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SIMULATION BASED - EARLY DESIGN (SBED) TOOL FOR APARTMENT BUILDINGS

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ABSTRACT

Estimating the thermal performance of buildings using simulation programs during the design phase can help to move towards greener buildings in the future. However, thermal simulation is usually time consuming, expensive and needs expertise and detailed information to be conducted which is not always available. To overcome these challenges, there is a need for simplified tools and applications to help the designers to integrate energy simulation during the early design phase with minimum effort, time and expenses considering the local building materials, local construction techniques, typical building designs and the climatic conditions. This study presents simulation-based tool that accommodates the Palestinian context and that help the designers to make decisions at early design stages by guiding them toward energy efficient buildings. The tool was designed for the apartment buildings by defining the building prototype then conducting sensitivity analysis, then parametric simulation was performed to rapidly and flexibly assess thermal performance and energy consumption of different envelope design alternatives.

The tool variable design parameters were carefully identified: apartment layout, orientation, floor level, insulation type, glazing type, glass color, site density and topography. Their influence was tested and evaluated in terms of their effect on indoor air temperatures and on energy consumption using Design Builder Simulation program. This tool alert designers to carefully selecting building envelopes components. The results proved that such tools can improve thermal performance while minimizing energy consumption. Energy consumption in residential buildings can be minimized by 30% if designers define envelope related parameters at early design stage.

Keywords: Building Performance, Simplified tools, Early design phase, parametric simulation, building Envelope.