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Final Report Executive Summary

The primary purpose of the following report is to examine the potential for a proposed HVAC system redesign to reduce energy costs and consumption at the Altoona Area Junior High School. The scope has been reduced to include an examination of seven direct-expansion/gas air handling units that serve the school's athletic facility. Based off of an anticipated high level of efficiency offered by ground source heat pump systems, this option was critically analyzed and selected to serve as the redesign featured in this study.

It has been found that the use of a GSHP system has the potential to reduce annual maintenance and operating costs by as much as 57% in this instance. It was also determined that while a GSHP system figured to increase annual electricity consumption by an estimated 33%, it totally eliminated the need for natural gas. The main drawback for the proposed GSHP system is its high initial cost, costing an estimated \$95,000 more than the traditional existing design.

Furthermore, a proposed gymnasium daylighting system utilizing skylights has been found to increase the thermal loads for the system redesign, as expected, but has demonstrated a potential in decreasing electric lighting costs by as much as 67%.

The conclusions made by this report indicate that a GSHP system with integrated daylighting has the potential to significantly reduce energy costs and consumption and should therefore be considered as a feasible and adequate alternative to the original design.

Additionally, this report has verified the feasibility of diverting outdoor air from an air handling unit serving the school's band room to the school's auditorium, where deficiencies have been noted through previous analysis. This report has also concluded that the use of additional air diffusers to accommodate this diverted outdoor air will not have an adverse effect on background noise if the proper diffuser size is specified. If a diversion of outdoor air meeting the requirements of ASHRAE Std. 62.1 were to be carried out to improve the original design, it is the finding of this report that the acoustic considerations, while critical, are minimal.