Executive Summary

Analysis of Ground Source Heat Pumps and Chilled Beams

APPELL LIFE SCIENCES

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Mechanical Option

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Executive Summary

The life sciences building is a classroom and lab building for the York College of Pennsylvania. It also has several administrative and teacher offices. Along with the life sciences building there is a greenhouse building that also has laboratories. Because there are so many labs and computer labs in this building there electrical load is most likely higher than some regular school buildings, making the cooling load higher.

A VAV system is used to condition the office spaces. Fan coil units are used to condition the lab and classroom spaces. The fan coil units were selected for the labs and classrooms because they are better at ventilation than VAV systems. These systems are supplied with chilled water from a centrifugal chiller and supplied with hot water from three gas-fired boilers. Of great importance to the client are low operation costs, long equipment life, low maintenance, and ability for systems to be modified.

To help optimize the systems a ground source heat pump system will be analyzed to replace just the chillers and just the boilers. This study is being done to see which system, cooling or heating, would be more feasible to replace with ground source heat pumps. Along with this chilled beams will be employed to replace the fan coil units that condition the labs and classrooms. The AHUs for the fan coil units utilize a heat wheel to recover energy from the exhaust air. A run-around coil system will be analyzed to replace this to compare the energy savings of each.

Along with these studies a construction management breadth will be done to optimize the number of boreholes and their depth for each of the GSHP systems. Also included in this will be a life cycle cost analysis of the heat pumps and construction schedule changes. Another study being done will be an electrical breadth. This will be done because there is new equipment being added to the mechanical systems. New panelboards, feeders, feeder sizes, and switchboard sizes will need to be analyzed for the GSHP systems.

With the following analyses being done the best option for the life sciences building is to replace the chiller system with ground source heat pumps. Along with this chilled

beams can be used to replace fan coil units because they reduce the supply air. However, the run-around coil system was found to use more energy than the already existing heat wheels.