ABSTRACT

The building shapes which might optimize heat gain and heat loss were identified for 16 different orientations in the Oklahoma City area through a series of computer simulations of hourly building heat gain and heat loss. The building shapes were expressed in the width-to-length ratios.

Most critical weather elements were identified by understanding the climatic forces on the built environment, then a set of 8760 hour weather data which might represent the long term climatic conditions in the Oklahoma City area was prepared.

In addition, a computer model was prepared to calculate hourly building heat gain and heat loss amounts through opaque materials and windows using the Heat Transfer Function method, which was introduced by ASHRAE, and conventional UAdT method, respectively.

As a result, the width-to-length ratios between 1:1 and 1.3:1 or 1:1.3 elongated along the east and west axis of the building were identified as the optimum shapes for a building having its main window wall oriented toward the south, north, east or west. For a building having its main window wall not facing one of above orientations, a square form was identified as the optimum shape.

The procedure of this study might be considered an introductory guideline for deciding energy optimizing building shape in the design process.