

The Impact and implication of the Energy Efficient Building Code
In Sri Lankan context

A dissertation presented to the department of Architecture
University of Moratuwa, Sri Lanka
For final examination in M.Sc.
(architecture)

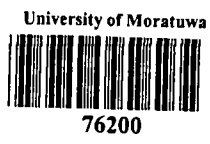
LIBRARY
UNIVERSITY OF MORATUWA, SRI LANKA
MORATUWA

72 "01"
697.1(548.7)

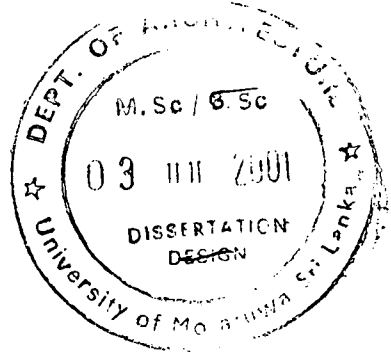
TH

A.,M G.D. Amarakoon
M.Sc. , final year (2001)
Faculty of Architecture ,University of Moratuwa ,
Sri Lanka

76200



76200



Abstract

Being a scarce resource energy conservation is becoming an important issue today. It believes that the new energy conservation regulations considerably contribute to solve the problem generating because of the scarcity of energy. As a new experience the energy related regulations creates so many debuts within professional groups such as Architects and engineers who directly involving in the construction industry and many of them have less knowledge in this area.

The study pays special attention for the section of building envelope which come under Energy Efficient Building Code introduced by the Ceylon Electricity Board in year 2000 and the recommendations have taken under that.

The study examines the behavioural pattern of the Overall Thermal transfer value (OTTV) with the contemporary design parameters and energy consumption in Sri Lankan context.

Doing so, the first chapter deals with the literature review, discussing the nature of the energy, importance of conserving energy, conservation approaches concentrating the energy efficient building code in Sri Lanka.

The second chapter deals with the impact of the external and internal heat gains. The way of heat gain and heat transfer and OTTV as an index for a heat transfer in to the building envelope in theoretical basis and further the properties of the building material which contributes to determines the nature of OTTV.

Third chapter examines the nature of the OTTV under five cases for 17 design parameters and analysis have done under five base cases and the findings used to identify the practicability of the OTTV and it have been given suggestions with a set of guidelines which help the architects and designers to designs building envelope under the EEBC recommendations.

The presence of energy efficient building cord in Sri Lanka



Acknowledgment

My sincere thanks are due to the following, for the help, they have rendered and the encouragement given me in the preparation of this dissertation without which this would not have been a success.

Dr R. Emmanuel, Dr Samitha Manawadu, Dr L. S. R Perera, Architect. Gamini Weerasinghe senior lectures, university of Moratuwa for their guidance through out.

I am deeply obliged to the architects of the central Engineering Consultancy Bureau in helping me. My heartiest thanks to the officers of the reading room and the computer room, faculty of architecture university of Moratuwa in helping me to prepare this dissertation.

I wish to get this opportunity to give my special thanks to Mr & Mrs Weerasuriya in helping me to prepare this monograph in a short period.

Specially to my dear parents, my sister brother extended their blessings all the time.

I would like to extend my gratitude to my dear friends who encourage me always finally I thank all those who help me in numerous ways.



University of Moratuwa, Sri Lanka
Electronic Theses & Dissertations
www.lib.mrt.ac.lk



Impact and implication of the Energy Efficient Building Code In Sri Lanka

context

Contents

*List of illustrations

Introduction

Need of the study

Scope of the study

Method of the study

1.0 Chapter one

1.1. The definition of energy

1.2 Need of conservation of energy

1.3 Purposes and scope of law and regulation to promote energy conservation and energy efficiency

1.4 Energy Efficient Building Code for Sri Lanka

1.4.1 Energy efficient building code building envelope

3.0 Chapter two

2.1 Heat in built environment

2.2 Heat gain in to the built environment

2.3.1 Internal heat gain

(a) Metabolic heat

(b) Heat gain from internal lighting

(c) Heat gain from machinery and equipment

2.3.2. External heat gain

(a) Solar energy

2.3 Heat transfer through the building envelope

2.3.1 OTTV value

2.3.2. Concept of OTTV value

2.3.3 Implementation of the OTTV in regional codes.

2.3.4. Properties of material which determines the OTTV value of the building

(a) Thermal conductivity

(b) Thermal resistance

(c) Thermal conductance

(e) Thermal transmittance

3.3.5 Calculation of U value for materials.

2.3.5 Surface characteristics of material

(a) Absorptivity

(b) Reflectivity

(c) Emmissivity

3.4 Computer simulation

3.4.1 DEROB as a computer simulation method used to identify the nature of the OTTV value.



3.0 Chapter three

Case study-Office building of the Central Engineering constancy Bureau

3.1 Orientation

- (a) Base case West orientation
- (b) case01 East orientation
- (c) case02 North orientation
- (d) case03 South orientation

3.2. Construction material

- (a) case 04 225mmtk. Concrete wall
- (b) case 05 115mmtk. Brick wall
- (c) case 06 225mmtk. Brick wall with insulation layer
- (d) case07 225mmtk. brick wall with Al. cladding
- (e) case 08 225mmtk. Brick wall with glass cladding
- (f) case 09 Fully glass wall
- (g) case10 80%glass wall

3.3 Colors and textures

- (a) case11 Light colors
- (b) case12 Rough textures

3.4 Type of shading devisers

- (a) case14 Window without shading devisers
- (b) case15 Window with vertical shading devisers
- (c) case16 Window with egg create shading devisers.

3.5 Window to wall ratio

- (a) case17 Wwr.2419
- (b) case18 Wwr.272
- (c) case19 Wwr.5040
- (d) case20 Wwr.5218

4.0 Chapter four

Analysis

- 4.1 thermal performance of OTTV with cooling load
- 4.2 Thermal performance of the building –wall types
- 4.3 Thermal performance of the building with colours and textures
- 4.4 Thermal performance of the building for shading devisers
- 4.5 Thermal performance of the building for orientation
- 4.6 Thermal performance of the building for window to wall ratio
- 4.7 Thermal performance of the CECB building

5.0 Chapter five

CONCLUSION

Bibliography



list of illustrations

Fig. 1 Power generation in air Lanka

Fig. 2. Sun earth relationship

Fig. 3. Earth inclination of the axis to the plane of revolution

Fig. 4. The effect of solar radian in indoor climate

Fig. 5 heat transfer through the building envelope

Fig. 6 illustration unit conductivity

Fig 7 the behavior with the surface with respect to the radiant heat exchange.

list of tables

table 1 thermal conductivity of material

table 2. external convective film coefficient(fsc)and surface resistance (Rse)

table 3. internal convective film coefficients (fis) and surface resistance(Ris)

table 6. calculation of the value

table7. clculation of the u value for 225mm

table8. calculation of the u value for 150mm thick brick wall

table9 u valeve calculation -225mm thick concrete wall

table 10 u value calculation brick wall with mosaic tile

table11 u valve calculation brick was with insulation layer

table12 u value calculation brick wall with metal cladding

table 13 OTTV calculation west orientation

table15 OTTV calculation north orientation

table16 OTTV calculation South orientation

table17 OTTV cooling load data for orientation

table18 OTTV calculation 225mm concrete wall

table19 OTTV calculation 150mm brick wall

table 20 OTTV calculation 225mm brick wall with insulation layer.

table 21 OTTV calculation 225mm thick brick wall with insulation layer

table22 OTTV calculation 225mm thick hollow brick

table23 OTTV cooling load for wall material

table24 OTTV calculation 50% absopitivity

table25 OTTV calculation 80% absorptivity
table26 OTTV calculation window without shading devises
table27 OTTV calculation window with vertical shading devises
table28 OTTV calculation window with egg. crate shading
table29 OTTV cooling load for solar absorptivity
table29 OTTV cooling load data for shading devise
table 30 OTTV calculation 448/1885
table31 OTTV calculation 505/1885
table32 OTTV calculation
table33 OTTV calculation
table34 OTTV cooling load data window to wall ratio



University of Moratuwa, Sri Lanka
Electronic Theses & Dissertations
www.lib.mrt.ac.lk

