Applied Patterns of Light in Iranian Traditional Architecture

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Abstract
Lighting and light design art is one of the most influential factors in creating a sense of architectural space. Lighting harmony with the architecture can be one of the factors reinforcing the identity of a place and enhancing its special character. In this regard, monuments as valuable urban points have a significant role, and due to such a value, are of national and international importance. In technical and artistic value of elements, hidden spaces and architectural decoration and real meanings are also displayed. The purpose of writing this article using the case study method was to examine Sheikh Lotfollah Mosque in Isfahan and knowing all the angles and trying to understand the main idea of the designer. The light has numerous applications in other mosques, for example in Isfahan Jame' Mosque. Therefore, to achieve a research due to distribution of content and lack of resources, the parameter of light on the verses written in Sheikh Lotfollah Mosque is studied.

Key words: architecture, lighting, Iranian traditional architecture

Introduction
The relationship of monuments with light is a natural relationship that have been more attentive to sunlight; but today, with the advancement of optic and light-related technologies, a new context can be provided for the recognition and presentation of monuments and tissues. Moreover, the light was designed in the existing constructions so that it intensifies the main constructor sense with the natural, historical and human environments and adds their richness. In designing architecture of Iran monuments, light effects during the day are specially considered. Reflection of transparent surfaces, light openings, fixed and variable light and shadows as a result of sunlight, mirror works and illuminations are some of these cases. Sometimes, the light intensity is so high that the value of historical buildings is reduced to level of a lawn and night recreation area, and sometimes, on the contrary, low intensity light is in contrary to the real identity and greatness of a construction. Some other time, the choice of color and light is so that attracts insects which causes great harm to the building and its decorations, and creates chemical irreversible effects to colored surfaces.

Literature Reviews
The worship of the sun and the importance of light in the form of Qibleh to the south (the best manifestation of the sun at noon) as well as Mithraism effects on Christian buildings in the world (the East as Christian altar as hope for the return of the Christ) is used in Religion in the past. The presence of light in the past also included the following.
1. As clarifying the space (Mehraveh’s lighting, Sheikh Lotfollah lighting).
2. Light worship (temple of the Sasanids: during the day: being off in front of the sun, and at night: the illuminated cross in plan’s view).
3. Light as a unit of time (Niasar temple, Alhazar palace and city

In addition, knowing the use of the sun in designing is necessary as the process of material formation or various forms of infrastructure of buildings. Hence, we decided to examine the application of the sunlight in the monuments including Sheikh Lotfollah Mosque, and how this element affects the Quran verses.

Research Method
In this study, using a descriptive-analytical (qualitative) research method, first, factors influencing the decision-making process on the lighting of monuments were examined considering the position and how to apply the light. As a case study, research is conducted on lighting of Sheikh Lotfollah Mosque. The building is examined in terms of architectural form, light and shadow on the building during the day and recognizing the values.

The Most Beautiful Mosque in the World
The complexity of the most plan and intelligent and scientific design with the most delicate sizes has been used in its construction. Tile work inside and outside the dome is the most exquisite mosaic tiling in the world. A square map at the bottom of the dome at the height passes the steps where all the beauty is an inseparable element of its construction, as if its architecture is set on the relation of sky and light. The two windows break the light two times, then the stylized light is shed on thousands of tiles and holy names to reveal an unearthly beauty, and place human in a living spiritual light, so that the human gets entirely rich by greatness and dignity, so that nothing could describe it (Pourabdollah, 2010, p. 221).
Scale of the construction
As all the windows and vents guide the light from the outside to the inside during the day, at night, due to the mystical and religious aspect of the buildings, and to create sacred space, it is intended that light be directed from windows to outside with color temperature lower than the exterior, and with more brightness. Low color temperature of warm light and its more intensity is because the God in holy Quran describes himself as the light of the heavens and the earth, and Light of Lights. This is the highest level of excellence that has the greatest intensity of light, and in reducing levels to the material world, the intensity of the light decreases (Borna, 2006, p. 24). Sheikh Lotfollah Mosque is constructed by Mohammad Reza Esfahani, the great master. There are several writing about the mosque. It can be called an ideal Figure of paradise for Muslim architects, paradise has been depicted in the dome (Pirnia, 2008, p. 285). Iran’s variable whether, sharp and bright sun, wind and storm, and the whirlwind, as well as national and religious beliefs, require the building that in addition to doors, windows and skylight, has a blind or network for protection. In tholobate and tore of Sheikh Lotfollah dome, beautiful networks of mosaic tiles are laid, like other miracle of this architecture (Memarian, 2008, p. 354).

Assessing the lighting: case study of Sheikh Lotfollah Mosque
Sheikh Lotfollah Mosque is located on the east side of Naghsh-e Jahan square. Its building started in 1011 lunar Hijri and continued to 1028. The building of the mosque is a foursquare that joins the dome in a circular shape (Honarfar, 1971, p. 402).

Evaluation of the Mosque’s light during the day
In building mosques a symbol of religious architecture, in addition to material use of light, architects apply its symbolic concept (A sample of architectural where light has a fundamental role is religious architecture, built according to the views of employers with clerical or governmental hierarchy, to carry out religious rites. Spiritual architecture reflects the spiritual and religious attitudes of the people who build it). Sheikh Lotfollah Mosque is one of the mosques where presence of light have always been considered. In this regard, Arthur Upham Pope refers to the light feature in tholobate of dome, and the proportion of full and empty spaces in Arabesque motifs, which has led to creation of a non-earthly beauty (Pope, 1991, p. 217).
The Content of Inscriptions

Inscriptions in eastern and western sides consist of poems by great mystic poet and scholar Sheikh Bahaei. The inscriptions on the north and south, which are the same, also consist of poems with the names of 14 Innocents by Sheikh Lotfollah. The contents of other inscriptions placed in the corners of the mosque include: Infitar surah in southwest, Lail surah in southeast, Baienah in northwest, and Shams in northeast. As well, in tholobate of the main dome, just above the arches at distance, two ring inscriptions are placed in Suls in an opaque blue context of windows in 16 numbers. These windows are decorated with elegant porch whose delicate network is covered with mosaic tiling with Arabesque designs, where the thickness of the tiles and the space between them has the same size. Such a design is repeated at a distance of 1.7 to 2 meters on the outer wall of the dome. The length and width of the inscription on the wall between two windows is exactly in the size of the windows. In tholobate of the dome at the top and bottom of windows, two ring inscriptions are written by Ali Reza Abbasi, including verses in Suls written in blue context. A noteworthy point is that verses writing started from the western part of the dome, this is intentional, since when a person enters the hall, usually looks to the top right, and can easily see the beginning of verses. The content of the upper ring inscription is Nasr surah and the lower inscription consists of hadiths about life of Imam Sajjad (Najmabadi, 2002, pp. 20-21).

Lighting features

Since the structural principles of Sheikh Lotfollah mosque are based on lighting, more attention should be paid to the light used (Authors).

Light sources

The light of the yard is provided by two light sources. The first source meant to clarify the overall yard is a relatively large incision in the northern side of the wall, and is intended to illuminate the altar. The second source, that is the main yard light, is radiated from direct sunlight through the windows into the yard (Authors).
Today, we know that the lighting mechanism is based on the following four factors:

1. **Light control**

   The move of light from the window to the wall represents only half a square meter area from a 10-square-meter courtyard, which draws our attention. Thus, we see the beautiful reflection of golden designs and shades or rainbow of tiles with beautiful forms that become more beautiful and more diverse by sun movement. The constructor of the building could eliminate walls and put more and larger windows to easily solve the problem of light, and represent the tiles and their designs like other mosques. However, the capable artist could use walls to offer us more designs. However, he transmitted controlled light on the tiles to attract our attention to every single one of these designs (Najmabadi, 2002, p. 34).

2. **Light stylization**

   Mohammadeza Esfahani had a strong understanding of form and the quality of light. Light stylization and smoothing is another characteristic of his work at the mosque. Those who work in photography or filming know that direct sunlight should be avoided, and to do so, pass light through a filter or cloth to bring the light on cellulose film sheet with the most possible tenderness and smoothing (Najmabadi, 2002, p. 36).

3. **Light reflection and absorption**

   Most tiles of the mosque (especially tiles in azure), due to their super shiny glaze, have the potential to work as a mirror when light hits them at a certain angle, and shine in a golden color, and thus reflect the resulting light depending on the angle of light hit them. The reflected light hits the opposite wall, and finally, the light is projected on the floor of the mosque. This not only increases the light in mosque, but also, as noted above, since all tiles do not have a special glaze that can turns them into a mirror, their surrounding tiles shine strongly and appear as the most beautiful forms and brilliant flowers in the mirror. Using glossy glazed tiles adjacent to the opaque bricks creates a pleasant combination of two different textures (Najmabadi, 2002, p. 40).
Harmonizing the vision and light
Passing visitors from a long corridor with a length of 28 meters and darkish, has only one goal: To get viewer’s vision accustomed to the darkness. If a visitor passes through the Naghsh-e Jahan square with its effect of the sunlight and its reflection of the myriad arches that makes ocean of light, and enter the mosque yard, he/she will not be able to see and recognize anything. Without doubt, for a capable architect such as Mohammadreza Esfahani, it was very easy to put few extra windows in the corridor of the mosque to eliminate the problem of lack of light (Najmabadi, 2002, p. 44, p. 45).

Conclusion
In Sheikh Lotfollah Mosque architecture, lighting is especially concerned, and architectural form is harmonized with the normal behavior of light in order to emphasize the spiritual and religious meanings, and this building has a specific approach in nature. Important characteristics of conclusion are as follows. Sunlight reflection on the verses creates a unique form of creativity in creating architecture space. That is: Southwest part: Al-Infitar: When the sky breaks apart, And when the stars fall, scattering...
Northwest part: Al-Bayyinah: Those who disbelieved among the People of the Scriptue and the polytheists were not to be parted [from misbelief] until there came to them clear evidence.

Northeast part Ash-Shams: By the sun and its brightness, And [by] the moon when it follows it, And [by] the day when it displays it, And [by] the night when it covers it.

References


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