SUSTAINABLE BUILDING RETROFITTING AND ENERGY EFFICIENCY

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Penerbit UTHM
2021

Perpustakaan Negara Malaysia Cataloguing in Publication Data

Nur IzieAdiana Abidin, 1989-
SUSTAINABLE BUILDING RETROFITTING AND ENERGY EFFICIENCY / Nur IzieAdiana Abidin, Rozana Zakaria, Eeydzah Aminudin, Dodo Yakubu Aminu.
ISBN 978-967-2817-07-9
1. Sustainable buildings.
2. Buildings--Retrofitting.
3. Energy consumption.
4. Architecture and energy conservation.
5. Government publications--Malaysia.
I. Rozana Zakaria, 1970-. II. Eeydzah Aminudin, 1987-.
III. Dodo Yakubu Aminu, 1973-. IV. Title.
720.472

Published and printed by:
Penerbit UTHM
Universiti Tun Hussein Onn Malaysia
86400 Parit Raja,
Batu Pahat, Johor
Tel: 07-453 7051 / 7454
Fax: 07-453 6145

Website: http://penerbit.uthm.edu.my
E-mail: pt@uthm.edu.my
http://e-bookstore.uthm.edu.my

Penerbit UTHM is a member of
Majlis Penerbitan Ilmiah Malaysia
(MAPIM)

CONTENTS

PREFACE

This book introduces various topics related to energy efficiency and sustainable retrofitting. The topics cover researches and studies on the initiatives, strategies, reduction and improvements, applications, effect, and approach.

Chapter 1 discussed the steps of retrofitting initiatives that can implement to achieve building energy reduction. Retrofitting initiatives consist of three steps which are lean energy, green technology, and clean energy. Lean energy is also known as passive design, such as shading, glazing, green roof, green wall, daylighting. Green technology involves adopting technology such as occupancy sensors, automatic daylight harvesting systems, Variable Frequency Drives, energy-efficient lighting, and air-conditioning. Then, for the greatest effect of energy reduction and the demand for building energy, clean energy or renewable energy provides an opportunity for more significant energy reduction such as solar photovoltaic, wind power, and solar hot water. Chapter 2 focuses on giving an overview of green building assessment tools, the concept of retrofitting and retrofitting technologies. The retrofitting technologies categorized into three groups: supply-side management, demand-side management, and change of energy consumption pattern such as human factors.

Chapter 3 discussed the building lighting energy simulation for retrofitting the Rest and Service Area (RSA) at Ayer Keroh Malaysia, which conducted using the Revit BIM model. The simulations were performed to analyze the lighting performance and proposed retrofitting initiatives to reduce lighting consumption. Meanwhile, Chapter 4 presents the prototyping of retrofitting strategies in the educational building to reuse a building type or building design. This process needs to ensure compatibility of the design usage and functions.

Chapter 5 reveals the strategies for mitigating the influence of modernism towards sustainable retrofitting of Hausa traditional palaces. This is because traditional buildings are constructed from different materials and in different structural forms than modern buildings, and therefore, they perform differently. Thus there are some general qualities of traditional buildings that are worth defining compared to modern buildings, which require different understanding, skills, and material solutions.

Chapter 6 presenting the attitude towards energy consumption and strategies to encourage energy efficiency in a building. The attitude and strategies were obtained from a questionnaire survey conducted at the M50 office building, School of Civil Engineering Universiti Teknologi Malaysia. Consumers have shown a positive attitude towards energy savings by turning off the electrical appliances when they do not use them, utilizing natural sunlight to lighten the room, and setting up the air-conditioning temperature. Meanwhile, implementation of energy audit, information through seminars, and encouragement campaign ranked among the top 3 of other strategies to encourage energy efficiency.

The energy consumption and occupant's well-being based on the retrofitting implemented in the office building at National Primary Health Care Development Agency Abuja were highlighted in Chapter 7. This chapter aims to present the technical details of the building's current state and highlight the retrofitting projects since the building has consumed a lot of energy due to the light bulbs, heat gain from window units, continuous pumping of water, and poor indoor environmental quality. The case study grounded on 40% energy savings by providing adequate illuminance, ventilation, and thermal comfort for the occupants. Chapter 8 reveals cool paint application to the indoor temperature conducted at the student hostel room in UTM residential college. The study proved that the student's surrounding temperature in the residential college is lower after applying the cool paint. The paint also reflects more infrared light to reduce heat

absorption and decrease the level of energy consumption used to bring down the room's temperature. Lastly, Chapter 9 highlighted the passive design approach of building envelope for individual residents in achieving energy-efficient building. Selection of type, size, and location of glazing and windows at the building envelope and dominant wall areas for solar access is the most significant approach to site planning and orientation. A critical understanding of the energy efficiency problem is required in conjunction with the passive design approach of the building envelope. The related construction player should take a rule from the Overall Thermal Transfer Value (OTTV) as a tool for calculating the efficiency of the building envelope to achieve the minimum target value.

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