

Executive Summary

This report contains multiple analysis of Central High School that includes a GCHP depth analysis, acoustical breadth analysis and construction breadth analysis.

The first section was the sizing and layout of the GCHP system located at the soccer field next to the school. A total of 500 wells each at 400 feet deep would be used to satisfy peak cooling and heating loads. In case of breaks there are thirty eight rows of thirteen wells that can be individually shut off in the mechanical room.

To circulate the water throughout the system three Bell & Gossett variable speed, centrifugal pumps were selected. One of the pumps would be used for redundancy purposes while the other two would run to meet the pumping demand.

Vertical water source heat pumps from Carrier were selected with a typical range of one to three ton units. These would be placed in heat pump closets, which the feasibility of them was then further explored in another analysis.

Energy recovery units were the primary air movers in the building but the original design had a boiler and chillers supplying hot and chilled water. Therefore new packaged energy recovery units from Semco were selected that would utilize water-to-water source heat pumps.

It was found that by implementing a GCHP system the school would decrease their energy usage by 35% saving them \$19074 annually. Also because of the energy reduction in the use of natural gas by not having a boiler emissions from the site decreased. However electrical usage increased by 45% which caused source emissions to rise.

The second section analyzed how a heat pump would affect the acoustics of a typical classroom. Going along the lines of ANSI S12.60 a wall of STC 60 would be implemented to negate immediate room noise from the heat pump. An additional analysis was done to see if noise would exceed an NC 30 value which it did not.

The third section analyzed the feasibility of installing a heat pump closet in comparison to installing it in the ceiling space. It was found that it was not feasible to install a heat pump closet based on cost, schedule and coordination issues.

The final recommendation of this report is to implement the GCHP system but to not build heat pump closets and install the heat pumps in the ceiling.