COMPUTER AIDED ENVIRONMENTAL SOLUTIONS:

Evaluation of Optimum Building Orientation in Lahore, Pakistan.

.SABAHAT ALAMGIR, ARIF KHAN
University of Engineering .and Technology, Lahore
sabahatarif@hotmail.com
arifuet@hotmail.com

AND

KHALID ALAMGIR
Quad-e- Azam University, Islamabad
khalid_alamgir@yahoo.com

Abstract. One of the primary features of solar passive design is the orientation of a building on a particular latitude. The client of Information Technology demands testing, validity, practicality and sustainability of a building project before execution. The computer based simulations are the only practical way to predict the complex energy performance and analysis for a large number of passive design solutions. This paper investigates the optimum residential building orientation having various zones, located in Lahore, Pakistan, with the help of Energy Simulation program. It is concluded that with the help of software, it is possible to orient the residential plan with the minimum solar gain of the required living zones.

1. Introduction

An energy efficient architecture aims to create environmental- friendly and energy- conscious buildings which implies that the architects and designers should employ the passive solar strategies and techniques in their designs utilizing materials that cause the least possible damage to the global commons. The design team can manipulate the building massing, siting and orientation, internal organization and appearance of the facades without adding significantly to the cost of design (LANL, 2002).

2. Analysis Tool and Thermal Performance

Ecotect v5.5, is a highly visual and interactive building design and analysis tool that links a three dimensional model with the broad range analysis functions that are required how a design will perform, solar thermal, lighting, acoustics, building regulations and cost aspects (ANDREW, 2006). Simulating, feeding the weather data of Lahore, the effect of orientations of four test rooms are measured by the digital thermometers with controlled environmental and fabric parameters and analyzed. Fabric gain is found to be the minimum at east orientation (8966 as compared to 9006 north, 9015west, 9029south in kilo watt hours. FATEH, (1986), suggested that the Living spaces should face south, east or west. Bed rooms, bath rooms, hallways and utility room best face north or east to influence the indoor climate. To testify the optimum conditions in a house plan comprised of different zones in Lahore, a simple house layout is simulated at various angles. It is found that a maximum heat gain occurred in the living room rotated at 270 degrees (south oriented house plan), as this room faces two north and east oriented external walls. As the solar gain of under observation living zones is affected by the adjacent zones characteristics also, therefore, an optimum solution is identified and compromised at extreme summer conditions in Lahore, with the help of Ecotect v5.5. Hence a number of simulations are possible to run at various degrees to reach the optimized solutions for the desired zones output solar gain.

3. Conclusion

The optimum positioning of zones in a house plan is optimized with the help of Energy simulating applications.

References

ANDREW J. M., 2006, Thermal Modelling: *The ECOTECT Way* ISSN: 1833-7570, 002.

BARUCH G., 1998, Climate Consideration in Building and Urban Design., John Wiley and Sons.

HASSAN F., 1986, Natural Energy and Vernacular Architecture *Printed in the United States of America.*

LOS ALAMOS NATIONAL LABORATORIES OF SUSTAINABLE DESIGN GUIDE, Site and Project Planning Group, PM, state and community programs energy efficiency and renewable energy , U.S. department of energy. *Chapter 4,The Building Architectural Design.,53.*