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Ain Shams University
Faculty of Engineering
Architecture Engineering Department

Evaluating the Use of Environment Friendly Recycled Building Materials in Egypt

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

By

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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.

List of Contents

Acknowledgement	i
Abstract	iii
List of Contents	v
List of Figures	x
List of Tables	xv
List of Acronyms	xvii
Introduction	xxi
Overview	xxiii
Problem Statement	xxvi
Research Aim and Objectives	xxvii
Research Methodology.....	xxvii
Research Scope and Limitations.....	xxviii
Research Structure	xxix
1 Chapter 1: Environmental Impacts of Building Materials	1
1.1 Introduction	1
1.2 Building Materials Properties	2
1.2.1 Physical Properties	3
1.2.2 Mechanical Properties	3
1.3 Classification of Building Materials.....	3
1.3.1 Classification Based on Building Phase	4
1.3.1.1 Pre-Building Phase	4
1.3.1.2 Building Phase	5
1.3.1.3 Post-Building Phase	5
1.3.2 Classification Based on Usage Fields.....	6
1.3.2.1 Building Materials for Basic Construction	6
1.3.2.2 Special Purpose Building Materials.....	6
1.3.2.3 Protective Building Materials	7

1.3.2.4	Decorative Building Materials.....	7
1.3.3	Classification Based on Materials Source	7
1.3.3.1	Natural Building Materials	7
1.3.3.2	Synthetic Building Materials	9
1.3.4	Classification Based on Improvements Made on Synthetic Building Materials.....	12
1.3.4.1	Conventional Building Materials.....	12
1.3.4.2	Innovations in Conventional Materials.....	13
1.3.4.3	Alternative Recycled Building Materials.....	14
1.3.5	Classification Based on Materials Origin.....	15
1.3.6	Classification Based on Usage Value	16
1.3.6.1	Classification A.....	16
1.3.6.2	Classification B.....	16
1.3.6.3	Classification C.....	17
1.4	Impacts of Construction Sector on the Environment.....	17
1.4.1	Impacts on Materials Consumption.....	18
1.4.2	Impacts on Energy Consumption	19
1.4.3	Impacts on Carbon Emission Rates	21
1.4.4	Impacts on Greenhouse Gases Rates	22
1.5	Conclusion.....	24
2	Chapter 2: Environmental Impacts of Conventional Building Materials in Egypt.....	27
2.1	Introduction	29
2.2	Use of Conventional Building Materials in Building Elements in Egypt.....	29
2.2.1	Bricks as Building Materials.....	29
2.2.1.1	Impact of Bricks Manufacturing Process on the Environment.....	32
2.2.2	Mortar as a Building Material.....	33
2.2.2.1	Impact of Mortar Manufacturing Process on the Environment	34
2.2.3	Glass as a Building Material.....	35
2.2.3.1	Impact of Glass Manufacturing Process on The Environment	40
2.2.4	Plastic Materials as Building Materials.....	41
2.2.4.1	Impact of Plastic Materials Manufacturing Process on the Environment	44
2.3	Conclusion.....	49

3	Chapter 3: Alternative Environment Friendly Building Materials in Egypt.....	51
3.1	Introduction	53
3.2	The Need for Environment Friendly Building Materials	54
3.3	Alternative Environment Friendly Recycled Building Materials Available in Egypt	56
3.3.1	Bricks with Recycled Content	57
3.3.1.1	Use of rice straw in Construction Sector	57
3.3.1.2	Impact of Using Recycled Chopped Rice Straw in Cement Bricks	59
3.3.2	Recycled Cement Mortar.....	62
3.3.2.1	Use of Recycled Cement Mortar in Construction Sector	63
3.3.2.2	Impact of Using Fine Recycled Concrete Aggregate	64
3.3.3	Recycled Glass	66
3.3.3.1	Use of Recycled Glass in Construction Sector	66
3.3.3.2	Impact of Using Recycled Glass	68
3.3.4	Recycled Plastic materials	70
3.3.4.1	Use of Recycled Plastic Materials in Construction Sector	71
3.3.4.2	Impact of Using Recycled Plastic Materials.....	77
3.4	Constrains of Using Alternative Environment Friendly Recycled Building Materials in Egypt.....	78
3.5	Conclusion.....	80
4	Chapter 4: Evaluating the Use of Materials with Recycled Content	83
4.1	Introduction	85
4.2	Climate Description of Egypt.....	87
4.2.1	Weather Data Files	90
4.3	Climatic Characteristics of Selected Studied Cities	91
4.4	Selection of The Used Energy Modeling software.....	92
4.5	Base Case Specifications.....	93
4.5.1	Base Case Geometry.....	93
4.5.2	Base Case Construction Materials	94
4.5.2.1	Evaluating Glazing type Used in Building Facades	94

A) Evaluating the Use of Conventional Glazing Material	94
B) Evaluating the Use of Glazing Material with Recycled Content	97
4.5.2.2 Evaluating Bricks type Used in Building External Walls	99
A) Evaluating the Use of Conventional Cement Bricks.....	99
B) Evaluating the Use of Rice Straw - Cementitious Composites of Bricks 100	
4.6 Base Case Assigned Template	102
4.7 Base Case Results	102
4.8 Simulation Results	104
4.8.1 Evaluation of Using Conventional Glazing Material Type in Comparison with Glazing Material Type with Recycled Content.....	104
4.8.1.1 Cairo City	104
A) Annual Heat Gained Through Glazing in Facades.....	104
B) Discomfort Summer Time.....	105
C) Annual Energy Consumption	106
a) District Heating.....	106
b) District Cooling	107
4.8.1.2 Alexandria City.....	108
A) Annual Heat Gained Through Glazing in Facades.....	108
B) Discomfort Summer Time.....	109
C) Annual Energy Consumption	110
a) District Heating.....	110
b) District Cooling	111
4.8.1.3 Aswan City	112
A) Annual Heat Gained Through Glazing in Facades.....	112
B) Discomfort Summer Time.....	113
C) Annual Energy Consumption	114
a) District Heating.....	114
b) District Cooling	115
4.8.2 Evaluation of Using Conventional Brick Type in Comparison with Brick Type with Recycled Content.....	116
4.8.2.1 Cairo City	116
A) Discomfort Summer Time.....	116
B) Annual Energy Consumption	117
