



Housing and Building National Research Center

HBRC Journal

<http://ees.elsevier.com/hbrcj>



FULL LENGTH ARTICLE

Develop an environmental assessment technique for human comfort requirements in buildings



Ahmed Ahmed Fekry ^a, Abbas Mohamed El Zafarany ^b,
Amal Kamal Mohamed Shamseldin ^{c,*}

^a Faculty of Engineering, Cairo University, Egypt

^b Faculty of Urban Planning, Cairo University, Egypt

^c Faculty of Engineering, Ain Shams University, Egypt

Received 15 January 2013; revised 23 April 2013; accepted 24 May 2013

KEYWORDS

Human comfort;
Environmental assessment
methods;
LEED;
BREEAM;
Kano Model

Abstract Environmental assessment methods have emerged to assess the environmental performance of buildings across the world. Accurate results obtained using these methods are considered highly important, especially when taking into account the global trend of being obligatory and the use of their results to compare the environmental performance of buildings creating a fair competition amongst them. They are used for assessing green buildings regarding issues such as energy, water . . . , etc. The indoor quality is one of these issues and human comfort is evaluated in those methods using a set of items to assess achieving the identified comfortable ranges by evaluating a number of factors influencing them. These items are using quantitative measurements, so the current assessing way is considered complex besides the consumption of time and effort without reaching significantly accurate results. Therefore the research problem appears in the lack of an appropriate mean in the current assessment methods to evaluate items linked with sensation and emotions. The research paper aims to propose a more credible and an accurate assessment approach to assess those items, and also helps evaluating another set of items which are linked to the psychological comfort. The previous type of comfort rarely appears in current assessment methods despite being one of the green architecture principles. The 'Kano Model' is the proposed way used for the application of questionnaires that are put through the information network and linked to assessment methods to get more accurate and creditable results when assessing human comfort items.

© 2013 Production and hosting by Elsevier B.V. on behalf of Housing and Building National Research Center.

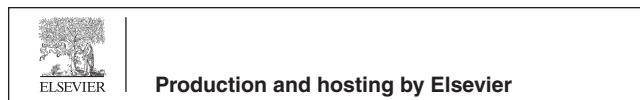
* Corresponding author. Tel.: +20 01140033359.

E-mail address: amal_ksh@hotmail.com (A.K.M. Shamseldin).

Peer review under responsibility of Housing and Building National Research Center.

Introduction

Green Architecture is known as a highly efficient system that is compatible with its surroundings through self-control in the inputs and outputs of the system [1], with minimal negative impacts on the environment and minimal energy



and resource consumption over the building's life cycle [2]. Green Architecture puts a set of principles to treat the imbalance in the relationship between the building and the environment [1]. Creating a healthy society, providing comfort and enjoyment, reducing stress from buildings on their users, increasing satisfaction and achieving integration with the surrounding environment are some of the Green Architecture principles along with many others [3]. There are several forms to meet the human requirements associated with Green Architecture starting from nature accommodating to continuous responding to the environmental changes [4]. Assessing human comfort requirements is currently done by using quantitative techniques although their subjective characteristics, raises a question about the efficiency of such techniques and the validity of having another more efficient technique to express achieving those requirements.

Environmental assessment of buildings

Environmental assessment methods of buildings appeared to lay the principles and standards that are meant to be reached with the environment, posed by the principles of the Green Architecture. Assessment certificates were issued and granted for buildings to confirm their commitment to the environment according to a specific classification that places buildings in competition with one another environmentally.

Importance of the environmental assessment of buildings

Environmental assessment concept appeared in line with the increasing of environmental awareness and the need for global systems to measure its application in various sectors. In the building sector, significant and accelerated development appeared in the field of issuing certificates to assess the environmental dimension in new and existing buildings [5]. Environmental assessment methods of buildings are voluntary in many places and mandatory in others, like most American cities, where it is necessary to obtain an environmental approval prior to the construction of any buildings [6]. Environmental assessment methods are also considered as a solution to the commitment of energy codes, helping to reduce carbon dioxide emissions and increase energy utilization efficiency. They can also help creating a comparison system between buildings, and making a specific scale for the classification of buildings in terms of preference in dealing with the environment [2].

Environmental assessment methods of buildings

A number of environmental assessment methods of buildings appeared all over the world. Building Research Establishment Environmental Assessment Method (BREEAM) in England is considered the first [5], which emerged in 1990 to assess the environmental performance of offices. Many different other methods appeared later in other places in the world [7,8], such as Leadership in Energy and Environment Design (LEED) in the United States, which first appeared in 1998 and began to be applied in 2000 [6], Green Star in Australia which appeared in 2003 [9], and Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) in Japan in 2004 [5]. In Egypt Green Pyramid Rating System (GPRS) was put to use in 2011 to assess the residential buildings, and it is issued

by the Egyptian Green Building Council (EGBC) [10]. Those methods were developed for assessing green buildings regarding many issues such as energy, water, ..., etc. The indoor quality is one of these issues.

Human comfort

Man feels comfortable when equilibrium is achieved between the inside and the outside of the human body. There are a set of requirements associated with achieving human comfort, and its achievement is considered one of the important principles in Green Architecture.

Human comfort requirements

The human being is the main element affected by the building, and he is the key element in selecting the appropriate design of healthy buildings. Achieving human requirements is a major objective for the success of any building. Physical and psychological human comforts are the clearest amongst these requirements [1]. Physical human comfort is achieved when the person stays in a balanced state (thermal, visual, acoustical) to be able to do tasks with the maximum energy possible and without any stress. There are limits of physical balance, which are common for most people, thus when exceeding these limits the rate of a person's work will be affected leading to exhaustion and additional wasted energy [3]. The building helps in influencing human physical requirements by affecting those limits, for example, it helps in achieving thermal comfort by providing climatic suitable conditions in terms of temperature, humidity, and ventilation [4]. It can also help achieving acoustical comfort by providing appropriate voice level, and helps achieving visual comfort by taking into account the acceptable level of brightness [2].

A human being has a psychological energy expressed in his response actions and behavior, and this energy helps him in interacting subconsciously with the surroundings besides other patterns of interaction which expresses the status of the human psychological balance. Psychological equilibrium limits vary from one person to another; however, there is a range of psychological satisfaction determined by psychologists. As the human psychological energy is involuntary, it is difficult to determine the influence on it, so it may be determined by experience. Human psychological requirements include security, privacy, need for forming relationships, the ability to control the surrounding environment and to share in its formation, sense of beauty and its perception, need for meeting with others and interacting with them, and so on. These requirements may vary amongst individuals and groups, and the absence of any of the human psychological needs leads to mental balance losses and prevents human interaction and responsiveness with the environment [3].

Characteristics of human comfort requirements

It could be easily noticed from the information stated above that there is a direct relationship between achieving human comfort requirements and the surrounding environment, therefore the human comfort requirement properties are linked to the environment properties which cannot be defined in a static state, so a problem appears when determining the human comfort

Download English Version:

<https://daneshyari.com/en/article/274676>

Download Persian Version:

<https://daneshyari.com/article/274676>

[Daneshyari.com](https://daneshyari.com)