Satisfacción ambiental de la vivienda. Interacción y entorno

Environmental satisfaction of housing. Interaction and environment

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Resumen

El presente trabajo evalúa las oscilaciones de temperatura y humedad relativa del estudio de caso, es decir, la vivienda común; por lo tanto, el objetivo de la presente investigación es determinar la satisfacción ambiental. Para ello se recurre a una investigación experimental aplicada, apoyada en varios tipos de estudio tales como el descriptivo, el bibliográfico y de campo, y cuya finalidad más importante es determinar la calidad ambiental al interior de la vivienda en Tampico, México.

Palabras clave: adaptabilidad, ambiente, satisfacción, vivienda.

Abstract

This paper evaluates the oscillations of temperature and relative humidity of the case study, i.e., the common dwelling; therefore, the objective of this research is to determine the environmental satisfaction. An experimental applied research, supported by various types of study such as the descriptive, the bibliographic and field is used for this purpose, and whose most important purpose is to determine the environmental quality to the interior of the House in Tampico, Mexico.

Key words: adaptability, environment, satisfaction, housing.

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Introduction

For Krueger et to the. (2014), environmental satisfaction to the interior of the House is understood as the degree of adaptability hygrothermal, which is "the realization of any normal activity in housing and where not it involved mechanisms Thermo regulators of the user". The study of environmental adaptability brings together the principles of architecture. For Ambrosini et to the. (2014), expresses those interactions of the basic elements of the user of the House with its surroundings and explains the difference of each situation that may be encountered such elements, based on the laws of thermodynamics, i.e. the dynamics of heat. According to Dimoudi et to the. (2013) is a branch of physics that studies the effects of changes of thermal quantities. Regarding how to measure the degree of interaction of the House with its surroundings, is takes the above by Olgyay (2004), who considers the process of a balanced environmental housing design. The first step towards environmental housing satisfaction, claim Berger et to the. (2014), consists of the analysis of the climatic environment of the chosen place, where it should be noted that each element produces a different impact and presents a varied situation; the second thing to evaluate, according to Ho et to the. (2014), are incidents of climate in physiological terms, and the third element to establish according to Kolaitis et to the. (2013), is the technical solution adopted in the construction of housing.

RESEARCH HYPOTHESIS

If the evaluation of the interaction with the climate environment, must be checked that the constructive system of common housing determines environmental satisfaction to the interior in Tampico, Mexico.

Study variables:

Independiente. Construction system of ordinary housing

Dependent. Environmental satisfaction

Observation values: air temperature and relative humidity.

Thematic Development

The need for new alternatives to current habitual modes of housing production, explained Lee and Lee (2014), they are determined by the evident and growing weighting of environmental damages that have been generated in the field of housing and its direct involvement in worsening reflected in the city and the natural environment.

Therefore, for Perini and Magliocco (2014), it is expected to overheating in the housing increase due to anthropogenic climate change and local urban climate change leading to increased urban heat island effect. The characteristics of housing for Taylor et al. (2014), as geometry, orientation, appearance and glass and envelope characteristics such as strength and thermal mass, may influence the risk of overheating.

On environmental monitor inside, to Goldberg et al factors. (2013), temperature (T) is the basic parameter for thermal evaluation of the housing as a component of the climate; is the parameter that determines the transfer of heat from one body to another comparatively through a scale in ° C.

Similarly, the relative humidity (RH) is usually adequate without apparent influences factor with values between 40.00% and 60.00% within the housing. When the personal and environmental factors are moderate, Runnalls and Oke (2006) considered satisfactory the interval between 30.00% and 70.00% RH.

For the analysis and interpretation of environmental satisfaction of housing, there are several ways to analyze environmental factors and their interrelationships; say Stewart et al. (2014), among the best known are the hour-grade hourly measurements inside and outside the home of temperature and relative humidity.

As regards the case of research, to Hedquist and Brazel (2014), a way of assessing environmental satisfaction housing, it is to know the data for a typical winter day and a typical summer day, as the times intermediate climates usually have less stringent; equally necessary if any uncomfortable weather conditions at one time, as a rainy season or dry wind.

Under these proposals, the local thermal comfort zone is determined and from these temperature values according to Coseo and Larsen (2014), all average temperature that is above the upper limit is too much cooling requirements, subtracting degrees exceed the limit. While all monthly average temperature, which is below the lower limit of the local thermal comfort zone has heating requirements for loss, determined by the number of degree days of the month under review (Wong et al., 2011).

To do this, Gago et al. (2013), pass environmental adaptability charts to determine environmental satisfaction space monitored in hours-grade and determining classification.

Fuentes (2011), asserts that the monitored measurements of both indoor and outdoor housing have to collect, sort and analyze in a log for future performance monitoring by environmental graphics used in this work.

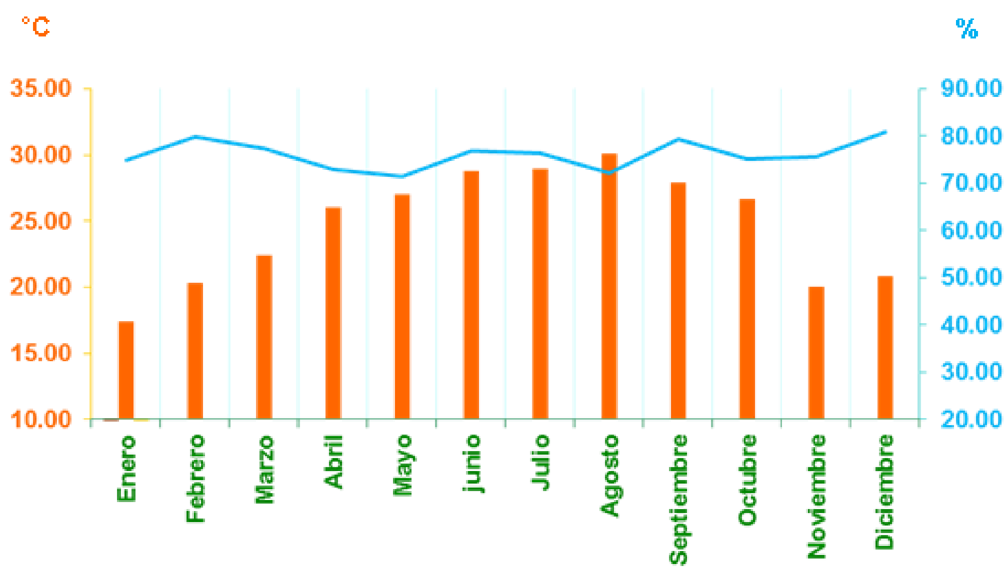
Climatic factors are the physical conditions that identify a region or a particular place and determine its climate. The main factors are: latitude, altitude and relief.

Monthly average temperature and relative humidity 2014

This research was conducted in 2014, and T and climatological data are obtained from CONAGUA HR 2015, as shown in the chart No.1.

Gráfico N° 1

Air temperature and relative humidity monthly average 2014



Source: Elaboración propia. Datos de CONAGUA.

Adaptive thermal comfort models

The main models are described to evaluate the thermal performance of housing case studies, which are adapted to the climate of the area and are known so far. These models are presented in previous research studies as Chavez Valley (2002) and Roriz (2003).

Thermal comfort model Humphreys, M. A.

Humphreys (1995), is a review of data from field studies, which found a strong statistical dependence of thermal neutralities (Tn). Is the value Tn ranges about 13.00 ° C that is between 17.00 ° C and 30.00 ° C, so that the following equation applies:

$Tn = 2.56 + 0.83. Ti$ (1)

Thermal comfort model Humphreys, MA and Nicol F.

Further analysis by Humphreys and Nicol (2001), replacing the inside temperature by the outer half, produces similar results in mechanical systems housing without air conditioning:

$Tn = 11.9 + 0.534. Tm$ (2)

Thermal comfort zone, with constant limits

The width of the strip of constant comfort or tolerance limits, as mentioned for Nicol and Humphreys (2002), considered directly proportional to the ability of users to perform adaptive actions width. In this case, the thermal comfort zone may be considerably wider than + 2.50 ° C around the mean preferred temperature.

Features common home in Tampico, Mexico

The technology joint housing is mass-produced architecture, and therefore, is industrialized and standardized housing for the general population, built from 1980 to 2014 Tampico, Mexico, similar to that produced in Mexico.

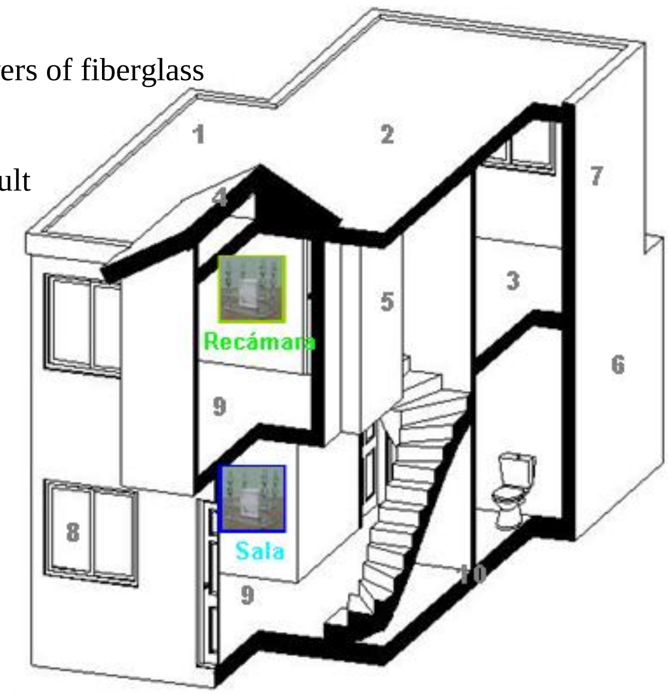
For Fuentes (2014), the typical common housing provides in average measures, interior floor to ceiling heights of 2.40 m; with an interior of 200.00 m3 total volume; slab area of 42.00 m2;

envelope area without slab 161.80 m2; area of openings in the envelope of 15.00 m2; giving a total percentage of openings in the envelope of 09.00%. See graph No. 2.

Gráfico N° 2
Isometric ordinary housing case study

Constructive solutions

1. Waterproofing based on acrylic resins and layers of fiberglass
2. Cover with lightweight roof beam and vault
3. Cover with lightened mezzanine beam and vault
4. light block Pretiles 0.15 x 0.20 x 0.40 m
5. Flattened inner gypsum
6. Wall heavy block of 0.15 x 0.20 x 0.40 m
7. exterior stucco cement-sand ratio 1: 5
8. Cancelería natural aluminum glazing
9. polished concrete floors
10. slab foundation of reinforced concrete layer
11. Hydraulic installation of PVC pipe
12. Sanitary installation with copper tubing



Source: elaboración propia.

Methodological foundations

The investigation is a procedure that allows focus on environmental satisfaction ordinary housing as a case study to obtain broad, deep and thermally contrasting information. Feng et al., (2014) consider priority use interview, observation, document analysis and thermal measurement.

Therefore, it is considered an experimental applied research, carried out in 2014 to only identify patterns of temperature (T) and relative humidity (RH), and that had not been previously performed in this type of housing in Tampico, Mexico.

The methodology is to implement multimodal type and by triangulation, as different methods applied provide quantitative and qualitative approach aim to facilitate the analysis of the case study and evaluate. At the same time, this research is based on various types of study to achieve suitable, such as descriptive, bibliographic and field results.

The assessment of the interaction with the climatic environment is the theme of the research through the factors that influence the environmental satisfaction, in order to determine into temporary fluctuations of temperature and relative humidity of the common housing.

As this paper an experimental applied research, is set in the document establish environmental satisfaction housing case study considering that inhabited that uses no artificial air-conditioning and in their usual functions are performed not to interfere with the timely monitoring temperature and relative humidity.

Measuring instruments

According to Fuentes (2014), measurements within the common housing are made with Hobo's U10-003, data loggers; Hobo is a reliable electronic instrument capable of measuring air temperature and relative humidity. Thermal measurements made by space of a year in housing case study, with hourly monitoring intervals, 24 hours.

For the experiment data loggers only two well-defined spaces housing case study, a social area as the living and intimate area and the master bedroom are located, since measurements of air temperature and relative humidity both spaces vary according to various factors and activities that affect the day and night (Shahrestani et al., 2015).

Daily log monitoring

The measurements presented by each data logger Hobo U10-003 Tmr of the internal spaces, exported to a spreadsheet for Microsoft Office Excel; there is a table made from the intact air temperature measurements in ° C and relative humidity expressed in%, contrasted with thermal values provided for climatology 2014 by CONAGUA.

Hygrothermal evaluation through graphs comfort zone

Typical months and days, and determining the excess loss with respect to variable temperature, are obtained from considering the temperature of neutrality according to the adaptive model of thermal comfort and Nicol Humphreys (2001).

Tn = 11.9 + 0.534. Tm °C=	Constant limits °C
Upper limit =	+2.50°C
Lower limit =	-2.50°C

The months to determine the surplus and loss with respect to the variable relative humidity, should take into account the provisions of ISO 7730: 2005, which places it ideally in 50.00%; They are determined as follows:

HRn=	50.00 %
Upper Limit=	60.00 %
Lower limit=	40.00 %

Graphics environmental adaptability

Graphics and HR Air T housing are made according to the daily average values provided by U10-003 hobo's for the interior; while for the outer ones provided by CONAGUA, considering the months of January and August estimates by research, and developed with a constant comfort zone used. Also, Pathirana et al. (2014), provide the annual performance rating of T and monthly average HR 2014. This chart type resulting from the Tn-lower limits-day comfort, too much heat loss and higher and the HRC-determined limits, and top and bottom-day comfort, too much heat loss and HR.

Monthly typical day graphics and environmental adaptability

Below are graphs of typical days of each house and space with constant comfort zone every month of 2014. This chart type is determined to Li and Babcock (2014), the Tn are produced; the upper and lower limits; hours of comfort, and too much temperature loss; T oscillations inside and outside-amplitude minimum and maximum T; HRC; upper and lower limits; hours of comfort, too much loss and HR; indoor and outdoor swings HR; minimum and maximum amplitude RH.

RESULTS

The results are presented according to scientific experiment with hard data.

Climatic environment in 2014

The annual behavior of monthly average temperature of 25.30 ° C with a higher temperature differential of + 0.30 ° C in contrast to the historical.

The month with the lowest average temperature is January with 17.40 ° C, therefore, it is the most critical month winter season. Also the month with the highest average temperature is August with 30.10 ° C, which is the most critical month summer season. The temperature variation between them is 12.71 ° C.

For this work it is determined that the stations most critical and relevant to perform the research experiment were winter and summer, and the critical months are from January and August respectively.

Environmental adaptability

Environmental satisfaction of ordinary housing in the room in January 2014

In temperature it has a total of 25 days convenience 0 and 6 of excess loss. The minimum expansion between the inner and the outer is 0.00 ° C, and the maximum of 5.90 ° C. Relative humidity comfort filed 5 days, 0 and 26 too much loss. The minimum differential expansion relative to the inner and outer is 1.00%, and the maximum of 16.40%.

The average temperature is 21.50 ° C inside, outside 19.50 ° C, while the inner half relative humidity is 71.80% and 71.30% outside.

Environmental satisfaction of ordinary housing, room typical day in January 2014

Consistent comfort zones exhibit the typical 24 hour day comfort temperature. The oscillation indoor temperature is 3.10 ° C and 2.00 ° C outside. Its minimum magnification of 1.50 ° C and maximum of 2.80 ° C. Presents relative humidity 24 hours in excess, with an internal oscillation 6.80% and 6.10% outside the extension with respect to the inner and outer minimum is 0.000% and maximum 1.80%.

The inner average temperature is 21.50 ° C, 19.40 ° C outside, the relative humidity within average 71.80% and 73.00% outside.

Environmental satisfaction of ordinary housing in the room in August 2014

In temperature it has a total of 6 days of comfort, 25 and 0 too much loss. The minimum expansion between the inner and the outer is 0.20 ° C, and the maximum is 4.90 ° C. The relative humidity has 31 days to excess. The minimum differential expansion with respect to the interior and exterior is 0.00% and maximum 9.00%.

The average temperature is 30.60 ° C inside, outside 28.90 ° C, and the average relative humidity inside is 74.70% and 73.60% outside.

Environmental satisfaction of ordinary housing, room typical day in August 2014

In areas of constant comfort typical day there are 24 hours of excess temperature. The oscillation indoor temperature is 0.90 ° C and 0.70 ° C outside. Its minimum magnification of 1.40 ° C and 1.90 ° C maximum. Presents relative humidity 24 hours in excess, with an internal oscillation 5.00% and 3.30% outside the differential expansion with respect to the inner and outer minimum is 0.10% and maximum 3.00%.

The inner average temperature is 30.60 ° C, 28.90 ° C outside, the relative humidity within average 74.70% and 73.60% outside.

Environmental satisfaction of ordinary housing in the chamber in January 2014

In temperature it has a total of 27 days of comfort, 0 and 4 of too much loss. The minimum expansion between the inner and the outer is 0.10 ° C, and the maximum of 6.30 ° C. Relative humidity presents four days of comfort and 27 days too much. The minimum magnification with respect to the interior and exterior is 0.10%, and the maximum of 14.50%.

The average temperature is 21.60 ° C inside, outside 19.40 ° C, and the average relative humidity inside is 72.90% and 71.00% outside.

Satisfaction environmental common housing, the chamber typical day in January 2014

In areas of constant comfort typical day there are 24 hours in the Gaza comfort temperature. The oscillation indoor temperature is 3.20 ° C and 2.00 ° C outside. Your minimum magnification is

1.60 ° C and 3.10 ° C maximum. Presents relative humidity 24 hours in excess, with an internal oscillation and exterior 17.50% 6.20%, and the differential expansion with respect to the inner and outer minimum is 0.60% and maximum 6.80%.

The inner average temperature is 21.60 ° C, 19.40 ° C outside, the inner average relative humidity is 72.90%, and 71.00% outside.

Environmental satisfaction of ordinary housing in the chamber in August 2014

In temperature it has a total of 7 days of comfort, 24 and 0 too much heat loss. The minimum expansion between the inner and the outer is 0.10 ° C, and the maximum of 5.20 ° C. The relative humidity has 31 days to excess. The minimum differential expansion relative to the inner and the outer is 0.10%, and the maximum is 18.40%.

The average temperature is 31.00 ° C inside, outside 28.90 ° C, and the average relative humidity inside is 75.30% and 73.60% outside.

Satisfaction environmental common housing chamber typical day in August 2014

In areas of constant comfort typical day has 24 hours in temperature excessively. The oscillation indoor temperature is 1.80 ° C and 0.50 ° C outside. Your minimum magnification is 1.00 ° C and 2.90 ° C maximum. It presents relative humidity 24 hours in excess, with an internal oscillation 8.70% and 3.30% outside, the thermal expansion with respect to the inner and outer minimum is 0.10% and the maximum is 7.80%.

The inner average temperature is 31.00 ° C, 28.90 ° C outside, the inner average relative humidity is 75.30%, and the exterior is 73.60%.

Conclusion

The common living case study presents architectural plans on two levels with good spatial and formal distribution, the spaces are minimal but significant to the essential functions of the users; however, it has the disadvantage of not having openings in its east-west facades, thereby neglecting the direction of the prevailing winds and, therefore aeration.

In ordinary housing on the top floor, the percentage of thermal disadvantage is higher than on the ground floor that is in contact with the roof slab, achieving thermal conduction into the chambers by direct solar radiation.

The common living room features architecture of passive option, you are in the comfort zone and summer only requires good ventilation. The annual average hygrothermal classification of the room is a warm humid space.

The bedroom of the common housing which also manifests a passive architecture option, you are in the comfort zone only in summer, demand cross ventilation and dehumidification of space. The annual average hygrothermal classification bedroom is a warm humid space.

Therefore, in terms of environmental satisfaction of the common housing case study and their interaction with the environment, as warm humid spaces, ie stifling heat producing evaluated; However, while the relative humidity is higher inside, the hotter it will perceive that space.

With this it is found that by the climatological assessment and construction system of ordinary housing, can be determined environmental satisfaction inside in Tampico, Mexico.

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