Elements Of Light Architecture In Reconstruction And Restoration Of Historical And Architectural Monuments Of Uzbekistan

Kamalova Dilnoza Zaynidinovna

Abstract. Since independence, in the Republic of Uzbekistan, the foundations of statehood have been formed as soon as possible and priority reforms and transformations have been carried out. Thanks to this, it was possible to achieve qualitative structural changes in all spheres of life, and, first of all, in the economy, education, construction and architecture. The ancient cities of the Republic of Uzbekistan again acquired the significance of centers of world culture. The steps “on the return of cultural heritage” undertaken over the years in the Republic are the contribution of the people of Uzbekistan to the rest of the world in the civilization of all mankind.

Index Terms— restoration, conservation, lighting architecture, three-dimensional modeling, lighting design

1 INTRODUCTION

Being carriers of spiritual heritage, the ancient monuments of each nation are, as it were, evidence of ancient traditions. A society that recognizes the universal value of cultural heritage also assumes responsibility for the future of this heritage, accepts safety for future generations in all its wealth and authenticity. In Uzbekistan, unique monuments are carefully guarded and restored, their original appearance is restored. The country’s Constitution enshrines the idea of preserving monuments and determines their importance in the development of science, culture, and public education. On the basis of the relevant provisions of the Constitution, the Parliament of the Republic of Uzbekistan adopted a law on the protection and use of cultural heritage. The constant attention of the government of the Republic of Uzbekistan to the issues of protection, restoration and rational use of architectural monuments allowed to develop a program for the revival of the ancient historical cities of Uzbekistan. At present, master plans for the development and reconstruction of the capital of Uzbekistan, Tashkent and other regional centers, provide solutions to classical urban problems associated with the implementation of urgent work to bring into line the urban appearance that meets modern architectural and urban planning requirements. The implemented practical measures are scientifically substantiated and consistent with the tasks of the State scientific and technical program for the development, reconstruction and renovation of historical cities of Uzbekistan for a period up to 2025. Uzbekistan in terms of its tourism resources is one of the leading places in Central Asia and is among the 10-15 countries of the world that have unique potential in this area. In the cities through which in ancient times the Great Silk Road passed, connecting China with the countries of Europe, a large number of historical and architectural monuments of various historical eras have remained, which cause great interest among tourists. Tourism is one of the largest and most dynamic sectors of the economy. High rates of its development, large volumes of its revenues actively influence various sectors of the economy, which contributes to the formation of its own tourism industry. The tourism sector accounts for about 6% of the world gross national product, 7% of world investments, every 16th workplace, 11% of world consumer spending [1,2]. International tourism in Uzbekistan is perhaps the most promising sector of the national economy: it can become the main source of GDP growth and foreign exchange earnings. Those wishing to visit, for example, Samarkand, Bukhara and Khiva, according to the World Tourism Organization, annually is at least 10 million people. Tourism potential - the historical, cultural, architectural and national values of Uzbekistan attract the world. Natural and historical-cultural attractions of Uzbekistan determine the types of tourism activities. The republic has developed a methodology for the development of tourism with the provision of 25 of its types, including 300 types of tourism services [3]. In the historical cities of Uzbekistan - Tashkent, Bukhara, Samarkand, Khiva, etc., unique architectural monuments from ancient times to the late Middle Ages have been preserved. Many of them are works of world architecture, preserved almost intact. Today in the republic there are more than 10,000 historical and cultural monuments, of which 7,844 monuments are under state protection: 3,013 architectural, 3,843 archaeological, 998 monumental, including more than 20 of them under the protection of UNESCO. These are world-famous architectural masterpieces of the East and Central Asia, such as the Bibi-Khanym mosque, the ensemble of Shahi Zinda mausoleums, Registan square, Afroasiab settlement, Gur-Emir mausoleums, Ismail Samani and others. Registan, created during the reign of Amir Temur's grandson Mirzo Ulugbek, can be considered the pearl of architectural genius. The ensemble of the square is formed by the Ulugbek madrasah - 1417-1420, the Sher-Dor madrasah – 1619-1636, the Tila – Kari madrasah –1647-1660. The architectural ensembles of Samarkand are unsurpassed monuments not only of Central Asian architecture, but also of world architecture. Necropolis of Shahi Zinda XIV-XV centuries, can be called a museum of glazed decor and glazed tiles, the facades of the mausoleums are so diverse [4]. The Republic of Uzbekistan is one of the ancient centers of world civilization. Scientific and practical interest, including for world tourism, is represented by medieval architectural monuments with an original unique bizarre facing decoration. To successfully solve the problem

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4214
not only the preservation, but also the development of historical cities, the question of the modern use of architectural monuments is one of the most important. It is recognized that the best preservation of monuments can be achieved only with its active service for the benefit of society, because an architectural monument that has lost its function is destroyed both morally and physically. In its essence, architecture is not only an object that can arouse certain feelings and mood among the audience, architecture is closely connected with the life of society, its views and ideology. Therefore, one of the main ways to preserve the monument is that the monument must acquire the right to an active life with the mandatory preservation of its historical and artistic significance. This requires the development of a method and ways of evidence-based adaptation. The use of architectural monuments, in addition to ideological and aesthetic aspects, has a serious economic basis. Monuments can be actively used for the needs of modern society, while preserving and bringing significant revenue to the state, because only reconstruction and restoration do not guarantee the preservation of the architectural monument and its participation in society. In this regard, it seems more rational to use existing knowledge in solving problems and problems. The problem of using historical and architectural heritage begins with the study and organization of the spatial environment of the monument, which consists of many aspects that require social solutions to problems. The main ones are “docking” of the old building with new spatial formations, transport communications, landscaping and landscaping of the monument, etc. One of such methods and solutions to this problem, allowing the historical and architectural monument of the ancient cities of Uzbekistan to give a “second life and breath” is “light reconstruction” and “light architecture”. Light architecture will not only “extend” the life of monuments in the evening and at night, but will also give them a new status of an acquired artistic image [5]. Lighting architecture based on natural and artificial lighting in historical and architectural monuments of Uzbekistan is relevant and has an inexhaustible source of development prospects [6]. The solution and use of light architecture based on natural lighting is “classically” proven and implemented in the work of architects and architects on uniquely grandiose structures and ancient monuments. Natural or daylight at all times was present in the works of architects, architects and urban planners. Elements of natural light were an integral component of the architectural concept. Light architecture, light and its elements together with architectural compositions made up the conceptual completeness of the embodied object, allowing to solve a number of technical and aesthetic problems. The techniques of light architecture, the “work of light” (natural) in the unique structures of the countries of Ancient Rome, Greece, Egypt, Babylon, Central Asia and other countries of the East and West still delight, delight and amaze with their beauty and originality. Artificial lighting is a more flexible material for architects than natural lighting. The possibilities and spectra of artificial lighting can be adjusted as much as they are necessary for the architect to complete his artistic design. Light architecture plays an important role in the conservation, restoration and reconstruction of building structures and ancient monuments. The main principle of restoration, as well as the operation of an architectural monument, is to preserve the building in its original form [7]. In this case, contradictions arise, caused on the one hand by the desire to preserve the monument without change, and on the other hand, by the need to find each concrete architectural monument such a function that it organically fits into the existing structure of the monument. Light in architecture is not just an architectural tool, but also a material that they have learned to calculate in the same way as they calculate construction. The evolutionary development of construction and architecture is associated with various materials that dictated architectural decisions. Historically found or invented materials that replaced or complemented each other. Now the field of architecture and construction makes extensive use of materials such as wood (wood, chipboard, fiberboard, plywood, etc.), stone, reinforced concrete, plastic (polyethylene, phenolic plastics, amino plastics, polyamides, organosilicon, etc.), architectural and construction glass (glass blocks, facing tiles, decorative panels and products, reinforced, etc.) [8]. In the future, new materials will appear. They will be better than the old ones, and will replace the materials that are considered modern today. The techniques and means of light architecture are diverse. Light in architecture is a creative problem. Light is an architectural category that affects design and implementation. To study and analyze the “light reconstruction”, “light restoration” of ancient monuments, we examined more than fifteen most significant, expressive objects - complexes or ensembles of the Timurid era in the cities of Uzbekistan - Tashkent, Bukhara, Khiva and Samarkand. Currently, almost all historical and architectural monuments of Uzbekistan in their modern form are an ensemble, including the adjacent landscape areas (paths, grounds, squares with ornamental shrubs and trees, a fountain or cascade of fountains, monuments and other structures). The development of light architecture at the objects we have chosen, associated with a certain complexity and a large volume of research, has been carried out in two complementary stages:
- the first stage is a theoretical, computer version of the design of light architecture;
- second stage - practical recommendations for the local installation of modern lighting devices at selected sites.
Currently, information technology has penetrated almost all spheres of human activity. Using a computer as a tool facilitating the processes in the field of reconstruction and restoration of historical cultural and art monuments - this task meets the modern requirements of reducing the time and cost of restoration, accumulating information during work and its reuse. Some areas of information technology use in reconstruction, restoration, conservation and storage include:
- virtual reconstruction;
- restoration of monuments;
- 3D scanning.
Virtual three-dimensional reconstruction is a visualization technology that is used to recreate individual art objects and architectural monuments (lost or partially destroyed objects). The capabilities of modern computer programs allow you to create both three-dimensional models of individual structures, and ensembles as a whole. Using the technology of three-dimensional modeling, world-famous unique structures were recreated, such as the ancient Indian palace complex Fatepur Sikri, a masterpiece of Roman architecture, the Forum of Trajan, the Colosseum, the tomb of Nefertiti, the Taj Mahal mausoleum and others. At the sites we have chosen, the computer version of the lighting architecture design is performed using the 3D MAX program. Three-dimensional
graphics programs (Light Wave 3D, Maya, Softimage, 3Ds MAX) are the most interesting in their capabilities and the most difficult to master [9]. One of the leading places among such programs is 3Ds MAX. Using the 3Ds MAX program allowed us to create a three-dimensional graphic model of an element of a complex or ensemble of an object and recommend the use of lighting types. It should be noted that currently lighting projects are becoming more complex. Lighting systems must provide optimal and uniform illumination of objects without a dazzling effect, in addition, they must comply with the standards of illumination. 3Ds MAX today is one of the best programs for lighting design and visualization of complex three-dimensional objects, which are the historical and architectural monuments of Tashkent, Bukhara, Khiva, Samarkand and other cities of Uzbekistan. The capabilities of the programs are unlimited, it is a universal product of three-dimensional modeling. The program allows the calculation of lighting with high accuracy results (Figure 1).

Figure 1 Mausoleum of Gur Emir in the city of Samarkand. XV century.

Fragments and the main stages of the computer version of the design of lighting architecture for the ensemble of the mausoleum “Gur-Emir” of Samarkand are presented in Fig. 2-7. The results of the computer version of the project served as the basis for preparing recommendations on light architecture on ancient monuments of the Timurid era in the cities of Tashkent, Bukhara, Khiva and Samarkand of the Republic of Uzbekistan (Figure 2).

Figure 2. The arrangement of light sources, miscalculation. General constructive scheme of shadows and general illumination of objects.

The results were implemented and were highly appreciated at some sites in the city of Samarkand: the mausoleums "Ruhabad" and "Gur-Emir", the ensemble "Registan". The tests were carried out during the celebrations "City Day" (October 18) and the international festival "Melodies of the East" (August-October 2015 and 2019) Thus, the light architecture in the monuments of antiquity of Uzbekistan will make it possible to change the appearance of cities, make them even more beautiful.

Three-dimensional model of spatial objects

Landscape lighting posts attractive and spectacular, which will undoubtedly affect the increase in inbound tourism and will become a factor of additional foreign exchange earnings to the state treasury, an integral part of the national and world tourism market.

Halogen spotlights (on lawns and flower beds)

Ground luminaires (main portal of the Gur-Emir mausoleum) (installed at the base of decorative trees)beds

fact that the material values of all the objects that make up the urban environment in historical cities are supplemented by the historical and artistic composition of the new look of the objects of study, created on the basis of "light reconstruction "And" light architecture." This provision is an integral component of cultural heritage.

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