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3 Executive Summary

This final report consists of five parts overall – two depth analyses and two breadth analyses, and the appendices. Two depth analyses are thorough analyses of lighting systems and electrical systems of Brecht Elementary School. Lighting depth work is redesigning of 5 spaces selected, which are 1) Gym 2) Cafeteria 3) Façade 4) Media Center / Library 5) Corridors. Lighting fixtures are selected to meet the design goals, design criteria and power density requirements for each specific space. All the lighting systems in this lighting depth work were analyzed by either Lightscape or AGI32. Lightscape was mainly used to generate photorealistic images while AGI32 was used purely for lighting calculation for values only.

The electrical depth work is to redesign the electrical system of the Brecht Elementary School to become an evacuation space under emergency cases such as natural disasters. It includes sizing the protecting devices, panelboards.

Two breadth work are daylighting and mechanical analyses. Daylighting was done for the gym space for an entire year to analyze the special daylighting system called “Honey Comb System”. The outcome from that was used for mechanical breadth analysis to calculate appropriate heat gain and load calculation.

4 Building Overview

i) General Building Information

- (a) **Building Name:** Brecht Elementary School
- (b) **Location and Site:** Manheim Township School District, School Road, Lancaster, PA 17606-5134
P.D.E. I.O. # 2499
- (c) **Building Occupant Name:** School District of Manheim Township
- (d) **Occupancy or Function Types:** School
- (e) **Size:** 56,715 Sq. Ft.
- (f) **Number of Stories:** 2 Stories + Basement, Total 3 Floors
- (g) **Primary Project Team:**
 - **Owner:** School District of Manheim Township
Website: <http://www.mtwp.net/>
 - **Architect:** Reese Lower Patrick & Scott Architects, Ltd.
Website: <http://www.rlps.com>
 - **Civil Engineer:** Rettew Associates, Inc.
Website: <http://www.rettew.com/>
 - **Structural Engineer:** Zug & Associates, Ltd.
302 South Broad Street Apartment 2
Lititz, PA 17543-2319
Phone: (717) 627-6873
 - **MEP Engineers:** Moore Engineering Co.
Website: <http://www.moore-engineers.com/>

Due Date: Monday, April 3, 2006

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- **General Contractor:** Eichelberger Construction, Inc.
1313 Monroe Street
Harrisburg, PA 17103
Phone: (717) 234-4718
 - **Electrical Engineer:** Reese Engineering, Inc.
Website: <http://www.reeseinc.com/>
- (h) **Dates of Construction:**
- **Planned: Completed by 2 June, 2000**
 - **Entire Project Completed by 31 July, 2000**
 - **Date of Bid Opening: October 20, 1999**
- (i) **Cost: \$ 6,530,527**
- (j) **Project Delivery Method: Design-Bid-Build**
- (k) **Use Group:**
- **Labor & Industry: B – Educational**
 - **BOCA: E – Educational**
- (l) **Construction Classification:**
- **Labor & Industry: Ordinary**
 - **BOCA: E – Type 3B – Unprotected**
- (m) **Jurisdiction:**
- **Manheim Township, PA**
- (n) **Architecture**
- Brecht Elementary School is a school building located in Lancaster, Pennsylvania. To strive to be pride of “the tradition of building solid educational foundations generation after generation” in Manheim township, Brecht Elementary School was built. The mission of Brecht Elementary school was to be a “diverse and dynamic learning community to build a solid academic foundation for every child by providing a challenging, nurturing, arts-integrated academic environment which fosters creativity and self-awareness” from children’s early stages.
- On its first floor, Brecht Elementary School holds five classrooms while Gymnasium is located on north east end of the building, which is combined with the Stage Area for their musical/theatrical activities. In order to offer the students health awareness, they offer meals at the Cafeteria with a kitchen, which has convenient access to Faculty Dining room where faculties can always keep close care with the children. For another prominent place for health care, Nursing Room is also located near the center of the building. To be another important source of knowledge, books-filled Media Center is located in the center of the first floor for easy access to all the classrooms.

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On the second floor, Art Classroom is placed in the center of the first floor to nurture children's creativity and comprehension to art. Also nine classrooms are located on the second floor to provide sufficient spaces for growing population of children in Lancaster, while these spaces can be modified into other types of rooms when vacant. To maintain computer aided education from the early ages, they also offer a Media Center in south east end of this floor.

In the basement, they offer most office spaces for faculties while they provide necessary mechanical equipments.

(o) Building Codes:

- **Pennsylvania Code, Title 34, PA. Department of Labor & Industry**
- **BOCA, 1996, Administered by Manheim Township, PA**
- **Zoning:**

Zoning Data	Required
Existing Zoning District	Residential District R-3 (Elementary Schools by Special Exception)
Minimum Lot Area	10 acres
Minimum Lot Width	At Street Line = 100' / at Front Yard Setback Line = 150'
Minimum Lot Depth	200'
Minimum Front Yard Setback	50' from the right-of-way
Minimum Side Yard Setback	50' per side
Minimum Rear Yard Setback	50'
Minimum Open Area	65%

(p) Historical Requirements of Building or Zone Where Built

- **Restrictions:**
 - ✓ Deed Book D. Volume 29. Page 582 – No building of any character shall ever be erected on the front of the hereby conveyed premises nearer to the west side of the Lancaster and Lititz turnpike road than --- feet.
 - ✓ Deed Book D. Volume 29. Page 582 – That the premises herein conveyed shall not be used for any other than school purposes or for such other purposes for which school property may be used under authority of the laws of the commonwealth.

ii) Primary Engineering Systems

(a) Construction:

Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project. Total project cost

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comes to \$ 6,530,527.

(b) **Electrical:**

Brecht Elementary School's power distribution is both standard 480/277V and 208/120V. Predominantly 480V distribution is provided for heat pumps, heat recovery units, duct heater, unit heater, and one circulation pump in HVAC system. For lighting fixtures, the power supply is either 277V system or 120V system. Exhaust fans have 115V sometimes.

(c) **Lighting:**

Mostly lighting at 277V, a few applications with 120V
Mostly fluorescent troffers (1'x4', 2'x4', 2'x2')
Metal Halide for exterior and a few spaces with special tasks
Glazing on windows allows for daylighting integration

(d) **Mechanical:**

HVAC system is a geothermal heat pump system with a wellfield. Air compressor has 1/2 HP 1176VA, 120V

(e) **Structural:**

- 4" Concrete slab on grade foundation for the entire building
- Masonry/Steel columns for wall reinforcement
- Composite deck
- Timber roof truss system for Cafeteria, Gymnasium, and Media Center / Library
- First floor: 4" concrete slab on 1-1/2" x 22G. Composite Deck with 6x6 – WI.4xWI.4 WWF

(f) **Building Envelope:**

- Foundation of Brecht Elementary School consists of primary 4" concrete slab on grade with fibrous reinforcing.
 - ✓ First floor: 4" concrete slab on 1-1/2" x 22G. Composite Deck with 6x6 – WI.4xWI.4 WWF → To be described with More Information
 - ✓ Roofing:
 - ◇ Above the Media Center, Wooden Truss "3" below was used
 - ◇ W12 x 26
 - ◇ 7' x 14" Parallam® Beams
 - ◇ 2-1/4" x 6" T & G Roof Deck
 - ◇ Wooden Truss System
 - ✓ Attic:
 - ◇ 3/4" Sturd-1-Floor Plywood
 - ◇ Shingled Roof