



Cairo University

**METHODOLOGY FOR OPTIMIZATION OF ENERGY
EFFICIENCY USING VEGETATED FAÇADES IN
MULTI-STORY RESIDENTIAL BUILDINGS WITH
REFERENCE TO COLD SEMI-ARID AND HOT ARID
CLIMATES**

By

Reem Ali Talib Alothman

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
in
Architectural Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Under the Supervision of

Prof. Dr. Ahmed Reda Abdin

Prof. Dr. Ayman Hassaan Ahmed

.....
Professor of Architecture and
Environmental Control
Architecture Department
Faculty of Engineering, Cairo University

.....
Professor of Landscape Architecture and
Environmental Planning
Architecture Department
Faculty of Engineering, Cairo University

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Approved by the
Examining Committee

Prof. Dr. Ahmed Reda Abdin, Thesis Main Advisor

(Professor of Architecture and Environmental Control, Faculty of Engineering, Cairo University)

Prof. Dr. Ayman Hassaan Ahmed, Advisor

(Professor of Landscape Architecture and Environmental Planning, Faculty of Engineering, Cairo University)

Prof. Dr. Ahmed Ahmed Fikry, Internal Examiner

(Professor of Environmental Architecture, Faculty of Engineering, Cairo University)

Prof. Dr. Morad Abdelkader Abdelmohsen, External Examiner

(Professor of Architecture and Environmental Control, Faculty of Engineering, Ain Shams University)

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2020

Engineer's Name: Reem Ali Talib Alothman
Date of Birth: 13/06/1978
Nationality: Iraqi
E-mail: reemalitalib@yahoo.com
reemalothman@uomosul.edu.iq
Phone: 009647717881532
Address: Al Rehab, Cairo
Registration Date: 01/03/2017
Awarding Date: / /2020
Degree: Doctor of Philosophy
Department: Architectural Engineering



Supervisors:

Prof. Dr. Ahmed Reda Abdin
Prof. Dr. Ayman Hassaan Ahmed

Examiners:

Prof. Ahmed Reda Abdin (Thesis main advisor)
Prof. Ayman Hassaan Ahmed (advisor)
Prof. Ahmed Ahmed Fikry (Internal examiner)
Prof. Morad Abdelkader Abdelmohsen (External examiner)
(Faculty of Engineering, Ain Shams University)

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Key Words:

Energy consumption; Green vegetated façade; Multi-story residential; CO₂ emissions.

Summary:

The issue of energy consumption, especially in the building sector and, reducing energy are considered a major challenge faced by construction today. The research aims is optimization of energy efficiency by using vegetated façades in multi-story residential buildings in cold semi-arid and hot arid climate. It investigates the parametrical design for using vegetated façades. For this purpose, the energy consumptions are evaluated by using DesignBuilder tool, a vegetated layer considered as an additional layer for building, also as shading device therefore, the comparison will be between non-vegetated, direct and indirect green vegetated, insulated and shading façade. The study concluded that indirect green vegetated façades reduce the energy from 16.6% to 70.0% for cooling, and from 3.5% to 100% for heating period except increase in energy or not effective in some orientation, and reduce the annual energy consumption and CO₂ emissions was from 18% to 63.3% according to location and orientation.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Reem Ali Talib Alothman

Date: 03/11/2020

Signature:

Dedication

I dedicate my humble work to all my **Family**.....

To the reason for my existence and my role model in this life, who always encourage and support me to walk the path of knowledge and took care of my children always and especially at the beginning of my studies which helped me to get started, my **Father** and my **Mother**, may God preserve them and keep them as a candle that illuminates my path in life

To my dear **Husband**, who without his support, encouragement and his standing beside me in the most difficult situations, I would not have reached what I am now.....

To my **Children**, my loved ones, the joy of my heart, who carried a lot during my studies because of my being busy and far from them.....

To my dear **Brother** and my dear **Sisters** and their families.....

Finally, I dedicate the outcome of my humble effort to my beloved country, **Iraq**

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