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Evaluating the Use of Environment Friendly Recycled Building Materials in Egypt

A Thesis submitted in partial fulfillment of the requirements of the degree of Master of Science in Architectural Engineering (Architecture Engineering)

By

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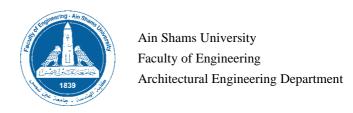
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This thesis is submitted as partial fulfillment of M.Sc. degree in Architecture, Faculty of Engineering, Ain Shams University.

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Abstract

Building materials are all over the place. They create the built environment. Choosing the appropriate material is a necessary step in the design process of the product, as the reliability of the design relies on the chosen materials. Materials have cultural, moral, social and environmental impacts that affect the user experience. Depending on recycled materials helps to achieve a better environmental performance with less energy consumption and construction cost.

This research aims at defining recycled materials and evaluating their performance to raise awareness about the benefits of using these materials in building sector. Proving that, recycled building materials have the potential to offer a better environmental performance of the building with less energy consumption and less cost in comparison with using conventional building materials. In addition to that, recycled materials have the potential to close the circle in the life cycle of the building. On the other side, Egypt has a potential to use waste materials and develop recycling process depending on the available amount of waste materials that can be recycled instead of being thrown in landfills causing environment pollution. The research addresses the environmental performance of recycled materials in three different climatic regions in Egypt (Cairo, Alexandria and Aswan).

The thesis consists of two parts and ends with conclusion and recommendations. The first part was a theoretical study of; building materials and their classifications and their impacts on the environment as introduced in in (Chapter 1), the use of some commonly used conventional building materials in Egypt and their availability and impacts on the environment as introduced in in (Chapter 2), alternative building materials which depend mainly on recycled materials or materials with recycled content and their availability in Egypt and impacts on the environment as well as introduced in (Chapter 3). In The second part of the thesis an office space in three climatic regions in Egypt (Alexandria, Cairo and Aswan) was selected as a base case and its environmental performance was analyzed. The effect of using glass panels with recycled content in facades on building performance is analyzed through thermal simulations applied on the case study, results were compared to the base case results (Chapter 4).

The simulation software used in this study was Design Builder for modelling, and Energy Plus as an engine for the analysis. The duration of the experiment was chosen to be the working hours of the day.

The scope of the research was limited to study only two different types of materials which are with recycled content (Glass Panels with Recycled Content in Building Facades and the second materials are cement bricks with recycled content of rice straw). The impact of using these materials with recycled content on building performance was studied in all days around the year in the three climatic regions in Egypt.

Keywords: Building Materials, Waste Materials, Recycled Materials, Building Performance, Environmental Performance, Energy Consumption, Design Process, Construction Process, Design Builder; Energy Plus.

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