Abstract

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Life-cycle cost analysis for façade retrofit measures of residential buildings in Cairo

Nowadays, energy retrofit for existing buildings has become a worldwide approach to reduce total energy consumption. A wide range of energy-efficient retrofit measures is actively affecting the decision process, of which retrofit alternatives should be used. The existing study aims to evaluate the effects of façade retrofit measures in residential buildings in Cairo using life-cycle cost analysis. An extensive variety of façade retrofit alternatives was explored individually and combined. A hypothetical benchmark building was used as a reference to represent typical residential buildings in Cairo. DesignBuilder was adopted to assess and quantify the energy-saving potentials for the proposed measures. The evaluation process was based on a parametric analysis of four major façade parameters that are affecting building energy performance: exterior wall configuration, glazing type, window-to-wall ratio and external shading. Thermal characteristics for façade retrofit measures were analysed to give a better understanding of the thermal performance for each retrofitting case. Results showed that the most cost-effective alternative for façade retrofit is to install a 1m overhang as an external shading device, which reached 1.4% life-cycle cost saving and 18% energy saving. Finally, a sensitivity analysis for the main life-cycle cost supplements was presented to show major variables that are affecting life-cycle cost analysis.