

# Productive interior spaces: illumination parameters of architecture

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**Abstract:** Human spend a lot of time inside building, it can be a residence, office, school, college, industry etc. Each and every person will spend their time effectively inside a building if he is provided with the perfect atmosphere within the building. This perfect atmosphere can be the mixture of HVAC, anthropometry and ergonomics inside the building and perfect interior lighting.

In this study I'll work on how natural and artificial light affect the occupants inside the building and also the aids used for getting proper light in the interior. Each and every room in any building is meant for a specific function, light can help the designer of architect to implement the perfect atmosphere inside a room and hence make the space effective for its function. The interior environment affect the person psychologically.

There is a common misconception in many countries that building is just a place to live surrounded by four walls, they need no proper light and ventilation. This misconception has to be changed and must make people aware that light plays a major role inside the building and affect the person in both mental and physical manner. People's perception in the interior environment influences their social behaviour within that environment.

The same way different age group people want different types of light and hence affect them in different manner.

## INTRODUCTION

Architecture is no longer a definition of the region it is in, vernacular architecture is fading away more and more with every day, replaced by the bright ideas of leading architects around the world, new technologies and techniques that make construction faster, easier and more efficient; new visions and concepts that redefine the very meaning of architecture from being a "space" to satisfy a need, into being a functional piece of art, every aspect of which serves a certain purpose. Studies are made for the betterment of this functionality, on different fields that affect architecture one way or another. The built and the living things are not divided from each other, but one is part of the other, and the architect has to imagine how the structure will affect the person psychologically, will it change the mood of the person or does it have any other impact? In parallel, the architect should wonder how will human presence affect the architecture of the project, and he should use this presence to enhance the project and not deprive it.

The architect has to look into the smallest details of what he is creating: The volumes of the interior, the colours, the lights, the height of the ceiling, the materials used for the interior as well as the exterior, the openings and windows, the types of lamps, paints, furniture etc. However my interest has always been

the light and its effects on the building. It is incredible how the natural light can affect our mood: we feel gloomy on a rainy cloudy day, we feel exhausted if we stay too long in the hot sun. Also the sun, and the light in broad, affect how we see things, depending on the intensity, the focus, the colour etc. It can change shapes and add or subtract emphasis from one point or another, it affects how we see volumes whether it was in interior space or the exterior. Seeing and reading about architecture of residential and other buildings amazed me at how much the effect of natural light in the first place and artificial in the second place, is taken into consideration.

## 1. LIGHT

### 1.1 Definition of Light

All sources of light have their own particular qualities, some of which are the result of the light source itself and some the result of external influences, such as the weather and the landscape. The light from the sun, for example, is continuously changing, depending on the time of day, the time of year, the weather ...etc The quality of any light (whether natural or artificial), can be defined in three simple ways:

- **Tone**
- **Intensity**
- **Focus**

### 1.2 Natural effects of light:

The atmosphere we experience in the outside world in the combination of the tone and the contrast produced by the conditions. We can begin to study those natural conditions by analyzing the tone, intensity and focus. The quality of sunlight at noon in the Sahara desert is harsh and bright, with intense shadows. By contrast, in a deciduous wood on a wet day in the northern hemisphere, the light is muted and soft with very little obvious shadow, the whole effect being diffuse and vague. Human's mood is strongly influenced by these conditions, the feeling tend to vary in a certain way about a place or scene, depending on the quality of the light. The search for understanding the relationship between light and mood was of primary importance to the impressionist school of painters at the turn of the century. They sought to represent light with pigment, capturing atmosphere through colour. Studying their work has brought important information about the colour of light and its effect on mood.

### 1.3 Light as material:

Architects thoughts always seek the material of finished product while they work out the puzzles of the volume or proportion of space. Different materials, including stones, brick, steel, glass, wood, tile, plaster, paper and cloth render different qualities in architecture. Light is an equally and sometimes more influential element in determining the result. It can even highlight or damage the value of architectural materials themselves. Lighting fixture is an important tool for architectural lighting design that distinctively offers specific function. Each fixture has a different purpose according to the architects

intention. Be it spots or lamps or chandelier, these fixtures are the architects accessories to producing the space. However, the fixtures should stay behind the scene, the goal of light is to create a miraculous situation whereby the right amount of light is floating in the air comfortably. The ideas for lighting design usually do not come out of the blue. Because architecture is a mean of various space functions, a function of light is also hidden for each of these segmented spaces. Liberal ideas full of creativity should be employed after thoroughly examining how the space should function.

## **2. EFFECT LIGHT HAS ON MOOD AND PSYCHOLOGY**

So light has a direct effect on our mood and feeling, from a scientific medical point of view. Light acts on the production of cortisol, serotonin, and melatonin, three important hormones that affect our internal clock and our mood states, among many other effects. It is important to keep these hormones in proper balance. Low levels of serotonin (the daylight hormone) cause depression. Light therapy, be it artificial or natural, has been found to be an effective antidepressant but only when the light is bright enough.

Light not only affects the psychological state of the person, but also has a direct effect on what he feels in a certain ambiance.

An architectural space accompanied by a satisfactory function of light has the power to move people. The root of architectural lighting is how it can cater not only to the biological, but also to the psychological needs of humans. The way architectural spaces are perceived generally vary from a person to another, but there is something known as an emotional impact, which is rather common among people. However, different studies have shown that the light colour and intensity may affect people differently according to their age and gender: a study showed that young adults (of around 23 years old) preserve a negative mood in a warm (red tones) atmosphere, while older adults (65 years old) the cool (blue tones) conveyed the same negative effect when it came to cognitive performances. Light, its colour and intensity, vary according to the function of the local it is in. Thus, a hospital room, a classroom and a living room of a residential home should have different lighting whether it was artificial or natural (variation of opening types and spaces). Hence, Light is often used by architects as a metaphor, a mood-giver or a carrier of a meaning in and of itself.

## **3. EFFECT LIGHT HAS ON SPACE**

Light plays a central role in the design of a visual environment, the architecture, people and objects are all made visible by the lighting, since it is what enables “what we see” .Our perception of architecture will be influenced by light:

- Light defines zones and boundaries
- Light expands and accentuates rooms

•Light creates links and delineates one area from another The challenge of a qualitative lighting design is to develop a design concept that combines the technical and aesthetic requirements of complex guidelines.

#### **4. WINDOWS AND ITS PURPOSE**

Daylight is inextricably linked to windows and openings within the exterior envelope of a building. The two cannot be separated under typical design approaches, although it is technologically possible to bring in daylight without windows through the use of light pipes and other strategies. Windows play several roles and have more than one effect on a room and its occupants. The changing character of daylight adds a dynamic qualitative dimension to the ambiance of the room that is not easily achievable with an electric illuminant. Windows allow diffuse daylight and sunlight inside a room while providing views to the outside, thereby adding a sense of openness, spaciousness, and orientation. Because of the technological advances of the last five decades, we are able to design buildings with large glass façades that permit daylight to enter and allow views to the outside. The importance of the connection with the outside world can be observed in the behaviour of people who live and work in windowless spaces. They appear twice as many visual materials to decorate their workstations than do their counterparts who have windows. Landscape scenes and nature-related themes seem to be the prevalent content of these visuals, an indication of a need to connect with the natural world. Attention to the outside world proved an important ingredient to relieve a sense of enclosure. The window is an opening in a wall or side of a building admitting light and often air to the interior. Early windows were developed before the introduction of glass, so initially windows were left open to the external atmosphere, or filled by some form of closure to minimize the heat loss at night. The more sophisticated buildings would have had thin slabs of marble, mica or oiled paper for this purpose. In mediaeval times wooden shutters were installed on the interior, and these were left open or closed to regulate the light and air. With the introduction of glass, used first in small panes in Roman architecture, the window as we know it today had its beginnings. The concept of small panes of glass, divided by bronze or later lead divisions, as used in early buildings dies hard and window manufacturers still offer these as alternatives to fully glazed windows in new domestic work, however inappropriate they may appear. Windows can broadly be divided into two main types, first the window set in the side walls of a building, and second the opening light set into the roof, generally known as roof lights, the first allow the light coming from the sun to come inside the room, called sunlight, and the second lets the light coming from the sky, called skylight to come in. A successful day lighting strategy is one that maximizes daylight levels inside the building but optimizes the quality of the luminous environment for the occupants. Day lighting design is not only about maximizing light levels. Excessive sunlight in an interior can be extremely uncomfortable for its occupants. The key word in day lighting design is control, not only of light levels but also of the direction and the distribution of light.

## 6. MUSEUMS AND THE LIGHT

Light has a special importance in museums, because the main function of a museum is the display, hence the items shown should be clearly visible without causing any irritation of the sight to the viewers or discomfort. On the other hand, light should be illuminating the museum as a whole to allow circulation and other functions. So to summarize this, there are two types of light in the museum, Task Lighting (the illumination of art and exhibited items) and Ambient Lighting (the general use of light within the museum). Museum visitors usually prefer to see objects that are displayed under day light. The daylight may be provided by side windows or roof lights and maybe highly controlled or partially controlled. The effects of daylight in a space are much more noticeable from side windows than roof lights but is more difficult to control to ensure avoidance of glare and poor viewing conditions. Highly controlled roof lights may however fail to give a good impression of daylight and often, such diffusion also destroys much of the quality that we associate with natural light. Properly designed reflected light can provide general control and still maintain directionality, although it is difficult to provide acceptable light distribution in all directions at the same time.

## 7. CONCLUSION

The importance of light has always been acknowledged, but not often is the light carefully studied in architecture as to provide not only global illumination of the interior, but to set a mood, an ambiance, and a vision. As shown in the paper, light has many roles and can have many different uses. It has a direct effect on the wellbeing of humans from a physical and psychological point of view, and affects the way the occupants perceive the interior space, whether it was artificial or natural light. It is common knowledge that artificial light is easily controlled and manipulated to reach the desired effect, but natural light can also be manipulated and control using a set of ways. The windows shapes, placements, orientation, dimensions and shading devices placed on them help control the light and balance it to the wish of the architect, as well as create a game of light and shadow in the interior that can set a mood as much as interior decoration, hanged paintings or walls colour.

Finally one of the institutions that require most study on the light is the museums, because their main aim is to “show”. The main problem in museums is that a great number of them are a restoration of old buildings and facilities main function of which was not museum. Careful light study hence has been done on them and the restoration shows a great deal of which and use of modern technologies. It is a very hard job to fix all the problems of the modern constructions, aiming in majority on the commercial outlook. Should not however be denied the praise those few facilities and buildings that respect light to

a great extent. The problem however is far from being solved. The start should be in the legislations; this would point to the problem, awaken people to the importance of light and in spite them to take lighting into consideration not as a necessary, but as a main element.

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