

ABSTRACT

The traditional design of desert houses depends in many cases, on an architectural point of view without giving great consideration to the thermal comfort inside such buildings. As an example, the influence of using domed roofs on the cooling load is not considered in many cases. Similarly, air cooling in such buildings depends mainly on using of “desert air-conditioners”, that depends on humidifying the air inside such houses to saturation and an unhealthy state. Such conditioners utilize also fans and pumps that involve the need for electric energy to run up these equipment.

In this thesis, the influence of using domed roofs on thermal comfort inside these buildings is measured. It is found that the traditional shapes of these domes may lead to accumulation of heat inside these buildings if not vented. However, by introducing some modifications for such buildings we can improve its performance. Building of the so called “Solar Chimney,” which resembles a pipe of suitable length and diameter close to the domed roofs, creates a natural draft inside these desert-houses. Similarly, by passing such air draft along a porous water bucket (the Egyptian Zeer) helps in reducing the air temperature.

Several small scale models for such modified desert houses were built and the influence of the inserted solar chimneys and water buckets was measured for different shapes of roofs as well as for different geometry of the chimney and of the bucket. It has been found that it is possible to determine the optimum modification regarding the chimney geometry and bucket’s area that may lead to the maximum temperature reduction and the best comfort conditions inside the desert houses.