

## Executive Summary

The Sunshine Elementary School has been considered for a proposed redesigned system. The following report is a compilation of new redesign work along with information from previous Tech. Reports 1, 2 & 3. The information supplied from the previous reports is to give a solid background on the existing systems and design. The redesign considerations are in no way proposing to be a better system than the original design, but instead an alternative with different attributes.

The Sunshine Elementary School is a 103,000 square foot building containing Kindergarten through 5<sup>th</sup> grade classrooms, along with administration areas, gymnasium and cafeteria. The building is primarily one floor with only one area of two floors for the 1<sup>st</sup> through 5<sup>th</sup> grade classrooms. The school is located in the Hershey, PA area and has a design goal of LEED<sup>®</sup> Silver accreditation.

The redesign included changing from water-to-air ground source heat pumps to water-to-water ground source heat pumps within the 1<sup>st</sup> through 5<sup>th</sup> grade classrooms, kindergarten classrooms and the gymnasium. The proposed system is to use both radiant slab heating and cooling. Capacity was immediately a noticeable concern. This caused for a proposal of a hybrid system in which the Dedicated Outdoor Air System would supply conditioned air during times of needed additional cooling. The DOAS system was changed from ceiling displaced ventilation system to a low velocity displacement ventilation system. This was to add comfort and improve the learning environment. The low velocity displacement system will also improve indoor air quality improving the indoor environment. Daylighting was also incorporated. This also was to improve the learning environment while reducing in the peak cooling demand and thus creating a plausible system. Together the daylighting, radiant system, and DOAS conditioned air were able to meet the peak cooling and heating demands. An acoustical analysis was also performed on the changes made to the ventilation system.

The end result of the redesign system was positive and feasible. The initial cost of designed changes was calculated and found to be an overall 5% increase to the original MEP system. The annual utility saving accrued by the redesign allowed for a payback within 10 years. The system not only pays back in financial measures but also in less measurable ways such as indoor comfort and an increased learning environment. Elementary Schools are an investment in our future. The higher the quality of learning obtained by students starting at an early age the brighter our future.