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.

ملاحظات: لا يوجد

Cairo University

OPTIMIZING ENERGY EFFICIENCY AND INDOOR ENVIRONMENTAL QUALITY IN ADMINISTRATIVE BUILDINGS THROUGH INTRODUCING BIM AT DESIGN STAGES

By

Wael Muhammad Abdelwahhab Mousa

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
INTERDISCIPLINARY-MASTER OF SCIENCE
in
Integrated Engineering Design in Construction Projects

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Under the Supervision of

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Title of Thesis:

Optimizing Energy Efficiency and Indoor Environmental Quality in Administrative Buildings through Introducing BIM at Design Stages

Key Words:
BIM; Solar Radiation; Thermal Comfort; Energy Consumption; Green Building.

Summary:
The sun plays an important role to humankind on Earth as it provides many useful things such as light and warmth to all living organisms. However, the solar radiation that strikes buildings' envelope is considered as one of the main challenges that faces the designers of administrative buildings' projects. This research discusses the problems that are resulted from the negative effects of solar radiation on existed administrative buildings when not considered in the design. In addition, it introduces a solution by involving Building Information Modelling (BIM) in the design stage, which helps designers to model their design, simulate its performance using BIM predictive software, and then accordingly modify the design to reach to the best performance.
A case study of an existing office building is introduced to monitor the building actual performance in terms of energy and thermal comfort as a baseline, then using its data in a BIM model to improve its performance.
At the end, the research concludes that using BIM process in design not only solves problem of negative effects of the heat gain coming into building and high-energy consumption for air condition system, but also enhances building performance and users' thermal comfort as well, which is part of indoor environmental quality.

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: Wael Muhammad Abdelwahhab Mousa Date: / /2022
Signature:

Dedication

To my parent’s soul.
To my wife and my kids.
To my supervisors.

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Wael Muhammad Abdelwahhab Mousa
……… 2022

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Nomenclature

BIM:
Building Information Modelling
POC:
Proof of Concept
ASHRAE:
The American Society of Heating, Refrigerating, and Air-conditioning Engineers
AEC:
Architecture Engineering Construction
LEED:
Leadership for Environmental and Energy Design
GPRS:
Green Pyramid Rating System
BREEAM:
Building Research Establishment Environmental Assessment Method
EPA:
Environmental Protection Agency
CAD:
Computer Aided Design
SDG:
Sustainable Development Goals
UN:
United Nation
DGNB:
Deutsche Gesellschaft fur Nachhaltiges Bauen (German Sustainable Building Council)
GSAS:
Global Sustainability Assessment System
IGBC:
Indian Green Building Council
CASBEE:
Comprehensive Assessment System of Building Environmental Efficiency
USGBC:
U. S. Green Building Council
GSA:
General Services Administration in U. S
iBIM:
intelligent Building Information Modelling
GBS:
Green Building Studio
IES:
Integrated Environmental Solutions
VE:
Virtual Environment
SQM:
Squared Meter