

## Investigating the Energy Saving of Pit Yard Houses in the Hot and Dry Climate; Case Study: Classic Houses of Kashan City<sup>1</sup>

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### Abstract

The energy crisis has become one of the most important issues these days. In Iran, with very high energy consumption per capita, the primary energy source is fossil fuels, which produce very high pollution. According to the statistics of the National Iranian Oil Company, the largest share of energy consumption 27.2% belongs to the household sector. The pit yard is a courtyard in the middle of the main courtyard of the building, which is usually sunk into the ground to the extent of one floor. The main purpose of creating a pit yard in a hot and dry climate is to reach water, but researches show that the presence of this element in the building has led to a reduction in energy consumption. The purpose of this research is to calculate the amount of reduction in energy consumption due to the existence of a pit yard in traditional buildings and also to find the optimal physical characteristics to achieve the maximum amount of reduction in consumption in such buildings, and its method is descriptive-analytical. In the first step, Kashan city has been selected due to the number of pit yard projects and its hot and dry climate. After selecting three samples of these houses, we search for physical information and their sizes. Then the houses were simulated in two scenarios, on the ground and under the ground, in Honeybee. According to the results, pit yard has had the greatest impact on cooling energy demand and it has reduced EUI by 9.4%. In the final step, by considering 81 different states of physical characteristics, we attempt to find the most optimal state of the pit yard houses for today's construction. According to the results in the optimal state, it is possible to achieve 11.2% reduction in EUI compared to the current situation.

**Key words:** Pit Yard, Optimizing Energy Performance, Saving Energy, Hot and Dry Climate, The Traditional Architecture of Iran.

1- This article is extracted from the master's thesis of the first author titled "Investigation of thermal performance of pit yard in a hot and dry climate (case example of traditional houses in Kashan city)" And the second author was the first supervisor and the third author was the second supervisor of this thesis

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