بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / منى مغربي أحمد

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

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AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
Architecture Engineering

Efficient Energy Consumption in Egypt through Using Smart Materials in Building Envelope

A Thesis submitted in partial fulfilment of the requirements of the degree
of
Master of Science in Architectural Engineering

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Statement

This thesis is submitted as a partial fulfilment of Master of Science in Architectural Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Thesis Summary

The purpose of this thesis is to investigate how smart materials can be applied in architecture, particularly in the outer envelope, and to demonstrate their impact on current and future architecture. The reason for selecting this theme is the growing architectural and social concern for utilizing advancements in the field of smart materials to find new solutions to the increasing global environmental and social concerns in terms of energy conservation and ecological design.

The availability of various types of smart materials has a high potential for use in the field of architecture. In this context, considering smart materials as an energy-saving tool is a critical area of research, opening the door to extraordinary ways for concept generation and optimization in the fields of architecture, building, and construction.

This thesis is an endeavor to link between smart materials and smart envelope through exploratory and analytical research, by focusing on the literature review of smart materials and building envelope development, starting with exploring general characteristics, properties and classifications of materials, then the taxonomy of smart materials their types and characteristics as a set of selected properties and types is extracted. Also researching for smart materials application categories in outer envelope ending with comparative analysis for these materials in outer envelope. At last analyzing a case study in order to evaluate the application of such an approach on current and future architecture.

Smart materials are characterized as reactive materials that can change their properties when exposed to stimuli such as electric and magnetic fields, stress, moisture, and temperature.

The conclusions drawn from the comparative analysis of the case study in the last chapter of this thesis, which done in different climate zones in Egypt showed that, measuring outer envelope energy efficiency to achieve building interior heat comfort through using selected smart materials as insulation in outer shell then examine sample module in different zone of Egypt to have many comparable result in different zones. The extracted results present efficiency of smart materials for insulation than ordinary one in outer envelope. This trend and extracted results will encourage using of this materials in Egypt, this will be done by increasing knowledge of importance of this materials and its extent of its efficiency in energy conservation.

Key words: Smart materials, Smart envelope, Sustainability.

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