

## **Study on Varying Solar Blocking Depths in the Exploration of Energy-Saving Renovation of the Energy-Saving Design of the External Shell of Existing Buildings: Using Townhouse Residences in Kaohsiung City as an Example**

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**Abstract :** Buildings in the 21st century are facing issues such as an extreme climate and low-carbon/energy-saving requirements. Many countries in the world are of the opinion that a building during its medium- and long-term life cycle is an energy-consuming entity. As for the use of architectural resources, including the United Nations-implemented "Global Green Policy" and "Sustainable building and construction initiative", all are working towards "zero-energy building" and "zero-carbon building" policies. Because of this, countries are cooperating with industry development using policies such as "mandatory design criteria", "green procurement policy" and "incentive grants and rebates programme". The results of this study can provide a reference for sustainable building renovation design criteria. Aimed at townhouses in Kaohsiung City, this study uses different levels of solar blocking depth to carry out evaluation of design and energy-saving renovation of the outer shell of existing buildings by using data collection and the selection of representative cases. Using building resources from a building information model (BIM), simulation and efficiency evaluation are carried out and proven with simulation estimation. This leads into the ECO-efficiency model (EEM) for the life cycle cost efficiency (LCCE) evaluation. The buildings selected by this research sit in a north-south direction set with different solar blocking depths. The indoor air-conditioning consumption rates are compared. The current balcony depth of 1 metre as the simulated EUI value acts as a reference value of 100%. The solar blocking of the balcony is increased to 1.5, 2, 2.5 and 3 metres for a total of 5 different solar-blocking balcony depths, for comparison of the air-conditioning improvement efficacy. This research uses different solar-blocking balcony depths to carry out air-conditioning efficiency analysis. 1.5m saves 3.08%, 2m saves 6.74%, 2.5m saves 9.80% and 3m saves 12.72% from the air-conditioning EUI value. This shows that solar-blocking balconies have an efficiency-increasing potential for indoor air-conditioning.

**Keywords :** building information model, eco-efficiency model, energy-saving in the external shell, solar blocking depth.

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