

CONCEPTUALIZATION OF UTILIZING WATER SOURCE HEAT PUMPS WITH COOL STORAGE ROOFS

by

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ABSTRACT

This is a concept paper which discusses the potential integration of a ground-coupled water source heat pump with the Cool Storage Roof (CSR) to provide full year thermal comfort at reduced energy costs.

Prior CSR research efforts in Omaha, Nebraska and Davis, California have concentrated upon the physical phenomena related to maximizing summer radiative and evaporative heat loss from exposed CSR surfaces. Although performance results have been highly favorable, the CSR will not supply full building cooling demands for many applications. Coupling of the CSR with auxiliary cooling/heating systems may offer additional energy conservation opportunities. Combination with the ground-coupled heat pump may be particularly attractive for its utility load control features in addition to energy conservation advantages.

In particular, the relatively constant ground source/sink condition can provide predictable daily peak cooling and heating output from the heat pump, allowing reduced heat pump sizing and potentially eliminating resistance auxiliary heating. This concept paper develops a preferred CSR-ground coupled heat pump schematic configuration, and evaluates both system advantages and probable sizing implications for a Midwest U.S. application.