

Prospects for Completion of Construction of the Akhmet Yassawi's Mausoleum-Khanaka in Turkestan City

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Received June 14, 2023; Revised September 19, 2023; Accepted October 15, 2023

Cite This Paper in the Following Citation Styles

(a): [1] Yerassyl Aidar, Konstantin Samoilov, Bolat Kuspangaliyev, Darkhan Assylbekov, Oksana Priemets, "Prospects for Completion of Construction of the Akhmet Yassawi's Mausoleum-Khanaka in Turkestan City," *Civil Engineering and Architecture*, Vol. 12, No. 1, pp. 203 - 217, 2024. DOI: 10.13189/cea.2024.120117.

(b): Yerassyl Aidar, Konstantin Samoilov, Bolat Kuspangaliyev, Darkhan Assylbekov, Oksana Priemets (2024). *Prospects for Completion of Construction of the Akhmet Yassawi's Mausoleum-Khanaka in Turkestan City*. *Civil Engineering and Architecture*, 12(1), 203 - 217. DOI: 10.13189/cea.2024.120117.

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Abstract The problem of long-term construction exists in many countries. There are numerous examples of multi-stage construction over several centuries. Very often, ongoing construction does not go according to the original project. But there are also examples of preserving the original idea. Such examples are most typical when restoring destroyed buildings. However, in some cases, the construction of a building has not been completed. One of these is the mausoleum-khanaka of Akhmed Yassawi in Turkestan city. The active phase of the construction of this building ended at the beginning of the 15th century. Partial completion was made at the end of the 16th century. Since then, the building has been in an unfinished state. This stimulates its gradual destruction, despite the complex of repair and restoration works. This problem requires an urgent solution, as the building is in a state of disrepair. In this context, the proposed project of completing the construction of the mausoleum-khanaka in accordance with the original design plan is of interest. The use of lightweight structures based on a steel frame, which is based on independent reinforced concrete foundations,

reduces the load on the existing part of the building. This building has great historical and cultural significance. The completion of this building will eliminate the existing danger of its destruction and will have a significant social and economic effect.

Keywords A Design Concept, A Project of Recreating, A Reconstruction, A Restoration, The Medieval Architecture of Central Asia, A Mausoleum-Khanaka

1. Introduction

The mausoleum-khanaka complex of Ahmed Yassawi is located in the city of Turkestan – the regional center of the Republic of Kazakhstan (43°17'52"N, 68°16'15"E). Now the complex is part of the State Historical and Cultural Reserve-Museum "Hazret-Sultan". The position of the complex is shown in Figures 1 and 2.

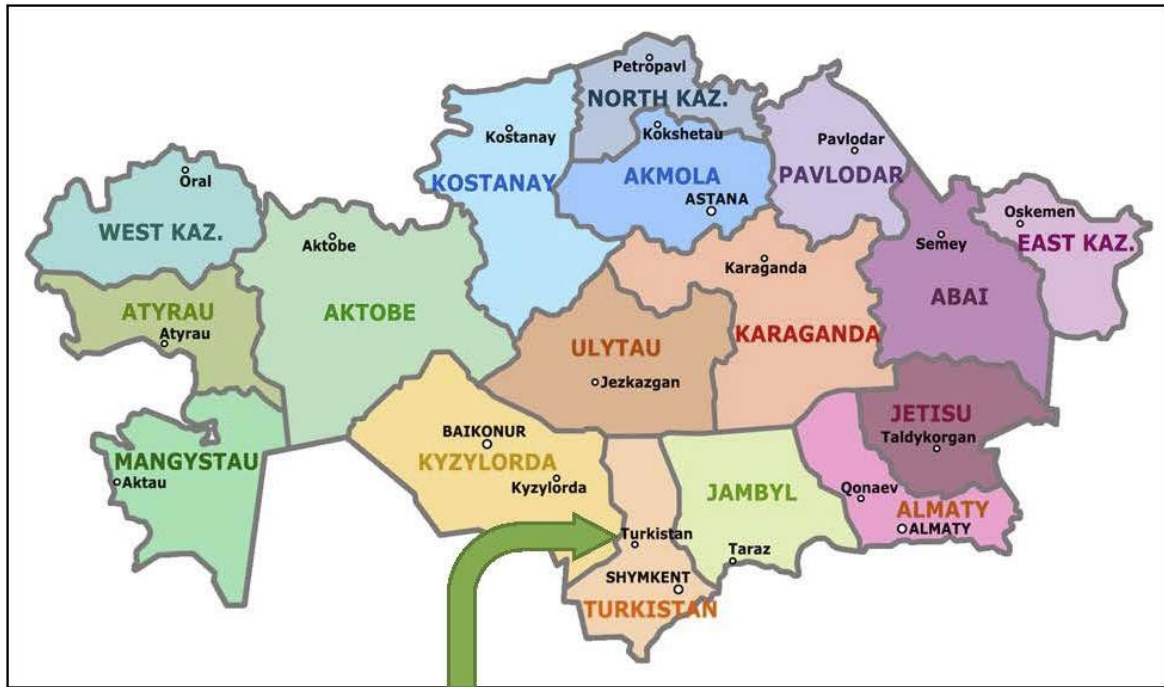


Figure 1. The location of the complex – Turkestan city on the Kazakhstan's actual map [54]

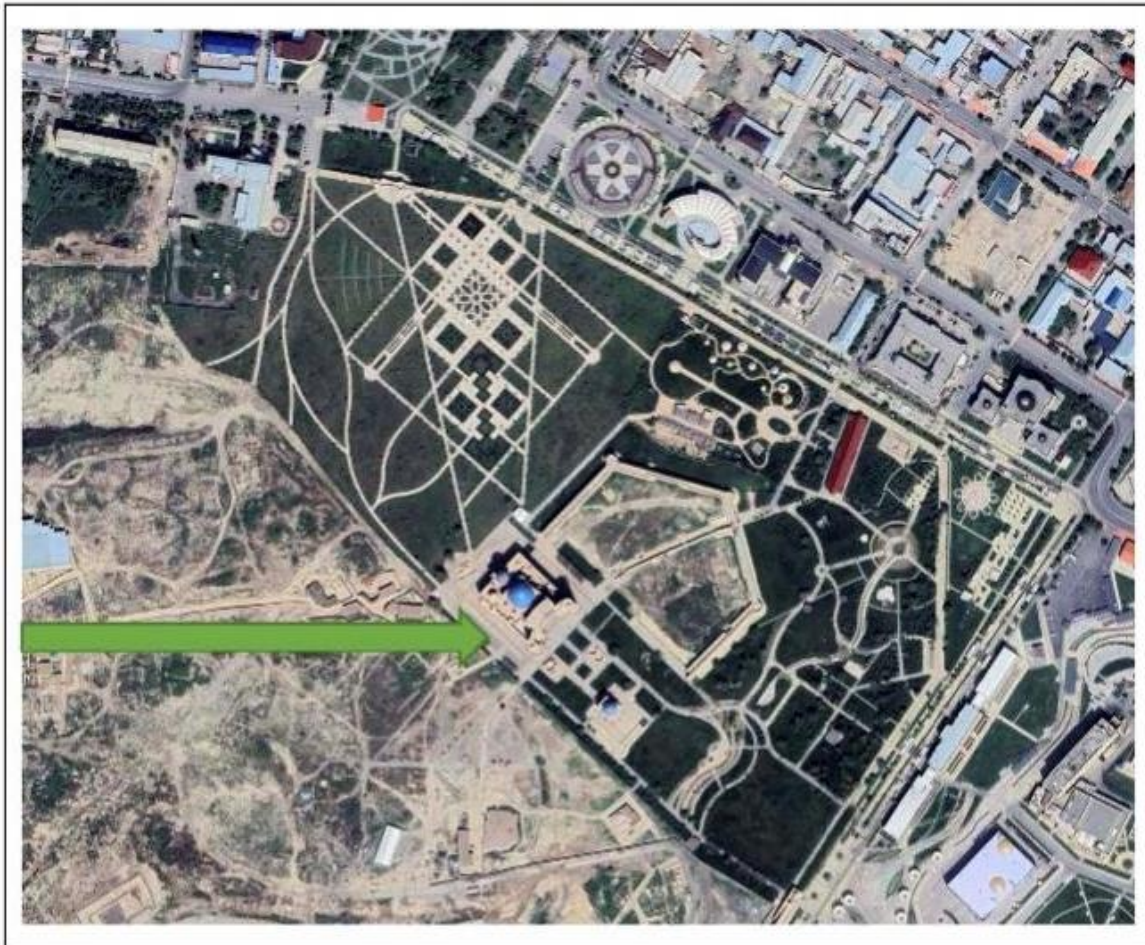


Figure 2. The location of the complex – The mausoleum-khanaka of Ahmed Yasawi in the historical part of Turkestan city (the Google-Earth space view) [55]

The mausoleum-khanaka is an important part of the World historical and architectural heritage. The study of various aspects of the development of the complex has been actively conducted for more than 150 years. These studies are collected and summarized by [1], [2].

Among these studies, it is advisable to highlight the following. The mausoleum-khanaka in Turkestan has been described and studied in detail for more than one hundred and fifty years. The works are devoted to the direct analysis of various aspects of the form and decoration of this building: Alliyar and Samoilov [3], [4], Baitanaev and Yelgin [5], Basenov [6], Bekchurin [7], Man'kovskaya [8], [9], [10], Masson [11], [12], Mustapayeva [13], Ordabaev [14], Patsevich [15], Tuyakbayeva [16], Yelgin [17] and other.

Consideration of this building in the context of contemporary architecture of the Central Asian region is reflected in researches: Alliyar and Samoilov [18], Barsukova [19], [20], Chmelnizkij [21], Glaudinov [22], Kasymbekova, Glaudinov and Samoilov [23], Kozha [24], Man'kovskaya [25], Pugachenkova [26], Pugachenkova and Rempel' [27], Roxburgh [28], Samoilov [29], Tondi [30], Umnyakov [31], Vyatkin [32], Weimarn [33], Yakubovsky [34], Zahidov [35], [36], [37], Zasyppkin [38] and others [39], [40].

From the point of view of the assumption of the original plan, which was not fully realized, it is important to study identical buildings of that era: Gilmanova [41], Kabanov [42], Khakimov [43], Masson [44], [45], Masson and Pugachenkova [46], Paskaleva [47], [48] and others [49]. This is especially true of compositional analyzes of the formation of various monuments of the region in general (Bulatov [50]) and individual examples in particular (Ratiya [51]). A new study concerning the design concept of the mausoleum-khanak was carried out by Samoilov, Kuspangaliyev, Sadvakasova, Akhmedova [52]. Paradoxically, in the complex under consideration, it is difficult to understand at what point the "construction" ended and the "restoration" began.

In the context of these studies, it is of interest to consider the possibility of implementing the project concept of the 14th century. This is the purpose of the article. The implementation of the proposals will allow solving a complex of existing technical, economic and socio-cultural problems, most of which are related to the incomplete construction of the Building.

2. Methods

The research methodology is based on the consistent collection of information (text, graphic materials, photographs of various years, authors' own visual surveys), analysis of the data obtained, generalization of the analysis data, and determination of suitable ways to solve the problem of completion of construction. Based on this, initially, on the basis of literary sources, the history of the

long-term construction of the Building and the repair and restoration work carried out was considered. Together with the visual surveys conducted by the authors during 1984-1985 and 2021-2022, this served as the basis for determining the state of preservation of the main structures of the Building. Based on the assumptions previously put forward by the authors' regarding the original design plan of the 14th century [52], the locations of further design and construction work that will allow the construction to be completed were determined. This eliminates the existing emergency state of the mausoleum-khanaka.

3. Materials

Spatially, the building is a two-story portal-dome volume. The height of the highest part is about 40 meters. The building plan has a rectangular configuration (46.5 x 65.5 meters). The layout is axial hall-enfilade. It consists of several blocks and includes thirty-six rooms for various purposes. The main door is located along the planning axis. To the right and left of the main door, there are additional passages through auxiliary rooms. The main entrance leads to a large central hall. Along the axis, behind the Main hall, there is a mausoleum. Adjacent to the mausoleum is a Mosque and a large Palace room. Adjacent to the Main hall are: a small Palace room, a well room, a kitchen, a library, a dining room and cells for pilgrims. The premises have a one- and two-level solution. The connection between the floors is carried out by spiral staircases.

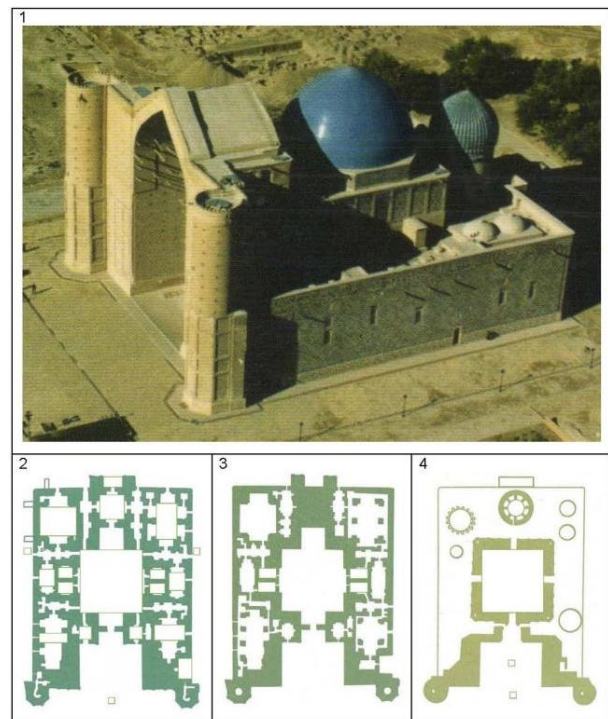


Figure 3. The mausoleum-khanaka of Akhmed Yassawi: 1 – the Main view [56]; 2 – the First level plan [57]; 3 – the Second level plan [57]; 4 – the Third level plan [58]

Some of the rooms are topped with single or double domes of various sizes and shapes. The external pointed dome above the mausoleum has a ribbed solution. Two low domes overlap the main Palace room. The Main hall is covered by the largest preserved single Dome in the region with a diameter of 18.2 m. The interior of most domes and dome structures has a plaster lining of stalactite type. The main material of structures and finishes is baked brick made of the Sauran's clay. Finishing bricks have a glazed surface of various colors. The ornament of the exterior decoration is geometric, epigraphic and floral. The unfinished Main portal with corner tower is not lined. Figure 3 shows the modern look of the building and the plans of various levels.

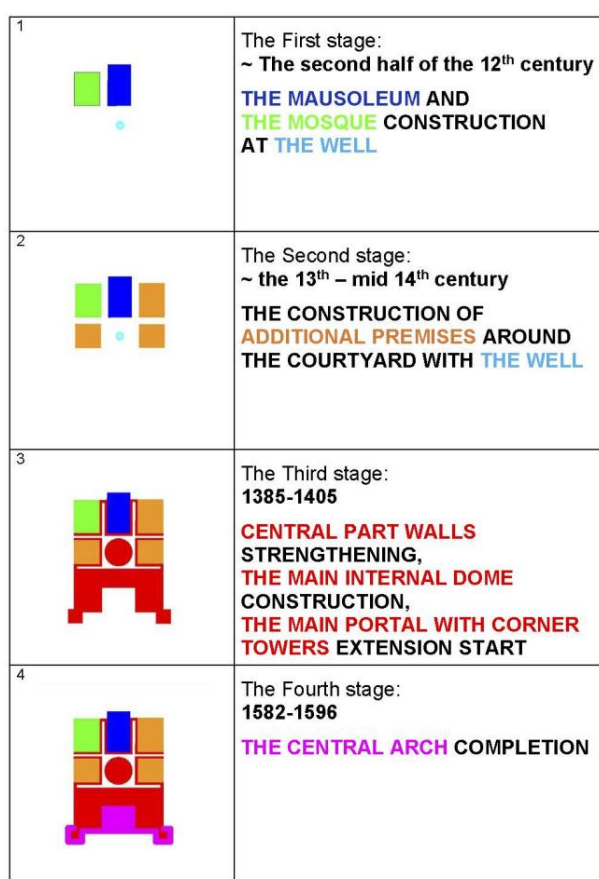


Figure 4. Mausoleum-khanaka of Akhmed Yassawi stages of construction (12th – 16th centuries): 1 – The First stage: ~ the second half of the 12th century – the Mausoleum and the Mosque construction; 2 – The Second stage: ~ the 13th – mid 14th century – the construction of additional premises around the courtyard with the well; 3 – The Third stage: 1385-1405 – the central part walls strengthening, the main Dome construction, the main Portal with corner towers start of extension; 4 – The Fourth stage: 1582-1596 – the central Arch completion.

Briefly, the evolution of the complex looks like this. The necropolis began to form in the 5th – 10th centuries. In the 12th century, the mausoleum of Khoja Ahmed appeared. Further, by the beginning of the 14th century, an “ensemble of buildings was formed, the organizing center of which was a mausoleum of the Karakhanid type with an extensive

courtyard in front of it and a well in the middle of the courtyard. Now it is definitely said about the imposition of the plan of the Timurov complex on the plan of the original ensemble with the coincidence of the centers of the courtyard and Kazandyk” [1] (pp.149-150). The stages of construction of the complex in the 12th – 16th centuries (in accordance with this concept) are schematically shown in Figure 4.

The main period of construction work in the complex began, as Masson suggests [12] (p.6), in 1394-1395 (the date on one of the hinges of the inner door of the mausoleum-khanaka). In 1395, by order of Timur, a monastery for Sufis was founded on the site of the complex. Emir Timur personally visited the construction site in 1397. The idea of the customer, presumably, was part of the overall Architectural concept.

Describing this concept, Ratiya writes: “In the “Timur’s State”, architectural art has reached an exceptionally high level of development. The buildings of this time, proudly completed with high spherical domes resting on drums and decorated with stalactites and giant inscriptions, are distinguished primarily by the massiveness of their architectural forms and grandiosity of size. A characteristic compositional technique, known in the art of Central Asia since the 11th – 12th centuries, is the construction of huge entrance portals, sometimes with tall and slender minarets at the corners. There is a tendency to exquisite multicolored decoration of structures, especially from the exterior, facade side. At this time, all types and types of architectural decoration are widely used, of which tile decoration, mosaic and watered terracotta, as well as wall ornamental painting and monumental painting achieve high perfection” [51] (p.10).

Active construction work continued until 1399. The walls of the buildings around the courtyard were reinforced with brickwork. The well in the center of the courtyard was filled in. The new well was dug in a room specially designed for it (there is an assumption that the new well was dug in the 18th century). The courtyard was blocked by a single Main dome. The construction of the main portal with corner towers was started on the south-eastern side of the complex. All external surfaces (except the Main Portal, the Main Dome, the dome over the mosque, the domes over the front room) were lined with multicolored glazed tiles. This is confirmed by the studies of foundations and walls carried out in the early 1950’s, about which Yelgin writes: “1) a new building was not built entirely, before that there was another building with an inner courtyard (or a group of buildings forming a courtyard), covered later by the dome of Kazandyk; moreover, a mosque has older walls (north-western corner of the complex); 2) the main southern portal with minarets was attached to a pre-existing building; to install the Kazandyk dome, the walls of the former courtyard were reinforced with linings, and the passageways in these walls were narrowed (this explained the lack of foundations under the southern

portal)” [1] (p.146). This suggests that the Timur’s project of the 14th century implied the overlap of the existing courtyard with the Dome, an extension on the southeastern side of the Main Portal and uniform cladding of the facades of buildings and domes, which was built at different times.

However, for example, Muminov supports the previously formed opinion that “The construction of the mausoleum-complex was preceded by the destruction of buildings of the 12th – 14th centuries that previously existed on its territory. The first stage of construction began in 1389-1391 and ended in the mid-90’s of the 19th century. The height of the building reached 14.63 m on the main portal, 12.8 m in Kazandyk, 11.8 m in gurkhan from the day surface of the 15th century. [...] At the second stage of construction, which apparently began in 1397, smooth high-rise parts of the main portal, the domes of kazandyk and Gur-khana were built, the room in the northwest corner of the building was turned into a mosque. The decorative moment was strengthened: the domes of the main halls were covered from the inside with ganch stalactites, the side rooms with plaster” [53].

In 1405, construction stopped due to Timur’s death. By this period, the Main Portal with corner towers, the outer Main Dome, the facing of the portal and domes remained unfinished. Describing the situation, Masson writes: “If the rear facade, finished in its exterior decoration, as well as both side ones, is now the most beautiful exterior of the building in terms of decoration, then the bare front portal with its dimensions and proportions and at the first glance amazes the viewer, who after that remains of the entire monument a sense of greatness. In its general appearance, it is impossible not to notice the similarity with the main entrance of the palace of Timur’s (Aksaray) in Shakhrisabz, which began construction much earlier, namely, in 1380. Most of all, they are brought together by the nature of angular minarets, faceted at the bottom, turning into cylindrical ones from a certain height. The wonderful decorations of the ruins of Aksaray and the surviving skeleton of the portal of the mausoleum of Khoja Ahmed in comparison complement each other in mental reconstruction” [12] (p.14).

In the period 1583-1598, by order of the Ruler of Bukhara, Abdullah Khan the Second, the arch of the Main portal was completed. The upper parts of the portal walls were crowned with battlements. The arch lock turned out to be slightly away from the planning compositional axis of the building. In addition, the right archivolt subsequently partially buckled. Figures 5 and 6 show the modern look and drawing of the main facade. The images show sections of the Portal walls erected in different periods.

In the next almost two and a half centuries, minor repairs were only occasionally carried out in emergency areas. In the 1840’s, the building became part of the fortifications of the citadel erected nearby. In 1846, during the siege, the area around the building and the building itself were partially flooded with water for several months. This had critical consequences for clay and brick foundations. The

number of cracks and the rate of their formation have increased. During the siege in 1864, several artillery shells hit the building, which destroyed the cladding in some areas.

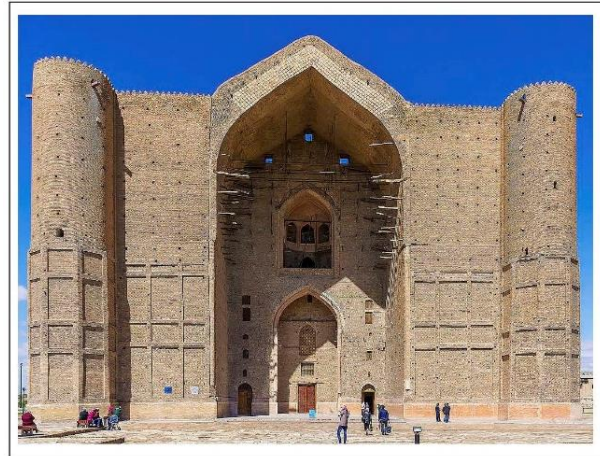


Figure 5. The mausoleum-khanaka of Akhmed Yassawi Main fasade – the View [59]

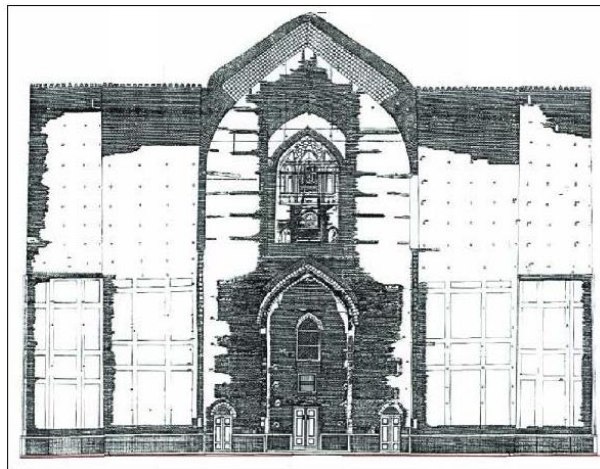


Figure 6. The mausoleum-khanaka of Akhmed Yassawi Main fasade – the Drawing [60]

In the early 1870’s, the disrepair of the building stimulated ideas for its demolition. However, the demolition project was rejected, and in 1872, by order of the leadership of the Turkestan Governor-General, the first repair and clearing of the premises and the adjacent territory from accumulated garbage was carried out for many years. In 1884, the roof was repaired, drains were arranged, and the collapsed sections of the basement walls were repaired. In 1886-1887, the northwest corner of the building, which began to settle and collapse, was reinforced from the outside with four buttresses. In 1910, major repairs were carried out – the installation of a brick basement, repair of some cracked arches, partial restoration of plaster. The condition of the facades of the building at the beginning of the last century is shown in Figure 7.

The changed State Authorities expanded organizational

and financial measures to preserve the building. In 1925, the repair work continued: the lower parts of the walls were shifted in some rooms and a small dome was erected. In 1928-1929, cracks in the walls were filled in, the collapsed sections of the walls were bricked up, emergency vaults and arches were dismantled and re-erected.

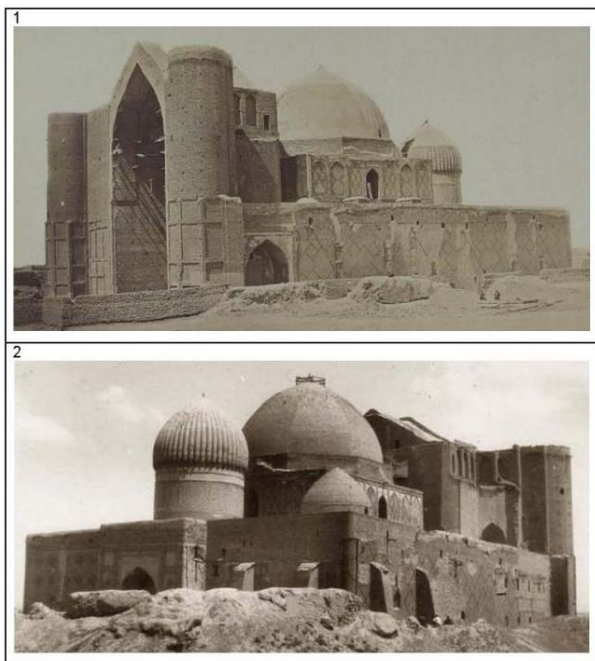


Figure 7. The mausoleum-khanaka of Akhmed Yassawi views at the end of the 19th century: 1 – the view from the East [61]; 2 – the view from the West [62]

In 1939-1940 the following was done:

- partially restored lost finishing elements;
- the main dome is lined with small bricks of local production;
- gutters are made on the roof;
- the walls on the second level are bound with steel ties;
- plastered archivolt arches of the main portal and ribbed dome over the mausoleum visit;
- in the mosque's premises, the domed wooden elements of the beam sails were replaced with metal ones;
- the base of the dome above the mosque was reinforced with a steel hoop.

Since the middle of the last century, research and repair and restoration work has been carried out constantly. Figure 8 shows the Longitudinal and Transverse sections from the set of drawings of Measurement works 1956-1957.

In the 1950's, steel elements connected the rear wall of the portal with the quadrangle of the main dome. Tape foundations made of various materials (reinforced concrete, brick on cement mortar) were placed under most of the walls. Partially destroyed sections of walls and polychrome cladding were restored. A number of restoration activities

continued in the 1970's and 1980's. Measures were taken to lower the groundwater level. As Ordabaev recalls [14], in the mid-1970's, an idea appeared to complete the construction of the building (complete the portal, perform cladding), but it was not implemented. In the early 1980's, the complex received the legal status of a monument of history and culture of Republican significance. By the end of the 1980's, the area of urban planning regulation of the adjacent territory was determined.

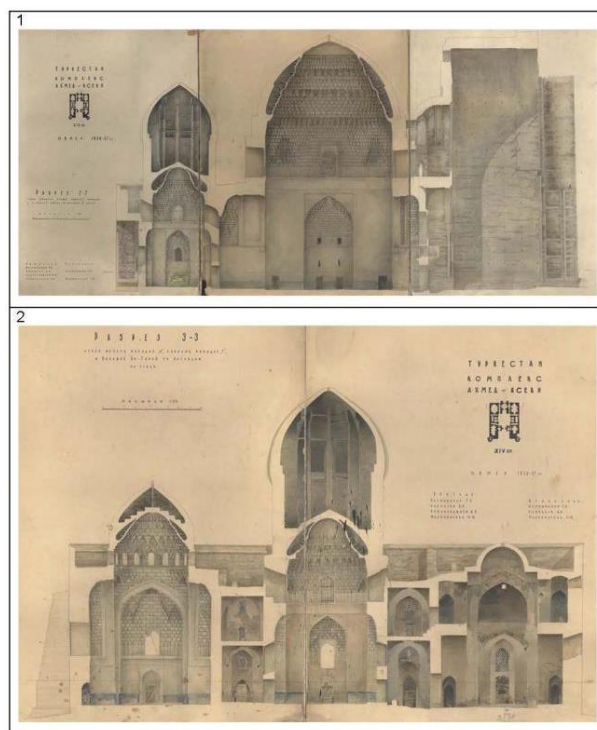


Figure 8. The mausoleum-khanaka of Akhmed Yassawi measurement drawings of 1956 – 1957: 1 – the Longitudinal section [63]; 2 – the Transverse section [64]

Special attention has been paid to the complex since the early 1990s. The city of Turkestan began to be perceived as the spiritual capital of Kazakhstan. The Government of Kazakhstan has organizationally and financially ensured the rhythmic conduct of all research, design and construction activities with the involvement of domestic and foreign specialists. In 1993, the cementation of the soils under the building was carried out. A significant amount of work (including strengthening the foundations) was carried out during the complex restoration of 1995-1996. In 2017-2020, the next repair of the Main Dome was carried out. Since the beginning of this century, all repair and restoration works have been coordinated with UNESCO, which included the complex in the World Heritage List in 2003. The current state of the facades of the building is shown in Figure 9.

Thus, to date, the construction of the Ahmed Yassawi's mausoleum-khanaka has not been completed. In some areas, due to unfinished construction, emergency transformations are observed. Steel fasteners made in

various years in the crack zone along the arch of the Main Portal from the back side, steel cable ties inside the archivolt of the Main Portal arch, periodically plastered cracks on various parts of the walls, deflection of the right part of the arch of the Main Portal and a number of other phenomena show the expediency of carrying out complex measures to complete the construction of the mausoleum-khanaka. Part of these destructions is associated with the ongoing soaking of the walls with groundwater (the next traces of soaking were revealed at the turn of 2022-2023). Solving this problem is a priority.

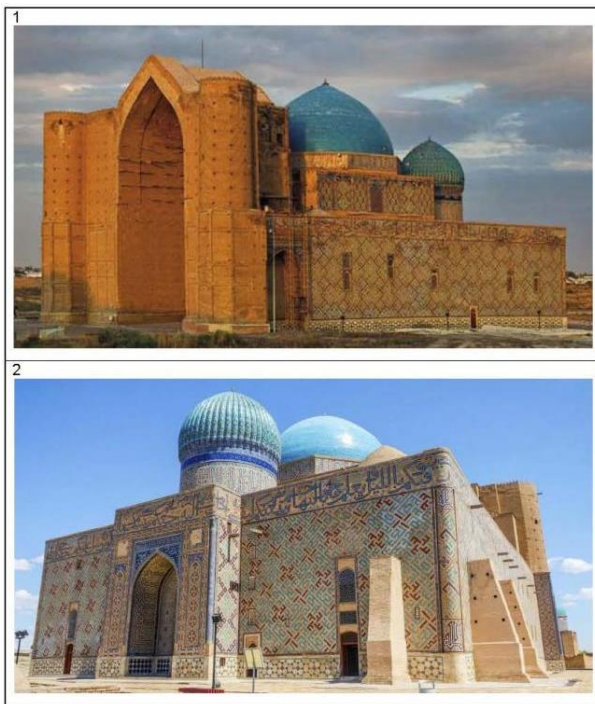


Figure 9. The mausoleum-khanaka of Akhmed Yassawi views of the 21st century beginning (after reconstructions of 20th century): 1 – the view from the East [65]; 2 – the view from the West [66]

Based on the analysis of similar buildings of the Timur era (mid-14th – early 15th centuries), to complete the construction of the building, it is necessary to: erect the main (external) Dome over the existing internal one; complete the Portal with corner towers; perform glazed tile cladding of the Portal, the main dome, the dome over the mosque and the domes over the front rooms (the version of Samoilov, Kuspanaliyev, Sadvakasova and Akhmedova [52]). Figure 10 shows the intended appearance of the facades of the building according to the original plan of the end of the 14th century.

The practice of solving such problems exists, including for buildings of the Timur era. The Bibi-Khanym Mosque in Samarkand (39°39'38"N 66°58'47"E), built from 1399 to 1404, by the middle of the nineteenth century was in a ruined state due to some natural and anthropogenic influences. In the twentieth century, work was carried out to clear the complex and preserve it.

In 1950, Ratiya [51] proposed a project to restore the

building. The project started in 1997. Using reinforced concrete and steel structures, brick and glazed tiles, the building was almost completely restored (including the Main Dome). To date, the lanterns crowning the corner towers have not been erected, and the cladding has not been partially completed. Figure 11 shows the ruins of the Bibi-Khanim mosque in the 1870's, the restoration project of 1950, construction work in 1997, the current state of the building.

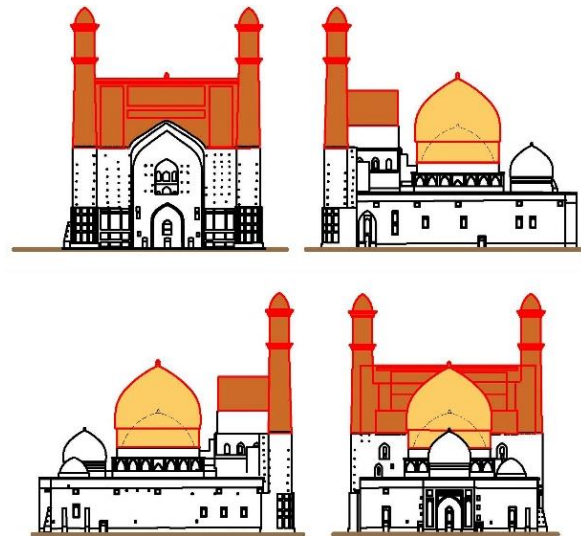


Figure 10. The mausoleum-khanaka of Akhmed Yassawi construction completion project: facades in the completed form (the author's version, 2023 [52])

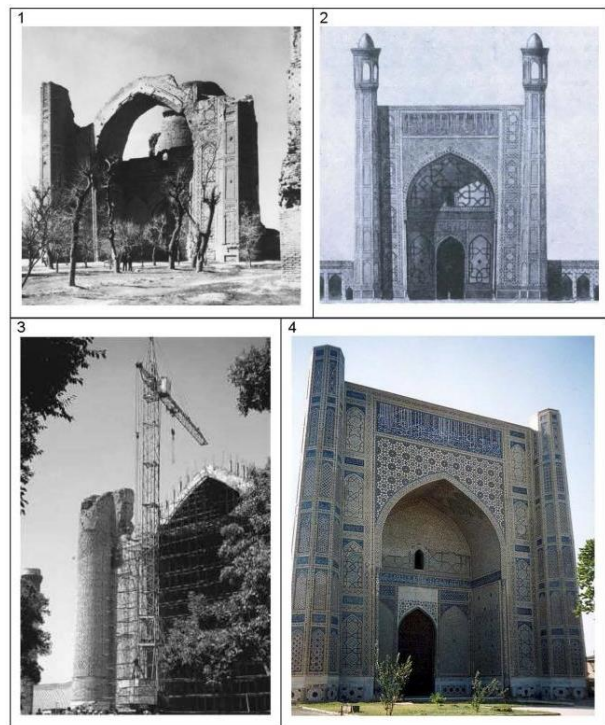


Figure 11. The Main facade of the Bibi-Khanym Mosque in Samarkand: 1 – the View in the 1870's [67]; 2 – the Restoration project of the 1950 (Ratiya) [68]; 3 – Reconstruction works in 1997 [69]; 4 – the View in the early 2000's [70]

Accordingly, the design solution is of interest, which implies the completion of the construction of the building. This continues the work of the ancestors, realizing their Grandiose plan.

4. Result and Discussion

The first task is to minimize the soaking of walls and ceilings by both atmospheric and groundwater. The elimination of soaking by rain and melting snow can be solved by completing the cladding. Not lined: the dome over the mosque, paired domes over a Large palace room, two single domes over other rooms, the Main portal, parapets and adjacent sections of the roof. Elimination of groundwater suction can be solved by lowering the level of the territory adjacent to the building by 1.0-1.5 m. The lowering section begins approximately 6.0 m from the walls.

The configuration can be specified by the location of nearby underground crypts. The retaining wall made of monolithic reinforced concrete has an L-shaped shape. It is buried at 7.0 m. The area adjacent to the building (up to the retaining wall) is concreted and waterproofing. Paving slabs made of natural stone are laid on top. An injection

membrane is carried out in all the walls of the building: bores (the height of the impregnation layer is 0.5 m) extending to the entire thickness of the wall are filled, for example, with injection resin. Given the large thickness of the walls (2.0-3.0 m), injections are performed from two sides. The scheme of these activities is shown in Figure 12.

The constructive solution of the new (customizable) parts of the Ahmed Yassawi's mausoleum-khanaka takes into account the current state of the preserved structures. The main element of the aboveground structure is a steel frame. It is proposed to use a monolithic reinforced concrete foundation as a support. The foundation has the form of cross ribbons (width 1900 mm, height 600 mm). The top of the foundation is located 100 mm below the floor of the existing building. It is fed under the existing brick walls to a width of 500 mm. The foundation is being built in stages. First, the tapes are executed outside the wall area. Then the sections adjacent to the walls and located under them are carried out in parts. In parallel, work is underway on waterproofing reinforced concrete structures. The sequence of work will be determined by the "Production of works Project", taking into account the preservation of the stability of existing walls at all stages of construction. If necessary, some sections of the walls can be reinforced with steel clips.

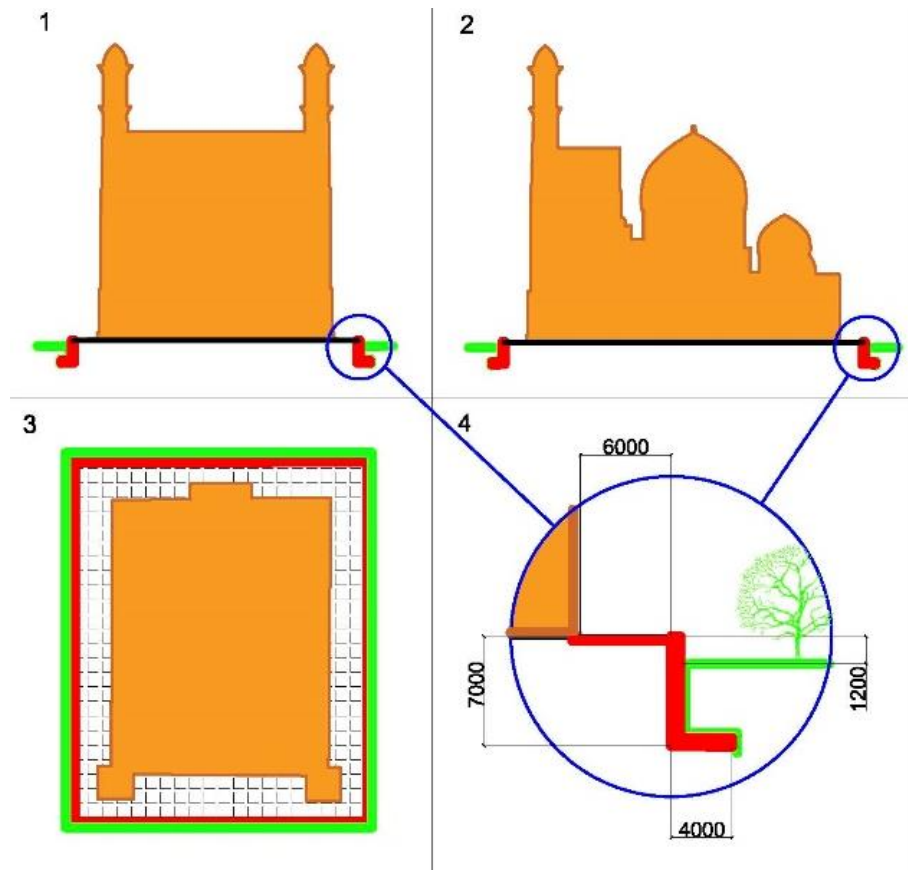


Figure 12. The Scheme of lowering the area adjacent to the building to reduce the impact of groundwater (1 – the Transverse section; 2 – the Longitudinal section; 3 – the Plan; 4 – the Retaining wall node) – dimensions are given in millimeters

Taking into account the current state of the preserved structures of the building, the external dome being erected is in minimal contact with the structure of the existing internal dome. Therefore, the structures of the new dome are based directly on the new reinforced concrete foundations. The support is eight steel columns (650 mm I-beam). The columns are located directly at the walls of the main hall. The shelves of the I-beam are partially buried in the walls. When finishing, the columns are lined, forming pilasters. The columns are supported on the foundation through steel plates. The plates are fixed with anchor bolts in the foundation structure.

At a height of approximately 21.0 m from the floor (the bottom of the dome quadrangle), the columns are interconnected by beams (400 mm I-beam). The configuration is a square. These beams are hidden by a “Stalactite type” of cladding when finishing. The columns continue to approximately a height of 25.0 m. They pass inside the wall of the dome octagon. Here they are also connected by beams (400 mm I-beam). The configuration is an octagon. The support ring of the dome drum (350 mm channel) is located on these beams.

Filling the frame of the dome drum and the dome itself is possible, both from new bricks produced in the Sairam city (bricks were made in this city for the construction of this building in the 14th century) and from other wall materials. Openings for ventilation of the inter-dome space are provided in the dome drum and at the top of the dome. The cladding is made with glazed tiles. The dome acquires a blue lining. The dome drum is lined with tiles of various colors (similar to the preserved sections of the walls; it is possible to use epigraphic decor).

The main columns extend to the base of the dome. They are part of the frame of the dome drum. The frame of the dome drum and the dome itself is made of steel beams (240 mm channel). The construction is completed at a height of approximately 51.0 m. Additional frame elements are 180 mm channels. Diagonal cross ties are made of steel elements (100 mm L-corner). To attach the lining from the outside, belts are made (65 mm L-corner). The joints of the steel elements are welded. After installation, the steel structures are painted.

The extension of the Portal to a height of 50.422 m (20.0 m higher than the existing part of the Portal) and corner towers to a height of 67.293 m involves not only a steel frame for new sections, but also the strengthening of existing walls. All vertical elements are supported on a monolithic reinforced concrete foundation (cross-band type) through plates with anchor bolts. The vertical structures of the arched niche are made of steel columns (I-beam 400 mm).

Horizontal ties are a 240 mm I-beam. For the pillars of corner towers, a 360 mm I-beam with horizontal connections is used – a 240 mm I-beam. Diagonal connections are made from a 140 mm channel. Part of the columns must be placed inside the existing walls. Vertical

elements are interconnected inside the walls by 240 mm channels. The lanterns above the towers are made of a 200 mm channel. After installation, the steel structures are painted.

Both bricks from the city of Sairam and other wall materials can be used to fill the walls. The cladding is made of glazed tiles in accordance with the preserved sites and historical analogues.

When performing a detailed calculation of new building structures, the cross-sections of the main elements of the steel frame can be specified. Figures 13-21 show the schemes of the structural solution of the superstructured parts of the Building.

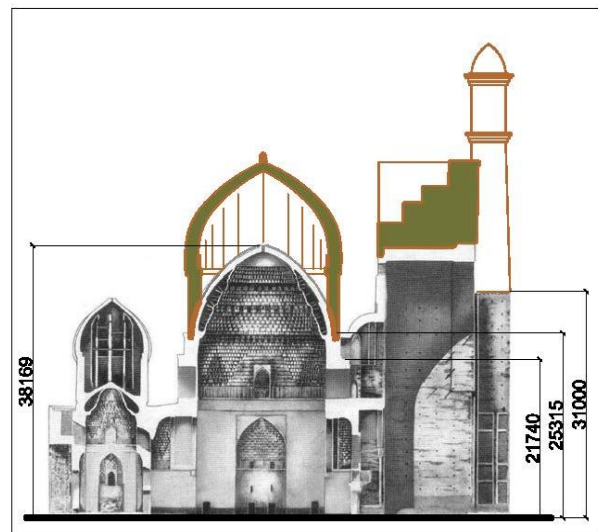


Figure 13. The mausoleum-khanaka of Akhmed Yassawi construction completion project – the Longitudinal section (shape) – Drawings based on figure 8 – dimensions are given in millimeters

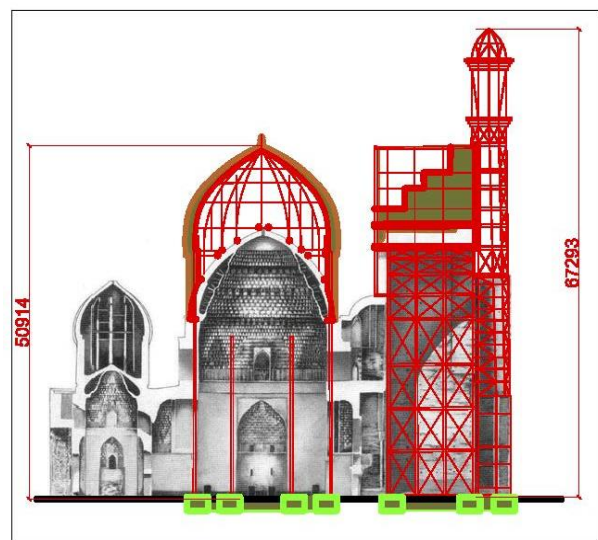


Figure 14. The mausoleum-khanaka of Akhmed Yassawi construction completion project: – the Longitudinal section (construction) – Drawings based on figure 8 – dimensions are given in millimeters

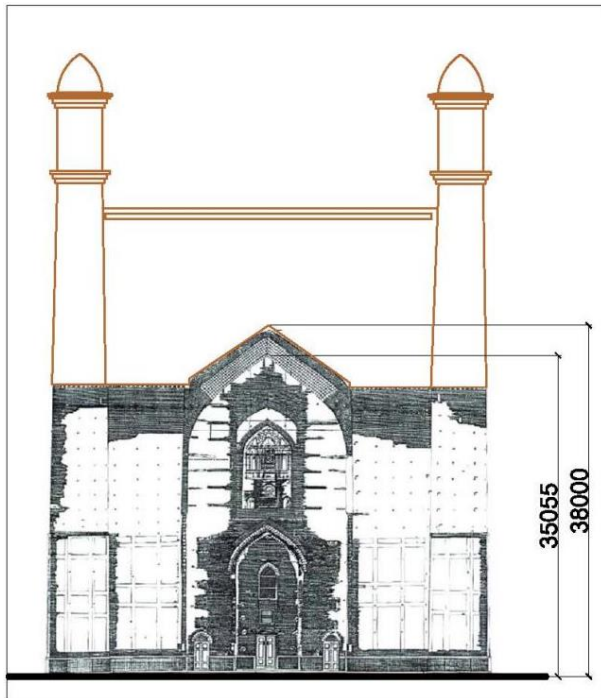


Figure 15. The mausoleum-khanaka of Akhmed Yassawi construction completion project – the Main facade (shape) – Drawings based on figure 6 – dimensions are given in millimeters

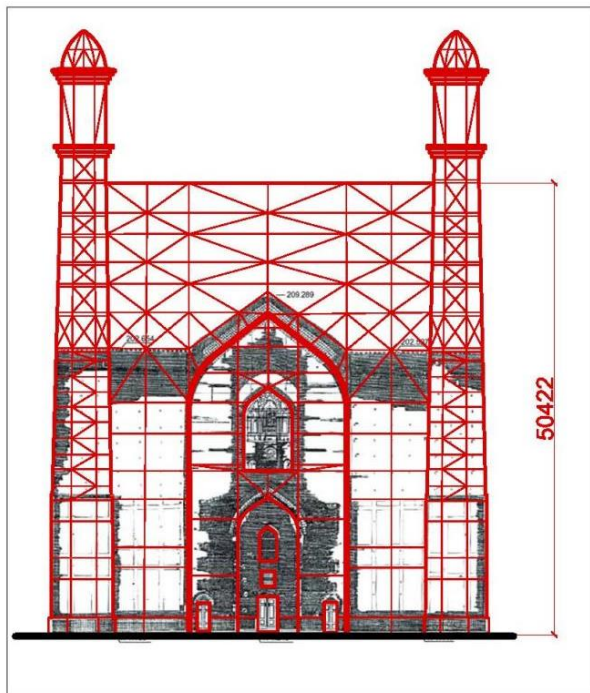


Figure 16. The mausoleum-khanaka of Akhmed Yassawi construction completion project – the Main facade (construction) – Drawings based on figure 6 – dimensions are given in millimeters

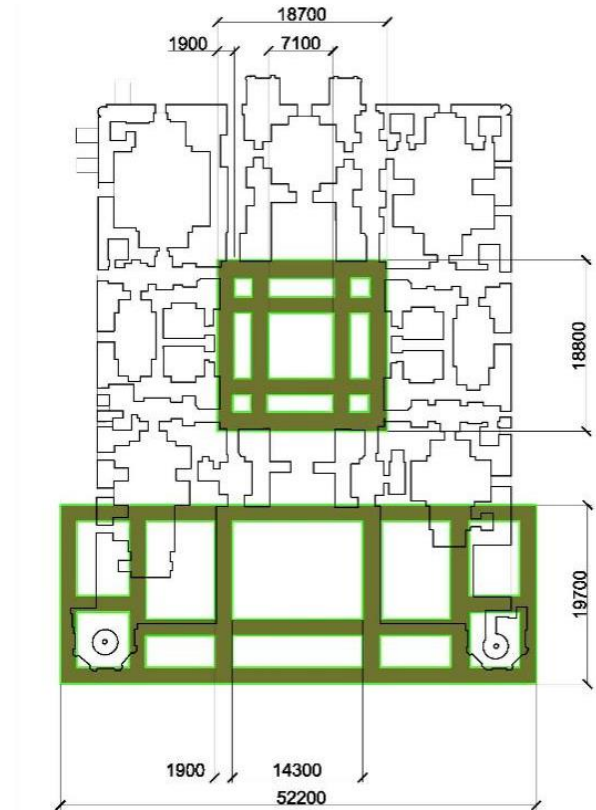


Figure 17. The mausoleum-khanaka of Akhmed Yassawi construction completion project – Cross-band reinforced concrete foundations (the plan) – dimensions are given in millimeters

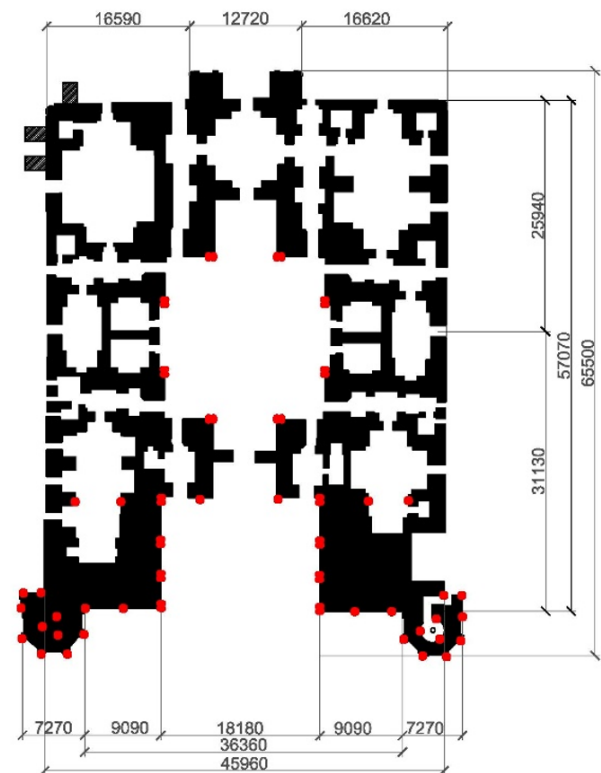


Figure 18. The mausoleum-khanaka of Akhmed Yassawi construction completion project – Steel columns on the first level (the plan) – dimensions are given in millimeters

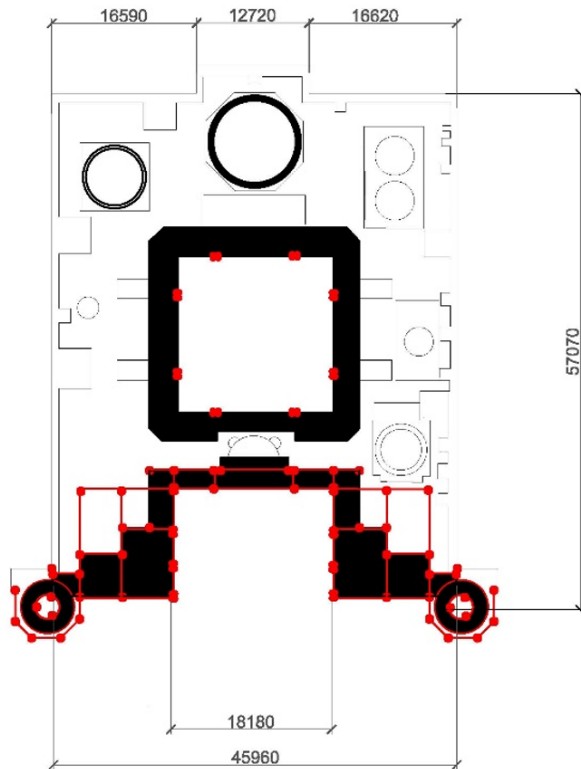


Figure 19. The mausoleum-khanaka of Akhmed Yassawi construction completion project – Steel columns and ties at the base level of the Main dome (the plan) – dimensions are given in millimeters.

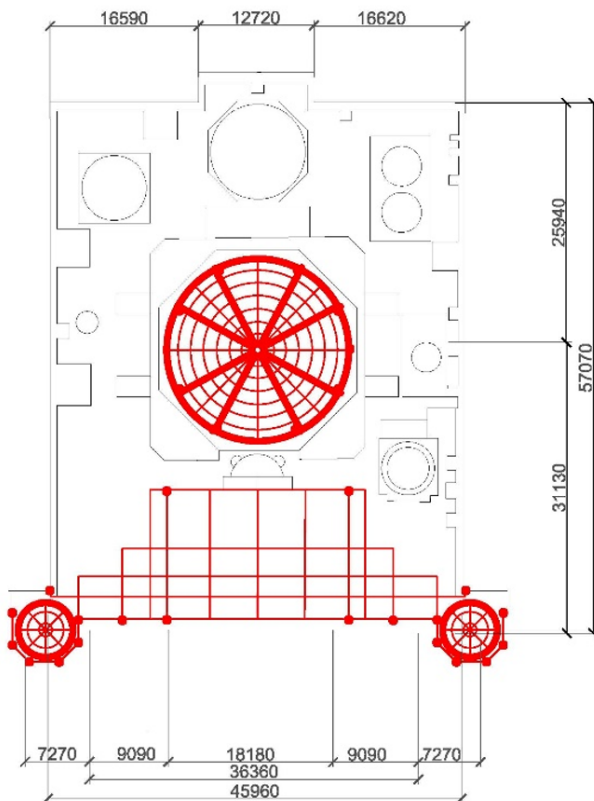


Figure 20. The mausoleum-khanaka of Akhmed Yassawi construction completion project – Steel structures of the Main dome and the top of the Portal (the plan) – dimensions are given in millimeters

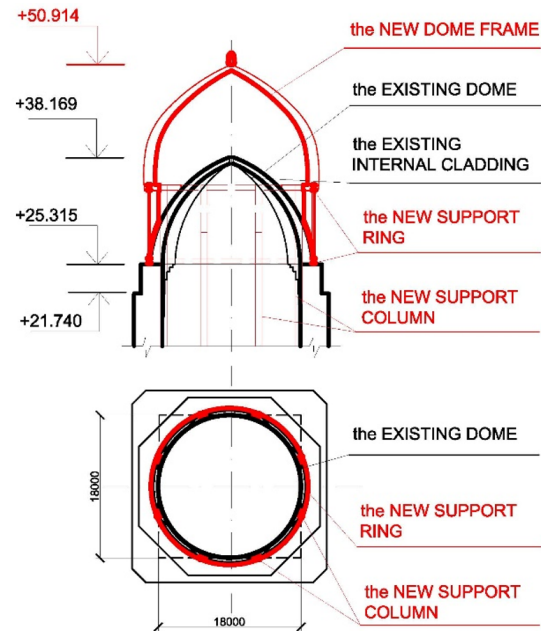


Figure 21. The mausoleum-khanaka of Akhmed Yassawi construction completion project: steel structures of the Main dome (the section and the plan) – dimensions are given in millimeters.

5. Conclusions

The building of the Ahmed Yasawi's mausoleum-khanaka has a long history of construction. This story includes several stages of active construction and repair work, as well as long-term breaks between them. Currently, the building of the mausoleum-khanaka of Ahmed Yasawi is still in an unfinished state. Some of the main load-bearing structures have critical deformations that can lead to the destruction of the building. The ongoing conservation measures are insufficient to preserve the building. In addition, the unfinished appearance of the building causes moral and aesthetic damage to the process of cultural development of the Region. This is a problem that needs to be solved on the basis of a complex of design and construction activities.

The task of preserving the building can be solved by completing the construction in full. The basis of the project for the completion of the construction of the building can serve as research materials on the alleged initial design.

The completion of the multi-year construction involves solving a number of tasks related to the state of the structures of the unfinished building. The main task is to determine the possibility of using existing structure as part of new structures. In the situation under consideration with the mausoleum-khanaka of Akhmed Yassawi, the active construction of which ended more than four hundred years ago, the existing structures are of little use for supporting the new, overlying parts of the building. In addition, due to various natural and anthropogenic factors, the structures of the existing building are still susceptible to getting wet from both atmospheric and groundwater.

Accordingly, the first priority is measures for waterproofing and lowering the groundwater level. Waterproofing from atmospheric influences is solved by the completion of glazed brick cladding of domes and parapets in existing and newly erected parts, as well as film-membrane insulation of the roof. The elimination of groundwater suction is solved by helium insulation of the walls and lowering the level of the territory adjacent to the building. New constructions of the Main Dome are solved on the basis of a metal frame based on independent reinforced concrete foundations. The completed upper part of the Portal with corner towers also has a steel frame, which in the lower part fixes the cracked walls of the existing building and a deformed arch. Independent reinforced concrete foundations also serve as a support.

The completion of the centuries-old construction of the mausoleum-khanaka of Akhmed Yassawi will be of great importance from a historical and cultural point of view. This is the completion of the grandiose plan of the ancestors, demonstrating the continuity of the historical process.

Acknowledgements

Authors express their gratitude to the Google search engine, the USA Library of Congress, the British Library, whose resources are used for the selection of theoretical material and illustrations.

REFERENCES

- [1] Yelgin Yu.A. "Arheologicheskie i istoriko-arhitekturnye issledovaniya mavzoleya Hodzhi Ahmeda Yasavi: Vtoraya polovina 19 v. – seredina 1950-h godov: (Ocherki i materialy)" ["Archaeological and historical-architectural studies of the mausoleum of Khoja Ahmed Yasawi: The second half of the 19th century – mid-1950's: (Essays and materials)"], Almaty, 2013, pp. 1-225. – URL: <http://tehne.com/library/yolgin-yu-arheologicheskie-i-istoriko-arhitekturnye-issledovaniya-mavzoleya-hodzhi-ahmed-a-yasavi-vtoraya-polovina-xix-v-seredina-1950-h-godov-almaty-2013> (accessed on 3 June 2023).
- [2] Yelgin Yu.A. "Mavzolej Hodzhi Ahmeda Yasavi: (Bibliograficheskij ukazatel')" ["Mausoleum of Khoja Ahmed Yasawi: (Bibliographic index)"], Shymkent, 1992, pp.1-48.
- [3] Alliyar N.B., Samoilov K.I. "Issledovaniya arhitektury kompleksa mavzoleya-hanaka Ahmeda Yassavi v g.Turkestan v 20 veke" ["Studies of the architecture of the mausoleum-khanaka complex of Ahmed Yassavi in Turkestan in the 20th century"], Nauka i obrazovanie segodnya, 2021, № 7 (66), pp. 60-64. – URL: <https://publikacija.ru/images/PDF/2021/66/Science-and-education-today-7-66-.pdf> (accessed on 3 June 2023).
- [4] Alliyar N.B., Samoilov K.I. "Razvitie arhitektury kompleksa mavzoleya-hanaka Ahmeda Yassavi v g.Turkestan v 16-19 vekah" ["The development of the architecture of the mausoleum complex-hanaka Ahmed Yassavi in Turkestan in the 16th – 19th centuries"], Nauka i obrazovanie segodnya, 2021, № 6 (65), pp.68-71. – URL: <https://publikacija.ru/images/PDF/2021/65/Science-and-education-today-6-65-.pdf> (accessed on 3 June 2023).
- [5] Baitanaev, B.A., Yelgin, Yu.A. "Voprosy istoricheskoy onomastiki mavzoleya Hodzha Ahmeda Yasavi. Istoricheskaya onomastika i epigrafika" ["Questions of historical onomastics of the mausoleum of Khoja Ahmed Yasawi. Historical onomastics and epigraphy"], Izvestiya Nacional'noj Akademii Nauk Respubliki Kazakhstan: seriya obshchestvennykh i humanitarnykh nauk, 2013, № 3 (289), pp. 241-255. – URL: <http://nblib.library.kz/elib/library.kz/journal/Baitanaev%20Elgin....3....13.pdf> (accessed on 3 June 2023).
- [6] Basenov, T. "Kompleks Mavzoleya Ahmeda Yasavi" ["The complex of the Mausoleum of Ahmed Yasawi"], Almaty: Öner, 1982, pp.1-71.
- [7] Bekchurin, M.S. "Opisanie mecheti Azreta, nahodyashchetsya v gorode Turkestane" ["Description of the Azret mosque located in the city of Turkestan"], Voennyj sbornik, 1866, № 8 (reprinted: Turkestanskaya oblast'. Zametki statskogo sovetnika Bekchurina. Kazan': Universitetskaya tipografiya, 1872, pp. 52-63).
- [8] Man'kovskaya, L.Y. "Issledovanie arhitekturnogo kompleksa-mavzoleya Ahmeda Yassavi v gorode Turkestane i voprosy ego restavracii" ["The study of the architectural complex-the mausoleum of Ahmed Yassavi in Turkestan and the issues of its restoration"]: avtoreferat dissertatsii kandidata iskusstvovedeniya, Tashkent: Izdatel'stvo AN UzSSR, 1963, pp. 1-18.
- [9] Man'kovskaya, L.Yu. "K izucheniyu priyomov sredneaziatskogo zodchestva konca 14 v.: (Mavzolej Hodzha Ahmeda Yassevi)" ["To study the techniques of Central Asian architecture of the late 14th century: (Mausoleum of Khoja Ahmed Yassavi)"], IZU, 1962, Vypusk 1, pp. 93–142.
- [10] Man'kovskaya, L.Yu. "Nekotorye arhitekturno-arheologicheskie nablyudeniya po restavracii kompleksa Hodzha Ahmeda Yassavi v g.Turkestane" ["Some architectural and archaeological observations on the restoration of the Khoja Ahmed Yassawi complex in Turkestan"], Izvestiya Akademii nauk Kazahskoj SSR, Seriya istorii, arheologii i etnografii, 1960, Vypusk 3(14), pp. 52-69.
- [11] Masson, M.E. "Mavzolej Hodzhi Ahmeda Yassavi" ["Mausoleum of Khoja Ahmed Yassawi"], Tashkent: Syr-Dar'inskoe otdelenie Obshchestva izucheniya Kazahstana, 1930.
- [12] Masson, M.E. "O postrojke mavzoleya Hodzha Ahmeda v gorode Turkestane" ["About the construction of the mausoleum of Khoja Ahmed in Turkestan"] Izvestiya Sredneaziatskogo geograficheskogo obshchestva. T. 19, Tashkent, 1929, pp. 39-45.
- [13] Mustapayeva, D. "Issledovanie stroeniya mavzoleya Hodzhi Ahmeda Yasavi 12 veka" ["Study of the structure of the mausoleum of Khoja Ahmed Yassawi of the 12th century"] Yassavi universitetiniñ habarshysy, 2021, No4 (122), pp. 129-138 – <https://doi.org/10.47526/2021-4/2664-0686.12> (accessed on 3 June 2023).

- [14] Ordabaev, A. "Problemy izucheniya, ohrany i restavratsii pamyatnikov arhitektury na primere Mavzoleya Hodzhi Ahmeda Yassawi" ["Problems of study, protection and restoration of architectural monuments on the example of the Mausoleum of Khoja Ahmed Yassawi"], Videolekciya (Polnaya rasshifirovka lekcii / S.Romashkina), 2017, 9 Marta. – URL: <https://vlast.kz/gorod/22023-problemy-izucheniya-ohrany-i-restavratsii-pamatnikov-arhitektury-na-prime-re-mavzolea-hodzi-ahmeda-asavi.html> (accessed on 3 June 2023).
- [15] Patsevich, G.I. "Remont i restavratsiya mavzoleya-mecheti Hodzha Ahmeda Yassawi v 1939-1941 gg." ["Repair and restoration of the mausoleum-mosque of Khoja Ahmed Yassawi in 1939-1941"] Izvestiya Akademii nauk Kazahskoy SSR. Seriya arhitekturnaya, 1950, Vypusk 2, pp. 95-100.
- [16] Tuyakbayeva, B.T. "Epigraficheskiy dekor arhitekturnogo kompleksa Ahmeda Yassawi" ["Epigraphic decor of the architectural complex of Ahmed Yassawi"], Алма-Ата: Өнер, 1989, pp.1-176.
- [17] Yelgin, Yu.A. "V.S.Gejncel'man i ego programma remonta mavzoleya Hodzhi Ahmeda Yassawi v 1906-1908 gg." ["V.S.Heintzelman and his program of renovation of the mausoleum of Khoja Ahmed Yassawi in 1906-1908"], Arheologiya Kazahstana, 2018, № 1-2, pp. 201-214. – DOI: 10.52967/akz2018.1-2.1-2.201.214 (accessed on 3 June 2023).
- [18] Alliyar N.B., Samoilov K.I. "Features of the historical context of the development of architecture in Central Asia of the 14th – 15th centuries", Nauka i obrazovanie segodnya, 2020, № 12 (59), pp. 96-98. – URL: <https://publikacija.ru/images/PDF/2020/59/Science-and-education-today-12-59-.pdf> (accessed on 3 June 2023).
- [19] Barsukova, E.G. "Features of Architectural Decoration of Religious Buildings of Uzbekistan in the Middle Ages (9-16 Centuries)", International Journal of Science and Research (IJSR), 2019, Volume 8 Issue 11, November, pp. 1255-1257. – URL: https://www.ijsr.net/get_abstract.php?paper_id=ART20202799 https://www.academia.edu/45619859/%D0%90%D0%B2%D1%82%D0%BE%D1%80%D0%B5%D1%84%D0%B5%D1%80%D0%B0%D1%82_%D0%91%D0%B0%D1%80%D1%81%D1%83%D0%BA%D0%BE%D0%B2%D0%B0_%D0%95_%D0%93 (accessed on 3 June 2023).
- [20] Barsukova, E.G. "Vliyanie sufizma na arhitekturu i dekor kul'tovyhsooruzhenij Srednej Azii 9-16 vv." ["The influence of Sufism on the architecture and decor of religious buildings in Central Asia of the 9th – 16th centuries"]: 18.00.01 – Teoriya i istoriya arhitektury. Restavratsiya pamyatnikov arhitektury, Avtoreferat dissertatsii na soiskanie uchyonoy stepeni doktora filosofii (PhD) po arhitekture, Tashkent, 2020, pp.1-50. – URL: https://www.academia.edu/45619859/%D0%90%D0%B2%D1%82%D0%BE%D1%80%D0%B5%D1%84%D0%B5%D1%80%D0%B0%D1%82_%D0%91%D0%B0%D1%80%D1%81%D1%83%D0%BA%D0%BE%D0%B2%D0%B0_%D0%95_%D0%93 (accessed on 3 June 2023).
- [21] Chmelnizkij, S. "Characteristics of Timurid Architecture" in "Islam: art and architecture" / edited by Markus Hattstein and Peter Delius; [translation from German, George Ansell [and others], Cologne: Könemann UK Ltd., 2000.
- [22] Glaudinov B. "Istoriya arhitektury Kazahstana (s drevnih vremen do nachala 20 veka)" ["History of architecture of Kazakhstan (from ancient times to the beginning of the 20th century)"], Almaty: KazGASA, 1999, pp. 1-295.
- [23] Kasymbekova, M.B., Glaudinov, B.A., Samoilov, K.I. "Formoobrazovanie islamskikh memorial'no-kul'tovyh sooruzhenij v Kazahstane 10-19 veka" ["Formation of Islamic memorial and religious buildings in Kazakhstan of the 10th - 19th century"], Almaty: «CIS&Architecture», 2020, pp. 1-143. – URL: <https://ru.scribd.com/document/488132040/Kasymbekova-M-B-Glaudinov-B-A-Samoilov-K-I-THE-SHAPING-OF-ISLAMIC-MEMORIAL-CULT-STRUCTURES-IN-KAZAKHSTAN-OF-THE-X-XIX-CENTURY> (accessed on 3 June 2023).
- [24] Kozha, M.B. "Novye materialy o kul'tovyh sooruzheniyah g.Turkestana (12-18 vv.)" ["New materials on religious buildings of Turkestan (12th – 18th centuries)"], Vestnik KazNPU, Almaty, 2016. – URL: <https://articlekz.com/article/18266> (accessed on 3 June 2023).
- [25] Man'kovskaya, L.Yu. "Tipologicheskie osnovy zodchestva Srednej Azii. 9 – nachalo 20 v." ["Typological foundations of architecture of Central Asia. 9th – early 20th century"], Tashkent: «Fan», 1980, pp. 1-84.
- [26] Pugachenkova, G.A. "Zodchestvo Central'noj Azii XV v. Vedushchie traditsii i cherty" ["Architecture of Central Asia of the 15th century. Leading traditions and traits"], Tashkent: Izdatel'stvo literatury i iskusstva im. Gafura Gulyama, 1976, pp. 1-115.
- [27] Pugachenkova, G.A., Rempel', L.I. "Istoriya iskusstv Uzbekistana s drevnejshih vremyon do serediny 19 veka" ["Art history of Uzbekistan from ancient times to the middle of the 19th century"], Moskva: «Iskusstvo», 1965, pp. 1-688.
- [28] Roxburgh, D.J. "Timurid Art and Architecture", Art History, Oxford Bibliographies, 2014, 01, 30. – URL: <https://www.oxfordbibliographies.com/view/document/obo-9780199920105/obo-9780199920105-0028.xml?rskey=JJsodK&result=142> (accessed on 3 June 2023).
- [29] Samoilov, K.I. "Arhitektura Kazahstana 20 veka (Razvitie arhitekturno-hudozhestvennyh form)" ["Architecture of Kazakhstan of the twentieth century (Development of architectural and artistic forms)"], Moskva-Almaty: M-ArIdizain, 2004, pp.1-930. – URL: <http://tehne.com/assets/i/upload/library/samoilov-arhitektura-kazahstana-20-veka-2004.pdf> (accessed on 3 June 2023).
- [30] Tondi, A. "Arhitekturnyj dekor Srednej Azii epohi Timuridov" ["Architectural decor of Central Asia of the Timurid era"], Avtoreferat dissertatsii Kandidata iskusstvovedeniya, special'nost' 17.00.04, Moskva, 2003, pp. 1-22.
- [31] Umnyakov, I.I. "Arhitekturnye pamyatniki Srednej Azii: Issledovanie. Remont. Restavratsiya 1920-1928 gg." ["Architectural monuments of Central Asia: A Study. Repair. Restoration of 1920-1928"], Uz.SSSR NKP, Glavnyj Sredne-Aziatskij Muzej, Tashkent, 1929, pp. 1-40.
- [32] Vyatkin, V.L. "Pamyatniki drevnostej Samarkanda" ["Monuments of antiquities of Samarkand"], Samarkand: UZKOMSTARIS, 1927, pp. 1-32.
- [33] Weimarn, B.V. "Iskusstvo Srednej Azii" ["Art of Central Asia"], Moskva, Leningrad: Gosudarstvennoe izdatel'stvo «Iskusstvo», 1940, pp. 1-205. – URL:

- https://www.academia.edu/79709099/%D0%92%D0%B5%D0%B9%D0%BC%D0%B0%D1%80%D0%BD_%D0%91_%D0%92_%D0%98%D1%81%D0%BA%D1%83%D1%81%D1%81%D1%82%D0%B2%D0%BE_%D0%A1%D1%80%D0%B5%D0%B4%D0%BD%D0%B5%D0%B9_%D0%90%D0%B7%D0%B8%D0%B8_%D0%9C_%D0%9B_1940 (accessed on 3 June 2023).
- [34] Yakubovsky, A.Ya. "Samarkand pri Timure i Timuridah" ["Samarkand under Timur and Timurids"], Leningrad: Gosudarstvennyy Ermitazh, 1933, pp. 1-64.
- [35] Zahidov, P. "Arhitekturnye pamyatniki Zarafshanskoj doliny" ["Architectural monuments of the Zarafshan valley"], Tashkent: Uzbekistan, 1985, pp. 1-64.
- [36] Zahidov, P. "Arhitekturnoe sozvezdie epohi Timura" ["Architectural constellation of the Timur era"], Tashkent: Glavnaya redakciya izdatel'sko-poligraficheskogo koncerna «Shark», 1996, pp. 1-192.
- [37] Zakhidov, P.Sh. "Kanon garmonii v arhitekture" ["The Canon of Harmony in architecture"]: 18.00.01 - Teoriya i istoriya arhitektury, restavratsiya pamyatnikov arhitektury, Avtoreferat dissertatsii na soiskanie uchyonoy stepeni doktora arhitektury, Baku, 1990, pp.1-37.
- [38] Zasyarkin, B.N. "Arhitektura Srednej Azii: Ocherki po istorii arhitektury narodov SSSR" ["Architecture of Central Asia: Essays on the history of architecture of the peoples of the USSR"], Moskva: Izdatel'stvo Akademii arhitektury SSSR, 1948, pp. 1-160.
- [39] "The Artistic Culture of Central Asia and Azerbaijan in the 9th–15th centuries". Vol. 4. Architecture, Samarkand-Tashkent: IICAS, 2013, pp. 1-284.
- [40] "Svod pamyatnikov istorii i kul'tury Kazakhstana. YUzhno-Kazakhstanskaya oblast'" ["A set of historical and cultural monuments of Kazakhstan. South Kazakhstan region"], Almaty: Glavnaya redakciya «Kazak enciklopediyasy», 1994, pp. 1- 368.
- [41] Gilmanova, N.V. "The Ak-Saray palace", International Journal of Advanced Research in Science, Engineering and Technology, 2018, Vol. 5, Issue 6, June, pp. 6080-6087. – URL: <http://www.ijarset.com/upload/2018/june/12-IJARS-ET-Gilmanova.pdf> (accessed on 3 June 2023).
- [42] Kabanov, S.N. "Ruiny dvorca Ak-Saray v Shahrisabze" ["Ruins of the Ak-Saray Palace in Shakhrisabz"], TIIA AN UzSSR, t. 1. Tashkent, 1948.
- [43] Khakimov, Z. "Arhitekturnye shedevry izumrudnogo goroda" ["Architectural masterpieces of the emerald city"], "San'at" Journal of the Academy of Arts of Uzbekistan, 2002, №1. – URL: https://sanat.orexca.com/2002-rus/2002-1-2/history_art3-4/ (accessed on 3 June 2023).
- [44] Masson, M.E. "Kratkaya istoricheskaya spravka o Sredne-Aziatskih minaretah" ["Brief historical information about Central Asian minarets"] Materialy Uzkomstarisa; Vypusk 2-3 / Uzbekskij komitet po ohrane i izucheniyu pamyatnikov material'noj kul'tury, Tashkent, 1933, pp. 1-18.
- [45] Masson, M.E. "Sobornaya mechet' Timura, izvestnaya pod imenem mecheti Bibi-Hanym" ["The Cathedral Mosque of Timur, known as the Bibi-Khanim Mosque"] Sredneazijskij komitet po delam muzeev i ohrane pamyatnikov stariny, iskusstva i prirody (Sredazkomstaris), Tashkent, 1926, pp. 1-16.
- [46] Masson, M.E., Pugachenkova, G.A. "Shahrisabz pri Timure i Ulugbeke" ["Shakhrisabz under Timur and Ulugbek"], v knige: Trudy Sredneazijskogo gosudarstvennogo universiteta, Vypusk 49.b kniga 6, Tashkent, 1953, pp. 17-99.
- [47] Paskaleva, E. "The Bibi Khanum Mosque in Samarqand: Its Mongol and Timurid Architecture", The Silk Road, 2012, Vol.10, pp. 81-98. – URL: http://www.silkroadfoundation.org/newsletter/vol10/SilkRoad_10_2012_paskaleva.pdf (accessed on 3 June 2023).
- [48] Paskaleva, E. "A traveller's impressions, August 2013, Samarqand refashioned". The Silk Road, 2013, Vol. 11, pp.139-153. – URL: https://edspace.american.edu/silkroadjournal/wp-content/uploads/sites/984/2017/09/SilkRoad_11_2013_paskaleva.pdf (accessed on 3 June 2023).
- [49] "Masjid-i Bibi Khanum", Hidden Architecture, 2020, 01.29. – URL: <https://hiddenarchitecture.net/masjid-i-bibi-khanum/> (accessed on 3 June 2023).
- [50] Bulatov, M.S. "Geometricheskaya garmonizatsiya v arhitekture Srednej Azii 9-15 vv." ["Geometric harmonization in the architecture of Central Asia of the 9th – 15th centuries"], Moskva: Nauka, 1988, pp. 1-362. – URL: <http://science.totalarch.com/book/0112.rar> (accessed on 3 June 2023).
- [51] Ratiya, Sh.E. "Mechet' Bibi-Hanym v Samarkande: issledovaniya i restavratsionnye opyty" ["Bibi-Khanim Mosque in Samarkand: research and restoration experiments"], Moskva: Gosudarstvennoe izdatel'stvo arhitektury i gradostroitel'stva, 1950, pp. 1-108.
- [52] Samoilov, K., Kuspangaliyev, B., Sadvokasova, G., Akhmedova, A. "The Version of the Composition of the Mausoleum-Khanaka Khoja Ahmed Yassawi Main Facade in Turkestan". *Heritage* 2023, 6, pp. 1344-1377. <https://doi.org/10.3390/heritage6020074>
- [53] Muminov A. "Epigraficheskie nadpisi mavzoleya Hadzha Ahmada Jasavi kak istochnik po istorii Kazakhstana" ["Epigraphic inscriptions of the mausoleum of Khoja Ahmed Yasawi as a source on the history of Kazakhstan"], QOJALARKZ – Tarikh. Tanyim, Tagym. 12.09.2019. – URL: <https://kozhalar.kz/20197571-epigraficheskie-nadpisi-mavzoleya-hadzha-ahmada-jasavi-kak-istochnik-po-istorii-kazakhstana> (accessed on 3 June 2023).
- [54] "The Turkestan city on the Kazakhstan's map". – URL: https://upload.wikimedia.org/wikipedia/commons/2/29/Kazakhstan_provinces_and_province_capitals_en_2022.png (accessed on 29 May 2023).
- [55] "The mausoleum-khanaka of Ahmed Yasawi in the historical part of Turkestan city" (the space view – Google Earth Pro). – URL: <https://www.google.com/intl/ru/earth/versions/> (accessed on 29 May 2023).
- [56] "The mausoleum-khanaka of Ahmed Yasawi: the Main view". – URL: https://vlast.kz/media/pages/dw/148836372_4ghrci_1000x768.jpg (accessed on 29 May 2023).
- [57] "The mausoleum-khanaka of Ahmed Yasawi: the First level plan; the Second level plan". – URL: <https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcROlkoxXfIAReY2bN23Ka4xKuFzBNL4qeWxFc9Hor4TyfNWSRpPPf1TLdTzTA9sPCEOY&usqp=CAU>

(accessed on 29 May 2023).

- [58] “The mausoleum-khanaka of Ahmed Yasawi: the Third level plan”. – URL: https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcTR2Ojbq5Xc6O4hUmDYF3KKDW8sZXpEGP06altHS5l0034MtyHpkTfszEStwi0NX_qdxgk&usqp=CAU (accessed on 29 May 2023).
- [59] “The mausoleum-khanaka Akhmed Yassawi Main fasade: the View”. – URL: https://upload.wikimedia.org/wikipedia/commons/thumb/f/f5/Mausoleum_of_Khoja_Ahmed_Yasavi_in_Turkestan%2C_Kazakhstan.jpg/262px-Mausoleum_of_Khoja_Ahmed_Yasavi_in_Turkestan%2C_Kazakhstan.jpg (accessed on 29 May 2023).
- [60] “The mausoleum-khanaka Akhmed Yassawi Main fasade: the Drawing”. – URL: <https://fs.tonkosti.ru/ex/p5/exp5zrinc844wwg0cowcwks8.jpg> (accessed on 29 May 2023).
- [61] “The mausoleum-khanaka Akhmed Yassawi views at the end of the 19th century: the view from the East”. – URL: https://encrypted-tbn3.gstatic.com/images?q=tbn:ANd9GcSROwZC2MzVxfWCZagO2Q7C_oZLCdzR_ROq857t-xH1_gz-iTYp (accessed on 29 May 2023).
- [62] “The mausoleum-khanaka Akhmed Yassawi views at the end of the 19th century: the view from the West”. – URL: https://timeskz.kz/uploads/posts/2021-03/1615818864_2edc4b87521c378534b65d7276304823.jpeg (accessed on 29 May 2023).
- [63] “The mausoleum-khanaka Akhmed Yassawi measurement drawings of 1956 – 1957: the Longitudinal section. [Turkestan. Ahmed Yasawi Complex. XIV century. Measurements, 1956-1957]”, Arhiv NIPF RGP «Kazrestavraciya» KK MKS RK, shifr 1073-1084, chertezhi kompleksa Mavzoleya Hodzhi Ahmeda YAssavi. Section 2-2.
- [64] “The mausoleum-khanaka Akhmed Yassawi measurement drawings of 1956 – 1957: the Transverse section. [Turkestan. Ahmed Yasawi Complex. XIV century. Measurements, 1956-1957]”, Arhiv NIPF RGP «Kazrestavraciya» KK MKS RK, shifr 1073-1084, chertezhi kompleksa Mavzoleya Hodzhi Ahmeda YAssavi. Section 3-3.
- [65] “The mausoleum-khanaka Akhmed Yassawi views of the 21st century beginning (after reconstructions of 20th century): the view from the East”. – URL: (accessed on 29 May 2023).
- [66] “The mausoleum-khanaka Akhmed Yassawi views of the 21st century beginning (after reconstructions of 20th century): the view from the West”. – URL: https://cdn.elebase.io/173fe953-8a63-4a8a-8ca3-1bacb56d78a5/bdd2030a-5b57-4a9e-b94b-6c8a233aff3f-shutterstock_523672321.jpg?w=1000&h=500&fit=crop&q=75 (accessed on 29 May 2023).
- [67] “The Main facade of the Bibi-Khanym Mosque in Samarkand: the View in the 1870’s.” – URL: <https://www.turkestantravel.com/wp-content/uploads/2020/09/Bibi-Khanum-Old.jpg> (accessed on 29 May 2023).
- [68] Ratiya, Sh.E. “Mechet' Bibi-Hanym v Samarkande: issledovaniya i restavracionnye opyty” [“Bibi-Khanim Mosque in Samarkand: research and restoration experiments”], Moskva: Gosudarstvennoe izdatel'stvo arhitektury i gradostroitel'stva, 1950, p. 87.
- [69] “The Main facade of the Bibi-Khanym Mosque in Samarkand: Reconstruction works in 1997”. – URL: https://www.northernarchitecture.us/ancient-monuments/images/2953_156_168-architectural-tonal-quality.jpg (accessed on 29 May 2023).
- [70] “The Main facade of the Bibi-Khanym Mosque in Samarkand: the View in the early 2000’s.” – URL: <https://upload.wikimedia.org/wikipedia/commons/thumb/a/ab/SamarkandBibiKhanym.jpg/640px-SamarkandBibiKhanym.jpg> (accessed on 29 May 2023).