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The Khodja Akhmed Yassawi's mausoleum-khanaka in Turkestan—the peculiarity of centuries-old development and prospects

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ABSTRACT

The mausoleum-khanaka of Khoja Akhmed Yasawi in Turkestan has been actively investigated for almost 200 years. In parallel, repair and restoration work is actively underway. However, the now widespread version of the centuries-old sequence of construction of the complex is questionable. A comparative analysis of archaeological research conducted in the 1930s and 1950s, modern architectural planning, and compositional studies by authors of this article allowed us to confirm previously unemphasized assumptions and draw innovative conclusions:

- At the end of the fourteenth century, not a new building was being built, but several buildings of different times from the twelfth, thirteenth and fourteenth centuries were combined into one building by covering the courtyard with a dome and building a portal with corner towers;
- The exterior cladding combined the facades of individual pre-existing blocks;
- The Main Dome has not been completed, as it should be double, not single;
- The Portal and corner towers continued to be built in several stages throughout the sixteenth century;—the portal and the main dome must be completed in accordance with the design plan of the late fourteenth century to prevent the ongoing destruction of the monument.

The early completion of the centuries-old construction of the Mausoleum-khanaka will be of great cultural and historical importance.

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1. Introduction

The mausoleum-khanaka of Khoja Akhmed Yasawi in Turkestan (43°17'52" N, 68°16'15" E) occupies a peculiar place in the history of architecture in Central Asia. Throughout its centuries-old development, it has demonstrated both full and partial, both one-time and sequential implementation of various plans, including grandiose plans. Despite its unfinished state, the Mausoleum-khanaka makes a huge impression, allowing it to maintain its position as the most important element of the cultural identity of the population of the region for centuries. Having appeared as a small single-chamber mausoleum of the second half of the twelfth century, the complex by the end of the fourteenth century turned into a large multifunctional building, which, in the process of further operation, acquired and successfully carried out more and more new functions. The original forms of this complex and the rich history of its development have contributed to its inclusion in the UNESCO World Heritage List (object No. 1103). Now the mausoleum-khanaka is the main part of the State Historical and Cultural Reserve-Museum 'Azret Sultan', which is very popular with Kazakhstan's and foreign tourists.

The history of the study of this building dates to several centuries. The most active stage of study began in the second half of the century. The most famous works on this topic have been summarized in several editions (Roxburgh, 2014; Yelgin, 2013). Among them, there are (in chronological order) studies

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devoted to both the monument itself and its consideration in the context of medieval architecture of Central Asia: M. Masson (Masson, 1930)—1930: the biography of Khoja Ahmed Yassawi, history of the construction of the Mausoleum-khanaka, description of the layout, analysis of architectural and artistic forms in the context of World architecture; B. Zasytkin (Zasytkin, 1948)—1948: architecture of the Mausoleum-khanaka in the context of regional architecture; L. Mankovskaya (Mankovskaya, 1963)—1963: features of archaeological research and restoration of the Mausoleum-khanaka (Mankovskaya, 1980),—1980: the Mausoleum-khanaka as an organic part of regional architecture in the context of typological features; T. Basenov (Basenov, 1982)—1982: description of the complex, which includes the Mausoleum-khanaka; B. Tuyakbaeva (Tuyakbaeva, 1989)—1989: features of the epigraphic decoration of the building; E. Smagulov, M. Tuyakbayev, F. Grigoriev, A. Itenov (Smagulov & Tuyakbayev, 1998)—1998: analysis of the formation of an Ancient necropolis in the Turkestan city (Smagulov et al., 1999),—1999: archaeological data on the development of the Medieval Turkestan city; B. Glaudinov (Glaudinov, 1999)—1999: the Mausoleum-khanaka in the context of centuries-old architecture of Kazakhstan; A. Ordabaev (Ordabaev, 2017)—2017: description of the restoration work carried out in the second half of the twentieth—early twenty-first century; E. Baitenov, A. Tuyakbaeva, G. Abdrasilova (Baitenov et al., 2019)—2019: analysis of the shape of the Mausoleum-khanaka in the context of medieval forms of mausoleums in Central Asia; K. Samoilov, B. Kuspangaliyev, G. Sadvakasova, A. Akhmedova, Y. Aidar, D. Assylbekov, O. Priemets (Samoilov et al., 2023)—2023: analysis of architectural forms of regional architecture to determine the design concept of the mausoleum-khanaka, which was not realized in the fourteenth century (Aidar et al., 2024),—2024: determination of the current prospects for the completion of the Mausoleum-khanaka in the forms conceived in the fourteenth century; and others (Svod pamyatnikov istorii i kul'tury Kazakhstana, 1994)—1994: catalog's description of the Mausoleum-khanaka. The current state of the building is illustrated in Figure 1.

Despite the centuries-long development of the complex, special attention is drawn to the period of the late fourteenth century, when the greatest amount of work was conducted. The current widespread version of the history of the main stage of construction is as follows: 'The construction of the mausoleum complex was preceded by the destruction of buildings in the twelfth – fourteenth centuries that previously existed in its territory. The first stage of construction began in 1389–1391 and ended in the mid-1390s of the fourteenth century. The height of the building reached 14.63 m at the main portal, 12.8 m at the Kazanlyk, and 11.8 m at the Gur-khana from the ground surface of the fourteenth century [...] At the second stage of construction, which apparently began in 1397, Smooth high-rise parts of the main portal, the dome of the Kazanlyk and the Gur-khana were built, and the room in the northwestern corner of the building was turned into a mosque. The decorative aspect was enhanced: the domes of the main halls were covered from the inside with ganch stalactites, the side rooms were covered with plaster' (Muminov, 2019). However, this description does not consider the nuances.

2. Methods

To solve the issues emphasized in this article, a general scientific method was used from observations through generalizations to practice. In the context of this method, an in-depth study of the available literary sources was carried out, the images of the monument in photographs and drawings at various times were analyzed, and the experience of personal inspections of the complex in 1984–1986 and 2022 was considered.

An analysis of the description of archaeological research conducted in the middle of the last century revealed details that were unreasonably overlooked in modern interpretations of the history of the formation of the complex. This applies, for example, to differences in the size of bricks and masonry techniques. The difference is recorded not only on the unpainted main southeastern portal, but also inside the building. The foundations under different parts differ, which also indicates the different timing of construction work. A graphic analysis of the plans and facades of the Mausoleum-khanaka became an integral part of the research conducted by the authors of the article. This made it possible to identify the configurations of blocks built at different times. Based on this, the scheme of the historical sequence of the construction of the complex was carried out. A comparative analysis of the composition of the Mausoleum-khanaka

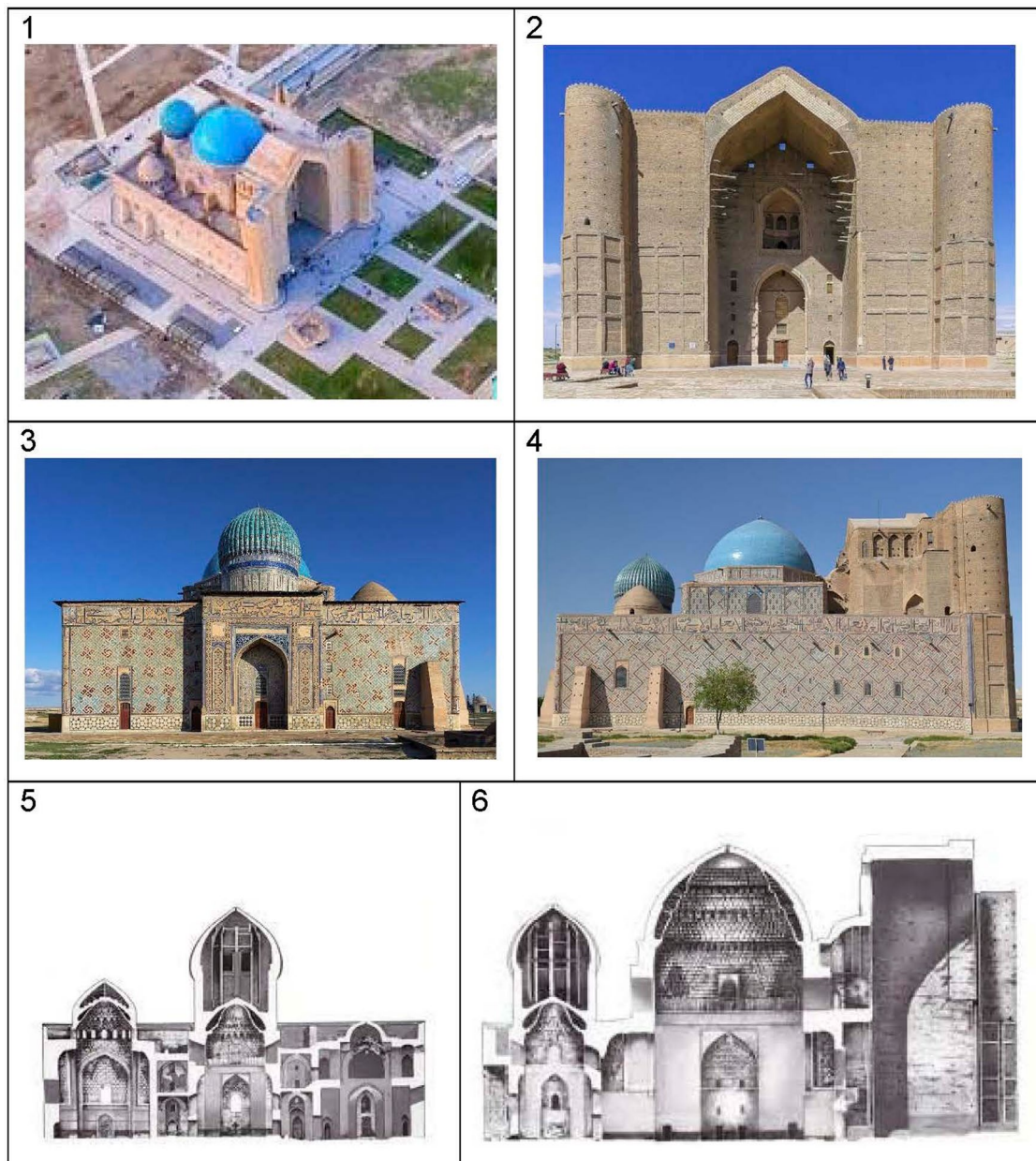


Figure 1. The current state of the Khoja Ahhmed Yassawi's mausoleum-khanaka: (1) The General view from above (*The Khoja Akhmed Yassawi's mausoleum-khanaka – The General view from above*); (2) The View from the southeast (*The Khoja Akhmed Yassawi's mausoleum-khanaka – The View from the southeast, 2023*); (3) The View from the northwest (*The Khoja Akhmed Yassawi's mausoleum-khanaka – The View from the northwest, 2024*); (4) The View from the southwest (*The Khoja Akhmed Yassawi's mausoleum-khanaka – The View from the southwest*); (5) The Cross section (the Mosque – the Mausoleum – the Grand Palace) (*The Khoja Akhmed Yassawi's mausoleum-khanaka – The Cross section*); (6) The Longitudinal section (the Small portal – the Mausoleum – the Central Hall – the Main portal) (*The Khoja Akhmed Yassawi's mausoleum-khanaka – The Longitudinal section*).

and similar buildings of the fourteenth and fifteenth centuries revealed a number of patterns of portals and domes. These patterns are important for understanding the design intent of the fourteenth century.

This allowed us to draw several peculiar conclusions, the details of which require further investigation.

3. Results and discussion

The analysis of previous studies allows us to make a number of clarifications, additions, and changes to the most common version of the development of the mausoleum-khanaka complex. For example, Yu A.

Ylgin, considering the research and restoration work of the 1950s carried out by T. S. Kurumidze and B. N. Zasytkin, drew attention to the original conclusion made at that time: 'not a completely new building was being built, before that there was another building with an inner courtyard (or a group of buildings forming a courtyard), blocked later by the dome of kazandyk; moreover, the mosque has older walls [...] the main southern portal with minarets is attached to a pre-existing building; for the installation of the kazandyk dome, the walls of the former courtyard were reinforced with linings, and the corridors-passages in these walls were narrowed' (Yelgin, 2013). And further: 'the Akhmed Yassawi complex existed before the works of 1397–1399 and Timur gave an order to build a portal and erect a dome over the courtyard' (Yelgin, 2013). These conclusions from the mid-twentieth century were partially confirmed by studies conducted at the end of the century (Smagulov & Tuyakbayev, 1998). The scheme of the multi-time development of the composition of Mausoleum-khanaka corresponding to this assumption, taking into account the prospect of completion of construction, is shown in Figure 2.

The author's analysis of the configuration of modern building plans shows the validity of these conclusions. The corridors between the rooms are operationally inconvenient because of the different-sized pilasters and wall linings that make them narrow in various places. The peculiarity in the arrangement of pilasters and partial wall coverings in two-story corridors (these corridors were previously open passages between separate buildings) and their different dimensions indicated that local wall reinforcements spontaneously appeared. These reinforcements were made in places that presumably caused the builders to have concerns about the strength of the building as a result of the completion. Additional foundations were laid under these elements. This is a standard technique for strengthening structures, which has been used in construction since ancient times and is still used in the construction of existing buildings.

If the building were built entirely at once, the corridors between the individual rooms would be more convenient and wider, and the pilasters and wall coverings would have a regular arrangement and uniform dimensions. The floor levels of all rooms on the second floor were the same. All wall structures would have the same foundations in terms of material. Even if the foundations of previously existing and demolished buildings were partially used before the new construction, a layer combining them with new foundations would be created on top of them. It is also a centuries-old and constantly used technique. Archaeological studies have not yet revealed the presence of this layer.

In addition, the usual construction practice implies the same thickness of exterior walls (if the same building material is used). In the building in question, the thickness of walls differs in many places. Thickening in the area of the main dome support may be due to structural features, and thickening of the outer walls is certainly the alignment of the façade line. The locations of the stairs also indicate their later construction. For example, the staircase between the mausoleum and mosque leads only to isolated rooms above the corridor. That is, it is assumed that the second floor above the blocks built in the third stage appeared as a result of completion in the fourth stage. The proposed contours of buildings built before the start of the main stage of construction at the end of the fourteenth century are shown in Figure 3.

In other words, the evolution of the building appears to be similar. Since about the fifth century (Smagulov & Tuyakbayev, 1998), necropolis began to form at this location in the Yassy city. In the second half of the twelfth century, the domed mausoleum of Khoja Akhmed appeared on necropolis. It presumably has a single-chamber 'Karakhanid-type mausoleum with a deep lancet-arched portal from the south-eastern side. In the thirteenth century, the mausoleum became part of a memorial and religious complex, which in addition to it included buildings symmetrically built on the southwestern and north-eastern sides, which later became a mosque and a large palace. These buildings also had domes. The domes of these buildings were single. The heights of these buildings were the same as the height of the mausoleum. In the Grand Palace building, small galleries are made along the north-eastern and south-western walls on the second level. There are no special staircases for these galleries. This is a widespread technique—there are similar galleries, for example, in Samanid's mausoleum, built at the beginning of the tenth century in Bukhara (39°46'37" N, 64°24'02" E). Considering the operational needs of the formed memorial complex, a well is built on the southeastern side.

In the second half of the thirteenth century—the first half of the fourteenth century—forming a traditional courtyard with a well for the era and the region, a one-story Small Palace and a library appeared. The question for further research is whether the library block was built at the same time as the neighboring block, as it has a shift in plan.

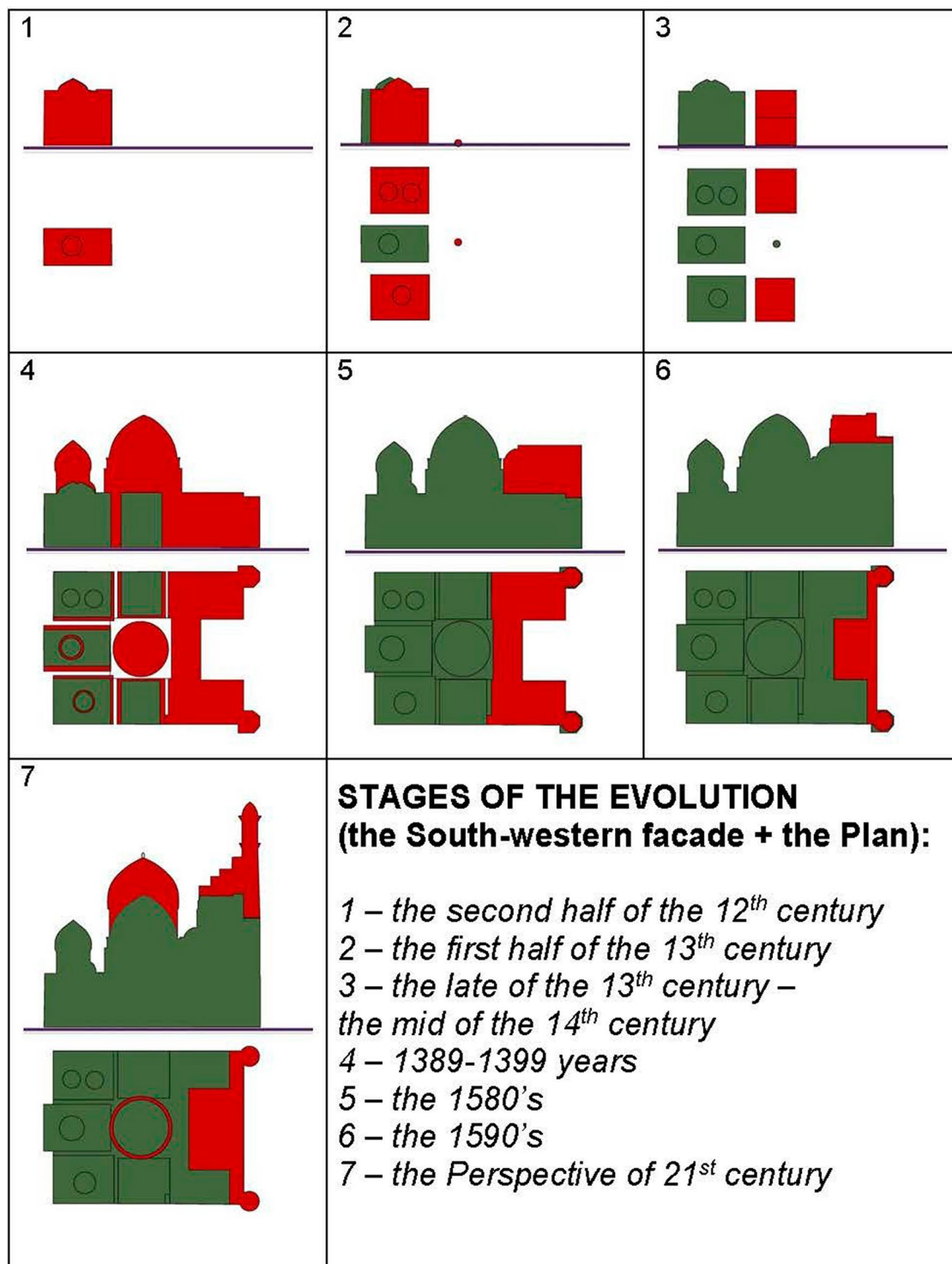


Figure 2. Stages of development of the composition of the Khoja Akhmed Yassawi's mausoleum-khanaka (southwestern facade+plan—drawing): (1) the Second half of the twelfth century; (2) the First half of the thirteenth century; (3) the Second half of the thirteenth century) mid-fourteenth century; (4) 1385–1399; (5) 1580s; (6) 1590s; (7) the Perspective of the twenty-first century.

The new stage began at 1385. Initially, according to Timur, the previously somewhat spontaneously functioning memorial and religious complex was organized as a Sufi monastery. In 1388, the complex plundered and was partially destroyed. The stolen property was fully recovered by 1395 thanks to Timur's the victorious campaigns. Based on the assumptions of the 1920's (Masson, 1930) and studies of the 1950s–1980s (Yelgin, 2013), it is believed that active repair and restoration work in dilapidated buildings and new constructions

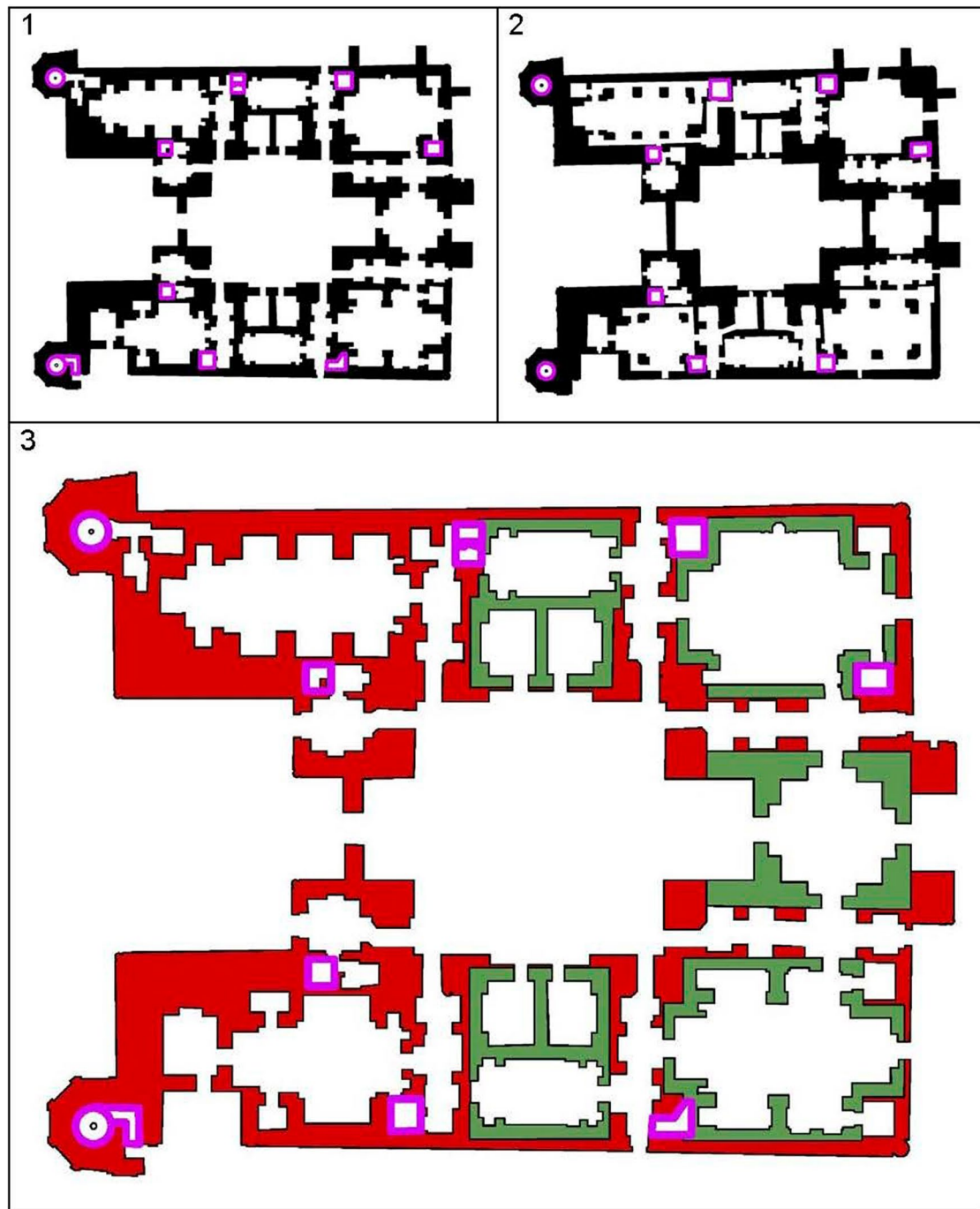


Figure 3. The mausoleum-khanaka plans analysis (stairs—purple color): (1) The first floor modern plan; (2) The second floor modern plan; (3) proposed configurations of different construction times blocks on the first floor: green color—blocks built before the beginning of the fourth stage at the end of the fourteenth century; red color—the work of the end fourteenth century.

began in 1389. Mavlian Ubaidullah Sadr was appointed as head of the construction site. Timur visits to Yassy City in the autumn of 1397 and, by his order, determines both the organizational and financial aspects of the further work of the complex and fixes the main spatial parameters of the building. The monastery (a complex of buildings) was typologically transformed into Mausoleum-khanaka (a single building).

During this period, the following works are performed:

- The previously described reinforcement of walls and ceilings in the passages between individual buildings was carried out, which turned them into two-level corridors.
- The second level is built over the library and the Small Palace.

- stairs are being built in the necessary places (nine positions)
- An arched portal is built on the northwest side of the mausoleum (in addition to the spatial accent, this portal visually masks the difference in the position of the northwest walls of the mosque and Grand Palace).
- the construction of the portal closing the courtyard from the south-east begins;
- The courtyard is covered by a single dome.
- External domes are built over the mausoleum and mosque.
- Uniform cladding of facades (with the exception of the southeastern part) and domes (with the exception of the main dome and domes over the Grand Palace) is performed.

The fact that the floor level on the second floor in the corridors does not coincide with the floor level of the galleries in the Grand Palace is another argument in favor of the different construction times of individual blocks. If the floor was at the same level, then the overlap of the corridor would not allow the light openings in the under-dome part of the mausoleum to be preserved.

A question arises about the reasons for the non-fulfillment of the cladding of the main dome. The analysis carried out by the authors suggested that the design plan implied the construction of a double dome rather than a single dome. This is justified by the fact that in historically and regionally close analogs, the domes are double. For example, the Gur-e-Amir mausoleum in Samarkand (39°38'54" N, 66°58'08" E) has a double dome with a diameter of approximately 15 m. In this building, as well as in the mausoleum-khanaka of Khoja Akhmed Yasawi, the portal has not been completed. The main Bibi-Khanym mosque in Samarkand (39°39'38" N, 66°58'45" E) has a double dome with a diameter of approximately 18 m. In Khoja Akhmed Yasawi's complex, external domes were erected over the mausoleum and mosque during this period, turning the previously existing single domes into double domes. This is also indicated by the compositional analysis of the facades: the domes characteristic of the epoch and the region corresponding to the height of the main portal or even rise above it. Accordingly, when erecting the main portal of the Mausoleum-khanaka to the design height (approximately 50.4 m portal; 67.2 m corner towers) and the dome should be significantly higher than the existing one and have an appropriate design. This process is schematically illustrated in [Figure 4](#).

Active construction work at this stage was reduced in 1399, and in 1405, it was completely stopped because of Timur's death. Despite the difficult political situation in the region, the building has been functioning successfully for the next century and a half, providing memorial and religious ceremonies and temporary accommodation for pilgrims. The heads of regional states honor the memory of Khoja Akhmed Yassawi and sponsor the functioning of the memorial and cult complex. Accordingly, various repairs were performed sporadically. Taking into account the perception of the Mausoleum-khanaka as the spiritual center of a multinational region, the city of the Yassy is beginning to be called Turkestan. Since the beginning of the sixteenth century, some rooms in the building have been used as crypts for the graves of prominent states and public figures.

The next stage of construction began at the end of the sixteenth century under the Abdullah Khan II. The widespread opinion that during this period, only the arch of the main portal was closed and the main portal's upper part was crowned with teeth was questioned in the 1920s: 'The boundary where the original masonry ends and the completion of the sixteenth century began has not yet been precisely traced, but according to a number of observations it lies near the level of the faceted parts of the minaret' (Masson, 1930). In addition, just above this level, the three-quarter columns of the framing of the lower part of the portal arch also ended, fixing the level at which the masonry in the portal niche ended at the turn of the fourteenth to fifteenth centuries. Simultaneously, all other corner three-quarter columns (on the lined facades) and under the frieze. If this assumption is correct, then the entire upper part of the Main Portal with cylindrical corner towers is a new construction in this period. That is, the similarity of the composition of the portal of the mausoleum-khanaka of Khoja Akhmed Yassavi to the Main portal of the Ak-Sarai Palace in Shakhryyabz (39°03'39" N, 66°49'45" E), which was indicated (Masson, 1930), appeared only in the sixteenth century, and the design plan of the fourteenth century was not envisaged. This means that the idea of the fourteenth century implied a similarity to the portal of the Main Bibi-Khanim Mosque in Samarkand with corner towers of prismatic cross-section along the entire

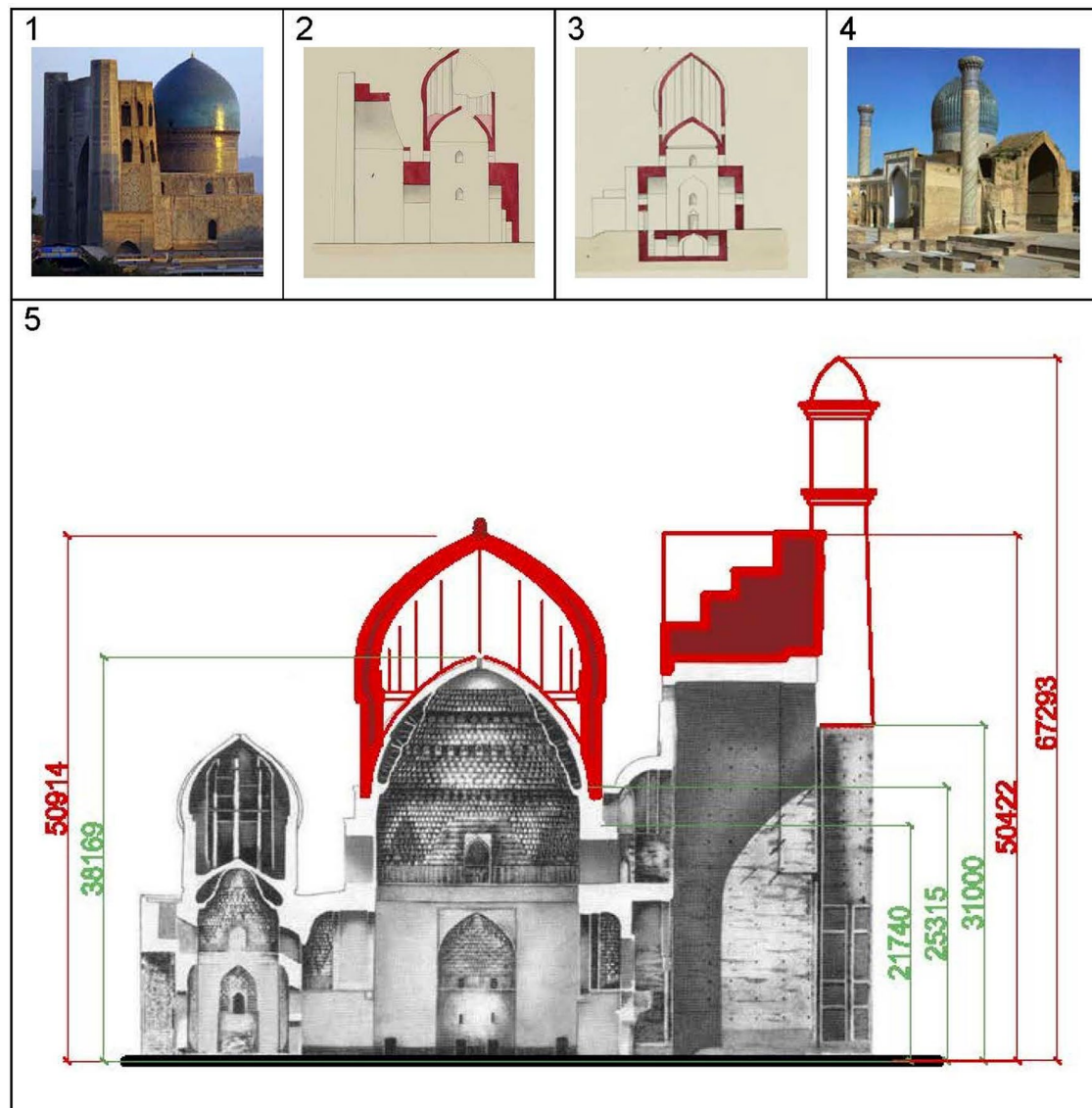


Figure 4. The confirmation of the design idea of a double dome in the mausoleum-khanaka of Khoja Akhmed Yassawi based on historically and regionally close analogues: The Main Mosque of Bibi-Khanim in Samarkand (1) the General view (*The Bibi-Khanym main mosque – the main view*); (2) the Section (*The Bibi-Khanym main mosque – the section*)), the Mausoleum of Gur-e-Emir in Samarkand (3) the Section (*The Gur-e-Amir mausoleum – the section*); (4) the General view (*The Gur-e-Amir mausoleum – the main view*)), the Mausoleum-khanaka of Khoja Akhmed Yasawi in Turestan (5) the Section (*The Khoja Akhmed Yassawi's mausoleum-khanaka – The Longitudinal section*) with the assumed shape of the Main Dome).

height (this building is now almost completely restored from the ruins on the basis of a project proposal by S. E. Ratiya (Ratiya, 1950), published in 1950).

Most likely, in the 1590s, the continuation of the construction of the mausoleum-khanaka of Khoja Akhmed Yassawi was also halted for reasons still unknown. This is indicated by a change in the type of masonry in the upper part of the arch and inaccuracy in the execution of work. The axis of the arch was significantly shifted to the right relative to the main axis of the building, and the masonry itself sagged on the right side. This was probably due to the aggravation of military confrontations in the region because the building was purposefully, in an accelerated mode, turned from a memorial and religious building into a fortress with the possibility of patrol and defense from the upper parts of the walls. In itself, the acceleration of work on the construction of the arch is explained precisely by military needs—'a battle course' was formed from one corner tower to another. The logs of scaffolding left in the nests also indicated an 'unplanned' termination of construction. In subsequent periods, up to the middle of the

nineteenth century, the defense function dominated the operation of the building, which became part of city fortifications, and some rooms were used for storing food and military supplies. Accordingly, the period of the end of the sixteenth century can be divided into two stages: the 1580s and 1590s. The scheme of the main facade with the allocation of masonry sections for different periods is shown in Figure 5.

In the seventeenth and eighteenth centuries, an additional function of the building was to use it as state residence. With further complications of the political situation in the region, the city of Turkestan has increasingly become an arena of fighting. As a result, the building was partially flooded during military conflicts (1846), shelled (1864), and so on, which negatively affected its safety. By the last third of the nineteenth century, military conflict had ceased. Rarely carried out repairs solved the private problems of the building in disrepair, which, due to the danger of self-destruction, was planned to be demolished in 1870. However, given the huge cultural and historical significance of the monument, the building was preserved, and its active survey and restoration began. In 1872, the cluttered premises were cleared, and repairs began. Ground movements, which arose for various reasons, led to the need to strengthen some sections of the southwestern and northwestern walls using buttresses (1886–1887). One of the four buttresses installed at that time was removed in the 1970's after the foundations were strengthened.

Active research and restoration work began in the 1920s and has continued to this day. In the course of these studies, the foundations were reinforced with reinforced concrete, some sections of walls and arches were shifted, cracked sections of walls were tightened with steel brackets, the structures of some domes were reinforced, the archivolt of the portal arch was reinforced with steel cables, ring ties were made from the outside of the dome over the mosque, the destroyed cladding on the walls and domes was restored, the previously nonexistent external cladding of the main domes, and several other events were held. According to their memoirs (Ordabaev, 2017), in 1975, the idea arose again to finish or at least decorate the main portal. However, this approach has not yet been implemented. In 1997, a well filled in in the Middle Ages (diameter 0.9–1.0 m) was discovered in the geometric center of the square of the central room plan. Accordingly, it was assumed that a twelfth-century complex existed on this site until the middle of the fourteenth century. The semantic center of this complex was probably a small mausoleum of Khoja Akhmed. In front of him was a vast courtyard with a well in front of him.

Despite the ongoing work, the building still raises concerns in terms of strength and stability, as the emergency wetting of structures from ground and atmospheric moisture continues, among other things. The complete completion of the construction of the building based on the design plan of the fourteenth century can solve the main problems of ensuring the strength and stability of the mausoleum-khanaka of Khoja Akhmed Yassawi (Aidar et al., 2024; Samoilov et al., 2023): complete and revette the main portal, erect and revette the outer dome over the central part, revette the remaining domes that do not have cladding, and perform other necessary tasks. A special study will determine the scope of the work and the order of execution.

There is experience of such work, including the completion or restoration of buildings in forms whose historical authenticity causes discussion but allows you to become an active part of modern culture.

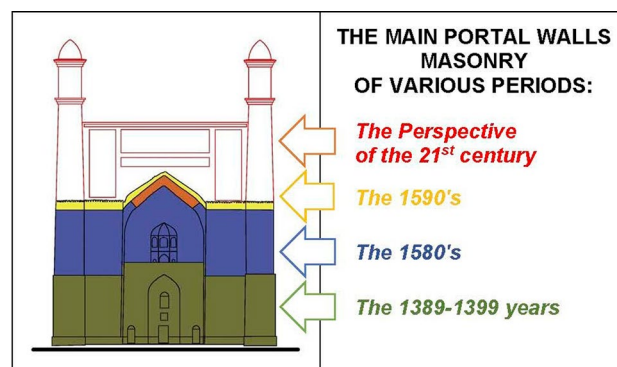


Figure 5. The location of brickwork of various periods in the Main, southeastern facade of the mausoleum-khanaka Khoja Akhmed Yassawi—drawing (1390s; 1580s; 1590s; the Perspective of the twenty-first century).

Karakhan's mausoleum (42°53'55" N, 71°23'06" E), built in the eleventh century, was in a dilapidated state by the beginning of the twentieth century. The building was demolished completely and built in 1906. The forms of the new building are completely different from those of the eleventh century monument. The Aisha-Bibi's mausoleum (42°50'01" N, 71°12'37" E) has been located in a pavilion specially constructed for its conservation since the middle of the last century, and had limited access for tourists. Reconstruction carried out in 2005 recreated the 'ideal shape' and returned the building to a modern urban context with free access. The mausoleum of Rabiga Sultan Begim (43°17'49" N, 68°16'19" E), built in 1486, was dismantled in 1896 because of dilapidation. In 1980–2023, the building was restored, but the shape of the portal caused discussion.

A frequently mentioned inscription on one of the buildings of the Timur's era reads: 'If You doubt Our greatness, then look at Our buildings'. The completion of the construction of the mausoleum-khanaka of Khoja Akhmed Yasawi, which is an essential part of the national and cultural identity of Kazakhstan, will allow us to present the deeds of our ancestors in all their greatness and demonstrate the continuity of the cultural process. This will also help increase the tourist flow.

4. Conclusions

Since ancient times, one of the characteristic features of the attitude towards historical and architectural heritage has been the priority of the spiritual and semantic value of a particular place associated with a particular religious cult, event or personality. The memorials erected during the long-term operation were not only sporadically repaired, preserving their original appearance, but also completed or even completely rebuilt. Sometimes the memorials were moved to another place, and the original buildings remained abandoned and gradually turned into ruins. Accordingly, the spiritual and semantic content was transferred to a new complex.

A frequent occurrence was a change in the functional purpose of the building, which was adapted to new needs by appropriate alterations. In rare cases, after some time, the building returned to its original appearance (for example, the city gates in Trier, which were built in the Roman era, converted into a church in the Middle Ages, and in Modern times they were partially restored to their ancient appearance and function).

The problem of the appearance of a building under construction for a long time is also peculiar. Very often, the architectural and artistic forms that were characteristic of the initial stage of construction underwent significant changes during the centuries-old construction (for example, the cathedral in Rouen, which has sharply different shapes of the north and south towers, built with an interval of three hundred years).

Accordingly, there is a conflict in the modern perception of historical and architectural heritage. It is related to the prioritization between genesis and evolution. On the one hand, the original architectural forms are historically important. On the other hand, historical changes reflecting the specifics of the development of the centuries-old cultural process are no less valuable.

Since the middle of the century before last and to this day, two approaches have dialectically coexisted in restoration practice (including Kazakhstans). The first approach goes back to E.Viollet-le-Duc, who considered it expedient to completely restore the monument even if the resulting 'ideal,' in fact, form of discussion from the point of view of historical authenticity. The second approach is associated with J.Ruskin's name. This approach focuses on maximum preservation—in fact, the preservation of the historical state of the monument. These approaches are compatible under specific conditions.

In the Mausoleum-khanaka, it is necessary to determine the expediency of preserving 'historical scars'. These were the deflection of the right archivolt of the portal arch and reinforcing buttresses on the southwest and northwest facades. When the foundations are strengthened under the entire building, the buttresses cease to have functional purposes. It is also desirable to alter the portal arch because deflection of the right archivolt is an obvious emergency deformation. The presence of modern steel cable ties inside the arch indicates the emergency conditions of this structure. The construction of a portal to the design height will be one of the ways to strengthen this arch. Accordingly, the realization of the fourteenth century design idea from a purely speculative task passes into the category of a structurally necessary measure to preserve the strength of the architectural monument.

Thus, a set of construction measures is being formed, which it is advisable to carry out in the Mausoleum-khanaka in order to preserve this building as an active part of the modern historical and urban planning context:

1. Complete the formation of a single solid reinforced concrete foundation slab under the entire building; when making the slab, take into account the presence of historically significant graves inside the building. This will eliminate the ongoing uneven sedimentary deformations and will allow the installation of supporting elements of the built-in outer Dome and the built-in Main portal.
2. To make frame steel structures of the external main dome being erected to a height of 50.9 m; to make the framing reinforcement of the main arch with steel structures; to make frame steel structures of the main portal being completed to a height of 50.4 m with corner towers 67.3 m high; to fill the steel frame with light bricks from Sauran's clay; to cover the erected dome and portal with ceramic tiles in accordance with to complete the waterproofing of the roof with ceramic tiles; to complete the installation of drains from the roof. This will strengthen the existing brick structures, eliminate the ongoing soaking of the main load-bearing structures of the building by atmospheric precipitation.
3. To form a 3.0–4.0 m wide platform around the perimeter of the building; to cover the site with tightly laid granite slabs with waterproofing seams; this slab coating must be performed on a waterproof base; the basement of the building to a height of 0.5 m should be faced with granite. This will ensure that rainwater does not soak the foundations and the lower part of the walls.
4. Lower the level of the surrounding area by 0.5–0.7 m around this site. This podium eliminates the existing soaking of foundations with surface and groundwater.
5. At a distance of 10.0–12.0 m from this site, perform a sheet-pile steel fence in the ground to a depth of 3.0–4.0 m; the distance from the building and the configuration of this fence in the plan should be determined based on archaeological data on the presence of significant cultural layers and artifacts in the adjacent territory. This will lower the groundwater level under the building.

Completion of the construction of the mausoleum-khanaka of Khoja Akhmed Yasawi will solve the main problems with its preservation and ensure an increase in its educational impact.

Of course, we can leave the building in its 'historical form' while continuing conservation and restoration work. However, the volume of these studies is likely to increase constantly. In the future, it will be necessary to erect a large pavilion for the building to completely eliminate destructive atmospheric effects. This will cause irreparable damage to the historical panorama of Turkestan's city center. Therefore, it is advisable to continue active research—the study of what the Mausoleum-khanaka might look like if it had been completed at the beginning of the fifteenth century, in itself, is of certain scientific and general cultural interest. Considering these innovations, it is possible to predict an increase in interest in this complex and in tourist flow.

The continuation of the construction of the Mausoleum-khanaka will become an organic part of the process of preserving and actively using the Architectural Heritage of the Region, which has been fruitfully carried out over the past decades. During this time, many monuments were restored from the ruins, restored and put into active urban development. The architectural and artistic forms of the Mausoleum-khanaka are an essential link for analyzing the evolution of the spatial solution of the memorial and cult architecture of Central Asia. Possessing the quality of uniqueness, they are the result of the evolution of Regional architecture.

By itself, the completion of one of the most important buildings in the history of the Central Asian region will have a huge cultural and educational effect. The Building originated as a memorial and a center for spiritual improvement. The Building was reconstructed as a center of cultural unity of the nomadic and settled civilizations of the region. The Building was used for many years as the government residence of the medieval state. The Building is a pantheon of outstanding government and public figures.

The completion of the mausoleum-khanaka of Khoja Ahmed Yasawi will demonstrate the continuity of spiritual development, which is part of the modern mentality of the Kazakhstan. Completion of the

construction will radically solve the problem of preserving the building from deformations and destruction associated with unfinished work on the main dome and portal in the Middle Ages. The central part of the city will acquire a full-fledged compositional dominant, which, in combination with other buildings, will form an integral, historically multi-layered urban planning context. This is important from the standpoint of the intensive development of the city as a promising regional center and the emphasis on the Turkestan city as the Spiritual capital of Kazakhstan.

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Authors contributions

All authors of the article meet the criteria of authorship in accordance with the ICMJE guidelines. Gaukhar K. Sadvokasova, Konstantin I. Samoilov, Bolat U. Kuspangaliyev, Aizhan T. Akhmedova, and Oksana N. Priemets made a significant contribution to the concept, design of the work; data collection, analysis and interpretation of data for the work; drafted the work, conducted a critical assessment on the subject of important intellectual content; finally approved the version for publication; and agrees to be responsible for all aspects of the work, ensuring that issues related to the accuracy or integrity of any part of the work are properly investigated and resolved.

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Data availability statement

The data that support the findings of this study are available from the corresponding author, [Dr. Konstantin Samoilov, e-mail: samconiv@yahoo.com], upon reasonable request.

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