Cairo University

INTEGRATING BIM IN SUSTAINABLE DESIGN FOR SOLAR POWER DESIGN WITH EMPHASIS ON PV DESIGN

By

BASSANT MOHAMED NABIL ABD EL MAGEED

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE

In

ARCHITECTURAL ENGINEERING

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Under the Supervision of

Prof. Dr. Ayman Hassan Ahmed
Professor of Landscape Design
Architecture Department
Faculty of Engineering,
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Approved by the
Examining Committee

____

Prof. Dr. Ayman Hassan Ahmed, Thesis Main Advisor
Professor of Landscape Design, Architecture Department, Faculty of Engineering, Cairo University

____

Prof. Dr. Ahmed Ahmed Fekry, Internal Examiner
Professor of Architecture, Architecture Department, Faculty of Engineering, Cairo University

____

Prof. Dr. Abbas El – Zafarany, External Examiner
Professor Dean of the Faculty of Urban and Regional Planning, Cairo University

FACULTY OF ENGINEERING, CAIRO UNIVERSITY

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Engineer: Bassant Mohamed Nabil Abd El Mageed

Date of Birth: 27/06/1989

Nationality: Egyptian

E-mail: bassantmohamednabil-239@hotmail.com

Phone.: 01009603579

Address: 25 El Kordi St, Espates, El-Haram, Giza

Registration Date: 01 / 03 / 2012

Awarding Date: / / 2019

Degree: Master of science

Department: Architectural Engineering

Supervisors: Prof. Dr. Ayman Hassan Ahmed

Examiners: Prof. Dr. Ayman Hassan Ahmed (Thesis Main Advisor)

Prof. Dr. Ahmed Ahmed Fekry (Internal Examiner)

Prof. Dr. Abbas El – Zaafarany (External Examiner)

Title of Thesis: Integrating BIM In Sustainable Design for Solar Power with Emphasis on PV Design

Key Words: BIM (Building Information Modeling); Sustainable architecture; Renewable Energy; Solar Energy; PV; BIPV

Summary:

The purpose of this thesis is to highlight the effect of using BIM through design possibilities regarding the solar technologies for sustainable design with emphasis on building integrated photovoltaic system using solar energy to generate electricity. Thesis methodology is based on a literature review of the last decade researches in Sustainable BIM integration by using BIM tools for BPS process with the emphasis of BIPV energy simulation. The Literature review revealed that integrating BIM in sustainable design done through IFC and gbXML open BIM formats which have a lot of interoperability issues while exporting BIM models to building performance analysis tools. The objective of the thesis is to integrate BIM in sustainable design using BPS BIM-based tools and avoiding the mentioned interoperability issues faced the users in the last decade. In order to accomplish this objective, we have used the same platform BPS BIM-based tools to avoid interoperability issues while exporting models to the open BIM formats such as IFC. The results accentuate that using same platform tools avoid all interoperability issues and achieves seamless BIPV simulation.

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 reference section.

Name: Date:

Signature:

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NOMENCLATURE

AEC	Architecture, Engineering, Construction
BEM	Building Energy Model
BIM	Building Information Modeling
BAPV	Building Applied Photovoltaics
BIPV	Building Integrated Photovoltaics
BPS	Building Performance Simulation
COMETH	COre for Modelling Energy and THermal comfort
CSP	Concentrating Solar Power
DD	Design Development
DNI	Direct Normal Irradiation
DXF	Drawing Exchange Format
EUI	Energy Use Intensity
eLOD	Geometry Level of Development
gbXML	Green Building XML
GHI	Global Horizontal Irradiation
GUI	Graphical User Interface
IDM	Information Delivery Manual
IFC	Industry Foundation Class
iLOD	Information Level of Development
ISCC	Integrated Solar Combined Cycle Power Plant
IMELS	Italian Ministry of Environment
IPD	Integrated Project Delivery
LOD	Level of Development