

MODELING OF THE RADIATIVE, CONVECTIVE, AND EVAPORATIVE HEAT
TRANSFER MECHANISM OF THE NEBRASKA MODIFIED ROOF POND FOR THE
DETERMINATION OF COOLING PERFORMANCE CURVES

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ABSTRACT

A passive solar heating and cooling technique with a sizable potential impact but lacking widespread recognition is the roof pond. Much testing and evaluation of roof pond systems occurred during the 1970's and 1980's. In 1984 much of the work in roof ponds was summarized in a book by Rockwell International (1). For various reasons none of the roof pond systems which can survive severe climates requiring cooling and heating have not been widely accepted.

In 1982, a variant of traditional roof ponds was codeveloped by Richard Bourne of the Davis Energy Group and Bing Chen. The Nebraska Modified Roof Pond (NMRP) would retain the advantages of traditional roof ponds while obviating many of the concerns associated with them. Construction of a test room began in the spring of 1982 and was completed during that summer. Since that time the NMRP has been undergoing a series of tests and evaluations

This paper presents the results from an analysis of the hourly cooling results and seeks to separate the radiative from the convective-evaporative component. The test room was set up as a calorimeter so that the total cooling could be readily ascertained while the water temperature of the pond is fixed. Under these test conditions the convection-evaporation component makes a significant cooling contribution.