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Construction Option
Spring 2009 - Messner

Kimberton Elementary School

East Pikeland Township, Chester County, PA

Ralph Gary Kreider – 2009 AE Senior Thesis
April 14th, 2009 – Construction Option - Messner

Kimberton Elementary School
East Pikeland Township, Chester County, PA

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Presentation Outline

- Kimberton Elementary Background
- Theme of Senior Thesis
  - Relocating The Building
  - Sustainability and VE
  - Estimating Using BIM
- Conclusions
- Questions

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Outline

PASD Seal

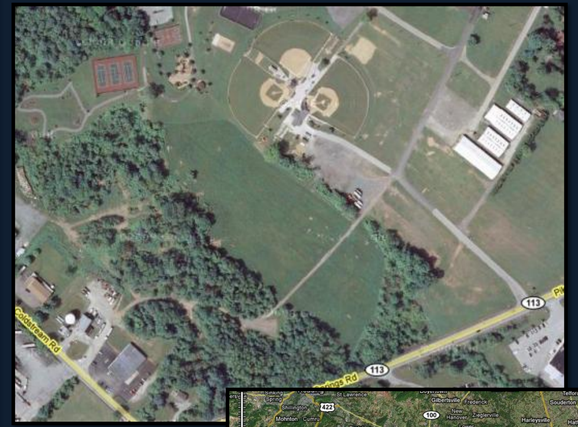
- **Delivery Method:**
  - **Design – Bid – Build with Multiple Prime and CM Agency**
  - **14 Prime Contracts**

Kimberton Elementary School

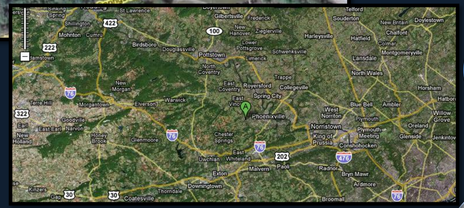
Project Background

- **Owner:** Phoenixville Area School District
- **Function:** 1st – 5th grade elementary School
- **Size:** 103,000 Square Feet on 2 stories
- **Construction Cost:** 25.5 million dollars
- **Construction Period:** July 2008 – January 2010*
- **CM:** Foreman Program and Construction Managers
- **Architect:** Gilbert Architects

*never constructed



Aerial View of Site and View of Surrounding Areas



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Outline

Rendering of Kimberton Elementary School (Gilbert)

View of Structural System

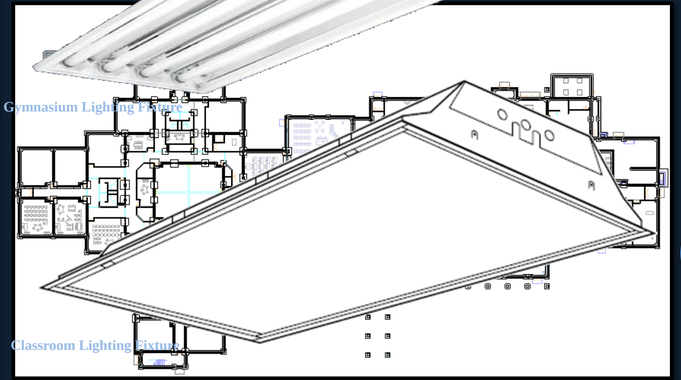
Project Background

Building Systems

- **Architecture:**
  - 30 classroom – 650 Student Building
  - Two Main Wings: Classroom and Activity Wing
- **Structural Steel Building with Spread Footings**
- **Water Source Heat Pump with Individual Heat Pumps for each Room**
- **Electrical System is typical for an Elementary School**
- **59 Different Types of Light Fixtures with Tandem Wiring**

Rendering of Kimberton Elementary School (Gilbert)

Plan of Kimberton Elementary



Gymnasium Lighting Fixture

Classroom Lighting Fixture

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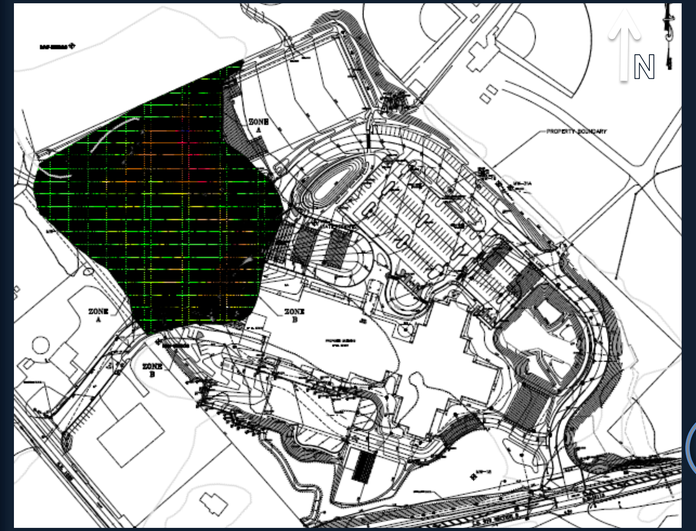
Project Background

Site Contaminates

- 50s and 60s used to dump household municipal waste
- Site was also used at a dumping site for construction waste until 1990s
- Site Closure Plan:
  - 8,500 CY to be excavated – 3.85 acres – 61,000 SF
  - Removed until bedrock Approx. 4ft -10ft below grade
  - 6,300 CY contaminated – remove for site
  - 2,125 CY can be used for fill
  - Bring to grade and cover with liner and 2 ft of topsoil



Dumping Area on Site

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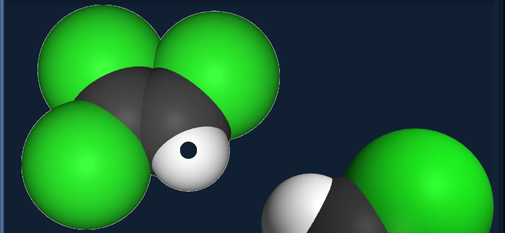
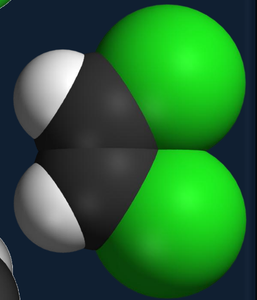
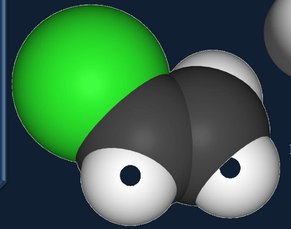


Trichloroethylene



Dichloroethylene



Vinyl Chloride

Project Background

Kimberton Superfund Site

- Located Across Cold Stream Road
- Previous owner from ‘47-’59 disposed of resides into 8 lagoons on site which leeched into groundwater
- Carcinogens detected in ‘81 when monitoring wells were installed
- Began removing contaminates by air stripping in 1989
- In '92 public water system was built to avoid groundwater
- Three Carcinogens of Concern
  - trichloroethylene, dichloroethylene, and vinyl chloride

Superfund site vs. Proposed Kimberton Elementary Site

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Outline

Philadelphia Daily News - June 19th, 2008

Project Background

Kimberton Superfund Site

- Installed additional monitoring wells
- Hazardous levels found 180ft below grade
- Only trace amount found on surface
- Vapor mitigation system at precautionary measure
- This expert states "The science clearly supports the conclusion that the Kimberton Elementary School can be built at the proposed site without unacceptable risk from vapor intrusion."
- Lead to project cancellation

6abc Action 6 News - June 19th, 2008

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Outline

michaeldmiller.wordpress.com

Thesis Theme

What Happens Now?

- **What does the school district do now?**
- **School needs to be built to replace East Pikeland**
- **Cannot use Kimberton site**
- **Cost about 3.8 million dollars so far**
- **My thesis is based around the school districts question of**

“What to do?”

www.matrixbusinesscoaching.com/

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Outline

Birdseye View of Proposed Site (Maps.live.com)

Relocating of Building

Locate New Site

- **Options Now Include renovating East Pikeland or Building Kimberton design on East Pikeland or**
- **Meadow Brook Golf Course**
  - **9 hole golf course**
  - **Discussed as an original possible site by school district**
  - **Neighbors the High School and Middle School**
  - **Additional Space To Expand Campus**
  - **50 Acres**
  - **2.5 Miles From Kimberton**
  - **Redrawing district lines**

Aerial View of Proposed Site and surrounding areas (Maps.live.com)

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Outline

Birdseye View of Proposed Site (Maps.live.com)

Relocating of Building

New Site Considerations

- **Site Survey**
- **Different Topography**
- **Need for New Site Plan**
  - **Grading of Site**
  - **Site Layout**
- **Permitting**
  - **Local Permits**
  - **Penn Dot Permits**
  - **Soil and Erosion Permits**

- **Utilities (Water, Sewer, Electric, Gas, Fire, etc.)**
- **Schuylkill township rather than East Pikeland**
  - **New zoning ordinances**
  - **% of impervious surface**
  - **Municipal Approvals**
- **New Traffic Patterns**
  - **Access to pothouse road**
  - **Distance to intersection**
  - **Width of Pothouse Road**
- **Storm Water Management**
  - **Retention Basin**
- **Different Soil Conditions**
  - **Revised Foundations**

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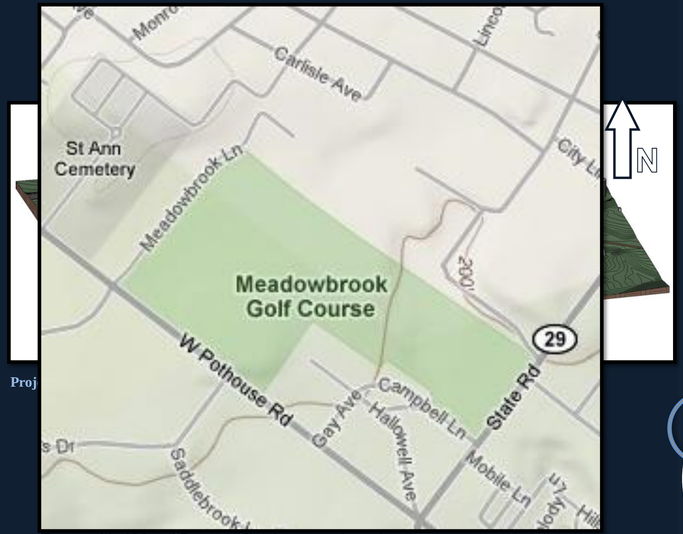
Outline

Birdseye View of Proposed Site (Maps.live.com)

Relocating of Building

Needs of a New Site Plan

- **Parking – 150 spaces + 50 Overflow spaces**
- **Bus Drop of Stalls – 11 Stalls**
- **Hard Surface Multipurpose Recreation – 39000 Sq Ft**
- **Soft Play Ground Surface – 2717 Sq Ft + 3750 Sq Ft**
- **Softball/ Kickball Field – 30,000 Sq Ft**
- **Grass Field – 22000 Sq Ft**
- **Soccer Field (185' x 300')**
- **Retention Area (at least 15% of impermeable surfaces)**



Topographical Map of Proposed Site (maps.google.com)

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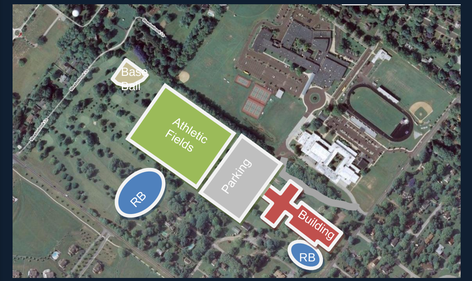
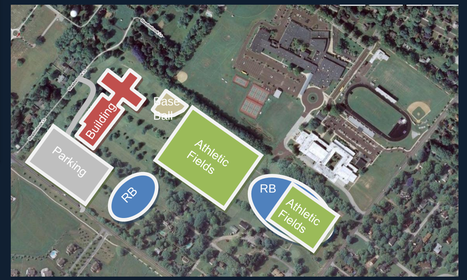


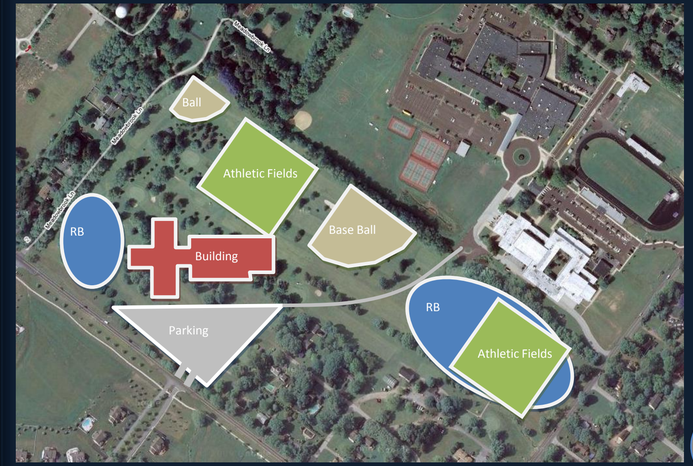


Potential Site Plans with Building

Relocating of Building

Location of the Building

- **Based on other schools in the area**
- **Minimizing Excavation to site**
- **Solar Considerations**
- **Vehicular Access**
- **Multiple locations considered**



Potential Site Plan with Building in Southwest

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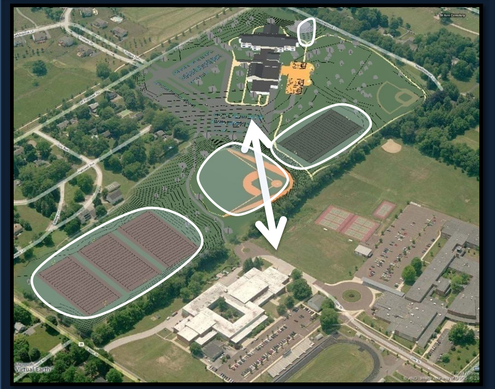
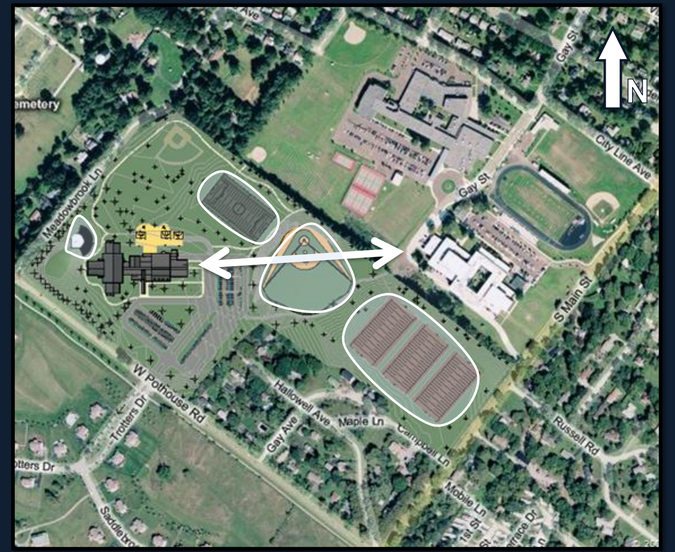


Perspective of Proposed Site Layout

Relocating of Building (breadth)

Views of New Site Plan

- **Exceeds site requirements**
- **Building separated from rest of schools to prevent interaction**
- **Building orientation allows for daylighting**
- **Additional varsity soccer and baseball field**
- **Fields can be used all schools**
- **Retention basins double as outdoor classroom and practice field**



Site Plan of Proposed Site Layout

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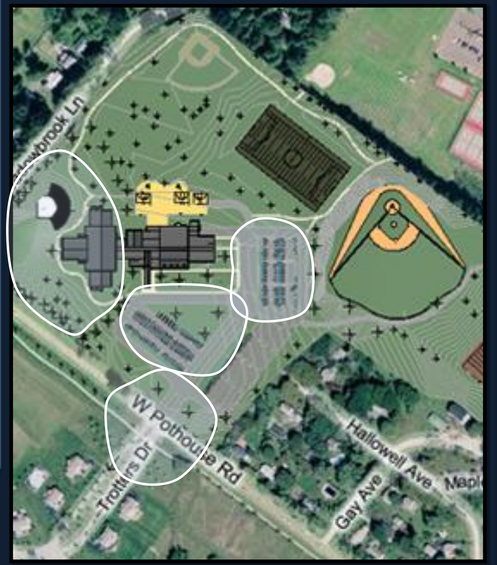
Outline



Site Plan of Proposed Site Layout

Relocating of Building (breadth)

Views of New Site Plan

- Classroom wing separated from Pothouse Road by trees and landscape
- Site entrance does not interfere with Pothouse Road
- Four Way Intersection with Trofters Drive
- Vehicular Traffic is separated from Students and Athletics
- Separate bus and car loops

Perspective of Proposed Site Layout

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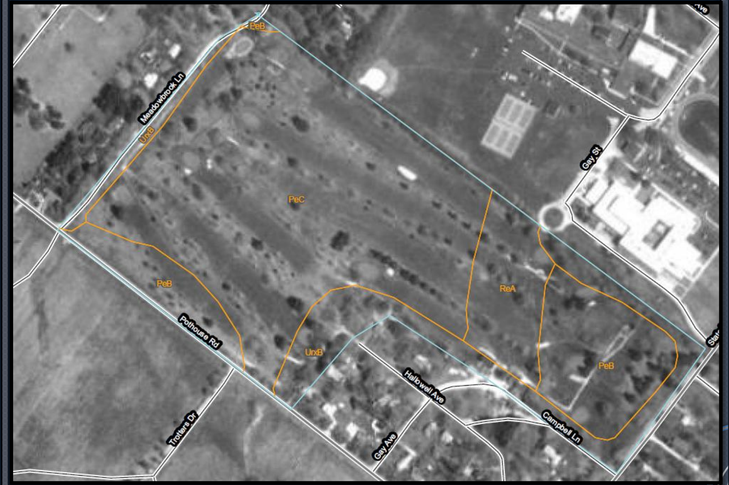
Soil Plan of Meadow Brook Golf Club (Schuylkill Township)

Relocating of Building

Soil Conditions

- 3500 psf soil bearing capacity for Kimberton Site
- 2500 psf soil bearing capacity for Meadow Brook site
  - 3000 psf based on local geotechnical engineer
  - 2500 psf used for extra precaution
  - A geotechnical report will have to be produced before building



USDA Web Soil Survey

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Outline

Primary Equation:

$$\frac{\text{(Original Size) x (Original Soil Bearing Capacity)}}{\text{(Revised Soil Bearing Capacity)}} = \text{(Revised Area)}$$

Strip Footing Schedule

Original Size	Revised Size
2'-0" x 1'-0" x 1'-0"	3'-6" x 1'-0" x 1'-0"
2'-2" x 1'-0" x 1'-0"	3'-6" x 1'-0" x 1'-0"
2'-4" x 1'-0" x 1'-0"	3'-8" x 1'-0" x 1'-0"
2'-6" x 1'-0" x 1'-0"	3'-10" x 1'-0" x 1'-0"
2'-8" x 1'-0" x 1'-0"	4'-0" x 1'-0" x 1'-0"
3'-0" x 1'-0" x 1'-0"	4'-4" x 1'-0" x 1'-0"

Foundations (breadth)

Assumptions

- 3500 psf soil bearing capacity for Kimberton Site
- 2500 psf soil bearing capacity for Meadow brooks site
  - 3000 psf based on local geotechnical engineer
  - 2500 psf used for extra precaution
  - A geotechnical report will have to be produced before building
- Ratio of Area of foundation to soil bearing capacity used for foundations
- Reinforcing changes are insignificant

Foundation Schedule

Mark	Original Size	Revised Size	Reinforcing (Same)
F4.0	4'-0" x 4'-0" x 1'-0"	5'-0" x 5'-0" x 1'-0"	4#5
F4.5	4'-6" x 4'-6" x 1'-0"	5'-6" x 5'-6" x 1'-2"	5#5
F5.0	5'-0" x 5'-0" x 1'-2"	6'-0" x 6'-0" x 1'-2"	5#5
F5.5	5'-6" x 5'-6" x 1'-4"	7'-0" x 7'-0" x 1'-6"	6#5
F6.0	6'-0" x 6'-0" x 1'-4"	7'-6" x 7'-6" x 1'-6"	8#5
F6.5	6'-6" x 6'-6" x 1'-6"	8'-0" x 8'-0" x 1'-8"	6#6
F7.0	7'-0" x 7'-0" x 1'-8"	8'-6" x 8'-6" x 1'-8"	7#6
F7.5	7'-6" x 7'-6" x 1'-8"	9'-0" x 9'-0" x 1'-10"	6#7
F8.0	8'-0" x 8'-0" x 1'-10"	9'-6" x 9'-6" x 2'-0"	9#6
F8.5	8'-6" x 8'-6" x 2'-0"	10'-6" x 10'-6" x 2'-2"	10#6
F9.0	9'-0" x 9'-0" x 2'-2"	11'-0" x 11'-0" x 2'-4"	11#6
F9.5	9'-6" x 9'-6" x 2'-2"	11'-6" x 11'-6" x 2'-4"	7#8
F10.0	10'-0 "x 10'-0" x 2'-4"	12'-0" x 12'-0" x 2'-6"	8#8
F8.0 x 6.0	8'-0 x 6'-0 x 1'-0	11'-0" x 6'-6" x 1'-8"	9#6 T&B

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Primary Equation:

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2'-8" x 1'-0" x 1'-0"	4'-0" x 1'-0" x 1'-0"
3'-0" x 1'-0" x 1'-0"	4'-4" x 1'-0" x 1'-0"

FOUNDATIONS (BREADTH)

COST IMPLICATIONS

- 286 Cubic Yards of Concrete in Addition
- Added approximately $84,000 more in Cost
- Added 1.9 Days to the Schedule at 150 CY per Day

Type	Takeoff Quantity	Cost per Unit	Total Cost
Original Strip Footing	314.26 CY	221.54 $/CY	$70,285.72
New Strip Footing	460.45 CY	221.54 $/CY	$102,009.45
Difference	143.20 CY	0 $/CY	$31,723.73
Type	**Takeoff Quantity**	**Cost per Unit**	**Total Cost**
Original Spread Footing	223.99 CY	363.40 $/CY	$81,397.50
New Spread Footing	366.78 CY	363.40 $/CY	$133,287.52
Difference	142.78 CY	0 $/CY	$51,890.02

Spread Footing Schedule

Mark	Original Size	Revised Size	Reinforcing (Same)
F4.0	4'-0" x 4'-0" x 1'-0"	5'-0" x 5'-0" x 1'-0"	4#5
F4.5	4'-6" x 4'-6" x 1'-0"	5'-6" x 5'-6" x 1'-2"	5#5
F5.0	5'-0" x 5'-0" x 1'-2"	6'-0" x 6'-0" x 1'-2"	5#5
F5.5	5'-6" x 5'-6" x 1'-4"	7'-0" x 7'-0" x 1'-6"	6#5
F6.0	6'-0" x 6'-0" x 1'-4"	7'-6" x 7'-6" x 1'-6"	8#5
F6.5	6'-6" x 6'-6" x 1'-6"	8'-0" x 8'-0" x 1'-8"	6#6
F7.0	7'-0" x 7'-0" x 1'-8"	8'-6" x 8'-6" x 1'-8"	7#6
F7.5	7'-6" x 7'-6" x 1'-8"	9'-0" x 9'-0" x 1'-10"	6#7
F8.0	8'-0" x 8'-0" x 1'-10"	9'-6" x 9'-6" x 2'-0"	9#6
F8.5	8'-6" x 8'-6" x 2'-0"	10'-6" x 10'-6" x 2'-2"	10#6
F9.0	9'-0" x 9'-0" x 2'-2"	11'-0" x 11'-0" x 2'-4"	11#6
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F10.0	10'-0 "x 10'-0" x 2'-4"	12'-0" x 12'-0" x 2'-6"	8#8
F8.0 x 6.0	8'-0 x 6'-0 x 1'-0	11'-0" x 6'-6" x 1'-8"	9#6 T&B

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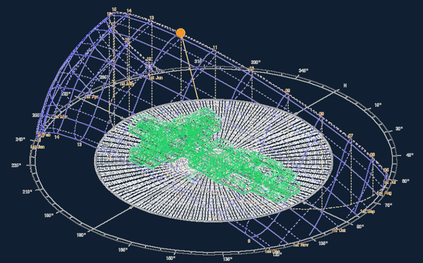
Outline

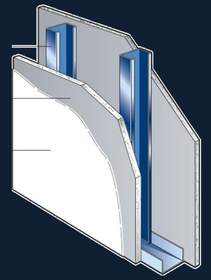
Reinstall[illegible]rmal

Adding Sustainability and VE

Daylighting Study



Alternative Partitions



PV C[illegible]n Roof

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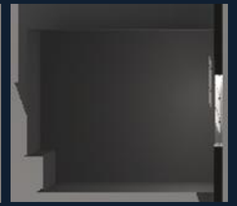
Outline

East Facing Classroom Plan

West Facing Classroom Plan



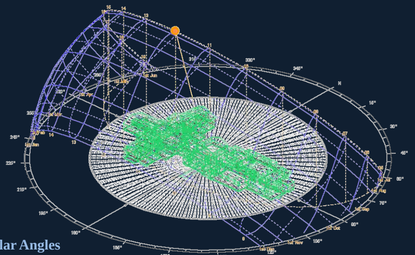
South Facing Classroom Plan

North Facing Classroom Plan

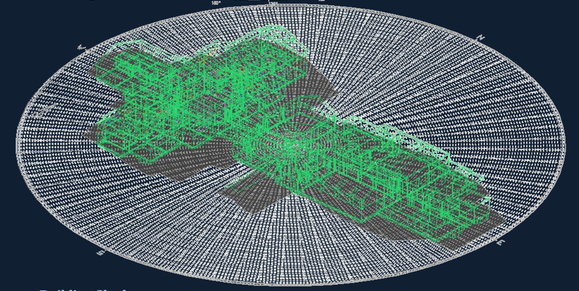
Adding Sustainability and VE

Daylighting (breadth)

- Not considered by architect
- AGI used to find out current daylighting
- Current classroom design does not offer much daylighting
- Ecotect was then used
- Exported directly from Revit
- Easily displays solar angles
- Building Shadows are all on the north



Solar Angles



Building Shadows

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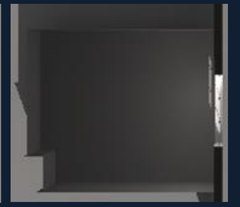
Outline

East Facing Classroom Plan

West Facing Classroom Plan



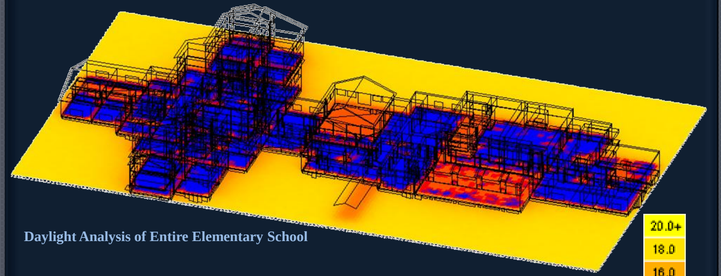
South Facing Classroom Plan

North Facing Classroom Plan

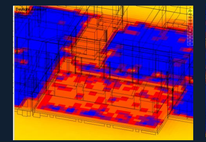
Adding Sustainability and VE

Daylighting (breadth)

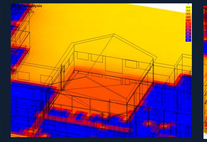
- Daylighting analysis of entire building was performed
- Little daylighting inside building
- Gymnasium has some daylighting
- Media Center has decent daylighting
- Classroom wing has very poor daylighting
- Overall Building not very well day lit
- Will need to redesigned to add better daylighting
  - Light shelves, windows, shape of building



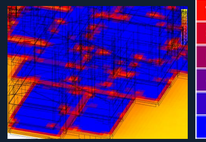
Daylight Analysis of Entire Elementary School



Gymnasium Analysis



Media Center Analysis



Classroom Wing Analysis

Kimberton Elementary School
East Pikeland Township, Chester County, PA

Ralph Kreider
Construction Option
Spring 2009 - Messner

Outline

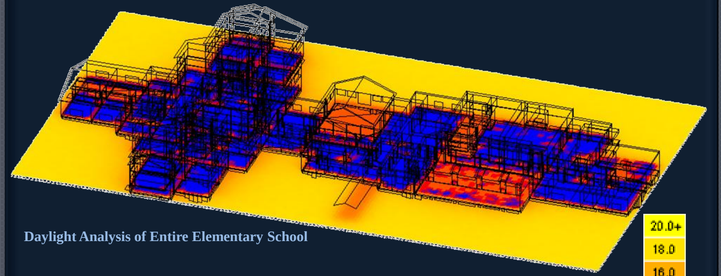
Example of Classroom Daylight (Ledalite)

Basic Sensor Layout)

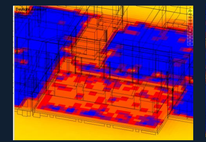
Adding Sustainability and VE

Daylighting (breadth)

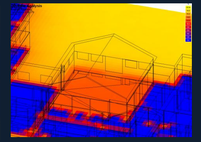
- Building must be changed for daylighting be viable
- Response Daylight by LedaLite may be possible if building is reconfigured
- Already installed in line of lighting fixtures
- Can be added to other lighting fixtures
- No commissioning required
- Better for construction



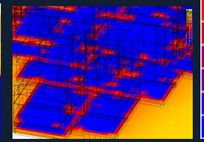
Daylight Analysis of Entire Elementary School



Gymnasium Analysis



Media Center Analysis

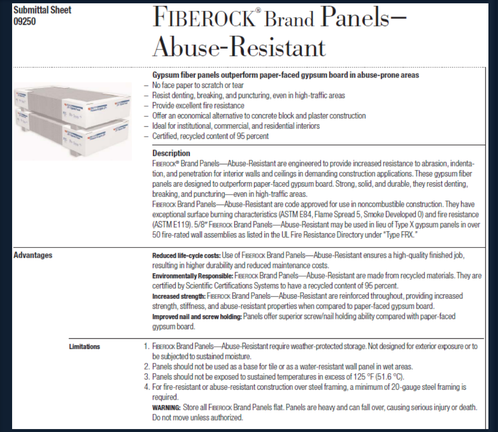


Classroom Wing Analysis

Kimberton Elementary School
East Pikeland Township, Chester County, PA

Ralph Kreider
Construction Option
Spring 2009 - Messner

Outline



Submittal Sheet
09250

FIBEROCK® Brand Panels—Abuse-Resistant

Gypsum fiber panels outperform paper-faced gypsum board in abuse-prone areas
- No face paper to scratch or tear
- Resist denting, breaking, and puncturing, even in high-traffic areas
- Provide excellent fire resistance
- Offer an economical alternative to concrete block and plaster construction
- Ideal for institutional, commercial, and residential interiors
- Certified, recycled content of 95 percent

Description

FIBEROCK® Brand Panels—Abuse-Resistant are engineered to provide increased resistance to abrasion, indentation, and penetration for interior walls and ceilings in demanding construction applications. These gypsum fiber panels are designed to outperform paper-faced gypsum board. Strong, solid, and durable, they resist denting, breaking, and puncturing—even in high-traffic areas.

FIBEROCK Brand Panels—Abuse-Resistant are code approved for use in noncombustible construction. They have exceptional surface burning characteristics (ASTM E84, Flame Spread 5, Smoke Developed 0) and fire resistance (ASTM E119, 5/8" FIBEROCK Brand Panels—Abuse-Resistant may be used in lieu of Type X gypsum panels in over 50 fire-rated wall assemblies as listed in the UL Fire Resistance Directory under "Type FRX."

Advantages

Reduced life-cycle costs: Use of FIBEROCK Brand Panels—Abuse-Resistant ensures a high-quality finished job, resulting in higher durability and reduced maintenance costs.

Environmentally Responsible: FIBEROCK Brand Panels—Abuse-Resistant are made from recycled materials. They are certified by Scientific Certifications Systems to have a recycled content of 95 percent.

Increased strength: FIBEROCK Brand Panels—Abuse-Resistant are reinforced throughout, providing increased strength, stiffness, and abuse-resistant properties when compared to paper-faced gypsum board.

Improved nail and screw holding: Panels offer superior screw/nail holding ability compared with paper-faced gypsum board.

Limitations

1. FIBEROCK Brand Panels—Abuse-Resistant require weather-protected storage. Not designed for exterior exposure or to be subjected to sustained moisture.
2. Panels should not be used as a base for tile or as a water-resistant wall panel in wet areas.
3. Panels should not be exposed to sustained temperatures in excess of 125 °F (51.6 °C).
4. For fire-resistant or abuse-resistant construction over steel framing, a minimum of 20-gauge steel framing is required.

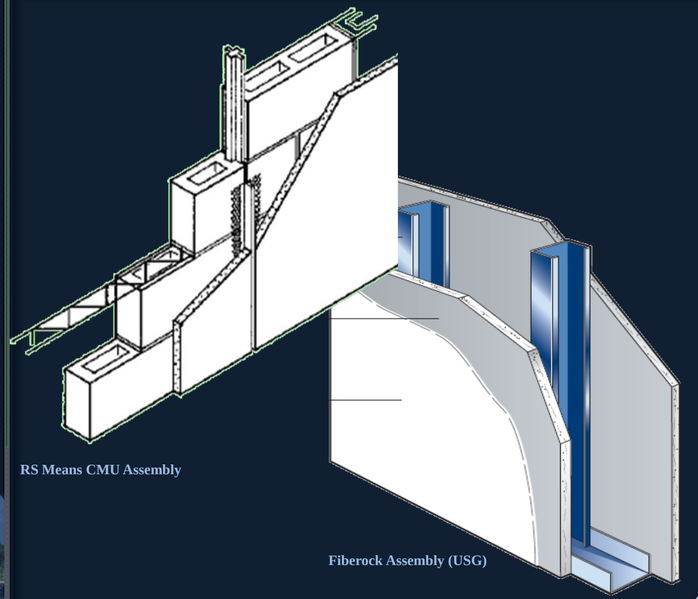
WARNING: Store all FIBEROCK Brand Panels flat. Panels are heavy and can fall over, causing serious injury or death. Do not move unless authorized.

Fiberock Brand Panels - Abuse-Resistant Submittal Sheet

ADDING SUSTAINABILITY AND VE

ALTERNATE PARTITION TYPE

- CMU is very costly and labor intensive
- CMU is more durable over time
- Drywall is less expensive and quicker to install
- Less durable over life cycle
- Use High-Abuse Fiberock Panel by USG
  - Reduced Life-Cycle Cost
  - 95% Recycled Material
  - Reinforced throughout entire panel
  - Improved constructability



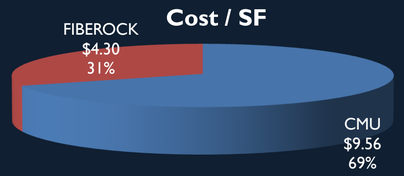
RS Means CMU Assembly

Fiberock Assembly (USG)

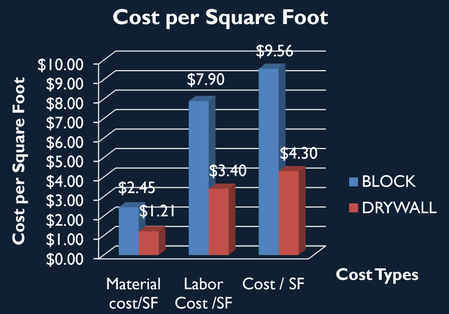
Kimberton Elementary School
East Pikeland Township, Chester County, PA

Ralph Kreider
Construction Option
Spring 2009 - Messner

Outline



Comparison of Per Square Foot Cost

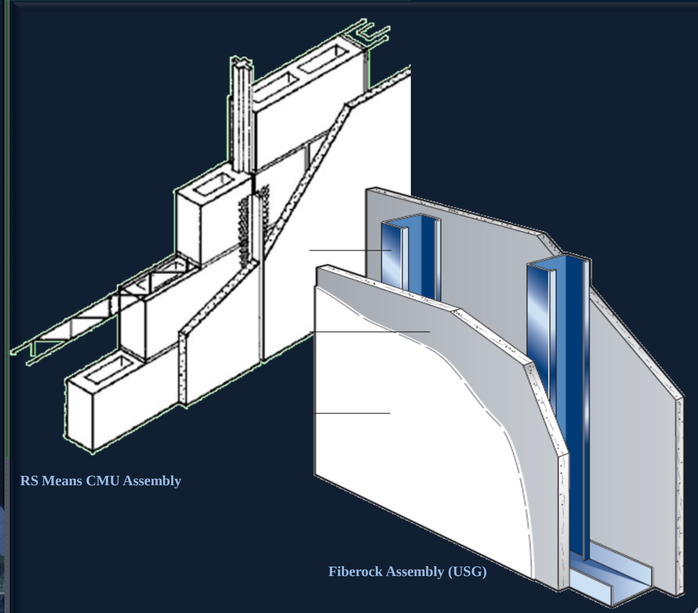


Per Sq Ft Cost Comparison of Alternate Partition Systems

Adding Sustainability and VE

Alternate Partition Type

- **$9.56 per square foot of CMU Block Wall**
  - **$2.45 per square foot for materials**
  - **$7.90 per square foot for labor**
- **$4.30 per square foot of Fiberock on metal stud wall**
  - **$1.21 per square foot for materials**
  - **$3.40 per square foot for labor**
  - **Fiberock cost varied between $.50 and $.87 per sq ft ($.80 used)**
- **Fiberock is $5.27 is less than CMU Block Wall**
- **Fiberock is 45% of the cost of CMU Block Wall**



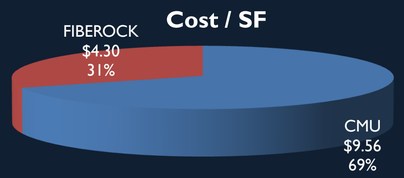
RS Means CMU Assembly

Fiberock Assembly (USG)

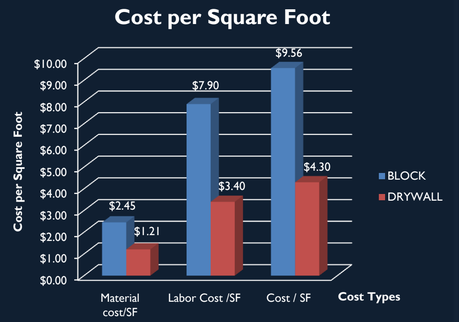
Kimberton Elementary School
East Pikeland Township, Chester County, PA

Ralph Kreider
Construction Option
Spring 2009 - Messner

Outline



Comparison of Per Square Foot Cost



Per Sq Ft Cost Comparison of Alternate Partition Systems

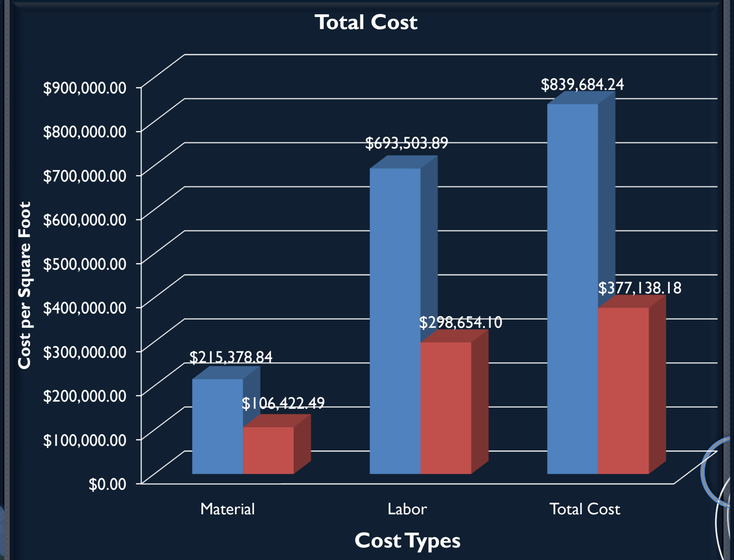
Adding Sustainability and VE

Alternate Partition Type

- **Total Cost for Block is $840,000**
- **Total Cost for Fiberock is $377,000**
- **$462,000 difference**

Difference	Area	Material cost/SF	Material	Labor Cost /SF	Labor	Cost / SF	Total Cost
BLOCK	87,798.64	$2.45	$215,378.84	$7.90	$693,503.89	$9.56	$839,684.24
FIBEROCK	87,798.64	$1.21	$106,422.49	$3.40	$298,654.10	$4.30	$377,138.18
Difference	0.00	$1.24	$108,956.36	$4.50	$394,849.80	$5.27	$462,546.06
Percentage		49.41%	49.41%	43.06%	43.06%	44.91%	44.91%

Differences in Price between Two Systems averaged with each Takeoff Method

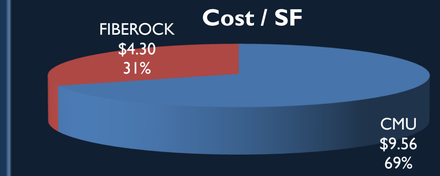


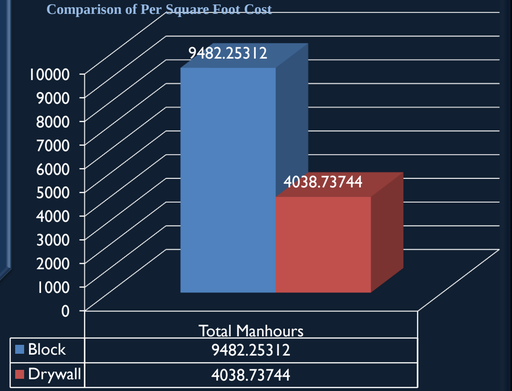
Cost Comparison of Drywall and Block Assemblies

Kimberton Elementary School
East Pikeland Township, Chester County, PA

Ralph Kreider
Construction Option
Spring 2009 - Messner

Outline





Total Man-hours Comparison

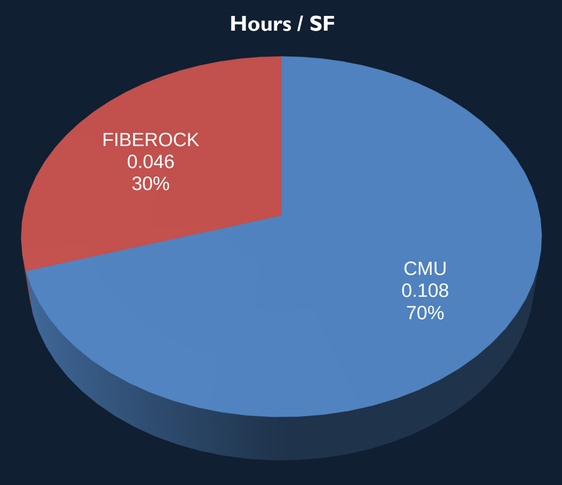
Adding Sustainability and VE

Alternate Partition Type

- **5,500 Man-hours less for Fiberock than CMU Block**
- **70 day less for a work crew of 10 people**
- **Difficult to know the true affect on schedule because project was not completed**

	Square Feet	Hours / SF	Total Man-hours	Days
CMU	87,798.64	0.046	4038.737	50.48422
Fiberock	87,798.64	0.108	9482.253	118.5282
Difference	0.00	0.06	5,443.52	68.04

Productivity Comparison of CMU and Drywall



Comparison of Hours per Square Foot of Partition

Kimberton Elementary School
East Pikeland Township, Chester County, PA

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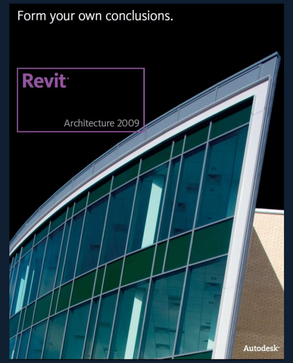
Outline

www.woolzee.com/

Estimating Using BIM



www.autodesk.com

www.innovaya.com

www.autodesk.com

Kimberton Elementary School
East Pikeland Township, Chester County, PA

Ralph Kreider
Construction Option
Spring 2009 - Messner

Outline

(www.havniearconstruction.com)

Estimating Using Bim

Traditional Estimating

- **Taken off with ruler and scale**
- **All walls were assumed to be 14 feet tall**
- **Prices From RS Means**
- **Area of 88,473.90 sq ft and 3.5 hours for takeoff**

Difference	Area	Material cost/SF	Material	Labor Cost /SF	Labor	Cost / SF	Total Cost
CMU	88,473.90	$2.45	$217,035.32	$7.90	$698,837.63	$9.56	$846,142.25
FIBEROCK	88,473.90	$1.21	$107,240.98	$3.40	$300,951.05	$4.30	$380,038.75
Difference	0	$1.24	$109,794.34	$4.50	$397,886.59	$5.27	$466,103.50
Percentage		49.41%	49.41%	43.06%	43.06%	44.91%	44.91%

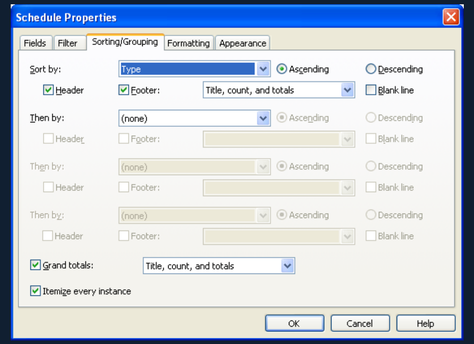
Cost Difference Summary between CMU Block and Drywall for Traditional Takeoff

(www.kempkeredu.com)

Kimberton Elementary School
East Pikeland Township, Chester County, PA

Ralph Kreider
Construction Option
Spring 2009 - Messner

Outline



Schedule properties from Revit

Estimating Using BIM

Revit Quantity Schedule

- Created a schedule in Revit
- Sorted by Wall type 3A – Interior CMU Wall
- Exported to excel
- 87,000 sq ft – 15 minutes to perform takeoff

Difference	Area	Material cost/SF	Material	Labor Cost /SF	Labor	Cost / SF	Total Cost
CMU	87,123.38	$2.45	$213,722.36	$7.90	$688,170.15	$9.56	$833,226.23
FIBEROCK	87,123.38	$1.21	$105,603.99	$3.40	$296,357.15	$4.30	$374,237.61
Difference	0	$1.24	$108,118.37	$4.50	$391,813.01	$5.27	$458,988.62
Percentage		49.41%	49.41%	43.06%	43.06%	44.91%	44.91%

Cost Difference Summary between CMU Block and Drywall for Revit Takeoff

Wall Schedule

Type	Assembly Co	Area	Length	Volume	Width	Assembly Descripti	Face Area
3A	C1010120	326.30	23.63	207.34	0.64	Partitions - CMU	652.60
3A	C1010120	75.40	5.70	47.91	0.64	Partitions - CMU	150.79
3A	C1010120	149.11	10.33	94.75	0.64	Partitions - CMU	298.23
3A	C1010120	353.50	25.25	224.62	0.64	Partitions - CMU	707.00
3A	C1010120	130.45	9.00	82.89	0.64	Partitions - CMU	260.90
3A	C1010120	37.55	2.68	23.86	0.64	Partitions - CMU	75.10
3A	C1010120	74.92	5.99	47.61	0.64	Partitions - CMU	149.84
3A	C1010120	37.11	2.65	23.58	0.64	Partitions - CMU	74.23
3A	C1010120	75.10	6.00	47.72	0.64	Partitions - CMU	150.21
3A	C1010120	83.78	5.83	53.24	0.64	Partitions - CMU	167.56
3A	C1010120	37.55	2.68	23.86	0.64	Partitions - CMU	75.10
3A	C1010120	140.22	10.33	89.10	0.64	Partitions - CMU	280.44
3A	C1010120	354.67	26.33	225.36	0.64	Partitions - CMU	709.33
3A	C1010120	41.30	3.67	26.24	0.64	Partitions - CMU	82.59
3A	C1010120	33.46	3.67	21.26	0.64	Partitions - CMU	66.92
3A	C1010120	41.30	3.67	26.24	0.64	Partitions - CMU	82.59
3A	C1010120	33.53	3.67	21.31	0.64	Partitions - CMU	67.06
3A	C1010120	28.78	2.50	18.29	0.64	Partitions - CMU	57.56
3A	C1010120	90.64	7.67	57.59	0.64	Partitions - CMU	181.27
3A	C1010120	28.78	2.50	18.29	0.64	Partitions - CMU	57.56
3A	C1010120	91.09	8.33	57.88	0.64	Partitions - CMU	182.17
3A	C1010120	232.33	27.33	147.63	0.64	Partitions - CMU	464.67
3A	C1010120	138.83	16.33	88.22	0.64	Partitions - CMU	277.67
3A	C1010120	133.43	16.33	84.79	0.64	Partitions - CMU	266.87
3A	C1010120	70.83	8.33	45.01	0.64	Partitions - CMU	141.67
3A	C1010120	79.47	9.67	50.49	0.64	Partitions - CMU	158.93
3A	C1010120	153.17	18.02	97.32	0.64	Partitions - CMU	306.33
3A	C1010120	76.23	8.33	48.44	0.64	Partitions - CMU	152.47
3A	C1010120	76.77	9.35	48.78	0.64	Partitions - CMU	153.53
3A	C1010120	325.97	38.35	207.12	0.64	Partitions - CMU	651.93
3A	C1010120	136.00	16.32	86.42	0.64	Partitions - CMU	272.00
3A	C1010120	62.20	7.00	39.52	0.64	Partitions - CMU	124.40
3A	C1010120	51.00	6.00	32.41	0.64	Partitions - CMU	102.00
3A	C1010120	170.27	20.83	108.19	0.64	Partitions - CMU	340.53
3A	C1010120	88.10	11.00	55.98	0.64	Partitions - CMU	176.20
3A	C1010120	195.50	23.17	124.22	0.64	Partitions - CMU	391.00
3A	C1010120	85.27	11.18	54.18	0.64	Partitions - CMU	170.53
3A	C1010120	85.13	10.33	54.09	0.64	Partitions - CMU	170.27
3A	C1010120	45.47	5.67	28.89	0.64	Partitions - CMU	90.93
3A	C1010120	62.33	7.33	39.61	0.64	Partitions - CMU	124.67
3A	C1010120	133.30	16.52	84.70	0.64	Partitions - CMU	266.60
3A	C1010120	106.81	38.33	67.87	0.64	Partitions - CMU	213.62
3A	C1010120	56.95	5.67	36.19	0.64	Partitions - CMU	113.90
3A: 608 3A Base		8713S.14	6627.97	55266.27	386.33		173952.86

Example of Revit Schedule

Kimberton Elementary School
East Pikeland Township, Chester County, PA

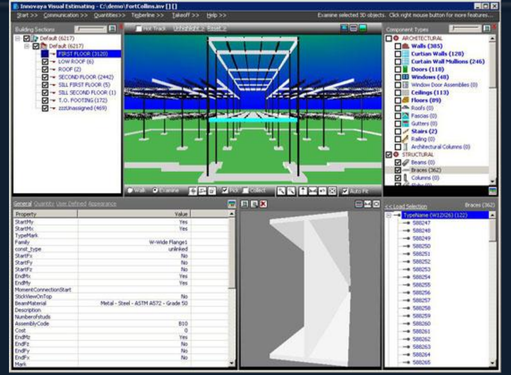
Ralph Kreider
Construction Option
Spring 2009 - Messner

Outline

(www.aecbytes.com)

Estimating Using BIM

Innovaya



(www.aecbytes.com)

innovaya

(www.innovaya.com)

Kimberton Elementary School
East Pikeland Township, Chester County, PA

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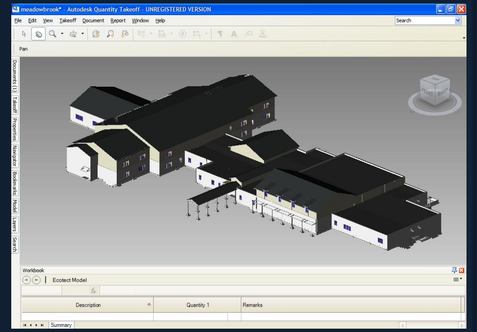
Outline



Elementary School model in Autodesk QTO

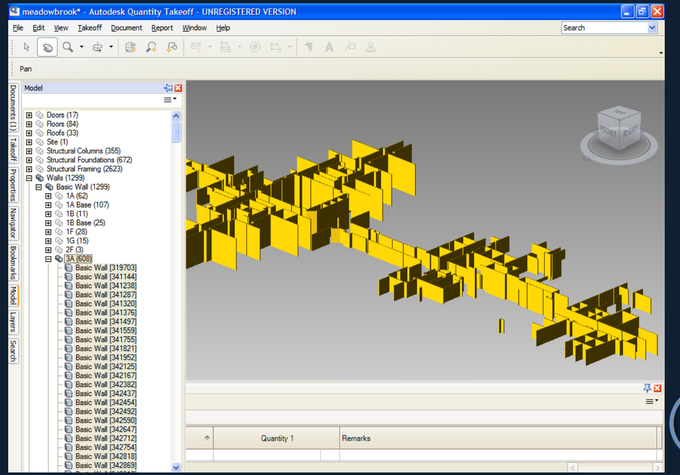
Estimating Using BIM

Autodesk Quantity Takeoff

- Publish Revit to 2D and 3D dwf
- Broken up by object types. i.e. walls, structural, floors, etc
- Open in Autodesk QTO take of wall type 3A
- Easily see what is being takeoff
- 87,000 sq ft, 10+ hours learning, .5 hours on takeoff

Difference	Area	Material cost/SF	Material	Labor Cost /SF	Labor	Cost / SF	Total Cost
BLOCK	87,123.38	$2.45	$213,722.36	$7.90	$688,170.15	$9.56	$833,226.23
DRYWALL	87,123.38	$1.21	$105,603.99	$3.40	$296,357.15	$4.30	$374,237.61
Difference	0	$1.24	$108,118.37	$4.50	$391,813.01	$5.27	$458,988.62
Percentage		49.41%	49.41%	43.06%	43.06%	44.91%	44.91%

Cost Difference Summary between CMU Block and Drywall for Autodesk QTO



Example of Autodesk QTO takeoff with only wall 3A shown

Kimberton Elementary School
East Pikeland Township, Chester County, PA

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Construction Option
Spring 2009 - Messner

Outline

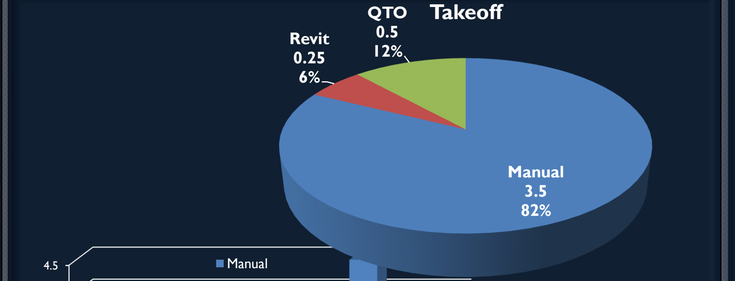
	Takeoff Time	Estimating Time	Quantity	Cost Block	Cost Drywall
Manual takeoff	3.5	1	88,474	$846,142	$380,039
Revit Schedule	0.25	0.5	87,123	$833,226	$374,238
Difference from Traditional	3.25	0.5	1,351	$12,916	$5,801
Average				$839,684	$377,138
Percentage of Manual Takeoff	7.14%	50.00%	98.47%	98.47%	98.47%
Manual takeoff	3.5	1	88,4731	$846,142	$380,039
Autodesk QTO	0.5	0.5	87,123	$833,226	$374,238
Difference from Traditional	3	0.5	1351	$12,916	$5,801
Average				$839,684	$377,138
Percentage of Manual	14.3%	50.00%	98.47%	98.47%	98.47%

Comparison of Takeoff Methods

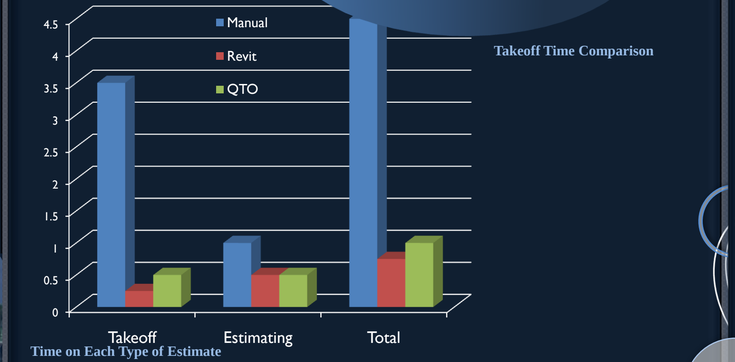
Estimating Using BIM

Comparing Different Methods

- Manual Takeoff took the longest time at 3.5 hours
- 15 minutes for Revit Quantity Schedules
- Half-hour for Autodesk QTO takeoff
- Manual takeoff takes 14 times as long as Revit Schedules
- Manual takeoff takes 7 times as long as Autodesk QTO
- Use Revit Schedules for quick takeoffs (1 step process)
- Use Autodesk QTO for entire building (2 step process)



Takeoff Time Comparison



Time on Each Type of Estimate

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East Pikeland Township, Chester County, PA

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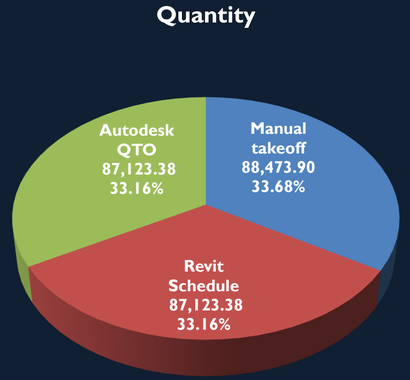
Outline

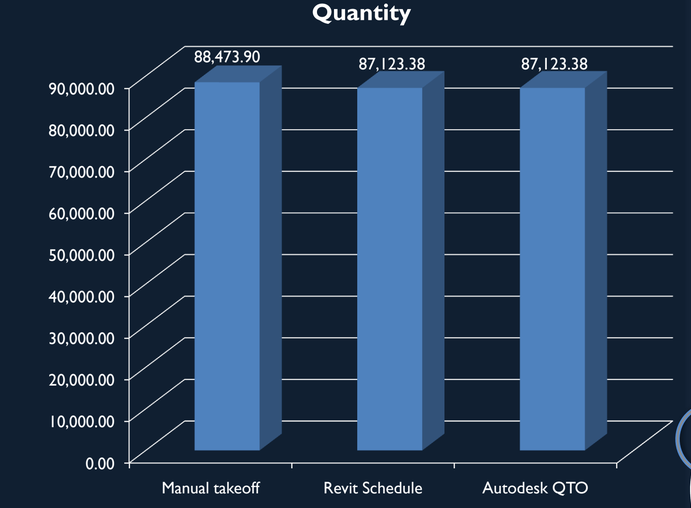


Comparison of Quantities Produced by Different Methods

Estimating Using BIM

Comparing Different Methods

- Only useful if accurate takeoff and comparable to actual
- Difference of 1,350 sq ft between methods
- Difference $13,500 for Block and $6,000 for Fiberock
- Automated takeoff 98.5% of manual takeoff
- 1.5% difference between the methods
- Would be good to use as verification on current estimating
- Soon will be trusted as alternative to manual takeoff



Comparison of Quantities Produced Through Different Methods

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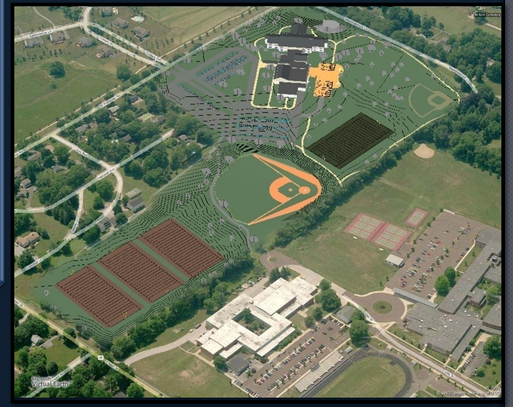
Relocating Site

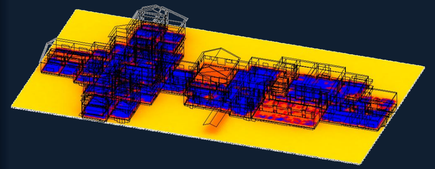
- New site is a viable alternative
- Structural changes insignificant
- Biggest cost is purchase of site



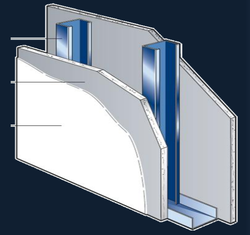
Conclusions

Sustainability And Value Engineering

- Currently very little daylighting
- Building will need reconfigured for daylighting to be feasible



- Recommend Fiberock Abuse-Resistant Panels over CMU block wall for cost and time saving



Estimating Using BIM

- Automated takeoff saves time
- Accurate results
- Quicker estimate turn around
- Use Revit of single assembly
- Use QTO for entire build takeoff

Revit Architecture 2009

Autodesk Quantity Takeoff 2010

innovaya

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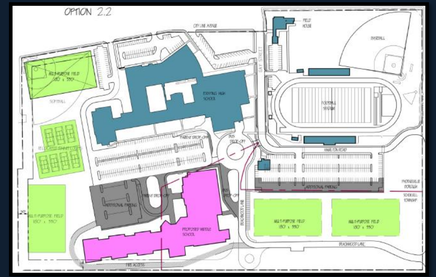
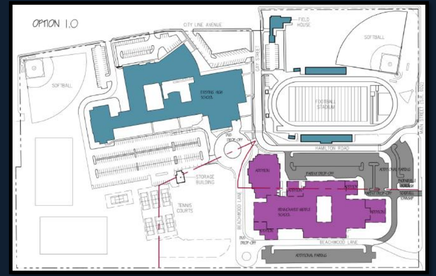
Outline





Possible Site Layouts for Middle School Locations

Final Thoughts

Project Update

- Superintendent has since Retired
- Business Manager has been Fired
- New Superintendent Resigned
- The School Board is Currently investing purchase of Site
- The District has filed claims against Superintendent
- Considering Claims Against Business Manager, Property Owner, and People responsible for the contaminants

- Not going to build the Elementary School
- Going Forward with Middle School Project
- Fired Foreman Construction and Program Managers
- Foreman is filing claim for lost profits for middle and elementary school

WHAT WE HAVE DONE AND WILL DO

Thank you for your patience. I'd like to move on now to what the Board is presently doing as an attempt to recover lost taxpayer money, to hold accountable those responsible, and to avoid future mistakes.

As for Dr. Noyes, the District has filed a claim against him in arbitration for the errors and omissions he committed in connection with the purchase of the property. The arbitration has recently been filed, and we will keep you updated as to its progress.

As for Ms. Diekow, she has been dismissed from her employment with the District as a result of her acts in connection with the purchase of the property and other acts. The Board is continuing to evaluate whether any additional action will be taken against Ms. Diekow.

As for C. Raymond Davis, Ciba, and Synergy, the District is attempting to reach an amicable resolution with each. If these efforts prove unsuccessful, the Board will likely authorize counsel to proceed with claims against them.

Although the investigatory phase is complete, the Board continues to evaluate all of the information discovered and, if the evidence warrants it, may assert claims against additional parties.

Portion of PASD School Board East Pikeland Statement

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Outline

Philadelphia Daily News - June 19th, 2008

Final Thoughts

Lessons Learned

- **There No Such Thing as a Sure Thing!**
- **Public Opinion Matters when Dealing with School Districts (Public Tax Money) and Children**
- **Take Small Bites - Don't Try to Eat the Whole Thing at Once**
- **The Construction Business is More About Dealing with Different Personalities than Knowing the Technical Details**
- **Don't Take Yourself Too Seriously**

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East Pikeland Township, Chester County, PA

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Outline

- **Penn State University Architectural Engineering Department**
  - **Dr. John Messner**
  - **Dr. David Riley**
  - **Dr. Michael Horman**
  - **Dr. Chimay Anumba**
  - **Mr. Robert Holland**
  - **Mr. Walter Schneider**
- **Penn State University Architecture and Landscape Architecture**
  - **Mr. Madis Pihlak**
  - **Ms. Ute Poerschke**
- **Everyone Else that Helped Along the Way**
- **Foreman Program and Construction Manager**
  - **Mr. Jeff Angstadt, Mr. Mike Arnold, Mr. Keith Smith, Mr. Algie LaBrasca**
- **Phoenixville Area School District**
  - **Mr. Ronald Miller**
- **Gilbert Architects**
  - **Mr. Brian Good**
- **CMX Engineering**
  - **Mr. Glenn Harris, Ms. Monica Sweeny, Ms. Ann Logue**
- **Baker, Ingram, & Associates**
  - **Mr. David Rosso**
- **Snyder Hoffman Associates**
  - **Mr. Robert Malehorn, Mr. Jeff Manhick**

Acknowledgements

Phoenixville Area School District

FOREMAN PROGRAM AND CONSTRUCTION MANAGERS

gilbert

CMX

Snyder Hoffman Associates

Baker, Ingram & Associates
Structural Engineers

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Outline

Questions

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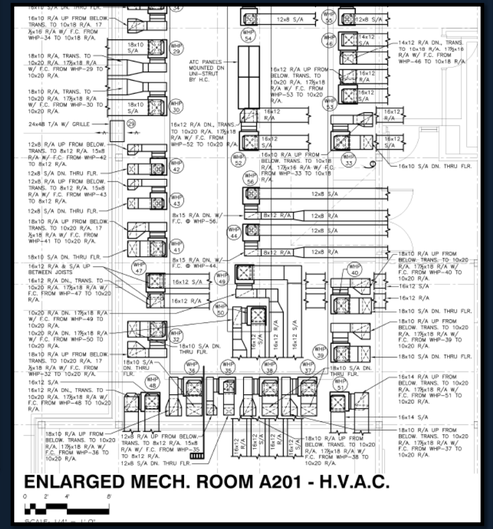
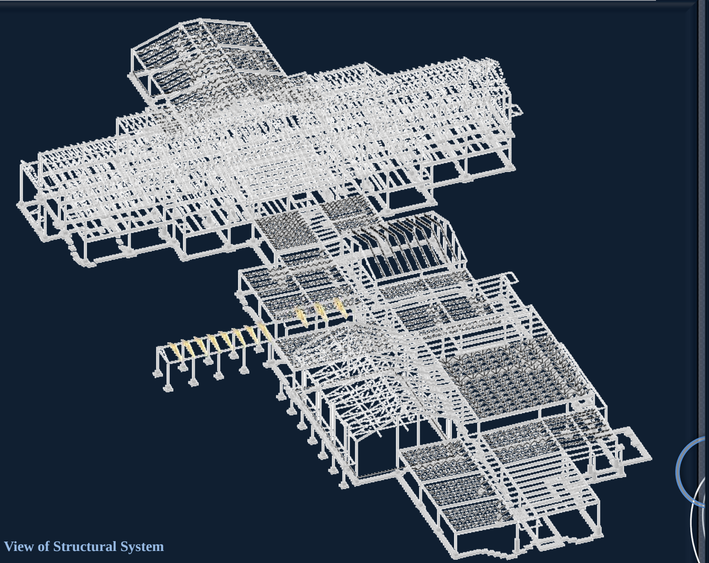


Example of complex mechanical room

Project Background

Building Systems

- **Structural System:**
  - Structural Steel Building with Masonry Sheer Walls
  - Spread Footing Foundation System
- **Mechanical System:**
  - Water Source Heat Pump using Cooling Tower and Boiler
  - Individual Heat Pump for each Room
  - Heat recovery Units on Roof
  - Originally Designed as a Geothermal Heat Pump



View of Structural System

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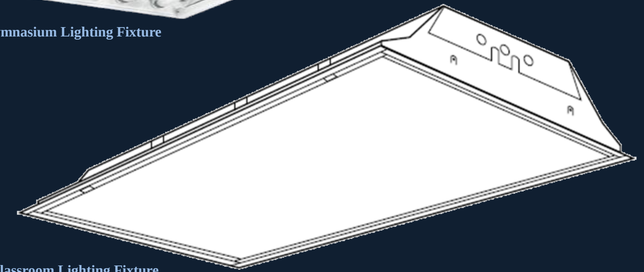
Outline

Project Background

Building Systems

- **Electrical System:**
  - 33KV to 480/277V – PECO Transformer
  - 40 Panel Boards on 5 Local Transformers
  - 125 KW Backup Generator
- **Lighting System:**
  - 59 Different Types of Light Fixtures
  - Classrooms Use 32W T8 - Tandem Wired for 3 Light Levels

Gymnasium Lighting Fixture



Classroom Lighting Fixture

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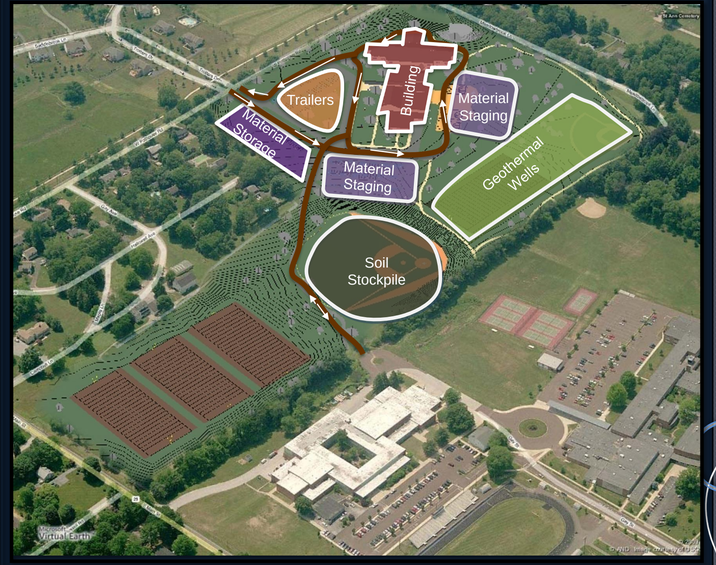
Outline

Perspective of Proposed Site Layout

Relocating of Building

Site Logistics

- **Temporary Drive Around Entire Building**
- **Trailers Right in Front of Building Yet Can Control Site Access**
- **Geothermal Wells Under Athletic Fields**
- **Site Fence Around Entire Site**



Site Plan of Proposed Site Layout

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Outline

Relocation of Building

- **Site Selection**
- **Transitioning to New Site Considerations**
- **Obtain Site Conditions**
- **Final Location of Building**
- **Site Layout**
- **Site Logistics**
- **Foundation Modifications**

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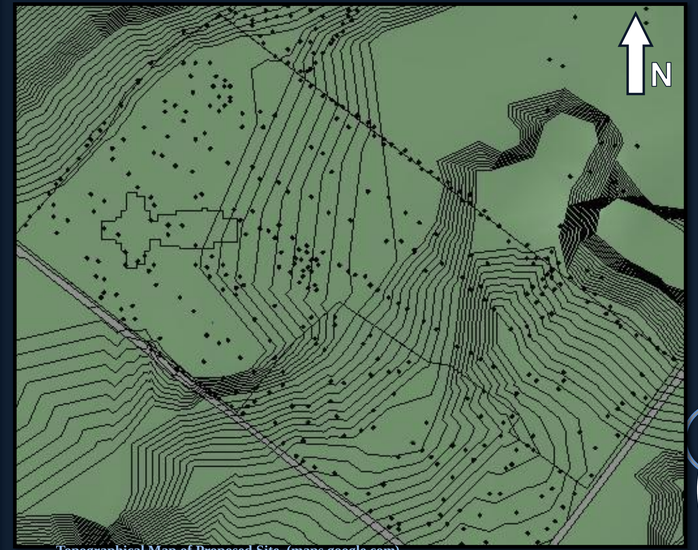
Outline

USGS Topographical Map of Meadowbrook

Relocating of Building

Obtaining Site Conditions

- Need Current boundaries, topography, vegetation, roads, building, non-pervious surfaces, utilities, hazards, etc.
- Actual Project Would have Site Survey
- No Site Soil Survey
- USDA Web Soil Survey Replaced Site Survey
- Attempt to import 1ft contours from GIS failed
- US Geological Survey Map gave 5ft contours
- Google and Live Maps filled in remaining conditions



Topographical Map of Proposed Site (maps.google.com)
Revit Model of Existing Site

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