ENERGY EFFICIENT BUILDING MODEL: A Case study for Proposed SL ARMY Headquarters

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(108888P)

Degree of Master of Science

Department of Electrical Engineering

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ABSTRACT

The Sri Lankan Tri forces Headquarters with Ministry of Defence office complex are schedule to be located in one place at Akuregoda Baththaramulla. This building complex will be one of the largest office complexes in Sri Lanka and to be accommodated for different nature functions except routine official duties. Therefore more attention has been given to improve the architectural view of the entire complex. In the mean time less attention has been given for energy optimizations issues. When the proposed design is thoroughly studied, many possibilities are available to improve energy efficiency of entire complex with some simple modifications. In order to optimize the energy use for illumination system and HVAC system, this case study has been done for selected building area of the total complex. The part of the building complex is selected to do the research and selected area is developed as a separate building model.

The research is mainly based on the finding of best wall to window ratio to optimize the energy consumption for illumination system and HVAC system of the selected building model. The calculation stages are done, maintaining the initial building parameters in human comfort zone as ASHRAE stranded and sun path over the location. The best orientation of the building model is obtained according to the north alignment. Then the condition of the building model is improved as an energy efficient model by replacing illumination system with LED luminaire, window glass with energy efficient low-e window glass and developing a building envelop.

Financial evaluation is done to all proposed building models with compare to the existing design for energy consumption. Then the lighting power density (LPD) is calculated for each building model and made a comparison with the maximum LPD values published by Sustainable Energy Authority.

The research methodology can be practiced in designing stage of any kind of a building to improve the energy efficiency effectively. It gives more opportunity for designers to develop more energy saving building environment, while maintain the human comfort in the same time.

DECLARATION

I declare that this is my own work and this thesis/dissertation[1] does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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G.W.A.S.B. Muhandiramge

Date: ……………………………..

The above candidate has carried out research for the Masters Dissertation under my supervision.

…………………………………….

Dr. Asanka Rodrigo

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Abbreviations

Abbreviation	Description
AC	Air Condition
AHQ	Army Head Quarters
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
Avg	Average
BF	By Pass Factor
C	Celsius
COP	Coefficient of performance
DB	Dry Bulb
DES	Directorate of Engineer Service
DP	Dew Point
ENE	East-northeast
F	Fahrenheit
GMT	Greenwich Mean Time
HQ	Head quarters
Hrs	Hours
HVAC	Heating ventilation and Air Conditioning
J	Joule
K	Kelvin
Lat	Latitude
LED	Light Emitting Diode
LHG	Latent Heat Gain
MOD	Ministry of Defence.
N/A	North alignment
NNW	North-North-West
RH	Relative Humidity
s	Seconds

SC	Shading Coefficient
SHG	Sensible Heat Gain
SHGF	Solar Heat Gain Factor
SSE	South-southeast
TR	Ton (Cooling load)
W	Watt
WB	Wet bulb
WSW	West-South-West
W/W ratio	Wall to window ratio

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