers 180 feet below the surface. The school board decided in June of 2008 to suspend the project and abandon the site at Kimberton. It is this cancellation that has played a critical role for a number of the analyses to be preformed during my senior thesis.

An elementary school still needs to be built for the school district. An alternate site needs to be selected for the school. It is this fact that ties this entire thesis together. Relocating this building requires the consideration of a number of factors including, building aesthetics, location on site, soil and foundation system. These analyses will include structural mechanical and architectural breadths.

The cancellation of the project gives the school district a unique opportunity to look areas of improvement in the old design. There is now a chance to add more sustainably to the project as well as value engineering the project, hopefully adding value to the project overall. A few considerations are modifying the window size for day lighting, returning the building to the originally proposed geothermal heat pump, changing the room partition type to metal stud and drywall solution, adding solar collection panels to the roof of the classroom wing of the building.

Foreman Program and Construction Managers spend a number of resources on the estimation of building projects at various times during design. In the world of building information modeling there are several software products available that promise faster feedback estimate feedback as well as more accurate quantities for estimating. These different software packages should be analyzed for potential benefits. This analysis will compare new products such as Autodesk Quantity Takeoff, Innovaya, and Revit Quantity Schedules to the traditional methods of estimating ability to calculate the cost of the value engineering and sustainability ideas found in the previous analysis. Additionally adjusting the general conditions estimate and updating the overall estimate of the project will be required.

Part of this thesis is to consider the constructability of the project on a new site. For this it will be necessary to revisit technical analysis preformed during previous technical reports for the new building location. The areas that will be revisited are developing new site utilization plans, updating the schedule and detailing the proposed modifications.

Overall this thesis will incorporate the knowledge gained throughout an entire architectural engineering education at Penn State. It will focus in the areas of Critical Issue Research, Value Engineering Analysis, Constructability Review, and Schedule Reduction /Acceleration Proposal. This thesis will also consist of investigations based on graduate level studies.

Appendix 1 – Breadth Studies

Architectural Breadth

The evaluation of an alternate site is very architecturally intensive. First I will need to locate the building aesthetically on the site as well as the best location for environmental gain. I will need to architecturally review the building to make sure that it will fit the site in the first place. Modification may be necessary. I will also evaluate the floor plan to see if the functionality is still maintained. Additionally the site will also have to be completely redeveloped to make sure that it incorporates all the uses of the original site plan.

Mechanical Breadth

When relocating the building it may be feasible to return to the originally proposed system of geothermal heat which was changed due to site contamination. This will involve reviewing the design and making the necessary changes to use geothermal heat. I would also evaluate the life cycle cost of the system. I would also need to locate the geothermal wells on the site and make sure they are up to the requirements of the system.

Lighting/Electrical Breadth

The evaluation of the day lighting of the classrooms of elementary school will incorporate knowledge gained in the lighting electrical classes. It is important to ensure that the light levels in the room will be proper for to facilitate learning as well as utilize all of the energy of the sun. Additionally, during my evaluation of solar panels on the roof of the building, I will need to calculate the loads provided by the panels and consumed by the lighting of the building.

Structural Breadth

When evaluating the alternate site, the structural stability of the foundation will need to be confirmed because of different site soil bearing capacity. I will need to check these soil conditions and make sure the soil bearing capacity is at least as high as the original site. If it is not as high I will make the recommendation that the foundation be redesigned.

Overall, my thesis investigations will require a very well rounded breadth of architectural engineering knowledge and is not just limited to my understanding of building construction.