Nolan Amos
Mechanical Option
Dr. William Bahnfleth
Phoenixville Early Learning Center
Phoenixville, PA
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Thesis Presentation Outline

1. Overview (~1 Slide)
2. Existing Conditions (~3 Slides)
    a. Site
        i. Utilities
    b. Architectural Features
3. Mechanical System Overview (~8 Slides)
    a. Water-Source Heat Pumps
    b. Boiler and Cooling Tower
    c. Energy usage
        i. Cooling and Heating Loads
    d. Life Cycle Cost Analysis
    e. Space Utilization
    f. Maintenance
4. Mechanical Depth (~14 slides)
    a. Objectives
        i. Alternatives Considered
    b. Ground-Coupled Heat Pump
        i. Heating and Cooling Loads
        ii. Cost
        iii. Space Constraints
        iv. Maintenance
        v. Well Layout
            1. Orientation
                a. Placement
            2. Piping Design
            3. Length
    c. VRF
        i. Loads
        ii. Cost
        iii. Space
        iv. Maintenance
    d. Centralized AHU
        i. Loads
        ii. Cost Space
        iii. Maintenance
        iv. Structural

5. Energy and Emissions (~ 2 Slides)
    a. Graphs comparing energy output and emissions of all four systems
6. Life Cycle Cost Analysis (~4 Slides)
    a. Graphs of payback of all four systems in comparison
    b. Feasibility of systems
7. Breadth (~3 Slides)
    a. Mention Electrical Breadth
    b. Construction Breadth
        i. Schedule impacts of Ground-Coupled system
        ii. Life Cycle Cost Impacts
8. Conclusions (~8 Slides)
    a. Acknowledgements
    b. Appendices

Presentation will be approximately 45 slides.

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Mechanical Objectives

- ❑ Increase Energy Efficiency
- ❑ Lower Costs
  - Maintenance
  - Upfront
  - Lifecycle
- ❑ Space Utilization
- ❑ Ease of Maintenance

Alternatives Considered

Ground-Coupled Heat Pump

Variable Refrigerant Flow System

Centralized Air Handling Unit

Water-Source Heat Pump - Current System

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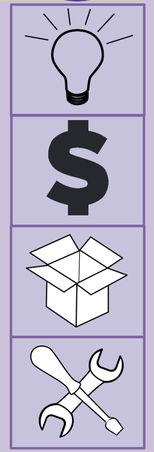

Ground-Coupled Heat Pump

Peak Cooling Load is 273.4 Tons
Energy/ Emissions

Cost

In building space remains constant.

Maintenance

Picture of Well Detail

Layout of Vertical Boreholes

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Scheduling and Cost Impacts

A Comparison of Water Source Heat Pumps and Ground Source Heat Pumps

Scheduling Text

Scheduling Graph

Equipment for Drilling

Table Presenting Cost of extra equipment

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