الأبحاث المقدمة للترقية لدرجة / أستاذ
ملخصات الأبحاث باللغة العربية / الإنجليزية

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Towards Developing the Performance of the External Envelope to Activate Solar Energy Systems
Case Study of Designing Sun Breakers for Government Standard Schools in Cairo Region

ABSTRACT

Depending on renewable energy in buildings has become an urgent necessity that represents an important part of relying on operating buildings using renewable energy technologies. This importance has increased with the global energy crisis. There has been a development in the systems and technologies of the renewable energy use in buildings, accompanied by several techniques to integrate it with the building elements, but it was not sufficient to reach the stage of complete integration between the building elements and the renewable energy elements, especially in the architectural elements of the building envelope.

The problem of the research discusses the separation between the architectural elements of the building envelope and the technical systems for the solar energy technologies, as it appeared more clearly with the use of these technologies in buildings, which may cause an obstacle that is not architecturally accepted by the users.

The research aims to study the environmental impact of the integration of photovoltaic units with the openings of the building's outer envelope through a proposed methodology for the design steps of integrated sun breakers, applying it to one of the widely typical building models represented by the prototype models for schools in the Educational Buildings Authority.

The research concluded the importance of amending the prototype design standards for school buildings for external windows, taking into consideration the differences between the climatic regions in Egypt, as it appeared that the energy-generating sun breakers have a positive impact on the natural lighting levels, thermal comfort and energy consumption, as the sun breakers contributed to increasing the natural lighting area from 62.50% to approximately 89% as a percentage of the internal area of the classroom, in addition to improving the level of thermal comfort by 48%, while achieving savings in energy consumption by about 14% by activating its role as a renewable energy generating element, which indicates the importance of the study, especially in the prototype buildings to achieve a positive impact throughout the Arab Republic of Egypt.