

# PERFORMANCES OF FLAT-PLATE AND CPC SOLAR COLLECTORS IN UNDERFLOOR HEATING SYSTEMS

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**Sarvenaz Sobhansarbandi**

*Eastern Mediterranean University, North Cyprus via Mersin, Turkey*  
sobhan.sarvenaz@gmail.com

**Ugur Atikol**

*Eastern Mediterranean University, North Cyprus via Mersin, Turkey*  
ugur.atikol@emu.edu.tr

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## ABSTRACT

There is a growing interest in using solar energy in the underfloor heating systems. However, the large areas required for the placing of the solar collectors can be discouraging, especially for the apartment buildings.

The objective of this study is to investigate the possibility of using Compound Parabolic Collector (CPC) collectors to replace Flat-Plate collectors in solar energy underfloor heating systems. By this way, it is aimed to explore the feasibility of area reduction required by the collectors. Secondly, the temperature profiles of the circulating water loops and the concrete slabs are sought to be examined.

The simulations were carried out under the winter weather conditions of the Cyprus. The system consists of solar thermal collectors, a storage tank and circulation of water to carry the heat to 4 floor slabs. The results of the simulations show that, a CPC collector which is commonly used in producing high grade heat can work more effectively with less area occupied in this system. It is observed from this study that the outlet fluid temperature of this collector is between 25 to 95°C, compared to that of Flat-Plate collectors which is between 25 and 75°C. The simulations suggest that a 2 m<sup>2</sup> CPC collector can perform satisfactorily to match the job of 8 m<sup>2</sup> Flat-Plate collectors. The heat that is stored in the tank can supply hot water at a temperature of 60°C which is reduced to 45°C after mixing with cold return water before entering the floor slabs. The estimated slab temperature is approximately 24°C which is compatible with the standards. Fluid which is passing through the slabs will eventually lose its temperature as the heat transfer occurs from the slabs to the environment. Consequently the fluid outlet temperature is observed to be approximately 25°C.