Quantifying Savings in Spaces Energy Demands and CO_2 Emissions by Shading and Lighting Controls in the Arabian Gulf

Albert Al Touma, Djamel Ouahrani

www.elsevier.com/locate/jobe

PII: S2352-7102(18)30089-5
DOI: https://doi.org/10.1016/j.jobe.2018.04.005
Reference: JOBE450

To appear in: *Journal of Building Engineering*

Received date: 24 January 2018
Revised date: 11 April 2018
Accepted date: 11 April 2018

Cite this article as: Albert Al Touma and Djamel Ouahrani, Quantifying Savings in Spaces Energy Demands and CO_2 Emissions by Shading and Lighting Controls in the Arabian Gulf, *Journal of Building Engineering,* https://doi.org/10.1016/j.jobe.2018.04.005

Quantifying Savings in Spaces Energy Demands and CO_2 Emissions by Shading and Lighting Controls in the Arabian Gulf

Albert Al Touma, Djamel Ouahrani*

Department of Architecture and Urban Planning, College of Engineering, Qatar University,

P.O. Box 2713, Doha, Qatar

*Corresponding Author: Email: djamel@qu.edu.qa; Tel: +974-44034347

Abstract

Despite the deceleration in worldwide annual energy consumption and CO_2 emissions, many countries, such as in the Arabian Gulf, are still unarguably far from following this international trend. This study investigates the potential savings in spaces energy demands, and consequently in primary energy and CO_2 emissions, by the installation of blind shadings and application of shading and lighting controls in four different façade orientations in Qatar. These controls ensure minimal space energy requirements in an indoor environment free of discomfort glare throughout the year.

A simulation model of an office space with a fully-glazed façade and external blind shading device in one predetermined orientation was developed and validated experimentally, Upon its validation, shading and lighting controls were applied. Results have shown that shading control was singlehandedly able to reduce the space total energy demand by 11.6% in north-oriented offices and 24.8% in east-oriented offices, thus potentially saving up to 24.5 kg of CO_2/m^2 annually. Once lighting control was incorporated, reductions were enhanced to 14.1% in north-oriented offices and 28.3% in east-oriented offices, consequently saving up to 27.9 kg of CO_2/m^2 annually. The simple installation of shadings on offices and the adoption of shading and lighting controls present a practical mitigation to both new and existing buildings that not only provides