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الملخص الإنجليزي



English Summary

SYNOPSIS

1. INTRODUCTION

1. This thesis reflects the interest (public and specialized) taken in the elements of the Arab-Islamic culture of which architecture forms an important part and at the same time in the "natural lighting" which is the proper alternative to the artificial day-time lighting, now being depended upon in Egypt in many modern buildings, which ignore Egypt's day-time everlasting high source viz : the great sun and ignore the fact that our economy, under present circumstances being unable to afford such a luxury is putting "Energy conservation" as one of its main targets.

From those two considerations stems the basic idea of this thesis: Natural Light in Islamic Architecture. A number of halls (Ka'as) in some houses belonging to the First Mamelouki Epoch (1257 - 1382) and the Ottoman Epoch (1517 - 1800) in Cairo were chosen to carry out this research work thereon and to draw out the necessary results.

II. OBJECTIVES:

The aim of the research work was to find out:-

- *Whether there has been a certain rule governing the design of the day-light openings (in the chosen Ka'as) as regards type, dimensions and position?*
- *Whether the designers adhered to a certain ratio between the effective (light permitting) area of the openings to the area of the Ka'as floor.?*
- *Whether any common characteristics between the similar parts of the different halls (regarding the degree of illumination)?*
- *Whether an acceptable natural - light quality has been achieved, as regards graduality and contrast among measurement points and the avoidance of glare?*

III. PROCEDURE:

After the historic and light science basis were reviewed, the following field work has carried out:-

- *Full dimensional survey of the selected ka'as was carried out including the day-light openings, and the elements of their wooden lattices. The quantity of natural light was determined in terms of calculating the ratio of the effective (light permitting) area to the area of the Ka'a flooring.*

- *Field measurement of the illumination intensity was made according to a certain system within those Ka'as in order to determine the natural light distribution therein and the extent of its conformity with the requirements of the proper quality and visual comfort and satisfaction.*

- *Comparative analysis of the said measurements was carried out.*

IV. CONTENTS OF THE THESIS:

Chapter I: "Historic review".

This chapter reviews the development of the architectural designs across the ages and how the daylight openings thereof were utilized and how they were affected by the customs; beliefs and constructional methods and ways.

Chapter (2): In-door Daylight characteristics:

This chapter is based on the science of light and its applications as regards quantity and quality of daylight, that change according to hours of the day and to months of the year and depend on the sky conditions and reflections inside and outside buildings in different cases.

Chapter (3): "Comparative field study in Ka'as of some Islamic Buildings in Cairo belonging to Mamelouki and Ottoman Epochs".

In this chapter, the field study in each of the chosen Ka'as was described showing the daylight conditions as regards quantity and quality. The natural light distribution and analysis is also given.

Chapter (4): "Results"

This chapter shows the results of the field study and the natural - light conditions in the chosen Ka'as together and the attempt to determine the rules that governed the choice of dimensions and positions of the daylight openings.

V. Summary of the Results of the Research Work in the Chosen Ka'as

1. As regards the bigger Iwan:

- *Average illumination intensity at the Bigger Iwan in most Ka'as is higher than that at the smaller Iwan and the Durka'a.*

The region with highest illumination intensity for the whole Ka'a always lies in the bigger Iwan.

This may indicate that the Bigger Iwan was the region where important activities were practiced.

At the same time, the unpermissible glare, if any, was found at the bigger Iwan.

- *Actual contrast Ratios at the bigger Iwan were congruent among themselves but were far from the recommended contrast ratios. In some cases there was no light graduation of all. Consequently, the light graduation was not satisfactory in all cases with a few exceptions.*

2. As regards the smaller Iwan:

- Average illumination intensity is much lower than any acceptable figure (100 Lux).
- Contrast Ratios are also far from recommended ones.

In some cases, no light graduation at all existed.

3. As Regards the Durka'a:

- Average illumination intensity is very low in most cases.
- Light graduation is lower than recommended values in all cases.
- The alm results were expected since the Durka'a is actually a sort of entrance to the Ka'a and a centre of distribution of activity to other regions of the Ka'a.

4. As regarding the Ka'a as a Whole:

- The ratio between the active (light penetration area) and the floor area ranges between 32.11% and 14.38%. This ratio is higher than the minimum value stipulated in the Egyptian buildings law in force now, viz. 8%.

- *The materials used in the internal surfaces in the chosen ka' as have a great effect in the light distribution according to their reflection factor which range between 15% (stone) and 45% (marble and mosaic).*
- *Average illumination intensity is below acceptable values, (taking into consideration present circumstances where the environments have changed).*

5. Daylight Openings (Windows)

- *No fixed rule governs the relationship between widths and heights of windows (In 3 ka'as that relationship was near the Golden Ratio viz 1 : 1.618).*
- *No fixed rule governs the distribution of windows in the Ka'a.*
- *No fixed rule governs the height of window sill.*

6. Window Lattices in Windows:

- *Narrow lattice in lower parts of Mashrabias has been effective in preventing direct sun light and consequent glare and high temperature.*

- *Breaking up of outdoor brightness into small pieces may cause glare as a result of contrast between dark brown colour of Mashrabias and out door brightness.*
- *The lattice efficiency affects the quantity of light in the ka'a.*

7. General Results Regarding Day-light Openings:

The day-light openings in most of the chosen ka'as did not achieve the required light quantity, quality and proper distribution. Light was concentrated in a certain region, with other regions left in darkness, although the ratios of window effective areas to flooring areas were sufficient.

It seems that the designer put the utmost importance to the aesthetic aspects, ventilation, psychological effects and social customs, without giving due consideration to good day lighth-distribution according to our present day criteria.

NATURAL LIGHTING IN ISLAMIC ARCHITECTURE

**A COMPARATIVE FIELD STUDY IN SOME HALLS OF
MAMELOUK AND OTTOMAN HOUSES IN CAIRO**

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