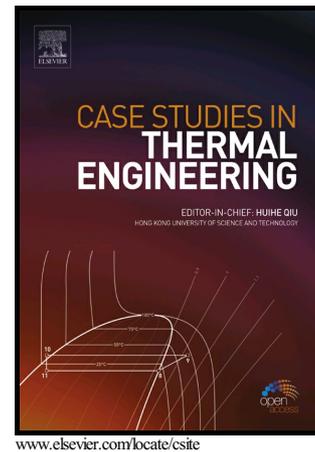


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# Actual validation of energy simulation and investigation of energy management strategies (Case Study: an office building in Semnan, Iran)

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## Abstract

Due to the wide range of parameters effect in energy consumption within a building, it is not possible to make a proper decision about the impact of different energy efficiency strategies without simulation tools. In this study, the annual energy consumption of an office building in Semnan, Iran is simulated using DesignBuilder software. The validation of simulation results is down by monthly electricity and natural gas energy consumption billing records with the highest simulation error of about 1.6%. Three strategies are proposed to management the energy consumption, e.g. the replacement of single-glazed windows with low-emission double-glazed window, installation of a thermal insulation sheet on the external wall of the building and use of horizontal shadings on the outside and removal of the internal shades. The simulation results show that these strategies lead to 14%, 18% and 13% reduction in energy consumption, respectively. In order to revalidate the simulation, the strategy of replacing the existing windows with low-emission double-glazed is adopted and the actual energy consumption of the building is compared with the simulated value after one year, indicating a good agreement at this stage.

**Keywords:** energy consumption, energy simulation, validation, office building, DesignBuilder

## 1. Introduction

The building sector accounting for about 40 percent of total energy consumption in most countries of the world [1, 2]. Given the advent of various technologies, operational complexities have also increased and decision making about the selection of optimal strategies and solutions for the reduction of energy consumption in buildings has become more important. On the one hand, the interaction between design elements, climate changing, different users, HVAC systems

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