Executive Summary

This report is an educational document that examines the design and redesign alternatives of the George W. Hays PK-8 School in Cincinnati, OH. All of the redesign ideas are based upon the proposal of implementing an ice storage system. The report analyzes different ice storage types and strategies after which a complete annual simulation and analysis of three scenarios was done. The first calls for a reduction in chiller size from 170 tons to 100 tons. This case requires an ice storage capacity of 358 ton-hr. The second case involved a 90 ton chiller with an ice storage system of 486 ton-hr. Finally, the third system was an 85 ton chiller with an ice storage system of 600 ton-hr.

Each of these systems saw an increased first cost due to the introduction of an ice storage tank, slab on grade, and ice storage components including a glycol solution, glycol monitoring equipment, and glycol mixing equipment. This increase in cost exceeded cost reductions from a reduced chiller size, reduced electrical equipment and reduced piping. These increases in costs ranged from $7,876 to $25,046.

The annual electric bill decreased in each of the three scenarios. Despite an increase in overall electric use, the electrical demand limitations reduced the annual electric bill by $1,575 to $3,979.

The final cost analysis showed that the 90 ton chiller and 486 ton-hr ice storage tank was the most economical decision with a payback period of 3 years. This report used this payback along with other advantages of an ice storage system to conclude that the implementation of an ice storage system in this building would be beneficial.