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Research Paper

Results and observations of natural and artificial lighting, in the homes produced in series in Ciudad Juárez.

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ABSTRACT :*Natural and artificial lighting is an important factor to consider in the construction of any type of housing. Since this, it is the one that will provide better visibility by performing any daily activity within the home. These activities vary according to their complexity or simplicity, depending on who performs them. Inadequate lighting can cause eye fatigue, tiredness, discomfort, stress and domestic accidents in its inhabitants, in addition to the obvious damage to the eye that entails the realization of tasks with insufficient lighting. That is why it is important to consider that incorrect lighting, can cause inconvenient postures that trigger in the short, medium and long term, as well as general physical conditions in its occupants. The objective of this research is to analyze the lighting conditions in the homes built in series and determine if they meet the main characteristics recommended by the official standards in Mexico, and that offer optimal lighting in order to generate recommendations that help improve the quality of life of its occupants.*
KEYWORDS: *Natural and artificial lighting, serial housing, quality of life.*

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I. INTRODUCTION

Lighting began with the simple fact of simplifying the life of the human being when the resources of natural light were no longer enough.Light is an essential component in any environment as it makes possible the vision of the environment. But in addition, by interacting with objects inside the houses in line with the visual system of the individual, it can modify the appearance of the space, influence its aesthetics and setting, affect or benefit visual performance, increase or decrease the mood and consequently people's motivation.

The lighting previously only involved providing light in appropriate or necessary quantities to enable daily activities. So, lighting today has a more complex approach. Efficient lighting must meet visual needs, create environments[1]

II. REFERENCE MARK WHAT IS HABITABILITY?

Habitability refers, to all physical and non-physical conditions of space, which allow human permanence, survival and to one degree or another, the gratification of its existence. Among these conditions are all those concerning the process of transformation of the territory and the spatial ordering of the internal and external relations of human element with its environment[2].

David Weimer [3] comments that the minimum of housing is that high enough to be commonly recognized as necessary for a dignified survival and this means that for a dwelling to be worthy for man he has what it takes to be able to carry out their day-to-day activities without suffering from needs or deficiencies in the home [8]. According to Javier Sánchez [4] mentions that a very important aspect for the development of housing of any kind is the size of it, the dimensions of any construction are determined by the needs, the budget and the purpose of each project. In the case of housing, this should be able to contain the spaces for the essential activities of a particular lifestyle, talking about economic housing, the budget is the main limit for this type of development, the objective of this kind of product is to provide decent housing to people of low purchasing power, in order to achieve this, most of the time the size of the house will be restricted to the extent that costs allow [4].

III. ANALYSIS OF THE HOUSES CONSTRUCTED IN SERIES IN MEXICO.

The Mexican housing law has a broad definition of what a decent home should build: It is one that provides its inhabitants with security, as well as aspects of construction, habitability, health and services, as well as considering the protection of disasters [5]

Gerardo Pisarello[6]mentions that having a home is a necessary condition for survival and for a safe, autonomous and independent life. It is an essential premise to be able to realize other rights such as health, education and the free development of personality, which are impractical when there are no minimum conditions of habitability, for this reason it is essential that the human being have a home with which human beings can perform in their activities [6].

Housing is one of the most precious assets for humans, as it takes place aspects of great relevance such as the process of socialization, development and individual development, in addition to be a space of security and privacy

3.1 DECENT HOUSING

The World Health Organization (WHO) says in its hygiene principles that adequate housing is one that provides protection against communicable diseases, trauma, poisoning and chronic diseases, so it must have non-communicable materials toxics, proper waterproofing and climate protection. It must have spaces that minimize psychological and social stress, should envisage an improvement in the housing environment and should especially protect exposed populations or in vulnerable conditions. The federal housing law indicates that it must have living spaces where meeting or rest activities take place, with minimum dimensions of surface, height, ventilation and natural lighting, a minimum bathroom, kitchen, a living room and two bedrooms, as well as auxiliary spaces such as work areas, hygiene and circulation[7].

Irma Romero [8] mentions that the house is suitable when occupied by a single family, has differentiated spaces in which the bathroom, the living room or the bedrooms to eat are not used, it only sleeps in the bedrooms, has enough rooms for the family to carry out activities that require them to develop healthy in which no more than three independent people sleep in a single room, and two in the case of a marriage, i.e. the occupancy rate is 2.5 inhabitants per quarter and has the surface according to the size of the family, therefore an optimal home must fulfil its function based on its activities and its inhabitants [8].

The definition of the size or characteristics of minimum housing that a citizen should have corresponds to a political decision on how far we are collectively willing to sacrifice to achieve better distribution according to David Weimer [3] comments that the minimum of housing is that high enough to be commonly recognized as necessary for a dignified survival and this means that for a dwelling to be worthy for man he has to have what it takes to be able to carry out his activities without suffering from needs or deficiencies in the home.

A very important aspect for the development of housing of any kind is the size of the house, the dimensions of any construction are determined by the needs, the budget and the purpose of each project. In the case of housing, this should be able to contain the spaces for the essential activities of a particular lifestyle, talking about economic housing, the budget is the main limit for this type of development, the objective of this kind of product is to provide decent housing to people of low purchasing power, in order to achieve this, most of the time the size of the house will be restricted to the extent that costs allow [4].Building spaces must have the means to ensure the ventilation and day and night lighting necessary for their occupants [9].

3.2 THE HOUSE BUILT IN SERIES IN MEXICO.

Jaime González [10] comments that mass production or mass production system is distinguished by its orientation towards manufacturing standardized products in high volumes, using machinery for special purposes, in the case of homes is when they occur in masse, depending on a housing model.

3.3 THE PROBLEM OF HOUSING BUILT IN SERIES IN MEXICO.

It is estimated that 60% of the population resorts to social production of habitat, self-construction and self-production, leaving 40% with access to credits and the possibility of acquiring a house produced in series, i.e. a house designed by ones for the v which motivates changes that must be known in their architectural causes in order to foresee effects on living conditions in urban space [11].

Elena Torres[12] comments, that the process of serial housing, teaches a trend towards lower quality for greater quantity, by decreasing the quality of the house, decreasing the quantity and dimensions of the spaces and materials used in its construction, in order to achieve a more economical and therefore accessible housing for a greater consumer audience, that is why the serial homes are produced in a large mass but the quality of the houses is diminished [12].

The massive production of supposed housing as a vehicle to improve the quality of life of the inhabitants is questionable due to the absence of mechanisms to identify the successes and misadventures with which to verify degrees of efficiency and reveal how it is achieved improving the living conditions of the

inhabitants, in fact, making housing and urban design smaller, is clearly an inadequate strategy, which also has negative effects for environmental urban quality [11].

JoeliaDávila[7] mentions that there are large urban development'swhose design is the replica of a housing model with minimal measures but at very low construction cost and that many times do not meet the requirements required by the federal housing law , much less the United Nations (UN), but that are the only options that millions of Mexican workers have access to, and that in the end they end up living in those dwellings where they are reduced and in some sometimes these homes are unsuitable for those families because sometimes they are families of more than 4 members per family.

3.4 OFFICIAL HOUSING STANDARDS IN MEXICO

According to the Secretary of Social Development (SEDESOL) in the housing building code, it gives a series of rules that must comply with housing and the National Housing Council (CONAVI) recommends the following: Every house must have at least, either in independent or shared spaces, a bedroom, a bathroom that has a toilet, sink and shower and another space in which the rest of the functions of the house are developed [9]. The relationship between the spaces of a home is feasible if, functional activities are not mixed or affected between them.

- The bathroom must not be forced to access another space.
- Laundry can only be mandatory passage between the kitchen, alcove, service patio, garage and outside.
- The bedroom should not be forced to access other premises other than the dressing room, bathroom or any other additional service premises intended for the exclusive use of who or those who stay there except the house with a single bedroom.
- When the house has more than one bedroom, at least one bathroom or half bathroom, it must be accessible from the circulation spaces of the house.
- Stay, dining room and kitchen can constitute a common space, but with functionality clearly defined and separated according to activities of each overlapping space.

Minimum dimensions for living and auxiliary spaces		
Habitable Space	Minimum area	Minimum side
Stay	7.29 m^2	2.70 mt.
Dining room	4.41 m^2	2.10 mt.
Bedroom	7.29 m^2	2.70 mt.
Bedroom	3.60 m^2	2.00 mt.
Kitchen	3.30 m^2	1.50 mt.
Bathroom	2.73 m^2	1.30 mt.
1/2 Elongated bathroom	1.44 m^2	0.80 mt.
Laundry	2.56 m^2	1.60 mt.
Patio	1.96 m^2	1.40 mt.
Stay-Dining Room	12.00 m^2	2.70 mt.
Stay-Dining-Kitchen	14.60 m2	2.70 mt.

Figure 1 Minimum dimensions for living and auxiliary spaces.

Thus, after observing these recommendations and adding up the square meters that recommend the building code of CONAVI. With a total of 24.62m2, which includes a room-dining room-kitchen, a bathroom and a bedroom or the other option of 25.32m2, living room, kitchen, bathroom and bedroom. That is why from this point it was determined to analyze the following fractions.

IV. METHODOLOGY

This research will be of exploratory type, where through analysis and observation in the homes and based on the use and use and review of the levels of natural and artificial lighting, taken by means of a luxmeter, as well as the application of color on the walls.

4.2 DETERMINATION OF CASE STUDIES

For the case study of the serial homes in Ciudad Juárez Chihuahua, three fractions located to the south east of the city were analyzed, which are; Las Haciendas, Parajes de San Isidro and Cedros I and II. The main factor to analyze for this study the location of the premises, the size of the lot, the meters of construction, which should be within the minimum housing range of CONAVI. Within this research several aspects of habitability were lightened, but for this project only light measurements were taken into account, Para was the level of natural and artificial lighting in the homes of which it was detected that due to factors such as the physical space of the houses does not allow to contemplate the use of furniture, this in the long run causes the entrance of natural light to be obstructed, in addition to not having artificial lighting suitable to light at night, because its economic resources, only allows them to have the most economical luminaires on the market, this resulting in less performance in their activities.

This case study in Ciudad Juárez tries to provide data on the selected fractions such as the year of construction of the fractionation, number of homes built by fractionation and location of the fractions in the city in addition to provide data obtained in the visit to the selected fractions, in order to finally give conclusions and compare results of each fractionation.

4.3 B. LOCATION IN THE CITY.

In general, developments are located in the urban growth area over the last 10 years, defined as south-east and north-east, which correspond to the period of greater territorial expansion and where the private sector participates as a developer and developer of these colonies. (See Figure 2 Colony Location Plane).

Figure 2 Location of the study colony's in trace in Cd. Juárez

The basic criteria that were considered for the selection of case studies were:
• There are single-family housing projects in lots of 120 m2.
• The range of the constructed area is between 32 and 38 m2.
• They are homes with a high percentage of acceptance in the allocation period.
• Location in housing development areas of social interest to the southeast.
• The proposal has vertical growth possibilities.

V. RESULTS

To understand a little better what was the perception of the quality of lighting in homes, 187 surveys were conducted and the following data

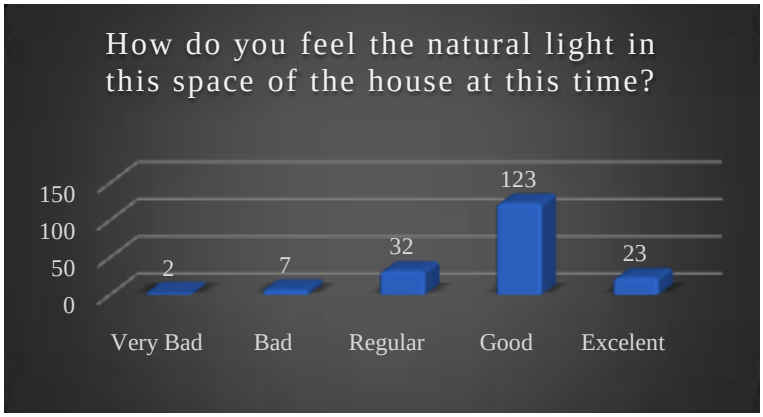

Figure 3 Results of how they feel the natural light in the space of the house in this moment

The results of the 187 surveys carried out in the homes were found that 123 of them mention that the quality of light is good, this result was taken with daylight, where the natural lighting was not of poor quality. Seven of them mentioned that it was bad, however, in these homes it was found that the windows were obstructed by furniture that prevented the entry of natural light.

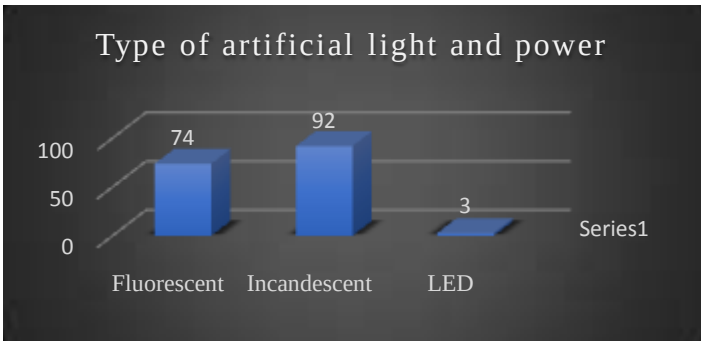

Figure 4 Results of the type of artificial light

In the question of what was the type of light they used, the results found were not the desired ones, since 92 of these homes the type of light bulb they use is the incandescent, this is for low cost of this type of spotlights, without considering which are the ones that consume the most electricity. Only three of the surveyed homes had LED type lights.

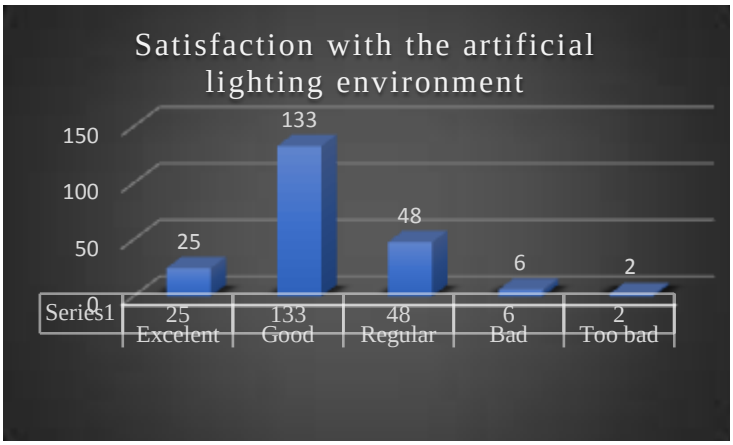

Figure 5 Results of the satisfaction with the artificial light

These 187 surveys, 25 consider it excellent, but only 12% and are those who receive a salary above the minimum. While 62% contemplate it good. Considering that these results give a total of 74% satisfied with artificial lighting. On the other side, 22% who are 48 of them consider it regular because it does not meet their expectations, although in the observation it was found that they are mostly those who only place a spotlight for the common kitchen area and living room. And only 8 of them consider it bad and would like to have more light outputs in other parts of the house.

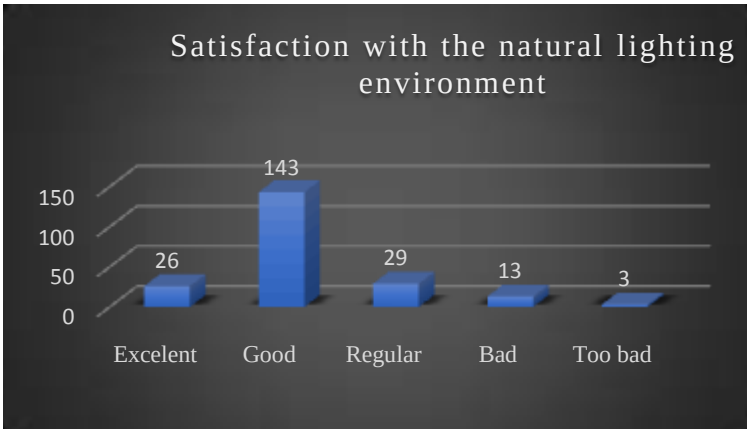

Figure 6 Results of the natural light

VI. CONCLUSION

The objective was to know the light quality in the houses built in series in Mexico, specifically in Ciudad Juarez, where the following was found:

1. The light quality in the homes is adequate, however, overcrowding does not allow sunlight in a convenient way by clogged the windows with furniture that require its occupants to either sleep or rest.
2. The artificial light quality, in terms of lamp outputs, is adequate to install a lamp that could have several functions or spotlights, such as ceiling fans or decorative lamps. However, many of its occupants only install a spotlight and this causes poor light quality. But, in the answers they provide they give favorable answers, although the measuring devices (lux meter) indicate otherwise.
3. Another detail is the type of focus they use, the majority is incandescent light since it is the most economical in the market, according to the data obtained in the in-depth surveys. Although they are aware that it is not the most energy saver, coupled with the purchase of low voltage and not enough to light the rooms. On the other hand, not all rooms had spotlights.
4. It should be emphasized that this research is a question of mentioning the problems faced by homes built in series and thus be able to detect possible problems to be solved or recommended to institutions in charge to jointly seek a solution to this problem. through the indicators that will be mentioned in the final project of CONAVI. The size of the windows if suitable for the room space, the problem is the physical space projected and built in the houses it does not contemplate the use of furniture, which allows to meet the needs of its inhabitants, whether rest and coexistence, among others. Moreover, the economic problem faced by these inhabitants in lacking resources for adequate artificial lighting.

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