

Yulia Ivashko\*

orcid.org/0000-0003-4525-9182

Andrii Dmytrenko\*\*

orcid.org/0000-0003-4757-5218

## Historical Background and Peculiarities of Mosque Construction in Iran as a Basis for Their Restoration

### Tło historyczne i cechy konstrukcji meczetów w Iranie jako podstawa ich odnowy

**Keywords:** Persia, Iran, influence factors, Islamic architecture, periodization, restoration

**Słowa kluczowe:** Persja, Iran, czynniki wpływów, architektura islamska, periodyzacja, restauracja

#### Introduction

The relevance of the research topic is explained by the fact that many mosques built at different times have survived in the cities of Iran, but most of them are practically unknown outside the country.

The specific features of the Persian (Iranian) Islamic school of architecture lie in the multiplicity of cultural influences that manifested themselves not only directly in mosques, but also in madrasahs and mausoleums. Since the historical mosques of Iran used specific materials and structures, this requires special knowledge when carrying out restoration work.

The lack of comprehensive documentation and building survey drawings for many mosques makes it difficult to carry out restoration work and to remodel mosques in an authentic form. The purpose of this paper is to provide an overview of religious architecture in Iran in three main periods, linking historical periodization with the stages of changing building materials and structures.

#### MAIN PART

#### Characteristics of Persia's architectural periodization and the three main periods of mosque construction

In Iran, as in other Islamic countries, the development of mosque architecture took place through a change in the Arab canonical pattern under the influence of local pre-Islamic architectural traditions and the natural and climatic features of a particular country.

Based on a comparison of the transformation paths of the characteristic Arab columnar type of mosque in Iran and in the Maghreb countries, it can be seen how, with the imposition of strong local architectural and construction traditions on the basis of one canonical type of plan, fundamentally different types of regional mosques were formed based on local building structures, materials and techniques.

We deliberately took the mosques of Iran and Algeria for comparison, since these two schools demonstrate opposite approaches to the appearance of the mosque—

\* D.Sc. (Architecture), Professor, Kyiv National University of Construction and Architecture, "Ukrrestavratsiya" corporation

\*\* Ph.D., Associate Professor, National University "Yuri Kondratyuk Poltava Polytechnic"

\* prof. dr hab., Kijowski Narodowy Uniwersytet Budownictwa i Architektury, Przedsiębiorstwo „Ukrrestavratsiya”

\*\* dr, prof. nadzw., Połtawski Narodowy Uniwersytet Techniczny im. Jurija Kondratiuka

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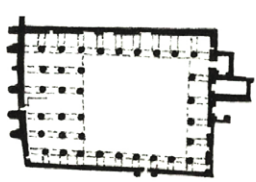
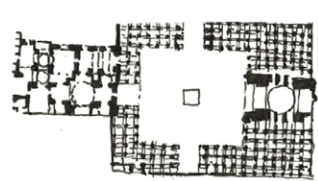
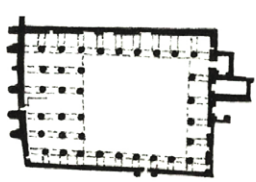
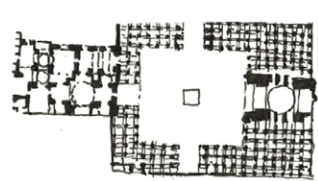
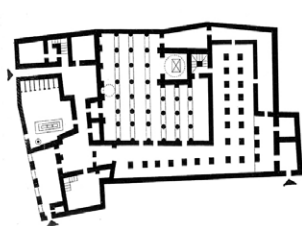
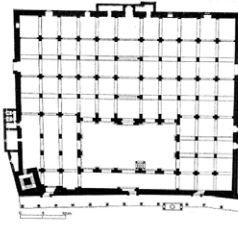
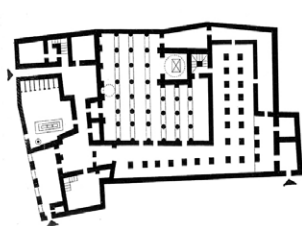
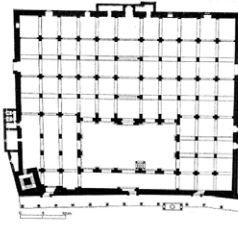
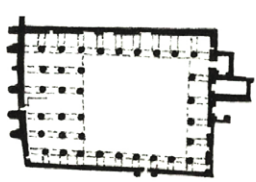
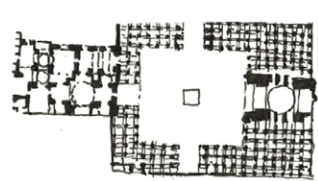
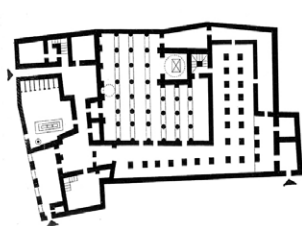
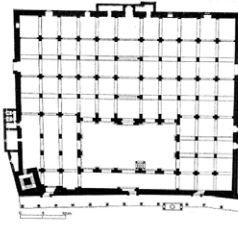
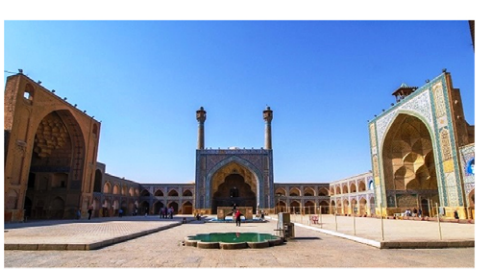

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Fig. 1. Two patterns of mosque development that stem from the Arab column type mosque (on the example of Iran and Algeria).



Fig. 2. Watercolor showing the appearance of the Jāme'h Nain (tenth century), 2019; by Peng Chang.

the emphatically luxurious motley Iranian mosques contrast with the mosques of Algeria, derived from defensive structures, without ornament (Fig. 1). On the example of these mosques of the Persian type and mosques of the Maghreb type, it was shown how from the same Arab column type mosque pattern, under the strong influence of local climatic characteristics, cultural and building traditions, lead to the development of two opposite directions of mosque architecture, from which the Persian type used the centuries-old traditions of pre-Islamic architecture of Persia, whereas the Maghreb type was based on the fortification construction of local Maghreb dynasties. That is why Persian mosques have commonality with the pre-Islamic palace architecture of Persia, and Maghreb mosques resemble fortresses with prismatic defense towers (in addition to their religious function, these mosques could serve as defensive structures when necessary) (Fig. 1).

Unlike historical periodization, the architectural periodization of mosques in Iran is based not on political and economic events, but on attitudes towards Islam and Islamic architecture, which led either to a heyday or decline in mosque construction.

Shahab Zahedi proposed his own version of Iranian mosque architectural periodization with the allocation of not five, but three major periods:<sup>1</sup>

- 1) between the seventh and eighth century AD—the early period when Islam spread across the territory of Iran and the enrichment of Eastern Arab countries with Iranian traditions (an indication of this fact is given in other scientific sources).<sup>2</sup> During this period, the main mosques were built in the east, since the nomads were the first to adopt Islam, in the center and in the north. The main mosques of this period are in the cities of Nain (Fig. 2, 3), Isfahan, Semnan, Yazd, Shiraz, Kerman. During this period, two types of mosques were widespread—without a domed pavilion and with a domed pavilion. At the same time, mosques could be small in size and have an undeveloped planning structure.
- 2) Between the ninth and fifteenth centuries AD—the middle period. New mosques were being built and those previously built in the center, in the north and east of Iran, in the cities of Tabriz, Yazd, Zavor, Neyriz, Damgan, Isfahan are being reconstructed. During this period, mosques become larger and may or may not have an altar. In the period from the thirteenth to the seventeenth century, mosques were often multifunctional complexes and provided for caravanserais—living quarters for visitors.<sup>3</sup> In the period between the eleventh and twelfth century, early minarets were built at the mosques—they have a square base, the base has a faceted or



star-shaped form, the fust is covered with patterned brickwork.<sup>4</sup>

- 3) Between the early sixteenth and the eighteenth century—the high period of the flourishing of Islam in Iran and the construction of mosques in the cities of Iran during the reign of King Abbas I Safavian of the Safavid dynasty. Mosques were built mainly in the center, south and east, in Isfahan, Shiraz, Kerman, Tabriz, Ardabil and Mashhad. Large mosques from this period were distinguished by the different period of the construction of their individual parts.<sup>5</sup> Two symmetrically located minarets became an obligatory element of the mosque complex; the mosque was transformed into a developed complex with a domed massing modified according to the “Chartak” type, an inner courtyard and adjacent galleries and rooms. The minarets acquired a characteristic cylindrical type, different from the multifaceted picturesque Egyptian minarets with numerous balconies, successive to the Alexandria lighthouse—an octagon on a square. During this period, large urban mosques called “jāmeḥ,” with a developed structure and an altar, and small rural mosques were prominent. There are known examples of mosques that acted as multifunctional complexes (the complex in Mashhad, 1405–1418) includes the Old courtyard, “iwān,” the New courtyard, the tomb of Imam Reza, the Goharshad (Gauharshad) mosque, madrasah and “caravanserai”).<sup>6</sup>

If we talk about significant changes that the Iranian mosque underwent in the third period, then this is the obligatory presence of a decoratively decorated minaret (either one or more) at the “Jāmeḥ” congregational Friday mosque, the final formation of the regional “four-iwān” type of mosque with iwāns, a domed “chartak” along the main axis.<sup>7</sup>

Another aspect directly related to the architectural periodization of mosques is the variety of styles. There are six regional styles of Iran: the Parsi style, the Party style, the Khorasan style, the Razi style, the Asari style and the Isfahan style. He found out that in the first architectural period of the mosques construction there were Parsi and Party styles associated with a continuity of Zoroastrianism, in the second period—the Khorasan style, the Asari style and fragmentarily—the Isfahan style, in the third period—the Khorasan style, Isfahan style and Razi style. They got their name either from the name of the city-center from which a given style had spread (Isfahan, Khorasan styles), or from the name of the nationality (for example, the Asari style).<sup>8</sup>

The most ancient are the pre-Islamic Parsi styles, which felt the influence of ancient Greek architecture, which was replaced with the Party style, characterized by a weakening of ancient Greek influence: both of these styles were closely associated with Zoroastrianism. Examples of the Parsi style include the buildings of Persepolis. The Parsi style (between the eighth century BC and the third century BC) is characterized by



Fig. 3. Watercolor showing the Jāmeḥ Nain interior, 2019; by Peng Chang.

the use of expensive materials (especially stone), the construction of buildings on platform-like bases, the use of a grid of columns, the use of raw bricks with polychrome coloring and the use of glazed tiles as a material for walls, thin facade carvings and luxurious site elements in the form of reservoirs and landscaping.

The emergence of the Party style (which lasted until the fifth century AD) was marked by the invasion of Alexander the Great and the weakening of the influence of Greek architecture. The specificity of the Party style was a great modesty of decoration using local building materials (stone, raw brick), a departure from decorativeness towards structurality, the development of new types of structures (large-span arches and domes), modification and variety of plan types, the widespread use of a modified “chartak” in the altar of buildings in the form of a dome on four arches for performing rituals with a blessed fire.<sup>9</sup> Examples of the Party style are the Zoroastrian sanctuary of Firuz Abad Altar, the Bishapur palace and the Sarvestan palace.

In contrast to the pre-Islamic Parsi and Party styles, the Khorasan style, which existed until 999 according to historical sources, arose in the early architectural period of the construction of mosques and was finally formed in the middle period. The region of Khorasan and the city of Khorasan in the east of Iran were the

center of its origin and a main early-period Islamic cultural center. Since the Khorasan style grew on a fundamentally different religious basis than the Parsi and Party styles, in accordance with the canons of Islam and the teachings of the Prophet, it promoted greater simplicity, asceticism, the use of local natural building materials and practically no decoration, the continuity of the previous constructive scheme with Sassanian architecture—overlapping vaulted premises, located at the four corners and walls of niches (Tarihane-Damgan mosque in Damgan, 340 km east of Tehran, Jāmeḥ Fakhrāj near Yazd). Due to its simplicity, the interiors of the early mosques of the Khorasan style were considerably remodeled and decorated during the reign of the Safavids, in the third architectural period, especially after the installation of ayvans, decorated from the inside with “stalactite vaults” and carpet type ceramics (Jāmeḥ Isfahan, Jāmeḥ Ardestan, Jāmeḥ Nain, Jāmeḥ Neyriz).

The early congregational mosques of the Arab column type were subsequently converted into Persian type mosques by means of extensions and remodeling, as can be seen on the example of one of the “iconic” mosques of Jāmeḥ Isfahan, founded during the rule of the Abbasids and subsequently expanded by a spacious courtyard with a reservoir, built up with two-tiered galleries, which bound equally vaulted “iwans” in the center of each of the four sides, among which the southern iwan that led to the domed prayer hall stood out, decorated with a monumental portal—a “peshtak”—with two minarets.<sup>10</sup>

The flourishing of the Persian regional Islamic school on the territory of Iran and Central Asia dates back to the periods of the Timurids and especially the Safavids, when the early ascetic small mosques with a simple planning structure and mass composition were replaced by the emphatically luxurious metropolitan “jāmeḥs” in the main squares.<sup>11</sup>

The main changes affected the massing composition, as a result, a single building was transformed into a developed large-scale luxuriously decorated multifunctional complex, the core of the composition of which was a vast courtyard with a reservoir and “iwans” with a “peshtak” portal, and the open courtyard was actually a continuation of the hall covered with a roof for prayers.<sup>12</sup>

The style that followed the Khorasan style was the Razi style that emerged in the north of Iran and especially developed in the vicinity of Tehran, the emergence of which dates back to the beginning of the tenth century.<sup>13</sup> The Razi style existed for three centuries and was interrupted by the Mongol invasion. It was characterized by a continuity with earlier Iranian styles: by scale—with the Parsi style; by expression of forms and composition—with the Party style; by perfection of simple forms and general similarity—with the late Khorasan style. However, unlike the Khorasan style, the Razi style was not simply used in mosques with local building materials, and various high-quality materi-

als, in comparison with the buildings of the Khorasan style, the Razi style mosques have a more developed arch and dome structures, with the simultaneous transformation of their functional structure into an element of décor.

The Razi style was replaced by the Azari style, which existed between the twelfth and the thirteenth century until the reign of Abbas I of the Safavid dynasty.<sup>14</sup>

### **Relationship between architectural periods and types of building structures**

A distinct feature of mosque building in Iran is that each architectural period was characterized by its own specific building materials and structures that determined the appearance of mosques. And if in the early period the design dominated was followed by the form, then in the third period the ornamentation predominated and the design was decorated and was deliberately turned into an element of décor. The most characteristic regional elements of mosques are domes and semi-domes, “iwans” with “peshtak” portals and pointed arches, as well as minarets. The typification of the different mosque dome forms was explained by the replication of the dome structural scheme with the use of unloading arches and squinches, as well as typical wooden patterns for coverings. The iwan, which optimally corresponds to the local natural and climatic conditions, was carried over from residential architecture to the architecture of mosques.

In the early and middle architectural periods (from the seventh to the fifteenth century), the architectural appearance of mosques was determined by the structural system. One of the typical methods of distributing the static load in the middle period was the construction of massive supports with the simultaneous construction of arches and niches in the blind load-bearing walls of the iwan.

In the first period, brick and stone masonry was used, with the dominance of fired modular brick masonry (with a gradual reduction in brick dimensions) on alabaster mortar while accounting for seismicity. The supporting structural scheme consisted of a system of columns, folded by the method of laying bricks on the edge, with vaults (first parabolic, then pointed), laid on them by the method of transverse sections, and arches.<sup>15</sup> The barrel vault and dome on squinches were characteristic of the early period, which, although they had limitations in the size of the overlapping space, could be used simultaneously in large numbers.

With the development and variety of types of mosques, changes were made to the design of the dome. One constructive scheme was provided for overlapping the galleries with domes on pillars, the other for the main dome, supported by a system of octagonal-type squinches in plan with intermediate arches between them.<sup>16</sup> Subsequently, the squinches were modified into traditional Iranian “stalactites.” From the early to the late period, a clear hierarchy of types of dome

structures appeared, depending on their purpose. The mosques of the early period were distinguished by the common design of the central dome on the squinches, where the system of unloading arches reduced the octagon to a sixteen-sided one.<sup>17</sup>

The main dome rests on a belt of squinches, while the secondary round and octagonal domes rest on squinches in the form of a closed vault, and on spherical or sail-shaped sails (the so-called “Seljuk”).<sup>18</sup>

It was in Iran that the local type of the so-called “monastic” vault was formed with brick ribs made of brick on the edge, without formwork to cover any internal space of any configuration and length. The variety of domes in the plan determined the variety of types of their overlap—the domes were lancet, hipped, and in the eleventh and twelfth centuries, domes with a double shell began to spread. In general, the Iranian school was quite content with local building traditions.<sup>19</sup>

A special type of overlap was provided for the domed halls of the chartak type, where a system of three-part squinches, arches and powerful four-bladed supports was used.<sup>20</sup>

The dominance of structure over decorativeness came to an end with the beginning of the third period, when from the sixteenth century a tendency towards emphasized luxury and monumentality became pronounced. The proportions and designs of the main bulbous dome began to change, visually dominating the total mass of the building as a whole. The designs and shapes became emphatically large-scale, and the décor, in contrast to them, was finely detailed. In the later period, mosques were built from fired bricks, and natural stone was rarely used.

If in the early and middle periods seismic conditions promoted the use of masonry on alabaster mortar, recessed into the thickness of the masonry of ribs and counteracting the settlement of the foundations by introducing longitudinal ties made of round timber, then in the later period, as new anti-seismic methods against wall settlement and deformation of the base of the main dome and stalactite vaults were reinforced by longitudinal ties from round timber.<sup>21</sup> Adaptation to seismic conditions in the structures of the main dome were reduced, among other things, to the construction of a double shell, the decorative of which, alabaster, works well in conditions of seismic activity, is attached to the structural dome and suspended on ropes.<sup>22</sup>

The process of vault diversification started at the end of the middle period and continued through the use of flat-arched vaults, vaults on transverse supporting arches, flat vaults, occasionally cross vaults and vaults on ribs.<sup>23</sup> The iwans were covered with semi-domes. The most widespread design of iwans was one in which they were completed with bundles of shield sails, on which there lied a flat star-shaped vault of a mosaic half-dome.

The scheme of the dome on squinches was being developed and improved by introducing a transition-

al strip of small arches, which provided a transition to a sixteen-sided one, and the structural scheme of the dome on squinches with sails was added.

Majolica, tiles, polychrome glazes, and ornamental masonry became integral elements of the mosques of the late period.

In the high period, the search continued for ways to improve construction in seismic conditions.

The traditional list of building materials and structures at different periods was selected by unknown builders empirically, by analyzing the main causes of emergency states. It is noteworthy that the builders of the mosques used the centuries-old experience of construction under seismic conditions from pre-Islamic Persia.

When discussing mosques with domes, then the main problem was associated with the appearance of cracks due to the uneven transfer of load from the dome to the walls. In order to counteract the appearance of cracks, the dome structure was supplemented with unloading arches at an early stage, which reduced the octagon to a hexahedron, and a pendentive system. In the middle period, emphatically massive columns at the points of maximum transfer of load from the walls and maximum stress of static power load became a countermeasure to the appearance of cracks. The design of the main dome on squinches contributed to the uniform transfer of the load and has its roots in the Sassanian period (224–651 AD), immediately preceding the period of early Islamization of Iran (the seventh and eighth centuries), which testifies to the experimental choice of the structural scheme, optimal for seismic conditions. Despite the optimality of this design in crack prevention, this system has been constantly improved. In the early period, the construction of a strip of pendentives of a geometrically correct octagonal type in plan was supplemented with intermediate arches between them. Subsequently, traditional Iranian “stalactites” gradually emerge from the configuration of pendentives. The uniform distribution of the load from the main dome was also facilitated by its variable thickness with ledges.

Seismic features (seismic vibrational twisting forces) and deformation of the vault of the main dome, which also led to the appearance of cracks and the destruction of mosques, were a significant problem, therefore, as a countermeasure, a system of ribs recessed into the masonry and designed to carry the load of the masonry without formwork and to resist deformation was developed vault of the dome, masonry was carried out on alabaster mortar. Seismic vibrations led to the appearance of cracks and settlement of the foundations, therefore, additional longitudinal ties made of round timber were introduced, and at a later period, to counteract the settling of the walls and deformations of the base of the dome and stalactite arches, they were reinforced with the same longitudinal ties from round timber.

## Conclusions

Iranian mosques are an integral part of the world's cultural heritage. Considering the special influence that the Iranian Islamic school has had on the architectural schools of other Islamic states, additional research and popularization in scientific literature outside Iran must be performed on the history of mosques in medium and small cities, their placement in the structure of cities, with the manifestation of regional originality in mosques of

Iran (analysis of typical types of compositions in different regions, regional forms and decor, types of structures).

The richness of the design schemes of Iranian mosques and the variety of building materials and décor is explained by the fact that the Islamic school of Iran was formed largely on the basis of millennia of pre-Islamic local building experience, onto which the Islamic ideology introduced by the Arabs was superimposed. Persian building traditions influenced many other Islamic schools during the early period.<sup>24</sup>

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<sup>2</sup> *Всеобщая история архитектуры в 12 томах*, ред. Н.В. Баранова, vol. 8, Москва 1969, p. 9–12, 27–30.

<sup>3</sup> *Ibidem*.

<sup>4</sup> *Ibidem*, p. 154.

<sup>5</sup> *Ibidem*, p. 169–179.

<sup>6</sup> *Ibidem*, p. 169–179; Т. Стародуб-Еникеева, *Сокровища исламской архитектуры*, Москва 2004, p. 204–225.

<sup>7</sup> *Всеобщая история архитектуры в 12 томах*, p. 251–256.

<sup>8</sup> Ш. Захеді, *op. cit.*, p. 64–69.

<sup>9</sup> *Всеобщая история архитектуры в 12 томах*.

<sup>10</sup> Т. Стародуб-Еникеева, *op. cit.*, p. 204–219.

<sup>11</sup> *Всеобщая история архитектуры в 12 томах*, p. 277–303.

<sup>12</sup> *Ibidem*, p. 169–179, 277–303; Т. Стародуб-Еникеева, *op. cit.*, p. 204–225.

<sup>13</sup> *Всеобщая история архитектуры в 12 томах*; P. Balsara, *Highlights of Parsi History*, Bombay 1963.

<sup>14</sup> *Всеобщая история архитектуры в 12 томах*; P. Balsara, *op. cit.*; D. Karaka, *History of The Parsis including their manners, customs, religion and present position*, London 2018.

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<sup>19</sup> Ibidem.  
<sup>20</sup> Ibidem, p. 150–153.  
<sup>21</sup> Ibidem, p. 147–179.  
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## Abstract

This paper studies the historical background of the formation of the Persian Islamic school, which was formed largely based on the pre-Islamic traditions of the Achaemenids and Sassanids. Insufficiently explored aspects concerning the architectural periodization of Iranian mosques were identified. This gives arguments as to how external factors influenced the formation of the Islamic architectural school of Iran; it was shown how elements of pre-Islamic Persian architecture were organically incorporated into the architecture of the Persian iwan mosque. The relationship between historical and architectural periods, between each architectural period and the types of building materials and structures was analyzed. The process of transition from a purely structure- and functionality-oriented to decorativeness and monumentality was presented.

## Streszczenie

W artykule przeanalizowano podstawy historyczne powstania perskiej szkoły islamskiej, która w znacznej mierze została oparta na przedislamskich tradycjach Achaemenidów i Sasanidów. Zidentyfikowano niedostatecznie zbadane aspekty periodyzacji architektonicznej irańskich meczetów. Przedstawiono argumenty, w jaki sposób czynniki zewnętrzne wpłynęły na powstanie islamskiej szkoły architektonicznej w Iranie. Pokazano także, jak elementy architektoniczne przedislamskiej Persji zostały organicznie włączone do architektury perskiego meczetu typu „iwan”. Przeanalizowano również związek między okresami historycznymi i architektonicznymi oraz pomiędzy każdym okresem architektonicznym a rodzajami materiałów i konstrukcji budowlanych. Zaprezentowano, jak odbywał się proces przejścia od czystej konstrukcji i funkcji do dekoracyjności i monumentalności.