Central Asian Studies I
Yeditepe University

Proceedings

International Online Symposium
April 7, 2022

History of Architecture and Conservation in Transoxiana (Maveraunnehir)

İstanbul Yeditepe University, Faculty of Architecture
Tashkent Institute of Architecture and Civil Engineering

YEDİTEPE ÜNİVERSİTESİ

YEDITEPE UNIVERSITY
CENTRAL ASIAN STUDIES I

HISTORY OF ARCHITECTURE AND CONSERVATION IN TRANSOXIANA (MAVERAUNNEHIR)

International Online Symposium

PROCEEDINGS

YEDITEPE UNIVERSITY, FACULTY OF ARCHITECTURE &
TASHKENT INSTITUTE OF ARCHITECTURE AND CIVIL ENGINEERING

ISBN: 978-975-307-132-1

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Minaret of Bibi Hanım Mosque in Semerkand (before restoration)

APRIL 7, 2022
İSTANBUL

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PREFACE

It is accepted that Turks migrated originally from Central Asia but the exact lands have been controversial. According to historical knowledge about Turkish migrations after Christ, Turkish Huns went from Orhun Region to steppes in South Kazakhstan, to Turkestan and Europe, and later to Iran and Asian Minor over the basin of Transoksiana, Avar Turks to Middle Europe, and the Bulgarians go to the banks of the Volga River over the Black Sea. Again, according to Chinese sources, in 500 A.D. the Gokturks and later Karahans (840-1212 A.D.) were the first Islamic Turkish Governments formed in Turkmenistan. Karahans as the first Islamic Turkish Government with Gaznes in Afghanistan and the Great Selchuks reigning from Turkmenistan to the Mediterranean are seen as the forefathers of Turks in Turkey. These crusading Turkish Tribes formed the Anatolian Seljuk State in Asia Minor in 1071, and Turkish Art began to take root in this region. The Osman Province of 1299 A.D. developed into the Ottoman Empire (1299-1923) and created the most magnificent architectural monuments in Asia and the East of Europe 16th and 17th Centuries. In literature, Turks in Anatolia showed great sensitivity to maintaining the Turkish Art of Central Asia by bringing in masters and specialists from Central Asia and Ottoman Classical Architecture greatly influenced by Central Asian Turkish Architecture.

Today there are three different schools of thought about the origins of Turkish Art in Anatolia;

1. Turks developed their art in connection with Central Asian Art. They showed great sensitivity to maintaining Turkish Art of Central Asia by bringing in masters and specialists from Central Asia and Ottoman Classical Art greatly influenced by Central Asia Turkish Art. Because of this over-sensitiveness, Turkish architectural elements such as the arch of windows or doors and bridges have a special character that distinguishes clearly in superpose periods and additions belonging to different cultures, especially Byzantine architectural elements.

2. When Turks came to Anatolia (10th Century), these regions already had important historical centers going back to the Palaeolithic Age (Stone Age). According to this view, Ottoman Art remained under the influence of these unique civilizations and came to fruition because of these past civilizations.

3. According to the third view, the Art of Islam in Anatolia was a continuation of Pre-Islamic cultures. Iran and Sasani Art were effective in the development of Islam culture and the Turkish religious architecture was abundantly affected in this way. It is still a debate if the Turkish architectural characteristics in Anatolia were carried from Central Asia or Iran.

This symposium, organized in collaboration with Yeditepe University and Tashkent Institute of Architecture and Civil Engineering, is the first study to examine the origin of Anatolian Turkish Architecture in Central Asia. The academicians from Istanbul and Tashkent will investigate the History of Architecture in Transoxiana (Maveraunnehir) and the conservation challenges of architectural heritage.

Moderator
Prof. Dr. Ayse Gulcin Kucukkaya
April 2022, Istanbul

CENTRAL ASIAN STUDIES I
HISTORY OF ARCHITECTURE AND CONSERVATION IN TRANSOXIANA (MAVERAUNNEHIR)

SYMPOSIUM PROGRAM

APRIL 7, 2022

Turkey/**Uzbekistan** 9.00-9.30/ **11.00-11.30**	***OPENING SPEECHES*** *Moderator, **Prof. Dr. AYŞE GÜLÇIN KÜÇÜKKAYA**, Yeditepe University, Faculty of Architecture* *Rector, **Prof. Dr. ERCAN KAHYA**, Tashkent Institute of Architecture and Civil Engineering* *Vice Rector, **Prof. Dr. AHMET AYDIN**, Yeditepe University / Tashkent Institute of Architecture and Civil Engineering* *Dean, **Prof. Dr.** [illegible], Yeditepe University*
9.30-11.30/ **11.30-13.30**	**HISTORY OF ARCHITECTURE**
Section I	*"Architectural Ensembles Of Bukhara Of 15th-17th Centuries: Formation, Typology And Artistic Features"* **Prof. Dr. MAVLYUDA ABBASOVA-YUSUPOVA,** Fine Arts Institute of Academy of Science of Uzbekistan *"Visualizing Amir Temur's Palace Aksaray in Shahrisabz, Uzbekistan, Based on Historical and Archeological Data"* **Dr. NILUFAR TUKHBOEVA,** AJOU University, Faculty of Architecture, Tashkent *"Mausoleum Of Fakhraddin Raziin Kunya-Urgench (XII-XIII Centuries)"* **Dr. ZAFARBEK MATNIYAZOV & Dr. LOBAR RASUL-ZADE**, *Tashkent Institute of Architecture and Civil Engineering,* Faculty of Architecture. Dept. of Interior and Landscape Design *"Early Turkish Tombs in Central Asia & Kaffal Shassi Tomb, Tashkent, Uzbekistan"* **Prof. Dr. AYŞE GÜLÇIN KÜÇÜKKAYA**, Yeditepe University, **Master Student OTABEK ABDURAZZOQOV,** Tashkent Institute of Architecture and Civil Engineering. *"The Role of the Ribats in Anatolian Turkish Architecture & Ribat-I Malik in Uzbekistan"* **Prof. Dr. AYŞE GÜLÇIN KÜÇÜKKAYA**, Yeditepe University, **Master Student TEMUR DOLIYEV,** Tashkent Institute of Architecture and Civil Engineering. "Evolution And Geometric Analysis Of Stalactites In Uzbekistan 9th-14th Centuries (Based On Squinches)" **Ph.D. Candidate SHAKHBOZ MUSTAFOEV**, TIACE, Faculty of Arch., Dept. of History and Theory Arch
11.30-12.30/ **13.30-14.30**	R E S T O R A T I O N
Section II	*"The Contribution Of The Folk Master Shirin Murodov To The Restoration Of Architectural Monuments Of Uzbekistan"* **Ph.D. Candidate NARGIZA KALANDAROVA,** Fine Arts Institute at the Academy of Sciences of the Republic of Uzbekistan. *"Conservation Values And Local Architectural Features Of The Mediaeval Hamam In The Town Of Shakhrisabz"* **Ph.D. Candidate AZIZA RAUPOVA** Fine Art Institute of the Academy of Sciences of the Republic of Uzbekistan, Department of Architecture. *"The History Of Architecture And Restoration Of Khwaja Akhrori Wali Memorial-Cult Complex In Samarkand"* **Ph.D. Candidate AKMAL RAYIMKULOV**, Samarkand State Architecture and Civil Engineering Institute, Faculty of Architecture, Department of History and Theory Architecture *"Restoration of the 16th Century of Kukeldash Madrasah in Tashkent, Uzbekistan"* **Ph.D. Candidate BEKNAZAROVA MALIKA BAURJANOVNA,** Institute of Fine Arts of Academy of Sciences of Republic of Uzbekistan
12.30-13.00/ **14.30-15.00**	C O N C L U S I O N

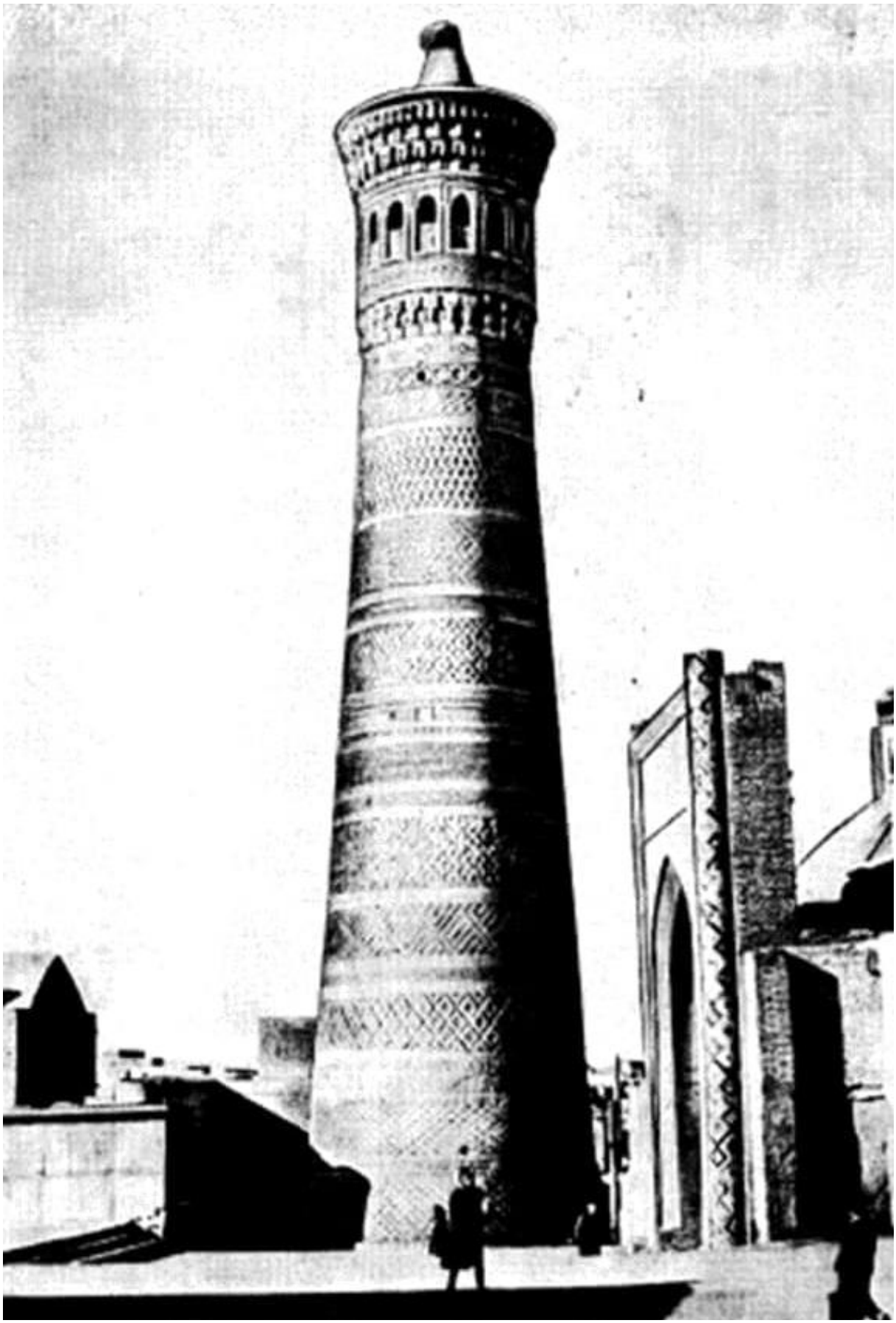
CENTRAL ASIAN STUDIES I

HISTORY OF ARCHITECTURE AND CONSERVATION IN TRANSOXIANA (MAVERAUNNEHIR)

TABLE OF CONTENTS

SECTION I
HISTORY OF ARCHITECTURE

SECTION II
RESTORATION



Kolon Minaret in Semerkand – Before Russian attack

SECTION I

HISTORY OF ARCHITECTURE

CENTRAL ASIAN STUDIES I
HISTORY OF ARCHITECTURE AND CONSERVATION IN TRANSOXANIA (MAVERAUNNEHIR)
INTERNATIONAL ONLINE SYMPOSIUM – April 7, 2022
Yeditepe University, Faculty of Architecture, Istanbul, Turkey
Tashkent Institute of Architecture and Civil Engineering, Uzbekistan
YEDİTEPE UNIVERSITY
TOSHKENT ARXITEKTURA QURILISH INSTITUTI

ARCHITECTURAL ENSEMBLES OF BUKHARA OF 15th-17th CENTURIES: FORMATION, TYPOLOGY AND ARTISTIC FEATURES

Prof. Dr. Mavlyuda Abbasova-Yusupova
Fine Arts Institute of Academy of Science of Uzbekistan, Head of Architecture Department
m.a.yusupova@gmail.com

Summary
This article discusses the formation process, planning typology, and compositional and artistic features of the architectural ensembles of the city of Bukhara, constructed during the heyday of the city in the 15th-17th centuries. The study is based upon the extensive material from scientific literature, archives, and medieval sources, as well as numerous years of field research by the author on medieval architecture and urban planning of Bukhara. Analysis involves the information on both, existing ensembles and fully lost, or only partially preserved ensembles of Bukhara, pertaining which the author's reconstructions are provided.

Keywords: *Bukhara, architectural ensemble, kosh-madrasah, types of composition, Shaybanids, Friday mosque, hawz*

Introduction

On the territory of Uzbekistan, located in the heart of Central Asia, such ancient cities, as Samarkand, Bukhara and Khiva have been found more than 2500 years ago. Later a Great Silk Road passed along them and stimulated further active development.

Among other cities of Uzbekistan, the town of Bukhara stands out with numerous antique and well-preserved architectural monuments, built from the 9th century until the beginning of the 20th century. The historical part of Bukhara, with surviving monumental buildings which were erected mainly in the 15th -17th centuries, was granted World Heritage status by UNESCO in 1993 as an architectural and artistic 'open-air museum'. This city was almost always the capital of the state or the capital of a large region within a state.

The city received a notable development in the 15th century under the Temurids dynasty. The magnificent flourishing of the architecture of Bukhara was observed in the 16th century under the Shaybanids and in the 17th century under the Ashtarkhanids when Bukhara again became the capital of the largest state of Central Asia. During this period, urban planning was actively developed and large majestic ensembles were constructed.

Types of Urban Ensembles

Many large towns of pre-Islamic Central Asia (Panjakent, Samarqand, Bukhara, and others) boasted architectural ensembles of specific compositional types which had emerged by then. In Bukhara, according to information provided by Narshakhi in the 9th-10th centuries, there already existed an open space in front of a fortress around which were erected cult, administrative, and other public buildings.

By the 15th century the main combinations of buildings and urban ensembles now known to us had already taken shape. They evolved a good deal more in the period under examination in this study as a result of the rapid advance in town planning and the wide scale of new monumental architecture.

The grand urban ensembles in Bukhara dating from the 15th-17th centuries can be divided into four types:

Pairs of buildings – kosh: (two *madrasah*s – the Great and Lesser Gaziyan Madrasahs,

'Abdallah Khan – Madar-i Khan Madrasahs, Ulugh Beg – 'Abd al-'Aziz Khan Madrasahs; the Hawz-i Naw similar to a *kosh* ensemble).

Ensembles with a frontal composition – (Gawqushan);

Ensembles built around three sides of a square (Pa-i Kalyan, Lab-i Hawz, and ensembles from the turn of the 17th century, probably, Gaziyan);

Ensembles with buildings round the entire perimeter of a square (Registan).

According to research undertaken by P. Zakhidov and M. Akhmedov in old Uzbek terminology, *kosh* ensembles were also known as *muqabil*, i.e. 'paired' buildings and interlinked buildings with extended front walls – *zhuft* or *mushtarak* (interlinked) (20, p.13).

1. The kosh or muqabil ('paired') ensemble – this composition consists of two buildings opposite each other arranged on the same axis on the sides of a square or a wider street area. The façades of the two buildings face each other and their portals often echo each other's height and decoration.

Almost all *kosh* ensembles evolved in stages at major urban junctions or along the main streets of a town.

Information regarding the earliest compositions of this kind dates from the 11th – 12th centuries. The buildings concerned were the Abu-Said mausoleum and his house, in which a Sufi set up his *khanaqah* in Miana (Turkmenistan). Each of the buildings had a portal and a dome and they were positioned opposite each other. This was not a *kosh* ensemble in the full sense of the word, of course, because it would have been highly unlikely at that time for the house of a Sufi to have had a large portal forming a harmonious ensemble with the portal of a mausoleum built opposite it at a later date. In the 15th century, on the site of the Sufi's house, the Timurids built the Abu Sa'id *khanaqah* with a portal and dome, as a result of which a true example of a *kosh* ensemble came into being (9, p.280).

The *kosh* ensemble – the simplest and most effective composition combining two buildings with a portal and dome opposite each other –became widespread as early as the end of the 14th century. An example of such an ensemble is provided by the

mausolea, each with a portal and dome, in the Shah-i Zinda necropolis in Samarqand situated along a narrow alley leading to the main shrine of the necropolis – the Qusam ibn 'Abbas Mausoleum. At the beginning of the 15th century, the grandest such ensemble in Central Asia was the Samarqand *kosh* ensemble consisting of the Bibi Khanum Friday Mosque and the Saray Malik Khanum Madrasah.

Throughout the first half of the 15th century, further *kosh* ensembles took shapes such as the Sultan Muhammad Khanaqah and Madrasah (incorporated later into the Gur-i Amir ensemble) and the Ulugh Beg Madrasah and Khanaqah on the Registan square which was erected around the perimeter of the square. In the second half of the 15th century the well-known Uzbek poet and vizier at the court of Husayn Bayqara, 'Alishir Nava'i, built the Halasyya *khanaqah* and the Ikhlasiyya Madrasah in Herat: they too had been arranged in the form of a *kosh* ensemble (15, p.156).

The concept of the *kosh* ensemble probably assumed its definitive form in the 14th and 15th centuries, when portal compositions were widely used for the façades of buildings and certain well-established canons already existed, infringements of which would not have gone unnoticed. This is clear, for example, from the keen disappointment experienced by Amir Timur on his return from his long India campaign, when he discovered the disharmony in the two buildings erected opposite each other in Samarqand: the portal of the Bibi Khanum Mosque was lower in relation to the Saray Malik Khanum Madrasah opposite it. The angered ruler gave orders for the negligent builders to be punished and for the *pishtaq* (large entrance portal) of the mosque to be rebuilt (3, p.96).

'Alishir Nava'i wrote in his *waqfiya* that, when he had built the *khanaqah* and the *madrasah* opposite each other in Herat, he had tried to link the buildings with each other (15 p. 156).

In the period under discussion in this volume, ensembles of the *kosh* type were widely spread across Central Asia, particularly in Bukhara where there were approximately five of them in the 15th-17th centuries, of which the two largest have survived.

In the subsequent period, as a result of the reduction in the volume and scale of monumental architecture, few ensembles were erected, and the principles underlying the building of ensembles were not strictly adhered to: types of composition, which had previously been regarded as canonical, were liberally interpreted (12, p.212). The ensemble consisting of the 16th-century Walida-i 'Abd al-'Aziz Khan Mosque and the 17th-century Juybari Kalyan Madrasah is a case in point. It should be noted that the *kosh* ensemble, which had come to be regarded as the classic and harmonious composition of the Bukhara *kosh-madrasah*, only reasserted itself once more in the architecture of Central Asia in the first third of the 19th century, in the heyday of the city of Khiva, when an ensemble came into being there consisting of two *madrasah*s – the Qutlugh-Murad Inak and Allah Quli Khan Madrasahs.

Almost all *kosh* ensembles – apart from a few isolated examples – consisted of buildings erected in different periods ranging from a few decades to more than

two centuries. Almost a century divides the Kalyan Mosque and the Mir-i Arab Madrasah, while the *kosh* consisting of the Madar-i Khan and ‘Abdallah Khan Madrasahs has a total timespan of only 23 years. Meanwhile the Ulugh Beg Madrasah near the Zargaran dome was 235 years older than the opposite building – the ‘Abd al-‘Aziz Khan Madrasah. I shall now examine in detail the evolution of the *kosh* ensembles in Bukhara in chronological order, by paying special attention to little-known data that is presented here for the first time.

a) The Gaziyan Ensemble

In historical sources and in the memoirs of Sadriddin Ayni, the Gaziyan *hawz* and *madrasah* are mentioned on several occasions. Our archival research, studying the remains of the southern *madrasah,* conversations with old inhabitants, who could remember traces of the now lost parts of this complex, and also data identified by Kazakov in the *waqf* documents (8, p.103) have revealed additional information on the architecture of the buildings located at the *hawz*. I can thus offer the following chronology and layout of the Gaziyan ensemble.

In 1534-1535 to the south of the ancient *shahristan* in the rich Gaziyan district, the Lesser (Gaziyani Khurd) Madrasah was built to the south of the already existing Great (Gaziyani Kalyan) Madrasah (16, p. 88). The façades of the buildings were opposite each other: there was a portal in the center of each façade flanked by two-story wings. In general, they constituted what in Transoxiana was a traditional *kosh-madrasah* ensemble. A *hawz* was built between them on the side of the northern *madrasah* and a road passed along the façade of the southern *madrasah*. At present, only the larger *madrasah* survives – the Great Gaziyan, which is now known as the Mirza Sharif Gaziyan.

In chronological terms, the following two *kosh-madrasah* ensembles, which have survived to the present, are widely famous across Central Asia. It might seem that as regards the building of these celebrated ensembles it would be difficult to discover anything new without undertaking expensive new excavations. Yet thorough research into archival material and other sources has allowed us to identify further information regarding the intermediate stages in their architectural history.

b) The Madar-i Khan – Abdallah Khan kosh-madrasah Ensemble

From the book *Sharafnama-yi Shahi* by Hafiz-i Tanish Bukhari it emerges that “in the western part of the town, on the Khiyaban street opposite the Khan’s bathhouse, which was also built by His Majesty (‘Abdallah Khan II) in 1566-1567, an imposing *madrasah* was built with high arches, splendid domes, upper and lower rooms” (1, p. 259). Judging from the location, the construction date and the above details, the *madrasah* in question is the one ‘Abdallah Khan built on behalf of his mother and which was later given the name Madar-i Khan. In 1490 he built a larger *madrasah* opposite the Madar-i Khan Madrasah in his own name. Thus, the *kosh-madrasah* ensemble was created.

Figure 1. Ensemble of kosh-madrasah Madar-i Khan –'Abdallah Khan, 16th century. Plan.

Figure 2. 'Abdallah Khan Madrasah. General view (photo by author, 2008)

From the *waqf* document drawn up for this building in the name of 'Abdallah Khan II, it emerges that the bathhouse at this spot had been an integral part of the *madrasah* (*22*). It therefore follows that the Madar-i Khan Madrasah was situated opposite the khan's bathhouse and 23 years later the 'Abdallah Khan Madrasah was built opposite it.

We can also find confirmation of the above information in the Archive GlavNPU of MC RUz in materials relating to the investigations carried out by the architect S. Pchelnikov. From his notes recording the oral testimony of A. Salikhov in 1946, it emerges that this ensemble had included a bathhouse linking it with the 'Abdallah Khan Madrasah (21, p. 31). In a photograph dating from 1946 next to the south-eastern tower of the *madrasah* traces of this secular building were found.

c) The Ulugh Beg – 'Abd al-'Aziz Khan Kosh-madrasah Ensemble

In 1417 the enlightened ruler of Transoxiana, Ulugh Beg, erected a two-storey *madrasah* near the central intersection of trading streets in the heart of the *shahristan.*

Without dwelling in detail on the architecture of the well-known Ulugh Beg Madrasah, which I have already described elsewhere, I shall now examine the construction stages of this particular ensemble. Starting out with the location of the *madrasah* at the ancient intersection of two main streets, it can be assumed that monumental buildings had previously stood there, given the fact that this was a bustling commercial area in medieval times. According to data provided by Vasifi, a trading street had existed there as early as the 15th century (10, p.48). As I noted earlier, it could have been rebuilt from scratch or partially reconstructed in the 15th-16th centuries. In either case by the end of the 16th century the Taq-i Zargaran (Dome of the Goldsmiths) had been erected at this particular spot.

In 1652, 'Abd al-'Aziz Khan built a large *madrasah* - opposite the Ulugh Beg Madrasah and near the above-mentioned *taq* – which at the beginning of the 20th century was still known as the Zargaran Madrasah. This was how the second *kosh-madrasah* ensemble in Bukhara was formed.

What had stood opposite the Ulugh Beg Madrasah between 1417 and 1652, i.e. in the period of almost 235 years before the 'Abd al-'Aziz Khan Madrasah was erected? Based on Samarqand documents of the 15th-16th centuries describing properties of Khwaja Ahrar, I managed to establish the following in relation to this question. According to the *waqf* documents, the shaykh owned two bathhouses in Bukhara. One of them "was opposite the new Ulugh Beg Madrasah", i.e. at the place where in the 17th century the well-known Zargaran Madrasah was built (6, p. 32). It thus becomes clear that at the end of the 15th century opposite the Ulugh Beg Madrasah there had been a bathhouse belonging to Khwaja Ahrar and on that same spot (but possibly also linked with the bathhouse) 'Abd al-'Aziz Khan had built his own *madrasah* which has survived to the present day.

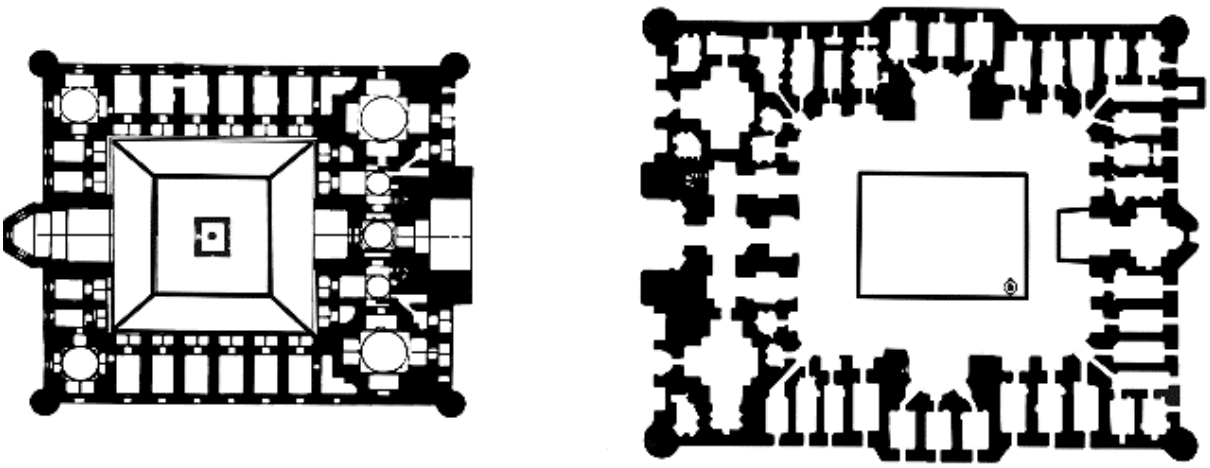


Figure 3. Ensemble of kosh-madrasah Ulugh Beg – 'Abd al-'Aziz Khan, 15th –17th centuries. Plan.

Figure 4. General view of this kosh-madrasah (Photo by author, 2009)

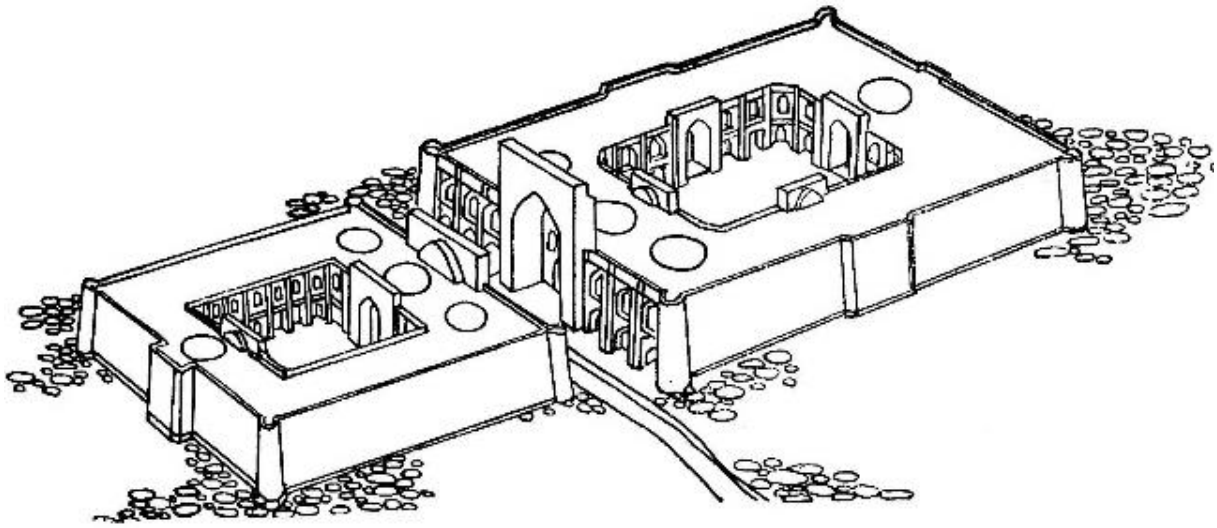


Figure 5. Ensemble of kosh-madrasah Ulugh Beg – 'Abd al-'Aziz Khan, 15th –17th centuries. Axonometry.

d) The Hawz-i Naw Ensemble

The composition of this ensemble, which was built in the 16th-17th century in the south-western part of the city in a street leading to the Karakul Gate, was also similar to that of the *kosh* type. In the light of new epigraphic research, the history of the building of this ensemble is being re-examined.

According to more precise dates which have come to light, first of all the Volidai 'Abd al-'Aziz Khan mosque was built during the reign of the Shaybanid ruler, 'Abd al-'Aziz Khan (1539-1550) and on his orders (14, p. 91). It is possible that, at the same time or a little later, the Hawz-i Naw pool was laid out.

Near the building of the mosque and opposite it, a small *madrasah*, asymmetrical in plan, was built in 1670-1671 – the Juybari Kalyan Madrasah. As a result of which a new ensemble, the Hawz-i Naw, came into being. It consisted of two buildings standing opposite each other (a mosque and a *madrasah)* and a *hawz* between them.

2. Ensembles with a frontal composition

These were known in the local terminology as *zhuft* or *mushtarak* (20, p. 16) and consisted of an open square on one side of which there would be two or three adjacent buildings with their main façades overlooking the square. It is possible to cite the arrangement of the city square in the pre-Islamic city of Panjakent (8th century) as the earliest known example of such an ensemble: on the square in Panjakent there were also two adjoining temples, the main façades of which extended along one side of the square. An example of a similar architectural composition is provided by two 'portal' *iwans* (15th and 19th century) facing onto a small square containing the tombs of the Ashabs in Old Merv.

In the 16th century during the era of the Shaybanids, ensembles of the *zhuft* type were also built: the now lost Samarqand ensemble of the early 16th century consisted of two adjacent *madrasah*s (18, p.185) - the Shayban-i Khan and the Khoyniyya Madrasahs – which were linked by an enormous *pishtaq* arranged between them. All that has survived of this ensemble is the

dakhma of the Shaybanids, which previously stood in the *madrasah* of the same name and was moved to the Registan square and set up between the Shir Dar and Tillya Kari Madrasah during a subsequent reconstruction of the centre of Samarqand (17, p. 21).

One of the few ensembles with a frontal composition dating from the 16th century survives in the centre of Bukhara. This is the Gawqushan ensemble, which stands in the district of the same name.

Initially, in 1570-1571, the Gawqushan Madrasah was built at the intersection of two minor streets in the district by the Juybari shaykh, Khwaja Sa'ad, (also known as Khwaja Kalyan): next to it was also built the Gawqushan *hawz* and nearby, in the same district, the Gawqushan bathhouse (7, p.94).

In 1579-1580 with resources of the Juybari shaykhs, a Friday Mosque with an open courtyard was built parallel to the *madrasah* and occupying the northern corner of the intersection.

Both buildings were arranged on the same side of the adjacent square and their main façades were lined up. Their side façades bordered a narrow street and the Shahrud Canal, which ran parallel to it. A minaret of 19.5 meters high was built in front of the mosque – a smaller copy of the Kalyan Minaret.

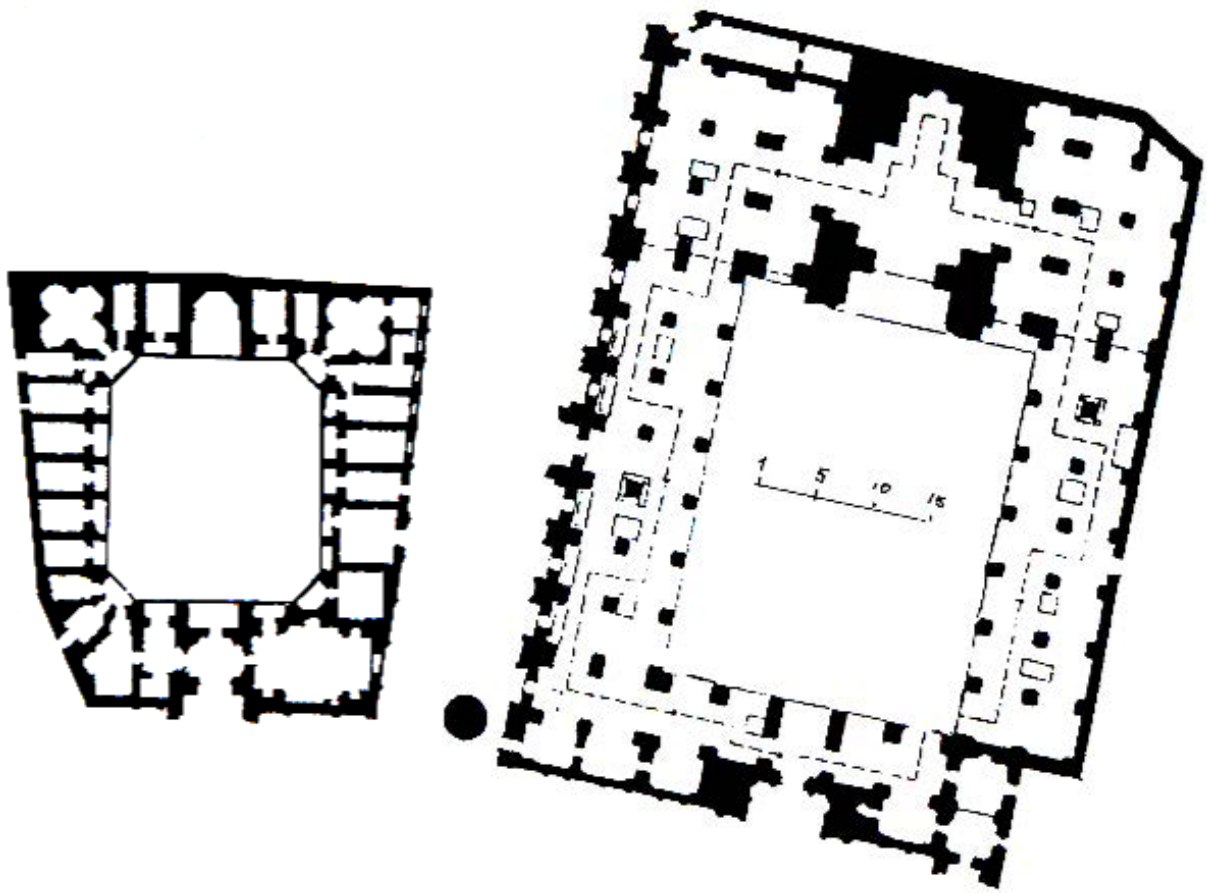


Figure 6. Ensemble Gawqushan, 16th century. Plan.

Figure 7. Ensemble Gawqushan, General view with the hawz (photo by author, 2006)

As a result of all these undertakings in the second half of the 16th century an ensemble of striking composition took shape: the main façades of the Gawqushan Madrasah and the Khwaja Kalyan Mosque, including the Gawqushan minaret, were open onto the square with a *hawz*.

3. Ensembles built round three sides of a square

The creation of a micro-environment by erecting buildings round the perimeter of a courtyard or a square – according to research carried out by M. Akhmedov – became one of the key principles in the architecture and town-planning of Central Asia as early as the 9th century (20, p.27). This idea – to be precise, building round three sides of a square – was the predominant one underlying the arrangement of cities' main central squares in the period under discussion. By way of an example, we can refer to the buildings erected along the three sides of the Registan square in Samarqand –and its re-building in accordance with the same principle in the 18th century.

In Bukhara there were several large squares laid out in the same way:

a) The Po-i Kalyan Ensemble

This is the grandest ensemble in Bukhara as regards its spatial arrangement and the oldest one considering its construction date. The square is set back from the main trading street and has buildings along its three sides, while the fourth one opens into the adjacent main thoroughfare.

As early as the 12th century, the Qarakhanid ruler, Arslan Khan, had erected a Friday mosque with the enormous Kalyan Minaret, which was almost fifty meters high. A new Kalyan mosque was eventually built in the 15th century on top of the remains of the earlier one and within the confines of the plan which dated back to pre-Mongol times.

In the centre of its façade there was a majestic portal and at the back of its courtyard there was an enormous blue dome above a hall for winter use. We do not have reliable information as to what stood opposite the original mosque in the 14th and 15th centuries. It has only proved possible to establish that there had been two bathhouses and a small plot of land belonging to Khwaja Ahrar to the East of the mosque in the 15th century (5, p.32).

In 1531-1536 the Mir-i Arab Madrasah, the most beautiful in all of Bukhara with two turquoise domes one on each side of its portal, was built opposite the Kalyan mosque sharing the same compositional axis.

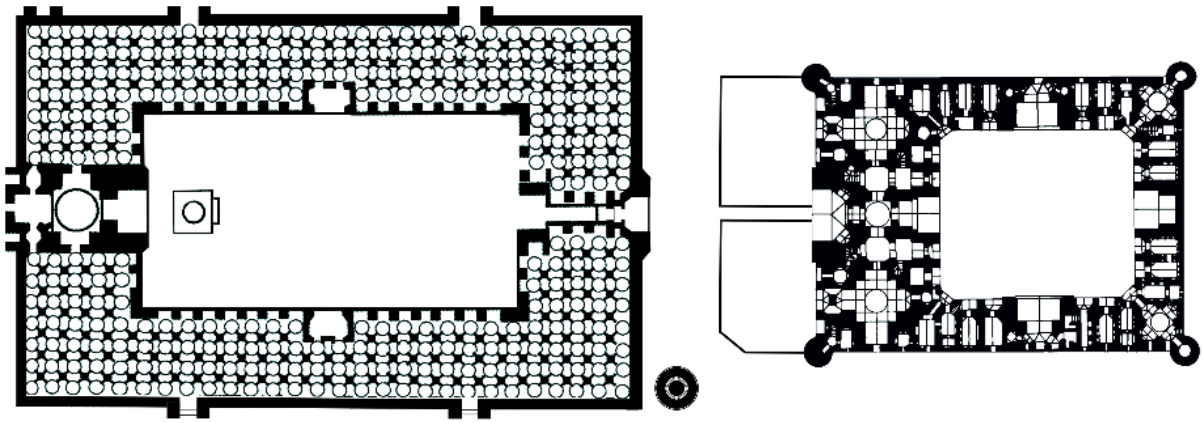


Figure 8. Ensemble Po-i Kalyan, 12th- beginning of the 20th century. Plan.

This meant that in the first third of the 16th century the Po-i Kalyan square already contained two major buildings opposite each other forming a *kosh* ensemble. At that time, the third – southern – side of the square, was, as it is today, bordered by a building of lower status, just providing a background but not impeding the view of the Kalyan Minaret in the south-western corner of the square.

All we know is that at the turn of the 19th century the Amir 'Alim Khan Madrasah was built on the south side of the square next to the Mir-i 'Arab Madrasah. According to some historical data and judging by the architecture, it had incorporated halls of the Qozi Kalyan bathhouse which had been erected unsatisfactorily near the Kalyan Minaret. It turns out that at the end of the 15th century there had been a bathhouse belonging to Khwaja Ahrar east of the Friday mosque (5, p. 32) and also that at the turn of the 19th century a certain Qozi Kalyan bathhouse had been rebuilt within the Amir 'Alim Khan Madrasah.

Both bathhouses were located east of the Friday mosque. Yet, due to the lack of direct evidence, we cannot assert that the references are to one and the same bathhouse.

Figure 9. Ensemble Pa-i Kalyan. 12th -15th-16th centuries. View from above (Archive Glav NPU, photo 1980s).

b) The Lab-i Hawz Ensemble

This ensemble took shape in the 16th and early 17th centuries and it is the most picturesque in the whole of Bukhara. First of all, the vizier of Abdallah Khan II built the extremely large Kukaltash Madrasah in this location in 1568-1569.

In 1620-1622 the high-ranking dignitary at the court of Imam Quli Khan, Nadir Divan-Beg, built a *kosh* ensemble consisting of a *khanaqah* and a caravansaray along the square situated further south and lower, as regards the relief of the terrain, in relation to the 16th-century Kukaltash Madrasah.

Between the *khanaqah* and the caravanserai, the latter being the more westerly of the two buildings, the largest *hawz* in the city was laid out – the Divan Begi *hawz.* As a result, the most important and most picturesque ensemble in Bukhara came into being – the Lab-i Hawz ensemble. The square containing the *hawz* has buildings along its three sides and the fourth, open side, faces onto the Shahrud Canal and the trading street running parallel to it.

According to a local legend, the *hawz* was built by the vizier Nadir Divan-Beg on land belonging to an old lady – a Bukharan Jew.

After lengthy persuasion, she eventually agreed to hand over the plot of land in exchange for permission from the authorities to build the first Jewish synagogue in Bukhara (13).

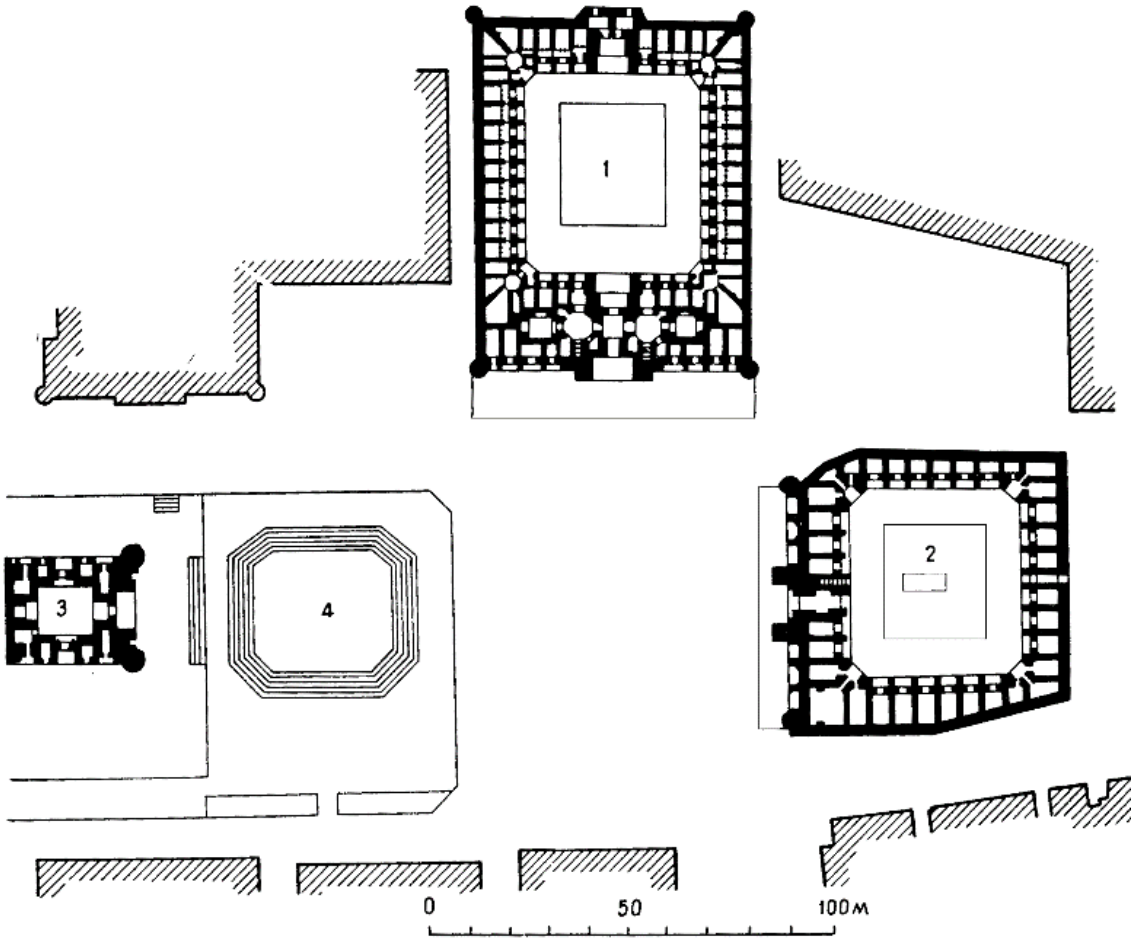


Figure 10. Ensemble Lab-i Hawz, 16th -17th centuries. Plan

What is certain in this connection is that Nadir Divan-Begi embarked most actively on the lay-out of this plot and the buildings on it: we would imagine that he had been inspired by the architecture of Samarqand's central square.

At that time, the Registan had been already surrounded by major buildings on its three sides: the 15th century *madrasha* and *khanaqah* of Ulugh Beg standing opposite each other as required by the *kosh* principle and also the Mirzan caravansaray enclosing the square on the third side. It is likely that Nadir Divan-Begi was endeavouring to create in Bukhara a stylized version of the Samarqand ensemble of Registan square. At any rate, the series of buildings erected around the square was one and the same: a *madrasah*, a *khanaqah* and a caravansaray which was later turned into the Divan-Begi Madrasah.

The Nadir Divan-Begi *khanaqah* (1620) is a traditional example of its type. Its numerous rooms are organized along a longitudinal axis, the entrance is marked by a majestic portal and the whole structure is covered by a massive dome. It was designed to impress the beholder from all sides and its four outer walls were embellished with brick-work fashioned in relief.

Figure 11. Nadir Divan-Begi Madrasah, 17th century. Fragment of the main façade (photo by author, 2010)

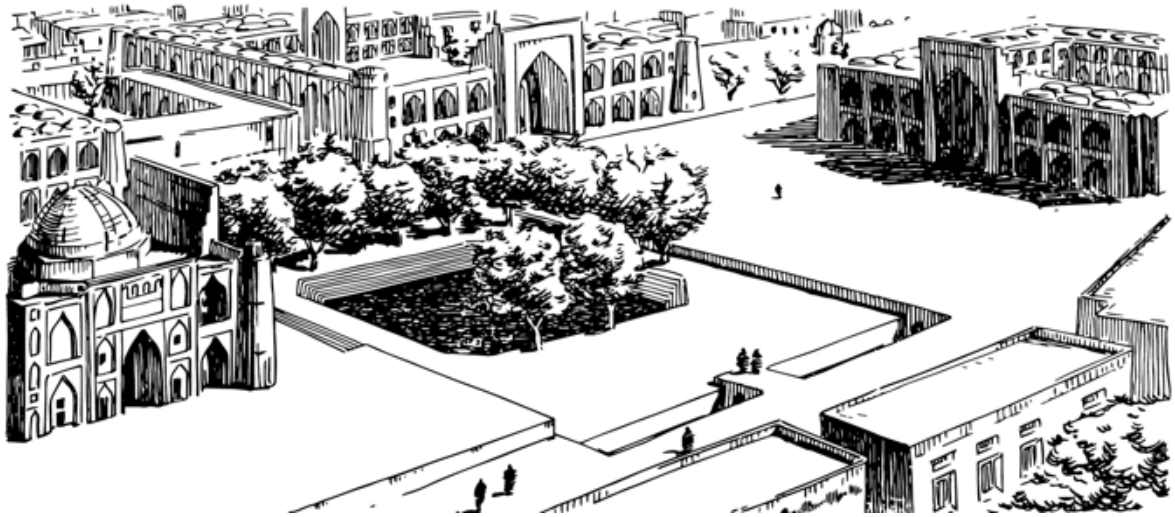


Figure 12. Lab-i Hawz ensemble, 16th-17th centuries. Axonometry.

The eastern (main) wall overlooking the *hawz* stood out with its large portal flanked with *guldasta* towers at the corners and refined *majolica* décor on the tympanum.

In the Nadir Divan-Begi Madrasah (1622-1623), as pointed out earlier, there are none of the typical *iwans* in the courtyard, there is no mosque and there are no lecture halls (*dars-khanah*). It is famous for the striking design of its *majolica* tiled decoration at the entrance portal with a depiction of colorful, large and wondrous birds flying towards the sun and attacking a fallow deer.

In its turn, the decoration of the Nadir Divan-Begi Madrasah may have influenced the choice of motif for the tympanum of the Shir Dar Madrasah erected on the site of the Ulugh Beg *khanaqah* on Samarqand's Registan square. The *majolica* tiles of its enormous panel are embellished with a mirror image of a tiger with a sun like a human face behind its back also attacking a fallow deer.

a) The Gaziyan Ensemble in the 17th century

At the end of the 17th or beginning of the 18th century, the previously analysed *kosh-madrasah* ensemble at the center of the large Gaziyan district was also transformed into an ensemble similar to the Lab-i Hawz: three buildings adorned the three sides of the square with a central pool.

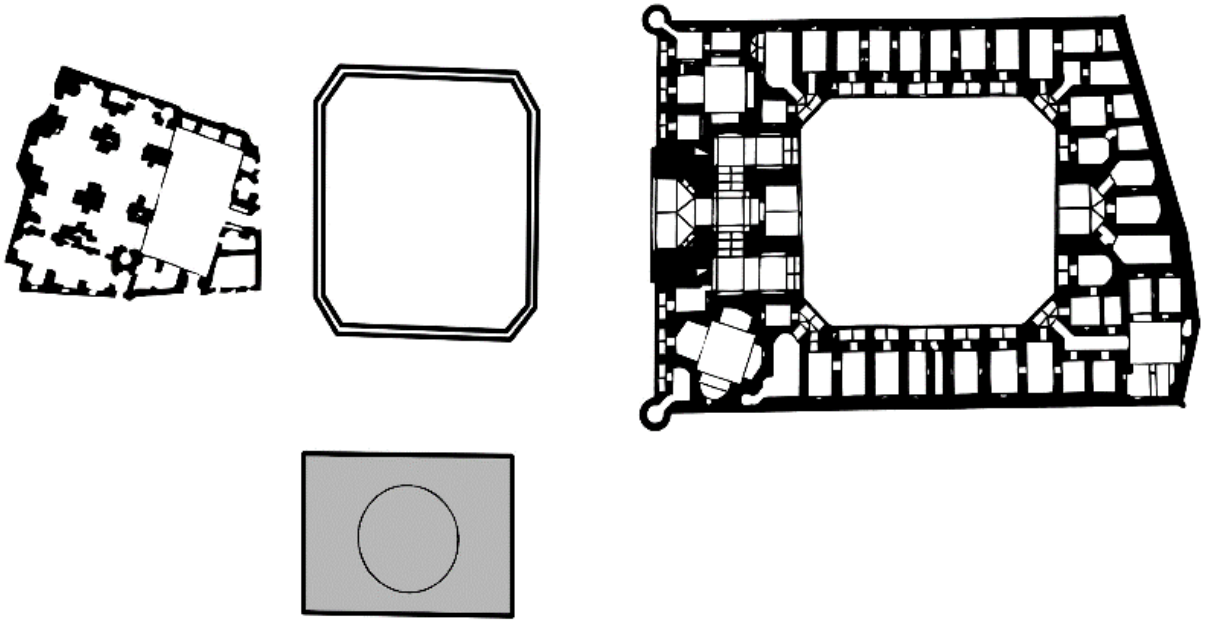


Figure 13. The Gaziyan Ensemble in the 17th century, plan (reconstruction by author)

The Gaziyan *hawz* next to the Lesser Madrasah, according to descriptions by Sadriddin Ayni (4, p.112) and archival plans, was still in existence at the turn of the 19th century. Judging by the plans of Bukhara dating from that time and from testimony provided by long-term residents, there had been a *khanaqah* mosque west of the *hawz.* It is possible that it was built at the turn of the 17th century. It is worth noting that previously on the site of the *khanaqah* (no later than the 15th century) there had been the grave of the holy man Gaziyan. The building of the newly erected *khanaqah* had probably been near this burial or had incorporated it underneath its arches, as was often the practice with venerated graves in the 15th century and at

the end of the 17th (Sayf al-Din Bakharzi, Khwaja Ahmad Yasawi and others) (19). The place of burial survives until today, defiled by atheists during the Soviet period and then respectfully reconstructed at the beginning of the 1990s. Archival photographs reveal that the main façade of the *khanaqah*-mosque was adorned with a portal on main axis, flanked by two stories with arched galleries (23). This means that the *kosh-madrasah* of the Great and the Lesser Gaziyan was transformed in the 17th-18th centuries into an ensemble with buildings around the three sides of the Gaziyan *hawz.*

4. Ensembles with buildings round the perimeter of a square were represented in Bukhara for many centuries, including the period of interest to us, by *the Registan ensemble* situated west of the city's fortress – the Arq. The history of this square goes back to ancient times. According to data provided by Muhammad Narshakhi, as early as the era of Nasr ibn Ahmad (914-943) the Amir's large palace had been built on the Registan square and ten *divan*s or ministries, which administered affairs of state (2, p. 36). These buildings are now lost but at the beginning of the 20th century there still existed buildings of a later date on the Registan square which had been erected round its perimeter in the 15th-19th centuries. Yet virtually none of these buildings, apart from the Arq and the Bala Hawz Mosque, have survived to the present day.

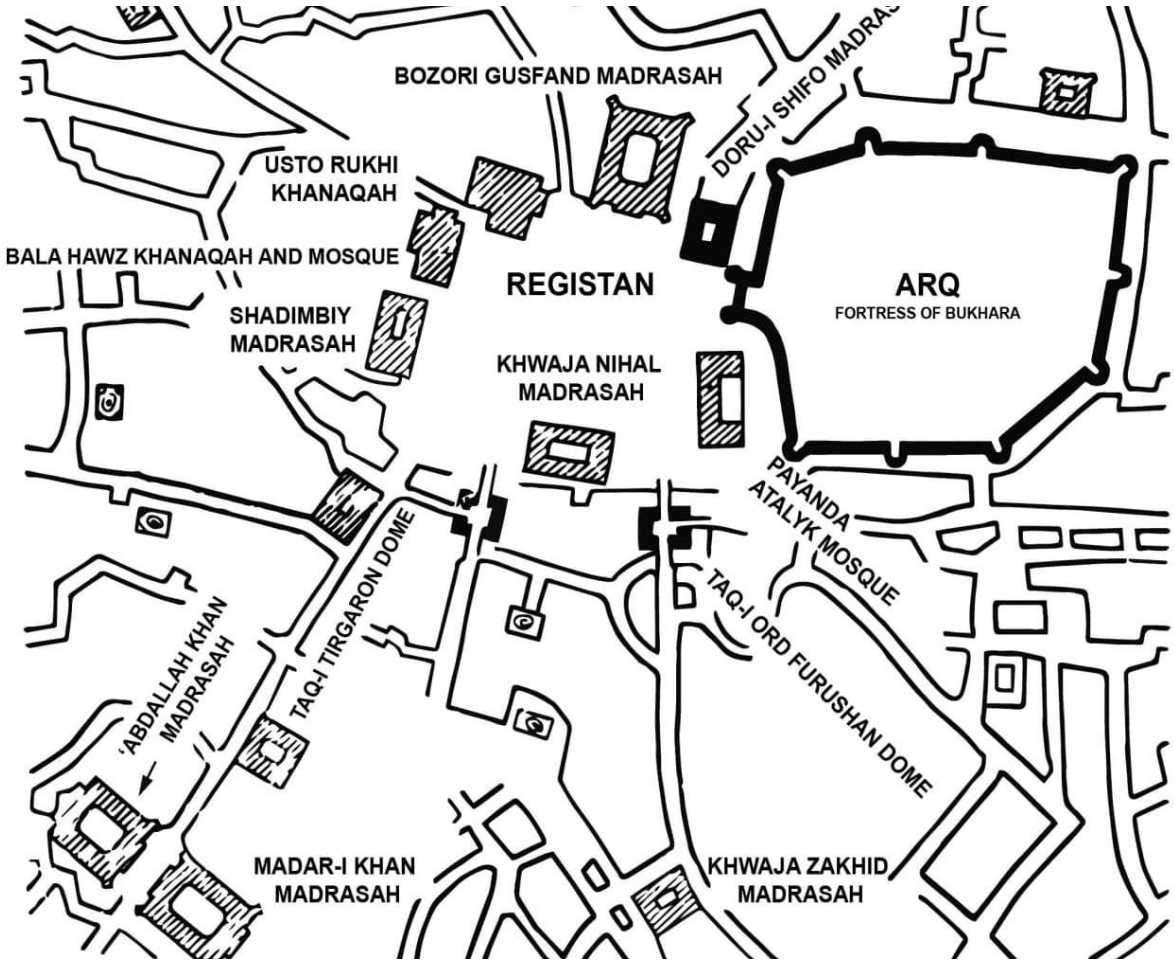


Figure 14. Registan ensemble. Plan (after: Rempel, 1981)

Figure 15. The Arq, the main façade (photo by author, 2018)

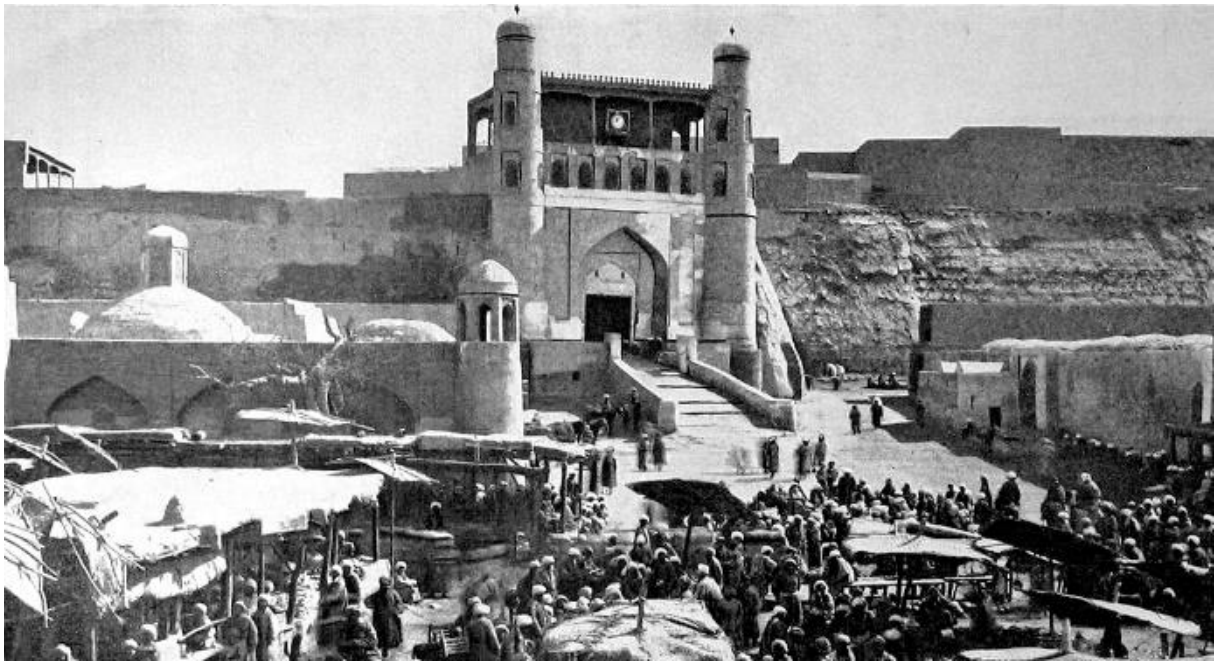


Figure 16. Registan ensemble, photo of the beginning of the 20th century (Archive Glav NPU)

The most monumental of the now lost buildings on Registan square were those erected in the 16th and 17th centuries. To the north of the square was the Ustad Ruhi (*khanaqah*) mosque (11, p.113) and the large Bazar-i Gusfand Madrasah.

Next to the Gusfand Madrasah on the east of the square, i.e. next to the west wall of the Ark and to the left of its entrance, had stood the Dar-ul Shifa' Madrasah and to the right of the entrance into the Ark the Payanda Friday mosque. In the 17th century the Shadimbiy Madrasah was built south-west of the square and the southern side of the square had been bordered by the 16th-century *taq*s – Taq-i Tirgaran (Dome of the Gunsmiths), Taq-i Ardfurushan (Dome of the Cotton Fabrics) and the Khwaja Nikhal Madrasah standing between the two.

This square, which from time immemorial had been a centre of public activities and administration and later a lively trading centre, teemed with life. There were all kinds of stalls belonging to traders, craftsmen and specialized bazars: public executions were held there and *pahlavan*s (wrestlers) performed there.

Conclusion and Evaluation

Architectural ensembles of Bukhara in the 15th–17th centuries were usually built in stages over several decades or even centuries. In the 15th and 16th centuries, the most widespread ensemble was that of the *kosh* type consisting of two large buildings erected opposite each other along the same axis across a street or a square. These *kosh* ensembles sometimes included a *hawz* (water reservoir) positioned between the buildings (the Gaziyan ensemble in 16th century). In Bukhara two *kosh madrasah* ensembles have survived – the Ulugh Beg and 'Abd al-'Aziz Khan Madrasahs, and also the Madar-i Khan and 'Abdallah Khan Madrasahs.

In the 17th century architectural compositions with buildings around the three sides of a square, often with a *hawz* within it, were more common for large urban ensembles. A picturesque example of such an ensemble is the Lab-i- Hawz in Bukhara.

Attention should be drawn to the trend we identified relating to the arrangement of bathhouses within ensembles. From plans of Bukhara dating to the turn of the 19th century it is clear that the Gaziyan ensemble described above was also next to a bathhouse, which according to the testimony of long-term residents had still been in existence in the 1950s.

If it is borne in mind that bathhouses in Central Asia were, in the vast majority of cases, designed for men, while time was set aside for women during a specifically defined period in only a few of the many bathhouses in Bukhara, then the close proximity of the men's bathhouse and the *madrasa* was extremely convenient for students from the latter. Such considerations would seem to explain why there had been bathhouses providing for the needs of the students from Muslim *madrasa*s and for those of the local inhabitants and visitors within the Madar-i Khan –'Abdallah Khan *kosh-madrasah* ensemble (from the end of the 16th to the middle of the 20th century), opposite the Ulugh Beg Madrasah (from the end of the 14th to the mid-17th century), to the side of the Mir-i 'Arab *madrasa* (possibly from the 15th right through to the 19th century) and near the two Gaziyan Madrasahs from approximately the 17th century to the beginning of the 20th.

In the medieval period bathhouses were usually built near areas of public assembly – Friday mosques, markets, in the centre of *guzar*s and so on. To judge from the four ensembles considered here, the close proximity of bathhouses and large *madrasah*s was also something traditional in the architecture of Bukhara in the Timurid era and later.

The large ensembles of Bukhara of the 15th-17th centuries considered above are outstanding examples of the medieval town-planning art of Central Asia. These ensembles and the monumental richly decorated buildings included in them are among the favorite best and most attractive places for visitors to Bukhara.

References

Historical Sources

1. Khafiz T. Al-Bukhariy, "Abdullanoma." Translated from Farsi into Uzbek by Sadik Mirzaev, Tashkent, 1999.
2. Narshakhi, M. Abu-B., "Istoriya Bukhary (A History of Bukhara)." Translated by N. Lykoshin and edited by V.V. Bartold, Tashkent, 1897.
3. Al-Din Ali Yazdi, S. "Zafarnama (Book of Victory) in Timuriilar bunyoidkorligi davr manblarida (Building Creativity of the Temurids in the Sources of the Period)." Translated and edited by A. Urinbaev, O. Buriev et al., pp. 91-92, Tashkent, 1997.

Books

4. Ayni S., Bukhara, Vospominaniya (Bukhara, Recollections), Book II, Stalinabad, 1957.
5. Chekhovich O.D., Bukharskie dokumenty XIV veka (Bukhara Documents of the 14th century), Tashkent, 1965.
6. Chekhovich O.D., Samarkandskie dokumenty XV-XVI vv. O vladeniyakh Khodja Akhrar v Srednei Azii i Afganistane (Samarqand Documents of the 15th-16th centuries. On documents regarding the properties of Khwaja Ahrar in Central Asia and Afghanistan), Moscow, 1974.
7. Ivanov P.P., Khozyaistvo Dzuibarskikh Sheikhov (k istorii feodalnogo zemlevladeniya v Srednei Azii v XVI-XVII vv.) (The Economy of the Juybar Shaykhs, towards a history of land-ownership in Central Asia in the 16th-17th centuries), Moscow-Leningrad, 1954.
8. Kazakov B.A., Dokumentalnye pamyatniki Srednei Azii (Documentary monuments of Central Asia), Tashkent, 1987.
9. Pugachenkova G.A., Paths of Development of the Architecture of Southern Turkmenistan in the Slave-owning and Feudal Periods, in Trudy YUTAKE (Proceedings of the South Turkmenistan Archaeological Multi-Disciplinary Expedition), Vol. II, Moscow, 1958.
10. Pugachenkova G.A., Zodchestvo Tsentralnoi Azii. XV v. Vedushchie tendentsii i cherty (The Architecture of Central Asia. 15th century. Leading Trends and Features), Tashkent, 1976.
11. Rempel' L.I., Tsep vremyon. Vekovye obrazy i brodyachie syuzhety v traditsionnom iskusstve Srednei Azii (The Chain of Time. Age-old Images and Roving Motifs in the Traditional Art of Central Asia), Tashkent, 1987.
12. Yusupova M.A., Buharskaya shkola zodchestva XV-XVII vv. Osobennosti i dinamika razvitiya (The Bukharan school of architecture in the 15th–17th centuries. Distinctive Features and Paths of Development), Tashkent, 2014.

Articles and book chapters

13. Amitin-Shapiro Z., "Legend about the Building of the First Synagogue in Bukhara," in Collection of articles compiled by the academic study-circle of the Oriental Faculty of the Central-Asian State University, Issue 1, pp. 1-3, Tashkent, 1928.
14. Babadzhanov B., "On the Dating of the 'Volidai 'Abd al-'Aziz Khan" Mosque in Bukhara (Based on epigraphic data and manuscript sources)," ONU (Social Sciences in Uzbekistan), No. 4-5, p. 91, 1998.
15. Gulyamov Y.G., "On the question of the Traditions for Architectural Ensembles in the cities of Central Asia in the 15th century," in Velikii uzbekskii poet (A Great Uzbek Poet). Collection of articles edited by M.T. Aibek, pp. 146-157, Tashkent, 1948.
16. Kazakov B.A., "Document regarding a Forgotten Monument," in Vekhi vremyon. Rasskazy o pamyatnikakh istorii i kultury Uzbekistana (Watershed Moments. Accounts of the Historical and Cultural Monuments of Uzbekistan), pp. C. 87-92, Tashkent, 1989.

17. Mukminova R.G., "The Madrasah of Muhammad Shaybani Khan" in K istorii agrarnykh otnoshenii v Uzbekistane XVI v. po materialam "waqf-name" (Towards a History of Agrarian Relations in 16th-century Uzbekistan. Based on material drawn from waqf-nama documents), pp. 9-25, Tashkent, 1966.

18. Pugachenkova G.A., "Architectural Notes," IZU (The Art of Architects of Uzbekistan), Issue I, pp. 178-210, Tashkent, 1962.

19. Yusupova M.A., "On the Question as to how the Architectural Ensembles of Bukhara took shape in the 15th-17th centuries," in Iskusstvo Tsentralnoi Azii: svoeobrazie istoricheskogo razvitiya (The Art of Central Asia: The Distinctive Nature of its Historical Development), Conference Abstract for the II International Academic Conference, pp. 82-84, Tashkent, 1997.

Abstract of dissertation

20. Akhmedov M., "Uzbekiston urta asrlar memorii ansambllari tarakkiestining tarikhii-nazarii asoslari" (The Historical-Geographical Principles underlying the Development of Medieval Architectural Ensembles in Uzbekistan). Résumé of a Dissertation for a Doctorate in Architecture, Tashkent, 1996.

Archival materials

21. Pchelnikov S., 'Materialy issledovanii po medrese Abdullakhana v g. Bukhare (Materials from Research-work carried out on the Abdallah Khan Madrasah in the city of Bukhara)" in the Archive GlavNPU of MC RUz, Tashkent.

22. TsIGA PUz (Central State Historical Archive of the Republic of Uzbekistan), Repository I-323, Inventory No. 24. Deciphered and translated by B. Babadzhanov.

23. Photo. 1930 Façade of the Gaziyan Khanaqah. Archive GlavNPU of MC RUz, 18336, code 99-3.

24. Photo. The beginning of the 20th century. Registan ensemble, Archive Glav NPU.

VISUALIZING AMIR TEMUR'S PALACE AKSARAY IN SHAHRISABZ, UZBEKISTAN, BASED ON HISTORICAL AND ARCHEOLOGICAL DATA

Dr. Nilufar Tukhboeva
Tashkent Institute of Architecture and Civil Engineering,
AJOU University in Tashkent
n.tukhboeva@posteo.de

Summary

Aksaray was in terms of both its dimensions and its decoration unique in the world. Palaces of Amir Temur and of the Timurid period in Central Asia have been preserved in ruins in many cases. The analysis of archaeological research shows that the architectural appearance of these constructions continues the centuries-old architectural traditions. Their structure was linked with unique climate condition in many ways.

This state of affairs is not just for erecting housing, social and cultural buildings but also for palaces that were surrounded with iwans and raised in the middle of the courtyards. Aksaray is excluded. This palace embodied in itself the great achievements of the middle Ages builders of Central Asia, Afghanistan and Iran.

Keywords: *Aksaray, preservation, Middle Ages architecture, 3D model, animation, pillars, peshtak, palace, ensemble, archaeological, excavations, ganch, Salomkhona, topography, iwans, yigoch, Ko'ksaray*

1. Introduction

Nowadays the role of improving the economic potential of the country in the tourism sphere is great. Measures are being taken actively for solving problems related to urban planning and architecture, further enhancement of education and science in construction, innovative development of construction industry in recent years, preservation of architectural monuments and their appropriate usage stated in the "Action Strategy" towards the intensive development of the country.

In this regard preservation of middle Ages architectural monuments and further enhancement of the ways of their efficient usage, appropriate usage of architectural monuments for improvement of traveling opportunities are of important objectives. Worldwide in scientific researches about appropriate usage of architectural monuments a great attention is given to preservation and restoration of historical monuments, enhancement ways of their durability.

For that matter, poor development of normative documents in this field, poor learning of complex ways of development of Middle Ages architecture, scientific research ways of historical monuments and giving them contemporary uses are creating many issues.

Special attention is given to providing sustainability of old towns, preserving the buffer zone of architectural monuments, development of digital tourism by creating 3D model and animation.

Objectives of the project is enriching with new data the research gaps of cultural heritage objects related to Amir Temur and Temurids buildings of Middle Ages in historical towns, developing digital tourism through their graphic reconstruction and creating visual animation.

The project proposal is implemented based on historical sources and archeological research results (Fig.1).

Figure 1. Amir Temur's Aksaray Entrance peshtak (portal) and location

Aksaray Palace was erected on behalf of Amir Temur as a venue for celebrations in 1380-1404.

Coming to present there are only two "pillars" of Aksaray palace in Shahrisabz at the entrance. Until now it is described as a huge, rectangular building in the specialized literature. Sharafiddin Ali Yazdi described Aksaray as a never-seen remarkable monument in the world. As the existing peshtaks (portals) evidence not only the scale of the building but also its architectural ornaments draw attention of viewer.

Amir Temur's Aksaray palace in Shahrisabz was not only an administrative place of Kesh city but also Temur's empire. At the end of the XIV-, beginning of the XV century it occupied a large territory, its height was about 70 meters. Out of complex Aksaray palace ensemble only 38-meter peshtak, entrance portal, has been left. The two huge pillars of the saved entrance peshtak were decorated with unique ornaments and patterns. It is possible to know about the initial structure of Aksaray from the written sources of medieval centuries.

2. Material and Method

The archeological researches carried out works here which allowed to discover the remains of the foundation of the monument that occupied not a big territory at the main entrance of Aksaray (Fig.2).

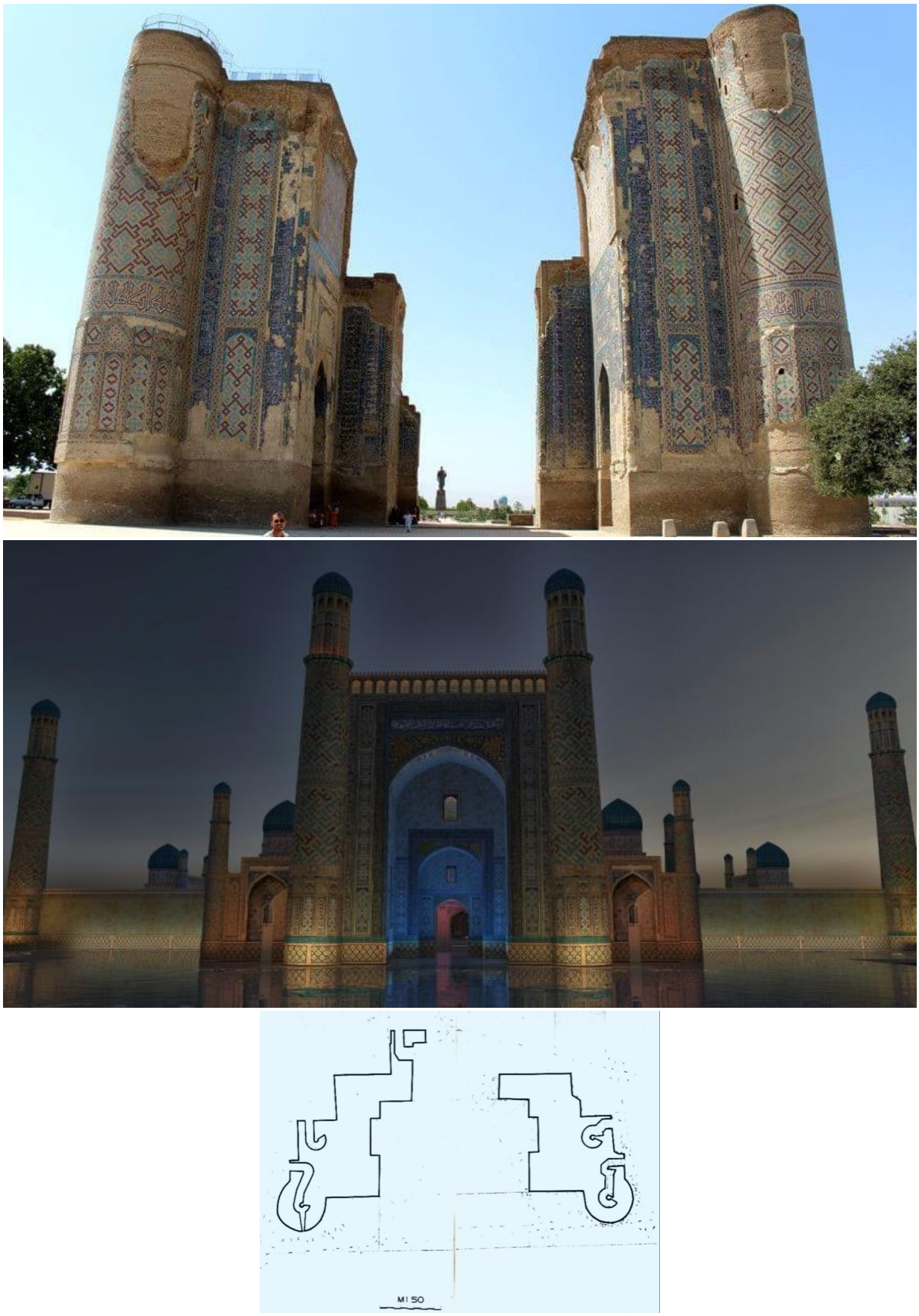


Figure 2. Main entrance of Aksaray and main entrance of Aksaray plan

At the same time the Spanish ambassador Ruy Gonzalez de Clavijo who visited the empire of Amir Temur when he was alive described this building as an outstanding monument:

"The following day on Friday the ambassadors were taken into big castle established on the order of the king.

It is said that the builders have been working here every day for over twenty years. Even now many masters are working.

The entrance of the castle is very long and its gate is very high. The brick arches decorated with different tiles stand on the right and left sides of the entrance. There are small rooms without doors under the arches and their surface is covered with tiles. This covering has been created for the visitors when the king comes to the palace.

There is another gate after the large gates. Then there is a courtyard paved with white stones and a richly decorated small domes (Fig. 3).

Figure 3. Decoration of Aksaray

There is a large pool in the middle of the courtyard and the courtyard's width is three hundred feet. Through the courtyard one passes to the largest building of the palace. The entrance to this building was a huge and high door, it was decorated masterly with gold, lacquers (lapis lazuli) and tiles. Through this door one can enter to the rectangular reception.

The walls of the reception were also adorned with gold, lacquers (lapis lazuli) and tiles, and golden water was poured

over it. From here ambassadors were taken upstairs. There are so many rooms that you cannot describe at once. All the decoration works are made out of gold, lacquers and recious stones and even the craft masters of Paris can admire them."

Zahriddin Muhammad Babur gives the following information "it is also Kesh province. In the south of Samarkand, located in nine yigoch distance. There is a mountain between Samarkand and Kesh. It is a pit of shackles and, the stones are all brought from the mountain."

Shahrisabz is also called the springs desert and city, of the root of the rocks and tombs.

Temurbek made great efforts to make Kesh as the capital city and a lot of buildings were constructed there. In order to have a castle for himself he had built a great portal and both on the left and on the right side his vizier was sited on the two smaller portals. In addition, he had small rooms built for his crowds in the castle and this kind of construction is considered so rare. It is considered more reputable than that of Kisro (Kisro is famous architectural building of middle Ages in Spain) (Fig. 4).

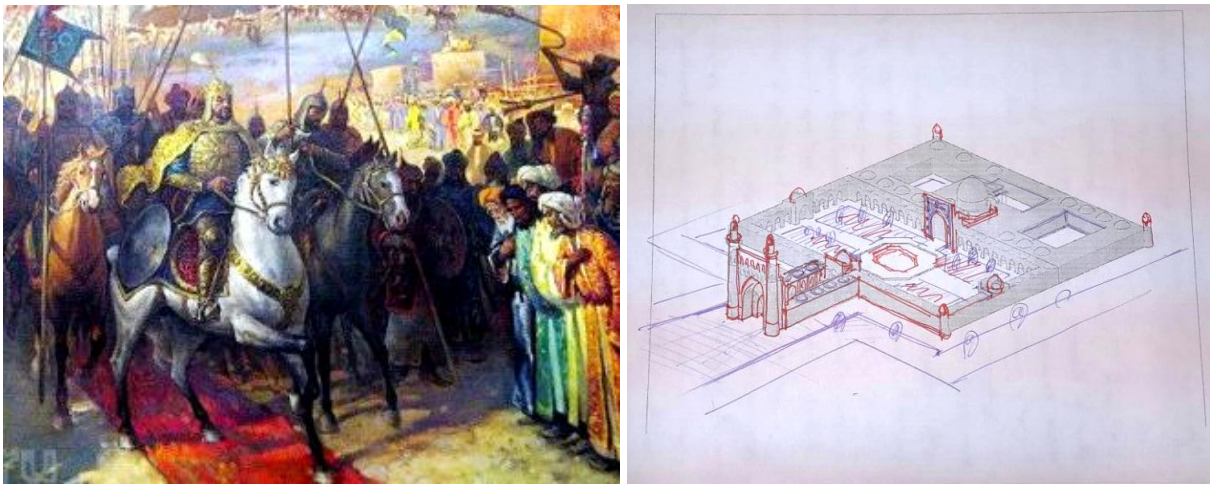


Figure 4. Project proposal of graphic reconstruction of Aksaray by Prof. M.K. Ahmedov, PhD N.M.Tukhboeva

Thus, initially Amir Temur wanted to make Shahrisabz as a capital city. However, the king wanted to opt for Samarkand as a capital and he erected in Shahrisabz his second residence Aksaray as a chancellery with the attendance of his sons in that place. Although this castle was considered as a second administrative place after Ko'ksaray in Samarkand and its dimensions were huge. Babur wrote that it was greater than the building in Kisro and Clavijo remarked that the width of the inner courtyard was three hundred feet (Fig. 5).

Based on architectural researches made on the historical monument its real appearance contained housing and public buildings. Efficiency of the building hugeness is in a unity of brick mass, and it is seen on the architectural ornaments on the main facade surface.

3. Findings

In 1976 archaeologist Sultonov X.T. began archaeological excavations in Aksaray building for the reason of the outstanding structure and conservation of the architectural building 3-4 meters south of

the ruins of the entrance. At a depth of 1.5 meters above the current earth surface it was discovered a wonderful combination of different colored tiles on the surface of the building (Fig. 6).

Figure 5. Decoration courtyard of Aksaray (three hundred feet)

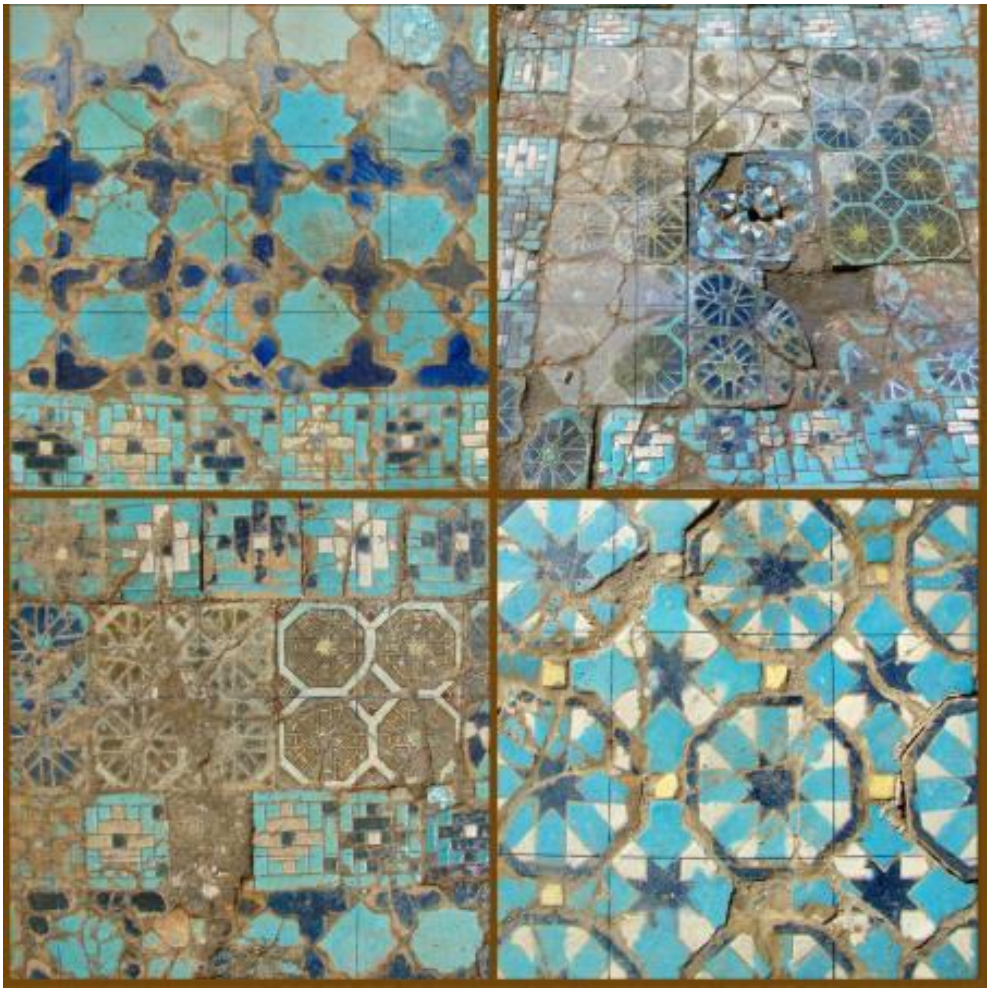


Figure 6. Archaeological excavations in Aksaray

During the excavations numerous ceramics have been found which decorated rooms of the palace. These include limestone glazed and poured with gold water fragments of cornices and embossed epigraphic ceramic tiles with patterns, carved marble tiles and molding's out of ganch and ceramics.

"In order to build the ancient monument, it was the construction.

The foundation of the building is ribbon-shaped and choosing its shape results from the distribution of the mass of the building onto the ground (Fig. 7).

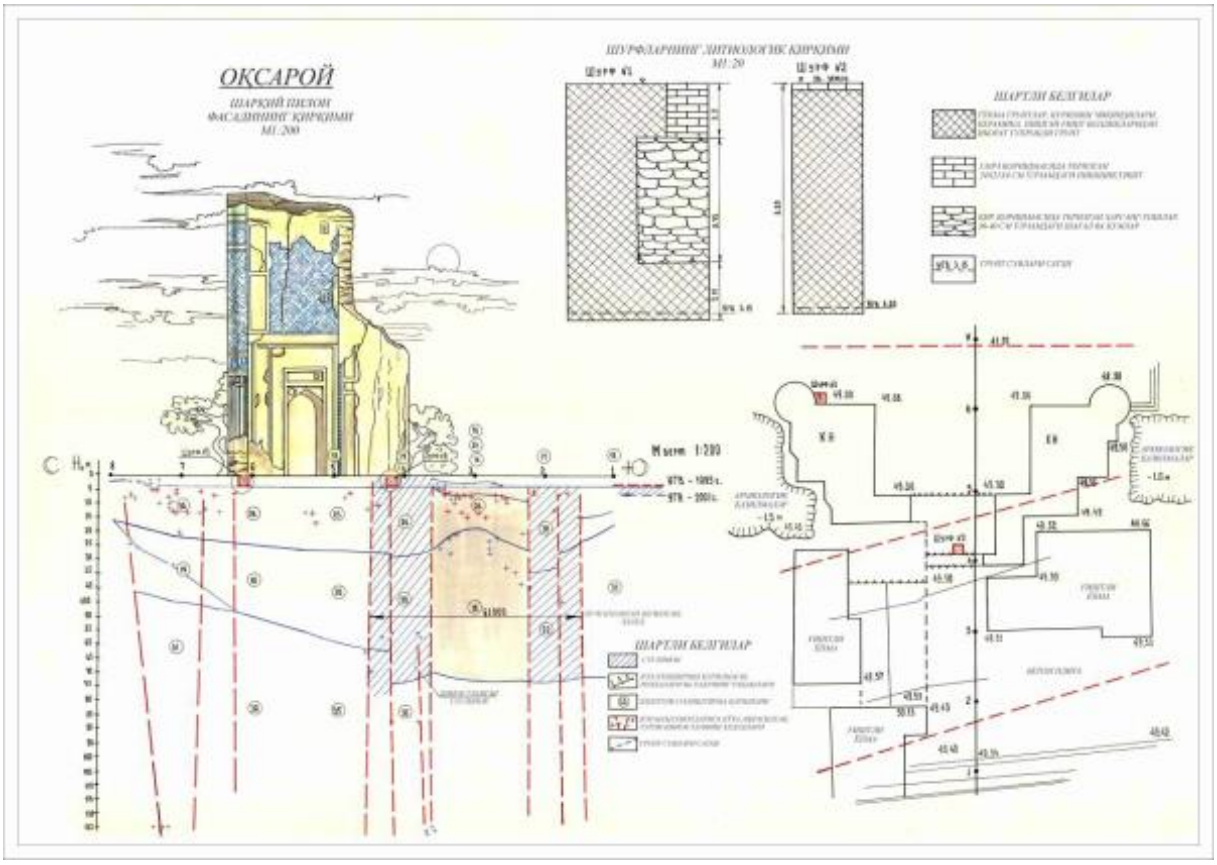


Figure 7. The foundation

To increase the bottom surface area of the foundation in historical monuments trapezoid and curved forms were used. The foundation is 7 meters deep, and the material consists of large stones." (Fig. 8)

In order to ensure equal resistance in the structures of the monument it was used same materials or materials with similar physical and mechanical properties. The main building material was burnt brick which was laid using a special type of mortar - ganch. The brick used in the construction of the monument was square shaped, measuring 24 to 28 cm on each side, 3 to 5 cm thick.

Longevity, earth-resistance and stability of historical monuments is the result of a good quality construction and installation work and of the relatively large volumes of the structures.

Figure 8. Geological shrineInstallation of roof basesStacking of stone rocks by means of stacking

4. Foundation

The foundation is built in the form of a single large mass under the pylon, from the appearance of an expanded trapezoid up to 2.0 m wide. The foundation material is out of medium and large stones and it was made by using earth mortar. The foundation depth is between 3 to 7 meters.

During the summer, the minimum level of groundwater is 3.05-3.10 m as a result of moisture in the mortar the level of water capillaries rises. In the construction of architectural monuments on the territory of Uzbekistan construction mortars were used from active mineral ashes and natural organic substances. It is known from historical sources that the ingredients were prepared by adding the ash of plants and natural fat components to the lime binder of the water-resistant joints that is used in the construction of the foundation of buildings.

Mortars from lime, ash and earth have hydraulic binding properties in monumental buildings and structures built in high humidity conditions.

The composition of earth mortars consists of lime paste and ashes of burnt plants (Fig. 9).

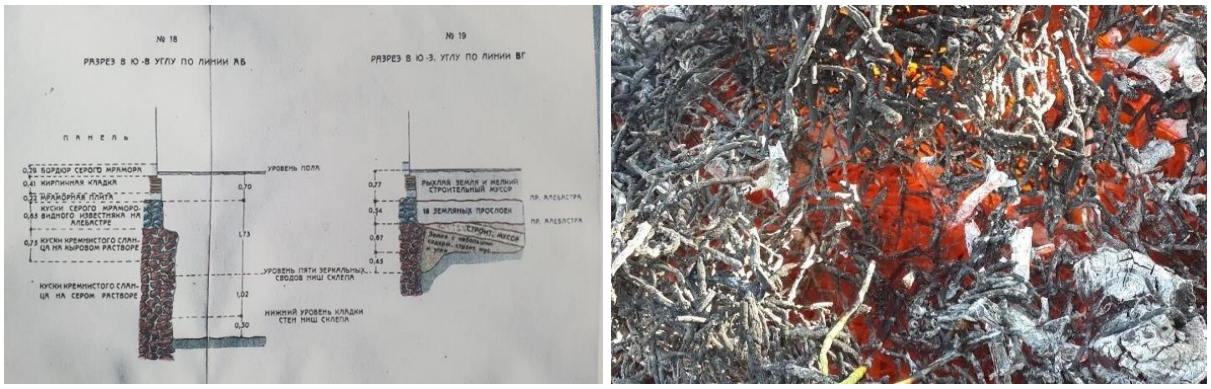


Figure 9. Excavations numerous ceramics and burnt plants

It should be noted that not all burnt plants make ashes having pozzolan properties; only plants containing active silica and metal oxides fall into this group. Active

silica and metal oxides react with lime binder and form small water-insoluble minerals.

Active silica, aluminum, iron, magnesium and other metals oxides reeds, rice husks and annuals - sagebrush, fisheye and can be found in the ash of other plants. Saxaul, tamarix and solyanka plants are rich in nutrients and contain a lot of white salt.

The upper part of the foundation is 50-60 cm below the size mark on the plan and these parts of the pylons are laid by bricks with the ganch mortar.

Based on data of Yazdi, Clavijo, Zakhriddin Babur and the materials of archeological observations, Amir Temur's Aksaray that was built in Shahrisabz consists of three interrelated parts in terms of layout, construction and usage, and the general design scheme of the palace can be restored.

According to this information from here one can enter the courtyard, which was not much larger than the main portal.

In the left and right sides of the courtyard small vaults with tiled floor were located for sons and beks of Sahibkiran in a structure ***Salomkhona*** which is preserved in the palaces of emirs of Bukhara (Fig. 10).

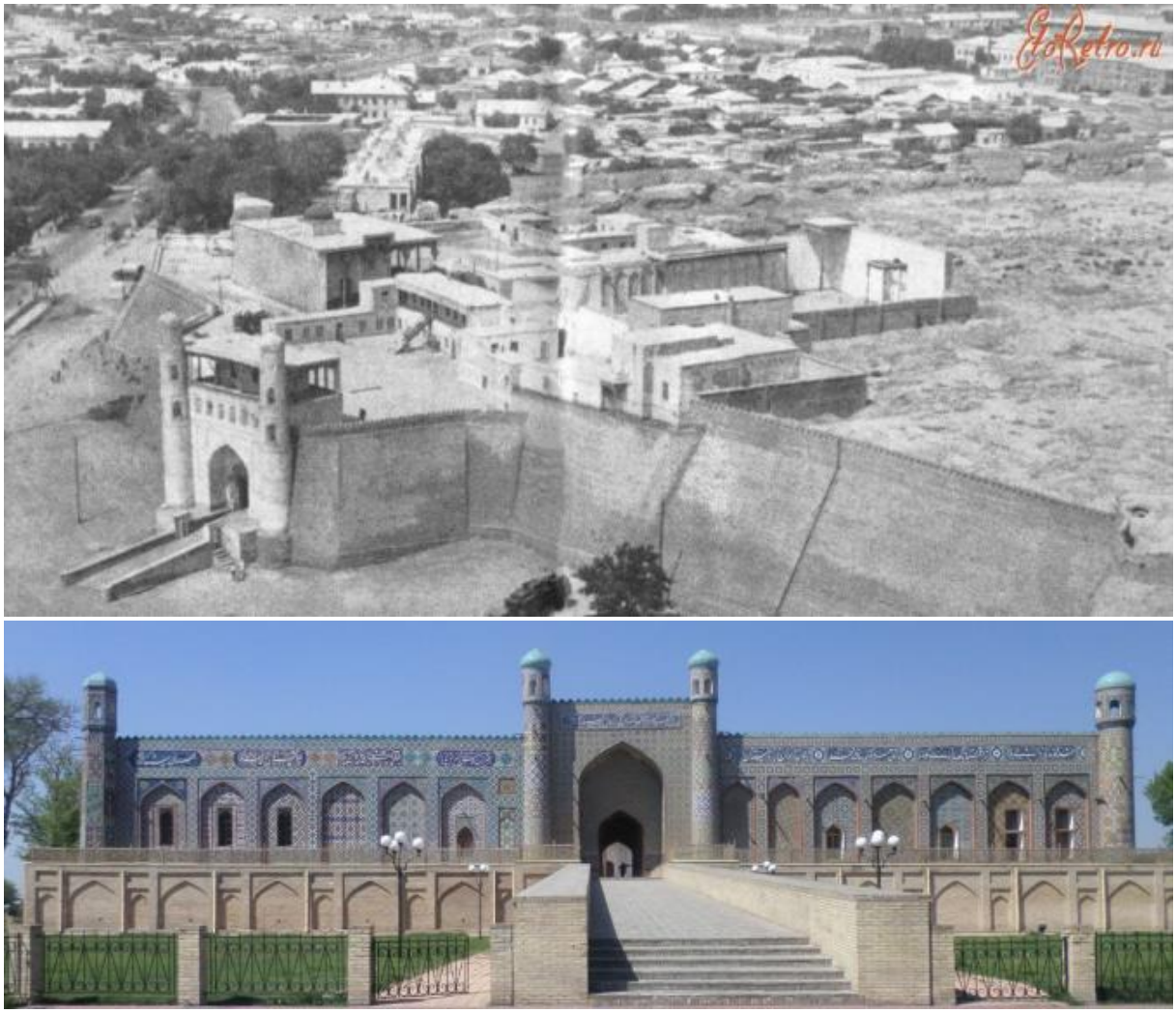


Figure 10. Salomkhona which is preserved in the palaces of emirs of Bukhara and and Kukhand

From another portal one can enter to a courtyard which was three hundred steps wide (120-125 meters).

The length of this courtyard is unknown but we know from Clavijo's data about Amir Temur's chancellery there (Fig. 11).

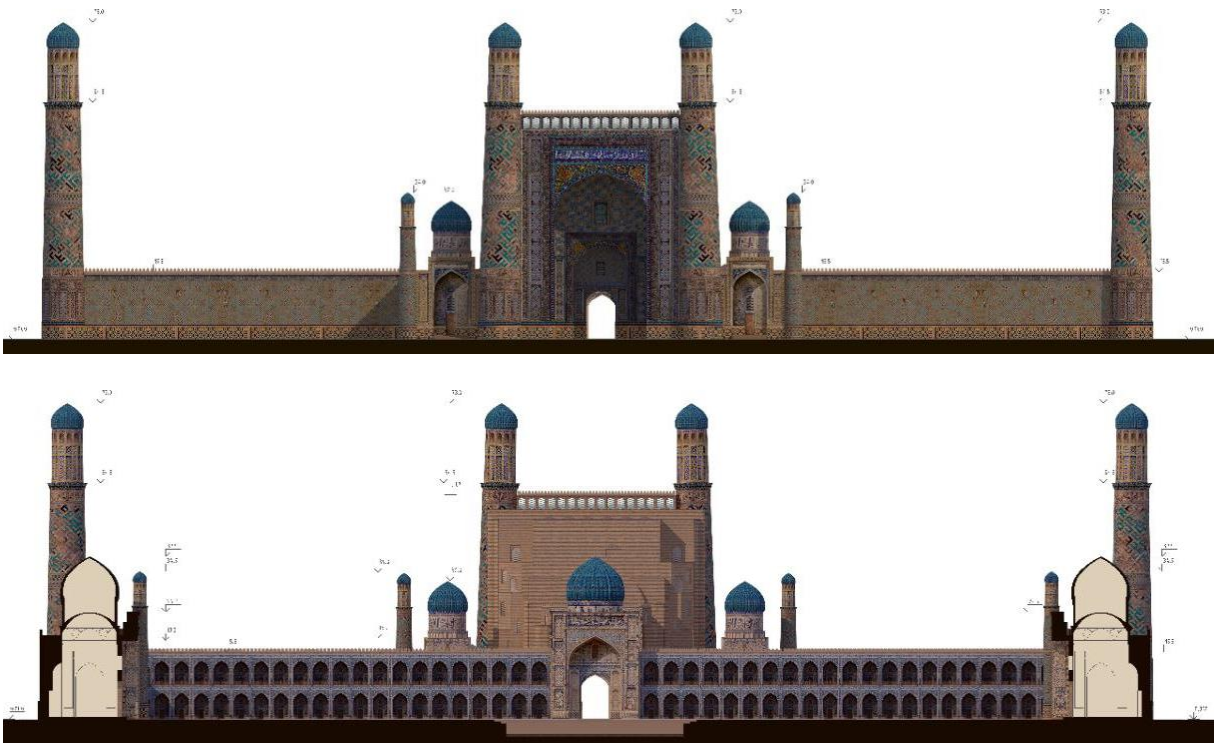


Figure 11. Courtyard of Aksaray three hundred steps wide (120-125 meters).

There was a pool, in the middle of the second yard. So, Aksaray was an incredibly huge building and it continued till the madrasah Cho'bin which has been preserved until today. It can be learned from the process of reconstruction of the city center in 2014 and according to the foundation bricks of 28x28x6 cm of the small rooms found on the site.

5. Discussion and Conclusion

Based on the historical data cited above, restoration drawings of the layout of Amir Temur's Aksaray in Shahrisabz can be created schematically.

From the front facade with a total width of more than 52 meters, by the central corridor which is about 8 meters, where one entered the second gate. Both Clavijo and Bobur stated about that corridor that was long and both sides adorned with brick arches.

Then one stepped into the courtyard which was three hundred feet wide and was paved with white marble. There was a pool in the middle of the yard, reception places on both sides of Amir Temur's sons and at the front Sohibkiron's reception hall.

In the Middle Ages, entrance portal had huge columns and the construction of the palaces in the middle of courtyard was spread widely.

According to the appearance and structure it is similar to the Palace of Termez rulers of the XI-XII centuries. (Fig. 12).

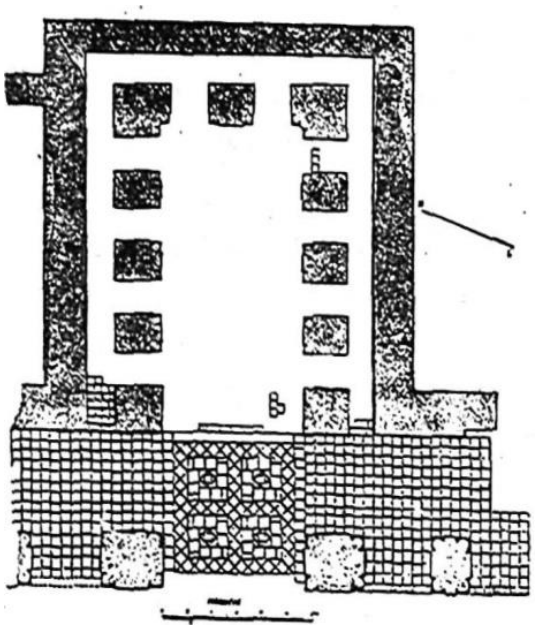


Figure 12. Palace of Termez rulers of the XI-XII centuries

In addition, the palace of the ruler Shahriyor-ark in Marv during the period of Saljukiy in the XI century is similar to Aksaray in terms of its layout. Moreover, the Ghaznaviys' Palace Lashkargoh from the XI century in Afghanistan is similar to Aksaray in terms of layout in many ways.

Aksaray is undoubtedly considered as the first type of palace. Political, administrative, and ideological power is centralized there. Its location inside of the city walls indicate that it has performed these duties.

The huge remnants of the entrance portal pillars of the Aqsaray prove that there were not any places like this in the Near and Middle East. Till present the floor tiles which covered the courtyard of the building are not similar to other palaces.

Kuksaray in Samarkand, Baghi Shahr palaces in Herat were also built by Amir Temur and had been considered as a place of government. But they were not as primary as Aksaray (Fig. 13-14).

Figure 13. Scheme of schematic reconstruction of Aksaray (author)

Figure 14. Project proposal of graphic reconstruction of Aksaray by PhD. N.M.Tukhboeva

REFERENCES

1. Pugachenkova G.A., Rempel L.I. "Outstanding monuments of architecture of Uzbekistan". Tashkent: Gosizhudlit, 1958.
2. Sharafiddin A. Y., Zafarnoma. Toshkent. 1997.
3. Clavijo R. G., "Diary of a trip to Samarkand to the court of Timur (1403-1406)." M., 1970.
4. Zakhiriddin M. B., "Baburnoma", Tashkent Yulduzcha Publishing House, 1989.
5. Nizomiddin S., "Zafarnoma", Tashkent: Uzbekistan, 1996.
6. Sultonov H.T., Dresvyanskaya G.Y., Lunin S. B. and Usmanova. Z. I. "Shakhrisyabz Part II". Tashkent "University" 1993.
7. Abdurashidov K.S., Kabulov F.R. and Rakhmanov B.K. "Engineering problems of architectural monuments". T.: Fan 2011.
8. Bulatov. M.S., "Geometric harmonization in the architecture of Central Asia of the 9th-15th centuries" p. 226-230.
9. Sh. Pidaev. Ancient Termez, Tashkent: Science, 2001.
10. Mankovskaya L.Y., Typological bases of architecture of Central Asia (IX-beginning of XIX). - Tashkent, 1980.
11. Yusupova M., Bukhara School of Architecture XV - XVII centuries. D. dissertation of Doctor of Sciences. - Tashkent, 2000.
12. Akhmedov M.K. Ensemble building: tradition and continuity. Architecture of Uzbekistan. Almanac. - Toshkent: "Safur Ulom", 1985.

MAUSOLEUM OF FAKHRADDIN RAZI IN KUNYA-URGENCH (XII-XIII CENTURIES)

Dr. Zafarbek Matniyazov
Tashkent Institute of Architecture and Civil Engineering.
Faculty of Architecture. Department of Interior and Landscape Design
zafar18@mail.ru

Dr. Lobar Rasul-Zade
Tashkent Institute of Architecture and Civil Engineering.
Faculty of Architecture. Department of Interior and Landscape Design
lobar.rasulzade@bk.ru

Summary

The article analyzes the ancient objects of Fakhraddin Razi and Tekesh of Mausoleum. Ancient and modern accounts are compared. It is illuminated by the evidence of the uniqueness of the monuments.

Keywords: *Monument, difference, Fakhraddin Razi, Tekesh of Mausoleum*

Introduction

The mausoleum attributed to Fakhraddin Razi is one of the buildings of the capital of Khorezm that survived after the destruction of Urgench by the Mongols (Figure 1). It is a one-chamber mausoleum of slender proportions, built of burnt bricks.

The mausoleum cubic volume carries a dodecahedral drum covered with a tent. The main facade is architecturally distinguished: three arched niches in rectangular frames with light openings are arranged in a rectangular frame with an epigraphic ornament, and the entrance to the mausoleum lies along the axis of the composition [1].

Some Information about the Mausoleum

The measurement of the monument, carried out by the architect A. N. Vinogradov, was accompanied by the laying of a pit near the monument, which made it possible to establish the ancient level of the bridge at a depth of about 1.5 m from the daylight surface.

At the same time, the remains of a plinth laid out of polished bricks on an edge, an entrance niche, three ledges of an expanding foundation and its base were found. When examining the monument, it was found that on the northeastern corner of the wall, the repair masonry protrudes 14 cm against the basement line; judging by

the vertical marks, the building leaned towards the east; later renovations distorted the architecture of the main facade. Nevertheless, the surviving profiled polished bricks under plaster and the removal of cultural layers near the monument make it possible to restore its former proportions and, to some extent, the appearance of the building repaired.

Figure 1. Mausoleum of Fahraddin Razi (XII-XIII centuries). General view (5).

Geometric Shaping of the Mausoleum

The mausoleum of Fakhraddin Razi is small, the sides of the square room are 364, 367, 359, 364 cm.

The arithmetic mean is 363.5 cm, or 6 gauzes, with a gauzes of 60.5 cm.

The thickness of the walls of the quadrangle is commensurate with the side of the octagon inscribed in the square of the room.

Therefore, the side of the quadrangle according to the outer outline is commensurate with the sum of the side of the square of the room and the two sides of the octagon (assuming a = 1):

$A = 1 + 2(\sqrt{2} - 1) = 363{,}5 + 301 = 664{,}5$ cm,

which corresponds to nature, since the dimensions of the sides of the quadrangle are 636, 678, 653, 697 cm.

The arithmetic mean is 665.5 cm, or 11 gases.

The width of the niches in the interior along the axes of the walls of the quadruple is 3 gauzes, the walls are 1.5 gauzes.

Inside the mausoleum, the level of the floor has not been established by archaeological excavations.

We take this level at around - 246 cm, i.e. at the level of the base.

At the same time, the height of the quad in the interior is 246 + 261 = 507 cm (Fig. 2) and corresponds to the diagonal of a square room, if we assume that for $\sqrt{2}$ the architects took 7/5.

So, $N_{quart.} = \sqrt{2}$=363,5 x 1,4 = 508,9 cm.

Natural dimensions - 507 cm.

The height of the octagon - the tier of sails - is commensurate with some errors to the side of the octagon.

The volume of the building is a cube, and the proportions of the portal are expressed in a ratio of $\sqrt{5}$: 2.

A twelve-sided prism has a round base.

Its diameter is 550,5 cm.

To determine the height of the prism, the diameter of the circle is divided by four, on one fourth the perpendicular is restored to the intersection with the circle,

which is the average proportional between the unit and the trinity, i.e.

$$\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3};$$

$$\text{h prisms} = \frac{D\sqrt{3}}{4} = \frac{550{,}5x3}{4} = 238 \text{ cm}.$$

Natural dimensions - 242 cm; error - 4 cm.

It should be noted that similar techniques were used in the construction of the architectural form of a number of other monuments, in particular, the mausoleums of Tekesh and Tyurabek-khanym, which will be discussed below.

The shapes of the dodecahedral tent, lined with a false vault, fit into an equilateral triangle.

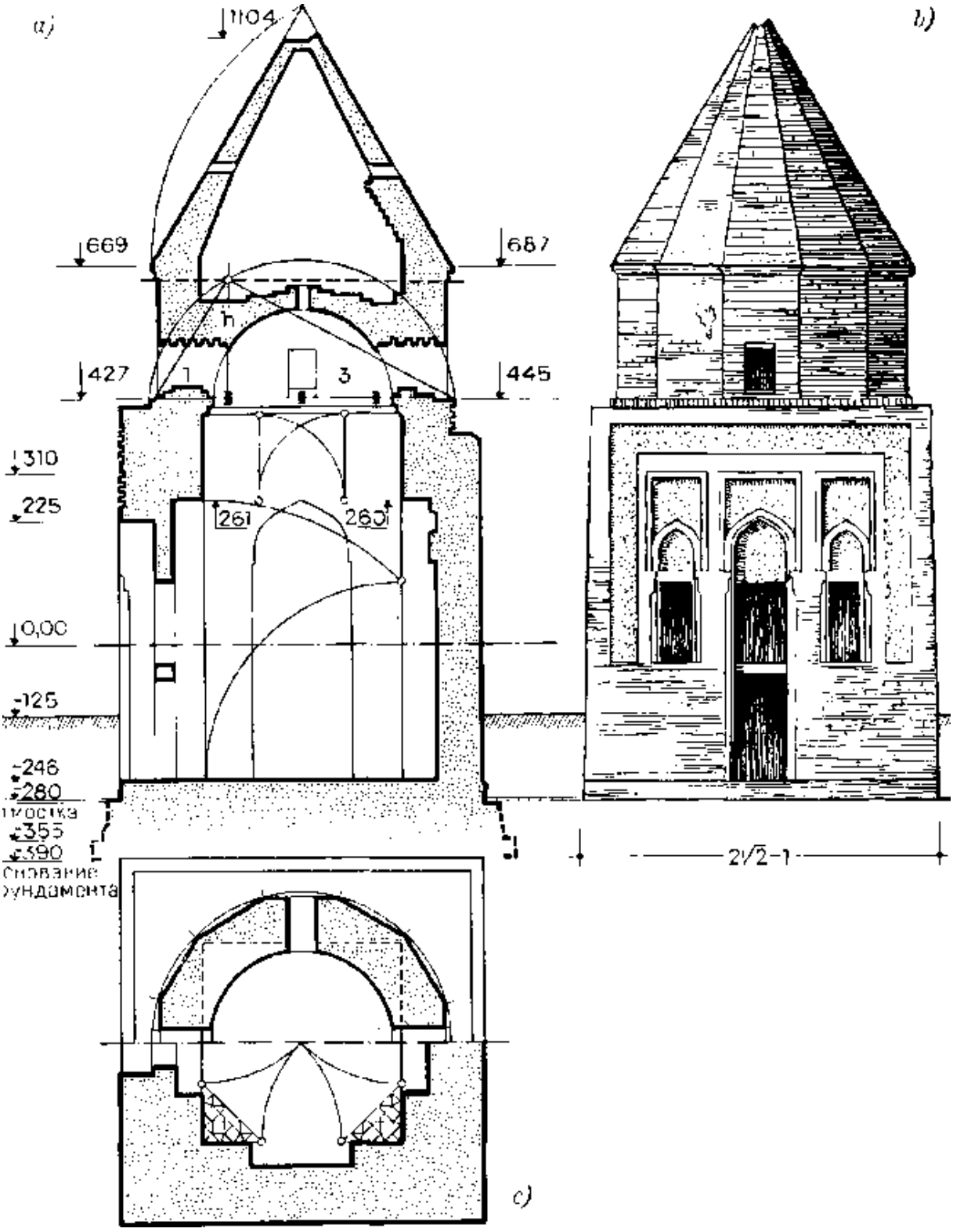


Figure 2. Mausoleum of Fakhraddin Razi. Plan and section. Building Analysis

Mausoleum of Tekesh in Kunya-Urgench (XII-XIII centuries).

The mausoleum dedicated to the penultimate Khorezmshah Abul Muzaffar Tekesh, who ruled from 1172 to 1200, is a "semi-cube", above which rises a round drum with 24 two-bladed pilasters, ending with an arcade of figured arches and turning into a round frieze belt with top inscriptions in colored ceramics.

The drum is covered with a cone [2] (Figure 3-4).

Figure 3. Mausoleum of Muzaffar Tekesh (XII-XIII centuries). General view

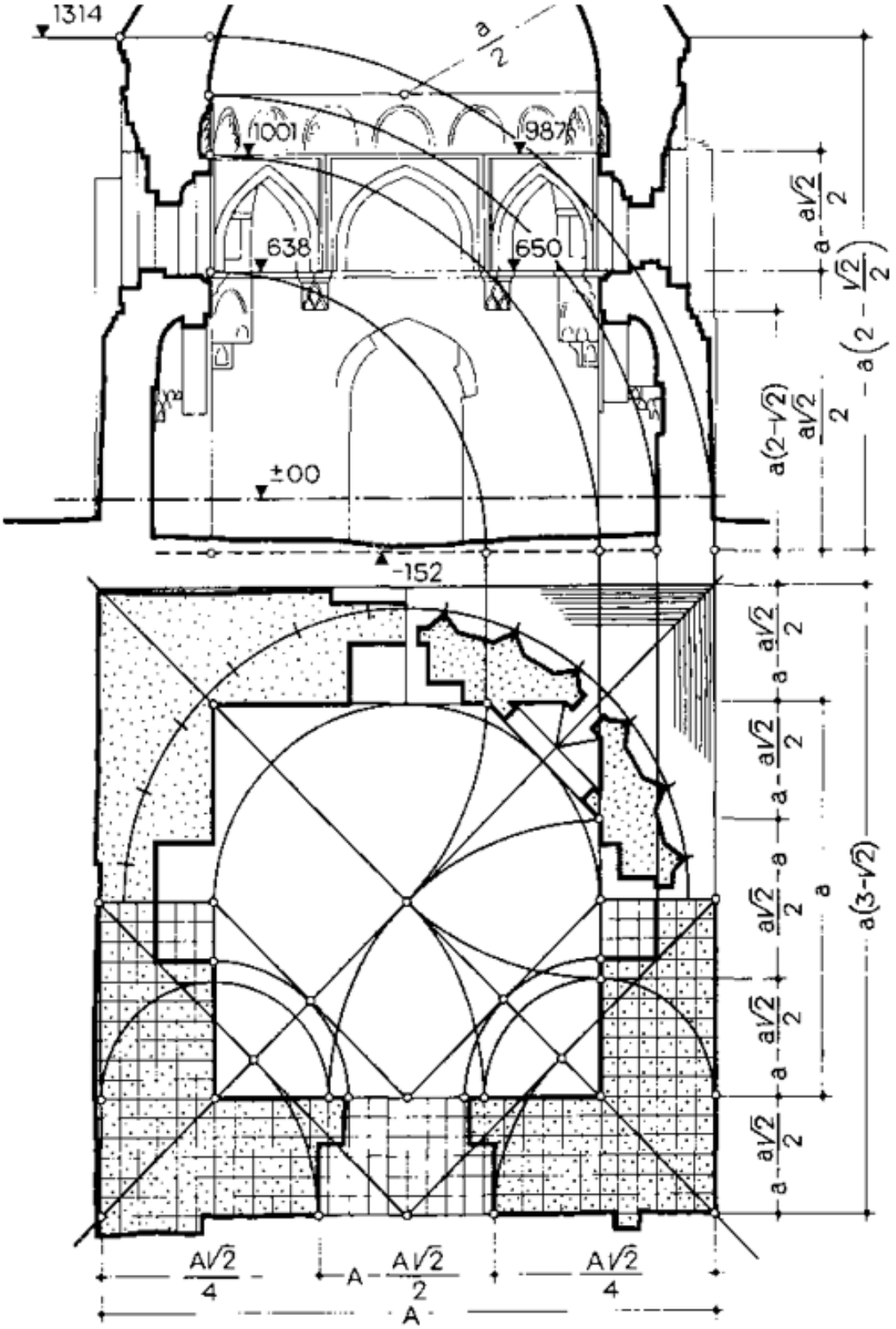


Figure 4. Mausoleum of Muzaffar Tekesh. Plan and section. Building Analysis

The domed square of the mausoleum has sides 1140, 1140, 1144, 1156 cm.

The arithmetic mean is 1145 cm, or 20 gauzes, with a gauze equal to 57,2 cm.

A diagonal corresponds to such a square, $a\sqrt{2}$ in the calculation of ancient architects:

$\frac{20x7}{5}$ = 28 gauzes, or 1603 cm

The height of the quadrangle corresponds to the half-diagonal of the square, i.e. 14 gauzes, or 801 cm, in fact, the height is 796 cm; error - 5 cm [3].

The corners of the octagon in plan are determined by half the diagonal of the square with the help of a cord, laying off a half-diagonal from each corner of the quadrangle.

The height of the octagon is proportional to the side of the square minus the half-diagonal.

$$a - \frac{a\sqrt{2}}{2},$$

In terms of ancient architects

$$20\text{-}\frac{20x7}{10} = 6 \text{ gauzes}$$

The total height of the quadrangle and octagon is 1146 cm, i.e. 20 gauzes,

which corresponds to the side of a square room.

The height of the inner dome is commensurate with half the side of the square.

The thickness of the walls of the quadrangle is commensurate with the side of the square minus the half-diagonal

$$a - \frac{a\sqrt{2}}{2}.$$

The thickness of the walls of the quadrangle is commensurate with the side of the square minus the half-diagonal

$$a - \frac{a\sqrt{2}}{2}.$$

According to the ancient architects 20- $\frac{20x7}{210}$ gauzes.

The total width of the main facade corresponds to the side of the square plus twice the difference between the side and the half-diagonal of the square:

$a+2(a - \frac{a\sqrt{2}}{2})$, *i.e.* 32 gauzes.

The height of the square "half-cube" stylobate from the level of the floor of the room is 683 and 700 cm, or 12 gauzes,

i.e., it is commensurate with two thicknesses of the quadrangle walls.

The width of the entrance niche corresponds to side A of the outer square minus the half-diagonal:

$$A - \frac{A\sqrt{2}}{2}.$$

According to ancient architects 32 - $\frac{32x5}{7}$ = 9 gauzes, which corresponds to natural sizes (Figure 5).

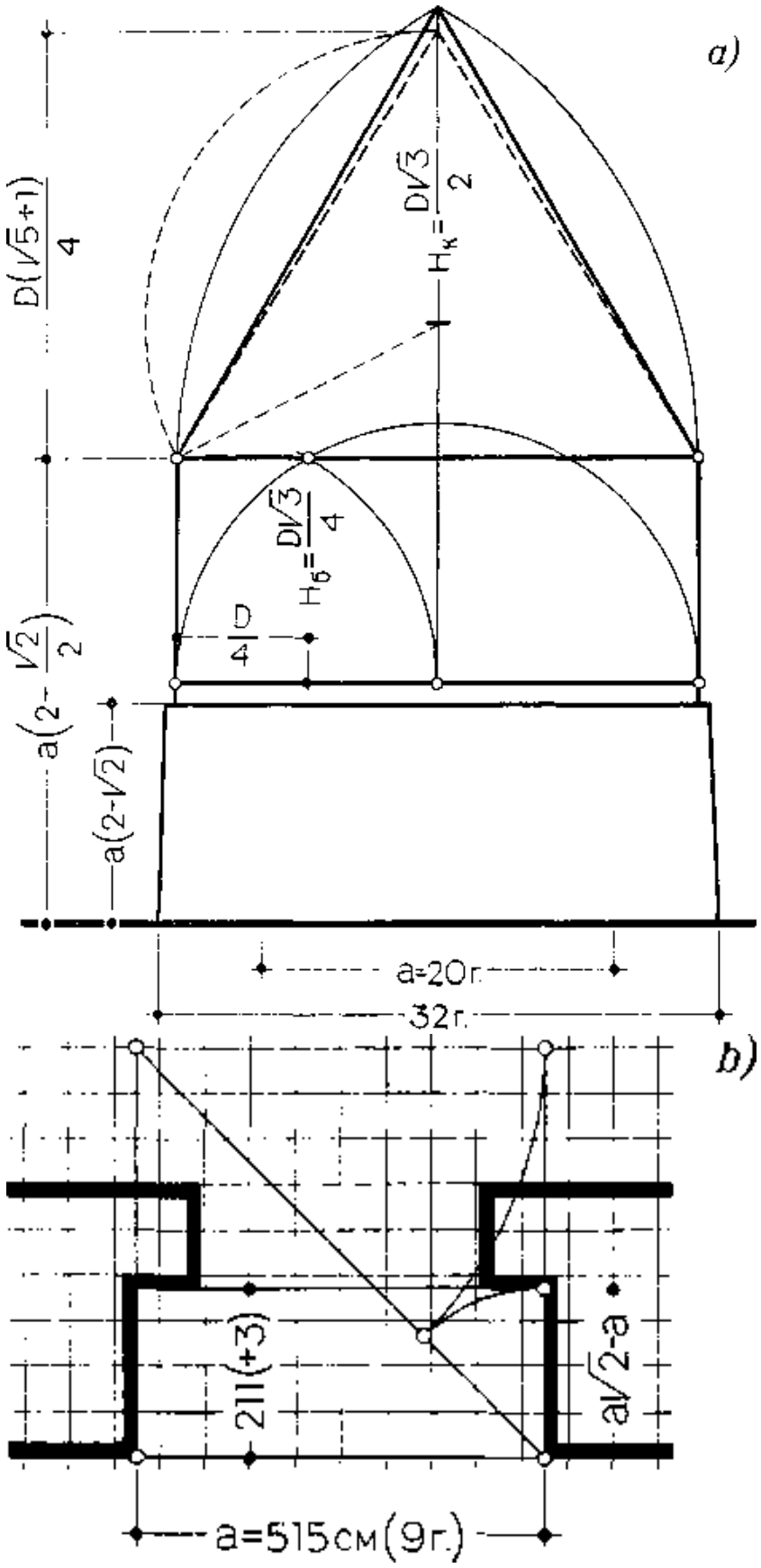


Figure 5. Mausoleum of Muzaffar Text. Facade scheme and entrance plan

Deserving special attention is the determination of the depth of the niche of the entrance arch. With its width of 515 cm, or 9 gauges, the depth corresponds to the difference between the diagonal and the side of the square built on the width of the niche, i.e. $a\sqrt{2}$ - a, or $515\sqrt{2}$-515=211 cm. Natural dimensions 214 cm; error - 3 cm.

The round plinth of the drum is commensurate with the diagonal of the dome square, however, there is no complete coincidence of their sizes, which, obviously, is due to arithmetic or modular coordination, convenience when dividing the circumference of the drum into 24 parts so that comfortable for use dimensions in gauges. This is confirmed by the following:

The circumference of the drum for breaking it into 24 parts could be calculated by the ancient architects in gyazs by multiplying the diagonal of the square, taken as the diameter, by three and one seventh:

$$\frac{28x22}{7} = 88 \text{ gauzes}$$

However, this figure, when divided by 24, did not give a convenient value in gauzes.

The diameter was increased from 28 to almost 29 gauges, with the expectation that the circumference would correspond to 90 gauges, since this figure divided by 24 gave $3\frac{3}{4}$ gas, which corresponds to full-scale dimensions.

The height of the drum H_b is the derivative of a circle with a diameter of 29 gauzes:

$$H_b = \frac{D\sqrt{3}}{4} = 12\frac{1}{2} \text{ gauzes or } 712 \text{ cm}$$

Natural dimensions - 705 cm; error - 7 cm.

The divisions of the drum are finely drawn.

With a total drum height of $12\frac{1}{2}$, the frieze of the drum is one fourth of its heights,

i.e. $3\frac{1}{8}$ - gauzes.

Above the pilasters of the drum is a system of three-lobed stalactite-shaped arches framed by rectangular frames with aspect ratios of 152:214 cm, or 1: $\sqrt{3}$ gauzes.

The results of the analysis of the proportions of a number of the monuments listed above allow us to conclude that during the 9th-12th centuries. The architects of Central Asia used a number of rules developed by practice for the construction of tectonic structures and architectural forms. At the same time, they took into account the constructive basis of the structure, the building materials used, and the expressiveness of the architectural image.

The square plan and its derivatives served as the initial parameters in determining the proportions of the structure. First, the overall dimensions of the plan were determined, then the components and elements proportionate to it, then the dimensions of the divisions of the heights of structures, also proportionate to the elements of the plan.

Such consistency in determining the dimensions of the parts of the structure on the basis of already existing elements led to the interdependence of the proportions of the parts of the architectural organism [4].

Architectural practice of the X - XII centuries. along with the use of the side and diagonal of the square, introduces a new theme in the construction and harmonization of architectural forms, affixed by the derivatives of an equilateral triangle $\sqrt{3}$, a right triangle 2, $\sqrt{5}$, 3, as well as dividing the segment in the middle and extreme ratio.

Conclusion and Evaluation

The system of proportions, based on the successive division of the side and diagonal of the square in half, is observed in the proportions of some monuments (the mausoleum of the Samapids, the mausoleum of Aisha-Bibi, etc.), giving a geometric progression with a denominator, has not received wide distribution.

The derivatives of an equilateral triangle or a dodecagon inscribed in a square found a concrete expression in the construction of the architectural form of the mausoleums in Serakhs and Mean. However, the data of the analysis do not provide material for the assertion that this system was associated with a decreasing or increasing geometric progression.

The division of the line in the extreme and middle ratio in the architecture of the pre-Mongolian period is most often organically connected with the construction of decagons that appear in the construction plan (the Qaboos tower, the Kalyan minaret, the round mausoleum in Maragha). The division of the line in the extreme and average ratio as a derived semi-square (the mausoleums of the Samanids, Sultan Sanjar, Se-Gumbad), i.e. proportions not related to the division of the circle into ten parts and the construction of a pentagon, is an indicator of the comprehension of this system, included at that time in the arsenal of skillful geometric techniques, but not yet widely used in architectural practice.

References

1. Bachinsky N. M., Architectural monuments of Turkmenistan. Issue. 1. M.-Ash., 1930.
2. Alberti L. B., Ten books about architecture. M., 1935.
3. Antonova E.V., Essays on the Culture of the Ancient Peasants of Western and Central Asia. M., 1984.
4. Afanasiev K. N., Construction of an architectural form by ancient Russian architects. M., 1961.
5. Mukimov, R., "Tajikistan", The Artistic Culture of Central Asia and Azerbaijan in the 9th-15th Centuries, IICAS, Samarkand-Tashkent, 2013.

EARLY TURKISH TOMBS IN CENTRAL ASIA & Kaffal Shashi Tomb in Tashkent, Uzbekistan

Prof. Dr. Ayse Gulcin Kucukkaya
Yeditepe University, Faculty of Architecture, Istanbul, Turkey
gulcin.kucukkaya@yeditepe.edu.tr

Master Student Arch. Otabek Abdurazzoqov
Tashkent Institute of Architecture and Civil Engineering, Tashkent, Uzbekistan
otabek1997Design@gmail.com

Summary

The Central Asian Turkish migrations took place in very wide areas in different geographies, and the tomb structures also showed different forms under the influence of different religious beliefs. Also, some tomb structures may show very different functional features; such as Radkan Kumbet as an observatory, and Kubbet-i Qabus, to create monumental structures, there are also two-story Turbes and Kumbets.

In this study, first, the evaluation of Central Asian and Transoxiana Turkish tomb architecture will be examined and compared with Anatolian Turkish Tomb Architecture. In the second step, the architectural features of the Kaffal Shashi Tomb in Tashkent will be examined and a relationship with the old Turkish architectural traditions will be established.

Keywords: *Maveraunnehir, Kaffal Shashi Tomb, Turkish Tombs, Transoxania, Turbe, Kumbet, Uzbekistan, Central Asia*

INTRODUCTION

"Turk" name refers to ethnic groups that speak languages belonging to the Turkish language family, or the people originating from the Oghuz family from Central Asia and spread to Europe and Asia. It is accepted that Turks in Turkey and the East of Europe migrated originally from Central Asia. (See Fig. 1)

Museum material at Tashkent State Museum (Fall 2021) shows that, Islamization started in the Maveraunnehir (Transoxania) region [VII –X Century] with the Turkish population, located between the Amu Darya and the Syrdarya Rivers. Before that, Buddhism, Zoroastrianism, Christianity, etc. were the popular religions in these lands.

In early accounts, the Maveraunnehir region was mentioned as Turkistan. The account which gave us what cities and areas of Turkish people included Maveraunnehir belongs to Arabic geographer Istahry determines us that the Turkish region included some cities such as Bukhara, Samarkand, Sogdy, Farab, Isfidjab as well as Talas, Ilah, and Hodjent (1).

Turks in Central Asia went through different stages to Europe and Anatolia and followed the same migration route several times in different periods. They fought with different states on 2 migration routes from the north and south of the Caspian Sea and got a new name by coming together. However, in most of them, Turkish was spoken as the dominant language. The Avars, the first Turkish state to come to Europe, were seen in Central Europe in 200 AD, while by 370 AD, the Huns had established a great dominance in the Volga region and Europe, for a short time, until 430 AD.

In this history, the Turkish population in Anatolia (Anatolian Seljuk Empire) has been seen in the 11th Century coming through the Iran route. (See Fig. 1)

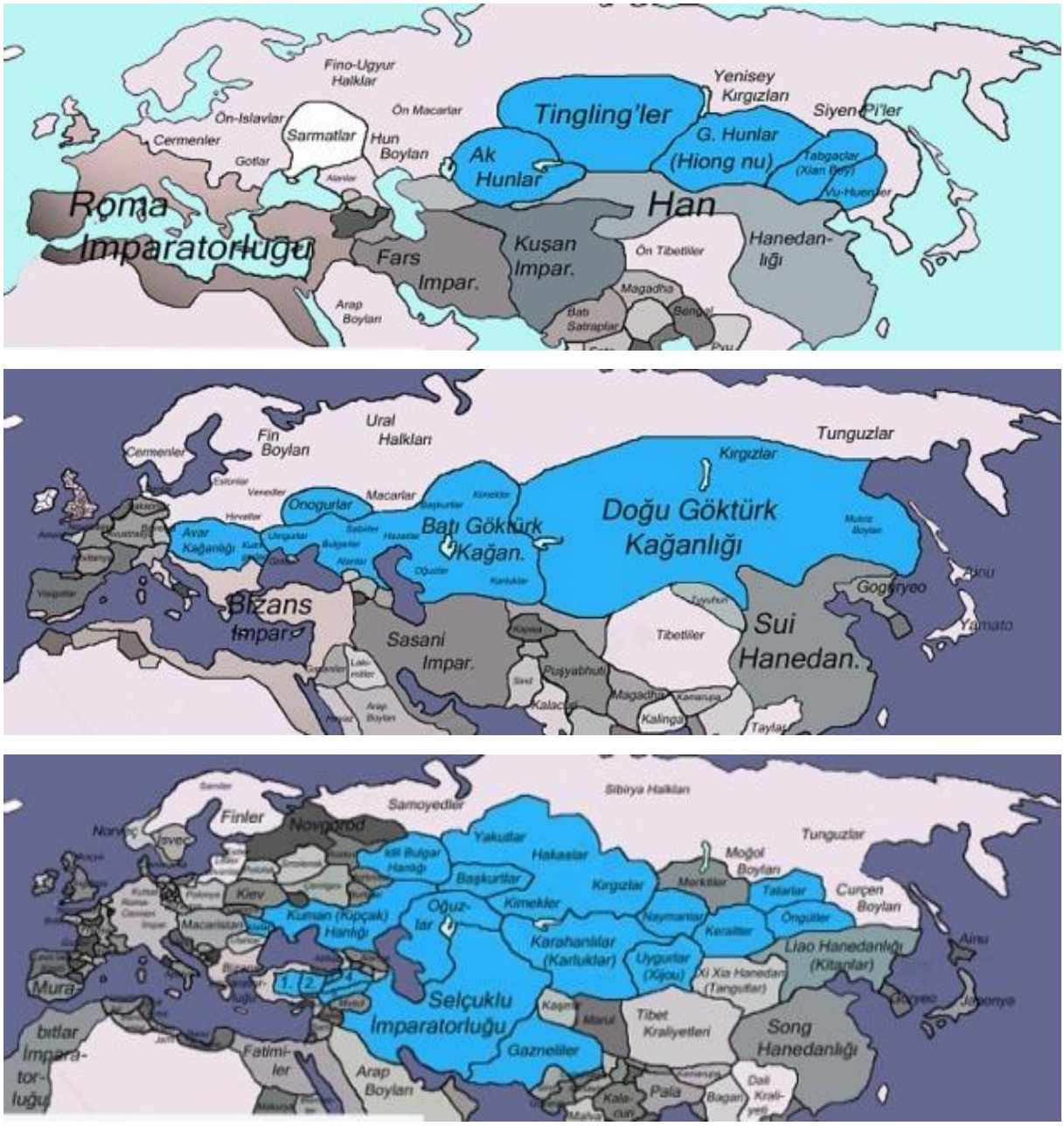


Figure 1. Turkish Speaking Lands at 200 AD., 600 AD. and 11th Century (Anonym)

In the history of Early Turkish architecture, they have respected the people who have done useful services to the state, the rulers who conquered new lands, the army commanders, and the khans' wives. Building monumental mausoleums was a way of thanking those heroes (Fig. 2). Like Radkan Kümbet, There were also multi-purpose buildings such as to be observatory buildings (Fig. 3).

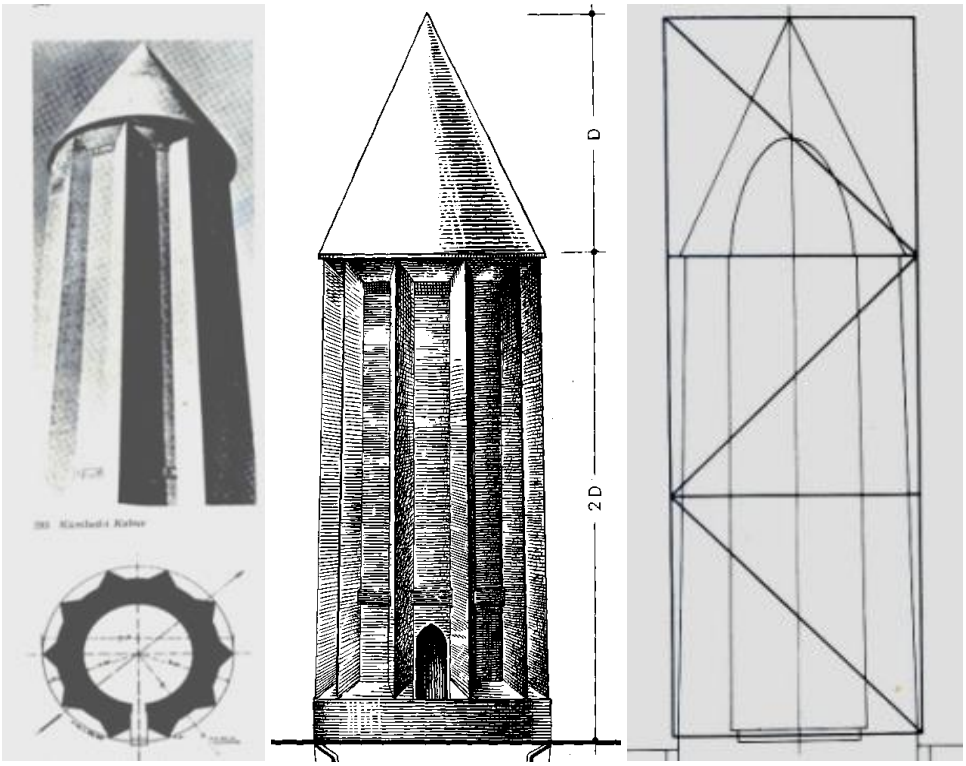


Figure 2. Kumbat-ı Kabus, shows the force of the state with an extraordinary monumental structure (14)

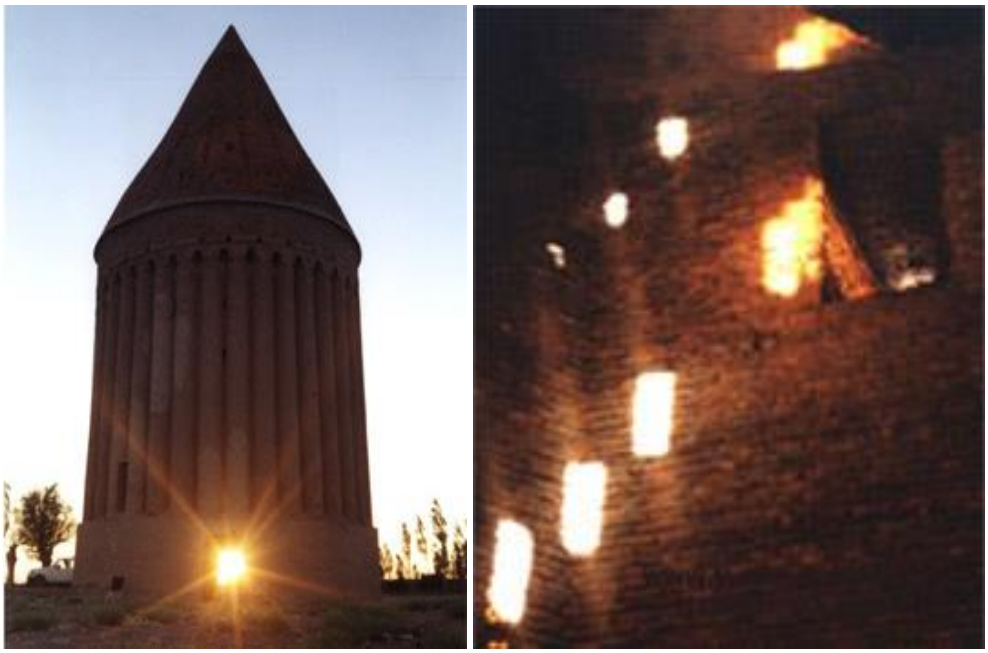


Figure 3. Radkan Kumbet, Horosan, 12th Century, was a solar observatory. At the first sun rise in winter and the last sunset in summer, the sun lights pass through the door and exit through the door the opposite. It shows the first days of each season. (15)

1. Early Turkish Tomb Structures

The burial methods and constructions of the Turks, who were integrated into different religious beliefs in very large lands (Fig. 1), were different.

Some of the first Turkish communities, before Islam, believed in Sky God, some of them were Buddhist, and the others perhaps Zoroastrians. The burial patterns of the dead could also be different (Fig. 4).

Figure 4. Workers doing basic work in Budapest, during the construction of a new bridge over the Danube, found a 6th Century mausoleum (December 2014) and analysis of the monument showed that it was probably the mummy of a Turkish Hun (2).

Today, in relation to many archaeological excavations; embalming, burning, and burying his belongings, are encountered in the wide Turkish Euro-Asia geography.

Kurgan: It is the name given to the underground burial chambers, which were covered with flat stones or trees, in which the Turkish tribes living in prehistoric times in Central Asia bury their dead (Fig. 5-6).

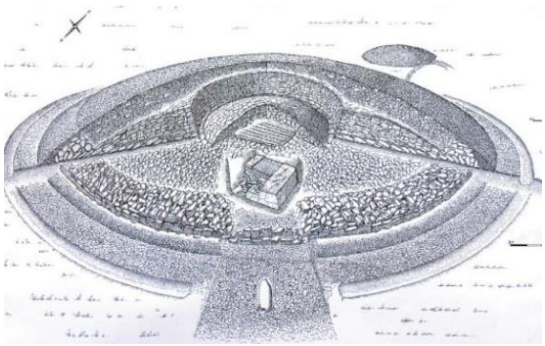


Figure 5. The architectural structure of a Kurgan (4)

Figure 6. Restitution project of an interior of a Kurgan (3)

1.1. Turkish Grave Structure (Tombs), Turbes and Kumbets in Great Seljuck and Qarahaniedes Time.

The Great Seljuk Empire (1037–1194) was a high medieval Turko-Persian Sunni Muslim empire, originating from the Qiniq branch of Oghuz Turks.

At the time of its greatest extent, the Seljuk Empire controlled a vast area, stretching from western Anatolia in the west to the Hindu Kush in the east, and from Central Asia in the north to the Persian Gulf in the South (Fig. 1).

Qarakhanid was the first Muslim Turkic dynasty (840–1212), that ruled in Maveraunnehir (Transoxania) and Central Asia, took over the Sāmānid territories, and occupied Bukhara, as a capital.

Building Forms of Turkish Tomb Architecture be evaluated under two groups in Great Seljuk and Qarakhanied Periods; A. Türbe and B. Kümbet; Türbe and Kümbet, are the words that define between 10th and 17th-century grave structures in Turkish Islamic Architecture. (Fig. 7-8)

A. Turbe structures are covered with domes. Although the Turbe is a domed and generally single-story structure, there are also two-story Turbes in the Seljuk Empire Period in Anatolia. (Fig.8) Turbe was popular in the late Seljuk and early Ottoman Buildings in Anatolia and Balkan Turkish Countries. (Fig. 8)

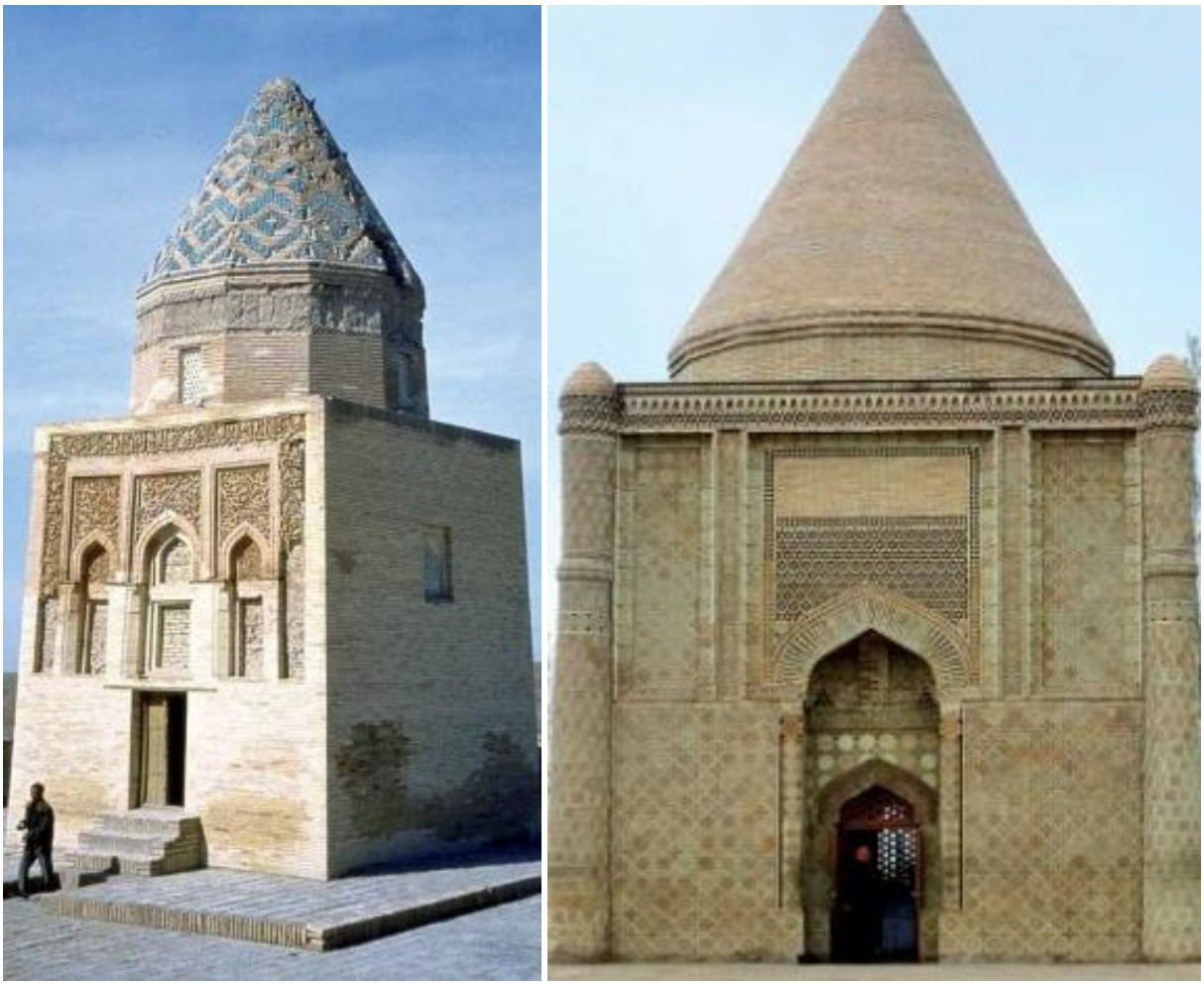


Figure 7. (Kumbets) Urgench. Mausoleum of Khorezmshah II-Arslan *in Tajikistan (17) and Aisha Bibi* Mausoleums in Kazakhstan (16)

B. The top of the **kumbet** structures are in the form of a conical or pyramidal. Kumbets generally have two floors, a basement, and an upper floor. There are also single-storey kumbets.

The kumbets were very common in the Great Seljuk Architecture, in Azerbaijan, East of Anatolia, and North of Iran. (Fig. 7)

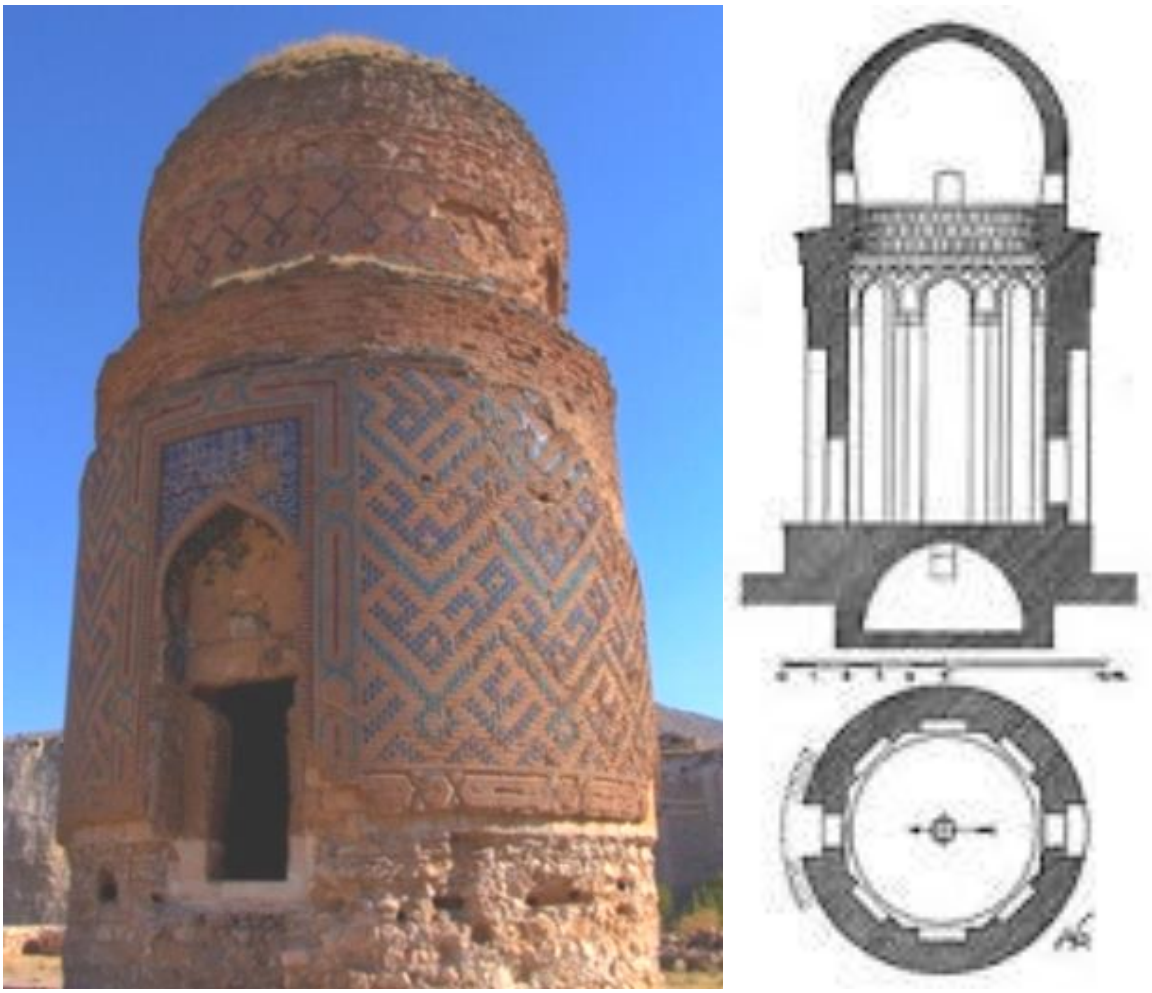


Figure 8. Two-level Turbe of Zeynel Bey in South East Anatolia (15th C.)

1.2. Examination of the Origin of the Dome Structures in the Turkish Tomb Architecture

A. Turkish Tents

The tent has been the living style of the Turkish community until they permanently settled. Tents called "Yurt" were made of felt. The semi-nomadic lifestyle of the early Turks led to the development of religious beliefs about death and new constructions for their dead fathers.

The roof covers of the Kumbet and Turbe buildings have a similarity with the Turkish tent form. (Fig. 9)

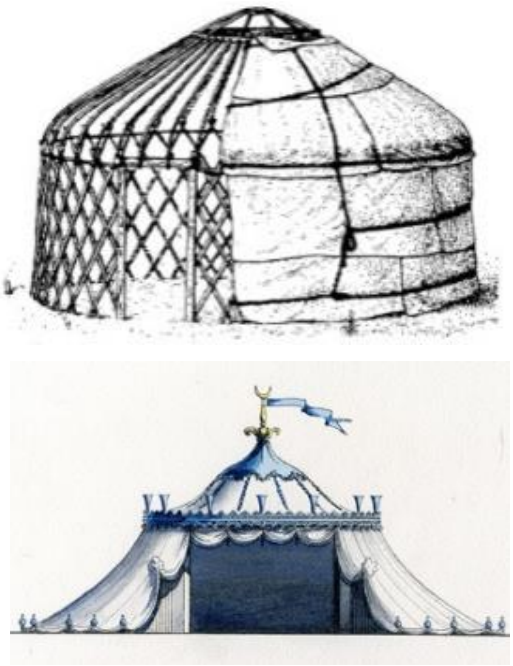


Figure 9. Turkish Tents in Central Asia

B. Stupas

It is highly probable that the Turks encountered many different cultures in the vast Central Asian geography and were influenced by Buddhism.

Stupas are structures with an egg-shaped dome and sacred objects that show a dominant character in Buddhist building complexes. It can be said that the top cover of the Turkish tomb and cupola structures takes these structures as a model. (Fig. 10)

Figure 10. Buddhist stupa in Fayaztepe Monastery in Termez, Uzbekistan, I-II Centuries (for similarities see fig. 17)

C. Fire Temples

Various beliefs existed in Central Asia before Islam, according to historical sources and archaeological evidence. Along with Central Asian ideas, beliefs from other geographical locations such as Iran, Mesopotamia, India, Anatolia, and Greece were sometimes skillfully combined with local beliefs. Zoroastrianism, or the cult of fire, had an entrenched tradition in Iran and Central Asia and would eventually become one of the region's major religious systems during the pre-Islamic period. Zoroastrianism, the religion of fire with roots in Iran and Central Asia, became one of the most dominant religious systems in the Maveraunnehir Region during the pre-Islamic period. Zoroastrianism, like Buddhism, is a belief that emphasizes a philosophical side and the pointed arch style is seen in the decoration elements beginning 2nd Century (9) (Fig. 18, 20).

The diagram above (Fig. 12) explains the architectural evaluation of the tomb structure in Transoxiana chronologically. In these figures, a simple four-legged plan similar to a fire temple is seen in the design of early tomb structures (7). It is possible that the Ismail Samani tomb was also a fire temple in the past, and was probably converted into a tomb in the 9th century during the Karamanid period. Throughout history, it is seen that Turks continue to use non-Muslim religious structures as Islamic structures. For example, they still use Hagia Sophia, an Orthodox church, as a mosque.

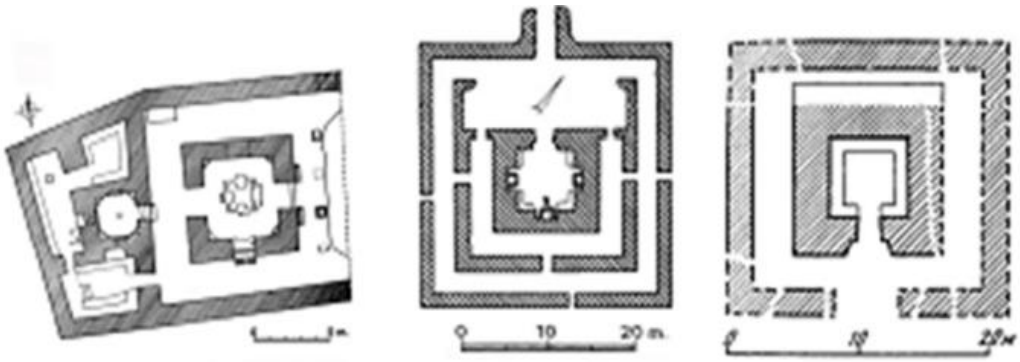


Figure 11. Centrally planned early Central Asian temples (8)

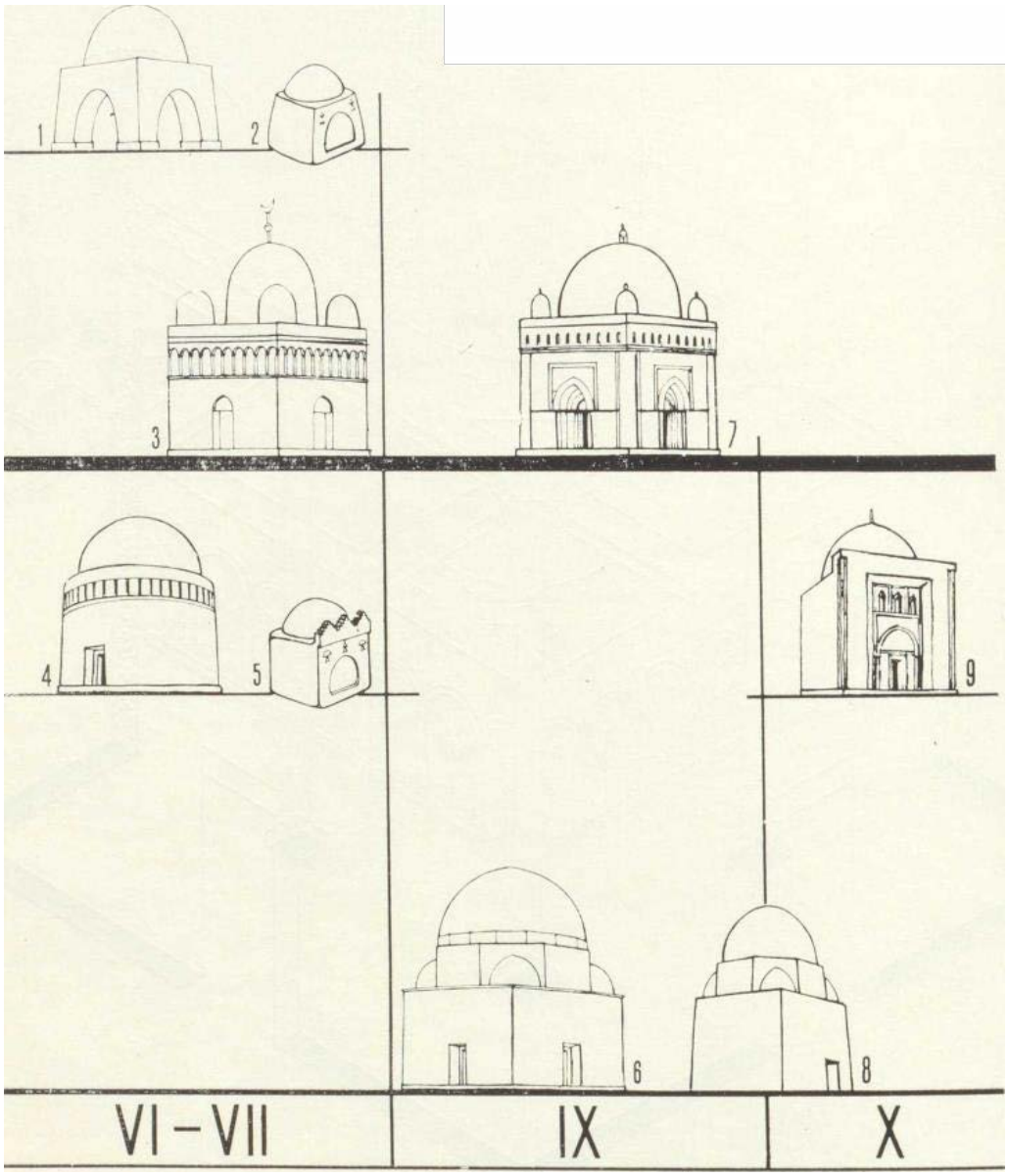


Figure 12. Evolution of the architectural forms of tombs in Central Asia in the 9th-12th centuries; 1. Atashked in Neisar, 3. Reconstruction of the "pavilion" depicted on a bronze dish from the Berlin Museum, 4. Temple of the First Cause (according to Dimeshki), 5. Portal-dome, ossuary from the Necropolis near the city of Bairam-Ali, 6. Kubba as-Sulabiyya, 7. Samanidov 8. ŞirKabri 9. Arab-Ata (7) Analysis of the tomb forms shows that central plan fire temples were the prototype of them.

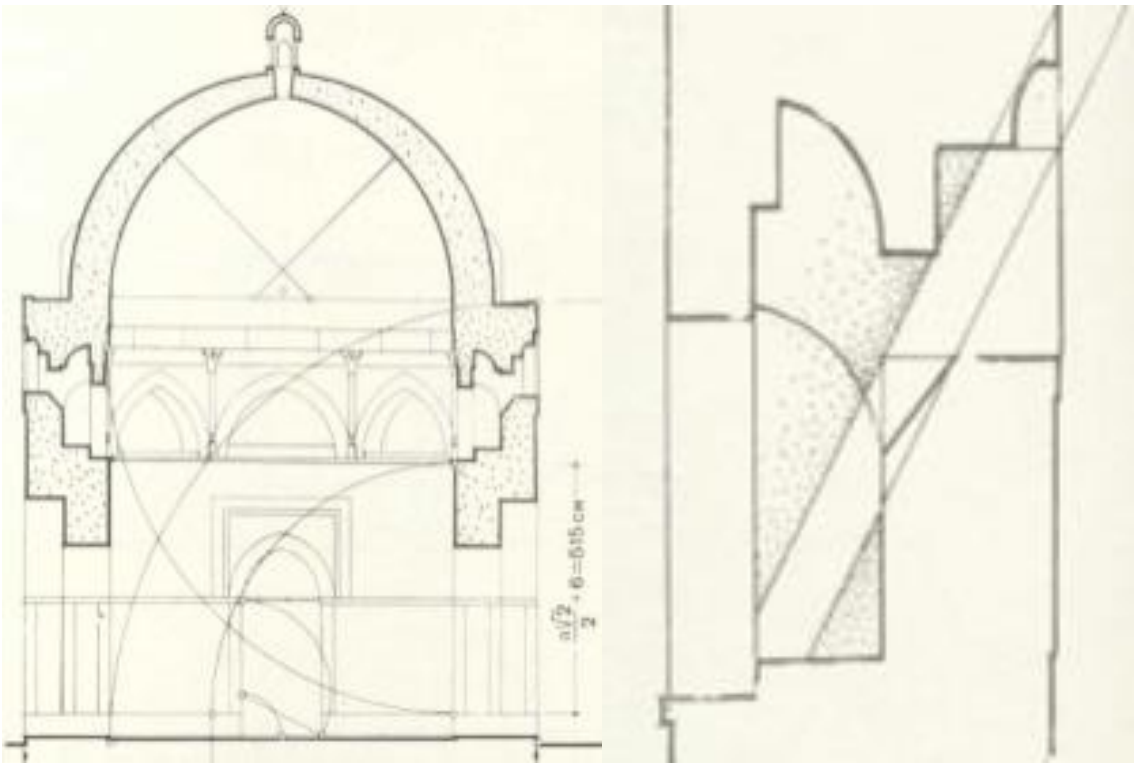


Figure 13. Section of Ismail Samani Tomb, and special unique corridor detail of upper floor window (8) These windows are not only to get light but also large enough to pass the corridor of a person who wants to walk upstairs and collect carbon deposits (see Fig. 18). Carbon is an important material to produce the pencil, which uses writing on a paper. This detail is important evidence to explain that this building was a fire temple.

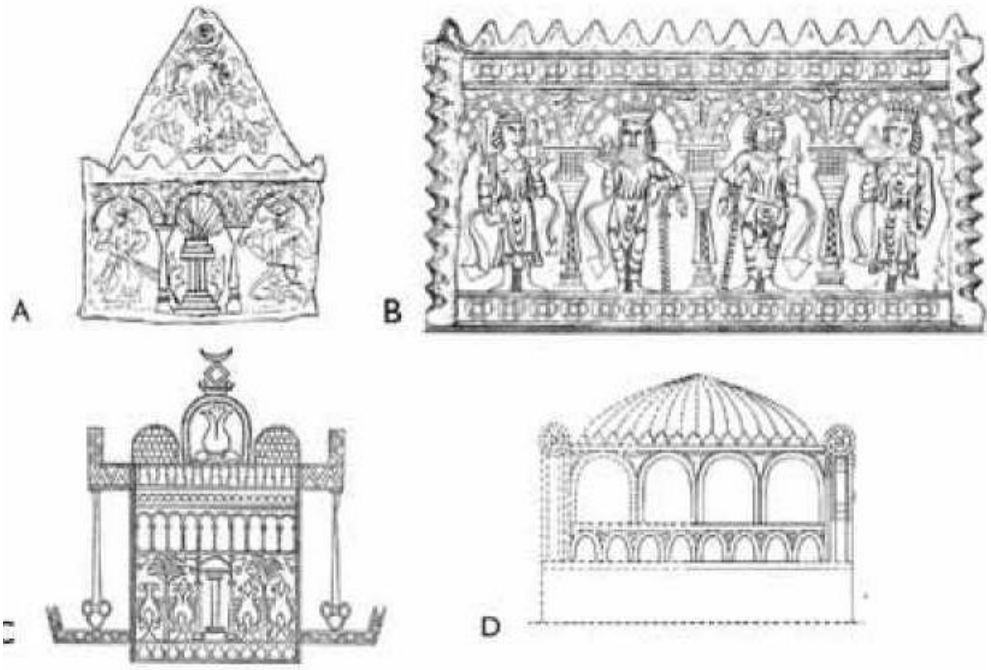


Figure 14. A. a ceramic vessel from Mullakurgan (Samarkand) depicting a fire temple and a Zoroastrian ritual; B Biyanaiman ossuary; C The image of a pavilion on an Iranian bronze dish of the 7th century. (Museum of Islamic Art. Berlin); D The image of the burial structure "ked" on the Penjikent paintings (6).

2. General Characteristics of Turkish Grave Structures

2.1. Turkish Pointed Arch

Inheriting earlier arch forms from the Greeks and the Romans in Anatolia, Turks brought a variety of new rules of pointed arches from Central Asia and they never used the rules of the arch of the Roman semi-circular arch form (7). (Fig. 15).

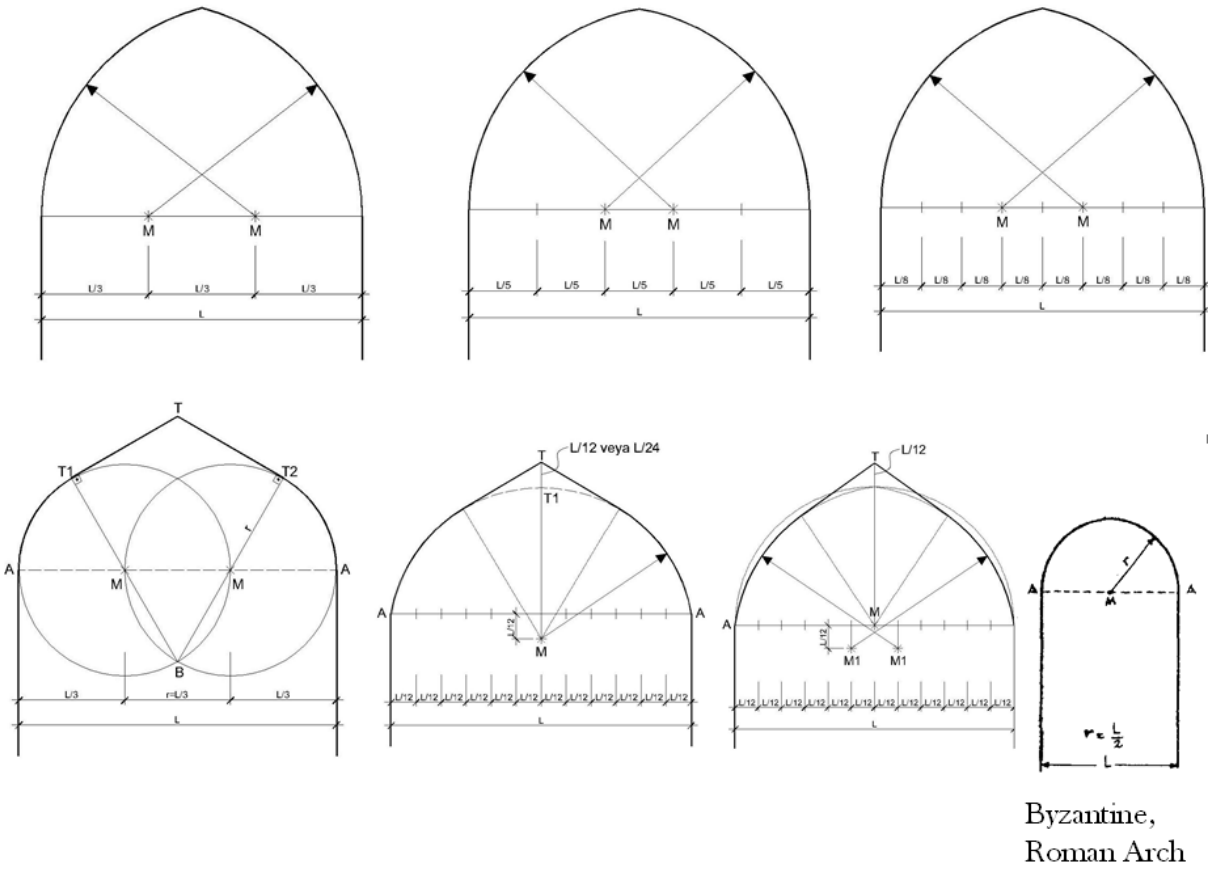


Figure 15.Orders of the Turkish Pointed Arches and a Roman Arch (5)

The Turks mastered the use and unique design of the pointed arches more than any other civilization such as the Persian Pointed Arch. (Fig. 16)

The Turks' knowledge of geometry and rules of statics must also have played a leading role in their choices of various types of pointed arches.

When looking at the origins of Turkish Architecture in Anatolia, it can be seen that Turkish Pointed arches have all the characteristics of arches of pre-Anatolian, Central Asian Turkish Architecture, and that this has come about knowingly, willingly, and by determined action.

The Earliest Turkish pointed arch was seen at Ibn Tulun Mosque (Fig. 17) in the 9th Century, located in North Africa, even before Gothic architecture appeared in France, in the 11th Century (11).

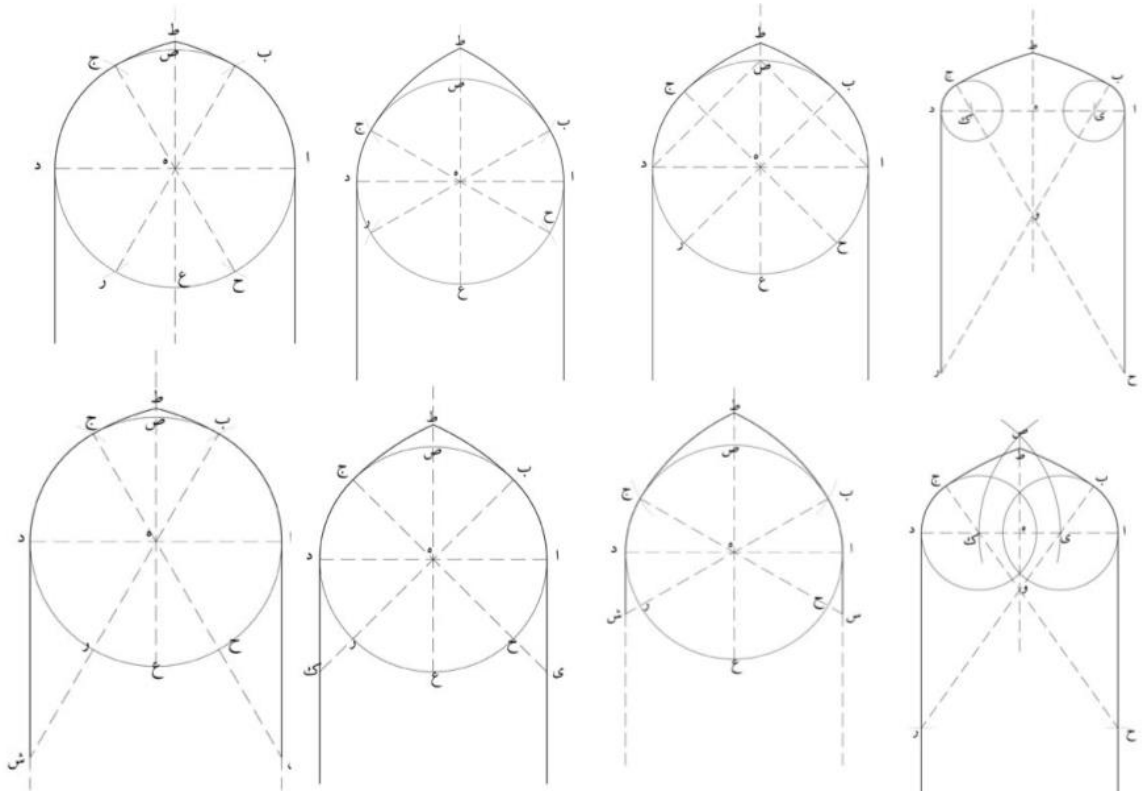


Figure 16. Orders of the Persian Pointed Arches. The Iranian pointed arch is formed using 2 circular arcs. (5)

About Tulun's son Ibrahim Mosque (879) in North Africa, in which the pointed arch was used (see Fig. 17), constructively and systematically, historical sources say that Sicily played a mediating role in the transmission of many Muslim motifs, including the pointed arch, towards Europe, and that the pointed arch of the Ibni Tulun Mosque was a prototype for the pointed arch of Gothic architecture in the west of Europe (11).

Figure 17. The Ibni Tulun Mosque (9th Century) in Kahire has similar Turkish pointed arch orders as the Ismail Samani Tomb in Bukhara. The stupa-like form of the dome is remarkable. (See Fig. 10)

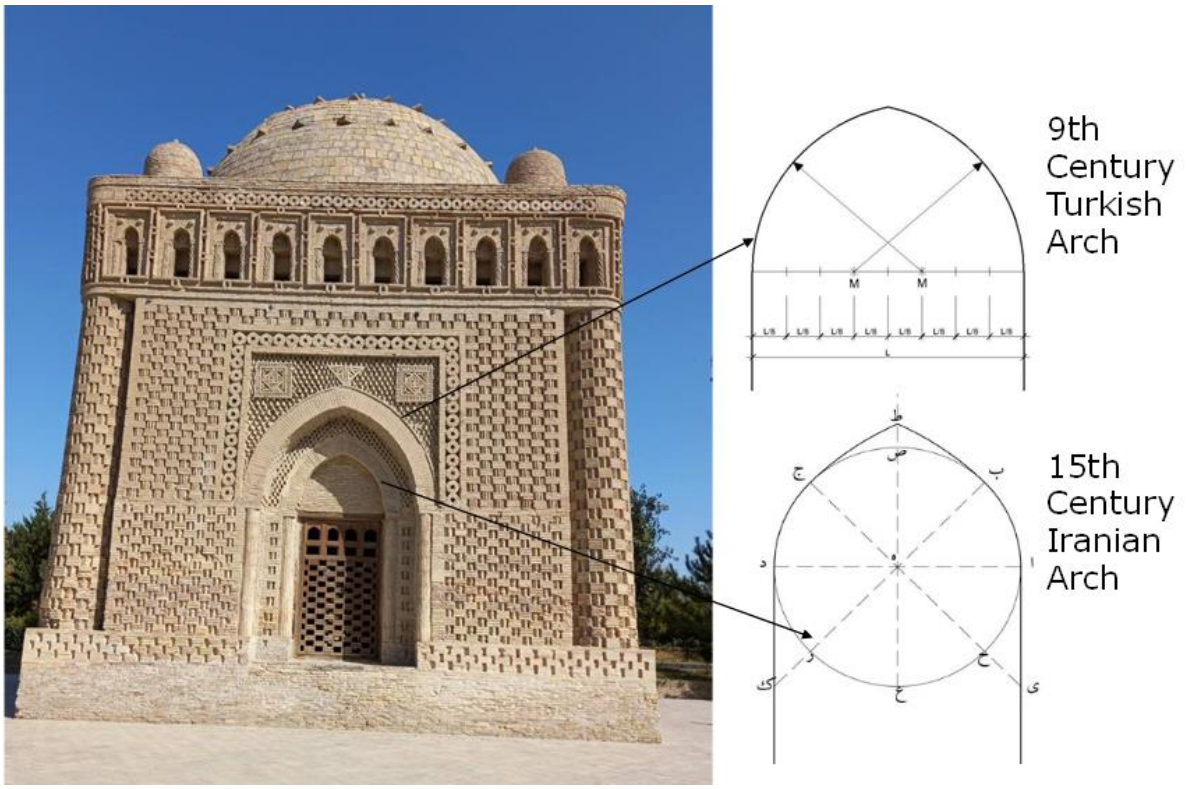


Figure 18. The Ismail Samani Tomb (9th Century) in Bukhara shows two different period arch orders. It has been renovated, into the form of a closed mausoleum with the second-period Iranian-arch windows. Originally, it was supposed to be built, with four legs, an open-air fire temple planned.

The first Turkish pointed arch in Central Asia was drawn by Archaeologist Kizlasov during an excavation of the 7th-century Buddhist temple in Suyab (11). The Iranian arch came to Maveraunnehir with Amir Temur, in the 14th Century (Fig 18-19).

Figure 19. The first Turkish pointed arch in Central Asia was seen in an excavation of the 7th Century Buddhist temple in Suyab (11)

Similar pointed arch order can be observed in the museum material and photographs of the excavations in Tashkent State Museum, which explains the origin of Turkish pointed architecture. (Fig. 20-21)

Figure 20. Pointed arch framing female Buddha statue (Uzbekistan State Museum-Tashkent) Buddha from Fayaz Tepe, Termez, 2nd Century.

When the exhibition material belonging to the archaeological area thought to date back to 300 AD is examined in the Afrosiyob Archeology Museum in Samarkand; it shows that the Turkish pointed arch orders were seen, on the tomb, in Afrosiyob, in Samarkand, Uzbekistan, before 300 AD.

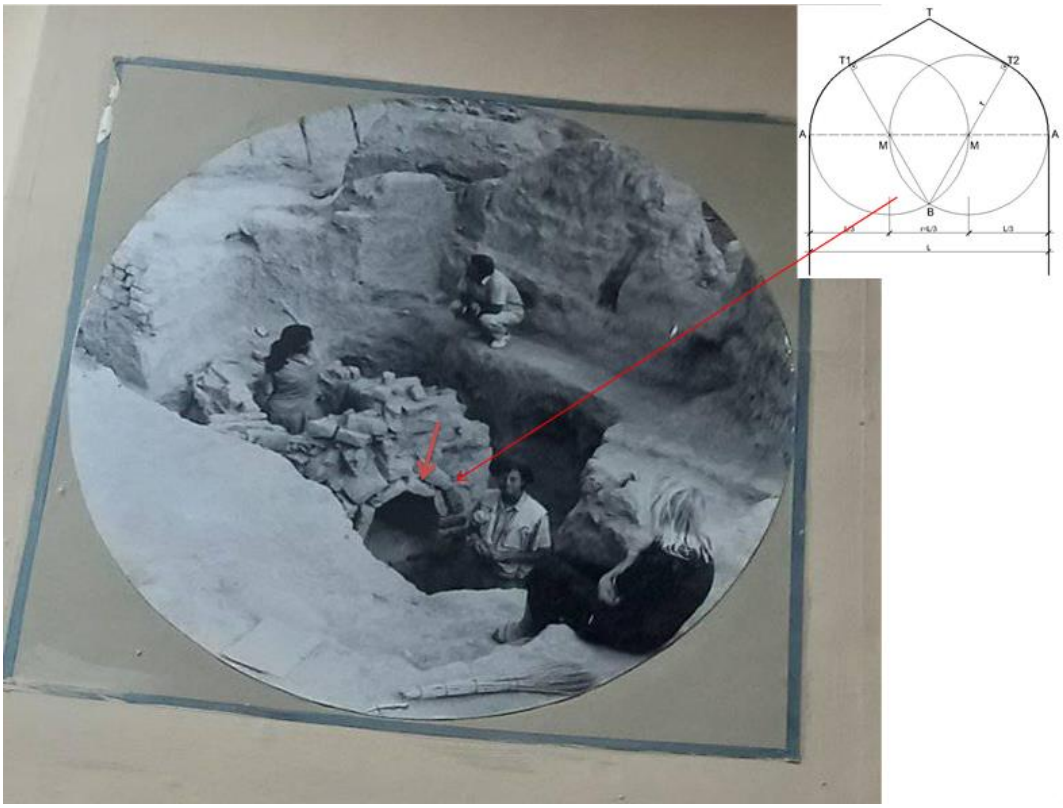


Figure 21. Turkish pointed arch is seen on the facade of the tomb (2nd Century), among the excavation photos, in the Afrosiyob Archaeology Museum in Samarkand. (2022)

Figure 22. Stepped tromp consists of Turkish pointed arches in Kyz-Bibi Mausoleum in Merv (X-XI centuries) (6). Arch orders can be made deformed knowingly to clean previous cultural remnants. However, sometimes, corners are forgettable!

2.2. Turkish Triangles

Anatolian Seljuk Architectural triangular transmission elements inside and outside, transmit loads of the structure of the main structures from square to circle or from circle to square and show a fragmented structure.

In minarets with square bases but round bodies, Turkish triangles are used in the transition from square to circle. Alternatively, the transition elements of the dome covering the square space are always composed of Turkish triangles. It is possible to see these features in early-Anatolian Turkish structures. (Fig. 23, 24)

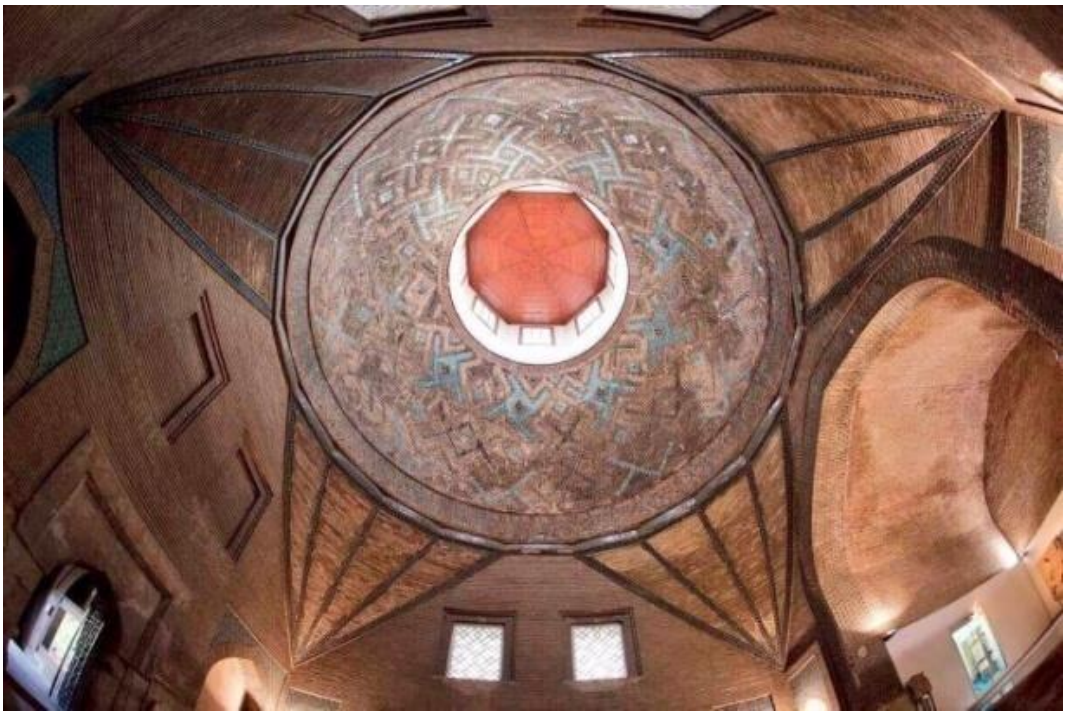


Figure 23. Turkish triangular transmission elements inside, in the corners at Ince Minareli Madrasa in Konya. (1264)

Figure 24. Qirmizi Qunbəz in Marağa, South Azərbaycan (by Gulchohra - Cahida Mammadova) and *Turkish triangular transmission elements outside, in the basement and on the roof (Emir Bayındır Kumbet in Ahlat, Anatolia*

2.3. Decoration Elements and Turquoise

Geometric decoration pattern built by colorful greased brick material has the main characteristics of the decoration of Turkish tombs in Maveraunnehir in the 9th and 15th centuries. But stone building material was available in Anatolia much more than happened in Maveraunnehir. The same geometric motives of Central Asian Turkish architecture was used in the

carvings of the facades of the stone building material in the Middle East, Caucasia, and Anatolian Architecture.

Turquoise is the color of the sky, and it is a greenish blue, that the Turks often use in the exterior and interior decorations. It is seen that turquoise blue is preferred in colorful geometric decorations made with glazed bricks on the façade of the construction elements. Turquoise glazed brick decoration also can be observed on the facade of the tombs. (See Fig. 24, 27, etc.)

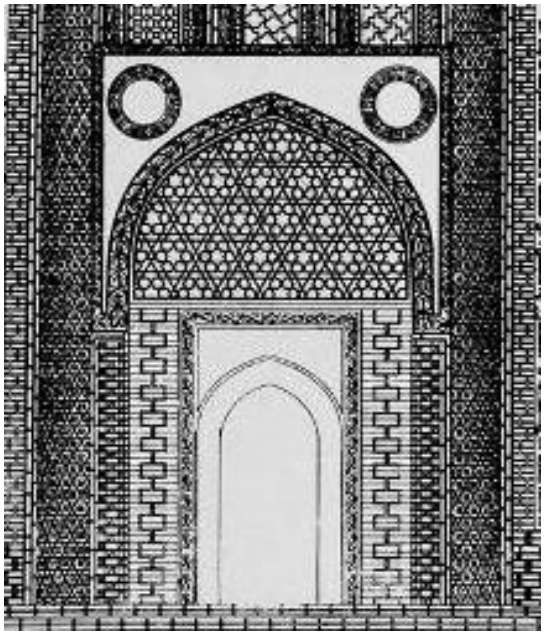


Figure 25. Geometric ornamentation on the façade of the Arap Ata Tomb (9th Century). The building was built in between Samarkand-Bukhara, Uzbekistan (10).

Figure 26. Geometric kundekari wooden panel in Edirne Selimiye Mosque (16th Century) (Kucukkaya)

Figure 27. Terracotta geometric ornament and Turkuaz on Mümine Hatun Tomb from Azerbaijan (by Gulchohra-Cahida Mammadova)

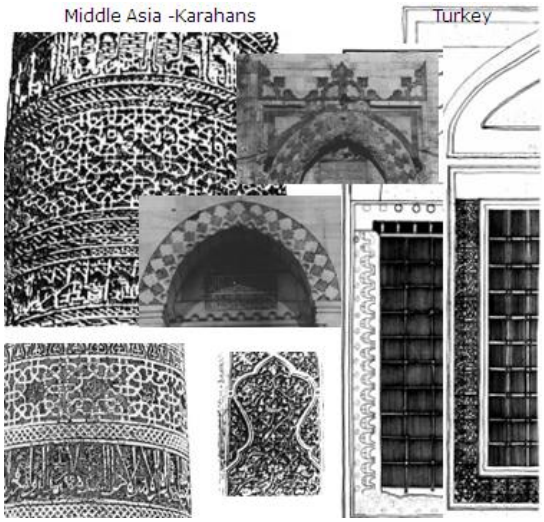


*Figure 28. Comparative ornaments from Central Asia and Anatolia; In Edirne, the geometric decoration features and Lotus motif of the Early Ottoman Period and the pre-Anatolian Turkish art features of the Karakhanieds Period are similar. (6) **Lotus** is a stylized plant motif originating from Central Asia, used in India, Transoxiana, the Middle East, and Anatolia.*

3. ABUBAKR KAFFAL ASH-SHASHI TOMB IN TASHKENT

The tomb of Abubakr Kaffal ash-Shashi, an important Muslim pilgrimage site, in the protected old part of Tashkent (Sebzor), rises on a high platform in an extraordinary position above an ancient burial area. (Fig. 29)

Khazrati Imam (Holy Imam) a famous imam, Quran expert, scholar, and preacher Abubakr Kaffal ash-Shashi was born in 903 in Tashkent in the Karakhanied Turkish Period. There is not much information about the 10th Century's first construction of the tomb, but it is assumed that after the death of Kaffal ash-Shashi this location was considered a holy place (Anonymous).

Today, in the new complex, there are also Barakkhan Madrasah, Tillashaikh Mosque, and Moi Mubarak Madrasa. The first structure was built by Architect Gulam Hüseyin, in the middle of the 16th Century.

It is possible that the tomb and its surroundings were exposed by many interventions for many reasons such as wars, invasions, natural disasters, earthquakes, destroyed, rebuilt, or changed with restorations, and expanded for the addition of the new mausoleums. (Fig. 29-31)

Figure 29. Abubakr Kaffal ash-Shashi Tomb, backside (the 1950s), the conical dome has inspiration from Turkish tomb constructions such as conical kumbets of Turkish architecture (Anonymous)

Figure 30. Abubakr Kaffal ash-Shashi Tomb with a new Russian-style dome (the 1930s)

Figure 31. Abubakr Kaffal ash-Shashi Tomb; after restoration studies in 2008; Building was ornamented with glazed brick decoration elements, the dome form changed similar to the other domes in Tashkent, and the newly added part (see. Fig. 32-33) of the tomb was covered by a metal roof. (Photo; Shavkat Ibragimov, 2022). As you see that the dome form, which is an identity determinant, has changed many times. In addition, making arbitrary additions, changing its decorations or adding new decorations to a historical work in every period weakens the original value of that building.

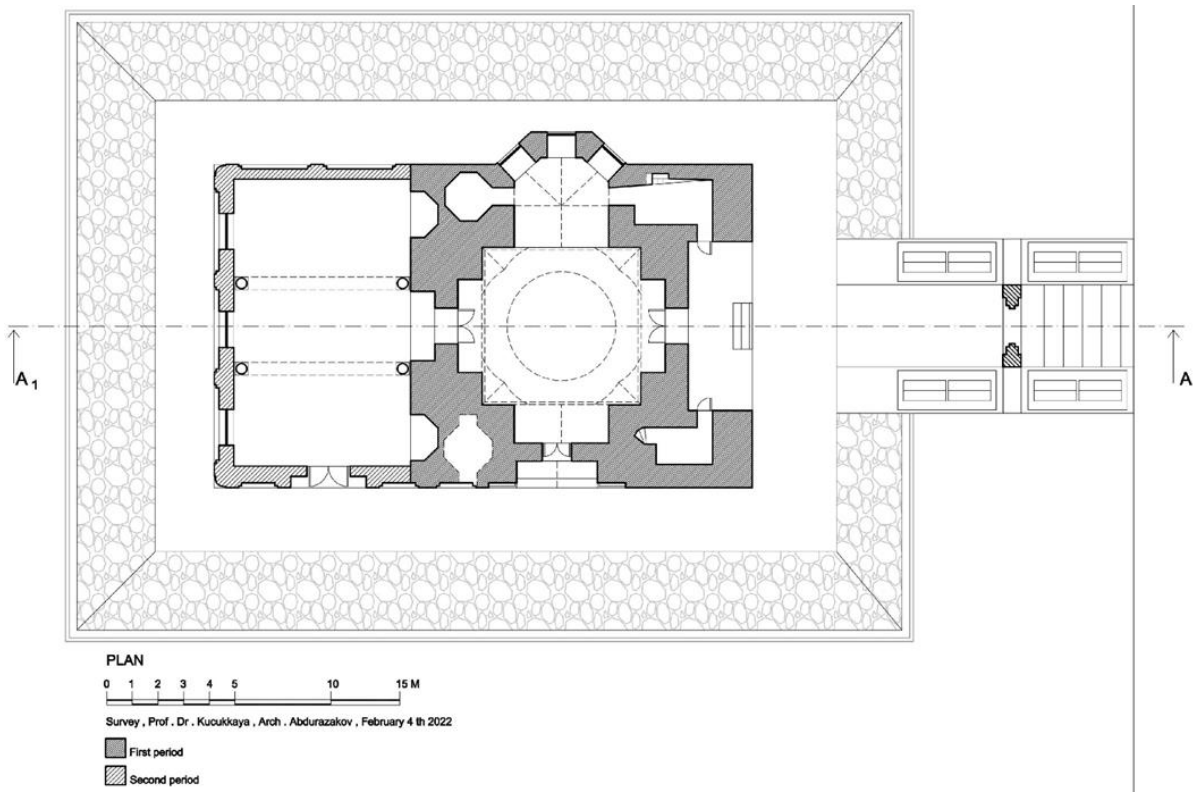


Figure 32. Hand Recording of the plan of the Abubakr Kaffal ash-Shashi Tomb (February 2022)
The original building is a centrally planned building and there are çilehane cells in its four corners. A second burial chamber was added to the rear part of the entrance axis in the second period.

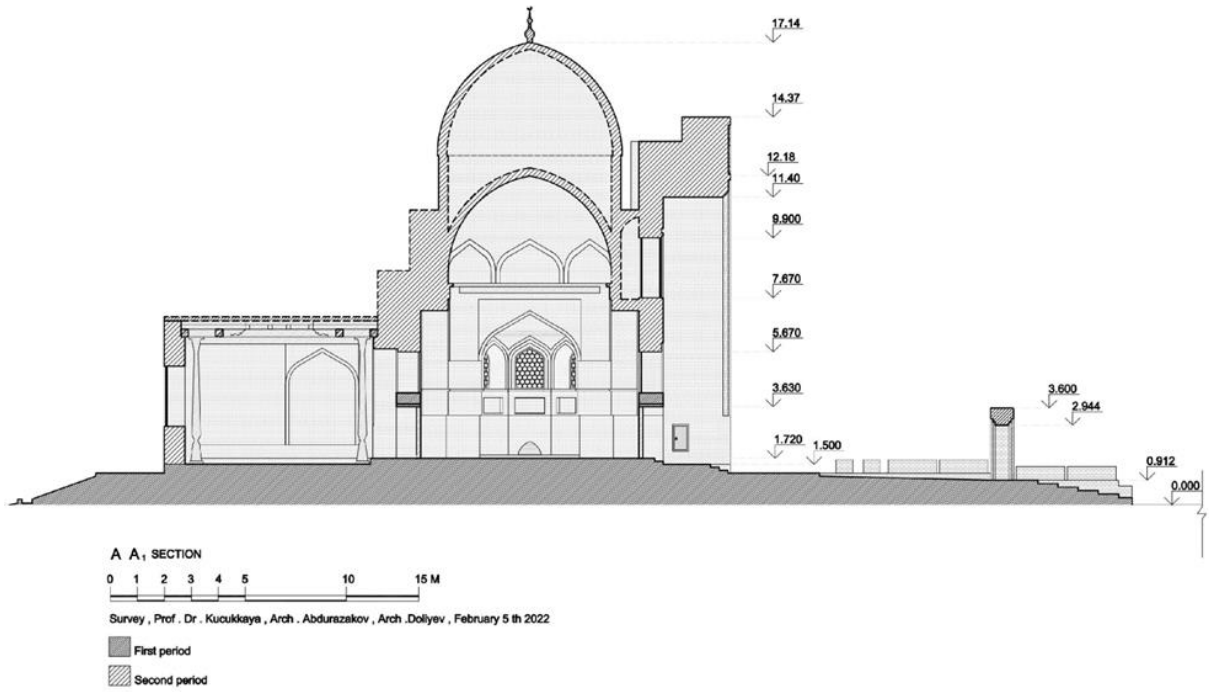


Figure 33. Hand Recording of the Section (A-A) of Abubakr Kaffal ash-Shashi Tomb (February 2022)

An Investigation of the origin of the Kaffal Shashi Tomb

Hazrat Imam is a person who lived in the 9th century when Karakhanid Turks were in these lands.

When wars, earthquakes, and invasions are evaluated, it is possible that the structure has undergone many changes in the past 1300 years.

The Kaffal Shashi Tomb rises on a high platform (170cm) and can be entered by passing the entrance steps and a corridor defined by brick mausoleums lined up on both sides and an arch in the middle (Figure 32, 36).

Figure 34. The stepped corridor with brick graves on both sides rises 170 cm and reaches the entrance of Abubakr Kaffal ash-Shashi Tomb. The arch order is in Iranian form. (2022)

This reminds us of the sphinx road leading to the Egyptian temples, as well as the holy road with balbals on both sides leading to the tomb cult of the Bilge Khan (Fig. 35).

Although the dome was rebuilt in different periods, the height of the dome is not exaggeratedly high, just like in Turkish tomb domes.

There is a similarity between the corridors at the entrance of the Kaffal Shashi Tomb (Fig. 34-35) with the sacred ways used by the cult-monument complexes in Kyrgyzstan (Fig. 36-37), and also in Anatolia.

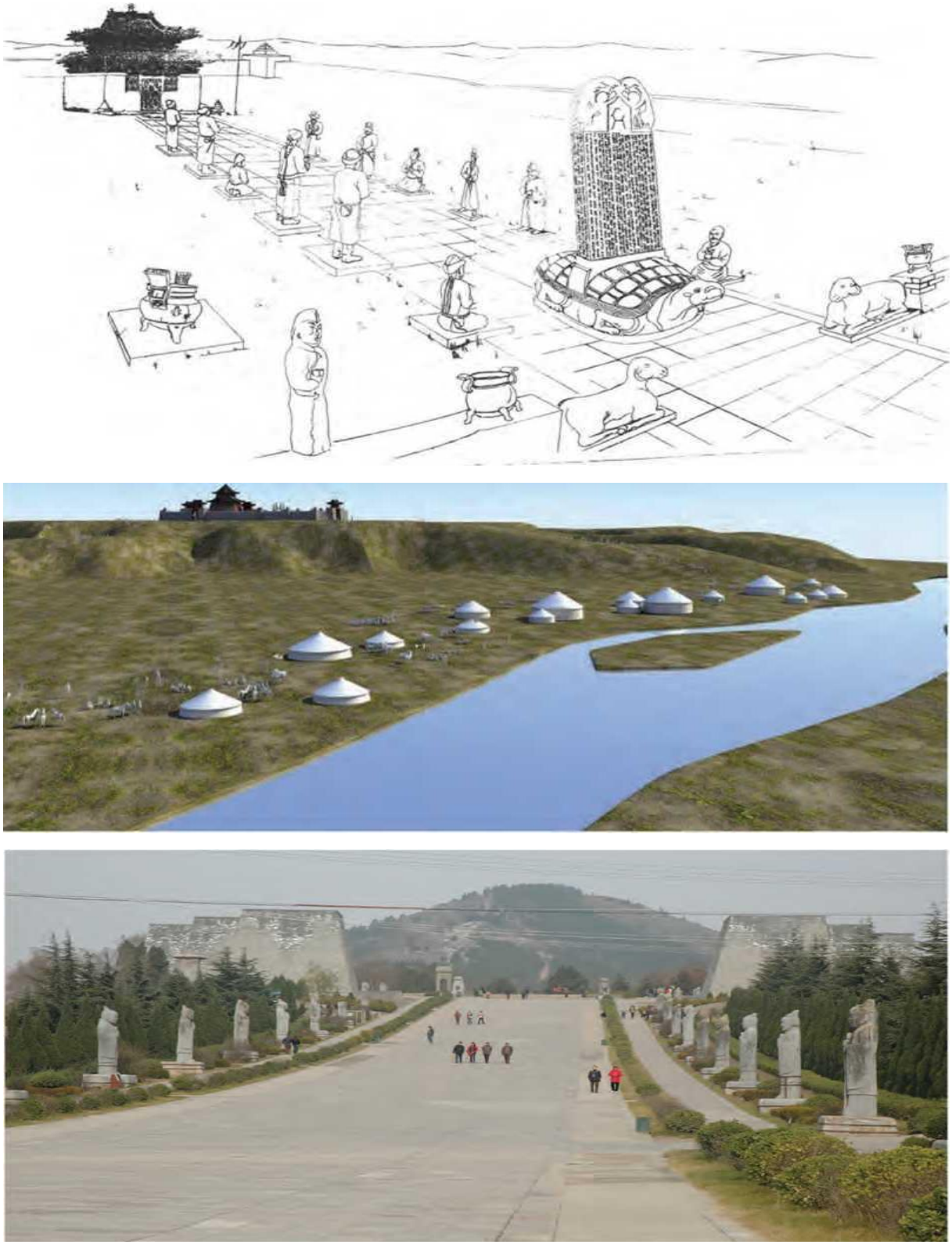


Figure 35. Restitution Projects of the cultural –memorial complex in honor of Bilge Kagan in Orkhon and some sacred ways to the cult-monument complex in Kyrgyzstan (8)

Figure 36. The corridor at the entrance of the Kaffal Shashi Tomb and the main Facade of the building (February 2022)

Figure 37. The restitution Project of a cult-memorial complex in Kirgizistan (8) has similarities with Kaffal Shassi Tomb in Tashkent

Figure38. Emir Ali Kumbet in Anatolia (15th Century) has similarities with the Kaffal Shashi Tomb in Tashkent (Anonymous)

Conclusion

It is difficult to identify a single tomb form in Turkish Architecture, which was influenced by different cultures in the vast lands stretching from the Central Asian Steps to Anatolia.

However, the Turkish pointed-arch pattern seen in the İsmail Samani Tomb (9th Century) was used in Anatolia until the 17th Century and became the main determining factor in Ottoman Turkish Architecture.

The Mongol invasion of 1220 and the Russian occupation are the most important reasons for Turkish culture being deliberately erased in Transoxiana.

It is also understood that during the time of Emir Temur, he admired Iranian architecture and a new architectural period was started in Transoxiana by bringing masters from Iran.

In this period, the conical and pyramidal top cover of the tombs was abandoned and the exaggerated double-domed roof concept was adopted.

In addition, it is seen that new forms were used instead of the old forms in the reconstructions made in the new periods in Transoxiana.

On the other hand, the Turks, who left these lands due to the Mongol invasion in 1220 preserved the original Turkish architectural identity (such as Turkish pointed arch, cone roof in tombs, and geometric plain ornamental features) in Anatolia, willingly.

Acknowledgements

We would like to thank, Yeditepe University, for the permission for a sabbatical leave for the research of Prof. Kucukkaya in Tashkent (Fall 2021-22), and then Prof. Dr. Ercan Kahya, Rector of Tashkent Institute of Architecture and Civil Engineering (TIACE), for his deep understanding and support.

Figure 39. Master Students of TIACE in during examination of the architectural material in the Uzbekistan State Museum.

Moreover, thanks to Dr. Nilufar Tukhboeva and Dr. Zafarbek Matniyazov from TIACE, for their help and support during private researchs about Turkish Architecture. Apparently, many thanks to Otabek Abdurazzoqov – Shavkat Ibragimov – Shanjar Dagarov - Temur Doliyeve, who were the Master Students of Tashkent Institute of Architecture and Civil Engineering (TIACE) joint master program course of Anhalt University and Tashkent Institute of Architecture and Civil Engineering (TIACE). (See Fig. 39)

They always motivated us with their extensive positive synergies.

Refrences

1. Akmonshak, U. "Maveraünnehir Bölgesinin İslamlaşma Süreci (VII-X yy.) (The Islamization Process of Maveraunnehir Region (VII-X C.)", PhD Thesis, Advisor: Prof. Dr. Şefaettin Severcan, Erciyes Üniversitesi, Sosyal Bilimler Enstitüsü, İslam Tarihi ve Sanatları Ana Bilim Dalı, İslam Tarihi Bilim Dalı, 2020.
2. Internet news, "Hungary: Archaeologists Discover Tomb of Atilla the Hun", Available from: https://tr.pinterest.com/pin/87398048998326653/
3. Demircioğlu Y., "Türklerin Öte Dünyaya Açılan Kapısı; Kurgan", Available from: https://www.google.com/search?q=kurgan&rlz=1C1SQJL_trTR878TR878&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiW0Laogrz3AhX6Q_EDHW7FDjMQ_AUoAXoECAIQAw&biw=1333&bih=615&dpr=1#imgrc=6xGnNn7weWlKvM
4. Kutlu M. and; Kutlu L., "Kurgan 11, At Berel and Pazyryk Culture", Sanat Tarihi Dergisi, 29/1, Nisan-April, 2020, 173-207.
5. Map (1) Available from: https://www.quora.com/What-are-interesting-facts-about-the-Great-Seljuk-Empie
6. Kucukkaya A. G., "Türk Mimarisinin Orijini Meselesi ve Türk Sivri Kemeri" (0rigine of Turkish Architecture and Turkish Pointed Archs), I. Uluslararası Türk Kültürü ve Tarihi Sempozyumu, 19-21 Nisan 2018, Yeditepe Üniversitesi, İstanbul. Available from: https://www.academia.edu/37662446/Yeditepe_%C3%9Cniversitesi_Tarih_B%C3%B6l%C3%BCm%C3%BC_I._Uluslararas%C4%B1_T%C3%BCrk_K%C3%BClt%C3%BCr%C3%BC_ve_Tarihi_Sempozyumu_19-20-21_Nisan_2018_Bildiri_Kitab%C4%B1
7. Mamadnazarov Munavar, Monuments of Architecture Tajikistan, Progress Tradition, Moscow.
8. Bulatov M. S., Samanid Mausoleum - The Pearl of Architecture of Central Asia, Society for Protection of Monuments of History and Culture of Uzbekistan Publishing House of Literature and Art. Gafur Gulyam, Tashkent, 1976.
9. Çeşmeli, İ. "Bronz Çağından Erken Orta Çağ Orta Asya Tapınakları" Art Sanat 2014/1.
10. Dizdar S. İ., "The Spatial Formation of the Fire Temple of Zoroastrianism", Landscape Architecture and Regional Planning, Vol. 1, No. 1, 2016, pp. 30-37.
11. Cezar, M., Anadolu Öncesi Türklerde Şehir ve Mimarlık, İş Bankası Yayını, İstanbul, 1977.
12. Saoud R., "The Arch That Never Sleeps", Muslim Heritage, the Foundation for Science, Technology and Civilization (FSTC), 2002. Available from: http://www.muslimheritage.com/article/arch-never-sleeps
13. Samashev Z., Tseveendorj D., Ongaruly A., Chotbaev A., Shiveet Ulaan Ancient Turkic Cult And Memorial Complex, Ministry of Education and Science of the Republic of Kazakhstan, Branch of the Institute of Archeology, Astana, 2016.
14. Tuncer, O. C., "Modülasyondan Restorasyonlarda Yararlanma", Vakıf Haftası Dergisi, 2(0):1, 1985, pp.92-99.
15. Manoochehr Arian, Available from: www.jamejamshid.com
16. Glaudino, B., Glaudinova, M., "Kazakhstan", The Artistic Culture of Central Asia and Azerbaijan in the 9th-15th Centuries, IICAS, Samarkand-Tashkent, 2013, pp. 12-55.
17. R. Mukimov, "Tajikistan", The Artistic Culture of Central Asia and Azerbaijan in the 9th-15th Centuries, IICAS, Samarkand-Tashkent, 2013, pp. 92-131.

THE ROLE OF THE RABATS IN ANATOLIAN TURKISH ARCHITECTURE & Ribat-i Malik in Uzbekistan

Prof. Dr. Ayse Gulcin Kucukkaya
Yeditepe University, Faculty of Architecture, Dept. of Architecture, Istanbul, Turkey
gulcin.kucukkaya@yeditepe.edu.tr

Master Student Arch. Temur Doliyev
Tashkent Institute of Architecture and Civil Engineering, Tashkent, Uzbekistan
dolievtemur@gmail.com

Summary

The Turks, who spread from the steppes of Central Asia to Europe and Anatolia, built structures called "Rabat" in different geographies and used them for very different purposes. These buildings, which used for accommodation and trade on the caravan routes in Central Asia, used as military camps during the wars for the spread of Islam, and some of them, used as palace buildings by changing their function over time. For example, Rabat-Malik, which built on the caravan route between Samarkand and Bukhara, was first a security structure surrounded by walls, and then used as a palace. The rabats, which generally preserve the character of a four-iwan plan, are show 3 different plan schemes such as 1. Open courtyard rabats, 2. Closed spaces rabats, and 3. Mix type of rabats. These plan schemes became the prototypes for many madrasahs, caravanserais, and hospitals built in Anatolia in the 11th and 13th Centuries by the Anatolian Seljuk State.

Keywords: *Rabat-i Malik, Rabat, Caravanserais, Anatolian Seljuk, Rabat-i Sherif, Tashrabat*

Introduction

It is mentioned in the Qur'an as "ribâtu'l-hayl" (horses tied and fed for jihad) (al-Anfal 8/60). From the same root, the command “râbitû” (Âl-İmrân 3/200) explained as “Be prepared for Jihad”. In the hadiths, the term Rabat used to mean, "To keep a watch" and "border guards", as well as keeping horses ready to fight in the way of Allah (1). In the beginning, the Arabic term “rebat”, meaning a fortified rest house on a land route, was common in Persian. Rabat; In Iran, they are fortified accommodation structures built for animals and passengers in strategic areas on the Islamic jihad routes. In Central Asian Turkish Architecture, it refers to much more complex and functional buildings that include mosque, school, bath, and hospital for humans or animals, guesthouses, shopping centers, etc. As a Central Asian term "Rabat" has never used in Anatolia. Rabat changed its name and function in Anatolia as "Caravanserai” or “Han”.

Figure 1: Ribât-ı Şerif (Nîşâbur-Merv)

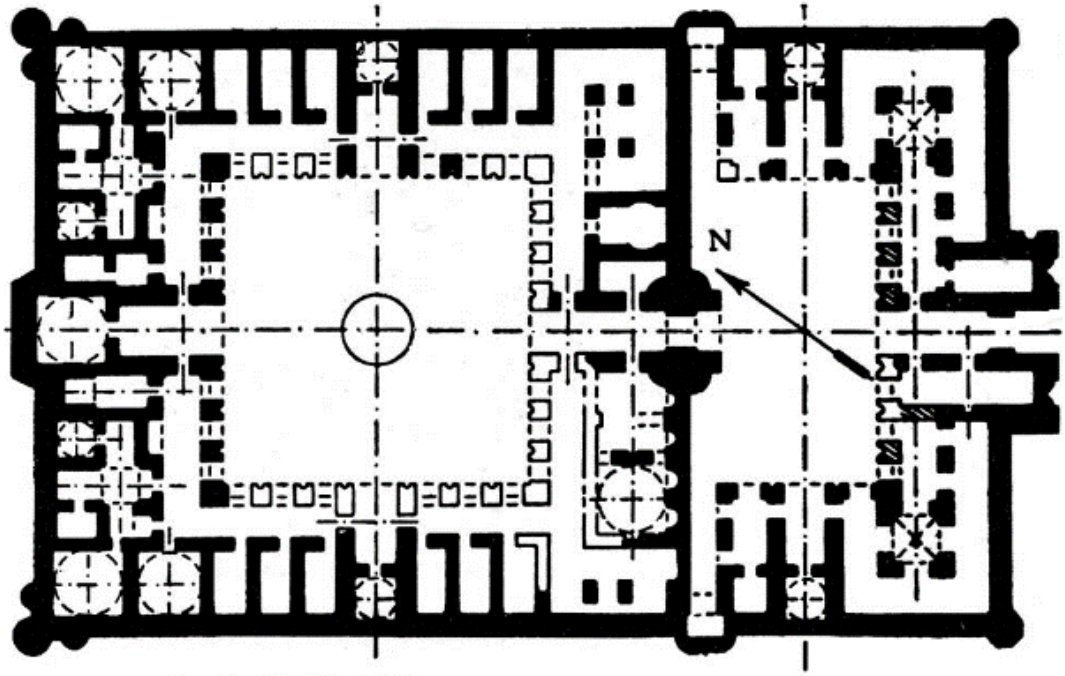


Figure 2. Plain of the Ribât-ı Şerif (Nîşâbur-Merv) (23)

They are structures that provide rest and safety for passengers and caravans on caravan routes in Central Asia. There are many well organized complexes built to meet the needs of passengers and their animals, to provide shelter, rest, and treatment on the transit routes of the Karakhanids, Ghaznavids, and the Great Seljuk State. They are generally safe structures with a square or rectangular plan, surrounded by very solid walls.

After Anatolia came under Seljuk rule, XII. At the end of the century, it became the center of international trade. Seljuk sultans, who arranged their economic policies and conquests according to the position of international trade, had caravanserais built in every area from one end of Anatolia to the other, from main trade routes to intermediate roads.

In these foundation structures built by sultans and emperors, the passengers considered as guests of the founder of the caravanserai for three days and no fee was charged. These structures arranged to meet all the needs of the people traveling with

the caravans as well as the safety of the caravans. In addition to accommodation and food facilities, services such as a bath, a mosque, a pharmacy and a doctor when necessary, free shoes for poor passengers, fodder for animals, farriers, veterinarians, and car repair provided (16).

Rabats in Turkish Architecture show three types of plan features: 1. open courtyard, 2. closed space, and 3. mixed types

1. Open Courtyard Rabats

Rabats with open courtyards consist of an open courtyard in the middle of a symmetrical axis and rooms arranged around it, and the dominant four iwans, forming the axes are the main characteristics of this plan type.

Rooms divided according to their functions into guest rooms, rooms for religious rituals, cooking and storage rooms, mini-baths, and technical rooms for animals. This planning scheme, which seen in pre-Islamic Buddhist temples (Fig. 3-7) dating back to the 2nd century, used also, in Central Asia and in Anatolia after the 11th century, for planning of the palaces caravanserais, madrasahs and hospitals.

Figure 3. Buddhist temple and monastery complex Ajina-tepa, Tokharistan, (VII-VIII Centuries) (3)

It is seen that early examples of square, open, courtyard plan schemes with iwans on all four sides were used in Buddhist monastery complexes. We know that the Gokturks in Central Asia (around 500 AD.) met Buddhism during their relations with China, and some Turks accepted Buddhism and spread to the vast Central Asian geography, and Western Gokturks lived in the territory of Northern Uzbekistan (Prof. Dr. Ahmet Tasağıl Lectures).

It is possible that the use of the open courtyard plan with four iwans in the Central Asian Ribats is also related to Buddhism, that there may even be some Buddhist rabat structures, and that these buildings, which were used as monasteries, schools, places of worship and social facilities first, were used as a prototype in the transformation to a new form with a predominant commercial function.

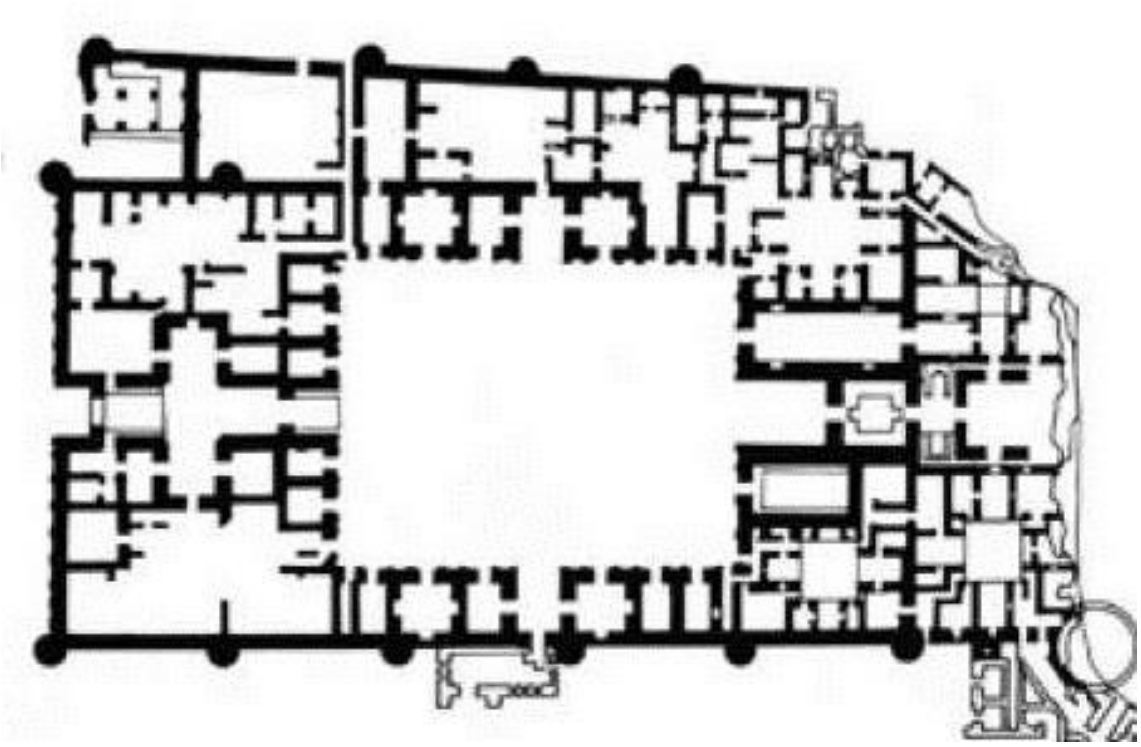


Figure 24. Mosque of the Ghaznavidsin Lashkari Bazaar, X-XI Centuries (3) The grand mosque, which is located in a large palace complex, shows a plan scheme with an open middle and four iwans.

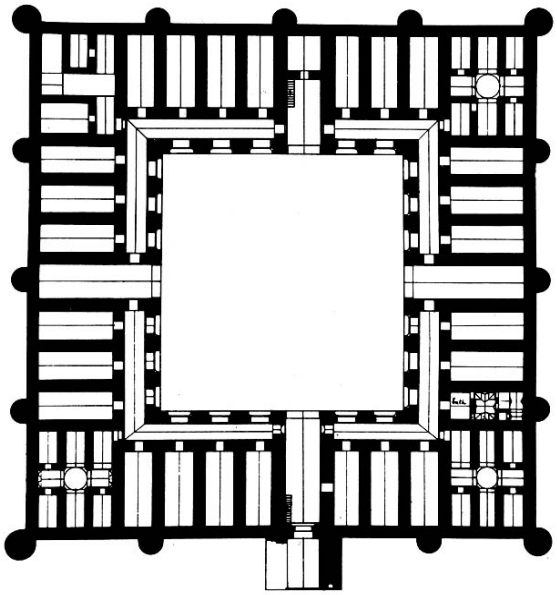


Figure 5. Rabat-ıAnuşirvan (Damgan-Semnan) (11th Century) (23)

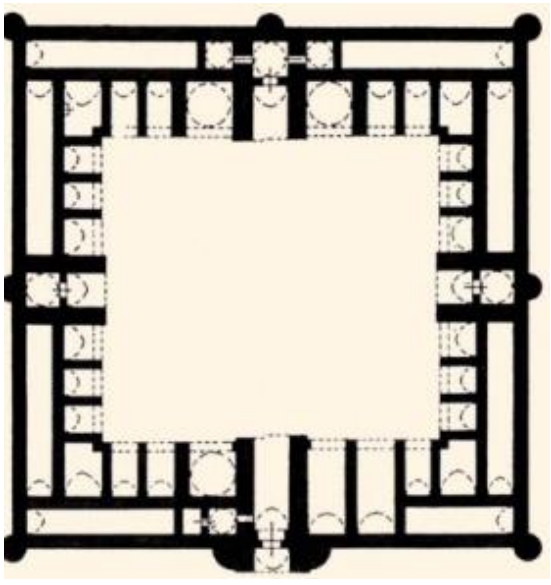


Figure 6. Rabat-ı Mahiin Afganistan (1019-1020) (23)

1.1.Manakeldi Caravanserai

The monument is situated on the route from the Fergana valley to the regions of the Inner Tien Shan, Issyk-Kul, and further to East Turkestan. It can be supposed that the construction was built in the Samanid time in the 9th Century and continued to function actively in the Karakhanid period and, perhaps, later. It has been considered as a military trading station for the people of Fergana (2).

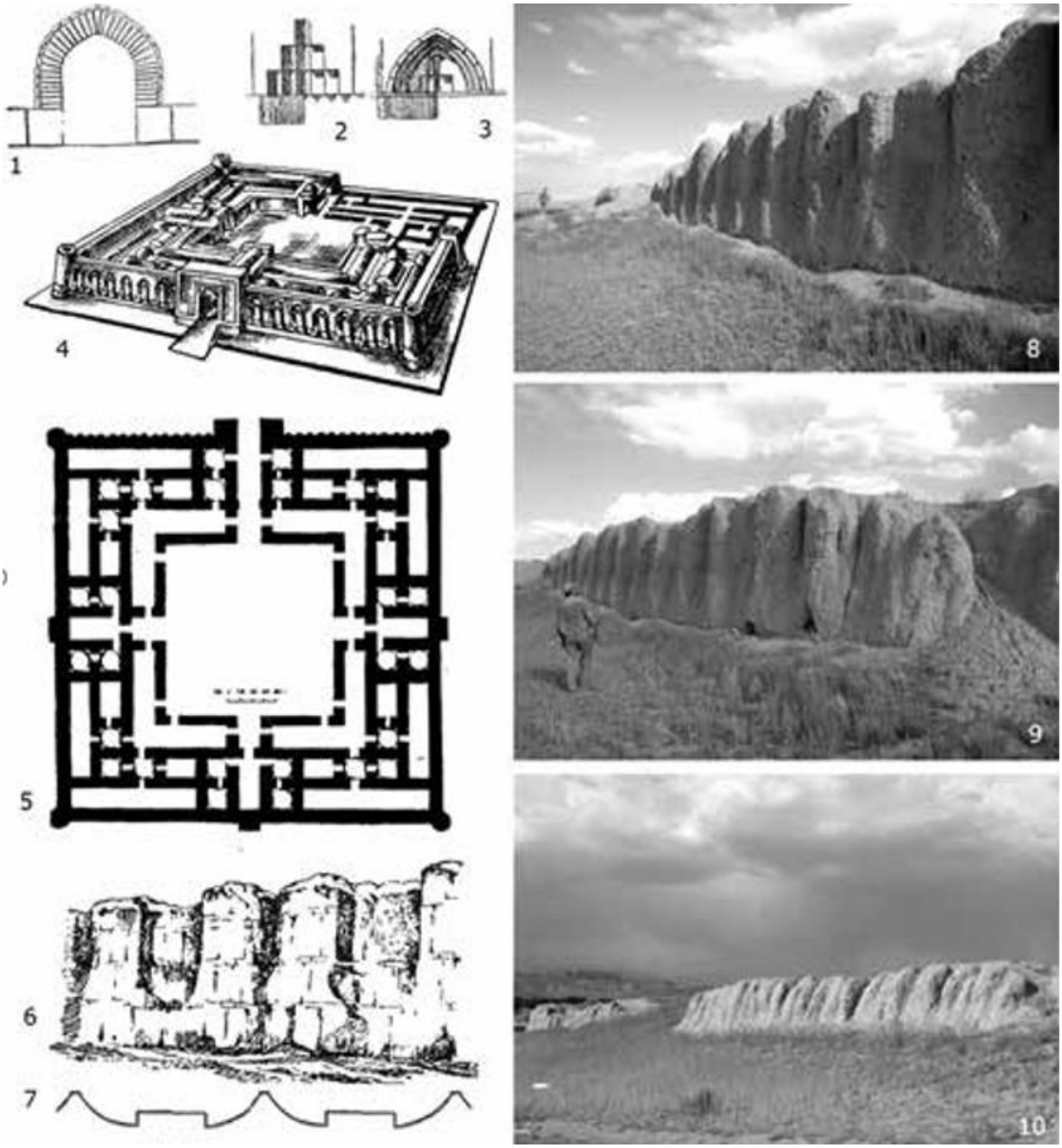


Figure 7. Plan, perspective and some architectural characteristic details (pointed arch and mukarnas) of the Manakeldi Caravanserai, Great Sejuck Period Building, 9th - 12th Centuries (2) Four eivans open courdyard planning, mud brick tick walls with decorative façade details have some similarities either with 2nd Century budist complex planning (Fig. 3) or 13th Century Caracansaraies in Anatolia (Fig. 10).

The Manakeldi Caravansarai is square in plan, 64 m by 64 m in size, and an open court 25 m by 25 m in size occupied the inner space of the caravanserai. Along the walls ran two rows of corridors, with square and rectangular living and guest rooms between them.

Each corridor had four archways leading to the court and two to the mean row. A stalactite trumpet arch used in the transitional zone between the tetragon of the building and the dome (see Figure 7).

According to their functions, the rooms divided into guest rooms, rooms for performing religious rites, and rooms for cooking and storing goods. In different parts of the outer corridor, there were found mangers for animals (2).

In general, the composition of this construction with four iwans, a square court, and long storehouse's stalls makes it a classical specimen of the late-Rabat or an early-caravanserai.

1.2.Akyrtash Palace

Akyrtash is a palace complex (10) located outside Taraz, 33 km east, on the Almaty road, at the foot of the very low mountains of Tien-Shan. (Fig. 8) The plan shows the character of a rabat with an open courtyard, like Ribati Malik, it must have been used first as a rabat and later as a palace.

Figure 8. Akyrtash Palace in Kazakhstan near Taraz (7) before excavation

Scientists who have studied the Akyrtash complex for a long time have argued relative. But the destination was very different. Theories have been put forward that it was a Buddhist monastery [P.I.Lerkh (7)]. It could be a Nestorian monastery [V.V. Bartold (11)], a palace-fortress [T.K. Basenov, KM Baypakov (12)], [V. Brentjes (13)], [S.G. Khmelnitsky (14)], and a caravanserai [L. Yu. Mankovskaya (15)] was discussed.

The building looks like an important defensive structure made of a durable stone different from the surrounding adobe and brick construction technology (7). The plan scheme of the complex contains central plan scheme with an open courtyard in the middle. This plan scheme is suitable for palace architecture as it is used in Rabat or caravanserai architecture.

1.4. Open Cordyard Plan In Anatolia

The plan scheme with rooms around an open courtyard is seen at the earliest in 2nd and 3rd century Buddhist monasteries and Rabats in Central Asia. This plan scheme constitutes the prototype of the madrasa, caravanserai, and hospital structures of the Turks living in Anatolia since the 11th century. (Fig.9-10)

A. Central Courtyard in Madrasas in Anatolia

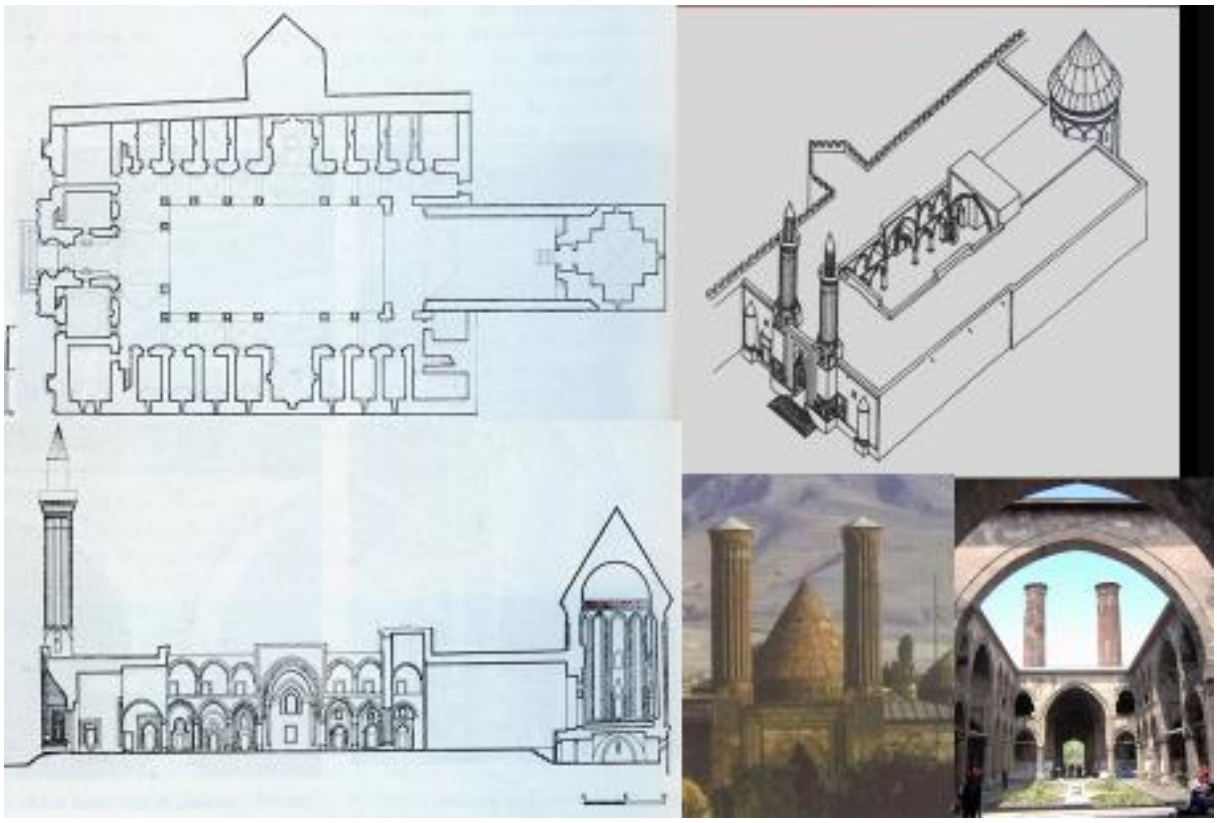


Figure 9. Erzurum Çifte Minareli Medrese (The double minaret madrasah) in Erzurum. It is a two-story madrasah with four iwans and a central open courtyard in Eastern Anatolia. Its estimated date of built is 13th century (17). It has an open-courtyard plan scheme driven from of the Central Asian Rabats.

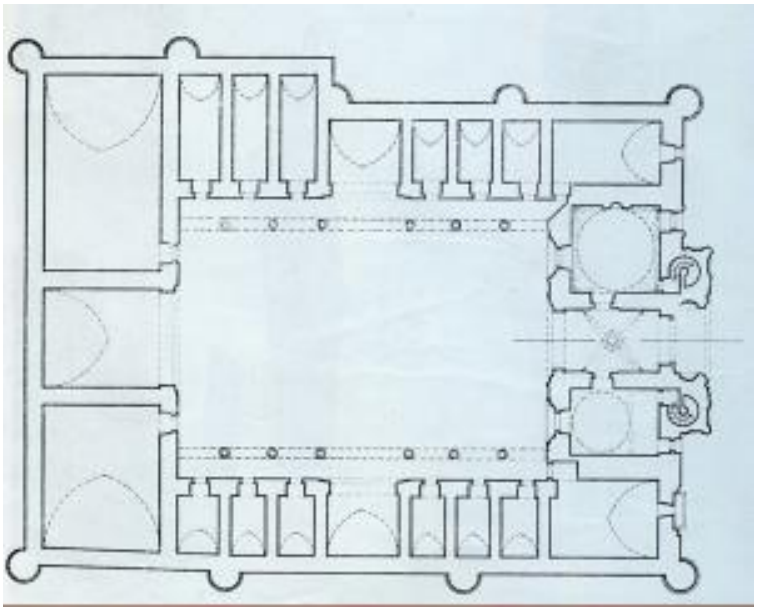


Figure 10. The building, also known as the Sahibiye Madrasa, is known as Gök Medrese due to its turquoise colored tiles. It was built in 1271 by the vizier Fahreddin Ali bin Hüseyin Sâhib Ata during the reign of Giyâseddin Keyhusrev III. It is made up of rooms around the central open courtyard, and there are iwan spaces. The large iwan on the door axis was active as an open (summer) classrooms, and on both sides of it there are closed (winter) classrooms.

Figure 11. Façade of Gök (Sky) Medrese in Sivas, in Central Anatolia.

Half of the minarets are not original.

B. Central Courtyard Plan in Caravansaraies in Anatolia.

The Silk Road, in the Middle Ages, starts from the Chinese city of Xian (Şian), one branch goes to Uzbekistan, from there it passes through East Turkestan, Mongolia, Kazakhstan, Uzbekistan, Kyrgyzstan, Turkmenistan, and reaches the Caspian Sea; the other branch crossed the Karakoram Mountains and reached Anatolia via Iran (18).

Central Asian rabats located on the caravan routes led the Anatolian caravanserais architecturally and the open courtyard plan scheme was widely used in Anatolia.

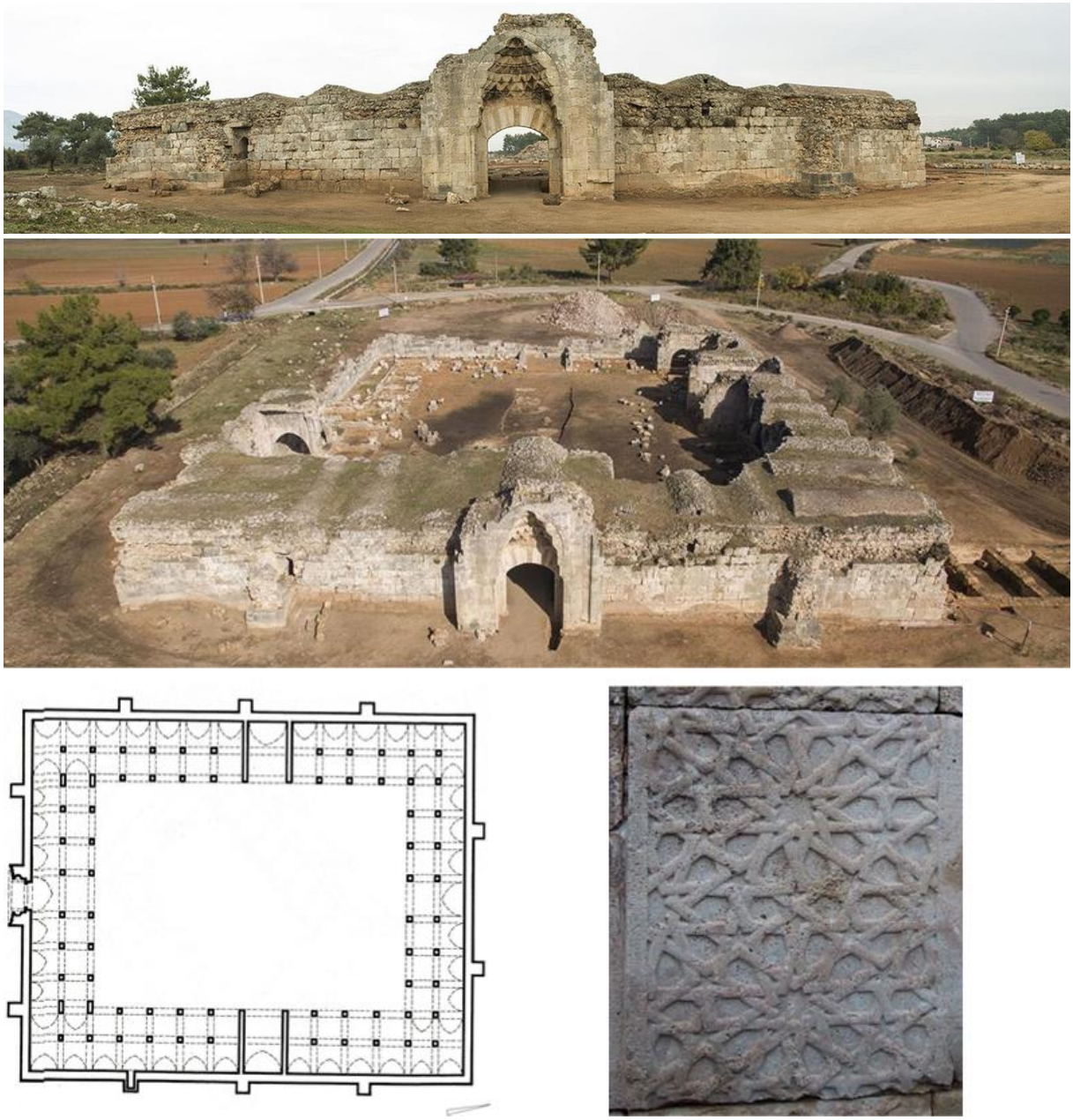


Figure 12. Plan and façade and a border detail of Evdir Han (Inn) between Antalya-Isparta in South-East Anatolia (19)

Evdir Han (Figure 12)

The term "han" is generally the name given to the caravanserais built by the Anatolian Seljuk sultans in Anatolia.

Evdir Han (inn) was built in central open courtyard planning, by Sultan I. İzzeddin Keykavus in between Antalya-Isparta in the South-East Anatolia, in 1210-1219. The stone carving decoration on the border of the mean gate, is a geometric ornament that used by the pre-Anatolian Turks in Central Asia and later in Ottoman Architecture.

Figure 13. Photographs from interior and exterior of Tashrabat in Tajikistan (after restoration); entrance arch, and some remnants inside, built with Turkish pointed arch orders, bears the traces of Karakhanid architecture.

2. Covered Rabats

The most important architectural feature of this covered Rabat type is the absence of an open courtyard in the middle (Figs. 12-13).

In the middle, there is a central hall covered with a dominant dome. This type of Rabat planning has been widely used in the castle and palace structures (Fig. 14) where security is important in Central Asia.

Since the 11th century, many closed madrasahs (Fig. 15), caravanserais and hospital buildings were built in Anatolia according to this planning scheme.

2.1. Tashrabat

Two groups of rooms can distinguish in the square plan of the unique planning of Tashrabat in Tajikistan. (Fig. 12-13) First of them connected with the central entrance corridor consists of 14 rooms (Fig. 13) and two lateral corridors.

The other group consists of rooms around a central square hall, which includes four-iwans on 2-axes. Skylights in the domes and vaults illuminate the interior space (2). The use of building materials and orders of arches is untypical for a single period - (9th Century Turkish arch in the entrance, and 15th Century characteristics on the vaults (see Fig. 13).

The researchers are not unanimous in the defining the date of its building and functioning. N. L. Zeland, a local historian, suggested that the monument could be a Buddhist or Christian temple (4), and in another study, Tashrabat ascribed to Mogul khan Muhammed (2).

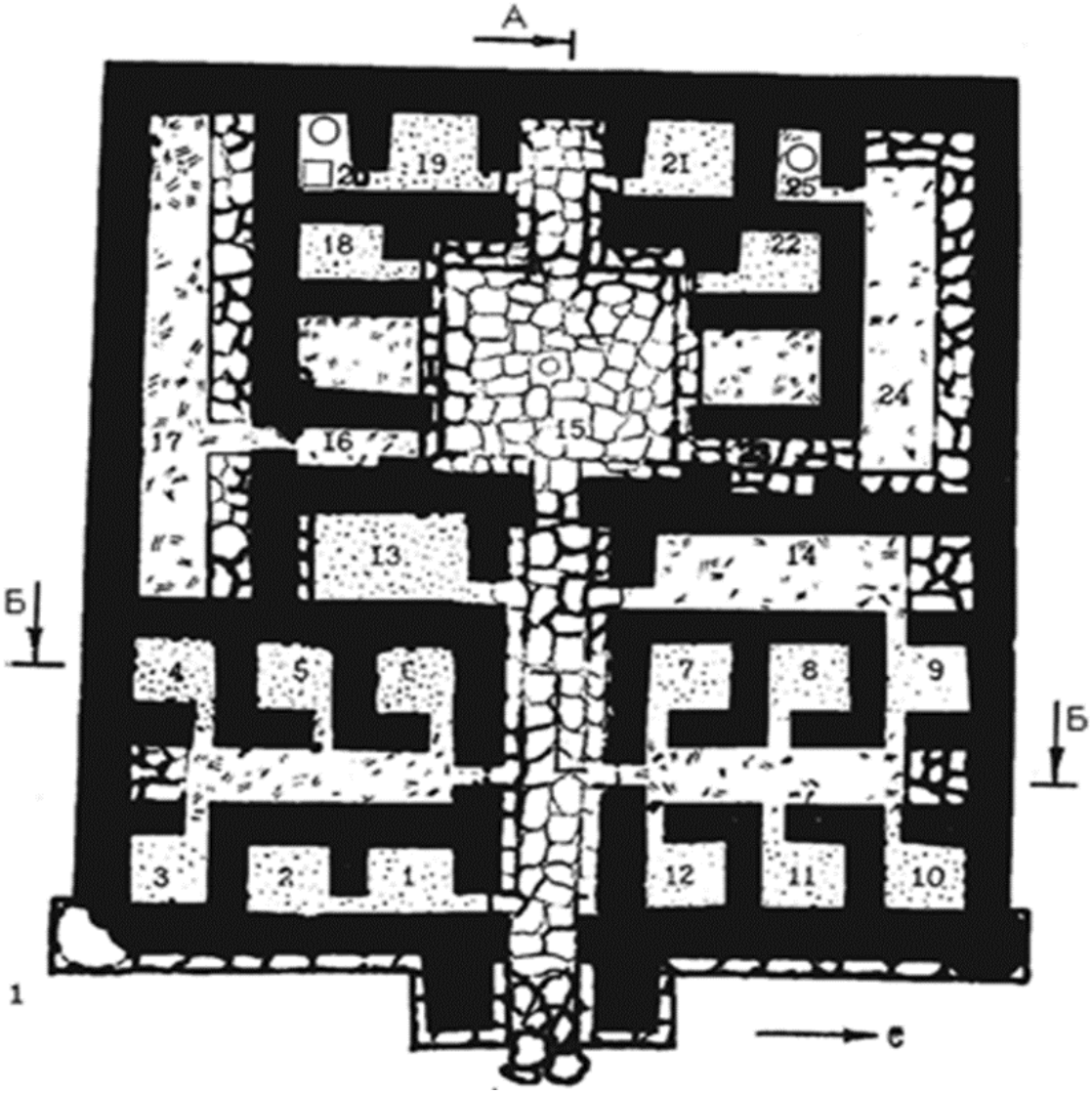


Figure 14.A. Plan of Tashrabat with four iwans planning, in Tajikistan (Before restoration) (2)

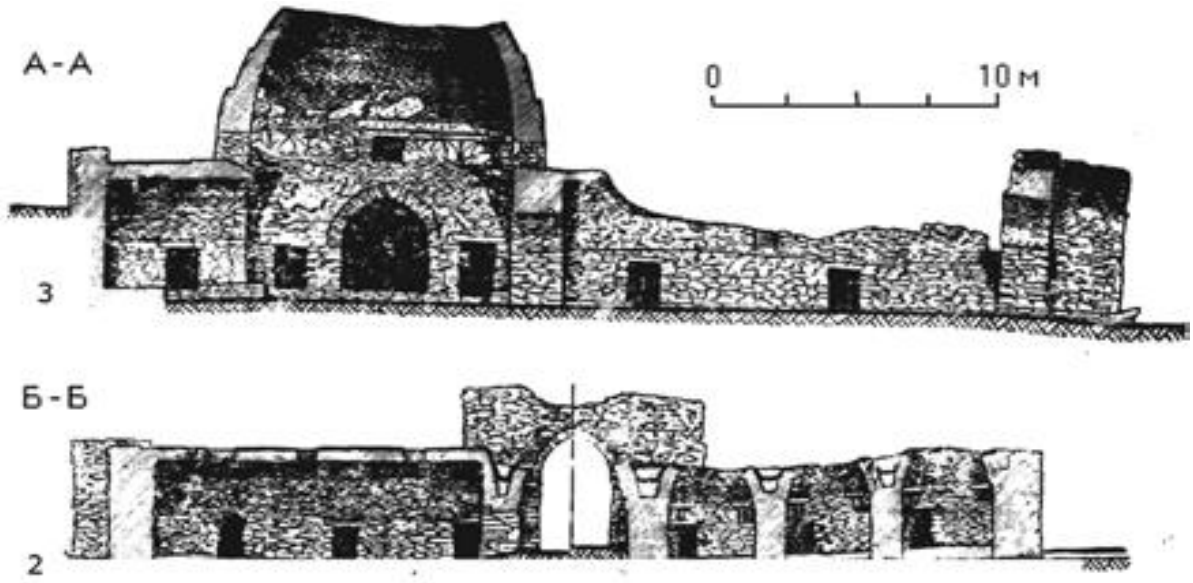


Figure 14.B. Sections of Tashrabat with four iwans planning, in Tajikistan (Before restoration) (2)

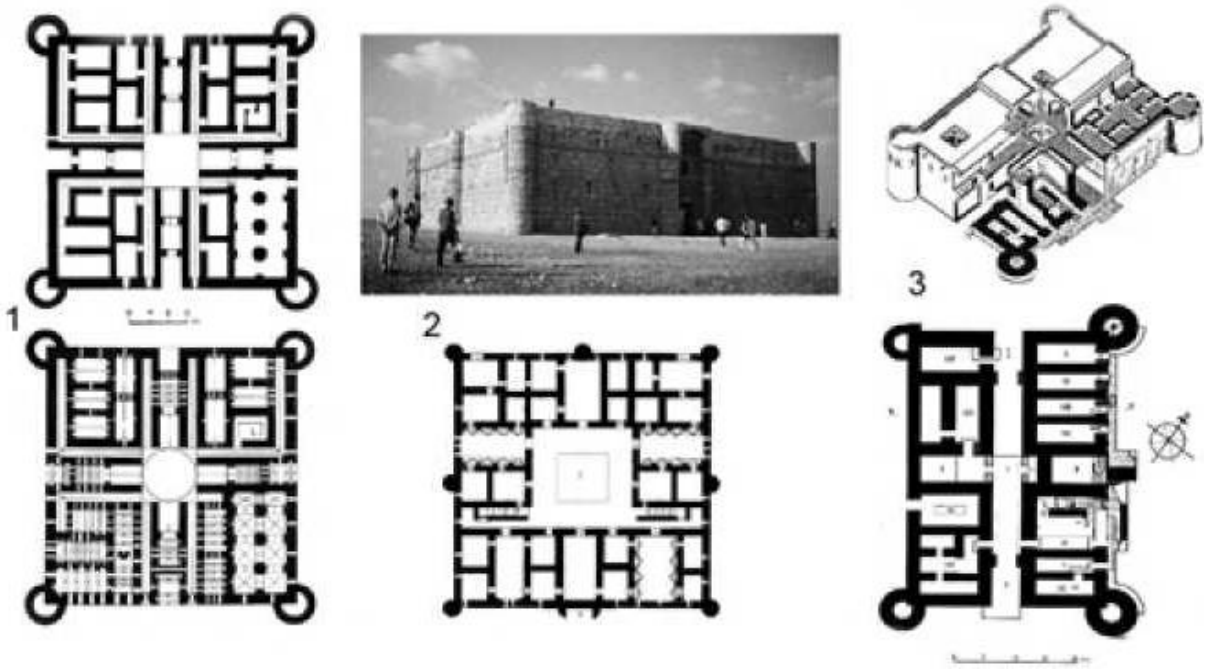


Figure 15.Compositional solutions for fortified castles of the VIII-XI centuries in Jordan, Termez and Lashkari Bazaar (3)

2.2. Coverd Plan in Anatolia

The aforementioned plan character holds significant prominence within the context of Anatolian Seljuk Architecture, as well as in the realm of Ottoman Architecture, where it finds extensive application in diverse edifices such as madrasas and caravanserais (Fig. 16-17).

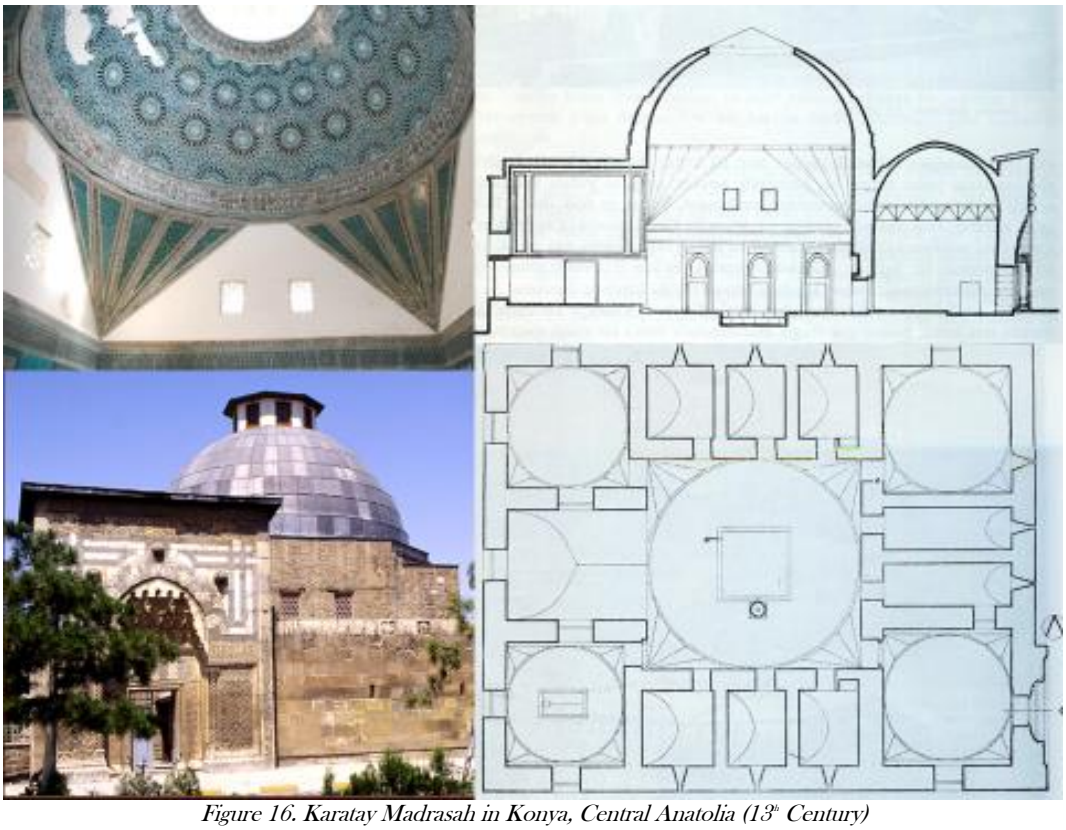


Figure 16. Karatay Madrasah in Konya, Central Anatolia (13th Century)

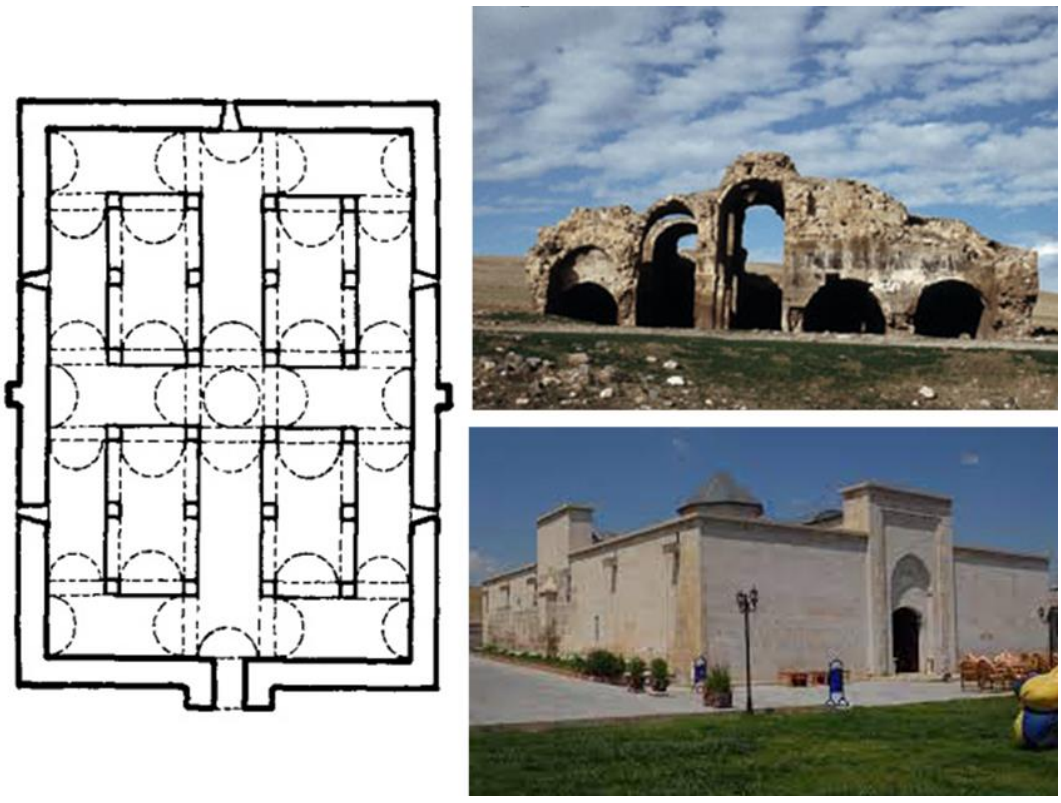


Figure 17. Uresin Han; Plan before and after restoration (2008) photos; It is a closed inn built in the 13th century during the Anatolian Seljuk period on the Aksaray-Nevşehir road in Central Anatolia.

3. Mix Type Rabats

This type of multifunctional rabat has both an open courtyard used in summer and indoor areas used in winter.

They are the structures on the trade routes where all the needs of passengers (mosque, bath, restaurant, mini-hospital, etc.), and caravans are met.

In addition, it is seen that they have been used with different functions throughout history, such as the Buddhist monastery complex, the caravanserai, the palace complex.

Rabat-ı Malik is the most original example of this plan type. Considering the existing ruins and the plan scheme, the building, which is thought to have served different functions in many periods, has a mixed plan scheme, which is passed to a more private indoor area after the open courtyard.

3.1. Ribat-I Malik

It was built in the 11th century by the Karakhanid Shamsülmülk Nasr (1068-1080), it was restored by the Karakhanid Arslan-han Muhammed ibn Süleyman (1102-1130) in the 12th century. It was a summer palace and only the walls of the central portal façade remain today (Fig.18-19).

The mixed type is Rabat's most prominent example. It is possible to say that the building was destroyed by the invaders, including natural destruction, and has been rebuilt many times with new additions for different purposes until today.

Although the ruin material shows that, there were two open courtyards, are allocated both sides of entrance, connected to a closed and safer area.

The open court must have been used by adapting into close spaces with the new constructions (residence) (Fig. 18).

Only a part of the main façade has survived, and during the excavations, the additions of different periods were removed and the whole plan was revealed.

A huge outer ring of fortifications (91 × 91 meter) of the palace type surrounded the building. Portal entrance is made of adobe. The siding, ceilings, pillars are made of burnt brick.

The embossed rhythmic decoration on the façade rises on a pedestal. The portal (12 m wide, 18-19 meter high) decorated with deep relief carvings.

After a long research, N.B. It was though by Nemtsova that there was an initial period in the 8th and 9th centuries [8] and the Achaemenid period was linked to the Sassanid palaces.

The finds, the interior planning composition of the monument are luxury residential apartments occupying almost the entire southwest, a mosque and a large courtyard bath complex, courtyards of houses with stables.

There are also those who think that it was a comfortable, solid and at the same time helpful and beautiful steppe residence compared to the Karakhanid period [9]. (See Fig. 18-20)

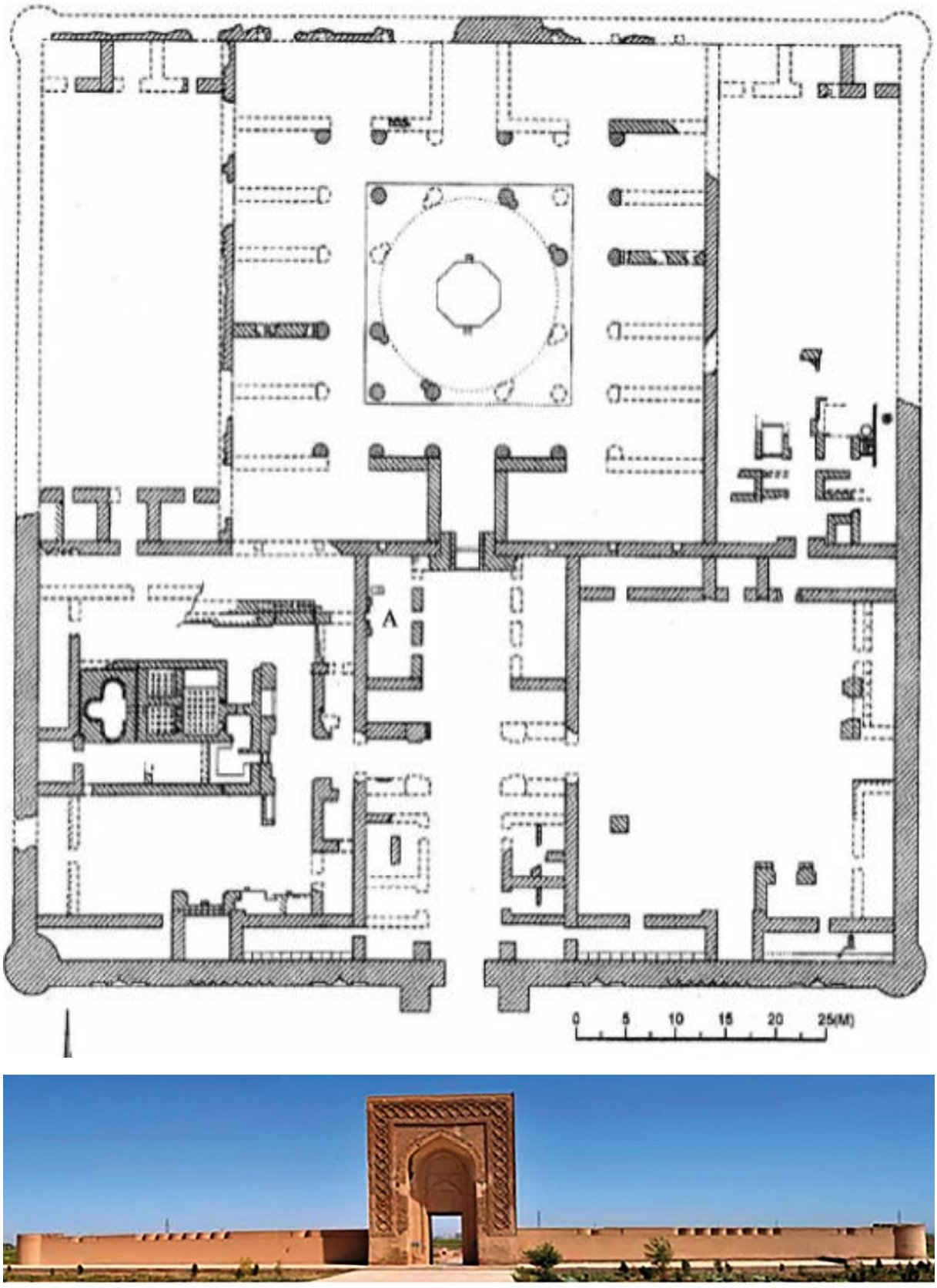


Figure18: Plan of Ribat-i Malik between Buhara-Semerkand after an excavation in the mid-twentieth century (7)

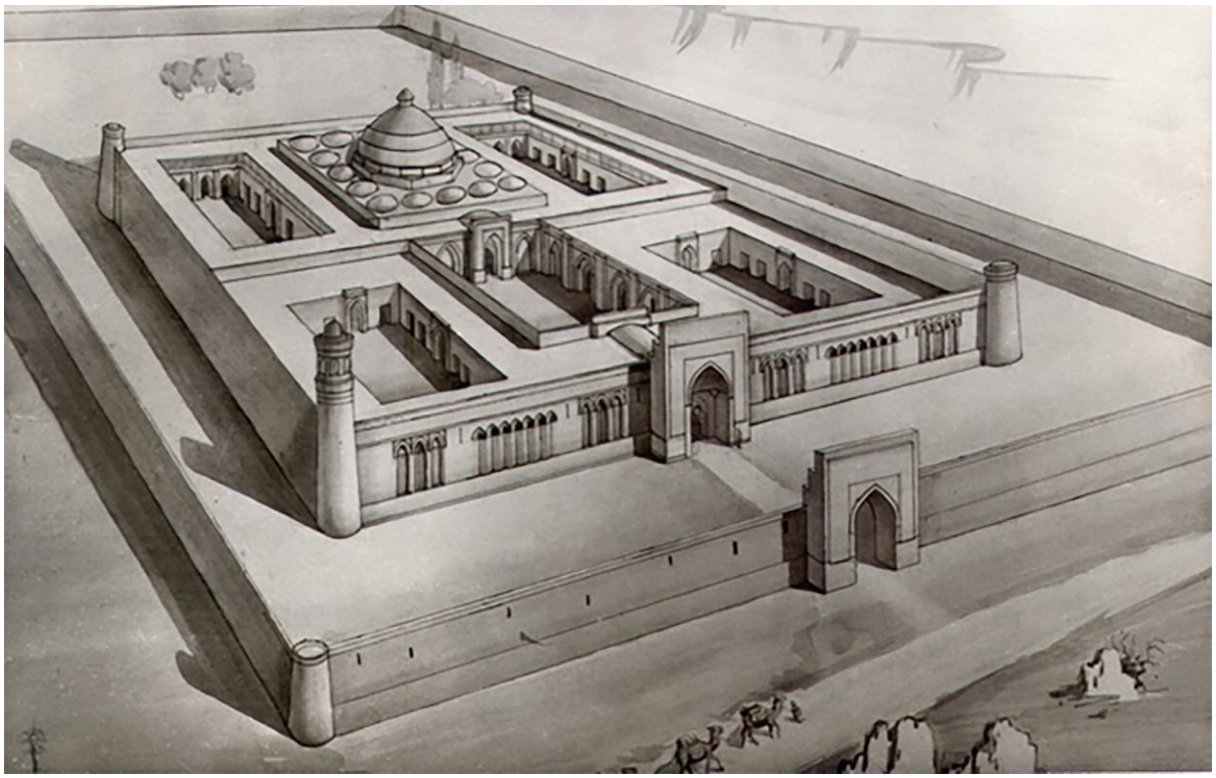


Figure 19. A Restitution Project about the origin of Ribat-i Malik (7)

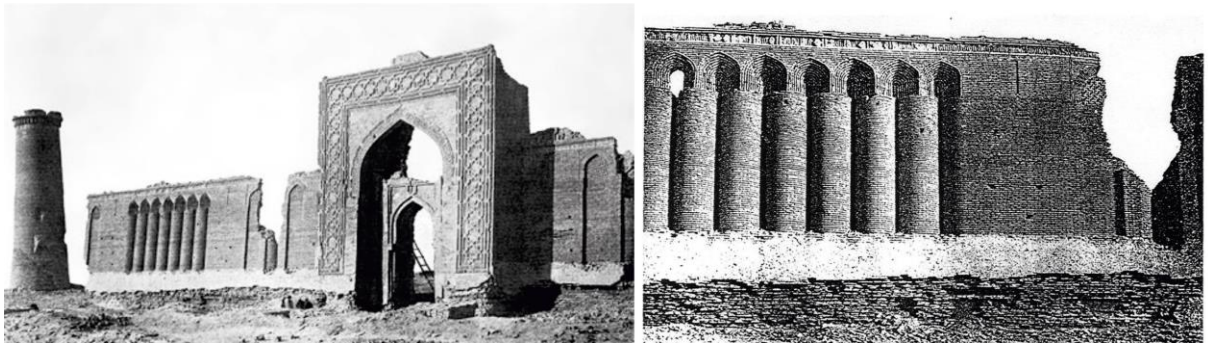


Figure 20. Ribat-i Malik (11th Century) (1068-1080)-Photo had been taken just before Russian bombing in 1938 (7, 20).

Conclusion

The main characteristic of these multifunctional structures, which are called "Rabat" and which have different functions in different locations in history, are gathered around a central, open or closed courtyard.

Although it seems to have entered the literature in the Qur'an for the first time as the camp of Islamic jihad armies, this plan scheme is also encountred in Buddhist complexes from the 2nd century.

The plan features of the open courtyard, closed and mixed type rabat structures used by the Turks in Central Asia before they came to Anatolia have been revived in Anatolian inns, caravanserais, madrasahs, baths, hospitals, kitchens and mosques. (See Fig. 19)

The most characteristic example of Rabat is Tashrabat, (Fig. 14) and historians think that this construction built as a Buddhist monastery first. (Fig. 3)

The Turkish pointed arched entrance gate, the pendentive with muqarnas in the middle courtyard and at the transition to the dome, and the covered central courtyard with four iwans is the prototype of Anatolian Seljuk Architecture.

Ribat-ı Malik plan scheme shows (Fig. 18) the same period features as Tashrabat, but the building material is completely different. Ribat-ı Malik is a larger scale building that used as a Palace.

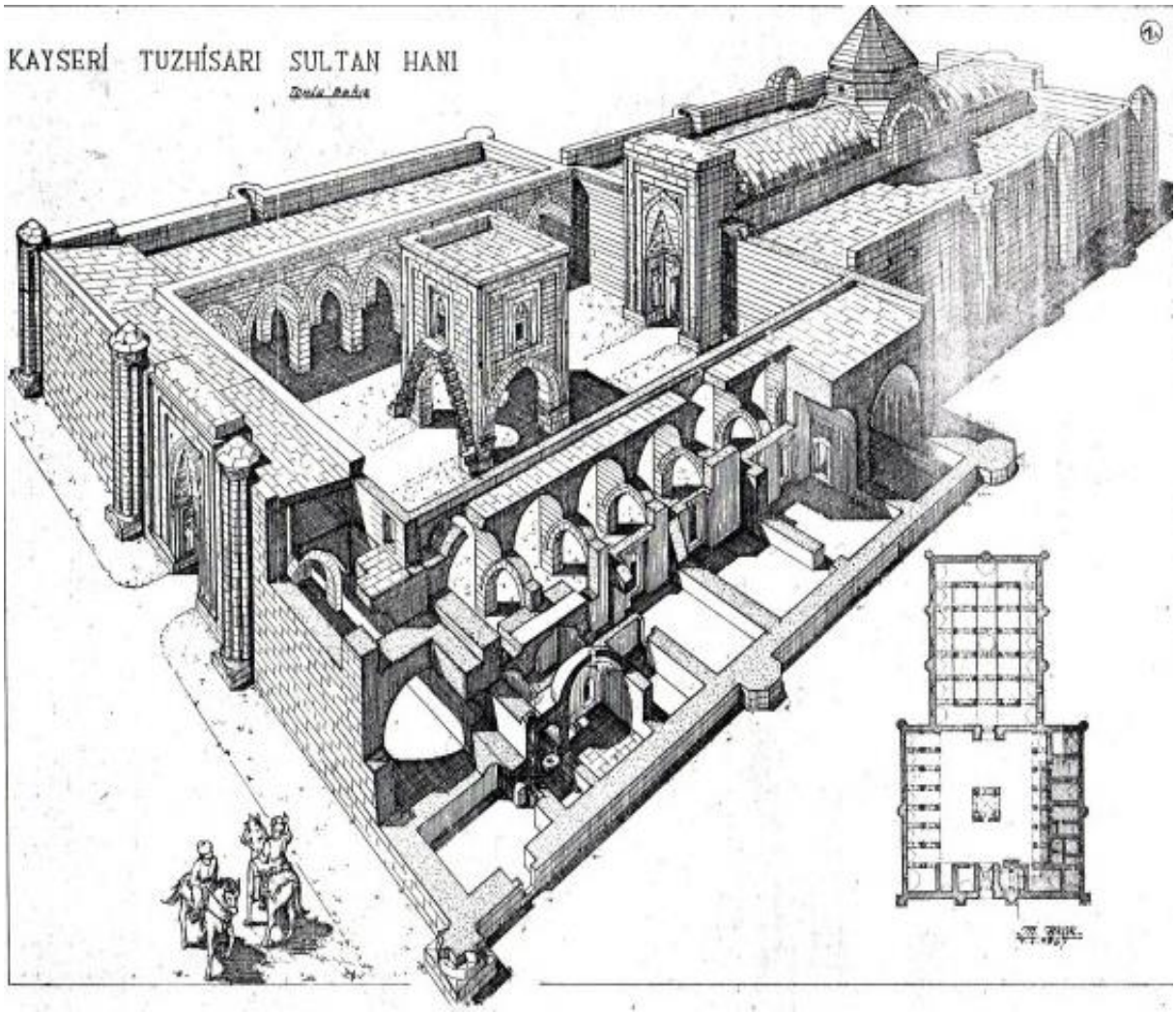


Figure 21. Kayseri Sultan Han (Inn) built by Seljuk Sultan Alaeddin Keykubad I in the 13th century (1233-1237) and consists of summer (open courtyard) and winter (closed part) areas. The plan scheme is a model of mixed type rabat plan of Central Asian origin (22)

References

1. Kuran A., Anadolu Medreseleri, C.1, O.D.T.Ü. Mimarlık Fakültesi Yayını, Ankara, 1969.
2. "Yakutiye Medresesi", Erzurum Ansiklopedisi, Available from: https://erzurumansiklopedi.com/yakutiye-medresesi/
3. Volichenko O.V., Almaganbetova K.A., Central Asian Palace Architecture

(genesis, evolution, typology), Monograph, Bişkek 2020

4. Немцова Н.Б. Рабат-и Малик, XI – начало XVIII вв. (археологическиеисследования) [Текст] / Н.Б. Немцова. Ташкент: Французскийинститутисследованийцентральной Азии, 2009. (Nemtsova N.B. Rabat-i Malik, XI - early XVIII centuries. (Archaeological research) [Text] / N.B. Nemtsov. Tashkent: French Institute for Central Asian Studies, 2009)

5. Мурадов Р.Г. Перваямонография о степнойрезиденцииКараханидов [Электронныйресурс] / Р.Г. Мурадов. – Режимдоступа: http://www.nemtseva.uz/reviews/Rabat-i_Malik. pdf9) (Muradov R.G. The first monograph on the steppe residence of the Karakhanids [Electronic resource] / R.G. Muradov. - Access mode: http://www.nemtseva.uz/reviews/Rabat-i_Malik. pdf9)

6. North edge Alastair , "Akyrtash, the first Islamic monument in Kazakhstan, and its interpretation", Available from: file:///C:/Users/gulcin.kucukkaya/Downloads/Akyrtash_the_first_Islamic_monument_in_K.pdf

7. Бартольд В.В. Сочинения [Текст] / В.В. Бартольд; отв. ред. И.П. Петрушевский. Т. 7. М.:Наука, 1971. С. 359–370. (Barthold VV Essays [Text] / V.V. Bartold; from ed. I.P. Petrushevsky. T. 7. M.: Nauka, 1971. p. 359–370)

8. Байпаков К. М. Раннесредневековаяархитектура Семиречья и Южного Казахстанана Великом Шелковомпути [Текст] / К.М. Байпаков, З.Ж. Шарденова, С.Я. Перегудова. Алматы: Ғылым, 2001. (Baypakov K.M. Early medieval architecture of Semirechie and South Kazakhstan on the Great Silk Road [Text] / K.M. Baypakov, Z.Zh. Shardenova, S.Ya. Peregudov. Almaty: Gylym, 2001)

9. Ardalan N. The Sense of Unity: The Sufi Tradition in Persian Architecture [Text] / Nader Ardalan, Laleh Bakhtiar. ABC International Group, 2000.

10. Хмельницкий С. Между Кушанами и арабами V–VIII вв. [Текст] / С. Хмельницкий. Берлин-Рига: Самалш, 2000. (Khmelnitsky S. between the Kushans and the Arabs of the 5th–8th Centuries. [Text] / S. Khmelnitsky. Berlin-Riga: Samalsh, 2000)

11. Маньковская Л.Ю. ТипологическиеосновызодчестваСреднейАзии (IX – начало X вв.) / Л.Ю. Маньковская. Ташкент: Фан, 1980. (Mankovskaya L.Yu. Typological foundations of architecture in Central Asia (IX - early X centuries) / L.Yu. Mankovskaya. Tashkent: Fan, 1980)

12. Uysal M., Aydın D., Çınar K., Arat Y., "Afyon Sultandağı Sahip Ata Kervansarayı", Türk-İslam Medeniyeti Akademik Araştırmalar Dergisi, Türk-İslam Medeniyeti İlmi Araştırmalar Enstitüsü Publication, Konya, 2(0):77-112, 2006.

13. Yetkin S. K., "Erzurum Çifte Minareli Medresesi", EAÜİFD, , 1952.

14. Acun H. (Ed.), Anadolu Selçuklu Dönemi Kervansarayları, Ankara, 2007.

15. Türkiye Kültür Portali, "Evdir Han", Available from: https://www.kulturportali.gov.tr/turkiye/antalya/gezilecekyer/evdirhan

16. Ribat-i Malik, Available from: https://www.britannica.com/place/Ribat-i-Malik

17. http://www.farisarslanyapi.com/dt_portfolio/aksaray-tepesi-delik-uresin-han-restorasyonu/

18. Turk Diyanet Vakfı, İslam Ansiklopedisi, "Sultan Hanı", Available from: https://islamansiklopedisi. org.tr/sultan-hani—kayseri

19. IICAS, The Artistic Culture of Central Asia and Azerbaijan in the 9th-15th Centuries, Samarkand-Tashkent, 2013.

EVOLUTION AND GEOMETRIC ANALYSIS OF STALACTITES IN UZBEKISTAN 9th-14th CENTURIES (BASED ON SQUINCHES)

PhD. Candidate Shakhboz Mustafoev
Tashkent Institute of Architecture and Civil Engineering: TIACE,
Faculty of Architecture, Department of History and Theory Architecture, Tashkent, Uzbekistan.
1993shaxboz3991@gmail.com

Summary
The research is devoted to the evolutionary development of stalactites in Uzbekistan of the 9th -14th centuries - a square-rhomboid type. Features of these stalactites from other types, methods of geometric analysis based on the methods of architect masters and archival materials. In addition, the article indicates some mistakes of restorers in the design and reconstruction of this type of stalactite.

Keywords: *Muqarnas, Tahbin, Squinch, Shamseh, Taseh, Toranj, Tee, Espar, Takht, Shaparak*

Introduction

Investigating of stalactites of Central Asia during the period of 9th -14th centuries is represents particular interest: there were intensive development of terracotta-glazed block stalactites took place, during this period, which exhausts itself only end of the 14th century. Furthermore, we could see the appearance of *ganch* (Zoxidov, 1996, p-19) and *mosaic* variations of stalactites and a changing their constructing method of a *square-rhomboid type* to a pole *table type* (Hamidreza, 2016. pp. 35-36). Complex as *Shah-i-Zinda* in *Samarkand* could be serve as excellent example of the location of architectural objects, which allows us to trace the line of evolution of a *square-rhomboid type* of stalactites in this period.

Architectural scrolls of 14th century made by Bukharian masters, as well as late (20th-early 20th centuries) architectural scrolls, etc. ("Bukhara scroll", inv. №: 4429/16, № 4430/16, № 4174 - № 4180), made by Uzbek and foreign artisans ("Tashkent scroll", doc. №1 - №7), reflect only the most important key of *muqarnassaze (traditional school of constructing stalactites)* - the *Tahbins* (2D

plans of muqarnas) shows hidden main lines of stalactites and creation methods.

The method of successive construction of stalactites, deployed from the general to the particular, to the geometric elements that make them up, was kept as secret as possible by the Ustozodas (qualified artisan) for many centuries, and knowledge was transferred only to students who were worthy of this knowledge.

If we analyze the scrolls of Bukharian masters, we could notice hypothetically the construction of stalactites for the 19th and early 20th centuries originated from stalactites of the 16th-17th centuries. They originated mixed type, but for the 9th- 14th centuries, characteristically used massive blocks. For example of the mausoleums of the Shakhi-Zinda ensemble, we could be sure that the harmonious, logical system for constructing terracotta stalactites was different - a square- rhombus shaped type [Table 1; 2.].

Subheading

In this study, the analysis of the solution of each plan of stalactites of the mausoleums from Central Asia such as Samarkand, Kune Urgench and Nukus is presented in four stages.

1. Beam grid (departing from the center of Shamseh - Nayzagi);
2. Geometric basis - "girih" figurative polygonal geometry;
3. Analysis - projection of series;
4. Typology of building blocks.

In this sequence, attention seems to linger on the most important, key moments of the project.

The key that opens the mechanism for constructing this type of stalactites can be seen in the example of stalactites (*sharafa*-stalactite frieze) of the mausoleum of Najmeddin Kubra (30s of the 14th century), which is as follows: forming in terms of square and rhombus figures, which can be converted from an octagon by drawing ray lines. Since these squares and rhombuses were constructed from the rhythmic divisions of the octagon. From this, it follows that the rhombus is 45°, and the square is 90° [Fig. 1].

Thus, the first operation to decipher this kind of stalactites is to find the *taqsim* (repeating part of drawing) and the dominant figure in the center of this *taqsim*, which begins the first row of stalactites. It should be noted that in *sharafas*, the dominant figure is usually the lower part of the decor and grows to the top, while in muqarnas they are, on the contrary, down.

The second operation is to build up a drawing consisting of polygons from the plane of the wall, that is, it is necessary to break large polygons into small polygons like a rhombus and a square. We conditionally called this stage the geometric analysis of "*girih*" shaped planes.

The construction of the “girikh's” perspective, unlike the classical planar one, is not limited to two options, and, having mastered it as a geometric density and following one nature, you can accurately “stick” the pattern of the entire stalactite ceiling (that is, in this case, the restorer or architect can serve polygons based on your skills and working out variations) (Notkin, 1970, p. 241).

An example of our hypothesis is the work of I.I. Notkin and the geometric analysis of the author, on the construction of stalactites in the mausoleum of Kusam-ibn-Abbas in Shakhi-Zinda, Samarkand. [Fig. 2; 3,].

If we compare the *Tahbin* stalactites from the mausoleums of Shakhi-Zinda, it is easy to see that all of them consist of the same rhythmically repeating elements like rhombuses and squares.

In the first stage of the analysis, as in the previous stalactite, it is necessary to draw ray lines. In this regard, it can be assumed that the master, creating a new original stalactite Squinch, mentally, as it were, join together three octagons along the ray lines and rhythmically projecting them together, establishes their relationship.

In the second stage, by dividing the main octagonal planes, as in the previous example, new polygonal blocks can be formed on the basis of the main polygon, which redirected towards Shamse. The master must consider, carefully observe, and check the dynamics of the geometry in this stage, in the extreme case, the master in the third stage may encounter a problem such as determining the location of *Takhts*.

This phenomenon can explain the evolutionary development of this type of stalactite. Gradually, not only structural, but also large-scale grinding of stalactites occurs. A clear confirmation of the fact is the stalactites of the corner sails located in chronological sequence and conditionally in the same dimensions in the mausoleums of Mane Baba (11th c.) Arslan - II (Fakhreddin Razi 12th c.), Mazlumkhan-Sulu (14th c.), Kusam-ibn-Abbas (12th -14th c.), Master Ali Nesefi (12th-14th c.) [Fig. 4].

In the third stage, it is better to emphasize individual parts of *Takhts*. If you do not take into account these lines and do not pay attention to them, you can mistakenly spoil the stalactite in the restoration process. That is, the master mistakenly can mix two separate rows of stalactite [As in Figure-3, III]. Such a gross mistake is considered unacceptable for the restoration of cultural heritage. In addition, in the same figure, the shortcomings of the stalactite components are noticeable as: *Kosagi* (type of *Taseh*), Type of *Poyagi* (also Geese feet, *Madani*) especially in the first, second and third rows.

Therefore, before starting the restoration of such stalactites, it is first of all necessary to learn the typology of the constituent blocks. The works of masters such as Al-Kashi, Usta Lorzade and others can serve as a clear consequence [Table 3].

The simplicity of building a grid of identical elements is obvious. At the same time, this type of muqarnas contains unlimited possibilities for development and application. Based on squares and rhombuses, we can create hundreds of pattern combinations, fragments of this geometric motif by using in building plans for stalactite vaults, arched sails, cornices, capitals, etc.

The versatility of polygons once again emphasizes its remarkable qualities: with a limited number of type elements [Table 3. The main elements of Al-Kashi muqarnas according to Harmsen, 2006], you can create a variety of three-dimensional compositions. The discovery of the

internal reserves of this system of construction, in our opinion, is far from being exhausted.

Conclusion and Evaluation

Based on our research, we can say that in the 9th - 14th centuries in Uzbekistan, the dominant type of stalactites was a square-rhomboid type; the structure of this type of stalactites was based on large polygons like an octagon. Based on our investigations and drawings of Bukharin masters, we could claim that initially they originated from Squinchs and gradually developed, the polygonal planes and divided them into rhomboids and square-shaped figures. But the development of building materials like ganch and the confluence of Iranian methods of building stalactites negatively influenced the development of this type.

With regard to the characteristics of the stalactites of this period: terracotta blocks based on geometric figures form squares and rhombuses in various combinations. Their sides are the same length. Graphic construction, as in cornice stalactites, begins with the walls. The ganch stalactites are characterized by a radial-beam articulation system, the construction of which begins from the top of the vault. The plasticity of terracotta stalactites becomes more fractional; in the corner sails, the sizes of the blocks are reduced, the number of flat elements in the niches of the portal increases. At first, terracotta stalactites are not connected with the vault, then gradually the outlines of the stalactite vault approach the bend of the lancet vault. This task is performed only in ganch and mosaic stalactites.

Figures and Tables

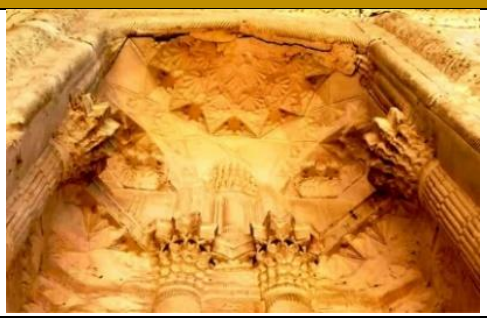
Square rhombus shaped type	Pole table type
	
Shodi Mulk Aqa mausoleum in Shakhi Zinda, Samarqand, Uzbekistan. Source by Sh. Mustafoev.	Abdulaziz Khan madrasah, Bukhara, Uzbekistan. Photo source by SH. Mustafoev
Other type	
	
Bukharain house. Usta Shirin Muradov. Poto source by B. Babamuratov	

Table 1. Evolution of Muqarnas in Uzbekistan

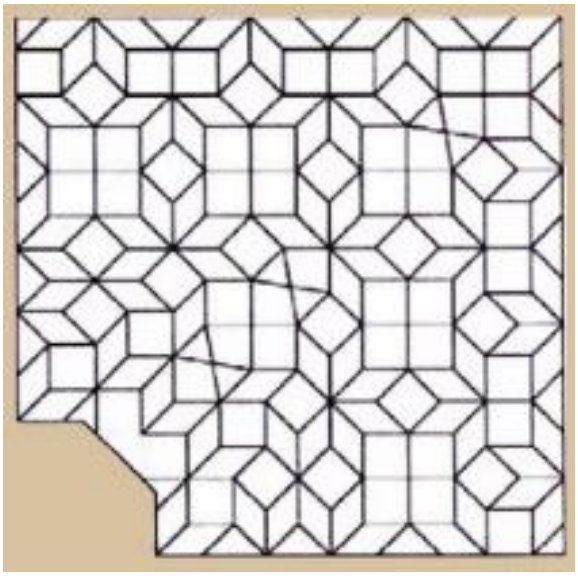
Square rhombus shaped type	Pole table type
	
The plaster plate found at Takht-i Sulaiman. Source by Dold-Samplonius & Harmsen, 2005.	"Daftari Girih" Tashkent 2/1. Photo source by SH. Mustafoev
Other type	
	
"Daftari Girih" Tashkent 4/3. Photo source by SH. Mustafoev	

Table 2. Evolution of Muqarnas based on architectural scrolls and artefacts.

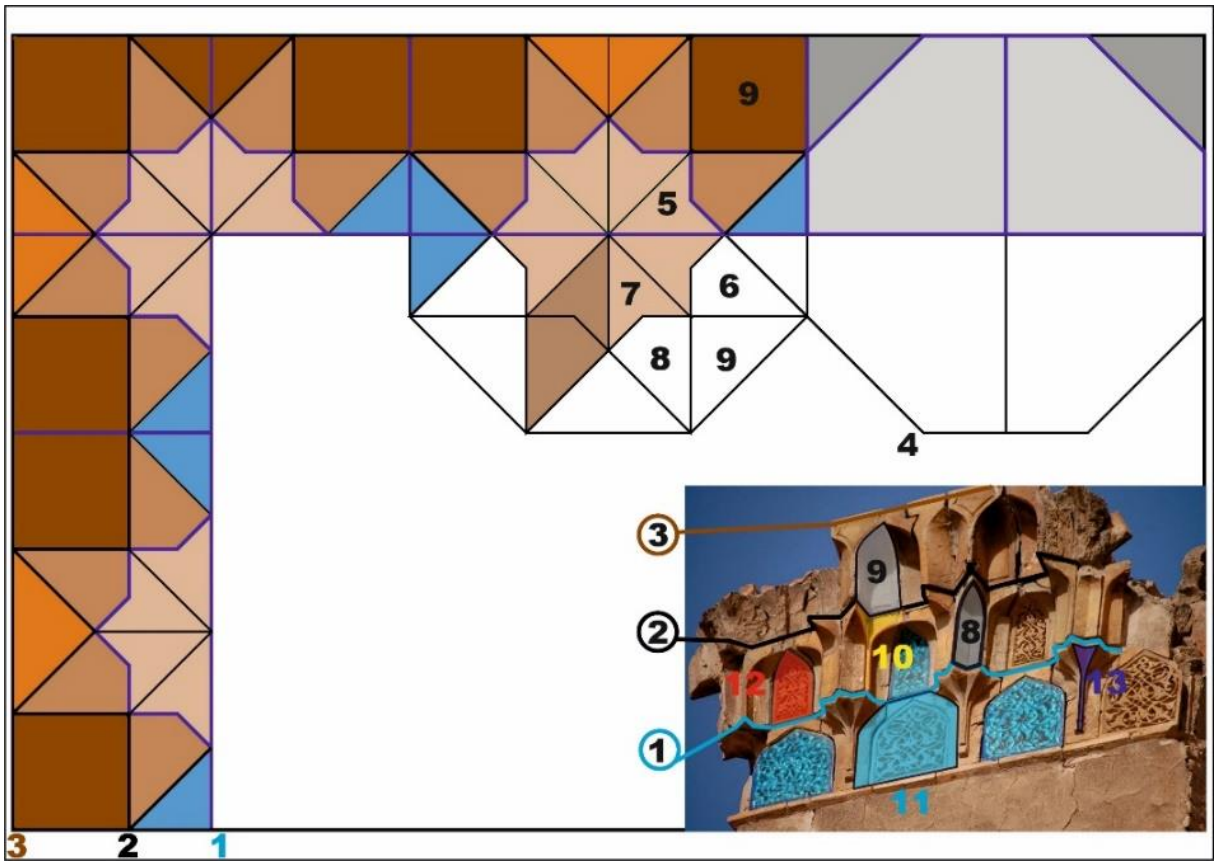


Fig. 1. Scheme of construction of a stalactite cornice in the mausoleum of Najmeddin Kubra (XIV century) in Kunya-Urgench by Sh. Mustafoev.
Etymological terms of the constituent parts of muqarnas1; 2; 3 – Takht. 5 – Part of Takht. 6; 8; 9; 12 – Kosagi (type of Taseh). 7; 13; 10 –G'ozpoya (Type of Poyagi also Geese feet, Madani). 11 – Kosacha (Espar)

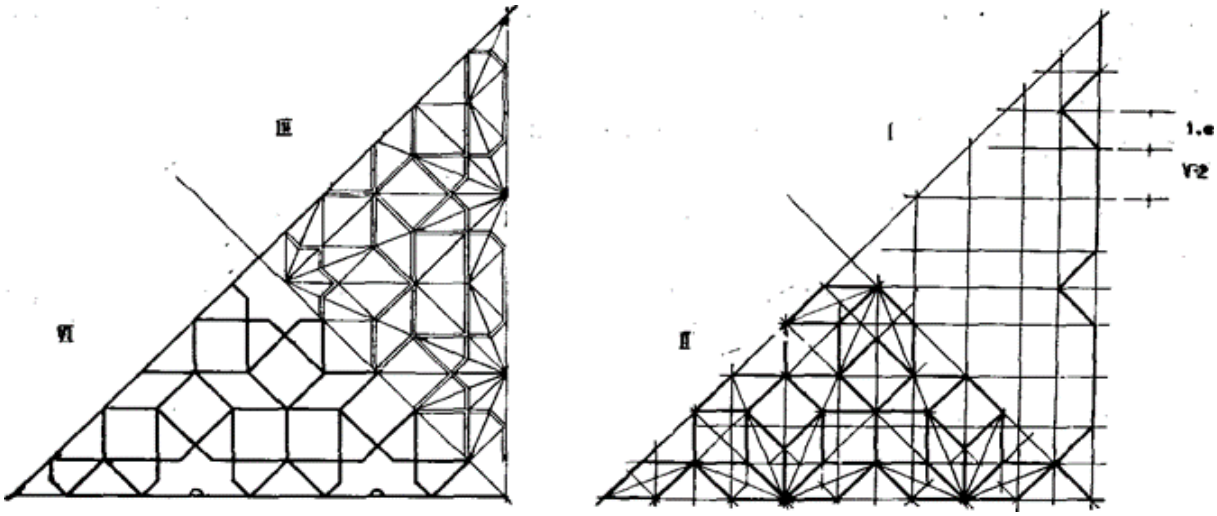


Fig 2. Construction of stalactites in the ziarat-khan of the mausoleum of Kusam-ibn-Abbas (1335). Corner Squinch. Sourse by I. I. Notkin

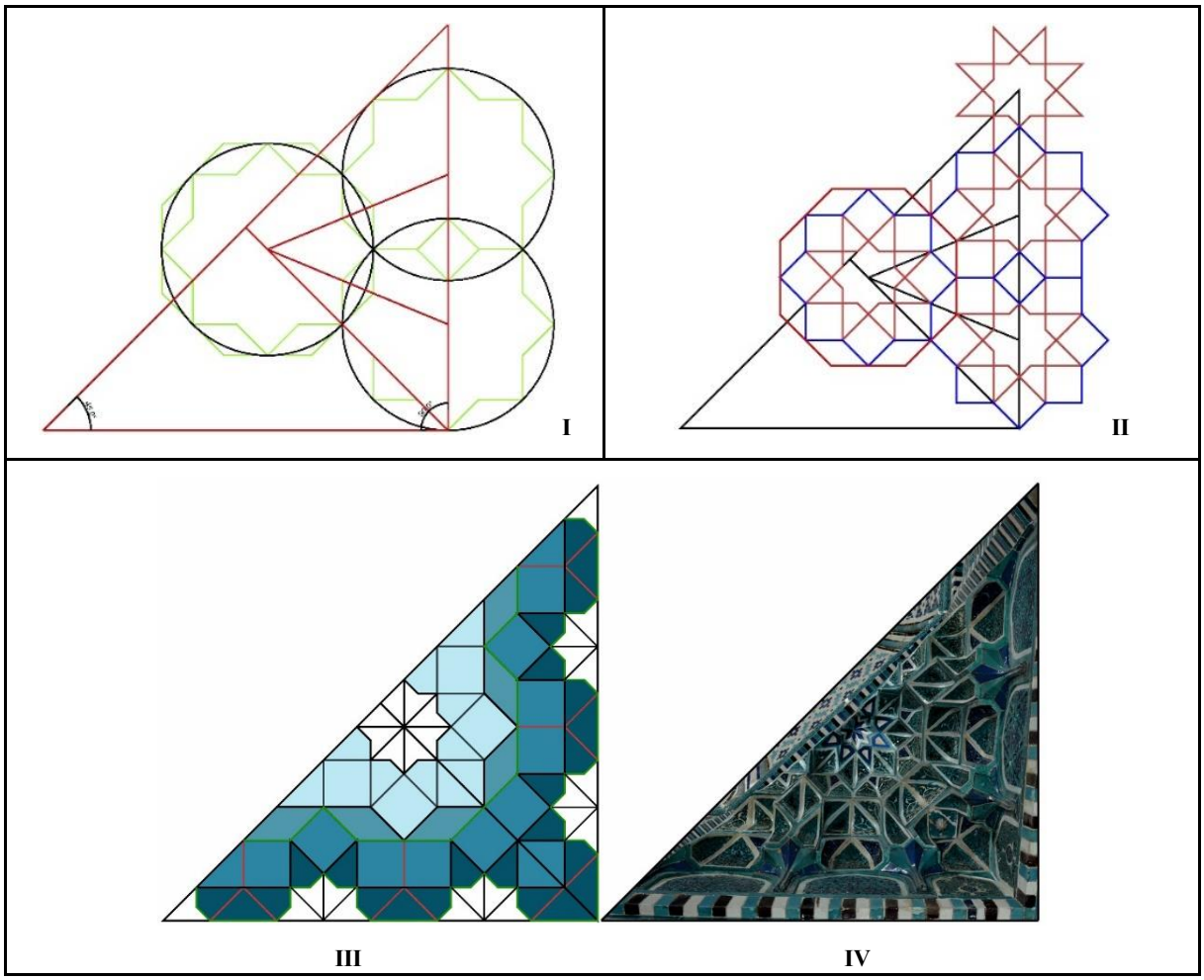
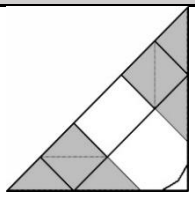
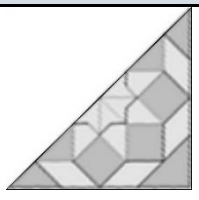
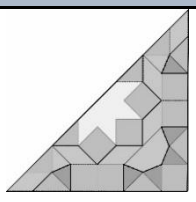
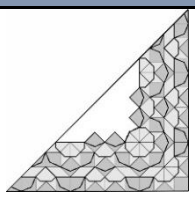
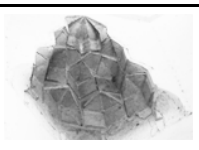
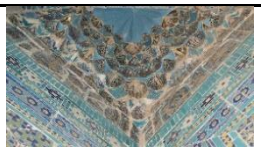
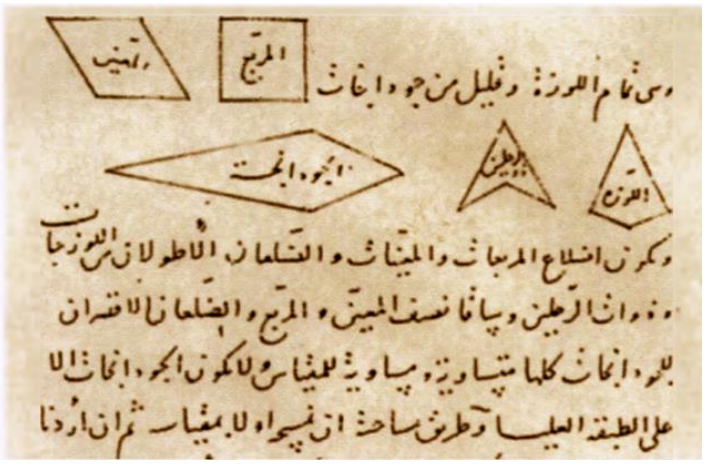
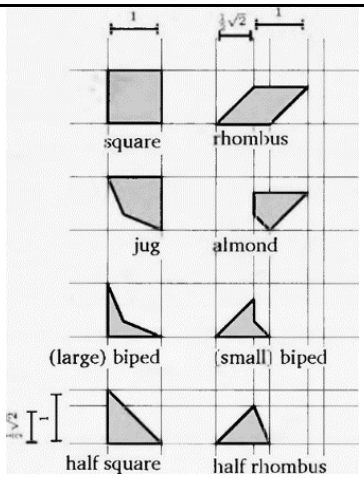


Fig 3. Construction of stalactites in mausoleum of Kusam-ibn-Abbas (1335). Corner Squinch. Geometric analysis and photo sourses by Sh. Mustafoev.
1. Beam grid (departing from the center of Shamseh - Nayzagi); 2. Geometric basis - "girih" figurative polygonal geometry; 3. Analysis - projection of series; 4. Typology of building blocks.

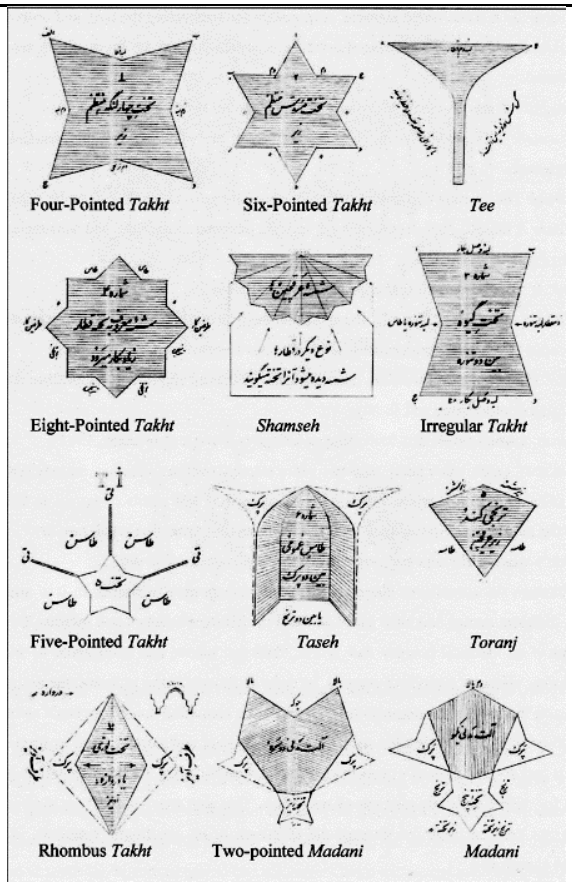
EVOLUTION OF STALACTITES IN CENTRAL ASIA IN IX-XIV CENTURIES. AN ANGULAR PART OF THE ARCHITECTURE – SQUINCH.			
XI th century.	*XII th century.*	*Beg. of the XIV th century*	*XIV th century.*
			
			
Mane Baba mausoleum.	*Arslan - II mausoleum. Kunyaurgench, Turkmenistan.*	*Mazlum sula khan mausoleum. Mizdakhan, Nukus.*	*Usto Ali Nesefi mausoleum. Shah-I-Zinda, Samarqand. Squinch.*



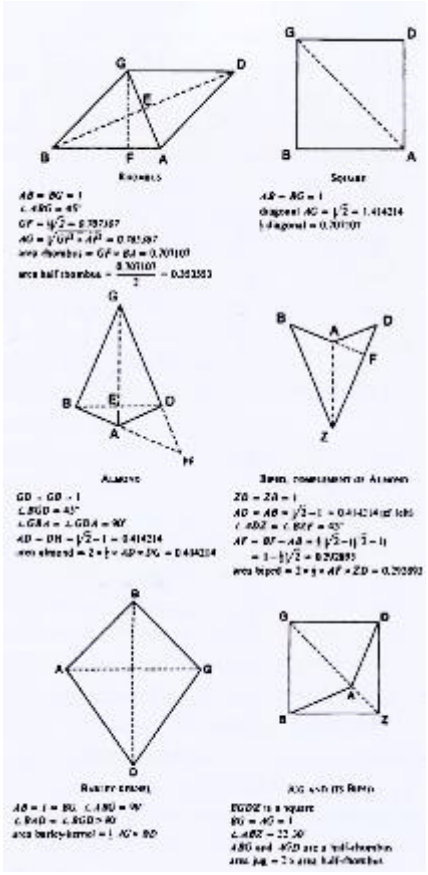
Constituent elements of muqarnas as introduced by Al-Kashi. Source by Dold-Samplonius, 1992.



Basic muqarnas elements of Al-Kashi by Harmsen, 2006.



Constituent elements of muqarnas, from Usta Lorzadeh. Source: adapted by Hamidreza Kazempour from Lorzadeh, 1981.



Geometrical definition of Al-Kashi's curved muqarnas components by Dold- Samplonius, 1992.

Table 3. Constituent elements of muqarnas

References

1. Andreev, M.S., Starinnie svitki albomi iz Buxari s obrazsami arxitekturnogo ornamenta (Architectural albums from Bukhara with samples of geometric ornamentation.). «Izv. Otd. obsh. nauk AN Tadj. SSR» (№.10 - II.). Stalinabad. pp. 121 – 136, 1956.
2. Dold-Samplonius, Y., Practical Arabic Mathematics: Measuring the muqamas by ALKashi. Centaurus, 35, pp. 193-242, 1992.
3. Dold-Samplonius, Y., How AL-Kashi measures the muqamas: A second Look. In M. Folkerts, ed. Mathematische Probleme im Mittelalter: Der lateinische und arabische Sprachbereich. Wiesbaden: Wolfenbütteier Mittelalter-Studien. pp. 56-9O, 1996.
4. Harmsen, S.L., Algorithmic Computer Reconstructions of Stalactite Vaults - Muqarnas – in Islamic Architecture. Heidelberg: Heidelberg University, 2006
5. Harmsen, S.L., Jungblut, D. & Kromker, S. (2007). Seljuk Muqamas along Silk Road. Zentrum far Wissenschaftliches Rechnen der Universität Heidelberg, pp. 1-11.
6. Kazempour, H., The Evolution of Muqarnas in Iran from Pre-Seljuk to Ilkhanid Period. Supreme Century. pp. 35-36; 63-65, 2016.
7. Mustafoev, Sh., Buxoro me'morchiligida qo'llanilgan qo'lyozmalar – daftari girixlar va ularning geometrik tahlili (Bukharian manuscripts – architectural scrolls and their geometric analysis.). // Arxitektura va qurilish sohasida innovatsiya, integratsiya, tejamkorlik mazvudagi xalqaro onlayn ilmiy-amaliy konferensiya (to'plami). Toshkent arxitektura-qurilish instituti. T., 2021.
8. Mustafoev, Sh., Construction of the "girih" – geometric pattern. Based on "Bukhara scrolls". Mejdunarodniy nauchniy jurnal «Vestnik nauki» (№ 10 (43). Tom I.). T. Russia, 2021.
9. Necipoğlu, G., The Arts of Ornamental Geometry: A Persian Compendium on Similar and Complementary Interlocking Figures. A Volume Commemorating Alpay Özdural. Brill. Leiden. The Netherlands, 2017.
10. Notkin, I. I. Buxarskaya rezba po ganchu v rabotax Usta Shirina Muratova (Bukhara "ganch" (clay gypsum) carving in masterpieces of Usta Shirin Muratov). Gosudarstvennoe izdatelstvo xudojestvennoy literaturi. T., 1961.
11. Notkin, I. I., Stroitelniye priyomi i konstruksii v arxitekture Xivi (Building techniques and structures in the architecture of Khiva). IZUz (№. 3.). T., 1965.
12. Notkin, I. I., Arxitektura Sredney Azii XIII-XIV vv (Architecture of Central Asia XIII-XIV centuries.). Vseobshaya istoriya arxitekturi, 1969.
13. Notkin, I. I., Minareti Xivi (Minarets of Khiva). T., Uzbekistan, 1978.
14. Notkin, I. I., Rebus XIV v (Rebus 14th century). № 7. Arxitektura i stroitelstvo Uzbekistana. T. pp. 23-25, 1991.
15. Notkin, I.I., Stalaktiti 14 v. Iz ansamblya Shaxi-Zinda (Stalactites 14th century From the Shakhi-Zinda Ensemble.). Zodchestvo Uzbekistana. Materiali i issledovanie (№ 2.). Izd. «Gafura Gulyama». T. pp. 239 – 254, 1970.
16. Notkin, I.I., Decoding Sixteenth-Century Muqarnas Drawings. In Muqarnas Volume XII: An Annual on Islamic Art and Architecture. Leiden: E.J. Brill, 1995.
17. Zoxidov, P.Sh., Me'mor olami (The world of architect.). "Qomuslar bosh taxririyati", 1996.

Manuscripts and Handwritten Sources

18. "Bukhara scroll". Ark foundation, Bukhara, Uzbekistan. Inv., №: 4429/16, № 4430/16, № 4174, № 4180, № 4176, № 4177, № 4179, № 4178.
19. "Tashkent scroll" Fund of Manuscripts of the Tashkent Institute of Oriental Studies named after Abu Rayhon Beruni. Documents with architectural drawings,

Tashkent, Uzbekistan. Doc.: №1, №2, №3, №4, №5, №6, №7.

20. Notkin, I. I., Obmeri medrese Ulugbeka v Gijduvane (Measurements of the Ulugbek Madrasah in Gijduvan). Arxiv GUOPMK. Inv. № 327, 1950.
21. Notkin, I. I. & Neumivakin, S. B., Obmeri medrese Ulugbeka v Gijduvane (Measurements of the Ulugbek Madrasah in Gijduvan). Arxiv GUOPMK. Inv. № 2873–2878, 1952.
22. Notkin, I. I. & Karasev, S., Obmeri medrese Ulugbeka v Buxare (Measurements of Ulugbek Madrasah in Bukhara). Arxiv GUOPMK. Inv. № 46, 49, 1348, 1549.
23. Abu al-Wafa Buzjani., Kniga o tom, chto neobxodimo remeslenniku iz geometricheskix postroeniy (A book about what an artisan needs from geometric constructions). Fiziko-matematicheskie nauki v stranax Vostoka. M, 1966.
24. Al Zabidi, الفاموس جواهر من العروس بتاج Trans.: Taj al-Arus Arabic Encyclopedia. Kuwait: Tab 'a Kuwait, 2008.
25. Al-Kāshī, Klyuch arifmetiki (The Key to Arithmetic). M, 1956.
26. Lorzadeh, H., رفته یاد از حیانفرعی، فنونمعرنص Trans.: Revival of Forgotten Arts: Muqarnas Techniques. Tehran, 1981.
27. Al-Kashi, رساله طاق و زح Trans.: Treatise on Arch and Vault. Hand-Written, 1954.
28. The Mirza Akbar Architectural Scrolls South Kensington Museum (the precursor of the Victoria & Albert Museum) by Sir Caspar Purdon Clarke in Tehran, 1876. [Online] Available from: https://patterninislamicart.com/drawings-diagrams-analyses/7/mirza-akbar-architectural-scrolls
29. Necipoğlu, G., The Topkapi Scroll: Geometry and Ornament in Islamic Architecture. Topkapi Palace Museum Library MS H., 1966. [Online] https://www.getty.edu/publications/virtual library/pdf/9780892363353.pdf

GEOMETRIC PROPORTIONS OF ARCHITECTURAL MONUMENTS

Dr. Rasul-Zade Lobar
Tashkent Institute of Architecture and Civil Engineering, Faculty of Architecture
Department of Interior and Landscape Design
lobar.rasulzade@bk.ru

Dr. Matniyazov Zafarbek
Tashkent Institute of Architecture and Civil Engineering, Faculty of Architecture
Department of Interior and Landscape Design
zafar18@mail.ru

Summary
The article is devoted to the history of the use of various methods of restoration and reconstruction of architectural monuments in Central Asia. Namely, the algebraic, geometric and modular way of defining the golden section in architecture as the most harmonious ratio of proportions. The application of these methods in Western European and Central Asian architecture, the influence of the law of the golden section on the system of measures are described.

Keywords: *Golden proportion, sequence of numbers, graphic reconstruction, architectural monument, golden section, modular system, diagonal system*

Introduction

Cultural heritage is the spiritual, cultural, economic and social capital of any irreplaceable value. Heritage feeds modern science, education, culture. Along with natural resources, this is the main basis for national self-respect and recognition by the world community.

Modern civilization has realized the highest potential of cultural heritage, the need for its conservation and efficient use as one of the most important resources of the world economy. The loss of cultural values is irreplaceable and irreversible. Architecture has been an essential part of human culture since ancient times. Therefore, the definitions of architecture are incomplete, limited by the characteristics of its activity side, like the one given by Alberti - “the art of building”. The concept of "architecture", even in everyday usage, extends to the historically established totality of the results of the application of this art.

Reconstructed construction method

Restoration of architectural monuments is a complex process that requires deep professional knowledge acquired over many years, practical experience, high

qualifications, a subtle, balanced approach to each individual structure, taking into account scientifically established methods established at the international level.

One of these methods is the reconstructed method of building proportional relationships in architecture, which is in good agreement with the problem of restoration of architectural monuments in Central Asia.

In architectural structures since ancient times, architects have sought to reflect the world cosmogonic order and world harmony.

And harmony, as it was already known to the ancients (Egyptians, Sumerians, Hindus, etc.), is contained in proportions. When searching for harmony, mathematical knowledge was used: both calculations and geometric constructions.

In more recent times, when the knowledge of ancient civilizations dispersed in the stream of time, much of their heritage was preserved among architects and even among builders' artels in the form of simple techniques for building a form.

Uzbekistan has a unique architectural heritage, of particular importance in the spiritual and economic development, as well as the recognition of the international historical and cultural status of the country.

The sights of Uzbekistan are, first of all, the ancient cities of the **Great Silk Road** with their stunning **oriental architecture** and unique cultural monuments: Samarkand, Bukhara, Khiva, Shakhrisabz, Tashkent, Kokand, Termez and a dozen smaller cities that have retained their original atmosphere.

Azure domes of mosques, grandiose portals of madrasahs, slender minarets, luxurious palaces, mausoleums and other medieval buildings, rock paintings, archaeological finds from the time of Zoroastrianism, ruins of ancient settlements and fortresses - here you will find a full immersion in the history of the East (Photo 1, 2, 3, 4).

Fun fact: while traveling in Uzbekistan, your eyes will constantly stretch upwards. The uniquely ornamented ceilings fascinate with their beauty and unsurpassedness.

Photo 1. Ensemble Khazret Imam. Photo by https: centralasia-travel.com [13].

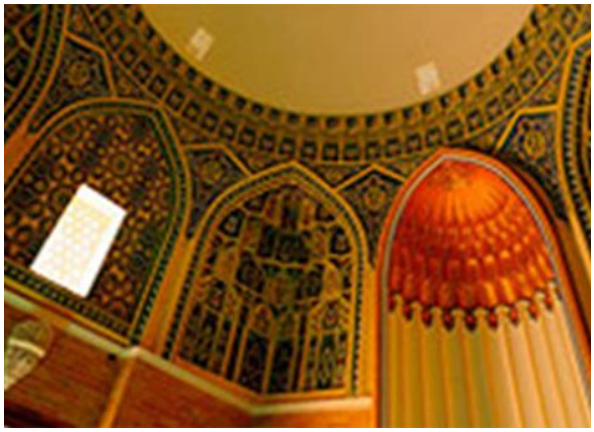


Photo 2. Mausoleum of Yunus-Khan in Tashkent. Photo by https: centralasia-travel.com [13]

Photo 3. Ceilings of the complex Hast-Imam. Photo by lostwithpurpose.com [14].

Photo 4. Ceilings of the madrasah Tilla-Kari. Photo by blog.agent.ru [15].

Uzbekistan is magical at any time of the day, but the blue hour at sunset and the golden hour before sunrise are by far the most beautiful times to explore the cities.

A case in point: the stunning Gur-Emir mausoleum, under which Amir Timur himself is buried, completely devoid of people, despite the beautiful lighting at 5 in the morning (Photo 5, 6).

Photo 5. Tillya-Kari Madrasah (Samarkand). Photo by geektrips.ru [16]

Photo 6. Registan square (Samarkand). Photo by Willy van Rooijen [17]

Khiva is one of the main cities of ancient Khorezm and the only city of modern Uzbekistan that has preserved almost intact a whole section of the medieval **Shahristan** - Ichan-Kala ("inner city"). The ancient citadel, surrounded by a mighty city wall, will appear before you in the guise of a living medieval city from an Eastern fairy tale (Photo 7, 8).

Turquoise and blue tiles are the signature style of Persian Timurid architecture that you will find throughout Uzbekistan.

Photo 7. Ichan-Kala. Khiva, Uzbekistan. Photo by centralasia-travel.com [18]

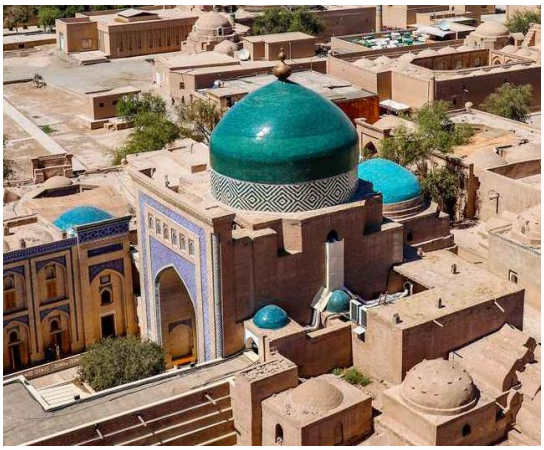


Photo 8. Ichan-Kala. Khiva, Uzbekistan. Photo by thetravelmagazine.net [19]

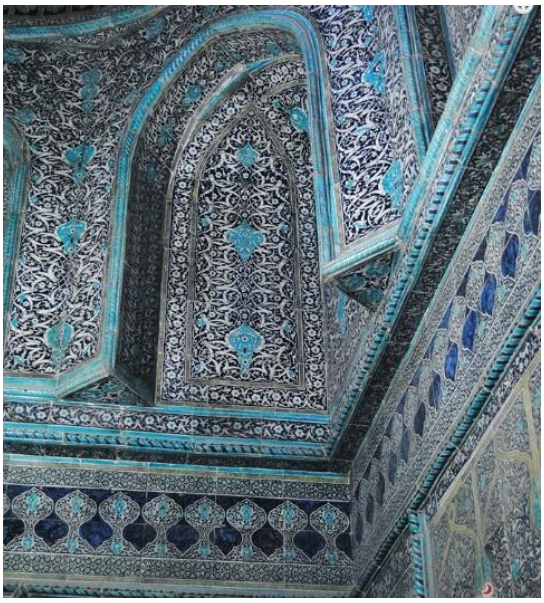


Photo 9. The architectural complex of Pahlavan Mahmud. Khiva, Uzbekistan [20]

Unfortunately, time is inexorable and many of the monuments are in a deplorable state or they are threatened with physical destruction.

In many cases, the requirements of scientific restoration are ignored with the involvement of restorers for its implementation, which leads to the replacement of repair and restoration work with work on the radical reconstruction of cultural heritage sites.

Bukhara, where this practice of restoration continues, could end up on the List of World Heritage in Danger. Below are just a few examples. In the madrasah of Abdulazizkhan of the 17th century, which is considered an encyclopedia of Central Asian decor due to the richness of decoration, as a result of lowering the cultural layers in the historical core of the city using heavy equipment, without preliminary research and competent preparatory work, the central part of the side facade and all the adjacent buildings of the madrasah collapsed (Photo 10). On the verge of collapse is the Ulugbek Madrasah of the early 15th century, the oldest surviving one in Central Asia. The monument is squeezed from both sides by two-story commercial buildings protruding onto the square, which appeared in 2017 (Photo 11).

Photo 10. Madrasah of Abdulazizkhan. Photo by Yusupova M. [21]

Photo 11. Madrasah of Ulugbek. Photo by Yusupova M. [21]

I would like to note that the restoration of architectural monuments is a complex process that requires professional knowledge, practical experience, high qualifications, a balanced approach to each individual building, taking into account scientifically based methods established at the international level.

The unifying principle that creates harmony in architecture is proportionality. "Proportion," Vitruvius wrote, "is the correspondence between the members of the work and its whole in relation to the part taken as the original, on which all proportionality is based." [1].

Restoration of architectural monuments according to the ancient method of constructing forms and establishing proportionality is based on identifying the modular structure of the building, which has the loss of individual elements (the completion of portals, domes, arches and arched vaults. To restore the building, it is necessary to restore its original modular structure, then the lost elements will be filled in this structure the place allotted for them in those proportions that are provided for in this modular structure.

The studies of proportionality and the construction of architectural forms, carried out on individual architectural monuments of Central Asia, include the publications of B.N. Zasypkina, L.N. Voronina, Sh.E. Ratia, V.L. Voronina, L.I. Rempel, G.A. Pugachenkova, L.Yu. Mankovskaya, Yu.Z. Shvab, I.E. Pletkova, S.G. Khmelnytsky.

The first generalizations of the methods of proportionality of the architecture of Central Asia in a wide time range were carried out in the 70s by M.S. Bulatov, V.M. Filimonov, P.Sh. Zakhidov, K. S. Kryukov.

The study of proportionality in the architecture of Central Asia should be carried out by a comparative analysis with the architecture of Greece. After the conquests of Alexander, the Great, the Hellenistic states - Parthia, Margiana, Bactria - were formed in Central Asia. Hundreds of years of communication with Greek culture left their mark on the methods of establishing proportionality, which is confirmed by the preserved architectural monuments of the 3rd - 1st centuries. BC.

There are three main methods for constructing proportions:

1. Arithmetic systems where proportions are calculated by an abstract method (by numbers).

2. Geometric systems of proportions, where all three projections of the structure are determined by geometric constructions (most often based on a square or circle). The principle of similarity of parts plays the greatest role here.

3. A variation of these methods is a modular system, in which any part of the building (for example, its length or column diameter) is taken as a unit (module), and

in relation to it all other dimensions are expressed in prime numbers.

This is how the proportions of Greek architecture were explained by the Roman theorist of the 1st century BC. BC e. Vitruvius and a number of modern researchers, for example, Choisy [2].

The cornerstone of world harmony, without faith in which natural scientific thinking would lose most of its attractiveness, is mathematics.

Already Plato deeply understood not only the mathematical, but also the aesthetic essence of proportion, which allows linking the whole and its parts. This is evidenced by the following passage from the Timaeus: "It is impossible for two things to be perfectly united without a third, since a connection must appear between them that would hold them together. This can best be done by proportion, for if three numbers have that property, that the mean is related to the lesser as the greater is to the mean, and vice versa, the less is to the mean as the mean is to the greater, then the last and the first will be the middle, and the middle the first and the last [3].

The mathematic method of proportion.

This statement of Plato will become clear if we translate it into the language of mathematics. Introducing the notation:

a is the larger ("last") number,

x - average number ("link"),

y is the smaller ("first") number,

- we have **x: y = a:x**, or **y: x = x: a**, or **ay = x2**

Under **x** and **y**, Plato understood parts of the whole **a**, that is, that **x + y =a**, and the ratio of these parts to each other constitutes the golden ratio **a: x = x: (a - x)**. Hence the opinion that ancient proportions are based on the golden ratio.

In mathematics, the golden ratio is present in the sequence of numbers traditionally called the "Fibonacci series". The Fibonacci series is named after the famous medieval mathematician Leonardo of Pisa, later called Fibonacci. This numerical sequence is a progression in which each subsequent term is equal to the sum of the previous two.

The Fibonacci series is an infinite sequence of numbers starting with: 1, 1, 2, 3, 5, 8, 13..., in which each of them is the sum of the previous two, corresponding to the formula

$$F_n = F_{n-1} + F_{n-2}$$

Thus: 2=1+1, 3=2+1, 5=3+2, 13=8+5. For any value greater than 3 contained in the sequence, the ratio between any two consecutive numbers is 0.618, or the golden ratio [4].

The peculiarity of this series is that the ratio of adjacent numbers is equal to the value of the golden section, namely, 0.618. For example: ratio **21:34 = 0.618**.

But a person distinguishes objects around him by shape. Interest in the form of an object may be dictated by vital necessity, or it may be caused by the beauty of the form. The form, which is based on a combination of symmetry and the golden ratio, contributes to the best visual perception and the appearance of a sense of beauty and harmony. The whole always consists of parts, parts of different sizes are in a certain relationship to each other and to the whole. The principle of the golden

section is the highest manifestation of the structural and functional perfection of the whole and its parts in art, science, technology and nature.

Back in the Renaissance, artists discovered that any picture has certain points that attract our attention, the so-called visual centers. In this case, it does not matter what format the picture has - horizontal or vertical. There are only four such points, and they are located at a distance of 3/8 and 5/8 from the corresponding edges of the plane [6].

About geometric method of proportion

This discovery among the artists of that time was called the "golden section" of the picture. The golden ratio is a harmonic proportion, and if in mathematics a proportion (Latin proportio) is the equality of two ratios: a : b = c : d, then in the language of geometry this proportion is quite easy to construct (Figure 1).

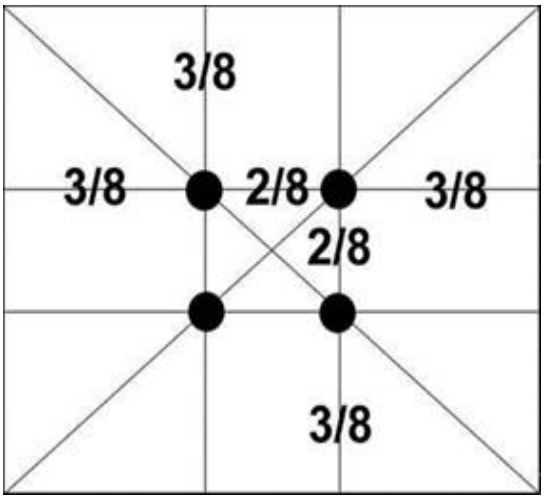


Figure 1. Golden section of the picture. (Voloshinov A.V. Mathematics and Art) [22].

Line segment AB can be divided into two parts in the following ways:

- Into two equal parts - AB: AC = AB: BC;

- Into two unequal parts in any ratio (such parts do not form proportions);

Thus, when AB : AC = AC : BC (Figure 2).

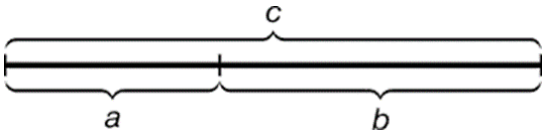


Figure 2. Geometric figure golden ratio [23]

Practical acquaintance with the golden ratio begins with dividing a straight-line segment in the golden ratio using a compass and ruler.

From point B, a perpendicular equal to half AB is restored. The resulting point C is connected by a line to point A. On the resulting line, a segment BC is plotted, ending with point D. The segment AD is transferred to the straight-line AB. The resulting point E divides the segment AB in the ratio of the golden ratio (Figure 3).

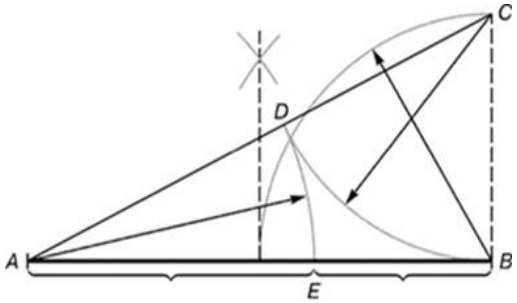


Figure 3. Division of a line segment according to the golden section BC = 1/2 AB; CD=BC [23]

Segments of the golden ratio are expressed by an infinite irrational fraction AE = 0.618, if AB is taken as one, BE = 0.382. For practical purposes, approximate values 0.62 and 0.38 are often used. If the segment AB is taken as 100 parts, then the larger part of the segment is 62, and the smaller one is 38 parts.

The most famous application of the golden ratio is the so-called golden rectangle, which can be divided into a perfect square

and a smaller rectangle of the same proportions as the "parent" rectangle.

In simple terms, if you have two objects (or one object that can be divided into two, similar to the golden rectangle), and if, after the above math, you get the number 1.6180, it is usually considered that two objects demonstrate the golden ratio.

The masterpieces of ancient architecture said that the "Exact proportionality" of parts and the whole can be achieved in another way - geometric.

For example, by constructing a square with side AB and measuring its diagonal AC with a cord, it was not difficult to obtain the irrational proportion AB / AC = 1, even without knowing the irrational numbers (Figure 4).

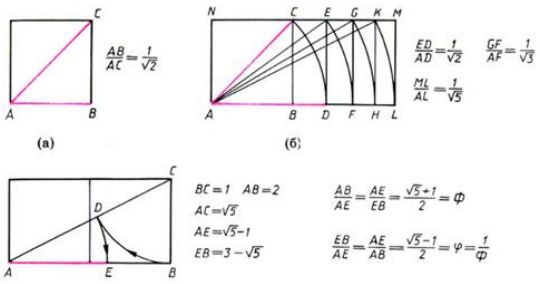


Figure 4. Construction of a golden rectangle (Voloshinov A.V. Mathematics and Art) [22].

Further, having set aside with the help of a cord on the continuation of the side AB the diagonal AC=AD, it was easy to construct a rectangle with an irrational aspect ratio DE/AD=1.

By repeating this operation several times, one can obtain a system of rectangles with irrational aspect ratios. It is clear that the rectangle AHNK (Figure 4-b) consists of two squares. Thus, we get another practically convenient way to obtain irrational relations - a system of two squares.

$$\frac{AB}{CD} = \frac{56}{90} = \frac{90}{146} = \frac{\sqrt{5}-1}{2} = \varphi = 0{,}618$$

There is another amazing evidence of the wisdom of the ancients. In Naples, in the National Museum, there is a proportional compass found during excavations in Pompeii. A proportional compass is a necessary attribute of an architect.

The action of the proportional compass is based on the similarity of triangles and does not require special comments (d). So, the Pompeian compass is tightly fixed in relation to the golden section!

This is easy to check, knowing the dimensions of the compass, which are indicated in figure (d) in millimeters (Figure 5).

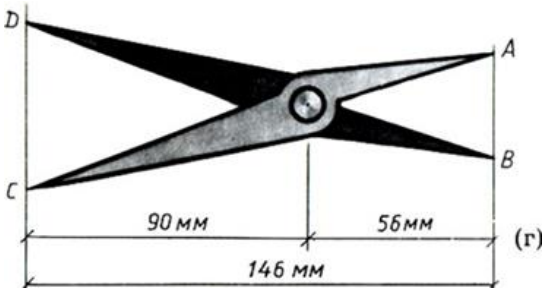


Figure 5. Proportion of the Pompeian compass. (Voloshinov A.V. Mathematics and Art) [22].

The property of continuous reproduction and preservation of the original geometric shape, noted above for rectangles and other geometric elements, is reflected in a peculiar way in a curve called a logarithmic spiral (Figure 6).

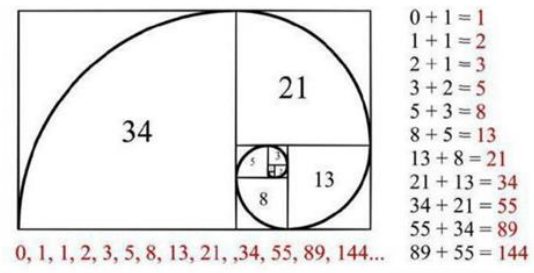


Figure 6. Building a golden spiral using Fibonacci numbers. (Voloshinov A.V. Mathematics and Art) [22].

It is known that the form of the logarithmic spiral was already used in ancient Greek and Roman architecture on the capitals of the Ionian order, and many prominent researchers were studying its features [7].

At one time, Choisy correctly noted that when establishing proportions, the Egyptians often used triangles with an aspect ratio of 3:4:5 or triangles, which are made up of various combinations of sides expressed by the numbers 3, 4 and 5 (Figure 7a, b).

In the Elephantine temple, Choisi indicated the use of a triangle with a ratio of height to base of 4:10, derived from the "sacred" triangle of 3:4:5 (Figure 7c, d).

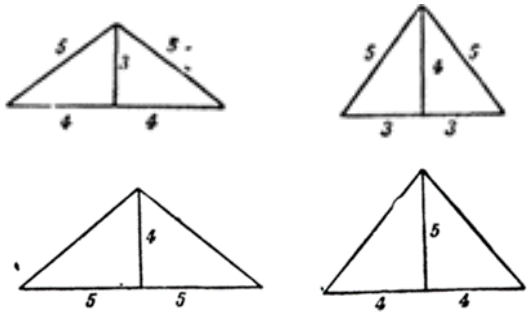


Figure 7. (a, b, c, d) Construction of triangles derived from "sacred". (Grant Arakelyan) [24]

In the architecture of Ancient Egypt, according to the rules of the golden ratio, the pyramid of Cheops was built. Looking at the creation of the builders, you can see a triangle with a right angle, one leg of which is the height, the second is half the length of the base.

If we take the ratio of the hypotenuse to the smaller side, we get the ideal value of 1.61950 or 1.62 (Figure 8 a, b).

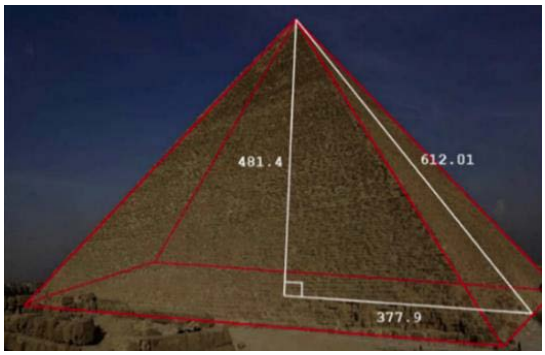


Figure 8 (a). Analysis of the construction of the Pyramid of Cheops. (Grant Arakelyan) [24]

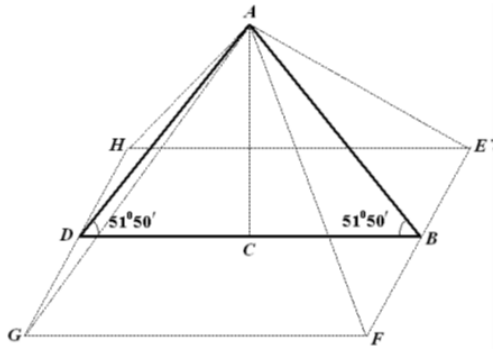


Figure 8 (b). Analysis of the construction of the Pyramid of Cheops. (Grant Arakelyan) [24]

Let's return to the golden model from the point of view of angular correspondence. Angle ϙ defined by the ratio well within the designated range of acceptable values. The golden angle, supported by the testimony of Herodotus, fascinates many with its accuracy (Figure 8 c, d).

$$\text{ϙ} = \text{arctg}\ \sqrt{\Phi} = 51°49'40''$$

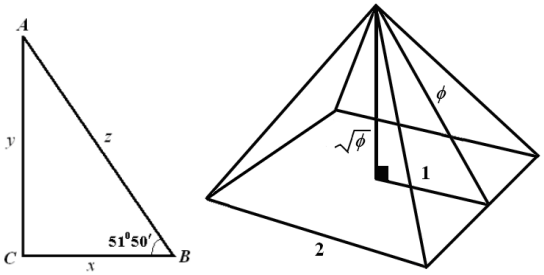


Figure 8 (c, d). Analysis of the construction of the Pyramid of Cheops. (Grant Arakelyan) [24]

Perfect proportion makes architectural objects memorable. A striking representative of the golden ratio from ancient Greece is the Parthenon, which was erected in the 5th century BC. If you take the ratio of its height to width, you get an almost perfect number of 0.618.

Naturally, each author sought to test his theory on the proportions of the Parthenon. The Parthenon was and remains the most perfect of architectural structures, architectural sculpture, a marble code of laws of ancient architecture.

But, the fact is that in his work Vitruvius rightly calls perfect those structures in which "exact proportion" of all parts with the main measure is achieved. Since then, the "exact proportionality" that Vitruvius speaks of has been understood in the simplest arithmetic sense - as the multiplicity of all parts of the structure to the main module [1].

A module in architecture (from Latin modulus - measure) is a unit of measure taken to coordinate the dimensions of the parts of a structure with each other and with the entire structure. Depending on the design and composition of the building, various values were taken as a module, for example, the diameter of a column in ancient architecture or the diameter of a dome in Byzantine architecture.

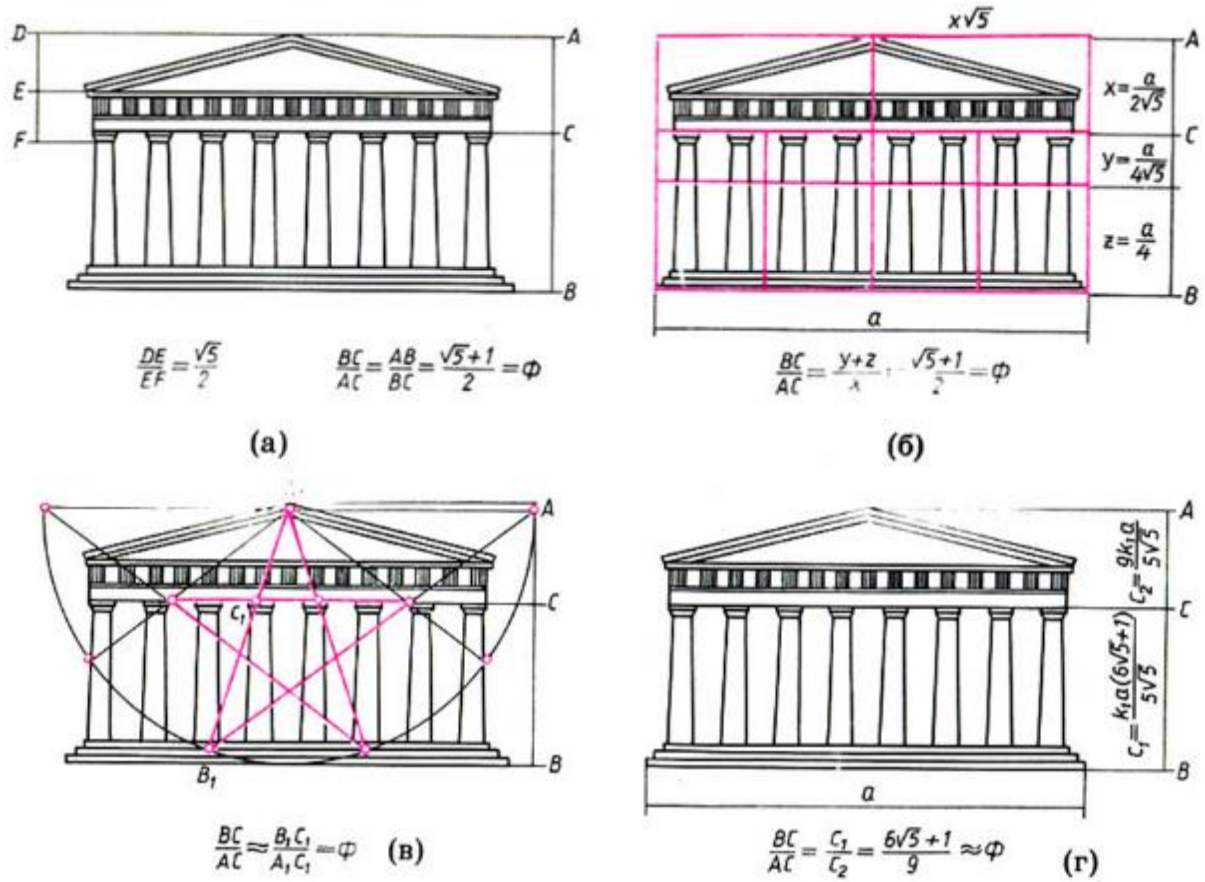


Figure 9. (а, б, в, г) Options for constructing proportions Parthenon. (Voloshinov A.V. Mathematics and Art) [22].

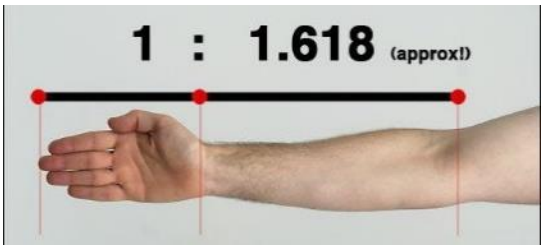


Figure 10. Proportionality of body parts in the golden ratio [25]

Even more often, the so-called linear module was used, when the architectural measure was directly a measure of length. In the history of all peoples, length measures have always been naturally associated with a person: a step, a azhen, a foot, a span, a foot, an inch, a yard, a gaz, etc.

Finding proportion with module systems

Thus, we have come to the third method of restoring proportions, namely, to the modular system in the analysis of proportions and proportions.

The famous restorer B.N. Zasypkin in his writings noted the presence of a modular system in the construction of architectural forms of the Rabat-i-Malik caravanserai in the Bukhara region. L.N. Voronin established the proportions of the architectural forms of the Barak Khan Madrasah in Tashkent, finding the proportionality of the portal 1/1, which has the proportions of the golden section. Sh.E. Ratia inscribed the plan of the Bibi-khanym mosque into a modular grid, the side of which is equal to the diameter of the western minaret of the mosque. The module is a multiple of a unit of length - gaz in 73 cm.

G.A. Pugachenkova carried out an analysis of the construction of the mausoleum of Gumbez Manas, inscribing it in a grid of semi-gazs - 35 cm. On a modular grid G. A. Pugachenkova built the plan of the Square House in Novaya Nisa, using the method of constructing diagonal squares, according to which the proportions of the plan of the mausoleum of Sultan Sanzhar were built. In the early 60s, K.S. Kryukov analyzed the modular structure on 35 architectural monuments. However, all these researchers perceived the modular system only as a tool necessary for organizing the construction process [10]ç

M. S. Bulatov, on the basis of extensive material, as a result of many years of research, determined the primacy of geometric constructions, resorting to algebraic formulas and believing that this method could be applied directly at the construction site [9].

1. The initial parameter in determining the proportions of the structure was a square plan, the main constituent elements of which, as well as the height of the cube, were expressed in terms of a module equal to a large-sized brick 60 X 60 cm.

2. To establish the proportions of the Samanid mausoleum, the architect used the derivatives of three squares: internal and external, at the level of the plinth and internal at the level of the tromp tier.

3. Along with the harmonization of architectural forms, based on the ratio of the side and diagonal of the square, the architect also uses the division of the segment in the extreme and average ratio, that is, the derivatives of the side in the diagonal of the semi-square.

4. The proportions of the mausoleum feature detailed rectangles with aspect ratios (Figure 11).

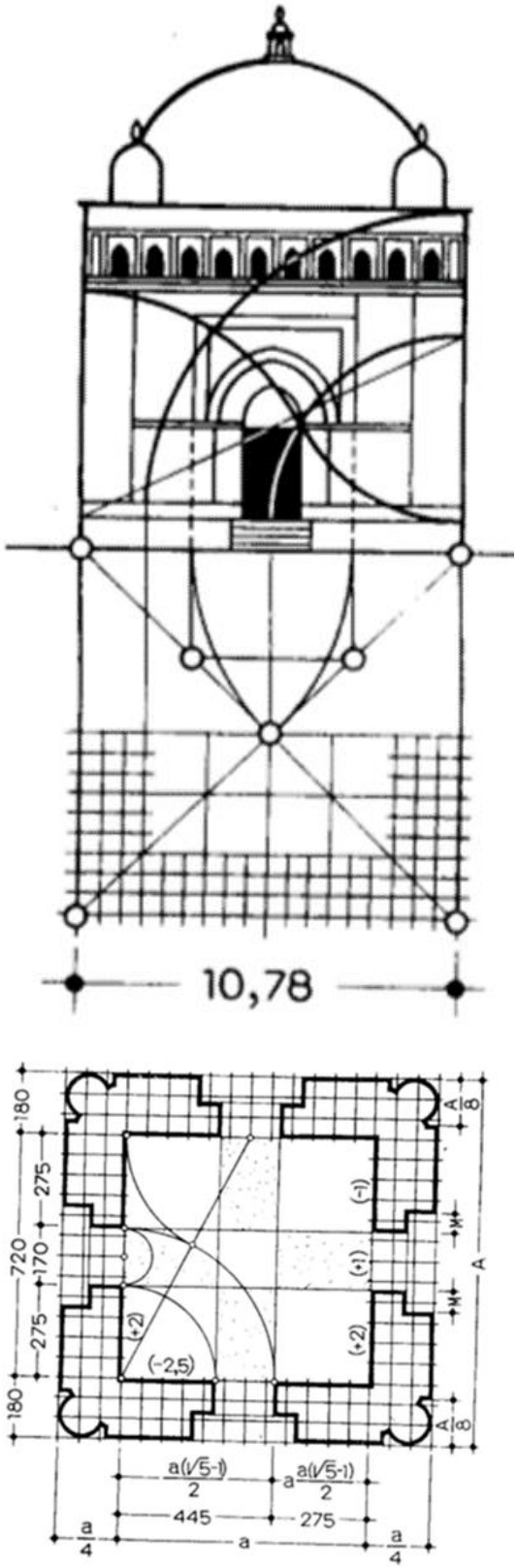


Figure 11. Reconstruction of the plan of the Samanid Mausoleum based on algebraic calculations. Bulatov M.S. [26].

$$\frac{\sqrt{5}\pm1}{2} \quad ; \quad 1:\frac{\sqrt{2}}{2}$$

However, the calculation of the dimensions of parts and the whole building, as suggested by M.S. Bulatov, resorting to algebraic formulas for calculating sizes, is incredibly laborious and hardly feasible in practice. It is easier to understand this if you put yourself in the place of an ancient architect who was given the task of building a certain structure (temple, palace, etc.). Any master used simple techniques and tools. Measures of length (a rope with knots), squares, plumb lines, as well as a set of proportions that made it possible to harmonize a future building of one type or another.

Moreover, the calculation of proportionalities by the algebraic method sometimes leads to an erroneous reconstruction. This is confirmed by various variants of graphic reconstruction of the mausoleum of Sultan Sanjar.

In the reconstruction of M. S. Bulatov gives an analogy with the mausoleum of the Samanids, repeating its artistic imaϕϕϕge and proportions based on the golden section.

The modular grid of M. Bulatov corresponds to the full size, but the proportionality of the inner and outer square expresses the golden ratio approximately (0.636)

However, with this construction, the quadrangle of the walls was overestimated so that the octahedron of the base of the dome was hidden behind the arcade, which did not correspond to the surviving photographs and fragments (Figure 12).

As. himself writes M. S. Bulatov "The upper levels of a quadrangle and a semi-cube could, generally speaking, be on the same level, but they do not coincide, which, apparently, was caused by the desire of architects in every possible way to maintain proportions due to derivatives: in one case - the inner square, in the other – the outer semi-square. The breakdown of the gallery in plan is characterized by a simple ratio of the values of a small module, i.e. gaz: the span of the arch is 4 gaz, the abutments of the arch are 3 X 2.25 gaz, the side abutments are 6 gaz.

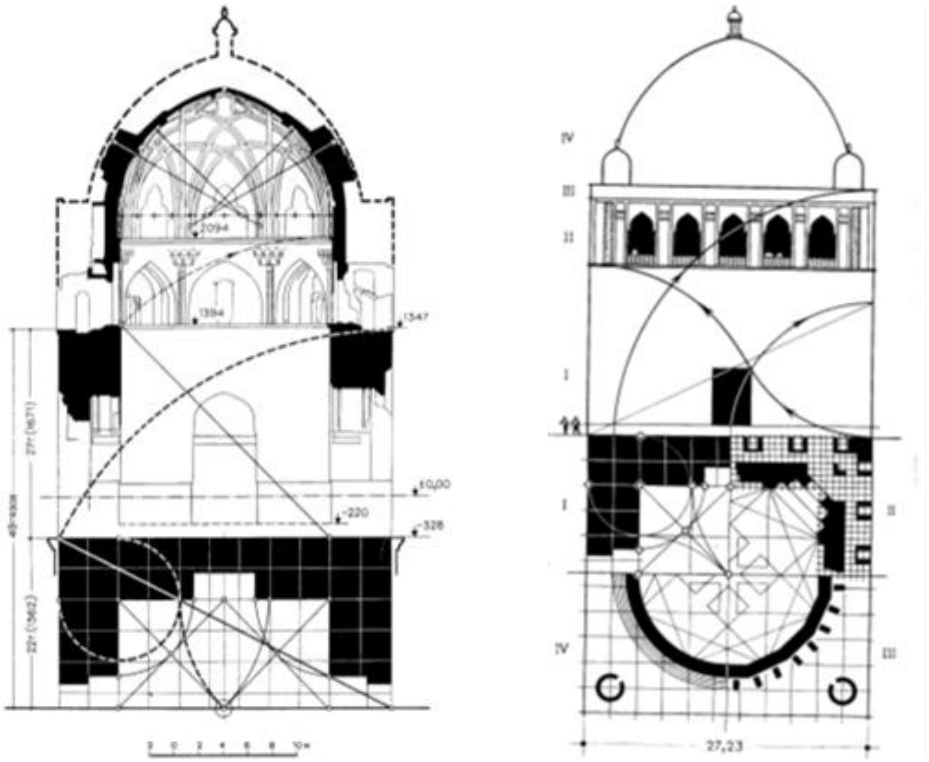


Figure 12. Graphic reconstruction of the mausoleum of Sultan Sanjar (Bulatov M.S.) [26]

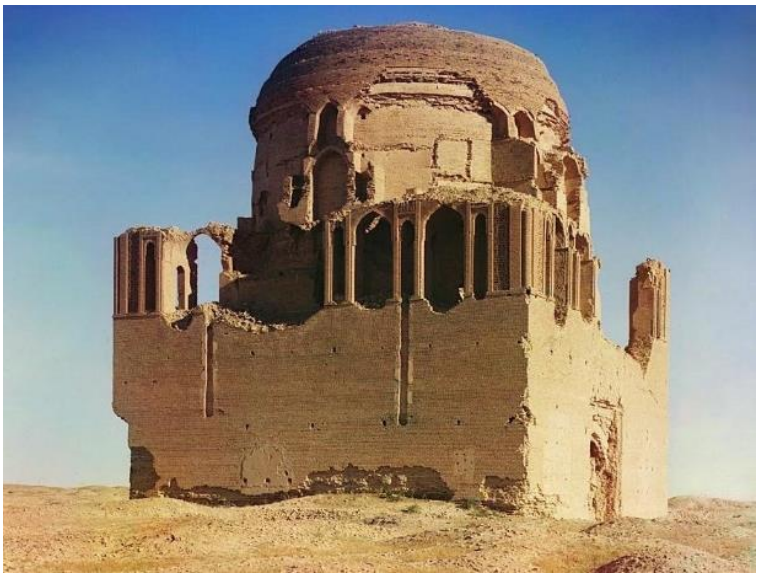


Photo 12. Mausoleum of Sultan Sanjar. Merv. Poto by humus [27]

In the future, researchers are more and more inclined to use a modular grid in the reconstruction of architectural monuments, believing that modular proportions are in multiple ratios with a measure of length.

The primacy in deciphering the method of constructing the architectural forms of the mausoleum belongs to G.A. Puganchenkova. She builds the plan of the mausoleum on a system of diagonal squares (Figure 13).

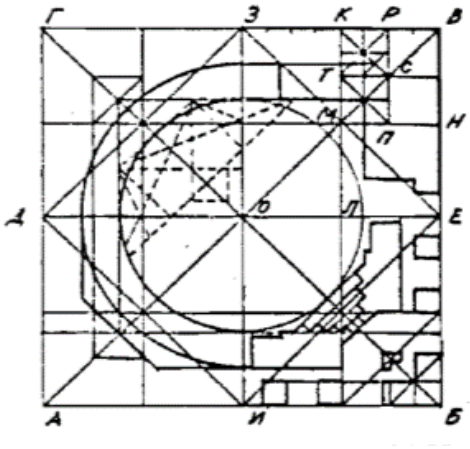


Figure 13. Construction of the plan of the mausoleum of Sultan Sanzhar according to the system of diagonal squares (Pugachenkova G.A.) [28]

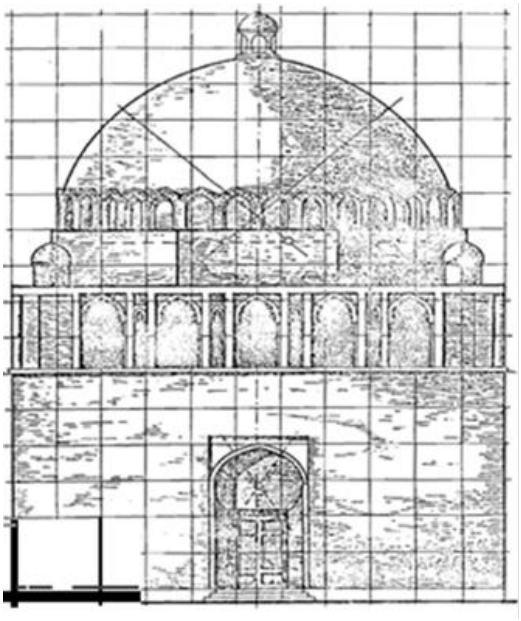


Figure 14. Graphic reconstruction. (Kryukov K.S.) [29].

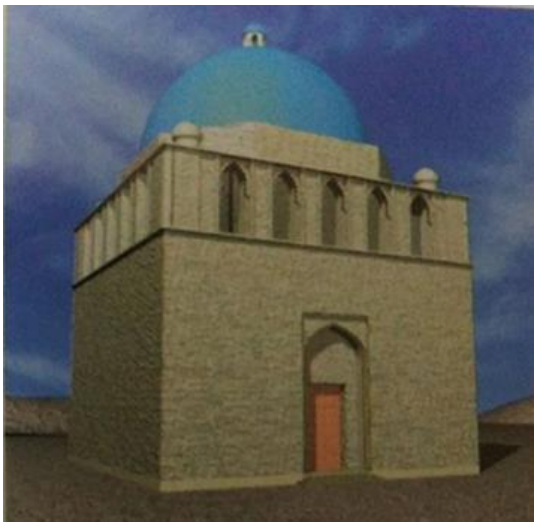


Figure 15. Reconstruction Mausoleum of Sultan Sanjar. Mausoleum with computer programs (Rasul-Zade L.U.) [30]

A new square (DZEI) is inscribed diagonally into the square of the outer walls (ABVG), the diagonals of which (DE and ZI) divide the square into 4 small squares (148, p. 347). The construction on the basis of diagonal squares leads to the fact that the side of the smallest square is 1/16 of the large one and is taken as a module, while the ratio of the inner square to the outer one is 10:16 or 5:8, which corresponds to the proportions of the golden section. By the way, according to M. Bulatov, the side of the small square was 1/11 part [8].

K.S. Kryukov proposed a graphic reconstruction of the mausoleum of Sultan Sanjar based on modular proportions. According to the author, the facade, plan, arched gallery of the mausoleum is subject to a modular structure in proportion to 25:24 gaz. With this construction, the mausoleum did not lose such an important element as the octahedron of the base of the dome [10].

Later, the author of this article proposed a graphic reconstruction of the mausoleum

based on a modular system using computer programs.

Thus, outstanding architectural works once again convince that the harmony of architecture is born not in the complexity of its forms, but in their ingenious simplicity [11].

Conclusion

The method of analysis of proportions and proportions is traditionally considered one of the most researched. The essence and special interest of this method lies in the fact that it allows you to penetrate into the creative laboratory of ancient architects even when no written or other documentary evidence has been preserved about the design and construction of works of ancient architecture that have come down to us. Ancient civilizations systematically accumulated knowledge - astronomical, mathematical, and engineering.

The method of proportionality analysis consists of two more or less autonomous directions.

A) Analysis of multiple ratios.

The study usually begins with a building plan. First, they try to find simple ratios (2:3, 3:4, 4:5, etc.) between the sides of the building plan. Then they look for the same relationship between large articulations or parts and the whole. At the same time, it is necessary to identify those patterns that were laid down by architects in the process of creating a structure. To do this, the identified divisions are compared with known historical measures of length. Then similar work is done with the facades, sections of the monument.

B) The search for geometric patterns in the structure of an architectural monument.

Ancient architects often used geometric constructions to create harmonious proportions of their structures. Such constructions could be based on simple geometric figures, such as an equilateral triangle, a square and half a square, etc.

It should be especially noted that both main directions of the research method under consideration (metrological and proportional) do not contradict each other, the same monument can be subjected to both types of research sequentially with subsequent generalization of the results.

References

1. Vitruvius, Ten books on architecture. - M., 1936.
2. Shuazi O., History of architecture. - vol. 1-2, M., 1935-1937.
3. Pacioli L., Divine Proportion. - 1509.
4. Fibonacci L., "The Book of the Abacus". - 1202.
5. Hembidzh L., Dynamic symmetry in architecture. -M., 1936.
6. Zeising A., Golden section as the main morphological law in nature and art. - M., 1876.
7. Vignola, Rules of the Five Orders of Architecture. - M., 1939.
8. Pugachenkova G.A., Ways of development of the architecture of Southern Turkmenistan during the period of slavery and feudalism. - M., 1958.
9. Булатов М.С. Геометрическая гармонизация в архитектуре Средней Азии IX-XV в.в. – М.,1978.
10. Kryukov K.S., Proportions in architecture. - Tashkent, 1995.
11. Rasul-Zade L.U., Computer graphics in projects for the reconstruction of

architectural monuments in Central Asia. - Tashkent., 1999.

12. Voronin L.N., Ratiya Sh.E. Barak-Khan Madrasah.//Architecture of the USSR, No. 11, 1936, p. 67-72.
13. Sights of Uzbekistan. Available from: https://www.centralasia-travel.com/ru/countries/uzbekistan/places
14. 40 photos of Uzbekistan to get you Silk Road dreamin'. Available from: https://www.lostwithpurpose.com/photos-of-uzbekistan/
15. Uzbekistan: Oriental shine. What to visit? Available from: https://blog.agent.ru/uzbekistan
16. What to see in Samarkand. Available from: https://geektrips.ru/chto-posmotret-v-samarkande/
17. Willy van Rooijen. Journalist Travel Magazine about Uzbekistan. Available from: https://uzbekistan.travel/ru/o/journalist-travel-magazine-ob-uzbekistane/
18. ICHAN-KALA. Available from: https://www.centralasia-travel.com/en/countries/uzbekistan/places/photos?cat=1114
19. 24 hours in Khiva, Uzbekistan. Available from: https://www.thetravelmagazine.net/24-hours-in-khiva-uzbekistan.html
20. The architectural complex of Pahlavan Mahmud. Available from: https://www.centralasia-travel.com/ru/countries/uzbekistan/places/photos?cat=1108
21. Yusupova M., Stop the destruction of architectural heritage. Available from: https://www.gazeta.uz/ru/2018/03/19/monuments/
22. Voloshinov A.V., Mathematics and Art: A book for those who not only love mathematics or art, but also want to think about the nature of beauty and the beauty of science. 2nd edition, revised and enlarged. Educational edition. Artists E.A. Adamov, S.I. Kravtsova, D.A. Voloshinov. Moscow: Enlightenment Publishing House, 2000.
23. Golden ratio. Available from: https://studfile.net/preview/7352106/
24. Grant A., LMF theory and the principle of the golden section. 2012. pp 271-282
25. Spiritual Elitism and Faux Humility. Available from: https://ldsperfectday.blogspot.com/2015_07_01_archive.html
26. Bulatov M.S,. Geometric harmonization in the architecture of Central Asia in the 9th-15th centuries. - M., 1978.
27. Humus. Merv. Part 2. Available from: https://humus.livejournal.com/4496973.html
28. Pugachenkova G.A., Ways of development of the architecture of Southern Turkmenistan during the period of slavery and feudalism. - M., 1958.
29. Kryukov K.S., Proportions in architecture. - Tashkent., 1995.
30. Rasul-Zade L.U., Computer graphics in projects for the reconstruction of architectural monuments in Central Asia. - Tashkent., 1999.

Kolon Minaret in Semerkand – After Russian bombing-before restoration

SECTION II

RESTORATION

THE CONTRIBUTION OF THE FOLK MASTER SHIRIN MURODOV TO THE RESTORATION OF ARCHITECTURAL MONUMENTS OF UZBEKISTAN

PhD Candidate Nargiza Kalandarova
Fine Arts Institute at the Academy of Sciences of the Republic of Uzbekistan
qalandarova.1985@mail.ru

Summary
The article states about the unique masterpieces and masterpieces of the master of pottery Shirin Murodov during his lifetime, the repair work in the preservation of architectural monuments and the art of pottery.

Keywords: *Architectural Monument, Master Shirin Murodov, Restoration, Ceiling, Arch, Portal, Mosaic, Sketch, Interior, Panel.*

Introduction

The Uzbek people are known all over the world for their historical and cultural monuments and unique architectural works. It is a living testimony to the fact that the architecture, art and history of Samarkand, Bukhara, Khiva, Tashkent, Shakhrisabz and other historical cities of our country began from afar.

The architectural monuments erected date back to different centuries and were damaged as a result of the losses that occurred in each period. Of course, many historical monuments have not been preserved due to the damage caused.

Nevertheless, these works of art, inherited from generations that have been preserved for centuries, today serve as a great school in the study of the unique solid arts of our creations and in their application and use today.

The sacred and at the same time responsible task of restoring the monuments damaged by time rests mainly with the repairmen.

In the twentieth century, lots of the work on the preservation, repair and conservation of architectural monuments in our country was carried out in conjunction with scientific research. Damage to the monuments was also observed due to improper repairs.

Nevertheless, experiments have resulted in quality repair methods. The role of folk craftsmen in the creation of quality repair methods has been great.

In the twentieth century in Samarkand, Bukhara, Khiva, Tashkent, many experienced folk masters have become masters of their profession and have contributed to the preservation of historical monuments together with scientists.

In the early years, the repair and restoration of ancient buildings and structures in Uzbekistan was carried out with the participation and leadership of the famous Samarkand master builder Abdukodir Bakiev. True experts of our national architecture - USSR State Prize winners Shirin Murodov, Bolta Juraev, Jalol Juraev, Kulli Jalolov, masters with extensive experience in architecture and repair - Akram Umarov, Ota Polvonov, Mirkhomid Yunusov, Toshpulat Arslonkulov and others are passionate about the future of our national culture (Yusupova, 2007, p.191).

Shirin Muradov (master Shirin) (1879-1957) was an architect from Bukhara, a master of the gesso carving dynasty. He worked hard in the repair, conservation and reconstruction of architectural monuments of Uzbekistan and throughout his life was a leading qualified specialist.

During the khanate, Shirin Murodov retained the status of a talented palace architect of the Emir of Bukhara. Master Shirin Murodov, who took part in the construction of several palace buildings and gardens of the Emir of Bukhara Ahad-khan, was relieved of his post in 1911 as a leading master in connection with the construction of the palace of Sitorai Mohi-Hosa (Notkin, 1961 s 33.)

One of the most famous and unique works of the master is the architectural decoration of Amir Alimkhan in the style of elegant plaster carvings on the walls and ceilings in the "White Hall" (Khonai-safid) of the summer palace of Sitorai Mohi Xosa.

In the creation of the building, master Shirin thinks about the idea of the hall for two months, and finally suddenly comes to him the idea of working on the carved mirror floor.

This method was the key to achieving the desired result in the relief and lightness of the carving. The construction of the building lasted for two years (1913-1914) and at that time gained unparalleled fame.

The plasticity of the pattern in the room, which was almost completely covered with ganch carving, appeared in a new look. Master Sweet sketches for wall decoration, worked all the drawings and patterns himself, personally performed the most important and delicate processes in ganch carving. The walls of the room, the arched corridors, and the ceilings are decorated with elegant patterns (Notkin, 1961 s 33.)

In 1920, many historical monuments were destroyed as a result of the revolution. In 1921, the Committee for the Protection of Turkestan Museums and Antiquities, Art and Monuments (Turkomstaris) was established to preserve and repair the monuments.

By 1925, Turkomstaris was renamed the Central Asian Committee for Museum Affairs and the Protection of Antiquities, Arts and Monuments (Sredazkomtaris). By 1932, the organization was reorganized under the auspices of the Committee for Museum Affairs and Preservation of Antiquities, Arts and Monuments of Uzbekistan (Uzkomstaris).

The Bukhara branch of Uzkomstaris, Bukhkomstaris, was opened by archaeologist V.A. Under the leadership of Shishkin I.I. Umnyakov, Musa Saidjanov and others were involved. They carried out restoration work together with folk masters - master Ibrokhim Khafizov, Rahim Hayatov, master Shirin Murodov.

The main direction of the creative activity of the master Shirin Murodov was the repair of these architectural monuments (Kryukov, 1990, s 34-36).

Master Shirin started from the Buyankulikhan madrasah (16th century) and then made great efforts to restore the Mir-Arab madrasah (16th century).

In 1937, the first phase of the restoration of this madrasa, especially its mosaic coverings, was completed (Kryukov, 1990, s 34-36).

In 1937-39, B.N. Zasypkin with Master Shirin Murodov is actively involved in the restoration of this architectural masterpiece. Master Shirin Murodov's An example of a prominent repair work under the leadership of B.N. Zasypkin is the mausoleum of Ismail Samani of the 9th-10th centuries. As a result of the work carried out, the walls in the interior of the mausoleum are cleaned of a layer of hard plaster, the lower part of the wall is washed with boiling water, as it is salted with salt. Experts decide to use only ancient Samanid bricks found during excavations of the side of the mausoleum to fill the wall decoration. [Yusupova, 2007, p. 193].

The white color and quality of the new blend could have ruined the appearance and aesthetics of the building as the monument's ganch blend had darkened over thousands of years.

Figure 1. Ismail Samani mausoleum, photo from the beginning of the 20th century (Archive of the Cultural Heritage Agency).

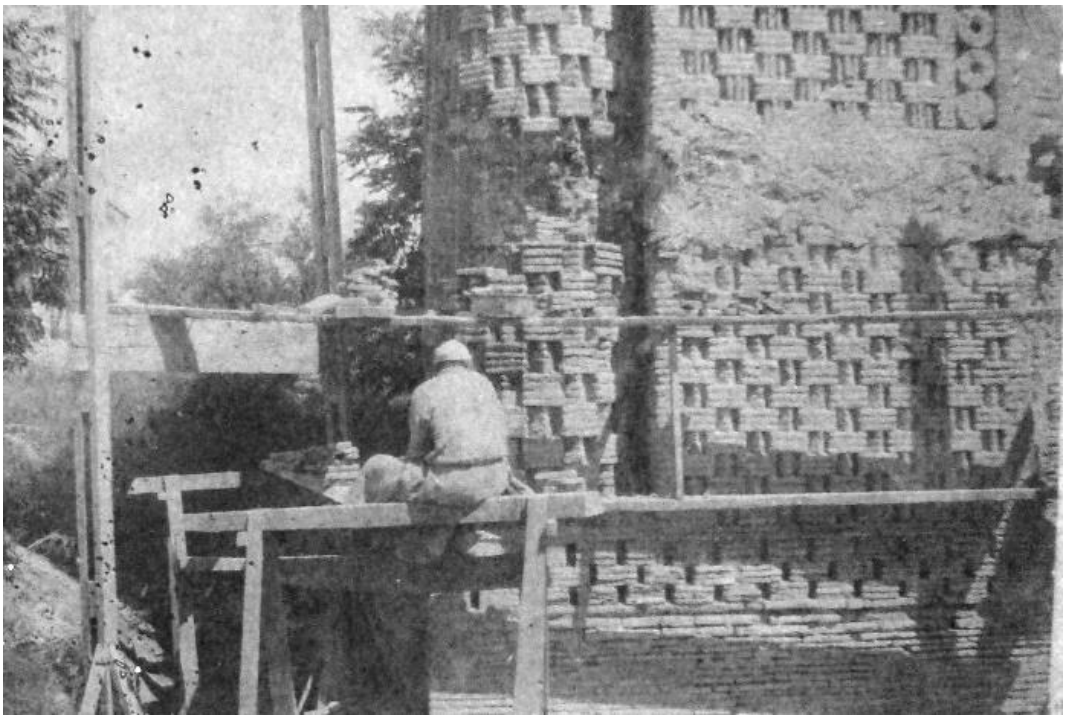


Figure 2. Ismail Samani mausoleum, restoration process, 1930s photo (Archive of the Cultural Heritage Agency, 24907-16).

Therefore, the old mixture fragments and their fragments are restored by initial processing (heating and grinding). This practice was highly valued in its time and is still recognized today as a worthy example of the study of renovation and careful treatment of architectural monuments.

Figure 3. Mausoleum of Ismail Samani (photo by M. Yusupova, 2004).

In those years, B.N. Zasypkin and master Shirin Muradov use it in the restoration of the Magoki-Attori mosque, in particular its southern portal dating back to the 12th century (Yusupova, 2014, p. 152).

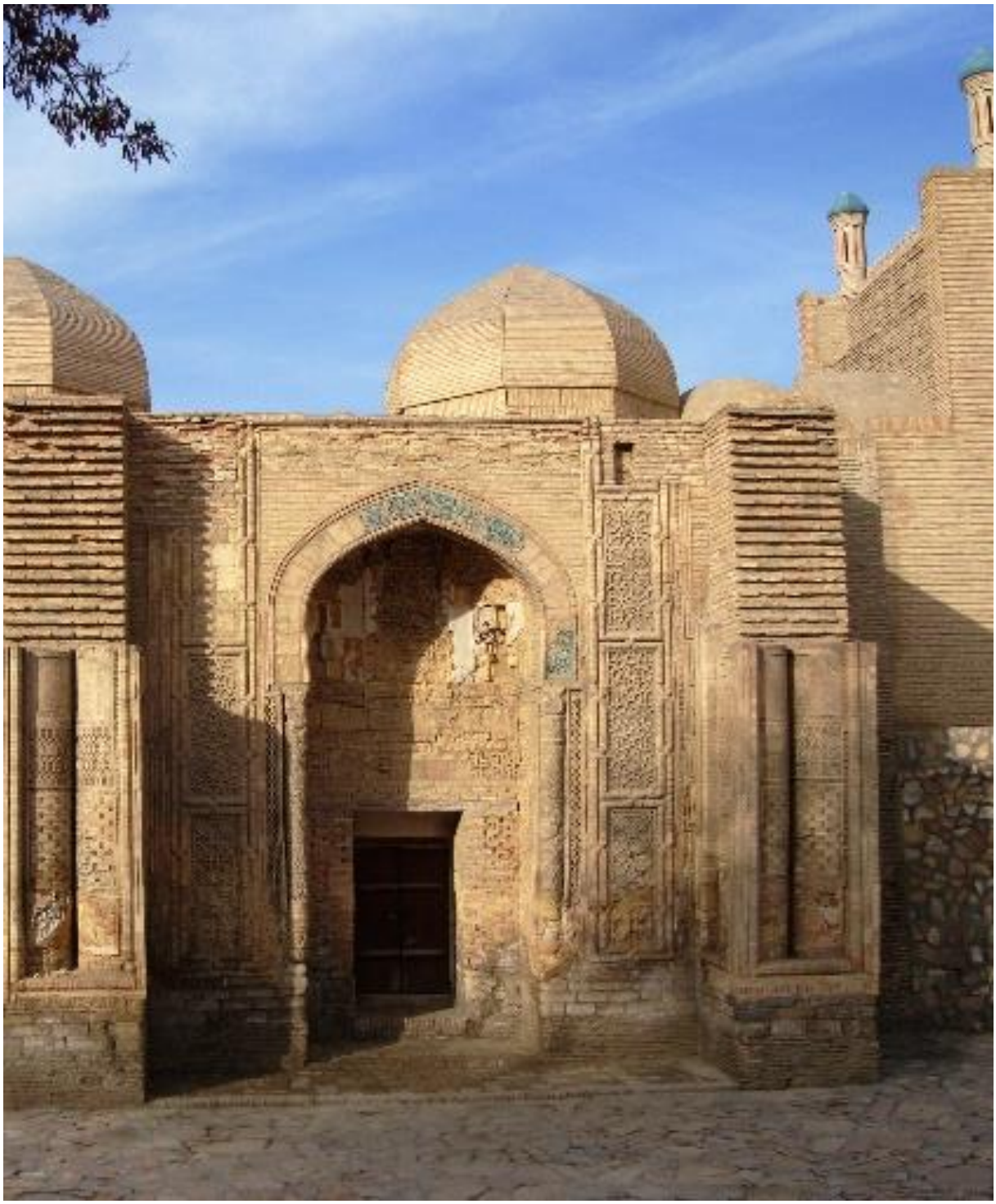


Figure 4. Maghak-i 'Attari Mosque, south portal (photo by M. Yusupova, 2008).

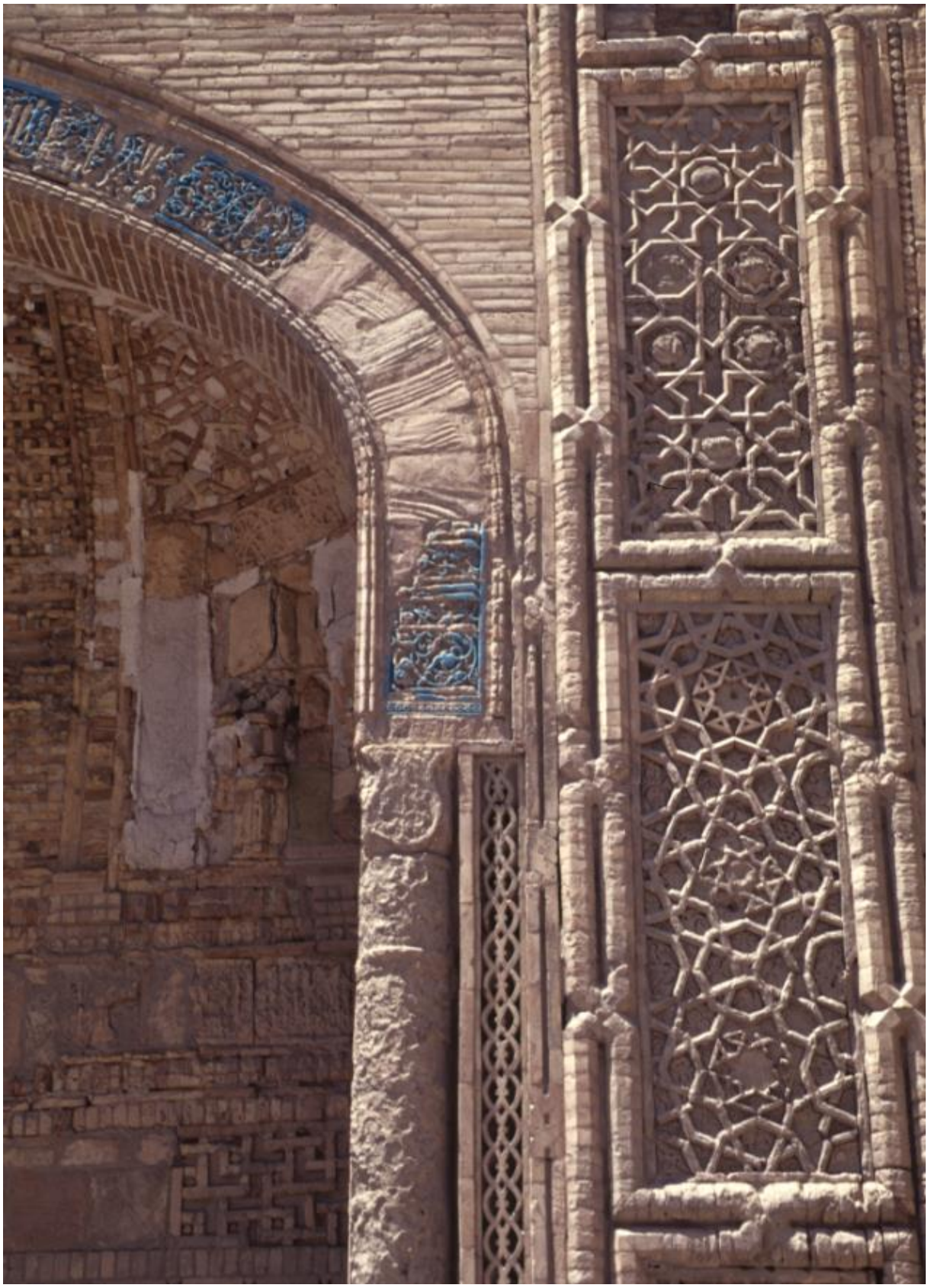


Figure 5. Maghak-i Attari Mosque, fragment of south portal décor, photo from the 1980s. (Archive photo of the Cultural Heritage Agency).

Figure 6. Master Shirin Murodov in the process of restoration of the southern portal of the Maghak-i 'Attari Mosque, photo 1937 (Photo from the archive of the Cultural Heritage Agency)

In 1940 (according to K. Kryukov as early as 1937) Uzkomstaris opened courses in Samarkand to train masters of construction arts of Uzbekistan. In this school, master Shirin Murodov and other masters laid the foundation of their school of practical restorers by training young talented masters. In this school, Master Shirin Murodov taught future talented masters how to carve ganch, create patterns, how to use them in buildings, and contributed to the establishment of a school of practical restorers.

In 1943, the Uzbek State Musical Theater named after Muqimi underwent renovation and conservation work. In this building, folk craftsmen not only design the walls, but also create its design. Master Shirin designed the corner columns at the entrance to the building, the stalactite cornice, and the grilles for the outdoor ventilation function (Notkin, 1961 s 11).

In 1947, Master Shirin used his most delicate "mirror decoration" to decorate the Tashkent clock, the current Museum of Literature named after Navoi, the State Musical Theater of Uzbekistan named after Muqimi, the Bukhara Hall of the State Academic Bolshoi Theater named after A. Navoi and other buildings (Haqqulov, 2020, p. 92.)

Figure 7. Work process of ganch carving method choka-makeup. (Photo from the book of I.Notkin, 1961).

The main object where master Shirin Murodov carved in ganch was the theater named after Alisher Navoi at that time, and this practice was the greatest and most elegant work.

Architect A.V. Shusev will entrust the architectural decoration of the Bukhara Hall of the Alisher Navoi Theater to master Shirin. Master Shirin embodies all the knowledge and experience gained in the art of ganch carving in the "Bukhara" hall of the theater.

The master created his own drawings based on the traditions of the Bukhara School of Architecture, skillfully used a lot of decorative work in pottery, and also

created a number of carvings. The result is creativity he further developed the decorative methods in the works of Bukhara masters and enriched them with his new style and creative compositions (Notkin, 1961 s 13).

Figure 8. Usto Shirin, photo 1938 (L. Pempel, 1981).

Figure 7. Work process Bukhara, photo 1938 (L. Pempel, 1981).

In contrast to the masters who decorated the halls of Samarkand, Tashkent, Khiva and Fergana according to the sketches of architects, the Bukhara hall is the richest in patterns, which consistently reflects the traditional Bukhara patterns, architectural details and ganch carving techniques.

In the architecture of this small room can be distinguished two main themes of the Bukhara-style interior:

1) A wall, completely covered with fine plaster, carved with glass;

2) Ceiling with muqarnas cornice (honor-tossak).

On the ceiling surface, where the walls are illuminated with light, the energetic shapes of the view and the large-volume ceiling rosettes stand out. At the top of the walls are three rows of muqarnas cornices and the ceiling area is framed.

The chandelier lift is made in the form of a large ceiling rosette muqarnas capital. The low walls are made of panels typical of the Bukhara interior.

In 1948, Master Shirin Murodov was awarded the State Prize for decorating the "Bukhara" hall of the State Academic Bolshoi Theater named after A. Navoi (Notkin, 1961 s 13).

In 1952-1957 Shirin Murodov taught ganch carving at the school named after P. Benkov.

In 1943, Murodov was awarded the title of Honored Artist of the USSR of Uzbekistan and in 1945, the honorary member of the Academy of Sciences of Uzbekistan (Haqqulov, 2020, p. 93).

Figure 8. Great masters of Bukhara: master Shirin, master Narzillo, master Rahim, photo 1938. (L. Pempel, 1981).

Master Shirin Murodov was a rare shining crystal among the people, his talent moves with the vast experience gained as a result of many years of tireless search, hard work and inspired creativity. The huge creative, practical work created by Master Shirin during his past life serves as a school for today's young professionals.

It should be noted that one of the traditions of folk masters is the master-student tradition. Folk masters work in collaboration with architects, designers, builders, installers.

When there is harmony in this collaboration that serves the art of architecture, the quality and durability of repairs and other work will be high. The role of the master-apprentice in repair is of great importance. High-quality repair work, especially using the skills of master and student experience, gives life and life to the monuments.

The master repairman is also an old building doctor, who should of course be aware of various aspects of architecture. Only then, as a master of his profession, can he ensure the durability of architectural monuments.

Conclusion and Evaluation

In short, Master Shirin Murodov not only made a significant contribution to the preservation and restoration of architectural monuments of Uzbekistan, but also brought a national spirit to modern architecture with his new works. If you look at his creative work, you can feel a special kindness in them, in addition to skill and experience. We think that Master Shirin's love for monuments and his work, his sense of responsibility will be an example to today's young restorers.

References

1. Rempel P.I., Dalyokoe i blizkoe (Buxarskie zapiski). – Tashkent: Izd-vo im. G. Gulyama, 1981. Far and near, Bukhara notes - Tashkent: Publishing house im. G. Gulyama, 1981.
2. Haqqulov A. A., Madaniy meros obyektlarining tadqiqotchilari va memoriy yodgorliklar tamirining fidoilari – Samarqand, Xakkulov A.A., 2020. Researchers of cultural heritage sites and devotees of the repair of architectural monuments. – Samarkand, 2020.
3. Notkin I.I., Buxarskaya rezba po ganchu v rabotax usto Shirina Muradova, Tash., 1961.
4. Haqqulov A.A., Tarixiy yodgorliklarni tamirlash // Ozbekistan tarixiy va madaniy yodgorliklarni saqlash gamiyati. – Tashkent, 1983.
5. Yusupova M. A., Buxarskaya shkola zodchestva XV-XVII vv.: Osobennosti i dinamika razvitiya. Tashkent. // Bukhara school of architecture of the 15th -17th centuries: Features and dynamics of development. – Tashkent, 2014.
6. Yusupova M., From the history of preservation of Uzbekistan architectural heritage on the example of Bukhara city// Materials of report – The International Workshop Culture preservation. Gwangju, South Korea, 2007.
7. Kryukov K.S., Organizasionnie formi ohrani i restavratsii pamyatnikov arhitekturi Uzbekistana (1920-1990) // ASU. - Tashkent,. - № 8.- C.34-36. (Kryukov K.S. Organizational forms of protection and restoration of architectural monuments of Uzbekistan, 1990.
8. https://www.booksite.ru/fulltext/1/001/008/079/073.htm
9. Archive of the Cultural Heritage Agency at the Ministry of Tourism and Cultural Heritage. Photos № 24907-16 and another, also 1 color photo from the 1980s.

CONSERVATION VALUES AND LOCAL ARCHITECTURAL FEATURES OF THE MEDIAEVAL HAMAM IN THE TOWN OF SHAKHRISABZ

PhD Candidate Aziza Raupova
Fine Art Institute of the Academy of Sciences of the Republic of Uzbekistan, Department of Architecture
aziiiiii_r@mail.ru

Summary
In this article, based on less-studied archival data, new materials of scientific and field research, local features of the architecture of the medieval baths of Shakhrisabz are highlighted as images of the civil architecture of Uzbekistan, the planning structure of which reveals certain traditions of the Muslim bath culture.
Keywords: *Bathhouse, Shakhrisabz, medieval, Temurids' architecture, baths in Tashkent and Karshi, baths in Vabkent and Bukhara*

Introduction

Among public buildings in the countries of the East, a special place is occupied by baths - hammams. The functions of the baths in the Middle Ages went far beyond their direct utilitarian purpose - they were also a kind of clubs where you can spend time pleasantly and profitably (Voronina, 1951, p.115). Baths personified not only the cleanliness of the body, but also the snow-whiteness of the soul and the purity of human spirituality.

In the Islamic period, based also on the religious precepts of keeping the body clean, the desirable full ablution - ghusl or partial - tahorat before prayer, great importance was attached to the construction of public baths near public centers (Yusupova, 2003).

The construction of public baths in Central Asia is known not earlier than the 3rd century, starting from the 9th century, and later they were built very intensively and were very popular (Belinitskiy, Bentovich, Bolshakov, 1973, p. 300, 307, 309). Medicinal and hygienic properties of baths were given great importance by scientists-encyclopedists (Bulatov, 1967, p.30).

At present, the medieval baths that are still functioning today have become objects of

tourism and recreation, providing traditional local bath culture to local and foreign travelers.

Subheading

In Mavarannahr, as the territory of Uzbekistan was called in the Middle Ages, baths were considered from ancient times as an integral part of civil architecture.

Among them are the little-studied baths of the city of Shakhrisabz. Back in 1870, A.N. Kun mentions that there are two baths in Shakhrisabz (Voronina, 1951, p.130). But, until 2014, only one Shakhrisabz bath of the 16th century was known, the second one was discovered in 2014 during large-scale work under the government's City Reconstruction Program (www.lex.uz).

Picture 1. An example of architecture, internal structure and life of medieval baths. Left: book miniature "Harun al-Rashid and the Barber", late 15th century. According to E. A. Polyakova and Z. I. Rakhimova, (1987). Right: book miniature "Khwarazmshah Fakhr ar-Razi in the bath", (1491-92). (According to: Suleiman H. and Suleymanova F., 1982

Bath of the 16th century in Shakhrisabz is known from a number of publications of previous researchers (A.N. Kun (Kun, 1886), L.Y. Mankovskaya (Man'kovskaya, 2014), V.L. Voronina (Voronina, 1983), etc.). It was a planning structure traditional for baths in many regions of Maverannahr, where the central hall, square in plan with cut corners, was covered with a dome of charkhi (Voronina, 1951, p.130), had a composition of premises similar to other traditional Central Asian baths and a single heating principle - through underground channels (Yusupova, 2003).

Along with this, it also had local features. For example, in the Shakhrisabz bathhouse, as well as everywhere in the cities of Kashkadarya, water was supplied from a well dug at the northeast corner of the building (Voronina, 1951, p.130).

In Mavarannahr, the floor of the bathhouse and the bottom of the cisterns, as well as the walls to a certain height, were covered with a hydraulic solution, which is called

"kyr". The recipes for making kyr were not the same everywhere. For example, according to Voronina V.L. in the 1950s, to Karimov from Shakhrisabz made a mortar without adding eggs and molasses, but the latter was rubbed into the plaster while smoothing it with stones - until saturation, and then the plaster was sprayed with milk to the full. It is also noteworthy that in Shakhrisabz, rice straw ashes were taken for “kyr”.

The plan of the bath is compact, the contour is rectangular, minus, as usual, one of the corners. The vestibule, the cloakroom and other outbuildings have been added today from the south, probably on the site of ancient buildings for other purposes (mosque, hairdresser, resting place). Orientation - north-south.

The location of the premises is three-row in diameter, four-row - along the body. At the entrance there are two usual rooms - a dressing room for underwear (rectangular) and a "dam olish" (resting room) with a moderate temperature for adaptation (cruciform in plan).

The central kinnik hall is square in plan, with cut corners, wide arches open into the side rooms, so that these rectangular rooms are perceived as niches. The plan is complicated by the introduction in the southeast corner of the kinnik of a small room - joi-hos - for an intimate toilet. Further to the north are three soapy parts - warm, hot and cold, connected with their respective reservoirs of water.

Water was supplied to them from a well in the northeast corner of the building, by the “crane” system (Man’kovskaya, 1986-1992).

Under the floors, as usual, a dense network of chimney heating channels is hidden, with a cross section of 35-50 cm.

The walls are made of burnt tile bricks measuring 27x27x5 cm at the base of the walls. The main halls are covered with ring domes on shield-like sails.

The use of expensive stone - marble floor slabs and sufas - indicates the construction of a bath during the prosperity of the city. Dimensions: general - 22.5 x 15 m (Man’kovskaya, 1986-1992).

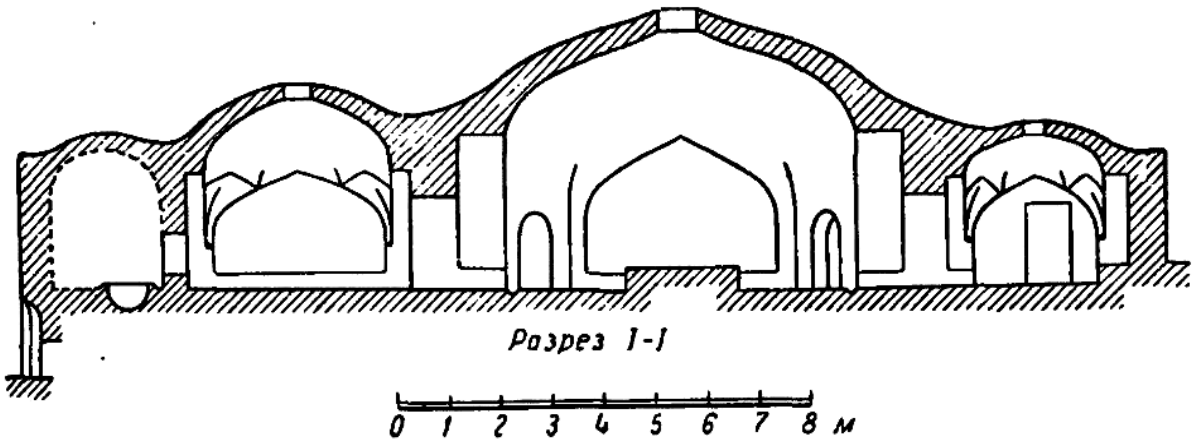


Figure 1.A. Section of Bathhouse in Shakhrisabz of the 16` century. Measurement V.L. Voronina (1959).

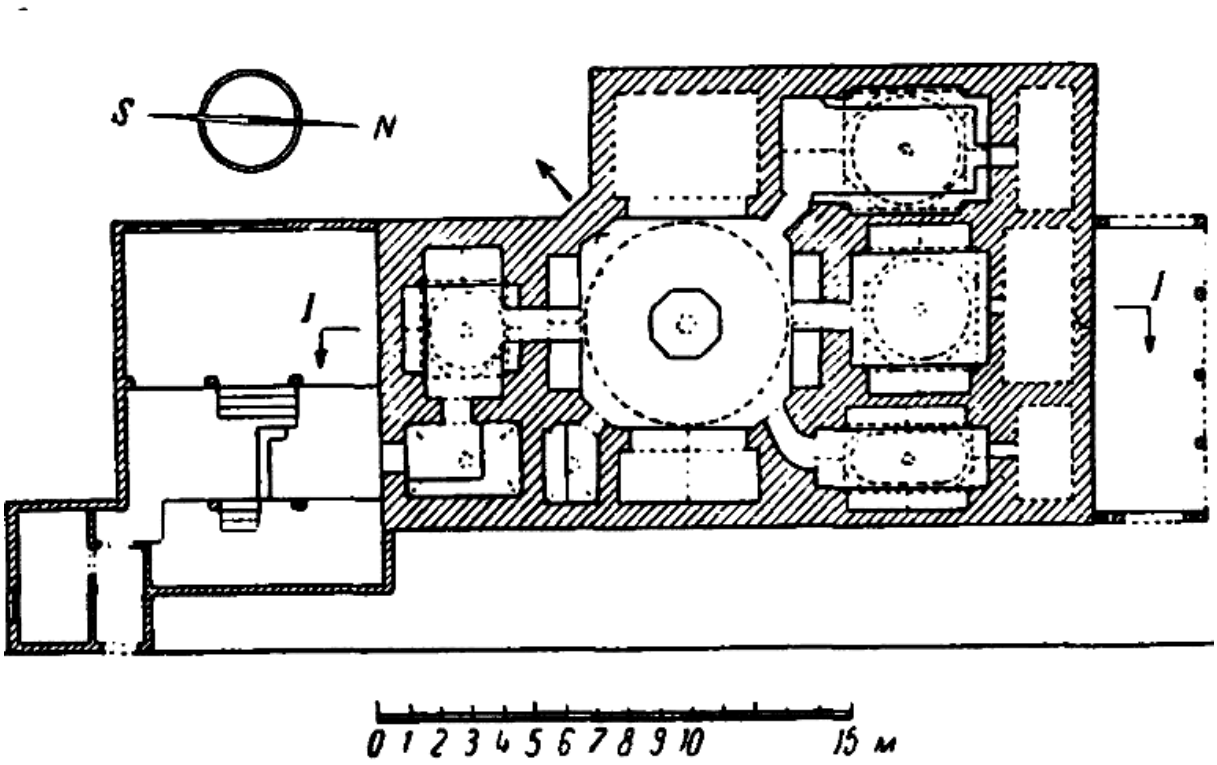


Figure 1.B. Plan of Bathhouse in Shakhrisabz of the 16` century. Measurement V.L. Voronina (1959).

Photograph 1. Bathhouse in Shakhrisabz of the 16th century, photo 2014, before reconstruction (Archive of Department of Cultural Heritage of Kashkadarya region).

2.1. Subheading

It should be noted that the medieval bathhouse of Shakhrisabz of the 16th century in the works of previous scientists (A.N. Kun (Kun, 1886), L.Y. Mankovskaya (Man'kovskaya, 2014), V.L. Voronina (Voronina, 1983), etc.) referred to as a medieval bathhouse of the 15th century.

Photograph 2. Bathhouse in Shakhrisabz of the 16th century, photo 2016-2022, after reconstruction (Archive of Department of Cultural Heritage of Kashkadarya region).

But, at present, judging by official data and the List of monuments under state protection, it is generally accepted that this is a bathhouse of the 16th century. An earlier bath at the turn of the 14th -15th centuries. - perhaps, from the time of Amir Temur, who thoroughly and magnificently rebuilt his native city of Shakhrisabz at that time, was also generally traditional.

The remains of this ancient bath were found 50-55 meters east of the dekhkan (farmer) market of Shakhrisabz.

In 2014, the Institute of Archeology of the Academy of Sciences of the Republic of Uzbekistan and the Museum of the History of Material Culture named after Amir Temur in its certain part excavated and studied underground structures (murilar - chimney heating channels), through which the bathhouses were heated. The sides of the building were cleared by opening 17.5 meters from south to north and 20 meters from west to east. Only the foundation of the western part of the bath has been completely preserved, the foundation of the remaining parts has been preserved in fragments. In the foundation from the northern wall, a furnace opening was preserved, on the right and left sides of which chimney heating channels were brought out to remove heat into the fire channels. From the northeast corner of the object there is a well in the form of a circle with an outer diameter of 170 cm and an inner diameter of 114 cm, built of burnt bricks measuring 26-27x14-15x5-6 cm. The foundation of the eastern part was preserved only in the southeastern corner, where part of the underground structures for heating the bath was discovered. Along with burnt bricks 26.5x26x5 cm in size, large rectangular bricks 42x22x8 cm in size were also used here (Information about the archaeologically discovered bathhouse of Shakhrisabz 14-15th, obtained from the materials of the Department of Cultural Heritage of Kashkadarya region.

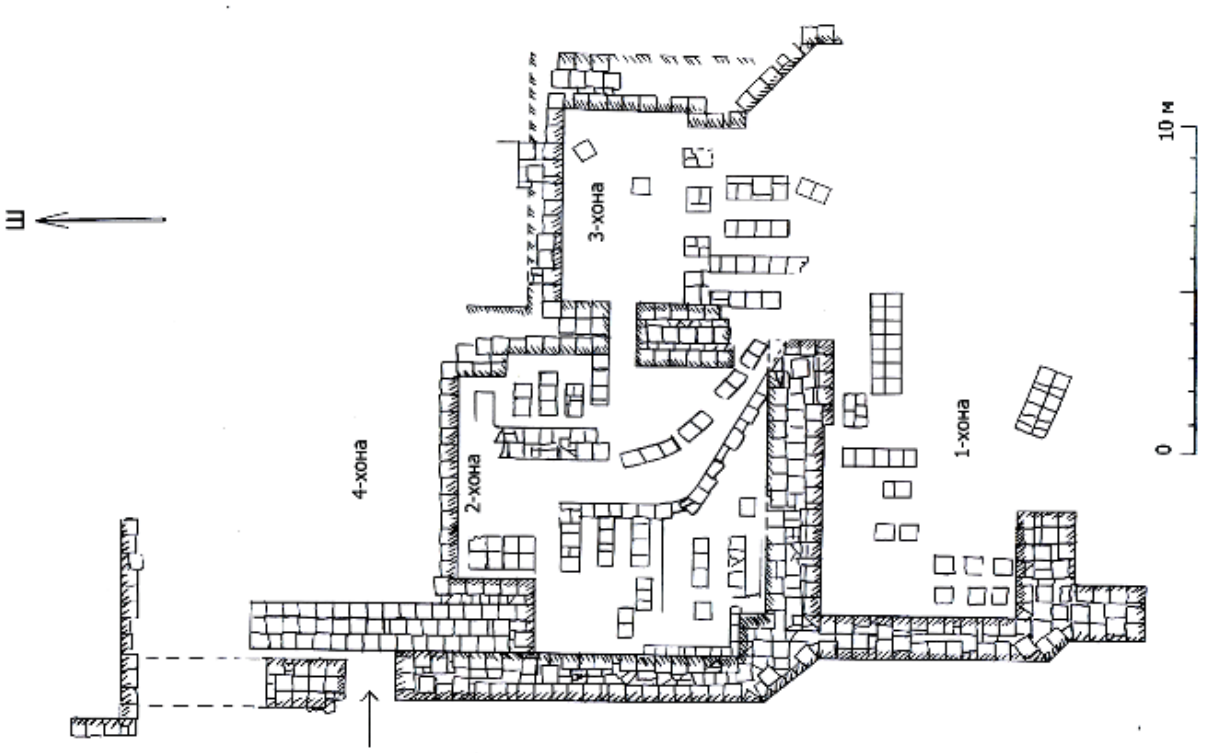


Figure 2. Bathhouse in Shakhrisabz 14th -15th century. Measurement of the archaeologist A. Yarkulov (2014).

Photograph 3. Ruins of Bathhouse in Shakhrisabz 14-15th century. Photo by https://www.gazeta.uz/ru/2014/12/09/shahrisabz/ (2014).

Conclusion and Evaluation

It should be noted that the medieval baths of Uzbekistan, including the baths of Shakhrisabz, did not have a division into male and female halves, as was customary in other Muslim countries, for example, in Turkey (Voronina, 1951, p.118). In Mavarannahr, there were mainly men's baths, in which there were women's baths for several days, or there were purely women's baths in a limited number, for example, Kunjak in Bukhara (Yusupova, 2016, p.48-57). Now this bath is preserved as an archaeological site through conservation.

As a result of the study, it was concluded that, in general, the Shakhrisabz bathhouse of the 16th century, according to typology, belongs to the full "classical" type of baths, along with the baths: Pushti Hammom in Tashkent in the 15th century, baths of the 16th century in the cities of Karshi and Vabkent (Man'kovskaya, 2014, p.209-212), as well as the famous and still functioning baths of Misgaron and Kunjak in Bukhara (Yusupova, 2003).

On the territory of Uzbekistan, baths of the XIV-XV centuries have been preserved in very small numbers. Judging by the remains of the archaeological bathhouse of Shakhrisabz of the 14th-15th centuries, it is possible that this bathhouse was built during the heyday of the Temurids' architecture. The ruins of the bathhouse are partially preserved, and therefore it is impossible to describe its entire planning structure. Further and more in-depth study of the bath is necessary, as it is a unique monument of the time of Amir Temur, which reveals the local features of the civil architecture of the Shakhrisabz School of architecture of the 14th – 15th centuries.

References

1. Bulatov M. S., Ibn-Sina i nekotoriye voprosi teorii arxitekturi i gradostroitelstva (Ibn-Sina and some questions of the theory of architecture and urban planning). (p.30) Tashkent. ONU, 1967.
2. Belinitskiy A. M., Bentovich I.B. and Bolshakov O.G., Srednevekovy gorod Sredney Azii (Medieval city of Central Asia). (p. 300, 307, 309). Nauka, GRVL, 1973.
3. Voronina V. L., Ob uzbekskix banyax (About Uzbek baths). (p.115). M.-L.: SE, 1951.
4. Voronina V. L. Bani-xammam u narodov Sovetskogo Soyuza i stran zarubejnogo Vostoka. Arxitekturnoye nasledstvo (Baths-hammams among the peoples of the Soviet Union and the countries of the foreign East). (p.133-167). M. Stroyizdat, 1933.
5. Ibn Sina A. A., Kanon vrachebnoy nauki. Kn.I. Perevod Yu.N.Zavadskogo (Canon of Medicine. Book I). (p.196, 320). Tashkent: AN UzzSSR, 1954.
6. Kun A. A., Ocherki Shaxrisabskogo bekstva. Zapiski imeperatorskogo Russkogo geograficheskogo obshestva (Essays on the bekstva of Shahrisabz). SPb. T.6., 1336.
7. Man'kovskaya L. Y., Formoobrazovaniye i tipologiya zodchestva Sredney Azii (IX-nachalo XX veka) (Form formation and typology of architecture of Central Asia (IX-beginning of XX century), p.209-212). Tashkent: A N RUz. Baktria press, 2014.
8. Yusupova M. A. Arxitektura buxarskix ban. San'atshunoslik masalalari (Architecture of Bukhara baths), Tashkent, 2003.
9. Yusupova M. A., Knijnaya minatyura XV-XVI vv., kak istochnik dannыx po grajdanskoy arxitekture srednevekovogo Uzbekistana (Book miniature of the XV-XVI centuries as a source of data on the civil architecture of medieval Uzbekistan,

p.48-57). Rol Kamaleddina Bexzada v mirovoy kul'ture: Istoriya i sovremennost. (The role of Kamaleddin Behzad in world culture: History and modernity) «San'at», 2016.

10. Pasport Man'kovskoy L. Y., Materiali proyekta «Svod pamyatnikov materialnoy kulturi Uzbekistana» (Set of monuments of material culture of Uzbekistan"). IA (m) M24 №221/7. Archive of the "Architecture" department of the Institute of Art History of the Academy of Sciences of the Republic of Uzbekistan, 1986-1992.
11. Information about the archaeologically discovered bathhouse of Shakhrisabz 14-15th, obtained from the materials of the Department of Cultural Heritage of Kashkadarya region.
12. https://www.lex.uz/
13. Polyakova Y.A. and Raximova Z. I, Miniatyura i literatura Vostoka (Polyakova E.A. and Rakhimova Z.I., 1987: The Miniature and the Literature of the East), Tashkent, 1987.
14. Suleyman X. and Suleymanova F., Miniatyury k proizvedeniyam Alishera Navoi XV-XIX vv. (Miniatures used to illustrate the works of 'Alishir Nava'i in the 15th-19th centuries), Tashkent, 1932.

THE HISTORY OF ARCHITECTURE AND RESTORATION OF KHWAJA AKHRORI VALI MEMORIAL-CULT COMPLEX IN SAMARKAND

PhD Candidate Akmal Rayimkulov
Samarkand state Architecture and Civil Engineering institute
Faculty of Architecture, Department of History and Theory Architecture
rayimkulovakmal@gmail.com

Summary
The article illustrates the history of the formation of the memorial-cult complex, the origin of the complex, the periods of construction, the relationship between the architectural style and decoration used in them and the environment. In this regard, bibliographic and field research was carried out, and the scope of work on the preserved and restored architectural monuments were presented. In Mavarannahr, in the second half of the 15th century, Khwaja Nasriddin Ubaydullakh Akhror, the leader of the Naqshbandi Sufi order, which gained great attention in political life and among the people, settled in the Khwaja Kashfir district near Samarkand.

The purpose of studying the history of the formation of the memorial complex is to determine the origin of the complex, the periods of construction, renovation, the architectural style used in them and the interaction of decorations with the environment. In this regard, bibliographic and field research was carried out, and the scope of work on the preserved and restored architectural monuments was presented.

Keywords: *Mosque, Sufi khanaqah, courtyard, dakhma, ganch, muqarnas, Islamic pattern*

Introduction

When looking back over a long period of time, many events can be, mysticism, Khwadja Nasiruddin Ubaydullah ibn Mahmudhoja - Akhrori Vali, who had a place in medieval philosophical and artistic thought.

In the article, we want to talk about the popular recognition of Khwaja Akhrori Vali, his contribution to architecture and creativity.

The main part. Khwaja Akhrori Vali was born in March 1404 (806 AH) in the family of district of the Shostan, Bostanlyk district of the Tashkent region (1). Ubaydullah in Tashkent with the help and advice of the master, he conquered Samarkand. At the request of Khwaja Ubaydullah Abu Said,

he moved to Samarkand and settled in Kafshir mahalla (2).

Khwaja Ubaydullah demonstrates his superiority over the sheikhs here with his ingenuity, soon becoming known as Khwaja Akhrori Vali and famous not only in Movarounnahr but also in other countries (3).

Khwaja Ubaydullah used the income from the land at his disposal to pay the excess taxes imposed on the people, and to build madrassas, mosques, khanaqahs and other buildings. In Kamongari of Urgut, Loish of Miyonkol, Motridm and Khoja Kafshir mahallas of Samarkand, there were courtyards and gardens of Khoja Ahror (4).

We know from the endowments that Khwaja Akhrori Vali spent large sums of money on madrasas and mosques. In madrasas, not only religion, but also science, astronomy, geometry, mathematics, algebra, medicine, jurisprudence, logic, morphology and syntax and the exact and social sciences, such as aruz, were also taught (5).

Although Khwaja Akhror had a very large yard near Samarkand's Shaykhzoda's Gate, he always lived in Khwoja Kafshir, giving it to the needy. After the death of Khwaja Akhrori Vali (895 AH) in his garden in Kamangaran in the month of Rajab 1490, the blessed bodies of the deceased were brought to Khwaja Kavshir district, now Khwaja Akhrori district, and buried in a dahma near a large pool and covered with white marble (6).

Many other historical figures were later buried in the shrine of Khwaja Akhrori, some of whose graves have not yet been found. Then the children and grandchildren of Khwaja and the caliphs and disciples of Mawlana Muhammad Kazi will be placed in this dahma. Thus about ten great men were buried in the dahma.

The foundation of this complex is the magnificent tomb of the great religious leader buried here in the 90s of the XV century, the cleric - Khwaja Akhrori Vali, who became the real ruler of the land in the second half of the XV century. It is written in this tomb that the Khwaja Akhrori Vali, who has not been preserved here, was a khanakah (7).

In 1490, he, like his predecessors Abdul Khalik Gijduvani and Bahovuddin Naqshbandi, was buried in an open-air dahma near his khan (8).

Nadir Devonbegi, one of the great officials of Samarkand in the XVII century, built his magnificent and large madrasah in the northern part of the complex, which was originally formed in this place.

Later, a summer mosque was built during this period, and over time, this architectural complex stretched to the north. Thus, by the twentieth century, the western part of the complex was completely covered with structures.

The components of the complex consisted of the Nadir Devonbegi Madrasa (9), the Khwaja Akhror Mosque or summer mosque, which occupied the northwestern part of the courtyard, the Khwaja Akhror's dakhma bordering it on the south, the entrance to the courtyard on the east, the minaret and the pool in the center (Figure 1).

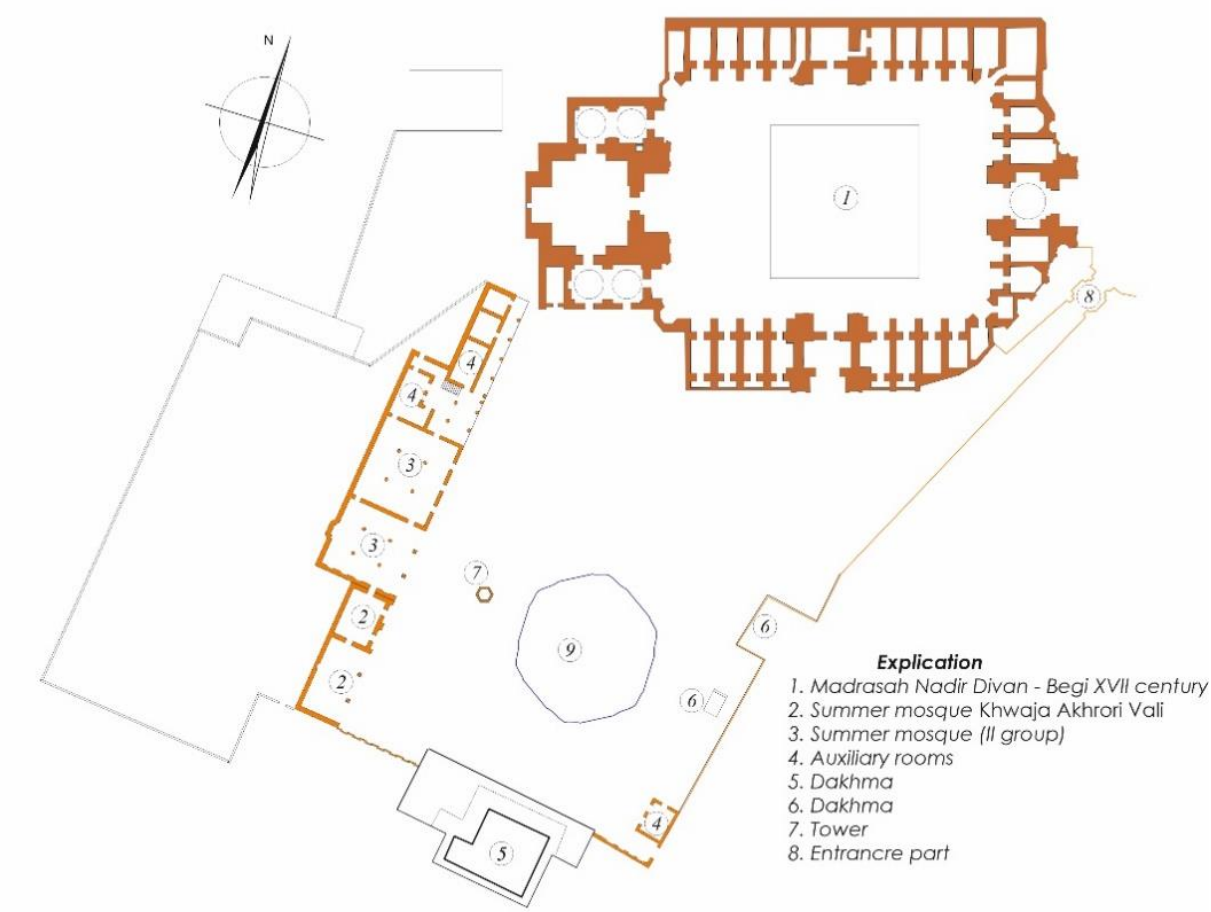


Figure 1. Master plan of Khwaja Akhrori Vali complex. (Inventory number prepared by Yu.Z. Schwab and Akimenko in 1970 № 2537

On the south side of the courtyard was a low wall, through which a passage led to the tomb of Khwaja Akhrori. The east side of the courtyard was partly surrounded by a new brick wall and partly by a reed wall. By the time the east side of the complex was cleared of walls, the open-air view of the entrance, as well as the small garden, had been added to the complex.

Four km south-west of the center of Samarkand, in the fortress "Ulugbek" there is a beautiful Khwaja Akhrori Vali memorial-cult complex, which also includes a summer mosque. The open porches and closed rooms lined up in a row in the composition of the mosque extend to the western boundary of the complex. Researchers note that the southern edge, a rectangular awning with a plan, and a closed room date back to the 17th century, the period of construction of the Nadir Divan-begi Madrasa (1630-1635) (Figure 2).

Figure 2. Khwaja Akhrori Vali Mosque. XII-XX centuries. The mosque in the first part of the South (photo by A. Sokolovsky in 1976).

This is confirmed by the decorative styles in the wall patterns of important buildings, the quality of tile finishes, the nature of the ornaments and the repetition of individual parts. But the ceiling and the inscriptions on it, the replacement of the columns with new wooden pillars, the disproportion of shapes in them, the lack of connection of the tiles on the wall with the flat ceiling and the artistic finish canopy are obvious (10). The frontal-style composition of a number of devices faces east.

The first part of the mosque dates back to the XVII century, and includes a south-facing porch and a winter room connected to it from the north. The dimensions of this part of the mosque are: 24.6 x 6.65 meters in the plan, the thickness of the brick walls is 1.2 meters. The front of the porch faces east and measures 14.4 x 5.4 meters. The enclosure is covered with a flat covering of wooden beams, supported by two columns on the wall and on the east side. The wooden columns have a carved marble tag chair and a muqarnas head. Divided into three pieces, the patterned ceiling is skillfully and beautifully polished using colorful Islamic patterns. Shops are the basis of large hand-painted patterns on the ceiling. The lower base of the walls has a green, hexagonal, checkered ceramic cladding. In the center of the western wall is the altar. The upper part of the wall is covered with plaster (11). The porch is decorated with winter room style glazed ceramic mosaics.

Here we would like to quote the ceiling of Pulat Zoxidov's "Samarkand School of Architecture" and the description given to them. “Rectangular (usually square) divisions are formed at the intersection of columns and walls on the ceiling. This section is called the "xona". Each compartment is covered with beams so that they rest only on one side of the shop. This constructive method was considered both appropriate and simple at the same time. While this sequence has a special character in the composition of the ceilings, the column that supports them has the appearance of a circular motion along the central axis (12).

This constructive elaboration then gives rise to religious views among the pious and the people. It is known that when the word Allah is written according to the Kufic letter الله - it is repeated four times around its own axis and, in return for some simplification, has a scheme reminiscent of the appearance of the same ceiling  . If the builder initially saw a logical and solid construction in this scheme, for the rest of the pious it was seen as a symbolic meaning reminiscent of the name Allah (13).

The device, called the "evening prayer room" of the XVII and early XIX centuries, consists of two similar parts. These are an almost square-shaped porch measuring 11.2 x 11 meters in size and an indoor winter hall measuring 10.8 x 10.2 meters. The walls are 1.2 meters thick, style facing east. The porch is supported by a wooden girder with six columns and a wall, and in the winter hall by four columns.

The winter room of the mosque is very simple. The walls are plastered with plaster and have shallow arched shelves. The walls of the porch are plastered with plaster, the main part of which consists of patterns and ornaments decorated with ornaments. The ceiling is wooden, divided into 9 equal

square shapes, each of which is decorated with original embroidered ornaments. 8 out of 10 columns are ordinary wooden columns. They should have been installed during the renovation, but the 2 awning-style columns are housed in an intricately crafted marble tag chair, and they tend to stand upright towards the muqarnas. The main color scheme of the plant is green. The floor surface is covered with baked bricks. The walls are lined with a mixture of baked bricks of various sizes. The foundation of the winter device is made of baked brick and its depth is 0.5-0.6 meters (14). The group of auxiliary rooms occupying the northern part of the mosque has no significant features.

The central porch and room of the summer mosque differ from the southern part in size, proportions and wall decorations (Figure 3). The plan has a square-shaped porch with six columns, bordered on three sides by thick walls, from which the entrance doors to the winter mosque are opened.

The initial construction period of the summer terrace, which is part of the central part, has not been determined, but can be based on the exact structural structures and elements of the structure. Most importantly, the building underwent major renovations in the 20th century. In the XIX century, adjoining the summer porch room, two rooms and auxiliary (service) rooms in the form of a column porch facing the complex courtyard were built.

Not far from the south of the courtyard, it is bordered by a wall leading to the tomb of Khwaja Akhrori.

Figure 3. The porch of the summer mosque of Khwaja Akhror Vali

The eastern part of the complex is occupied by graves. From the north-eastern part of it, the entrance to the complex is formed.

Until the twentieth century, there was a narrow entrance gate here, but now they are not preserved. The minaret in front of the mosque also dates back to the 20th century. The names of the masters who were directly involved in the construction and repair work of this period have been preserved: Master Sagdulla, Master Tursunboy Ismailov, and Master Hafiz (15).

In the center of the courtyard there is an ancient pool, which has existed since the XVII century. The octagonal pool was part of the central composition of the courtyard. Its edges have lost their shape, yet the walls are reinforced with wood. The axes of the sides of the pool are formed parallel to each other, one axis of which is proportional to the madrasa and the other to the shrine of Khwaja Akhrori Vali. The location of the pool in this respect indicates that it is undoubtedly ancient.

To the west of the pool is a low tower. It stands next to the axis of the central porch of the summer mosque. The tower is one of the standard examples of late medieval architecture.

The size is not large, the diameter of the base is not more than 2 meters, and the height - about 5 meters.

The brick pile is made of evening (European) bricks and leads to the tower lighting arches through spiral staircases on a central axis column.

The lighting arches in the minaret repeat the arches in the mosque. Major repairs to the complex were carried out in 1913-1921.

In the early twentieth century, the Nadir Divan-begi madrasah-mosque collapsed in an earthquake, then in 1913 the dome was covered with a wooden beam, mud-plastered roof. During these years, the entrance roof of the madrasa-mosque and the porch with a roof in the northern part of the complex were restored.

The appearance of the complex was changed in many inaccurate ways, resulting in the final appearance by the beginning of the twentieth century. The largest recorded repair work was carried out in 1921 (16). Minor repairs and utilitarian repairs have been used for many years without any supervision or documentation.

The Khwaja Akhrori Vali complex is located to the west of the central part of Ulugbek settlement. The area of the complex is irregularly stretched from south to north. The maximum length is 130 meters and the width is 70 meters from east to west. Despite the fact that the overall planning composition of the complex consists of buildings belonging to different periods - it can be called an ensemble-type complex.

The main facilities of the complex are Nadir Devonbegi Madrasa and Khwaja Akhrori Vali summer Mosque, which are considered to be one of the brightest buildings of typological significance.

The decorative ornaments of the Khwaja Akhrori summer mosque were first erected in the 1960s by P.Sh. Zoxidov conducted research. The results of the study are reflected in the book “Samarkand School of Architecture XIX - early XX century".

He is also one of the scholars who has written detailed scientific articles and pamphlets on monumental architecture.

Later, G. A. Pugachenkova, M.E. Pletnev and Yu. Z. Schwabs in their articles, suggest that the open and closed porch of the second part was built on a foundation that has survived from the XV century.

By 1977 UzSNRPM group of architects - N. V. Lasovskaya, E. Asanov and V. V. Ivanovs measurements of the summer mosque by the were carried out without archeological observations. Nevertheless, a number of the scientific findings of the scientists listed above are still preserved as the sole source of research.

The connection of the summer mosque with the rest of the complex is undoubtedly one of the brightest memorial complexes in Samarkand.

Thus, despite the fact that Khwaja Akhrori Vali had several courtyards and gardens in Samarkand, he lived most of his life in the Khwaja Kavshir district.

In addition to educating the people of the city, providing religious and secular knowledge, he is actively involved in political activities. Several madrasas and mosques will be built at the expense of the Khwaja's wealth.

In conclusion, it should be noted that the foundation of the memorial-cult complex was formed by a modern courtyard consisting of a dahma and a pool, and later a summer and winter mosque was built. The mosque is considered to be the best example of Samarkand architecture in the last Middle Ages. The architecture of the mosque reflects the architectural lines of religious and residential buildings, and residential elements: porches, luxurious construction of brightly patterned ceilings using traditional columns, the balance of indoor and semi-indoor volumes, the relationship with the environment, the beauty of the whole building - all medieval indicates that it was done in architectural style.

At present, the Khwaja Akhrori Vali Mosque is fully fulfilling its function. This whole memorial-cult complex is a shrine built in front of its dahma. Nadir Divan-Begi Madrasah is a composite building with a central courtyard, which serves as a madrasah and mosque.

The skillful connection of the parts belonging to different periods, i.e. the richness of the precise plan solution and decorative ornaments, testifies to the extraordinary ability of the architects. The architectural significance of the complex is high - it is one of the last monumental monuments of Samarkand after the Timurid period.

References

1. K.Kattaev. Interpretation of the problems of Khwaja Akhror Vali and Mirzo Ulugbek. Brochure; Tashkent, 2007. p.12.
2. Abu Tokhirkuja. “Samariya” – Translation by Abdulmumin Sattoriy, UzASc additional note, inv, № 600. 46. p.46.
3. K. Kattaev.Brochure about the problems of Khwaja Akhrori Vali and Mirzo Ulug'bek. Tashkent, 2007. p.15.
4. B. Valikhujaev. History of Khwaja Akhror. Tashkent, 1994. P.70.
5. K. Kattaev. Brochure; Tashkent, 2007. p.24.
6. K. Kattaev. Brochure about the problems of Khwaja Akhror Vali and Mirzo Ulug'bek; Tashkent, 2007. p.47.

7. N.N. Kuzmina, N.V. Lasovskaya. S-5335/l26. Medere Nadir-Divan-Begi. Predvaritelnye raboty po medrese Nadir-Divan-Begi v gorode Samarkande. Tashkent, 1977.
8. M.A. Yusupova, Z.I. Rakhimova, O.A. Ibragimov - Sufi traditions in the art of Maverannahr XV-XVII centuries. Collective monograph. Tashkent, 2010. P.50.
9. Passport Madrasah Nadir-Divan-Begi.
10. C-4339/L26 Khozha Akhrar Mosque. Preliminary work. Uzbek Special Scientific and Restoration Design Workshop. Tashkent, 1979. p. 2
11. Passport mecheti Khwaja Akhrar. Index № 3.4.13/b.-4.5.11. Insert № 1.
12. P. Zokhidov Samarkand School of Architecture XIX- beginning of the XX centuries. Science Publishing House, Tashkent, 1965. P. 21.
13. P. Zokhidov Samarkand School of Architecture XIX- beginning of the XX centuries. Science Publishing House, Tashkent, 1965. P. 22.
14. Passport Mosque Khwaja Akhrar. Index № 3.4.13 / b.-4.5.11
15. S-4339/L26. Mosque of Khwazha Akhrar. Preliminary work. Uzbek Special Scientific and Restoration Design Workshop. Tashkent, 1979. P. 29-30.
16. S-4339/L26. Mosque of Khwaja Akhrar. Preliminary work. Uzbek Special Scientific and Restoration Design Workshop. Tashkent, 1979. P. 30

RESTORATION OF THE 16th CENTURY OF KUKELDASH MADRASAH IN TASHKENT, UZBEKISTAN

Ph.D Candidate Malika Beknazarova
Institute of Fine Arts of the Academy of Sciences of the Republic of Uzbekistan
malikabeknazarova91@gmail.com

Summary
This article highlights that the research carried out in the Kukeldash madrasah in Tashkent in the 16th century, archeological and engineering-geological research, conservation and repair work carried out in a timely manner by well-known experts in the field of protection of the monument indicates that the correct methods have been selected when creating the zones and restoration. Also, based on study and analysis of the history and methods of repair of the Kukeldash madrasah, recommendations are made which is relevant to the modern restoration process in Uzbekistan.

Keywords: *Kukeldash madrasah, conservation, Barakkhan, Darvishkhan, Shaibanids dynasty, tympanum, geometric patterns, guldasta, portal.*

Introduction

Kukaltash madrasah which located in the old part of Tashkent, was built in 1550-1560 during the Shaibanids dynasty.

The construction of the building was led by the ministers of the rulers Barak Khan and Darvish Khan, and the madrasah was named after him. (Figure 1).

Kukaltash madrasah is one of the largest traditional madrasas which used the specific styles to its period in Central Asia, well developed in the 16th century.

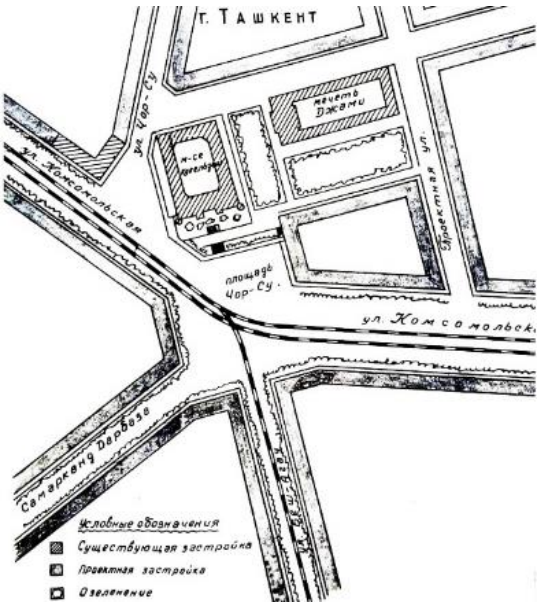


Figure 2. Blueprint of Charsu Square, Tashkent (Archive of Glav NPU).

The spacious courtyard of the building with a rectangular structure (63 × 45 m) (Figure 2) is surrounded by rooms and open porches.

The main facade of the madrasa faces south and has towers on either side which were corner (guldasta).

Once upon a time, on the east and west classrooms of the entrance roof (portal), there were high domes decorated with turquoise tiles, and in the (guldasta) there were arched openings at the ends of the towers. The canopy (tympanum) on the entrance roof (portal) and the shelves are decorated with intricate tile geometric patterns - girdles.

At the same time, the portal's quilts are decorated with surahs from the Qur'an.

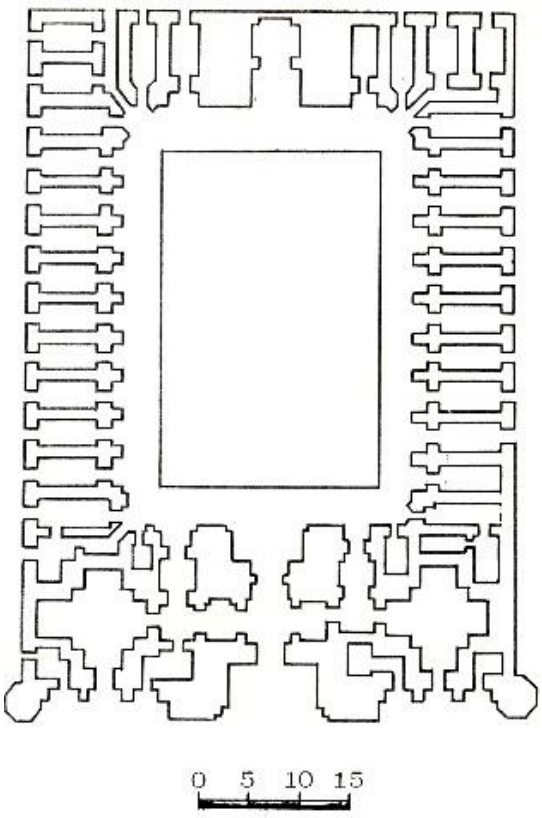


Figure 2. Kukaltash Madrasah Plan (Bulatova, Mankovsaka, 1893).

2. History, Methods and Problems of Restoration of the Tashkent Kukaltash Madrasah

In this regard, the madrasah can compete with the best architectural monuments of Samarkand and Bukhara architects with its unique artistic decorations (Yusupova, 2006).

However, in the 19th century, many earthquakes, renovations, and indifference during the economic downturn caused the building's original appearance to change completely.

The madrasa has repeatedly suffered destruction and the building had been used for various purposes in its time.

For example, the madrasah served as a caravanserai, warehouse, dormitory, and various workshops in the late 18th century (Man'kovskaya, Pulatov, 1972), and in the 1860 s as a fortress for the Kokand Khans.

In addition, in the middle of the twentieth century, during the Soviet era an exhibition promoting the atheistic way of life was organized in the madrasah, and expositions of national musical instruments of Uzbekistan were exhibited (Kryukov, 1964, s 155), (Bulatova, Man'kovskaya, 1983, S 104).

By summarizing and analyzing a number of archival documents and scientific research data on this monument, the following stages can be distinguished in the study, repair and preservation of the monument:

1. the colonial years of 1886-1910;
2. the Soviet period of 1920-1991;
3. 1991-2022 years of independence.

2.1. The colonial years of 1886-1910.

A photograph taken in 1866 shows the pre-earthquake condition of the madrasah (Figure 3). In this photo:

- the main style of the madrasah and the portal are well preserved;
- the partial disappearance of the ornaments of the tympanum and shelves on the portal;
- the domes on the east and west classrooms of the main portal and
- the lanterns on top of the towers in the (guldasta) indicate that they have not been preserved.

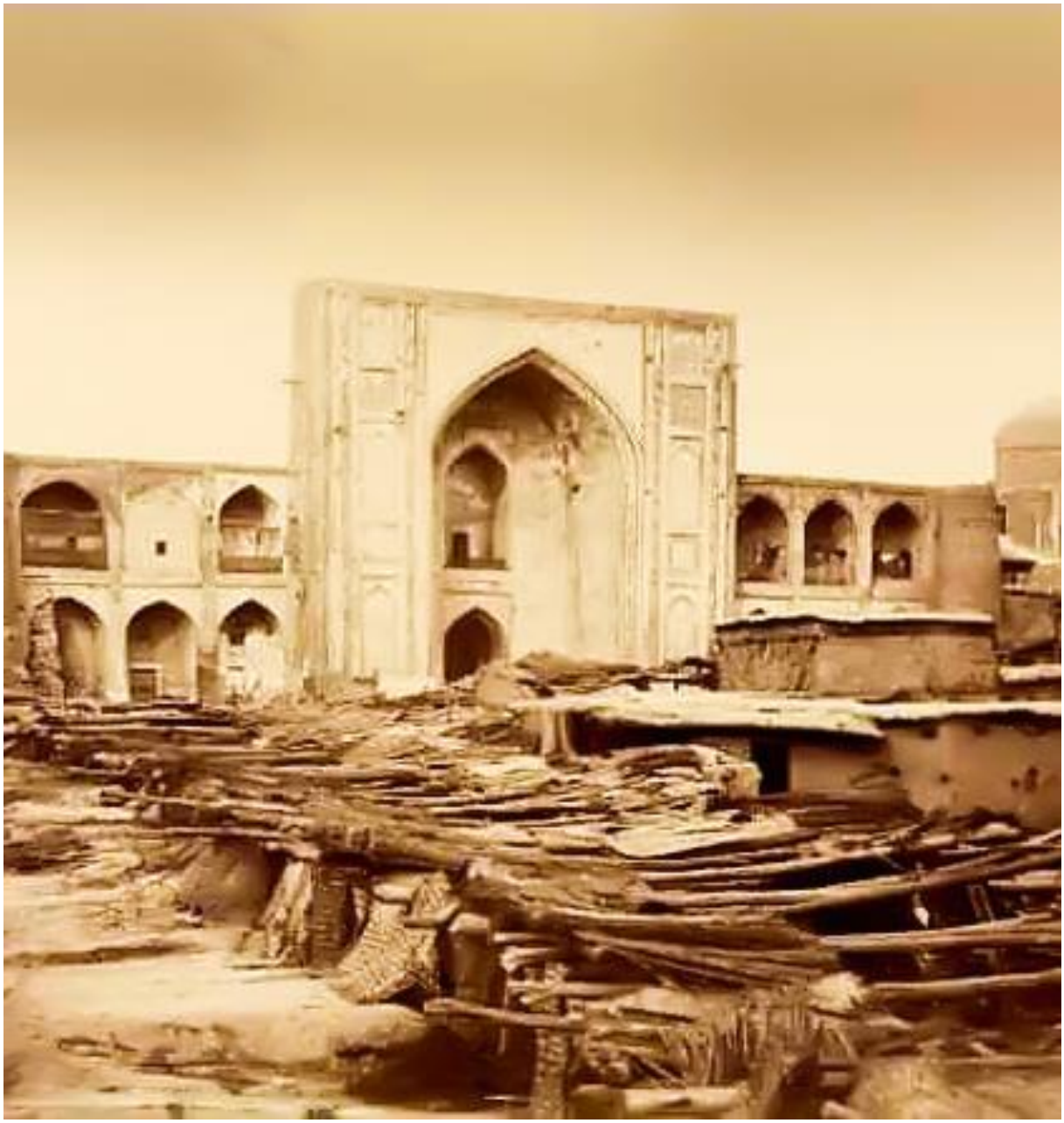


Figure 3. Kukeldash Madrasah, 1866. The pre-earthquake condition of the monument is reflected in the entire roof. (Arkhiv Glav NPU)

During the strong Tashkent earthquakes of 1868 and 1886, the main facade of the madrasah, the entrance to the portal collapsed and the second floor cells were damaged (Figure 4). Rectangular (26x13x6 cm) "Russian bricks" were used to repair the main facade, courtyard rooms and tympanums of the building.

Figure 4. Kukaltash Madrasah. General view. During the 1868 earthquake, the building portal collapsed and the madrasah collapsed (1868) (Archive of Glav NPU).

Then, in 1902-1910, major repairs were carried out (Figure 5): In 1903, the residents of Tashkent raised charitable funds for the repair of the madrasah; the remains of the main entrance portal columns of the building were studied and repaired; the cornices are finished; lanterns are mounted on top of the (guldasta); walls and roofs repaired; in some parts of the front facade of the building, the decorations have been preserved (Bulatova, Man'kovskaya, 1983, s 105). However, due to lack of funds, the repair of the entrance roof portal of the madrasah was not completed.

As a result of many earthquakes, improper repairs and economic downturns during this period, the original appearance of the building was completely changed.

Figure 5. Kukaltash Madrasah. Main facade after renovation (1902-1903) (Archive of Glav NPU).

2.2. The Soviet period of 1920-1991

Starting from 1935, the madrasah began to carry out scientific research: in 1935-1937, archeological research and Uzkomstaris restored the western facade of the building (Figure. 6) with old bricks; 1953-1954 (Arkhiv, № T1952/K-77); engineering research was carried out by engineers-designers of the special scientific-restoration production workshop (UzSSRPW – Uz. Special Scientific and Restoration Production Workshop); Engineers-geologists studied the pits dug under the walls of the madrasah and drew general conclusions (Arkhiv, № T1173/T-12).

The technical conclusion states that the cultural layer under the foundation of the building is not protected from water accumulation (Arkhiv, № T1174/T-12), there is a possibility of landslides near the western wall (guldasta), the general condition of the western wall can be dangerous and catastrophic.

The results of a number of engineering and technical studies studied on the surface of this monument have led to the use of the right techniques in the creation of future repair and protection zones.

Figure 6. Kukaltash Madrasah. Photo of the first half of the (20th century). Western facade of the madrasah (Archive of Glav NPU).

Figure 7. Kukaltash Madrasah. Western façade, 2022. (Photo by author).

Also, a number of studies conducted in 1954-1955 for the reconstruction of the main facade of the building provided a scientific basis for the project and the restoration of the monument. As a result, in 1956-1960, the repairman-architect K.S. Kryukov and engineer under the leadership of A.A. Asanov, a large-scale repair work was carried out.

Qualified restorers in repair work: A.A. Asanov, S.A. Patrikiev, R. Ibatov, A. Rakhmatov et al., they carried out the following research work (Bulatova, Man'kovskaya, 1983, s 104): engineering and geological research at the main entrance (facade) of the building (Arkhiv, № T1089/K-77, 1955); schematic plans of the location of the madrasah were drawn up; repairman-architect. Based on the data collected by K.S Kryukov, a project for the reconstruction of the southern facade of the building was developed (Figure 8); the presence of a monument (deformation), a serious attention is paid to the study of its deterioration and the improvement of the monument; In 1954-1955 the cracks of the southern facade of the monument, the base wall of the main facade were repaired: in 1955 the construction of the sofa was completed with the installation of a reinforced concrete staircase; In 1956, it was planned to complete the reconstruction of the main facade of the madrasah and the repair of the northern wall; the western facade of the building has been cleared of rubble and reconstruction work has been carried out, as well as the installation of modern equipment for the madrasa and the construction of department stores (Arkhiv, T1020/A-90, 1958).

The western facade of the building was studied in 1958 (Arkhiv, T2215/M-47, 1959) for engineering ideas for the reconstruction of the madrasa mosque and the drum and dome on the second floor; In 1961, the eastern walls of the madrasa were repaired.

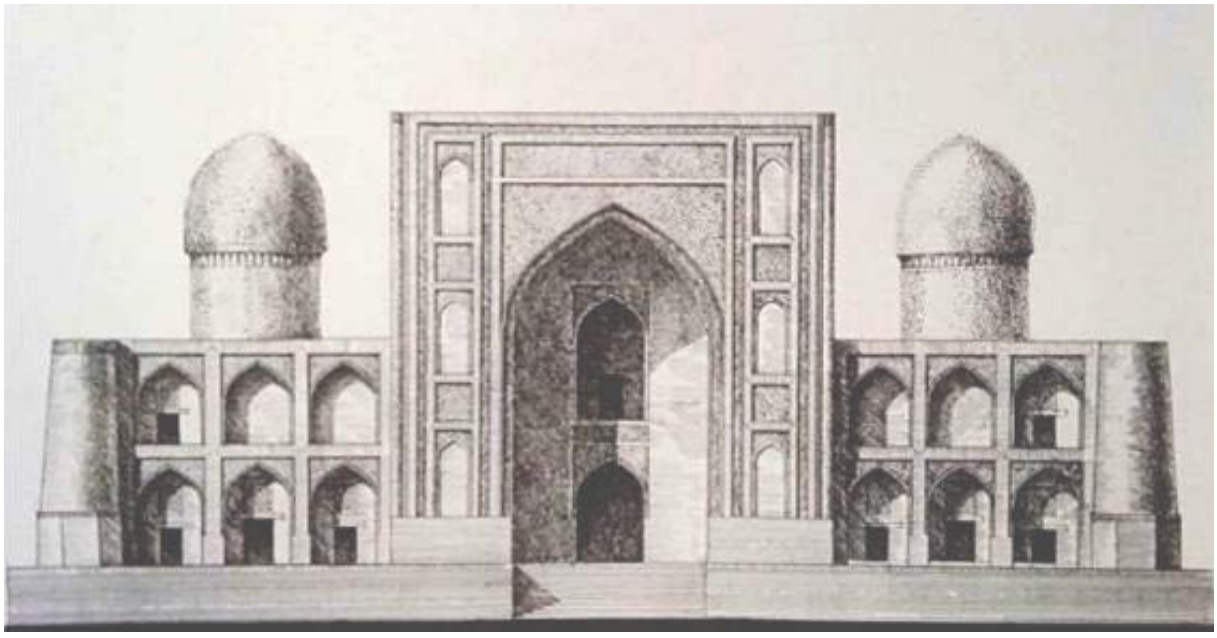


Figure 8. K.S. Reconstruction project of this madrasa, developed by Kryukov (Kryukov, 1956, Archive of Glav NPU).

In 1977-1987, a project was developed to restore the courtyard of the madrasah, the exterior facade, the dome of the classroom, the tympanum of the main portal: the project of repair of the madrasah was restored on the basis of archival documents and analogies (Kryukov, 1967 s 33).

However, the decorative domes have not been restored due to insufficient historical evidence.

During this period, radical changes were observed in the history of the repair of the madrasah.

The madrasah has become a hotbed of scientific research.

The renovation of the madrasah was carried out step by step by qualified specialists at a good level.

The main facade and entrance portal of the building have been renovated (Figure 9).

However, the tower - the (guldastas) and the rooms on the second floor of the building were left untouched.

Figure 9. Tashkent Kukaltash madrasah. Overview, photo 1980 (Bulatova, Man'kovskaya, 1983).

2.3. 1991-2022 years of independence

During the years of independence (1991-2022) through the efforts of Tashkent masters, the madrasah was completely restored and it was decided to return it to the status of a religious institution.

The second floor rooms and the high porch in the courtyard have been renovated.

In 2000, due to a burst water pipe on the eastern facade of the building, the foundation bricks of the madrasah were eroded.

Therefore, in 2002, the foundation of the madrasah was renovated. The tympanum and shelves on the entrance portal are intricately embroidered with geometric patterns - re-decorated with entrances, the embroidered ornaments of the portal book contain verses from the Qur'an (Figure 7), (Figure 10), (Figure 11).

Figure 10. Tashkent Kukaltash madrasah. Overview (2022) (Photo by author).

Figure 11. Tashkent Kukaltash madrasah. General view from the corner, 2022. (Photo by by author)

3. Conclusion and Evaluation

Research shows that the research work at the Kukaltash madrasah was carried out in stages, archeological, engineering-geological research, conservation and restoration work was carried out by qualified specialists in a timely manner during the twentieth century.

They testify to the skillful research carried out in the preservation of the monument and the use of the correct methods in the repair and creation of protection zones.

The results of this analysis allow for the following recommendations:

- conservation and restoration of the monument from time to time;
- ensuring the continuity of control and preservation of the monument;

In addition, given that today the historical monument serves as a religious institution, it is necessary to observe the following conditions:

- use the monument while preserving its architectural integrity and original decoration, adapting the monument to a new function without any changes;
- archaeological and historical research of the monument should always be carried out before and in conjunction with the restoration work;
- it is advisable to involve only qualified specialists in the repair work and
- to be carried out by a traditional master and master-restorers.

References

1. Bulatova V.A, Man'kovskaya L.Yu., Pamyatniki zodchestva Tashkenta. Tashkent, 1933. (Architectural monuments of Tashkent. Tashkent, 1983, s103-105).
2. Man'kovskaya L. YU. and Pulatov KH. SH., K izucheniyu arkhitekturnogo naslediya Tashkenta, 1972. (To the study of the architectural heritage of Tashkent SAU, № 6, Tashkent, 1972).
3. Kryukov K.S., Issledovaniye i restavratsiya medrese Kukel'dash v Tashkente. «Materialy i issledovaniya po istorii i restavratsii arkhitekturnykh pamyatnikov Uzbekistana», 1967. (Research and restoration of the Kukeldash Madrasah in Tashkent. "Materials and research on the history and restoration of architectural monuments of Uzbekistan". Tashkent, 1967, p. 33-42).
4. Kryukov K. S., Modul' v pamyatnikakh sredneaziatskogo zodchestva. «Arkhitekturnoye nasledstvo», Ташкент, № 17, 1964 (Module in the monuments of Central Asian architecture. "Architectural Heritage", 1964, p. 155-166).
5. Yusupova M. A., Medrese Bukhary XV-XVII vv.: formirovaniye i regional'nyye osobennosti arkhitektury. // Keruyen. № 4. Almaty, 2006, p. 91-98. (Madrasah of Bukhara of 15th -17th centuries: formation and regional features of architecture, 2006).
6. Akt tekhnicheskogo sostoyaniya i soobrazheniya s namechennym restavratsionnykh rabotakh po medrese Kukel'dash v g. Tashkente. Tashkent Arkhiv GlavNPU. № T1952/K-77, 1953.
7. Zaklyuchenie po shurfam medrese Kukeldash, Tashkent. Archive of Glav NPU. № T1173/T-12., 1954.
8. Zaklyucheniye po shurfam medrese Kukal'dash, Tashken. Archive of Glav NPU. № T1174/T-12, 1954.
9. Poyasnitel'naya Zapiska k proyektu rekonstruktsii glavnogo portala medrese Kukel'dasha v g. Tashkente, Tashkent.

Archive of Glav NPU. № T1089/K-77, 1955.

10. Zaklyucheniye po proyektu rekonstruktsii kupolov i monolitnogo zh/b perekrytiya medrese Kukel'dash v g.Tashkente, Tashkent. Archive of Glav NPU. T1020/A-90, 1958.
11. Inzhenernoye zaklyucheniye o rekonstruktsii barabana i kupola nad mechet'yu i 2-go etazha po vsemu peremetru medrese Kukel'dash v g.Tashkente. Komitet po okhrane pamyatnikov materil'noy kul'tury pri Sovetov Ministrov UzSSR. Restavratsionno-proyektnoye byuro. Tashkent. Archive of Glav NPU. T2215/M-47, 1959.
12. Kryukov K. S., Nauchnyy otchet medrese Kukel'dash v Tashkente. Spetsial'naya nauchno-restavratsionnaya proizvodstvennaya masterskaya. Tashkent. Archive of Glav NPU. № T1096 K-77, 1956.

SYMPOSIUM PHOTOGRAPHS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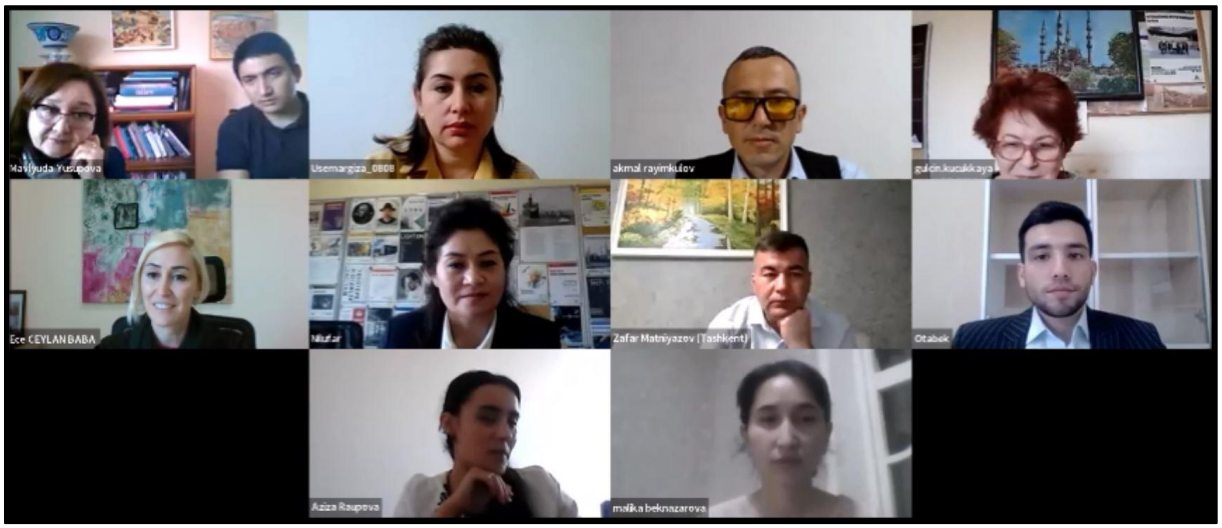
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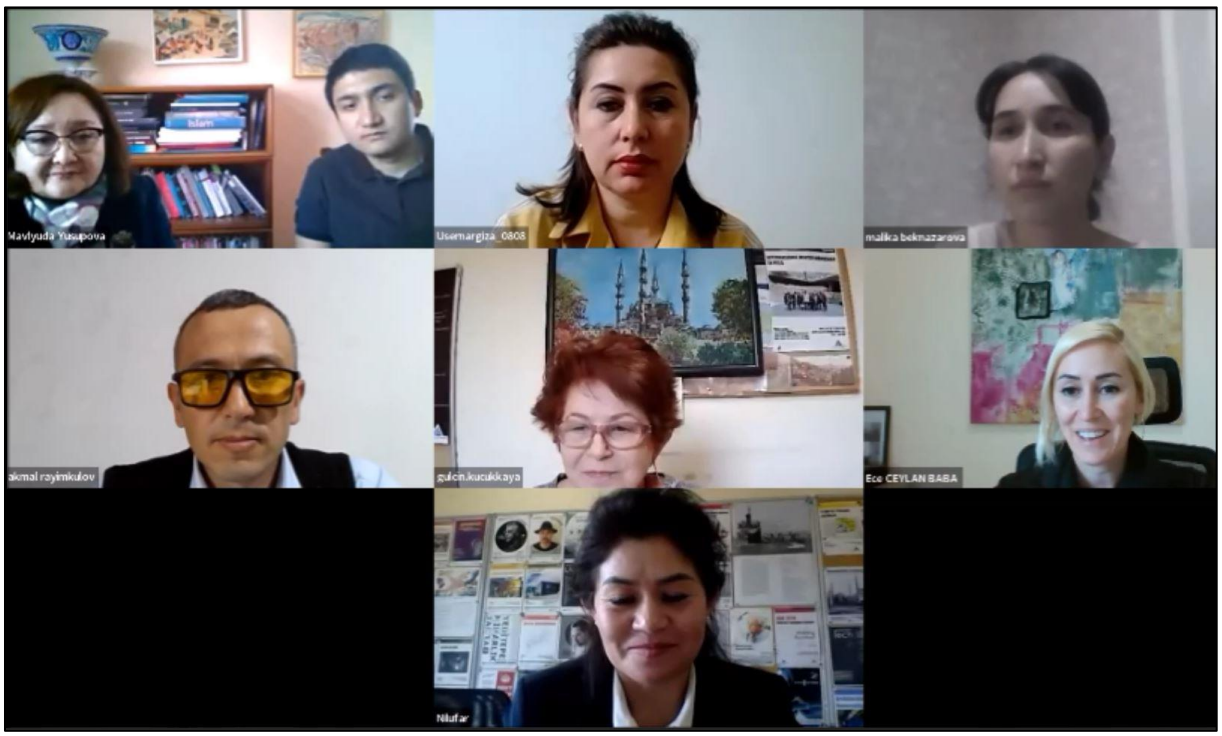
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